

Stereo Review's

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TAPE RECORDING & BUYING GUIDE 1979

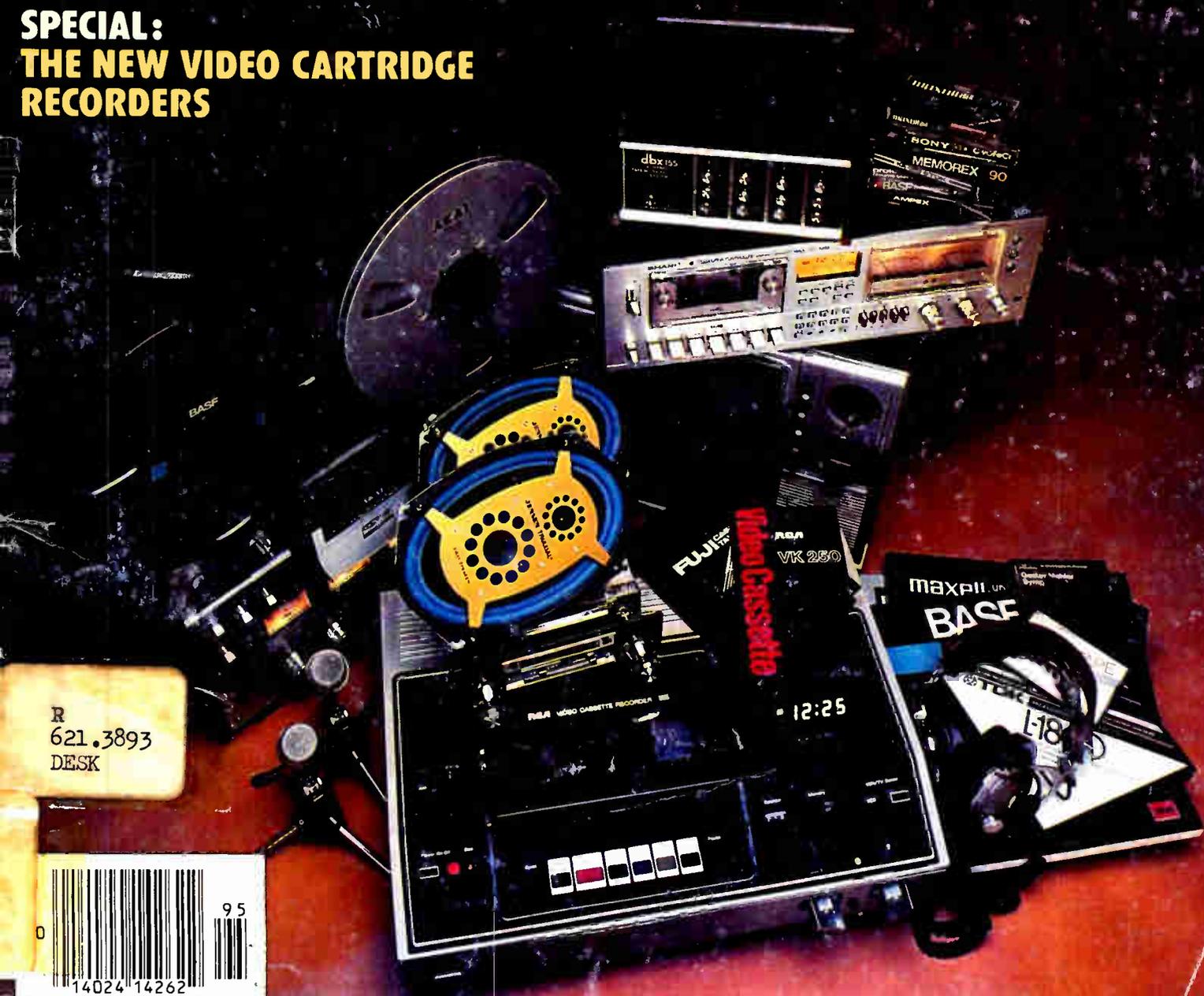
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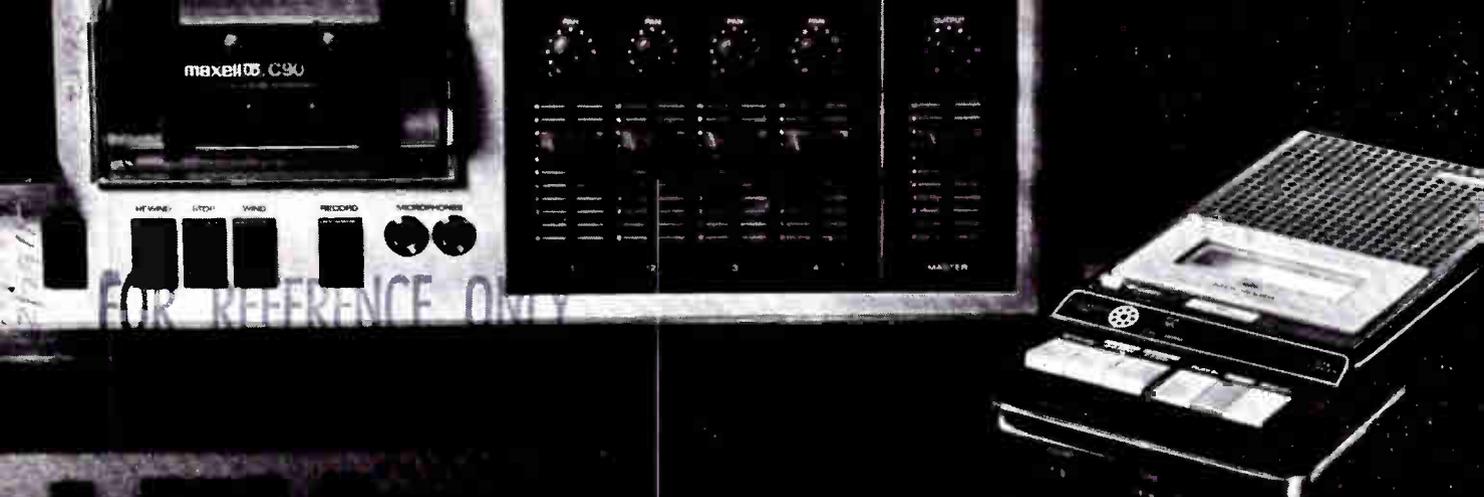
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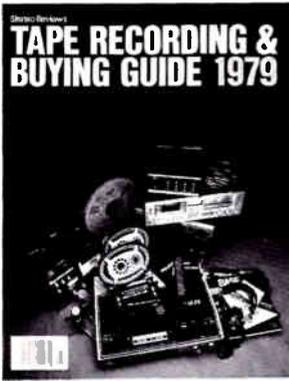
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TAPE RECORDING & BUYING GUIDE 1979

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TAPE TERMINOLOGY

ALC—See *Automatic Level Control*

Alignment—Most commonly, *Head Alignment*, but also used to describe the process of adjusting a recorder's *Bias* and *Equalization* for optimum results from a specific tape.

ANRS, Super ANRS—A noise reduction system used by JVC. ANRS operates on principles similar to those used by the *Dolby system*. Therefore, there is a degree of compatibility between recordings made with either system.

Automatic Level Control (ALC)—A circuit which automatically maintains recording level within permissible limits, so that, no matter how loud or soft the sound being recorded, the signal on the tape will not get strong enough to

overmodulate and distort or soft enough to be lost in noise. Also known as *Automatic Volume Control (AVC)*.

Automatic Reverse—The ability of some four-track stereo tape recorders to play the second pair of stereo tracks automatically (in the reverse direction) without the necessity for interchanging the empty and full reels after the first pair of stereo tracks is played. (See also *Four-Track Recording*)

Automatic Shut-Off—A device (usually a mechanical switch) incorporated into most tape recorders that automatically stops the machine when the tape runs out or breaks.

AVC—Automatic Volume Control—See *Automatic Level Control*.

Azimuth—The angle of a tape head's recording gap relative to the tape.

Azimuth Adjustment—See *Head Alignment*.

Azimuth Loss—High-frequency losses caused by head mis-alignment.

Bias—A constant magnetic field applied to the tape (usually by a high-frequency oscillation of 50–100,000 Hz or more) to minimize distortion and noise and increase frequency response and efficiency in recording. Since every tape formulation has slightly different bias requirements (too much bias cuts high frequency response, while too little increases distortion), modern recorders frequently allow bias to be changed by the user. Some inexpensive



recorders use DC bias instead of a high-frequency; the results are inferior.

Bidirectional—(1) in open-reel or cassette recorders, the ability to play (and, in some cases, record) both stereo track pairs on a tape by reversing the tape's direction of motion without removing and replacing the tape reels or cassette. (2) In microphones, a *Figure-Eight* pick-up pattern.

Blast Filter—A dense mesh screen on a microphone, which minimizes overload caused by loud, close sounds.

Boom—An overhanging arm attached to a microphone stand.

Bulk Eraser—A device used to erase an entire tape at one time. Bulk erasers are usually more effective than recorders' erase heads.

Capstan—The driven spindle or shaft in a tape recorder—sometimes the motor shaft itself—which rotates against the tape (which is backed up by a rubber pressure or pinch roller), pulling it through the machine at constant speed during recording and playback modes of operation. The rotational speed and circumference of the capstan determine tape speed.

Cardioid—The quasi-heart-shaped sensitivity pattern of most uni-directional microphones. Hyper-cardioid and Super-cardioid microphones have basically similar patterns, but with longer, narrower areas of sensitivity at the front, and slightly increased rear sensitivity.

Cartridge—A plastic container that holds tape for easy loading into a matching recorder or player. The term most commonly refers to the *Eight-track Cartridge*.

Cassette—A tape cartridge in which tape passes from one hub to another. Most commonly applied to the *Compact Cassette* developed by Philips, but also to the newer *Elcaset* and a variety of new *Micro* and *Mini Cassette* systems which are not compatible with *Compact Cassette* or with each other.

Condenser Microphone—See *Piezoelectric Microphone*.

Channel—An independent signal path. Stereo recorders have two such channels; quadraphonic ones have four.

Mixers generally have a large number of input channels which can be mixed down into a smaller number of output channels.

Chromium Dioxide (CrO₂)—A magnetic material used on some premium tapes.

Closed-loop drive—A tape transport mechanism in which the tape's speed and tension are controlled by contact with a capstan at each end of the head assembly.

Compact Cassette—A small (4 x 2½ x ½ inch) tape cartridge developed by Philips, containing tape about 1/7 inch wide, running at 1-7/8 ips. Recordings are bi-directional, with both stereo tracks adjacent for compatibility with monophonic cassette recorders, whose heads scan both stereo tracks at once.

Condenser Microphone—A microphone whose capacitance varies with sound pressure; electronic circuits within the microphone convert this change in capacitance to a varying voltage signal. Condenser microphones, unlike other types, require a battery or other power source.

Counter—A numerical tape-position indicator used to help locate recorded material. Also called digital counter or index counter.

CrO₂—See *Chromium Dioxide*.

Crossfield Recording—A system in which the *Bias* is not applied to the tape by the recording head, but by a separate head on the tape's backing side, so that the bias signal will not partially erase high frequencies as they are being recorded.

Crosstalk—Undesired signal-leakage from one sound channel or track to another. Opposite of *Separation*.

Cue Control—A switch which temporarily disables a recorder's *Tape Lifters* during fast-forward and rewind, so the operator can judge what portion of the recording is passing the heads.

Decibel—Abbreviated "dB" or "db," it is a relative measure of signal or sound intensity or "volume." It expresses the ratio of one intensity to another. One dB is about the smallest change in sound volume that the human ear can detect. (Can also express voltage and power ratios logarithmically.)

Deck, Tape—A tape recorder designed specifically for use in a high-fidelity music system. It usually consists only of the tape-transport mechanism and preamplifiers for recording and playback. It does not include power amplifiers or speakers.

Degausser—Demagnetizer. See *Bulk Eraser* and *Head Demagnetizer*.

DIN Jack—A system of multi-pin jacks and plugs allowing several connections to be made at once. Named after the German Institute for Standards (DIN).

Directional Microphone—One whose sensitivity to sound varies with direction. Such microphones can be aimed so their most sensitive sides face the sound source, while their least sensitive sides face sources of noise or other undesired sound. See *Cardioid*, *Figure Eight*.

Dolby—An electronic device or circuit that reduces the amount of noise (principally tape hiss) introduced during the recording process. It does this by boosting—in carefully controlled amounts—the strength of weak signals before they are recorded. During playback the signals (and the noise) are cut back by an exactly equivalent amount. The original dynamics are thus restored, but the noise is reduced by 10 to 15 dB. At one time found only in recording studios, simplified Dolby circuits designed especially for home tape recording are now available to the audiophile as accessories or built into tape machines.

Dropout—The momentary loss of a recorded signal resulting from imperfections in the tape. These may take the form of non-magnetic foreign particles imbedded in and flush with the tape's surface but are most commonly high spots or dirt on the tape surface that push the tape away from the magnetic head, thereby increasing the area affected (the "umbrella" effect).

Dual Capstan—See *Closed Loop*.

Dub—To copy another recording, or the copy so made.

Dynamic Microphone—Strictly speaking, any microphone that generates a signal by the motion of a conductor (*Moving-coil* or *Ribbon*) within a magnetic field; but most often used to describe the moving-coil type. *Impedance* and output are generally lower

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than those of *piezoelectric* (ceramic or crystal) microphones. Low impedance permits the use of longer connecting cables without high-frequency loss or hum pickup.

Eight-Track—Most commonly, a cartridge tape system having eight narrow tracks on ¼-inch tape wound in a continuous loop around a single hub.

Elcaset—A new tape system using a cassette similar in plan to the *Compact Cassette*, but holding ¼-inch tape running at 3-¾ inches per second; the tape is looped out of the cassette to reach the heads and capstan during recording and playback. (In other cassette systems, the heads contact the tape through windows in the cassette shell.)

Equalization—The selective amplification or attenuation of certain frequencies. Also refers to recognized industry standards for recording and reproducing “characteristics” (such as the NAB Standard), the proper use of which can assure uniform reproduction of prerecorded tapes and improvement of a system’s signal-to-noise ratio.

Erase—The neutralization of the magnetic pattern on tape by use of a strong magnetic field, thereby removing the recorded sound from the tape. During recording, the erase head on a recorder automatically removes any sound previously recorded on the tape just before the tape reaches the record head. (See also *Bulk Eraser*).

Fast Forward—The provision on a tape recorder permitting tape to be run rapidly through it in normal play direction, usually for search or selection purposes.

Feed Reel—Also called “stock,” “supply,” or “storage” reel. The reel on a tape recorder from which the tape is taken as the machine records plays.

Figure-8 Microphone—A microphone, (usually a *Ribbon* type), whose sensitivity is greatest to front and rear and weakest to both sides. The directional pattern is narrower than that of a *Cardioid*.

Flutter—Very short, rapid variation in tape speed, causing pitch and volume variations that were not present in the original sound. A form of distortion

Four-Channel Sound—Stereo produced by four loudspeakers, each being fed a different signal. At present four-channel tape machines are equipped with special heads and electronics that enable them to play back—and sometimes record—four tracks at a time.

Four-Track or Quarter-Track Recording—The arrangement by which four different channels of sound may be recorded on quarter-inch-wide audio tape. These may be recorded as four separate and distinct tracks (monophonic) or two related (stereo) pairs of tracks. By convention, tracks 1 and 3 are recorded in the “forward” direction of a given reel, and tracks 2 and 4 are recorded in the “reverse” direction. (See also *Four-Channel Sound*).

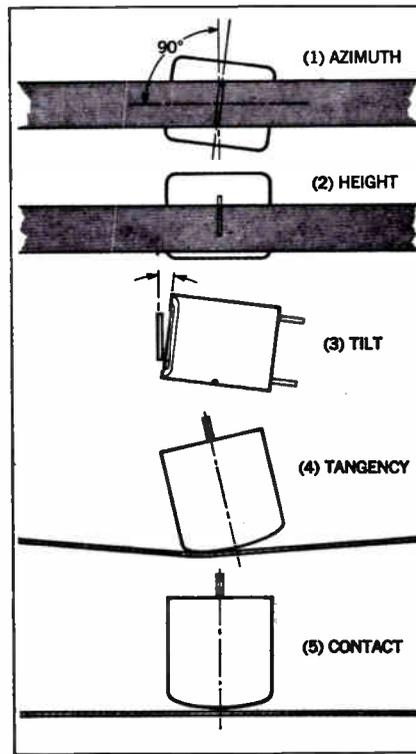
Frequency—The repetition rate of cyclic energy, such as sound or alternating electrical current, expressed in cycles per second (hertz or Hz) or thousands of cycles per second (kilohertz or kHz). By convention, “bass” frequencies in music extend from about 20 to about 200 Hz. “Treble” sounds are at the high-frequency extreme of the sound spectrum and may extend from 2 or 3 kHz to the frequency limit of audibility (about 18 to 20 kHz). “Middle” (or mid-range) frequencies occupy the remainder of the spectrum, from 200 Hz to about 3 kHz.

Frequency Range—The span between the highest and lowest pitched sounds that a tape recorder or other sound-system component can reproduce at a usable output or volume level.

Frequency Response—Always specified as a range, such as 50 to 15,000 Hz; in order to be meaningful it must be either defined in terms of decibel variation from absolute flatness over a specified frequency range (e.g., ± 3 dB in 50 to 15,000 Hz). An indication of a sound system's ability to reproduce audible frequencies supplied to it, maintaining the original balance among low, middle (or mid-range), and high frequencies.

Front-back ratio—The ratio between a cardioid microphone's sensitivity to sounds arriving from the front and from the rear, a measure of its directionality.

Full-track recording—Recording monophonically on one track whose width is essentially the same as the tape's.



Various tape-head adjustments.

Gain—The voltage ratio of the output level to the input level for a system or component of a system. Usually expressed in decibels.

Gap—The effective distance between opposite poles of a magnetic head, measured in microinches or microns. Especially critical for playback heads, in which gaps must be narrow in order to resolve (reproduce) high-frequency (short wave-length) signals. Recording heads generally have wider gaps than reproducing heads.

Harmonic Distortion — Distortion characterized by the appearance in the output signal of spurious harmonics of the fundamental frequency. Usually expressed as a percentage of the output signal, and abbreviated HD or THD.

Head—In a magnetic recorder, the generally ring-shaped electro-magnet across which the tape is drawn. Depending on its function, it either: (a) erases a previous recording, (b) converts an electrical signal to a corresponding magnetic pattern and records it on the tape, or (c) picks up a magnetic pattern already on the tape and converts it to an electrical playback signal. Two-head recorders, such as most cassette recorders, have a separate erase head, but combine the record and play functions in a single unit. Three-head machines have separate heads for erase, record and playback. Four-head

machines may have, in addition, an extra playback head for use with a different track format than that which the machine records on the tape, or a separate, *Crossfield* head to carry recording bias only. See also *Monitor Head*.

Head Alignment—Includes all mechanical adjustments necessary to assure proper spatial relationships between the head gaps and the tape—or, more specifically, a properly recorded tape track. It may be separated into five attributes describing correct head attitude. See Fig. 1.

Head Demagnetizer or Degausser—A device used to neutralize possible residual or induced magnetism in heads or tape guides. Unless the recorder has an automatic head-demagnetizing circuit and non-magnetic tape guides, periodic use of a head demagnetizer may be necessary to avoid addition of hiss noise to, or even partial erasure of, pre-recorded tapes.

Hz—The standard abbreviation for Hertz, the unit of frequency, amounting to one complete waveform cycle per second.

IC—Integrated Circuit, a small device incorporating the equivalent of hundreds or thousands of transistors, capacitors, resistors and other components within a small, solid block. IC's are widely used to reduce the cost and increase the reliability of complex circuitry.

Impedance—The resistance to the flow of alternating current in an electrical circuit, generally categorized as either “high” or “low,” but sometimes given in ohms or millions of ohms (megohms). Commonly used to rate electrical input or output characteristics of components so that proper “match” can be made when interconnecting two or more devices (such as a microphone, tape recorder, and loudspeaker). Power loss or frequency discrimination can result from a “mismatch” of impedances between two units. Abbreviated as “Z.”

Input—The terminals, jack, or receptacle provided for the introduction of the electrical input signal voltage into an amplifier or other electronic component.

Input Signal—An electrical voltage embodying the audio information that is presented to the input of an amplifier.

er, tape recorder, or other electronic component.

Intermodulation Distortion (IM)—Distortion that results when two or more pure tones produce new tones with frequencies representing the sums and differences of the original tones and their harmonics.

ips—Abbreviation for tape speed (inches per second).

Jack—Receptacle for a plug connector leading to the input or output circuit of a tape recorder or other piece of equipment. A jack matches a specific plug.

kHz—Abbreviation for kilohertz, or one thousand cycles per second. For example, 19 kHz equals 19,000 Hz.

Lavalier—A microphone designed to be worn around the performer's neck.

Leader—Special non-magnetic tape that can be spliced to either end of a magnetic tape to prevent damage and possible loss of recorded material, and to indicate visually where the recorded portion of the tape begins and ends.

Low-Noise Tape—Magnetic tape with a signal-to-noise ratio 3 to 5 dB better than conventional tapes, making it possible to record sound (especially wide-frequency-range music) at reduced tape speeds without incurring objectionable background noise (hiss) and with little compromise of fidelity. Additional characteristics of most low-noise tapes include extremely good high-frequency sensitivity and a heavy-duty binder system for reduced ruboff of magnetic oxide and an increase in wear life over ordinary tapes.

Low-Print Tape—Special magnetic recording tape significantly less susceptible to print-through (the transfer of signal from one layer of tape to another), which results when tape is stored for long periods of time. These tapes are especially useful for "master recording" (making an original recording from which copies will be made) on professional-quality equipment.

Memory Counter (or Rewind)—A system which allows the tape to be rewound automatically to any predetermined point on the tape.

Micro-Cassette—A miniature cassette system originated by Olympus and so far adopted mainly by Japanese manufacturers, allowing 30 minutes of re-

ording per side on a capstan-driven tape, 1/7-inch wide, running at 15/16 ips.

Mini Cassette—A miniature cassette system originated by Philips, allowing 15 minutes of recording per side on a narrow tape. The tape is not driven by a capstan, but by the take-up spindle; hence, tape speed is not constant, but increases as the amount of tape on the take-up hub grows.

Mixer—An audio control unit whose basic function is to combine two or more audio signals into a single, composite signal. Mixers typically have separate level controls for each of their input channels, and often level controls for their combined output channels as well.

Modulation—The imposing of a signal on some type of transmission or storage medium, such as a radio carrier or magnetic tape.

Monitor Head—A separate playback head on some tape recorders that makes it possible to listen to the material on the tape an instant after it has been recorded, and while the recording is still in progress. On some cassette decks with monitor capability, the monitor "head" is not completely separate, but is built into the same shell as the record head.

Mono, Monophonic—Single-channel sound.

Motion-Sensing—A type of tape transport in which certain actions which could break or spill the tape are prevented or delayed until the instant the tape has come to a stop or reached a speed which allows the action to take place safely.

Moving-Coil—A microphone whose generating element is a coil which moves within a magnetic gap in response to sound pressure on the diaphragm attached to it, rather like a small loudspeaker in reverse. The most common type of *Dynamic Microphone*, and the one most often referred to by that name.

MPX Filter, Multiplex Filter—Circuits to remove 19kHz tones from a signal to be recorded, in order to prevent audible interference between the tape recorder's bias signal and the 19kHz pilot tone in the output signal from a stereo FM tuner or receiver. Some receivers

and tuners have such filters built in, too.

Mylar—Dupont's trademark for Polyester.

NAB Curves, NAB Equalization—Standard tape playback equalization curves for various tape speeds, developed by the National Association of Broadcasters.

NAB Reel, NAB Hub—Reels and hubs used in professional recording, having a large center-hole, and usually an outer diameter of 10½ inches.

Noise—Unwanted electrical signals produced by electronic equipment, and rough or non-homogeneous oxide coatings on magnetic tape. Mostly confined to the extremes of the audible frequency spectrum where it occurs as hum and/or hiss, it may be reduced by good machine and tape design. (See also *Low-Noise Tape*)

Noise, Weighted—The noise measured within the audio frequency band using a measuring instrument that has a frequency-selective characteristic. The frequency sensitivity of the instrument is adjusted to correspond to that of the average human hearing response.

Omnidirectional—A microphone type that picks up sound relatively evenly from all directions (in practice, nearly all microphones become at least somewhat directional at higher frequencies.)

Output (or Max. Output Level)—The useful signal delivered by a recorder using a particular type of tape, usually at an arbitrarily fixed level of harmonic distortion (1 or 3 per cent) and relative to the performance of a tape with standard characteristics.

Oxide—The magnetic particles which, when properly dispersed in a plastic binder and coated on a backing or base, form the magnetic portion of magnetic tape.

Pause Control—A feature of some tape recorders that makes it possible to stop the movement of tape temporarily without switching the machine from "play" or "record."

Peak Indicator—An indicator, usually of the flashing-light type, showing when transient signal levels exceed a recorder's ability to handle them without distortion. Such indicators are of-

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ten used to supplement *Recording-Level Meters*, which usually indicate average signal levels.

Peak-Reading meter—A type of *Recording-Level Meter* whose needle rises quickly and falls back at moderate speed, permitting the operator to judge the levels of transient peak waveforms.

Piezoelectric microphone—A microphone whose generating element is a crystal or ceramic element, which generates a voltage when bent or stressed; such microphones tend to have lower cost, higher output, more limited frequency response and higher impedance than *Dynamic* microphones. Of the two main piezoelectric types, ceramic microphones are more rugged than crystal ones.

Pinch roller—A rubber or neoprene wheel which presses the tape against the capstan during recording or play, which in turn provides sufficient traction for the capstan to move the tape. Sometimes called an "idler wheel."

Pitch Control—A circuit which permits the speed of a tape transport's motor to be varied slightly. It is used to raise and lower the musical pitch of the recording being played (hence the name), or to slightly lengthen or shorten playing time.

Playback—The reproduction of sound previously recorded on a tape. The opposite of *record*.

Playback Head—Magnetic head used to pick up a signal from a tape. Often the same head as is used for recording, but with its circuits changed by means of a record/play switch which also energizes the erase head. (See also *Head*)

Polyester Base—A plastic-film backing for magnetic tape used for special purposes where strength and resistance to temperature and humidity change are important. (Mylar is a du Pont trade name for their brand of polyester.)

Pop Filter—See *Blast Filter*.

Portable Recorder—A battery-powered recorder requiring no external power for operation (though usually equipped to accept external power when available).

Prerecorded Tape—Tape recordings that are commercially available and generally embody the same material

that is available on phonograph records.

Pressure Pad—A device that forces tape into intimate contact with the head gap, usually by direct pressure at the head assembly. Felt or similar material, occasionally protected with self-lubricating plastic, is used to apply pressure uniformly and with a minimum of drag on the backing (non-coated) side of the tape.

Print-Through—Undesired transfer of magnetic pattern from layer to layer of tape on a reel. In many cases, will make recording unusable.

Program Selector—Control which switches an 8-track recorder from one set of tracks to another.

Pulse-Code Modulation (PCM)—A type of digital recording.

Punch-in Recording—A record button which may be actuated at any time, even when the tape is already moving. This allows the operator to listen to and add to a recording by listening to the tape to find just where the new recorded material should begin, and start recording there. It also, unlike the interlocked record and play controls typical of home machines, makes it easy to accidentally erase a previously-recorded tape.

Q8—A quadraphonic 8-track tape cartridge.

Quadraphonic—See *Four-Channel*.

Quarter-Track—See *Four-Track*.

Raw Tape—A term sometimes used to describe tape that has not been used for recording. Also called "virgin" or "blank."

Recorder—A tape machine consisting of a transport, playback and recording electronics, and an amplifier and speaker, as opposed to a *Deck*, which lacks amplifier and speaker. Also used to distinguish a tape machine (which can record) from a player (which cannot).

Recording-Level Meter—An indicator on a tape recorder that provides some idea of the signal-levels being applied to the tape from moment to moment. It is intended as an aid in setting the recording levels to ensure that the tape is neither overloaded with excessive levels or "under-recorded" with too little

signal, allowing hiss and other noise to intrude. Recording-level meters come in a variety of types, including meters that register the approximate *average* value of the signal (of which the professional *VU Meter* is an example), those designed to show the instantaneous *peak* levels of the signal, and some not readily classifiable into any group.

Rewind Control—A button or lever for rapidly rewinding tape from the takeup to the supply reel (or hub, in cassette recorders). Not found in 8-track, or other continuous-loop cartridge recorders.

Ribbon Microphone—A type of *Dynamic Microphone* whose generating element is a light, metallic ribbon which is moved directly by sound pressure within a magnetic field.

S/N—See *Signal-to-Noise Ratio*.

Saturation—The condition reached in magnetic tape recording where output does not increase with increased input, and hence distortion increases significantly. Useful for defining reference output levels, since it is independent of bias current.

Sensitivity—A measure of relative output for a given input of a tape, microphone, or electronic component.

Separation—The degree to which two stereo signals are kept apart. Stereo realism depends on the successful prevention of their mixture in all parts of a hi-fi or tape system. Opposite of *Crosstalk*.

Signal-to-Noise Ratio—The voltage ratio, usually expressed in decibels, between the loudest undistorted tone recorded and reproduced by the recorder and the noise reproduced when the audio signal is reduced to zero.

Single-Point Stereo Microphone—A housing containing two, usually directional, microphones angled so that each picks up sound from one side of the stereo field, with both picking up sounds from the middle.

Sound-on-Sound—A method by which material previously recorded on one track of a tape may be re-recorded on another track while simultaneously adding new material to it.

Source/Tape Switch—A control found on control amplifiers with tape monitor

jacks, and on recorders with *Monitor Heads*; allows comparison of the signal being fed to the tape (Source) with the signal just recorded.

Splice—A physical join made between two pieces of tape.

Splicer—A device, similar to a film splicer, for splicing magnetic tape automatically or semi-automatically.

Splicing Block—A type of splicer in the form of a metal or plastic device incorporating a groove which holds the tape ends to be spliced, crossed by additional diagonal and straight grooves providing paths for a razor blade to follow in cutting the tape.

Splicing Tape—A special pressure-sensitive, non-magnetic tape used for joining two lengths of magnetic tape. Its "hard" adhesive will not ooze, and consequently will not gum up the heads or cause adjacent layers of tape on the reel to stick together.

Squeal—The audible noise caused by alternate sticking and release of tape. It may occur at heads, pressure pads, or guides where friction develops with the face or back side of a magnetic tape. It is largely eliminated by regular cleaning of suspected surfaces and by using a tape employing a built-in dry silicone lubricant.

Stereophonic, Stereo—Using two or more channels to create a spatial effect. Strictly speaking, quadrasonic sound is therefore a form of stereo. But the term "stereo" is commonly used to distinguish a two-channel recording from a four-channel, quadrasonic one, as well as from a single-channel monophonic one.

Stroboscope—A pattern of markings on a moving or rotating part which appear, under the rapid flickering of an a.c.-powered neon light, to stand still when the part is moving at its correct speed.

Supercardioid—See *Cardioid*.

Synch, Sync—The maintenance of correct time relationships between events. Examples in recording include synchronization of sound and film for motion-picture use, synchronization of a slide-changing projector with a tape by means of signals recorded on the tape, and "Selective Synchronization," or "Sel-Sync" as it was original-

ly named by Ampex, used to synchronize several tracks when they are recorded one at a time.

Takeup Reel—The reel on the tape recorder that accumulates the tape as it is recorded or played.

Tape Guides—Grooved pins or rollers mounted between and at both sides of the tapehead assembly to position the magnetic tape correctly on the head as it is being recorded or played.

Tape Lifters—A system of movable guides that automatically prevents the tape from contacting the recorder's heads during fast forward or rewind modes of operation, thus preventing head wear.

Tape Loop—A length of magnetic tape with the ends joined together to form an endless loop. Used either on standard recorders, special "message-repeater" type units, or in four- or eight-track cartridge devices, it makes possible the repetitive playback of a recording without rewinding the tape.

Tape Monitoring—See *Monitor Head*.

Tape Player—A unit that is not capable of recording and is used only for playing prerecorded tapes.

Tape Speed—The speed at which tape moves past the head in recording or playback modes. Standard tape speed for home use is $7\frac{1}{2}$ ips or half that speed ($3\frac{3}{4}$ ips). Speeds of $1\frac{1}{8}$ and $15/16$ ips are found on some machines, but on reel-to-reel recorders are usually suitable only for non-critical voice recording. Some cartridge machines, using special tape and circuits, achieve very good results at the slow speeds. Professional recording speed (for making original master tapes of music, for example) is usually 15 ips and sometimes higher. Higher tape speeds increase fidelity and simplify editing (the sounds to be edited are spaced farther apart), but increase tape consumption and hence cost.

Tape Splicer—See *Splicer*.

THD—See *Harmonic Distortion*.

Three-Head—See *Head*.

Three-Motor—Having separate motors for the capstan and each of the two reel motors. This simplifies the mechanical design of a recorder, with some in-

crease in reliability, but increases its cost as well.

Track—The path on the magnetic tape along which a single channel of sound is recorded.

Transport—The platform or deck of a tape recorder on which the motor (or motors), reels, heads, and controls are mounted. It includes those parts of the recorder other than the amplifier, preamplifier, loudspeaker, and case.

Tuchel Connector—Brand-name of a manufacturer of *DIN plugs*.

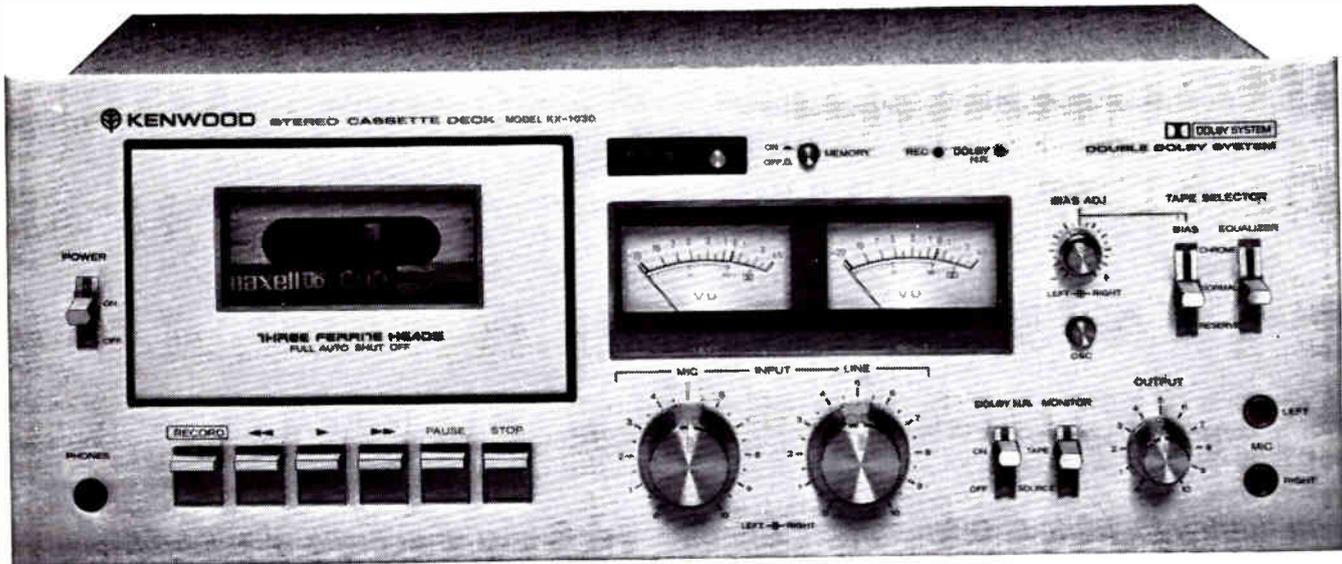
Two-Track Recording—On quarter-inch-wide tape, the arrangement by which only two channels of sound may be recorded, either as a stereo pair in one direction or as separate monophonic tracks (usually in opposite directions).

VU Meter—A type of *Recording Level Indicator* which shows average signal levels in decibels relative to a fixed (0-dB reference level (and, often, in percent of maximum recommended modulation). While the term is frequently used for any level meter using this scale, it applies most strictly to meters having a specified, standard degree of damping; it is widely used in professional equipment in the United States, because the standardized damping allows the operator familiar with one VU meter to closely judge signal levels on any other true VU meter.

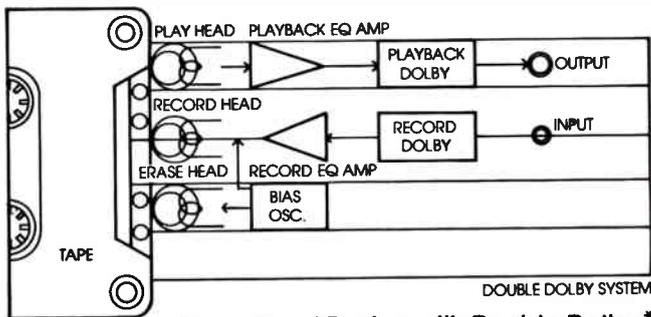
Wave Length—In tape recording (and referring specifically to the tape magnetization created by pure single-tone recording), the shortest physical distance between two peaks of the same magnetic polarity; also, when expressed in mils, the ratio of tape speed (in ips) to recorded frequency (in kilohertz).

Wow—A form of distortion in sound-reproducing systems caused by relatively slow, periodic variations in the speed of the medium (such as tape), and characterized by its effect on pitch. Rapid variations are known as *flutter*.

Wrap—The length of the tape's path along which tape and head are in intimate physical contact. Sometimes measured as the angle of arrival and departure of the tape with respect to the head. A "good wrap" means a good tape-to-head-gap relationship. (See also *Head Alignment*) □



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CASSETTE DECKS

Once you know what technical specifications and operating features are available within each price class, half the buying job is over

By Ivan Berger

ONCE you've decided that a cassette deck is what you want to buy, the easy part is over. What you have to do now is buckle down and study the features and specifications of all the available units and figure out what they mean in terms of your personal performance needs. And once you've done *that*, you need to determine which of those operating features and technical specifications are available in each price range and try to arrive at a relatively painless compromise (if compromise you must) between the performance you want and the price you can pay.

If all that sounds a bit too much like work, rest easy: we have already done much of the required research and are about to offer you a series of synopses of what is available in each price class. When you know just what you get—or don't get—at a given price, you'll be able to decide whether it would be better to pay a little more and step up a notch or two, or to lower your sights a bit and perhaps spend the difference on tapes or microphones.

Under \$160

Cassette decks bearing price tags of \$160 and under tend to have few special features and to be somewhat skimpy in technical performance as well. You can usually expect wow and flutter figures (weighted) of about 0.1 to 0.25 per cent. This is good enough to keep the music from wavering or gargling audibly—unless you are particularly sensitive to such effects. Listen to a recording of a piano, harp, or acoustic guitar on the unit to determine if the wow and flutter is low enough for your ears. Dolby noise reduction is fairly standard even at these prices—but even *with* Dolby noise reduction, neither frequency response (typically specified at about 50 to 13,000 Hz, with no statement as to flatness) nor signal-to-noise ratio (about 55 dB with Dolby) is equal to that provided by the better FM tuners. What that means in practice is that if you compare your recordings directly with the FM broadcasts or records you tape, you'll hear a noticeable (though not always *very* noticeable) difference. But, in any case, *most* listeners find the performance at this price level perfectly acceptable.

You will find a few extras, even here, if you look around a bit. *Servomotor speed control* is fairly common, and several models have a *peak-limiter switch*. (Limiters let you record at a higher average level without worrying that sudden transient peaks will overload the tape or heads and cause distortion. Since the higher noise levels of low-cost decks force you to record at higher average levels, such a feature can be quite useful.)

At the very bottom of this price range, Lafayette's \$75 RK-715 omits even microphone inputs—but that's not as serious as it appears. Many users of even more expensive decks seldom make live recordings, but just tape off the air, from records, or from other tape decks. Advent, in fact, omits mike inputs from its \$400 201A deck for just that reason (though low-noise microphone preamplifiers are available for it separately, at \$40, if you need them).

Around \$200

At this level, \pm \$25 or so, you'll find both improved performance and a few more features. In addition to peak limiters (or in place of them) there will often be *peak-level indicators* that flash to indicate the presence in the recording signal of high-level transients that are too fast for the recording-level meters (which read average, not peak, signal levels) to catch but which are still capable of overloading the tape momentarily. Peak-level indicator lights can also be monitored visually from across the room while you are taping a broadcast.

Adjustments for tape type get more

flexible in this price range also. While simpler machines tend to have single switches which change *bias* and *equalization* together to match either of two general tape formulations, more expensive models offer at least three or four combinations, usually by separating the bias and equalization switches. This increases your chances of matching the characteristics of the deck accurately to the tape you're recording with. Several machines have *memory rewind*, a convenient aid in checking back on what you've just recorded: set the counter to zero when you start recording, and when you've finished, press the rewind button; the tape will return to the zero point and stop itself, ready to replay. *Cueing* is another handy feature to have; it lets you monitor the "chatter" of the tape in fast forward or rewind for fast location of selections. Several decks have *input mixing* too. With line and microphone-input circuits separately controlled, you can use both at once, mixing live material from your microphones with music or sound effects from records. You can sing along with the Met (or the Muppets) or add a little prerecorded color to a taped bedtime story or slide narration. Independent output-level controls also begin to appear in this price class.

The chief differences between this price class and the one below it are in the area where improvement is most needed: performance. The typical deck in the \$200 class has a signal-to-noise ratio (with Dolby) of 60 dB or better—about what you'll get from most FM tuners on stereo programs—and response that's flat within \pm 3 dB to 13,000 Hz or so. Wow and flutter specs also improve significantly, to between 0.08 and 0.1 per cent, typically, in a weighted measurement. That's not terribly impressive by the standards of the *best* cassette machines (though open-reel machines, not too long ago, couldn't have matched this performance at this price level). But the ratio of price to performance is attractive enough to make this a very popular price category.

Around \$300

The range here is actually from about \$235 to \$340, and it offers the widest

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CASSETTE...

model choice—about fifty—though only about twenty manufacturers are involved. The main improvement in performance here is in high-frequency response, which is typically flat within ± 3 dB to 16,000 Hz—or at least to 15,000 Hz. Add a slight improvement in signal-to-noise ratio (just a decibel or two, on the average) and another slight improvement in speed constancy (wow and flutter averaging about 0.06 to 0.09 per cent instead of 0.08 to 0.1), and you'll get sound that's on a par with

that of a good FM tuner receiving a strong stereo signal, but still not quite a match for that of a top-quality, wide-range disc.

One indication of the performance available is the profusion of switchable *multiplex (MPX) filters* (they are almost unknown on lesser decks). Since the 19-kHz "pilot" tone that is a necessary but non-audible part of stereo FM signals can confuse Dolby circuits, and since not all tuner filters adequately suppress this tone, most cassette decks have circuits to filter it from the signals they're recording. But such filters also tend to reduce high frequencies down around 15,000 Hz, so it's good to be able to switch out that filter when you

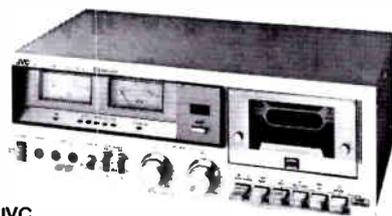
don't need its services. And if the deck's high-frequency response is capable of approaching 19,000 Hz, switching out the filter becomes more and more important if the recorder's full potential is to be realized.

Two other features commonly found in these decks are also FM-oriented. A *Dolby-FM* switch position enables you to use the deck's Dolby-decoder circuitry as a "straight-through" decoder for Dolbyized FM broadcasts you *don't* wish to record. The other FM-oriented feature is *timer record*. Together with a suitable external timer—anything from an appliance-switching clock to Nakamichi's elaborate digital device—this feature lets

A CASSETTE SAMPLER



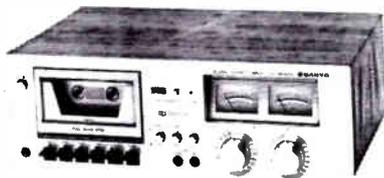
Superscope
CD-303, \$115



JVC
KD-25, \$260



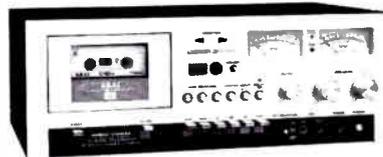
Teac
A-700, \$550



Sanyo
RD5030, \$140



Yamaha
TC-800D, \$310



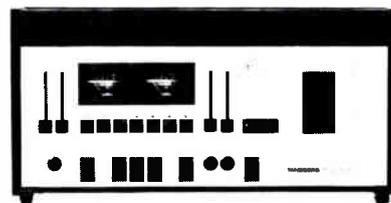
Akai GXC-730D, \$585



Sankyo
STD-1750, \$170



Pioneer
CT-F700, \$375



Tandberg TC-340A, \$1150



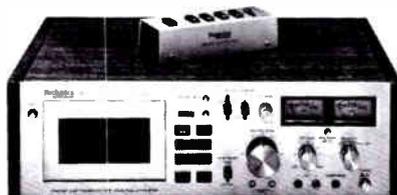
Kenwood KX-530, \$225



Dual
CB19, \$430



Nakamichi 1000 II, \$1650



Technics RS-677US, \$500

CASSETTE...

"... they seem to evoke an acquisitive itch..."

you set the deck to start recording at a preset hour—handy if there's a program you want to tape while you're not home.

The \$400 Class (\pm \$50)

Here is where luxury begins. Performance in all categories improves slightly, with rated frequency response often running to 17,000 Hz or more within \pm 3-dB limits and wow and flutter often as low as 0.05 or 0.06 per cent. But the most obvious differences are in the operating features offered (major improvements over the performance level of the \$300-class machines would be very difficult and even more expensive to attain).

Below this price level there are very few *three-head* decks but in this class there are several. With separate heads for erase, record, and playback (instead of one head that must serve for playback and recording alternately),

you can monitor your recordings as you make them, listening to the output from the playback head while the recording is still in progress. Each head can also be designed to do its job without the technical compromises inherent in dual-purpose heads: the record head's gap can be made wide to resist saturation and consequent distortion, while the playback head's gap can be made narrower for more extended high-frequency response.

You'll also find a few more decks with *multiple motors*. Their servomotors drive only their capstans, and a second motor drives the take-up and supply hubs. That opens up the possibility of reduced wow and flutter (which greatly depends on the capstan's steadiness of motion) and of faster rewind and fast-forward operation (for a C-60 tape, typically 1 minute with two-motor decks, 1½ minutes with one-motor models). It also simplifies the tape-transport mechanism, which should make for greater long-term reliability.

Recording-bias frequencies are higher in this class, typically 95 to 105 kHz rather than the 85 to 95 kHz of \$300-class machines. That also helps high-frequency performance; the design rule-of-thumb is that the bias fre-

quency should be five times the highest frequency to be recorded to prevent mutual interference.

One of the main limiting factors in cassette recording is the tape itself. Tape manufacturers therefore keep coming up with improved formulations. But these often have slightly different bias-current and equalization requirements than existing tapes. To take full advantage of these new formulations (including those yet to be developed), most of the more expensive decks have, at a minimum, separate bias and equalization switches, often with three positions each instead of the two apiece more common in the previous price group. (Three settings per switch doesn't always mean nine possible bias/equalization combinations, however; equalization is often the same in two positions of that switch, with the extra position just to provide a visual match for the three distinct positions of the bias switch.) Aiwa's AD-6400 and AD-6550, Kenwood's KX-1030, and others also offer fine adjustment of bias or equalization (JVC's knob is a five-position switch while the others are continuously variable over a range of about \pm 10 per cent). Several decks can also sense mechanically when physically coded chromium-diox-

Automatic CrO₂ switching: A mechanism in a cassette deck that automatically switches the machine's bias and equalization when it senses the presence of a coded notch in the rear edge of a chromium-dioxide cassette.

Automatic reverse: An operating feature that enables a cassette deck to play—and sometimes to record—in either direction of tape travel.

DIN jack: A jack designed to accept the European-type plugs that consolidate the four tape inputs and outputs into one socket (four "hot" leads plus ground).

Dolby: The registered trademark of a noise-reduction system developed by Dolby Labs, Inc. Most cassette decks include a Dolby-B circuit which reduces noise introduced in the process of making a recording but is not designed to do anything about noise already in the program being recorded, whether it is an FM broadcast or a disc.

Input mixing: Facilities permitting the combination (mixing) of several inputs (microphone or line) on the limited number of available "tracks" of a tape recorder (two in the case of a cassette deck). On cassette decks, this facility is used for mixing the line inputs (from a disc or tuner source) with one or two microphone inputs.

Limiters: A circuit that restricts input signals to a certain maximum level near the approximate overload point of the tape. This prevents overload and saturation of the tape by large input signals while allowing recordings to be made at a high enough level that tape noise is not excessive.

GLOSSARY OF CASSETTE-DECK FEATURES

Memory: A feature that simplifies finding the beginning of a specific recording. To use the device, the tape counter is set to "0" at the start of a recording; later, the memory feature will return the tape to the exact point at which the recording began simply by placing the deck in the rewind mode.

MPX switch: A front-panel switch that inserts a multiplex filter into the input-signal path for recording stereo-FM broadcasts. These broadcasts are accompanied by a 19-kHz pilot signal which, though beyond the frequency range of just about all cassette decks, could result in audible

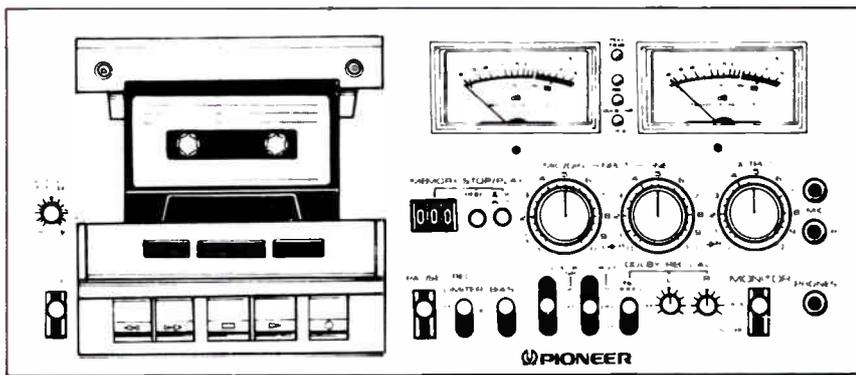
"beat tones" if it were to interact with the bias signal of the tape deck. A more common problem arises from the fact that the Dolby encoding circuit can be confused by the 19-kHz signal and respond improperly. The MPX filter applies additional suppression to the 19-kHz tone (in addition to that already applied by the FM tuner).

Multi-motor deck: A cassette machine with separate motors to drive the capstan and the tape hubs. Decks are available with two and even three motors.

Peak LED (light-emitting diode): A flashing indicator of transient high-level input signals that exceed a given preset threshold level that approaches overload.

Peak-reading meters: Meters that have electronic assistance circuits enabling them to indicate instantaneous peak values of the input signal. They indicate fast high-frequency signal peaks that average-reading (or VU) meters barely respond to.

Pitch control: A knob that permits variation of a cassette deck's nominal tape speed over a small range. This feature can be helpful to a musician wishing to alter the pitch of a recorded composition slightly in order to play along with it.



ide cassettes—or their electrical equivalents—are being used and set their own bias and equalization accordingly.

Interesting and individual features begin to crop up more frequently in this

Servomotor: A (usually) d.c. motor whose rotational speed can be controlled by speed-detection circuitry that generates an error-correcting voltage whenever the motor's speed drifts from its proper value.

Solenoid operation: In place of mechanical linkages to control the tape transport, some cassette decks have light-touch pushbuttons. These switches apply current to a solenoid (an electromagnetic mechanism), and the solenoid does the actual work of resetting the internal drive mechanisms for the desired operation.

Three-head deck: A cassette machine with separate erase, record, and playback heads that permit monitoring off the tape as a recording is being made. (A few machines have a non-monitoring third head for tape calibration.)

Timer: A switch or switch position that allows the deck to start recording the moment a.c. line power is applied to it. If the a.c. power is controlled by an external clock timer, unattended recordings can be made.

Variable bias/equalization: Controls (either multiposition switches or potentiometers) which afford greater-than-average flexibility in setting bias and/or equalization to achieve the best performance from a particular tape type.

price class. One such is a master level control with individual adjustments for each channel for level matching (the Marantz 5030 and Rotel RD-30F share this latter feature). Some of Aiwa's models can be started and stopped automatically by the Aiwa turntable to simplify the taping of discs. Marantz's 5420 and 5400 have *pan pots* in their input mixers so that some signals to be recorded can be positioned at any left-to-right point within the stereo spread, and Nakamichi's 500 has a third "center-blend" microphone input. Some of Sansui's models will automatically skip the initial portion of the tape to guard against your trying to record on the nonmagnetic leader. Dual's C939 can be installed as a top-load or front-load unit, with pop-up meters and small mirrors over the tape compartment so that the meters and tape motion will be visible from whatever angle you view the deck. Sharp's RT-3388, Pioneer's CT-F900, and Optonica's RT-6501 have a built-in microprocessor (a true computer) to control everything from timing recordings to finding any particular selection on the tape at the press of a button.

Above \$500

This is where the decks become so feature-laden and attractively styled that they seem to evoke an acquisitive itch automatically. These are, of course, the models that are least alike in appearance and facilities, because price no longer restricts the designer's

expression of individuality. Virtually every feature mentioned so far can be taken for granted here. There's hardly a deck lacking three heads, mixing inputs, memory rewind, timer start, high bias frequency, and so on. Quite a number have multiple motors as well, and several three-head machines employ dual capstans, one on either side of the head assembly, to regulate tape tension across the heads and smooth tape-speed irregularities. And though overall performance is better than that of the \$400-class machines, again it's just a *little* better: yet another kilohertz or so at the high end, signal-to-noise ratios more frequently above the 60-dB mark (and here and there above 70 dB), and perhaps another 0.01 per cent knocked off the wow and flutter figure. The one specification that shows most improvement is fast-winding time (owing to the multiple motors).

Many of these de luxe models are *solenoid-operated*, with very light-touch pushbutton controls. Solenoid operation makes it easy to add remote control as an extra-cost option. Remote control makes it easier to cut out commercials and announcements from your armchair when you're taping off the air, or, with the controls by the turntable, to start and stop a recording more precisely when taping discs.

Metering facilities become more interesting and elaborate in high-end machines, too. Aiwa's new AD-6900, for example, has recording-level meters that look quite ordinary—until you notice that they have *two* needles each. In normal operation, one needle on each meter reads average recording level;

CASSETTE...

the other reads peak level, registering against the same scale for easy comparison. A peak-hold button causes the meter to show the highest program peak for up to 30 minutes. These meters are also used to adjust bias for the specific tape in use: a built-in oscillator feeds the tape 400- and 8,000-Hz tones, and bias is adjusted until equal readings on both meters indicate that output from the tape is the same for both frequencies. The head that reads tape output for this test is technically a separate playback head, but it is used only for tape-calibration purposes.

Dual's C939 has another unusual metering system: *no* meter needles. Instead, there are arrays of seven green and five red LED's per channel. Since LED's don't have the mechanical inertia of meter needles, they can easily respond fast enough for peak-level reading; Dual also lets you use them for average-level indication at the flick of a switch.

Even the most ordinary-looking meters may contain pleasant surprises: the scales on the Akai GXC-570D, the Nakamichi 600, 700 II, and 1000 II, the Pioneer CT-F1000 all read down to at least -40 dB, or 20 dB lower than the usual meter scale. (The Technic 9900's transport—on a separate chassis from its recording amplifier—has a meter that reads time remaining on the tape; one of the Aiwa AD-6550's recording-level meters can be switched to read tape time, too.) And quite a number of machines priced from about \$400 up have meters that either read peak level or can be switched to read either peak or average levels.

Dolby circuits are the norm, of course, even in the least expensive cassette decks. But several of the more expensive models have both Dolby facilities and a second noise-reduction system. The Nakamichi 1000 II and Uher CG-362 have the DNL (Dynamic Noise Limiter) as their second system; although not as effective as the Dolby technique, it can be used to reduce noise on any tape, not just specially encoded ones. The Teac C1 has dbx II, a compressor/expander system that can yield signal-to-noise ratios of over 80 dB. However, dbx-encoded tapes *must* be played back through dbx decoders; Dolby tapes, by contrast, sound reasonably good when played back undecoded.

All cassette decks can play for up to an hour without interruption if you use

C-120 tapes. For still longer listening, Akai's GXC-730D, Dual's C939, and Uher's CG-362 will play both sides of the tape before stopping (or start over with the first side again if you prefer); the Akai and Dual will also record in both directions. If you need still more playback time, Lenco's PAC 10 not only plays both sides of the cassette but holds and plays up to ten cassettes, in sequence, by means of a system similar to that of an automatic slide projector. Additional "cassette trays" are available if you want to have the next ten or twenty hours' worth of music ready in advance. A few decks without reverse facilities (the Nakamichi 1000

"Dolby circuits are the norm . . . but several of the more expensive models have both Dolby facilities and a second noise-reduction system."

II, Sansui SC-5100, and Akai GXC-570D), though they play just one side of the tape, can repeat that side indefinitely if you wish.

On the other hand, deliberate interruption is the idea behind Dual's unique "fade edit" feature. This allows you to gradually erase undesired portions of a recording for a professional-sounding fade-out. You can also fade in already recorded material. A two-handed interlock ensures that you won't accidentally edit out something during play by hitting a button accidentally. You can also do a measure of such editing-out with the *punch-in recording* feature on Pioneer's CT-F1000 and Tandberg's C-330. This feature, more commonly found on professional or semiprofessional open-reel decks, lets you start recording after the tape begins to move instead of requiring that you press "play" and "record" simultaneously. Of course, this also takes an extra measure of care so that you don't accidentally record over some material that you meant to save.

Time for Decision

Making the final choice is of course not easy with such riches to select from, but various pressures will help to narrow the field of choice: the state of

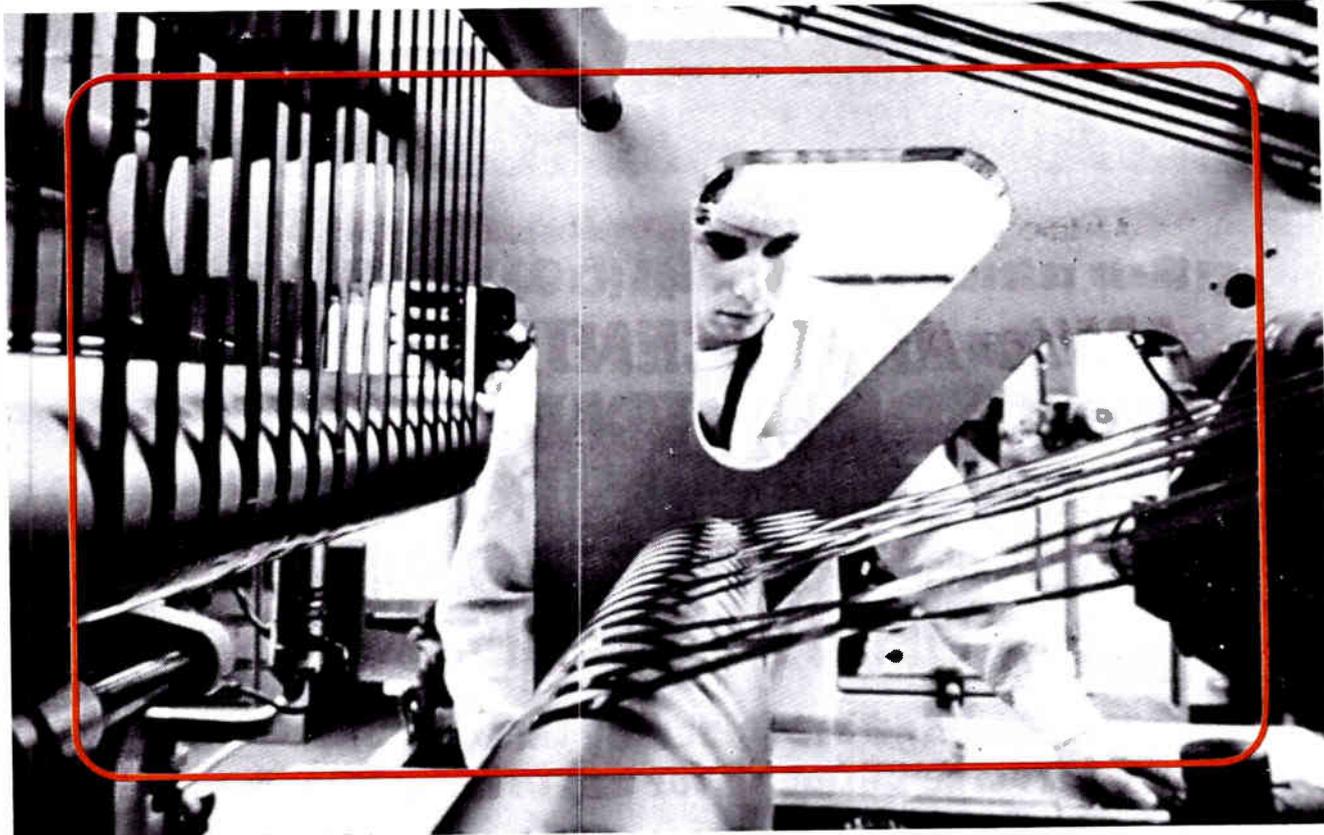
your finances will limit it a bit, and a physical space that is suitable only for a front-loading deck—or only for a top-loading one—will cut the choice of models about in half. (Incidentally, the type of loading a machine employs has no necessary relationship to its quality.) For the rest, you'll just have to face the agony of decision, but when you do, it is always best to be systematic about it:

1. From the models in your price range, pick the ones which have those features you cannot live without (if they also have others, fine, but don't let that affect your choice).

2. Next, test their performance at a dealer's showroom by making test recordings and comparing the deck's recorded output with your source material. Two good sources to use are fresh discs of wide-range music (discs have a wider frequency range than FM, and they can be played back for direct comparison) and the "white noise" you'll find between stations on the FM dial with the tuner's muting shut off (the latter is an extremely difficult signal for a cassette deck to record, however, and the recording should be made at a level of -10 dB or even lower).

3. If you can't tell the difference between the original program and the recording of it, then the deck is good enough; if you can't afford a deck on which the difference is inaudible, pick the one whose differences are least apparent or important to you. No matter what you read on the spec sheet, it's the sound you hear that ultimately counts. □

Note: A comprehensive Cassette Deck Product Buying Directory is presented in Section I of this Handbook. Refer to this section for manufacturer product listings, feature and technical specifications, and suggested retail prices.



Cassette Tape Progress

ONE EXPERT'S VIEW
OF PAST, PRESENT,
AND FUTURE
DEVELOPMENTS

By Robert Donadio

As recently as ten years ago, the making of recording tape was still something of a magical art, but the industry has made tremendous strides in the interim in response to consumer demand for ever-better tapes. This is nowhere more apparent than in cassette technology, in which, in three short years, we have seen the introduction of cobalt-enhanced ferric-oxide, ferrichrome, and now a second generation of chromium dioxide. Further, several companies have already made and successfully tested *all-metal* tapes, and their market introduction awaits only the development of suitable machines to play them on.

The race to find the "perfect" magnetic-tape particle is hotter now than ever before, and the manufacturers of tape software are once again challenging the manufacturers of machine hardware to catch up. Poised as we are on the brink of even greater things, it is perhaps a good time to ask a few leading questions: How far have we come? How far have we yet to go? And, particularly, in which direction does the future of the cassette lie?

Despite the considerable progress of the past ten years, the major deficiency of the cassette format in comparison to open-reel studio tape still lies in the area of high-frequency output. Up to about 5,000 Hz, most cassettes are pretty much equal to open-reel, quite

capable of reaching the required amplitude for even the most critical music recording. Beyond that, however, cassette performance begins to drop off.

Ferric Oxide

The history of the development of open-reel ferric-oxide tapes since the late 1940's has been one of increased signal-to-noise ratio (S/N). With the introduction of the Philips cassette, with its much slower tape speed, the emphasis has switched to high-frequency performance above 12,000 Hz, and progress over the past decade or so has been dramatic. At the low frequencies, the S/N of ferric-oxide cassette tapes has been improved (with successful cobalt treatment) from about 45 dB to more than 60 dB, and at the high frequencies the S/N has gone from less than 30 dB to over 40 dB.

- **Better Oxides.** The drive to improve ferric-oxide tape formulations was sparked in 1970 with the introduction of chromium dioxide (CrO_2) by Du Pont. In one dramatic step, CrO_2 enhanced the potential S/N of cassettes by as much as 5 dB at the high end. Ferrichrome was introduced several years later as an attempt to combine the virtues of ferric oxide with those of CrO_2 . On machines properly set up to accept it, ferrichrome too provided cer-

HIGH BIAS.

These cassette deck manufacturers use SA
as their reference for the High(CrO₂) bias/EQ setting:

AIWA • AKAI • CENTREX • JVC
KENWOOD • MERITON • NAKAMICHI
OPTONICA • PIONEER • ROYAL SOUND
SANSUI • SHARP • TEAC • TOSHIBA
UHER • YAMAHA

And are joined by these
in recommending SA for use in their decks:

BANG & OLUFSEN • DUAL • FISHER
HARMAN/KARDON • LAFAYETTE
SANKYO • TANDBERG
AND MANY OTHERS.



There's been a quiet revolution going on in the cassette world. Leading makers of quality cassette decks have adopted TDK SA as their reference standard tape for "High" (CrO₂) bias and equalization settings. Why TDK SA? Because TDK SA's advanced tape formulation and super precision cassette mechanism let them (and you) take full advantage of today's advanced cassette deck technology. In addition, a growing number of other companies are recommending SA for use with their machines. So for the ultimate in cassette sound and performance, load your deck with SA and switch to the "High" or "CrO₂" bias/EQ settings. You'll consistently get less noise, highest saturation and output levels, lowest distortion and the widest dynamic range to let you get the best performance from any quality machine. But you needn't believe all this just because we say so. All you have to do is check our references.

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tain advantages. But there was more to come. The breakthrough for ferric oxide came in 1975, when the Japanese were successful in perfecting the cobalt treatment process and introduced a number of "chrome-substitute" tapes. With coercivities high enough to use chromium-dioxide bias and well suited to the 70-microsecond (CrO_2) time-constant playback equalization, these tapes equaled and in some ways surpassed the performance of the best chrome then available.

Cobalt enhancement, or "doping," involves chemistry that is simple in theory but proved at first to be very difficult to apply. Each ferric-oxide particle has a certain specific crystal structure made up of atoms of iron and atoms of oxygen. Most of these fit together in predictable ways, but a small percentage of the "sites"—the hookup points—in each crystal are ambivalent in that they can be filled either with oxygen or iron atoms (or any "impurity"). This ambivalence is actually undesirable, but it is possible to take advantage of it nonetheless by filling the ambivalent sites with cobalt (rather than iron or oxygen) atoms.

Cobalt improves the properties of each crystal and therefore the overall magnetic performance of the tape coating. In doping a crystal, however, the chemists were forcing the atoms to do things they didn't want to do, so the early formulations were very unstable. Eventually, however, the scientists learned the proper stage at which to introduce the cobalt atoms and the proper conditions of temperature and pressure; the result was the so-called "ferricobalt" tapes.

- **Better Binders.** None of these tapes have yet achieved the theoretical ultimate performance we can expect from ferric oxide, however, for it can—in theory, at least—be improved about 7 dB at the high end by smoothing the tape surface and thus improving tape-to-head contact (2 dB) and by enhancing magnetic properties through better particle orientation and faster, more controlled processing of the coating materials (5 dB).

To improve tape-to-head contact, the average roughness of the tape has to be reduced about 30 per cent. Right now, the average tape-to-head separation is roughly twice the peak-to-peak variation in the surface roughness—about 20 microinches. This head-to-tape gap can be brought down to less than 8 microinches (it has already been done in video-tape formulations), making possible 2 to 2.5 dB more output at 15,000 Hz.

The 5-dB gain will come from im-

proving the magnetic properties of the particles through physical means. In the history of magnetic tape, we have usually depended on the oxide manufacturer to do the work of improvement—and, indeed, we can still expect some contributions from that source. Today, however, we're also exploring tape *binders* as a means of accomplishing at least part of this goal. Heretofore, a binder system was only something to hold the oxide needles together on the substrate (the base film). In theory, however, the binder can and should not only hold them there, but hold them in a certain orientation. Powerful magnets are used to orient the oxide particles physically while the binder is still wet (unfortunately, not every particle winds up being properly oriented). The oxide particles have two directions of movement within the wet coating: up-and-down and side-to-side. Because of the coating thickness, a particle has a great deal of difficulty moving in the vertical plane. Under the influence of the magnetic field it naturally wants to do that; just as naturally, we do not want it to. The best kind of binder system is therefore one that will restrict vertical motion of the oxide particles, yet allow them to move easily in

"The race to find the 'perfect' magnetic-tape particle is hotter now than ever before. . . ."

the horizontal plane. Using such a binder, if we move very quickly from the coating point to the orientation point the particles can be "frozen" more or less in the direction of tape travel. This *longitudinal* orientation directly affects the output signal because it increases low-frequency flux and reduces interference between the magnetized particles at high frequencies

We could, theoretically, achieve total longitudinal orientation, but the best result achieved so far under laboratory conditions is 7 on a scale of 10. The *best* tapes now available have orientation factors of 3 on the same scale. By using new binder technology and better magnetic particles, the figure could be improved to 4.5.

- **Faster Milling.** Milling is another critical stage in the process of preparing the oxide dispersion, and the more time the magnetic particles spend in the

process the greater the chances are that they will be broken. Most of the effort in this part of the manufacturing process goes into developing milling methods that are faster and (consequently) less damaging to them.

This three-pronged approach—better oxides, better binders, and faster milling—will give us about 5 dB additional dynamic range for the ferric-oxide tapes at the high end, plus the 2 dB that comes from having a smoother surface. That, theoretically, is all we can expect from the ferric tapes—cobalt-doped, epitaxial, or whatever—until we get into pure-metal powders. Still, this is very respectable performance when considered in the light of the other advantages of ferric oxide, and if the problems of bias consistency can be solved worldwide, there is a bright future for the cobalt-enhanced ferrics, especially at the 120-microsecond playback equalization.

Chromium Dioxide

The other major category of cassette tapes, chromium dioxide, presents a far more encouraging picture even though it has had only a fraction of the developmental attention paid to it that the ferric tapes have enjoyed. The problem from the beginning has been that chrome was *too good*. At its introduction it was so far ahead of the other tapes then in use that its manufacturers were not motivated to invest in any research and development efforts to improve it. Though research on ferric oxide goes back more than twenty years, CrO_2 has seen only one improvement in its whole history.

The development direction for chrome from this point on is very likely similar to that for ferric tapes—creating a more uniform particle with a higher "crystal energy," which means more coercivity (high-frequency response) and more remanence (overall output). Fortunately for chromium dioxide, this is easy to accomplish—the particle is a lot more controllable than that of iron oxide. So far, it has been possible to increase chrome's coercivity without changing the bias from the "classic" chrome bias. This provides an increase in the short-wavelength response, thus adding 4 to 5 dB to the output at 15,000 Hz.

It is impossible to predict the ultimate practical performance of the chrome formulation, but the next *theoretical* goal is an additional 3 dB at low and middle frequencies and another 6 dB in the range between 14,000 and 20,000 Hz. And this is on top of the achievements of second-generation chrome, which has already demon-

Cassette Tape...

strated greater dynamic range and more high-frequency headroom than even the best chrome substitutes on the market today.

I do not mean to be critical of cobalt-doped iron-oxide tapes, but you cannot break the laws of nature. When we look at the theoretical limitations of ferric and chrome tapes, we find that the potential for chrome is way ahead. This is true partly because CrO_2 is the precisely controllable result of technology (CrO_2 does not occur in nature), while ferric oxide has to be grown or "cultured" in much the same way as yoghurt or bread dough.

Perhaps this idea of an "unnatural" oxide gave some credence to the "wear scare" that has hindered the sale of chrome cassettes over the past several years. The rumor that CrO_2 wears heads at a faster rate than iron oxide started shortly after the introduction of the chrome-substitute cassettes and was widely circulated among audiophiles, retailers, and even tape-deck manufacturers. According to all available current research, just the reverse is true: cobalt-treated ferric-oxide tapes actually wear heads faster than any current chrome formulation. Which is not to say that *either* type presents a serious wear problem. If you operate your machine an average of 150 hours a year for three years, you may notice a 2- to 3-dB deterioration of the signal at 8,000 Hz, depending on the composition of your tape head—and that's with the *most* abrasive ferric-oxide tape. And so it turns out that the "issue" of recorder head wear was never really an issue at all.

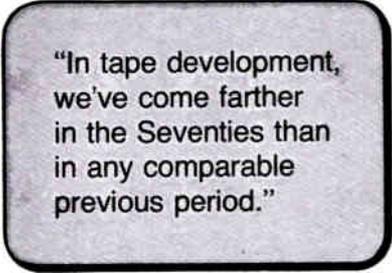
Coming Up

What performance levels can we expect in tomorrow's tapes? Certainly there will be improvements in chrome-substitute ferric-oxide formulations, though perhaps not to the point of reaching the theoretical limit of 7 dB more "head room" at high frequencies immediately. However, they should soon be capable of rivaling second-generation "super-chrome" formulations. Furthermore, ferrichrome, perhaps with some improvements, should continue to expand its popularity as more and more cassette decks add bias/equalization switching especially for it. And, of course, a steady—and rapid—improvement in chromium dioxide seems to be guaranteed now that the in-

dustry is finally committed to realizing its full potential.

But the biggest tape news of the near future will not be made by either ferric or chrome formulations but by pure-metal tapes or digital technology. A bit of a race is shaping up here, with the decision going to whoever is first to develop successful—best and cheapest, that is—hardware. *Which* one triumphs is not really all that important. Although the technologies are vastly different, the goal remains the same: an additional 10 dB of S/N more or less "across the board."

• **Pure Metal.** The figure of 10 dB is, at least, what many future manufacturers of pure-metal tapes are *aiming* for. It may prove to be a trifle optimistic, but it is necessary to identify some target so that equipment manufacturers can plan and design accordingly. Reports



"In tape development, we've come farther in the Seventies than in any comparable previous period."

of early work indicate that a 5-dB improvement from 20 to 20,000 Hz has already been achieved. Furthermore, 10 dB has evidently been squeezed out at high frequencies in the laboratories, though with a modest sacrifice of improvement at lower frequencies.

As far as we know, no one has yet managed to demonstrate the full 10-dB, all-frequencies increase with the consistency mass production requires, but the tape industry as a whole is probably 50 to 80 per cent of the way to the goal. Once it gets there it will be up to the machine manufacturers to produce affordable equipment capable of applying several times the present-day bias levels to the tape. This will entail development of entirely new head technologies and characteristics.

• **Digital.** It is safe to assume that the hardware manufacturers would prefer a system in which the tape is not so critical a factor—a digital system, in other words—whereas most tape companies would be willing to go either way. The demands made on the tape would be strikingly different for the two systems, however. Initially, at least, a tape for digital audio recording

would be an easier product to design and manufacture than even a cobalt-treated ferric-oxide tape—initially because the ultimate product will depend on what decisions the system designers make. In the matter of sampling rate, for example, it will make a major difference in tape requirements if the signal waveform is sampled and quantized 60,000 times a second rather than, say, 40,000 times a second [see this month's "Tape Talk"]. The packing density available from the tape and the permissible occurrence of signal dropouts will be critical.

Actually, the tape industry need expect no major problems in creating a workable digital audio tape. Historically, analog recording tapes have maintained—and had to maintain—a higher standard of performance than tapes intended for digital applications. Digital technique essentially involves working at a fixed frequency and either saturating the oxide particles or not recording on them at all. This is easier to cope with than the analog situation, in which the frequency bandwidth is fairly wide and the tape must meet higher criteria for noise and distortion.

Our considered opinion is that chromium dioxide is, once again, the best presently available magnetic material for digital applications. Far more bits of information per inch can be recorded onto and retrieved from chromium dioxide than can be handled by other materials. (When I joined BASF some years ago, computers worked with a packing density of 556 bits per inch of tape track. Today we're up to 6,250 bits per inch, and this figure is determined by the digital electronics rather than the tape, which is capable of more.) Chrome has all the characteristics of packing density, physical smoothness, and especially consistency that we'll require from a digital medium.

THIS year, magnetic recording tape will be forty-six years old; the cassette concept will barely have turned twenty. In tape development, we've come farther in the Seventies than in any comparable previous period. There's no doubt that the rate of improvement in this recording medium is accelerating. We have seen the design of tape change from near-alchemy to a science, and this is only the beginning. The future for the cassette—and for the ultimate satisfaction of the consumer—looks very bright indeed. □

See *Blank Tape* (Section 7) for information on available tape formulations, tape lengths, etc.

METAL TAPE DEBUTS

EVER since its introduction, magnetic recording tape has used metal oxides in one form or another for the recording material. Now, a new type of recording material made up of fine metal—not metal-oxide—particles is expected to make a tremendous impact in audio and video recording. The new tape is said to produce a level of performance that surpasses that of the best conventional metal-oxide tapes. Although the metal tapes are playback-compatible with current tape decks equipped with 70- μ s playback equalization (the CrO₂ setting), satisfactory recording will require new recording equipment.

One of the first of the new metal tapes to come on the consumer audio market is 3M Company's Scotch brand "Metafine" in the popular cassette format. (Other tape manufacturers are sure to market their own versions soon.) At a recent press conference, a Metafine audio cassette was recorded, erased, and played back on a tape deck that was specially modified to accommodate its characteristics. The cassette delivered a maximum output 5 to 10 dB

greater than typical chrome tapes and 3 to 7 dB greater than Scotch Master II tape. This means that maximum output is at least double that of other tapes, depending upon the frequency selected.

Lower distortion, additional high-frequency response, improved S/N, and increased maximum output are among the benefits it is claimed one will realize with metal tapes. Exact increases in performance will depend upon the selection of benefits manufacturers build into future tape recorders, of course.

Metal tape is said to permit higher performance characteristics at present tape speeds and packing densities. Accordingly, it also opens the way for dramatic changes in speed, format, and component size without sacrificing performance.

Technical Details. The level and frequency distribution of the new metal tapes are similar to those for CrO₂ tapes. A 70- μ s equalization was selected to minimize noise, while new metal-tape recorders will utilize Sen-

st dust heads because they do not saturate as easily as other types of heads. Because of its high-density recording capability, it has been suggested that a 1⁵/₁₆ ips recording speed is possible, providing better sound quality than is obtainable at today's 3³/₄ ips!

The characteristics of metal-tape audio cassettes are best realized at a recording bias significantly different from those of present recorders, which is one of the reasons new recording equipment is necessary. Another is that a stronger erase current is required.

One has only to look at the specifications for various types of tapes to see the superiority of metal tapes.

	Typical Chrome "Master II"	Scotch "Metafine"	Scotch 3400
Retentivity, gauss	1400	1500	3400
Remanence, lines/1/4 in.	0.43	0.60	0.80
Coercivity, oersteds	550	550	1000

The curves in Fig. 1 show comparative output levels for Scotch Metafine and a top CrO₂ audio tape. The maximum output level at saturation at 12,500 Hz is 7 dB greater for Metafine at the optimum bias for each tape. Figure 2 illustrates comparative modulation and harmonic-distortion levels for the same tapes. The maximum modulation level (3% third-order harmonic distortion at 333 Hz) is up to 9 dB greater for Metafine tape.

The Agenda. 3M Company (and undoubtedly other manufacturers) plans to have its Metafine tape on the consumer market shortly. It will first be introduced in the popular C-90 cassette size and will carry a list price of about \$10. So far, there is at least one manufacturer who announced production of a cassette deck to accommodate the new metal tape for both playback and recording. It is the Model TCD 340 AM three-motor/three-head cassette deck from Tandberg. And \$1300 is the suggested retail price. Other recorder manufacturers will likely follow and may already be offering for sale metal-tape recorders by the time you read this. □

Fig. 1. Maximum Output Level as a function of Bias, Scotch "Metafine" and Chromium Dioxide tapes.

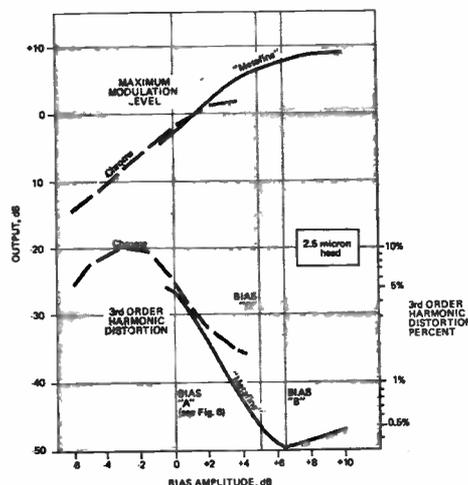
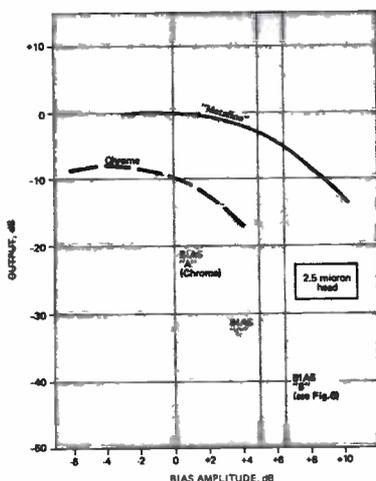


Fig. 2. Maximum Modulation and Harmonic Distortion Level as a function of Bias, Scotch "Metafine" and Chromium Dioxide tapes.

TAPE BIAS/EQUALIZATION CHART

By Craig Stark

MOST stereo cassette decks nowadays have switches to set bias and equalization for each tape type. But tape formulations come and go, so keeping track of what tapes require which settings can be a challenge. To make recording and playback easier for you, listed below are most of the major high-fidelity cassette

formulations of the past few years. A line divides the current and discontinued tape formulations in each manufacturer's product lineup. The discontinued tapes are listed for the benefit of those who still have some of these cassettes on hand.

Cassette	Ferric	CrO ₂	Ferrichrome	Cassette	Ferric	CrO ₂	Ferrichrome
Advent (all)		X		Meriton			
Ampex				Ferri-Chrome Cassette			X
Grand Master	X			Chromium-Dioxide Cassette		X	
364 Series 20/20+	X			Low-Noise/High-Output Series	X		
363 Series Chromium Dioxide		X		Low-Noise Series	X		
371 Plus Series	X			Nakamichi			
370 Series low-noise/high-output	X			SX		X*	
350 Series "Super"	X			EX II	X*		
360 High-Frequency Series	X			EX	X*		
362 Extended-Frequency Series	X			Chromium Dioxide		X	
BASF				Norelco (Discontinued)			
Professional I	X*			300 Series	X		
Professional II		X		200 Series	X		
Professional III			X	100 Series	X		
Studio Series	X			RCA (Discontinued)			
Performance Series	X			Red Seal Cobalt Energized	X		
Chromdioxid		X		Vibrant Cassettes, Series CV	X		
LHSM Series	X			Recoton			
SKLH Series	X			Low-Noise, Series CD	X		
SKSM Series	X			Royal Sound			
Capitol				Chromium Dioxide		X	
"the music tape"	X			Ultra-Linear, Series ULC	X		
Capitol 1	X			Low-Noise, Series APC	X		
Capitol Chromium-dioxide		X		Scotch			
The Mod Series	X			Master I	X*		
Columbia				Master II		X*	
2CB800 Series	X			Master III			X
2CL Series	X			Dynarange Low-Noise/High-Density	X		
Fuji				Highlander Low-Noise	X		
FX-I	X*			Master	X		
FX-II ("Beridox")		X*		Classic			X
FL low-noise	X			Chrome Cassettes		X	
FX	X			High-Energy	X		
FC		X		Extended-Range	X		
Hitachi				Sony (Sony/Superscope)			
"Ultra-Dynamic" UDC Series	X			Ultra-High-Fidelity Cassettes	X*		
Low-Noise Series	X			Chromium-Dioxide CRO Series		X	
Irish				FeCr Cassettes			X
261 Professional Series	X			Duad			X
262 Low-Noise Series	X			Soundcraft (Discontinued)			
263 Chromium Dioxide Series		X		2SR-801 Series	X		
Lafayette				2SC Series	X		
XHE Criterion Series	X			TDK			
Criterion Series	X			SA, Super Avilyn		X*	
Low-Noise Series	X			AD	X*		
Chromium-Dioxide		X		Dynamic Series, D	X		
Criterion Ultra-Dynamic Series	X			Audua	X*		
Voice-grade	X			SD series	X		
Maxell				Krom series (KR)		X	
UD-XL I	X*			Maverick series	X		
UD-XL II		X*					
UD Series	X*						
LN Series	X						
Memorex							
MRX ₃	X*						
Chromium Dioxide		X					
MRX ₂	X						

Note: In each company listing, those tapes below the line are older, discontinued formulations; the others above are either current or near-current (i.e. may be still on some dealer shelves).
 On Ferric tapes, those which can profit by a slightly higher-than-usual ("Japanese") bias are identified by an asterisk.
 On CrO₂-type tapes, those identified with an asterisk are not CrO₂ tapes, but so-called "70-microsecond ferrics," usually modified by cobalt.

THE CASE FOR OPEN REEL

What it most often comes down to is
signal-to-noise ratio and frequency response

IT will hardly come as news even to the minimally informed audiophile that the recording and playback facilities offered by a reasonably good cassette deck these days meet the needs of most music listeners very well indeed. Therefore, if you are even *thinking* about buying an open-reel tape deck, chances are that at least some of your requirements are, in one way or another, rather special.

What this most often comes down to is a question of technical specifications, particularly *signal-to-noise ratio* and *frequency response*. These are discussed in some detail in the accompanying box, but they can also be summarized briefly by recalling a couple of simple facts. First, the wider track widths and higher tape speeds of open-reel pull more tape past the recorder's tape heads in a given period of time. All else being equal, that means a better signal-to-noise ratio for open-reel. Second, while frequency response at slow tape (cassette) speeds can be extended for *small* signal levels, the slower the tape speed the poorer the tape system's high-frequency response at *large* signal levels. Thus, while cassettes are undoubtedly satisfactory for *most* home music purposes, if you set your tape standards high enough, only open-reel will do. It's not just for editing convenience alone that professionals record at 15 or sometimes 30 inches per second (ips) on tracks approximately four times as wide as those of the 1 $\frac{7}{8}$ -ips cassette!

Why Open-reel?

Beyond the critical questions of frequency response and S/N, there is also that of recording *flexibility*, another key attraction of open-reel. Simplicity of operation is no doubt a virtue the cassette format can legitimately boast of, but this simplicity means that you must forgo a great many choices offered by open-reel, and some of them may be important to you. Take, for example, the following:

• **Speed and Running Time.** All cassettes operate at a fixed tape speed of 1 $\frac{7}{8}$ ips. There are home open-reel recorders available, on the other hand, that run at two, three, or even four or five different tape speeds: 15, 7 $\frac{1}{2}$, 3 $\frac{3}{4}$, 1 $\frac{7}{8}$, and 15/16 ips. And each of these speeds has its special virtues. For recording live music, 7 $\frac{1}{2}$ ips is the minimum speed I would recommend, and if you're looking to make a master tape for even quasi-professional purposes (a high-school glee-club concert that will be turned into a limited-edition LP, for example), I strongly recommend 15 ips. The 3 $\frac{3}{4}$ -ips speed will do a more than adequate job for most off-the-air or disc-copy dubbing (though I still stick to 7 $\frac{1}{2}$ if the material is musically demanding), and it is perfect for background music such as you might wish to play at a party.

The 3 $\frac{3}{4}$ -ips (and slower) open-reel speeds bring the factor of uninterrupted running time into the picture. The thinnest cassette usually recommended for high-quality, reliable operation is the C-90, which gives you a maximum of 45 minutes per side. At 3 $\frac{3}{4}$ ips, a 1-mil open-reel tape (again, the thinnest recommended) on a standard 7-inch reel gives you an uninterrupted running time of 96 minutes, and *double* that time if your recorder can accommodate the larger, 10 $\frac{1}{2}$ -inch reel size. Open-reel operation at 1 $\frac{7}{8}$ ips (or even 15/16 ips) can double or quadruple the 3 $\frac{3}{4}$ -ips running times. (It should be pointed out that cassettes generally provide better performance at 1 $\frac{7}{8}$ ips than open-reel machines, but for undemanding applications, such as speech, open-reel offers enormous storage capacity on a single reel).

• **Track Formats.** Any cassette, mono or stereo, can be played on any cassette deck. That's simplicity, but it's also restriction. If you have a regu-

lar home quarter-track stereo open-reel deck, for example, and want to record a lot of monophonic material (from old discs or a non-stereo FM station, for example), you can utilize *each* of the open-reel deck's four tracks separately. You can't do that with cassettes.

Further, if you buy an open-reel deck you can choose either a half-track or a quarter-track stereo format. The former, preferred by the pros, records two wide tracks over the entire width of the tape at a single pass (there is no "side 2," as with quarter-track). This greatly simplifies any subsequent editing, yields a slightly better signal-to-noise ratio, and minimizes some of the dropouts near the tape edge that sometimes afflict quarter-track (both open-reel and cassette). On the other hand, most home open-reel decks are in the quarter-track format, as are most pre-recorded open-reel tapes. To give you full freedom of choice, some open-reel decks are available in either half-track or quarter-track as the main format but with a fourth, playback-only, head in the *other* configuration, so you can play either type of tape.

• **Multitracking and Four-channel.** While quadraphonic sound did not exactly take the country by storm, it still has many adherents and, so far as tape is concerned, the discrete four-channel open-reel recorder is the way to go. The chief interest of many purchasers of four-channel open-reel decks today, however, is not quadraphony, but exploring the "multitrack" techniques used in making virtually all popular and many classical releases. (See the article "Semi-pro Recording" on page 54.) Multitracking is a technique in which almost every separate performer in a musical performance is recorded individually on his own "track," sometimes in isolation from the other performers, so that his part can be processed on its own and then balanced ("mixed") with the other performers' contributions at the recordist's leisure.

(Continued overleaf)

By Craig Stark

OPEN REEL ...

"If there's a touch of the recording engineer in your makeup, you'll tend to regard the 'chore' of threading up tapes as an almost symbolic ritual. . . ."

The technique differs from the so-called "sound-on-sound" process (a standard capability of almost all three-head open-reel decks) in significant ways. Sound-on-sound involves constant recording of already-taped material as transfers are made from one track to another, and in the end any material "mixed" by the sound-on-sound process winds up on a single track. Multitrack techniques permit the same sort of sequential recording in assembling a performance part by part, but they also allow all the parts to be kept separate—at least up to the full track capacity of the recorder. Furthermore, the existence of the parts on totally separate tracks makes a stereo mix possible.

To create a multitrack recording in which different parts are added at different times, a way must be found to synchronize any new material with the tracks already recorded. With multitrack tape machines this is accomplished by switching the record-head gaps serving already recorded tracks into a temporary playback mode. The performer adding the new material can then listen to previous contributions and play or sing along while being recorded on any of the unused tracks. The fact that the record head is being used for both playback and recording maintains the synchronization.

Though the playback fidelity of the record head may not be ideal, it is of little concern, for the only need is to keep the parts in synchronization with each other, not separated by the time it takes the tape to travel between the record and playback heads. The names given to this synchronizing facility vary with the machine manufacturer; some call it "Sel-Sync," others "Quadra-Sync," others "Simul-Sync." But it is a feature found on *most* four-channel open-reel machines today. If you're an active recordist or a member of a musical group trying to "get the act together" before going into a professional studio, a four-channel deck with multitrack facilities will be of real interest.

The Price-tag Approach

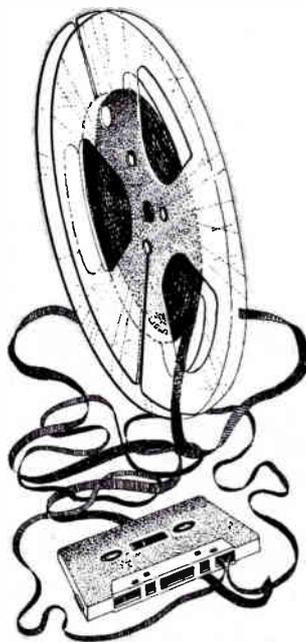
Whether you're interested in the higher quality of open-reel and its creative possibilities, or just a replacement deck that will enable you to play your library of open-reel tapes, sooner or later you'll have to try to narrow the field of available machines. Unlike the case with cassette machines, the *absolute* number of possibilities is reasonably limited, and many shoppers will find that the high cost of open-reel decks will limit even that number severely. In the low and low-to-middle price brackets (below about \$350) cassettes have taken over almost completely, and almost 40 per cent of the open-reel models listed in the 1978 edition of STEREO REVIEW's *Tape Recording & Buying Guide* are in the \$1,000-and-up range.

• **\$450 and under.** If you're a newcomer to tape, this is the price class in which it is most difficult to choose be-

tween the open-reel and cassette formats. On the other hand, if you have a library of older open-reel tapes and are on a tightish budget, you may find a perfectly suitable machine. Akai's 4000DS Mark II is probably the least expensive machine in the group (\$299.95), and it is available (for \$379.95) with built-in Dolby. Other offerings bear the mark of Sony, Toshiba, or Philips. Subject to some variation, machines in this class will offer three heads, a single-motor transport with mechanical controls, a wow-and-flutter percentage in the 0.1 to 0.15 per cent range, and a signal-to-noise ratio in the area of 50 to 55 dB. Frequency response may be somewhat limited on some models. Seven-inch reels will be the maximum size, and most decks will offer 7½- and 3¾-ips operation, with an additional 1¾-ips speed occasionally available.

• **\$500 to \$700.** A rather large number of decks, from most of the major

OPEN-REEL AND CASSETTE: A TECHNICAL COMPARISON



ONE question that puzzles many audiophiles (and annoys some others) is how a \$300 cassette deck can boast the same performance specifications as a professional open-reel mastering recorder that costs ten times as much. Part of the answer, of course, may lie in the optimism of some copywriter at the cassette machine's advertising agency or in the conservatism of the open-reel machine's engineering department. But another part of the answer all too often lies in the use of differing measurement techniques and standards. The average consumer, for example, can hardly be expected to know that a "wrms" wow-and-flutter specification (almost universally used for cassettes) is almost certain to produce a number that is 30 to 50 per cent "better" than a "DIN peak weighted" measurement made on the same deck. (Professionals use the DIN specification almost universally, but, confusingly, some consumer open-reel decks use the one, some the other, and neither is likely to specify which standard is being applied.)

Straightening out the whole tangled mess of specifications (even assuming the numbers given are always honest) describing open-reel and cassette tape decks in the space of a single article would be a task for Aquinas, who I am not. But I would like to address myself to two comparative specifications that often confuse audiophiles into thinking that there's no "real" difference between open-reel and cassette formats. These "specs" are *frequency response* and *signal-to-noise ratio*.

At one time or another, everyone

manufacturers, is available in this "bread-and-butter" class. Three heads (occasionally four) and three-motor transports are now the rule, some using directly driven capstans rather than belt-drive linkages. While 7-inch reels still predominate (together with a 7½-ips top speed), Pioneer and Teac offer models that accommodate the large 10½-inch reels. Wow-and-flutter figures are typically in the 0.05 to 0.07 per cent range, signal-to-noise ratios have improved (55 to 65 dB), and frequency response is generally well above 20,000 Hz at the highest machine speed. Pioneer and Akai offer auto-reversing models, and Sony has two four-channel decks (though without multitrack synchronizing) in this range. Here, too, are to be found Teac's popular A-2300SX (available for \$100 more with built-in Dolby), as well as the lowest-price model in the Tandberg line.

• **\$700 to \$1,000.** Decks in this price class are moving very close to profes-

sional caliber, and nearly every feature you could want (10½-inch reels with four-channel synchronizing, for example) can be found from several manufacturers. The renowned Revox A77 (and its updated version, the B77) are here, too, though you must go a little higher in price if you want them with built-in Dolby. Wow-and-flutter figures drop as low as 0.04 per cent, signal-to-noise ratios rise as high as 67 dB, and many of the machines have switching to permit the use of various types of recording tape. Decks in this class are, as their prices suggest, designed for the really *serious* tape enthusiast.

• **\$1,000 and up.** Shoppers looking for open-reel decks in this price range are really looking for lower-price versions of professional mastering recorders. All the "studio touches," such as servo-controlled reel tensions (and even, on the Technics RS-1500US, an iso-loop drive), are to be found here. The top-of-the-line models of almost

every manufacturer are represented, and most offer relative ease in accommodating not only top-quality consumer tapes, but the advanced studio mastering tapes as well. In essence, if you're ready to spend this much, you presumably expect to do a fair amount of live recording, and you no doubt already know more about the subtleties of tape-deck design than a general article such as this can cover!

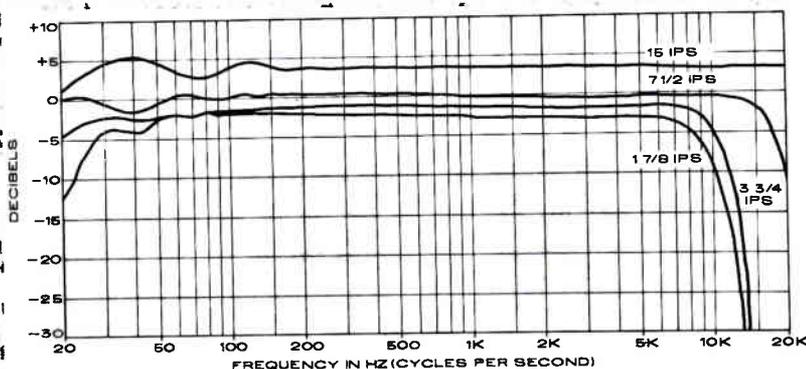
To return to the basic question: Is it to be open-reel rather than cassette for you? If there's a touch of the recording engineer as well as of the music lover in your make-up, it probably is, and you'll tend to regard the "chore" of threading up tapes not as an obstacle, but as an almost symbolic ritual dutifully observed to insure that you'll get the best sound your equipment is capable of. That might sound just a little like Walter Mitty's dreams of grandeur, but there are far worse dreams one might entertain. □

has heard a tape played back at half (or double) the speed at which it was recorded. The audible effect is to shift the frequency we hear down (or up) by an octave. What this proves technically, however, is that it is not the frequencies themselves that are recorded on the tape at all. What is recorded is a magnetic pattern that repeats itself at fixed intervals along the tape. The distance between repetitions of the magnetic pattern is called the "wavelength" of the signal. At a 15-ips tape speed, a 15,000-Hz tone has a wavelength of one thousandth of an inch, or one "mil." At 7½ ips the same tone must be compressed into half the distance along the tape, so the wavelength becomes 0.5 mil. At 3¾ ips, the wavelength of that tone is down to 0.25 mil, and, at the cassette speed of 1½ ips, the distance between each of the repeating magnetic patterns is only 0.125 mil (125 millionths of an inch).

Unfortunately, when magnetic wavelengths become very short, losses in the record-playback process increase substantially. To offset these losses at slow tape speeds, the high frequencies are considerably boosted before they are applied to the tape. (This process is called "record equalization.") There is, however, a limit to how much short-wavelength signal can be stored on the tape, and if we try to exceed this "saturation" point, the more we increase the input to the tape, the less we actually get back from it.

From this it can be seen that the "frequency response" of a tape system depends very much on the level of the signal fed into it. Customarily,

the frequency response of cassettes (and 3¾-ips open-reel) is measured at a level 20 dB below the nominal "0 VU" point—a level that would not cause most VU meters to show any input at all. Frequency response at 7½ ips is usually checked at -10 VU, and, at 15 ips, at 0 VU. Under these differing test conditions, some cassette decks can achieve flat frequency response out to 20,000 Hz, and at 7½ ips, open-reel response customarily extends far beyond the audible frequency range.



However, the accompanying figure shows what happens to frequency response when a "0 VU" input is used, even allowing for a higher "0" level at the faster speeds. The top three curves are taken from an excellent audiophile open-reel deck using best-quality tape. The fourth curve (1½ ips) is derived from one of the best cassette decks on the market using "state-of-the-art" tape. In each case,

bias and equalization were adjusted so that at low input levels the frequency response was ± 2 dB at 20,000 Hz. As you can see, the higher open-reel speeds buy both more high-frequency headroom and the ability to put more signal on the tape even at lower frequencies.

This brings up the vexed question of signal-to-noise ratios. Here again, a variety of measuring techniques is used in the equipment industry, making direct comparisons of the numbers reported impossible. To give

you some idea of the relative capability of the cassette versus the open-reel medium I measured weighted (CCIR/ARM) signal-to-noise ratios, all referred to the same 3 per cent distortion point, for the same tapes and speeds shown in the figure. They came out as follows: 15 ips, 68.7 dB; 7½ ips, 69.1 dB; 3¾ ips, 65.8 dB; 1½ ips, 55.7 dB. (This was without Dolby noise reduction.) —C.S.

Sony quality that speaks for itself.



The TC-K7 II front-loading cassette deck is its own best spokesman.

Switch it on, and that disciplined Sony engineering will come through loud and clear.

And no wonder. Sony's been making tape recorders for 30 years. And today, we're still pushing back the frontiers. The K7 II shows how.

Its transport mechanism is a DC servo-controlled motor, with a frequency generator. It emits a signal which is relayed to electronic circuitry that locks in the tape movement exactly.

Our heads are ferrite-and-ferrite. And they're Sony's own formula—we don't buy them, we use our heads and make them.

You'll also find a direct-coupled head-playback amplifier. This means we've eliminated the middleman—the coupling capacitor—from the signal path. You get your sound direct, with minimum distortion.

Another reason the K7 II is the logical choice: our logic controlled feathertouch push-buttons actually go from fast-forward, to rewind, to play, without going through the stop position.

The K7 II also speaks for itself with Dolby Noise Reduction System™ Large, professionally calibrated VU meters. Three LED's for peak level indication.

There's also bias and equalization switches for standard, Ferri-Chrome and Chromium Dioxide tapes. In fact, with nine possible combinations, any tape possibility of the future can be accommodated.

So if you're intrigued by quality that speaks for itself, get down to your Sony dealer and check this new cassette deck.

Before they're all spoken for.

Sony quality that doesn't speak at all.



But it won't be silent for long. Because the moment you record on one of our blank tapes, that quality will make itself heard.

Witness our Ferri-Chrome cassette.

Everybody knows that ferric-oxide tapes are ideal for reproducing the low frequencies. And that chromium dioxide is ideal for the high frequencies.

As usual, Sony wouldn't settle for anything but the best of both.

And as usual, Sony's engineers solved the problem. With a process that allows a coating of chromium dioxide to be applied over a coating of ferric-oxide.

Our two coats are leaving other brands of tape out in the cold. Because Ferri-Chrome boasts shockingly low distortion and startling dynamic range.

Sony is this advanced because we make more than tape. We make tape heads and tape recorders, too. (No other consumer company is that involved.) Because we know where tape winds up, we're better able to design and produce it.

Of course, in addition to Ferri-Chrome, Sony makes a complete line: Chrome, Hi-Fidelity, Low Noise, Elcaset and Microcassette.

Sony's been making tape for 30 years.

So when it comes to answering the tough questions about the manufacture of tape, no one fills in the blanks like Sony.

SONY AUDIO

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CIRCLE NO. 2 ON READER SERVICE CARD

SEMI-PRO recording is booming among today's aspiring musicians and recording engineers, judging from the amount and variety of equipment now available. Such equipment, although not inexpensive, starts at prices comparable to those of high-end home hi-fi equipment. Given the proper equipment and the know-how to operate it, a talented "basement" recordist can produce tapes of master quality—that is, tapes worth cutting discs from.

Our recording engineer in the case history that follows is Vincent Ficara, an experienced home recordist who has played in a rock band and taken electronics courses. By profession, he is a computer programmer, which may not at first seem relevant. But it turned out to be very important, for training in writing computer programs makes it easy to conceptualize the complex signal flow paths that normally occur when you use a mixer's multipurpose inputs and output to full advantage. It is also important that he had no experience with the type of semi-pro equipment he would be using, for only someone who has come fresh to the equipment would be best able to appreciate and write about the problems facing the novice in the field of semi-pro recording.

Peter Ponzol, the co-author, is a talented jazz musician who had recently received a Jazz Performance Grant

Fellowship from the National Endowment for the Arts, to make a recording of his own work. The article that follows describes the production of that record.

It is not just because Mr. Ficara is a programmer that the discussion begins with a planning stage. Those of us who have been involved in similar projects know how important planning is—and how often it is neglected. Professional recording engineers may sometimes seem to be improvising when they set up for recordings, but they are not so much improvising a new theme from scratch as creating variations on old and well-remembered ones that they've used over and over in past recording sessions.

Throughout, the authors assume that the reader already knows basic tape-recording and microphone theory, and they have tried to maintain a balance between providing too much detail about technique and too little. And keep in mind that this is a mere introduction to a large subject; no one article or even a book could provide all the information needed to turn anyone into a Master Recordist overnight. We are grateful to the various manufacturers who loaned equipment and gave generous advice in various stages of this project, and we hope that these efforts provide some insight into the joys, the problems, and the fantastic creative potential semi-pro recording opens up to the ambitious amateur.—The Editors

SEMI-PRO RECORDING

• HOW TO MAKE YOUR OWN MASTER TAPES •

Preliminary Planning

We had thought originally that we would do the recording on a four-track tape deck, but we rejected that approach because it would have meant pre-mixing stereo tracks for drums, acoustic bass, and synthesizer, leaving only two tracks for overdubbing reed and percussion instruments. You can, with a little ingenuity, "bounce" tracks around and record, say, nine different tracks on a four-track deck, but with an inevitable loss of sound quality. In a typical four-tracker you might first record three tracks, play them back, mix them as desired, and then rerecord the three tracks combined onto the fourth track. Then you erase the original three tracks, opening up three "new" tracks to record on. But . . . each time you "bounce" a track it is another generation away from the original, and each new generation means some deterioration of the original sound.

All other things being equal, the best results in multitrack recording are

-
- **THE PROJECT:** production of a master tape that would be used to produce a record album.
 - **THE INSTRUMENTATION:** five musicians playing drums, acoustic bass, synthesizer (keyboard and percussion), sax, flute, and percussion.
 - **THE SITE:** the living room—a little tight, but we would manage.
-

achieved when there's a separate track available for each microphone being used. But in the real world of home recording this is seldom possible: you never seem to have enough tracks no matter how many are available. Although most amateurs will be working with a four-track deck, an eight-tracker permits recording each track at optimum level and equalization. It also

offers the option of adding reverberation and/or other signal processing to any of the recorded tracks individually during the mix-down session rather than earlier. And, finally, it provides complete control of the mix of the individual instruments during the mix-down session. It was for these reasons (as well as the fact that one was available) that we chose to use an eight-track deck, but much of what follows is as applicable to four tracks as to eight.

Prior to this project, the closest I had been to eight-track equipment was at the 1976 Audio Engineering Society convention in New York, where I spent a good part of a day at the Teac/Tascam exhibit twisting knobs to my heart's content. It was my first exposure to the Model 80-8 eight-track, ½-inch tape deck and the Model 5 mixing board. Fascinated, I gathered all the allied literature I could get my hands on at the convention and spent the rest of the year digesting it.

When this recording project suddenly developed, I found that a considerable amount of additional research was

By Vincent Ficara
and Peter Ponzol

THE EQUIPMENT

- **Main record deck:** Teac/Tascam Model 80-8 eight-track, ½-inch, 15-ips tape deck with DX-8 dbx.

- **Mixdown deck:** Tandberg Model 10XD two-track, ¼-inch, Dolby tape deck.

- **Mixing equipment:** Teac/Tascam Model 5 mixing board with Model 1 "submixer."

- **Microphones:** Electro-Voice CS15 condenser (two); Electro-Voice RE16 dynamic (two); Shure SM56 dynamic (two); AKG C-451E con-

denser with CK-1 capsule (a microphone/preamp combination).

- **Monitoring headphones:** Shure SA-2E Solo-Phone headphone amplifier; Koss Pro/4AAA main monitoring phones; various other musicians' phones.

- **Signal-processing accessory:** MXR digital delay unit.

- **Tape:** Ampex Grand Master 456 ½-inch tape (10½-inch reels); Maxell UD35-180B ¼-inch tape (10½-inch reels).



The living room was big enough for recording, but not for photography. Author Ficara is shown at the console as set up in our photo studio (photo by Bruce Pendleton).

"As a first step, I made up a chart listing all the instruments to be recorded."

necessary before I could decide what equipment I would need, especially in the microphone area. So the first thing I did was to get my hands on a number of reference books (see the recommended reading list herewith). Then, armed with this secondhand expertise (and with a few firsthand experts available to ask questions of), I selected the equipment; you'll find it all listed in the box on the previous page.

The Mixing Board

The mixing console is the heart of the recording session. It provides complete control over the signals that come into the board as well as how the signals will be handled in terms of equalization (EQ), reverberation, or any other signal processing you may have connected to the setup. You can direct any input signal to record on any track. You can play back previously recorded tracks while recording new tracks (providing the tape deck has multitrack synchronizing capabilities). You can combine two or more inputs, mix them together, and direct the combined signals to any track(s) you wish. You have monitoring facilities that enable you to monitor any or all incoming signals in any combination you wish. You have facilities to feed any signal to the musicians' headphones. In fact, there are so many options that it would take a separate article to describe them in detail.

My own interconnections between the Model 5 and Model 1 mixers and the Model 80-8 eight-track deck for these recording sessions were arrived at after a great deal of deliberation. Considerable thought was required in order to work out the interconnections for maximum convenience and minimum need to plug and unplug audio cables each time I had to do something different. I found it very worthwhile to invest some time in organizing a logical approach to the problem. As a first step, I made up a chart listing all the instruments to be recorded. I then decided which instruments would go on the basic tracks and which would be overdubbed. I also worked out and listed the microphones, the console inputs, and the track assignments I would use for the specific instruments.

Microphone Setup

When track assignments were decided upon, I was ready to set up the microphones. I anticipated that the drum set would be the most time-consuming setup, so I did that first. Microphone inputs 1 to 5 on the console would be used for the five microphones covering the drum set. Input 1 was fed a signal from the CS15, a cardioid condenser microphone mounted on a "baby" boom positioned approximately one foot above the left cymbal and aimed directly down toward the edge where the sound seemed to be richest.

I chose an electret condenser mike over a dynamic because I believed it would be better able to handle the high-frequency transients produced by the cymbals. But this also meant that I had to be careful to avoid overloading the microphone's built-in electronics with high sound-pressure levels. Once an overload has occurred within the microphone itself, trimming the console's input doesn't help since the arriving signal has already been distorted.

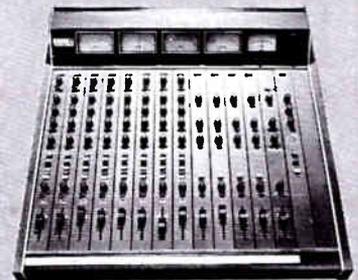
Having considered this possibility, I decided to install a 10-dB attenuator "pad" between the capsule and the electronics of the microphone. Any further gain or attenuation needed in its signal output would be handled at the mixing board. Although the main reason for placing this microphone where I did was to pick up the left cymbal, I also wanted it to provide overall pickup of the left side. I set the basic equalization at the mixer to roll off everything from 200 Hz on down.

Mixer input 2 was fed a signal from the RE16 dynamic cardioid microphone located several inches above and off to the side of the floor tom-tom's head. The cardioid microphone takes its name from the heart-shaped pattern of its directional (polar) response. It is designed to respond best to sound reaching it head-on and to reject sounds coming in from the sides and rear. However, because of the nature of sound, it is difficult for any microphone to reject off-axis low frequencies, and some lows do get through unaccompanied by the rejected highs. The result is referred to as "off-axis" coloration. The RE16 was chosen because it suffers from this problem less than most and has a good overall frequency response.

Obviously, experimentation with mike aiming and placement will also help avoid off-axis coloration and the muddy-sounding tracks it can produce. In any case, you can assume that there will always be some leakage of the sound of one instrument into another instrument's microphone, and there are

certain steps you can take to minimize it. In the case of the floor tom, I rolled off everything above 10,000 Hz—the tom has no significant output up there anyway—so that high-frequency room noise and leakage from the cymbals would be cut back.

The kick drum was next. I used an SM56 dynamic cardioid microphone. The SM56 has good bass and good overall response. I packed the kick drum, one head of which was removed, with a blanket pressed against the skin to provide more of a "thud" quality, and I aimed the SM56 off-center where it picked up the sound quality I wanted. The signal from this microphone was fed to input 3. I set the mixer to filter frequencies above 5,000 Hz to help minimize leakage from the rest of the drum set. I placed another RE16 equidistant from the hi-hat cymbal and the snare drum, filtering everything below 200 Hz to minimize leakage from the kick drum. The microphone was connected to input 4. For the overhead-right cymbal I used another CS15, with the same EQ setting as the overhead-left cymbal, connected to input 5.



Above, Teac/Tascam Model 5 mixer.



Stacked, MXR digital delay unit, Shure SA-2E headphone amp, Teac/Tascam Model 1 submixer; below, Teac/Tascam 80-8 tape recorder with dbx DX-8 noise reducer.



It is not always necessary to use this many microphones in order to capture a good drum sound, of course. Two cardioid microphones directed 90 degrees apart and aimed at the drum set from several feet away can produce a very good sonic image. However, this method requires a favorable acoustic environment; otherwise, the mikes will pick up too much room-reflected sound, which will dilute the "tight" drum quality that is wanted. Close miking would, for the most part, pick up only the direct, tautly damped sound.

Fixing the Phase

My decision to use five microphones created difficulties that required several hours to resolve. The major problem was controlling phase cancellation. Consider the fact that there are many sound waves emanating from the different components of the drum set. These sound waves reach the differently located microphones at different times, thus creating random phase electrical audio signals. When such signals are mixed, some frequencies will add

and be boosted, while others will cancel and be reduced. Close miking of the instruments helps considerably in avoiding this, because sound reaching a distant microphone from other instruments will have a lower sound-pressure level and will therefore have less effect on the mixed signal. One technique for guarding against phase cancellation employs what is known as the 3-to-1 rule: whatever the distance one microphone is from an instrument, no other microphone should be closer than three times that distance. For example, if you place a microphone 1 foot from the flute, you should not place another microphone within a 3-foot radius of it.

Frequency cancellations will not be heard when monitoring tracks *individually*. Each component of the drum set may sound good until the mix-down, when you suddenly find that the whole is unfortunately less than the sum of its parts. In order to avoid such surprises, it is a good idea to listen to the drum tracks mixed down into mono *before* taping them. Any problems can be detected at that point and adjustments can be made in your microphone place-

ments and EQ. It took me several hours of trial and error before I got the drum tracks to sound right.

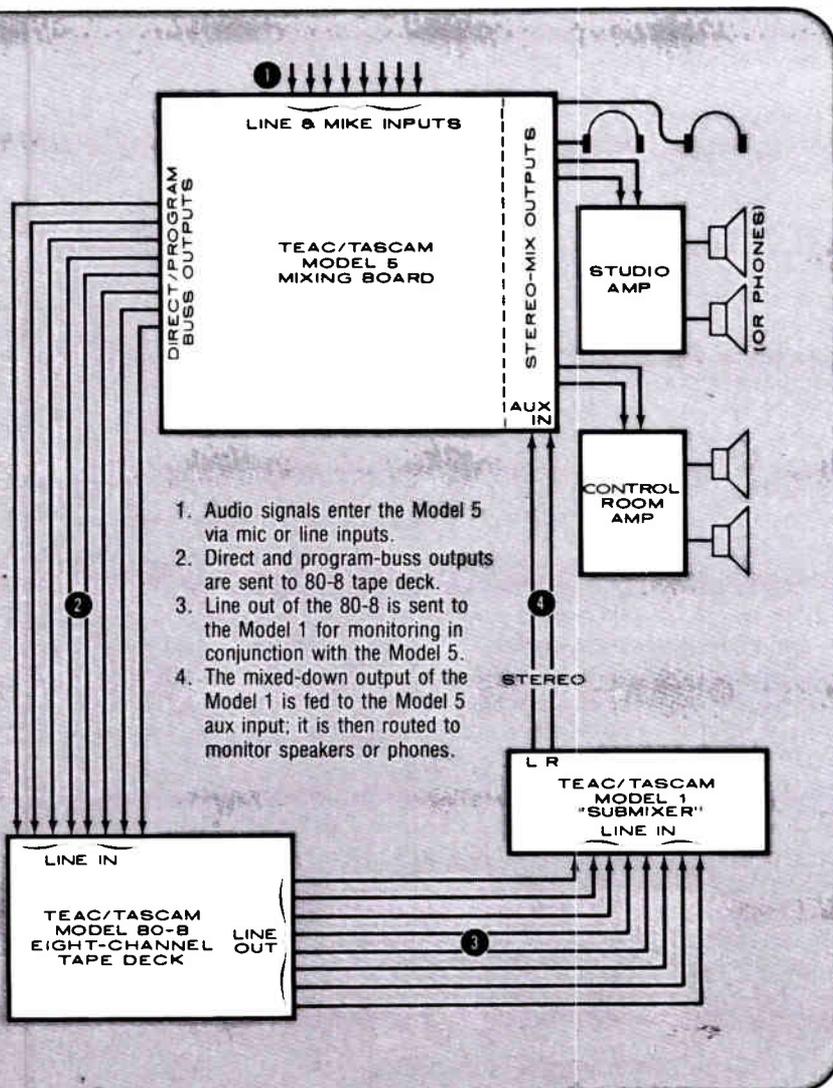
The Model 5 mixing board has extensive monitoring facilities that enable the operator to mix and monitor the incoming signals in various ways *without* affecting signals going out to the tape deck. These include separate panning and volume controls, plus the solo buttons that allow the operator to monitor one or more inputs to the exclusion of all others.

Signal Assignments

At this point I had five mikes picking up the drum set and connected to mixer inputs 1 to 5. It was necessary to mix the five inputs down to a stereo pair that would be recorded on two of the eight tracks. The Model 5 has four "summing" busses that are used when it is necessary to combine two or more signals. For the drums I used output busses 1 and 2, which were destined to represent the left and right channels of the stereo drum mix. I panned the left-overhead (input 1) and the tom-tom (input 2) toward the left channel, and I directed the kick-drum signal (input 3) equally to both left and right channels, thus placing it in the center of the stereo image. The right-overhead (input 5) and the hi-hat/snare (input 4) were directed toward the right channel. Output buss 1, left channel, was connected to tape-track 2. Buss 2, right channel, was connected to tape-track 4. I purposely separated the two tracks in order to minimize crosstalk between the left and right channels and maintain the best separation possible.

After I had established the proper recording levels, I moved on to set up the keyboard synthesizer; this wasn't going to be miked, but instead would be fed directly into the mixer via its high-impedance unbalanced output. I connected the synthesizer's output to a *direct box* whose purpose is to match the output characteristics of the synthesizer to the input of the console. The synthesizer's electronics were a little noisy, so I rolled off the high end just enough to cut out some of the hiss without affecting the quality of the signal. I established a good recording level and assigned the synthesizer (input 8) to tape-track 5.

Next to be dealt with was the bass guitar. It had a pickup on it which enabled me, using another direct box, to feed it directly to console input 7 and *also* to the input of its bass amp. I set up the bass amp in another room and placed an SM56 microphone to pick up the signal slightly off the center of its 15-inch speaker. (The bass amp was set



SEMI-PRO...

"A psychological danger is posed by the mixing board. You may feel you have to use everything at all times just to be sure you're getting your money's worth."

up in the other room to avoid acoustic leakage from the drums onto the bass track and vice versa.) The SM56 microphone was connected to mixer input 6. I used both a direct-box pickup and a microphone pickup because the direct signal into the mixer was too "clean" and lacked the special tonal characteristics of the bass amplifier and its associated speaker.

Using output buss 3, I mixed the two inputs so as to combine the best qualities of both pickups, filtering everything above 10,000 Hz for both inputs. It was vital that both the direct and the miked signals be in phase here; otherwise, the low frequencies would cancel. This is similar to the earlier problem with the drums, except that with the bass amp it is a matter of *electrical* rather than *acoustical* phase. Most amps have a phase-reversal switch for checking out potential problems. The combined signal assigned to output buss 3 was directed to tape-track 3, giving us a premix of the drums on tracks 2 and 4 and the bass guitar on track 3.

The Basic Tracks

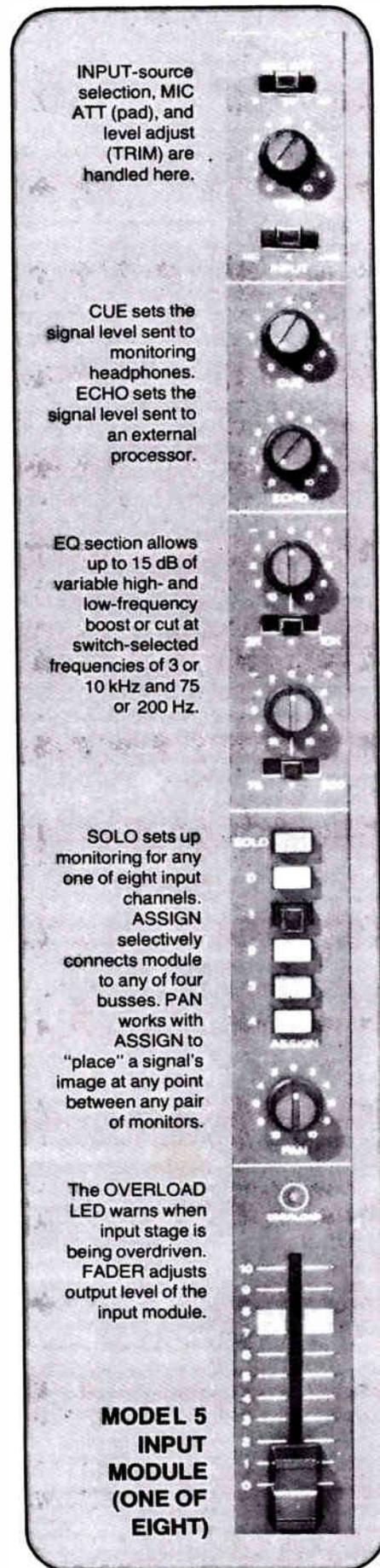
We were finally set to record the basic tracks. Each musician had to wear headphones in order to hear what the others were doing. I used the line-level studio feed of the Model 5 to drive a Shure stereo headphone amp which has two headphone feeds. For the third musician I used the built-in headphone amp from the model 5. Since the musicians would have no trouble hearing the drums (they're *loud!*), it was not necessary to give them a drum mix in their headphones. The three musicians were fed the same mix of bass guitar and synthesizer. If it were necessary, the Model 5 could have delivered different mixes. We played around with the level and balance controls of the headphone feeds until everyone was satisfied. Like most amateurs, I didn't have a soundproof control room to monitor from, so I also used a pair of headphones for monitoring. It was important that my phones be able to tell

me exactly what was going onto the tape while being able at the same time to sustain high sound-pressure levels and maintain good acoustic isolation from room sounds. The musicians' headphones weren't as critical in these respects.

While the group was warming up, I established the levels for both the Model 5 mixing board and the Model 80-8 tape deck. The Teac/Tascam 80-8 came already biased and set up for Ampex Grand Master 456 tape, so that's what we used. The machine could, of course, be readjusted for any type of tape, but the Ampex tape is recommended by Tascam, and rebiasing is a fairly involved process, something not to be attempted without adequate equipment and know-how.

It became necessary at this time to make some minor adjustments in level and equalization, for when you hear all the musicians playing together, the interaction of the various tracks can sound different than when heard individually. That's why it is imperative that all the tracks be monitored in approximately the same stereo mix as the final mixdown. However, each track should be *recorded* with optimum level and equalization, since once the musicians have gone home, you have to work with what you've got and there's only so much you can fix in the mix, especially with the premixed tracks.

A psychological danger is posed by the mixing board with its profusion of knobs and switches. You may feel that you *have* to use every one at all times just to be sure you're getting your money's worth. But be careful: it is *very* easy to misuse the equalization facilities. Experiment with different *subtle* equalization settings to achieve the results you want. On the other hand, despite its imposing appearance, I found the Teac 80-8 tape deck very simple to operate. You depress the function-select button for those tracks you wish to record, and the dbx noise-reduction unit (optional) will automatically switch to the encode mode. The LED's blink for those tracks that are in the record-ready mode. Simply press the forward and record buttons of the tape transport and you are recording. You can, of course, "punch in" if you find it necessary to rerecord over only a portion of a track. Punching in switches a track from the play to the record mode *while the tape is running*. For example, say you've recorded a good track, except that at one point a musician came in a little late or played a wrong note. Rather than rerecording the entire track, you can have the musician monitor and play along with his



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previously recorded version—and at the appropriate moment, between notes or during a natural pause, you *punch in*. When you reach the next natural pause you simply “punch out.” If the timing and the levels are right, the “correction” will not be heard as such in playback.

The Noise Reducer

The DX-8, as the dbx unit available with the Model 80-8 is called, is a wide-band compression-expansion system that provides noise reduction across the full audio band (not just the hiss frequencies) of about 30 dB for each of the eight tracks *individually*. In addition, the dbx DX-8 system is able to provide a tape recording with a dynamic range greater than 100 dB—important when you’re doing live recording. Not only can you get more signal on the tape, but you can also record at lower levels than normal without hiss, which insures lower distortion and more headroom when required.

Overdubs

Over several weeks of evening sessions we managed to lay down all the basic tracks, and the overdubs were recorded over the next several weeks as the various musicians became available. Tracks 1, 6, 7, and 8 were available for overdubs. Our first overdub was of a soprano saxophone. I used a C-451E electret condenser microphone with a cardioid-pattern capsule (the C-451E has provisions for interchangeable capsules). I set up the mixer to feed a mix of previously recorded tracks to the musician’s headphone feed so that he could play along with them. Of course, when a take didn’t work out right for some reason we could rewind and start again without affecting the tracks already recorded. I had the C-451E connected to the Model 5’s input 1 while I directed the output to tape-track 7. The track was recorded with very little equalization.

Some of the overdubs involved recording an alto saxophone and flute, with the musician occasionally changing instruments during the same cut. Other cuts were overdubbed with a percussion synthesizer that uses a drum-like surface instead of a keyboard to generate its sounds; the harder you hit it, the higher the pitch. This synthesizer was connected to mixer input 2 via a direct box. A CS15 was also mounted nearby in order to pick up the various other percussion instruments—bells, triangle and a gong—as well as a vacuum-cleaner hose (when swung through the air it creates interesting

sounds, particularly when a microphone is accidentally struck!) and an assortment of various other sound-producing devices. The CS15 was connected to console input 3. Inputs 2 and 3 were mixed using output buss 4 and directed to tape-output 1.

Finally, we completed the planned recording. Tracks 6 and 8 were left open in the event we wanted to add something at a later date. Track 6 was eventually used to record some special effects using the flute track and the MXR digital delay. Although the MXR unit is capable of a wide variety of effects, the basic function of the unit is quite straightforward. The input signal is processed through circuitry that delays it by a selected amount of time. It is then mixed back with the “dry” or

Final Mix-down

For the mix-down sessions, all of the eight input modules of the Model 5 were fed by the line outputs of the 80-8 tape deck. The seven recorded tracks were mixed onto program busses 1 and 3, which fed the left and right channels of a Tandberg 10-XD two-track deck biased for Maxell UD35 backcoated tape. The program busses of the Model 5 provide a pair of jacks in parallel for *each* of its four outputs. This enables a monitoring amplifier and speakers to be connected so that you can listen to the mix being fed to the two-track deck.

Each of the eight modules of the Model 5 can also be switched to send a signal through the MXR unit for processing. In the MXR the processed

RECOMMENDED READING

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

- *Microphones: Design and Application*, by Lou Burroughs, 260 pp., illus., \$20 hardbound, \$12.95 softbound (postpaid). Sagamore Publishing Co., 1120 Old Country Road, Plainview, N.Y. 11803.
- *Sound Recording*, by John Eargle, 327 pp., illus., hardbound, \$16.95

(postpaid on prepaid orders). Van Nostrand Reinhold Co., 450 W. 33 St., New York, N.Y. 10001.

- *Handbook of Multichannel Recording*, by Alton Everest, 322 pp., illus., \$10.95 hardbound, \$7.95 softbound (postpaid on prepaid orders). Tab Books, Blue Ridge Summit, Pa. 17214. (A “best buy.”)
- *Modern Recording Techniques*, by Robert Runstein, 368 pp., illus., softbound, \$9.95 plus 50¢ postage. Howard W. Sams & Co., Inc., 4300 W. 62 St., Indianapolis, Ind. 46206.
- *The Recording Studio Handbook*, by John Woram, 496 pp., illus., hardbound, \$35 postpaid. Sagamore Publishing Co., 1120 Old Country Road, Plainview, N.Y. 11803.

undelayed signal at the output of the delay. The effect produced will depend upon the amount of delay time chosen. The basic effects that can be obtained by using appropriate portions of the wide delay range provided by the MXR unit include discrete echoes, vocal doubling, and hard reverberation. In addition to those basic effects, the MXR contains circuitry that permits such unique effects as flanging (mixing an erratically delayed version of the main signal with the main signal itself), pitch alterations (vibrato, pitch bending), frequency modulation, and infinite (non-deteriorating) signal repetition.

The end result was a tape full of discrete tracks that had to be brought together into a standard two-channel stereo version. It was mix-down time!

signals are mixed with the “dry” (unprocessed) signal and can be selectively returned at various levels to any and all program busses. Aside from some special effects, the MXR was basically used to add reverberation whenever the close-miked instruments lacked “depth.” As with equalization, reverberation can be overdone. Unless you’re going for some special effect, it’s usually best to keep it subtle.

How did it all work out? In a word, superbly! Peter Ponzol has his master tape, and I have realized a long-standing fantasy of serving as a recording engineer. In addition, I had the pleasure of working with some really beautiful equipment. What more could anyone ask—except to own it! □

HOW HIRSCH-HOUCK TESTS TAPE RECORDERS

by Julian Hirsch

MOST people are far more concerned with how well a tape recorder tests than with the specific techniques Hirsch-Houck Labs used to test it. However, I am pleased to have an opportunity here to let readers look over my shoulder, so to speak, during our test procedures. A far better understanding and appreciation of the complexities and possible pitfalls of the test process should result. Moreover, it can make measurement results more meaningful to readers. There are a host of measurable characteristics to give one insight to a recorder's performance capabilities. There's a basic tape-recorder performance test for example, that determines the machine's playback-equalization characteristics as measured with a precision test tape and an a.c. voltmeter. This is usually shown in our test reports as a frequency-response curve. A playback response that perfectly conforms to the established standard will appear as a straight line, and any deviation from this indicates some loss of frequency fidelity in playing back tapes made on other machines. Other tests evaluate overall record-playback performance, including frequency response, distortion, signal-to-noise ratio (S/N), flutter, and various aspects of mechanical operation.

Because so much of the measured performance of a tape recorder (especially a cassette deck) is inseparable from the properties of the tape used in making the measurements, we ask manufacturers submitting machines for review to tell us which tapes they used for rating purposes and to provide test data on the particular sample they give

us (together, if possible, with the actual tapes used in the tests). This is almost a necessity if we are to achieve a good correlation between the manufacturer's measurements and our own. Nevertheless, the test data and tapes we request are not always furnished.

Since most of our tape-recorder tests are of cassette machines, I will first describe the cassette test procedures in detail and later mention the few respects in which open-reel-recorder testing differs.

We test all pertinent aspects of a recorder's performance with each type of tape it is designed to use (ferric, CrO₂, or ferrichrome). If no tape was furnished by the manufacturer, we use the recommended tape types (if available) from our own supplies. If, as in most cases, no specific tape is suggested in the instruction manual, we repeat all frequency-response measurements with a number of tapes to find the ones that seem to match the recording-bias level at which the machine is set. If the manual lists several recommended tapes and the suggested bias and equalization settings do not seem to produce the expected results, we repeat the tests with different switch settings, trying to find the optimum conditions. It is not uncommon (unfortunately) for us to have to make frequency-response measurements with six to ten different kinds of tape before deciding which one shows up the full potential of a given machine.

We first measure the record-playback (R/P) frequency response at recording levels of -20 dB and 0 dB (using a reference frequency of 1,000 Hz). The recorder's own meters are al-

ways used to determine levels for this purpose, since we are trying to evaluate the machine *from the user's point of view*. A manufacturer, who can control or measure the magnetic environment of the tape with considerable accuracy, would employ a different approach. With a two-head cassette deck, we first record a few seconds of the 1,000-Hz reference tone at a level of -20 dB. Stopping the tape, we set our General Radio frequency-sweeping oscillator to 20 Hz and simultaneously start the sweep and the tape recorder. The oscillator covers the 20- to 20,000-Hz range in a single logarithmic sweep in about one minute. We then stop the tape deck and rewind the tape to the beginning of the 1,000-Hz reference tone. We connect the playback output to the G-R graphic level recorder, whose chart motion is synchronized to the oscillator sweep (and thus to the recorded signal), and set the system gains for a suitable pen deflection from the reference tone. When the 1,000-Hz tone stops, the chart drive is started and the frequency response is automatically plotted. Following this, we make another recording, this time at a 0-dB level, and its playback is recorded on the same chart used for the -20-dB response.

Cassette recorders inherently require a large amount of high-frequency equalization (boost) during recording to achieve the desired flat frequency response in playback—so much in fact, that the tape tends to become saturated at high frequencies even when the recording level at middle and low frequencies is well within the tape's capabilities. This causes the playback curve from a 0-dB-level recording to fall off

rapidly, usually somewhere in the 5,000- to 10,000-Hz range. As a rule, the 0-dB and -20-dB response curves will intersect at some frequency above 10,000 Hz, and at higher frequencies the 0-dB recording actually gives *less* audio output than the -20-dB recording. The area between the two curves and the frequency at which they intersect indicate the high-frequency capability of the particular recorder and tape combination. On a given machine, they tell us something about the relative high-frequency performance of different tapes and, with a given tape, they tell us something about the relative amounts of high-frequency equalization used in different recorders (and, by inference, something about the effectiveness of their recording heads).

WITH a typical cassette recorder, we have to make from five to ten such response curves with different tapes, unless the manufacturer has been kind enough to supply us with the requested tapes (and even in that case, we usually test a number of competitive tapes for our own information). Whatever its advantages to the consumer, there is no doubt that the three-head cassette recorder has been a great boon to the tester. With a three-head machine (in which the third head is a true playback head) the R/P frequency response can be plotted in a single pass of the tape by reading the playback output as the recording is being made.

If the machine has the Dolby (or ANRS) system, as better ones do these days, we also test the input-output or encode-decode "tracking" of the noise-reduction circuits. Accurate level matching between recording and playback conditions is vital to correct operation of these circuits. A R/P response measurement is made at levels of -20 dB and -40 dB with and without the noise-reduction circuits in operation. Since all these curves are plotted on the same chart, any change in response due to incorrect adjustment or operation of the noise-reducing system can be seen at a glance. Dolby standards allow a 2-dB variation, and cassette decks typically meet this requirement.

Other measurements are made, without the chart recorder, using a single-frequency test signal. With the recorder's gain set to maximum, we measure the level of the 1,000-Hz input needed to give a 0-dB meter reading from both the line and microphone inputs. The microphone-input overload is measured by reducing the microphone gain and increasing the input level until the waveform at the playback output begins to clip.

We measure the playback output from a 1,000-Hz, 0-dB recording using samples of the tapes for which the recorder is designed (for example, ferric oxide, chromium dioxide, and ferrichrome as applicable). The third-harmonic distortion in the 0-dB playback from each tape is measured with a Hewlett-Packard spectrum analyzer. We increase the recording level in small increments to determine what input level results in a 3 per cent reference level for playback distortion. This 3 per cent point is generally considered to indicate the maximum recording level for any given machine/tape combination. (If the recorder has a limiter, we also measure the playback distortion from recording levels of +10 and +20 dB with the limiter in use.)

NEXT we record a short section of the 1,000-Hz tone at 0 dB, then reduce the input level to nothing and continue to record. During playback, we note the drop in output (expressed in decibels) when the tone stops. Adding to this figure the number of decibels (above the 0-dB meter reading) that were needed to reach 3 per cent playback distortion, we get the unweighted signal-to-noise (S/N) ratio of that machine/tape combination.

This measurement is repeated with two different weighting filters and also with the Dolby system in use. Both the IEC "A" and the CCIR/ARM weighting curves reduce the low- and high-frequency signals reaching the measuring meter. Since these frequencies are less audible than the middle frequencies, the weighted S/N is supposed to be more indicative of how noisy the machine will actually sound. The IEC weighting gives the "best" overall S/N numbers; the CCIR/ARM weighting gives a reading closer to an unweighted measurement, but shows the noise reduction of the Dolby system to better advantage. We also measure the noise increase through the microphone input at maximum gain (with a 2,000-ohm input termination) relative to the noise level through the line inputs.

The ballistic properties of the recorder's meters are checked with a 0.3-second, 1,000-Hz tone-burst signal repeated once per second. When the meters are set to read 0 dB on a steady-state signal of the same amplitude, the meter indications on the burst signal will be within 1 per cent of the steady-state value *if* the meters have true VU characteristics (very few do). Slow meter response and overshoot easily show up in this test.

With the exception of the flutter measurement, none of the following tests require making a recording. The

flutter measurement really should be a playback-only measurement, since flutter is added to the tape both when a recording is made and again (in a random relationship) when it is played back. Over the years we have acquired a number of flutter-test cassettes, each of which has been claimed to be "state of the art" (meaning its recorded tone is as free of flutter as possible) and thus better than its predecessors. Be that as it may, all the tapes give very different readings, and when we make a combined R/P flutter measurement (which should give a higher reading than a true flutter measurement) we frequently obtain a *lower* reading.

Flutter is essentially a frequency modulation of the recorded signal caused by small but rapid variations in tape speed. A flutter tape has a 3,000- or 3,150-Hz tone recorded on it and the playback from the machine is fed to a flutter meter, which is a form of FM receiver that can be tuned to the 3,000-Hz range. The demodulated FM carrier represents the flutter, which is displayed on a meter as a percentage of the carrier frequency.

Currently, most of our playback tests are made using an excellent set of test cassettes. Among them are cassettes with standard recorded levels to check the accuracy of the recorder's meter calibrations (in regard to Dolby level and the actual flux level corresponding to a 0-dB meter reading). There are also a flutter cassette and one recorded on one channel only that can be used to measure interchannel crosstalk at 1,000 Hz. Perhaps the most useful of the tapes are the playback-equalization test cassettes, which check playback frequency response. Most such cassettes we have used in the past left much to be desired in level constancy and accuracy.

The TDK AC-334 test cassette, which has eleven spot frequencies from 63 to 10,000 Hz, is one of the steadiest tapes we have used, and it is recorded with time constants of 3,180 and 120 microseconds to match the playback equalization of modern recorders (many earlier test cassettes used a 1,590-microsecond equalization, which required correcting the readings in order to get the true response of a machine). Like all other cassette test tapes we have used in the past, this one has an upper limit of 10,000 Hz. However, TDK now also has the AC-337 tape, which goes from 40 to 12,500 Hz. This has proved to match the AC-334 very closely within their common frequency range. The 70-microsecond playback equalization used for chrome and ferrichrome-equivalent tapes is checked with a Teac 116SP tape covering the 40- to 10,000-Hz range.

Other factors we test on cassette decks include fast-forward and rewind times with a C-60 cassette, accuracy and effectiveness of peak-level recording lights, headphone listening volume with 200- as well as 8-ohm phones, and accuracy in recording and playing back FM-tuner interstation hiss at an indicated -10-dB meter reading (the playback is compared to the input signal in an A-B test and even very small departures from flatness can easily be heard).

With open-reel recorders the basic procedure is much the same, although the prevalence of three-head machines makes the R/P response measurement much faster and simpler. Moreover, the difference between the -20- and 0-dB frequency-response curves is often so slight that it cannot be measured

in the audio range, in which case we also make a measurement between 20,000 and 40,000 Hz. For playback-equalization and flutter tests, we use various Ampex alignment and test tapes. At 15 ips we are able to make only R/P measurements.

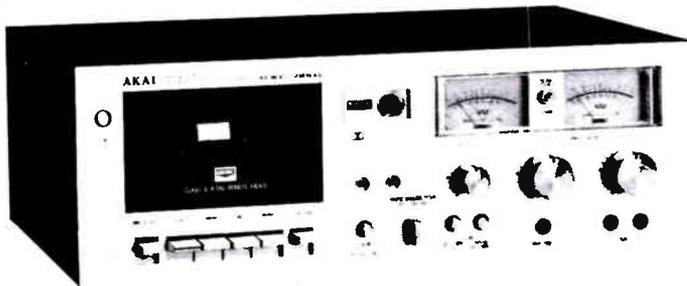
Of course, we also make recordings on every machine tested. We do not have easy access to live music sources, and recording music from FM or records may not fully tax the abilities of the better machines, whether open-reel or cassette. However, such sources are adequate to reveal any handling peculiarities that would merit comment, and we believe that recording interstation random noise is comparable to many live-music recording situations in that it requires a full audio bandwidth with negligible deviation from a flat re-

sponse and no audible loss of highs from tape saturation. (It also has the advantage of being unaffected by microphone placement and other such variables common in live recording.)

I SUSPECT that some readers are surprised and overwhelmed by both the complexity of the procedures and the amount of instrumentation required for these tests. By the time we have put, say, a simple \$200 cassette deck through its paces, it may have been involved with over \$10,000 worth of test equipment besides many, many hours of test-bench and use time. But if we are to provide a reasonably accurate evaluation of a product it is simply not possible to cut corners. □

TAPE MACHINE TEST REPORTS FROM HIRSCH-HOUCK LABORATORIES

Akai GXC-725D Cassette Deck



THE Akai GXC-725D is a moderately priced, front-loading, three-head cassette deck powered by a single electronically controlled d.c. motor. The transport mechanism is operated by the familiar row of levers below the cassette opening. Akai has arranged things so that the levers of the GXC-725D can be used in any sequence without going through STOP.

A single lever serves for both STOP and EJECT functions; the first pressure (even a very light one) stops the tape, and releasing it and pressing again opens the cassette door.

The cassette is loaded into retaining

clips built into the hinged door. The door opens quietly, with a slow damped motion. It can be removed easily for cleaning or demagnetizing the heads. Most of the cassette can be seen through the window in the door, and it is back-lit so that one can always see how much tape remains to be played.

The recording and playback heads of the Akai GXC-725D, though electrically and magnetically separate, are built into the same housing, which fits through the hole in the edge of the cassette usually occupied by a combination record/playback head. Since the azimuths of the two head gaps are set

precisely during manufacture, the GXC-725D does not require the alignment adjustments that are necessary with cassette recorders using physically separate recording and playback heads.

The cassette opening at the left of the panel is flanked by a pushbutton power switch and an index counter with reset button. The upper right portion of the panel is devoted to two large illuminated VU meters calibrated from -20 to +5 dB. Between them is a PEAK LEVEL light that flashes when brief signal peaks reach +7 dB.

Below the meters are the two recording-level controls and a single playback-level control. Two indicator lights show when the machine is set for recording and when the Dolby system is turned on. Across the bottom of the panel, to the right of the transport controls are pushbutton switches for MONITOR (delivering either the input source or the playback-output signals to the line outputs), DOLBY noise reduction, and the MPX FILTER that removes any 19-kHz pilot signal remaining in an FM stereo program, which might affect the

operation of the Dolby circuits. There is a TAPE SELECTOR knob that simultaneously changes bias and recording and playback equalization for four basic tape formulations. These are identified as LN (low noise), LH (low noise/high output), CrO₂, and FeCr. A stereo headphone jack and two microphone jacks complete the front-panel features. The line input and output jacks are in the rear.

The instruction manual for the Akai GXC-725D contains complete performance specifications, which are too lengthy to repeat here. It also has a table listing the recommended settings of the TAPE SELECTOR for some twenty-five types of tape and shows the "reference" tape used for each of the switch settings to establish the recorder's performance specifications. The Akai GXC-725D is supplied in a vinyl-clad wooden cabinet finished in simulated walnut grain. It is approximately 17½ inches wide, 11¼ inches deep, and 6½ inches high. Price: \$400.

● **Laboratory Measurements.** The playback frequency response was measured using TDK AC-331 and Nortronic AT200 test tapes for the "standard" 120-microsecond equalization, and Teac 116SP tape for the 70-microsecond equalization used with CrO₂ and FeCr tapes. In both cases the response was within ±1 dB over the full range of the tape (31.5 to 10,000

Hz). It is interesting to note that the CrO₂ performance of the recorder is specified only with cobalt-treated ferric "chrome equivalents" such as TDK SA and Maxell UD-XL II, and no actual chromium-dioxide tapes are listed in the table. We tested the machine with the recommended TDK SA and also with BASF Chromdioxid Super. Finally, the FeCr position was checked with the recommended Sony Ferrichrome and alternate Scotch Classic.

Although there were of course differences in frequency response between the tapes, the similarities between them were striking. For example, the overall response of the TDK SD and Maxell UD-XI were virtually identical over most of the audio range. Most of the deviation from flatness was in the low-frequency "ripples" caused by the head geometry. The overall response was within ±2 dB from 36 to 13,000 Hz with SD and from 34 to 15,000 Hz with UD-XL. Scotch Master (LH) had a mild high-frequency rise and a ±2 dB variation from 35 to 15,000 Hz. The TDK SA, used as a CrO₂ tape, had a slightly stronger and extended high end, with a ±1.5 dB variation from 37 to 16,500 Hz. The BASF chrome tape had a more pronounced high-frequency rise above 4,000 Hz, giving it a ±2.5 dB variation from 35 to 18,500 Hz. The ferrichrome tapes gave the widest and flattest frequency response. Sony FeCr was

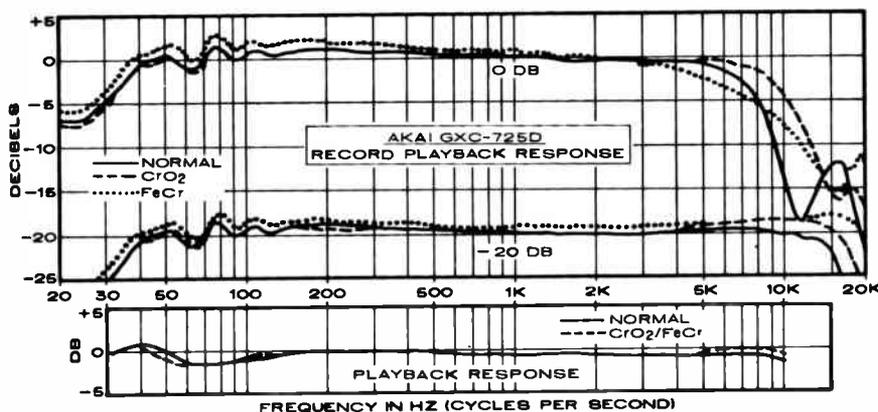
there was the expected rolloff of high-frequency response due to tape saturation. However, the loss of highs was much less than we normally measure on cassette decks, and the 0-dB curve remained above the -20-dB curve at all times instead of intersecting it, as usually happens with cassette recorders. This can be credited to the use of separate recording and playback heads whose gaps have been optimized for their particular functions.

The MPX FILTER cut off sharply above 13,000 Hz, reducing the recording response at 19,000 Hz by nearly 20 dB. The "tracking" of the Dolby circuits was excellent, with no more than a 2-dB difference between frequency-response curves run with and without the Dolby system at levels of -20 and -30 dB. The GXC-725D uses a "double-Dolby" system with separate Dolby circuits for recording and playback functions, so that programs can be monitored from the tape as they are made and heard with the correct frequency response and noise levels.

For a 0-dB recording level, the required input was 53 millivolts at the line jacks and 0.18 millivolt at the microphone jacks (the microphone amplifier overloaded at 43 millivolts input). The meters were calibrated so that the Dolby level of 200 nW/m registered +3 VU as marked. Their ballistic characteristics were exactly as specified for VU meters, so that they indicated 100 per cent of steady-state readings when driven with 0.3-second tone bursts once per second. The PEAK LEVEL light began to glow at a +7-dB input.

The 1,000-Hz, 0-VU playback distortion was only 0.25 per cent with TDK SD (LN), about 0.45 per cent with Maxell UD-XL (LH) and TDK SA (CrO₂) and 1 per cent with Sony FeCr. All of these are well below the rated distortion levels for the recorder. The reference distortion level of 3 per cent was reached at an input of +9 dB for LN, +10 dB for LH, +7 dB for CrO₂, and +6 dB for FeCr.

The signal-to-noise ratio (S/N) was measured for each tape using unweighted measurements, IEC "A" weighting, CCIR weighting, and CCIR with Dolby noise reduction. The differences between tapes were slight, with only about 2 dB separating Maxell UD-XL from TDK SD in a weighted measurement with Dolby. Considering that the worst S/N we measured under those conditions was a very good 64.6 dB, it seems that "noisy" is hardly the proper adjective to use when discussing either the machine or any of the tapes! The noise level increased by 8.5 dB through the microphone inputs at maximum gain, but it was not obtrusive at normal gain settings.



Hz) most of the variation being at the lower frequencies.

The record-playback frequency response was measured for each of the tape-selector positions using the recommended reference tape or a close equivalent. For the LN and LH tapes we used TDK SD and Maxwell UDXL in place of the specified Fuji FL and Maxell UD tapes. We also tried a Scotch Master tape with the LH set-

ting. It is interesting to note that the CrO₂ performance of the recorder is specified only with cobalt-treated ferric "chrome equivalents" such as TDK SA and Maxell UD-XL II, and no actual chromium-dioxide tapes are listed in the table. We tested the machine with the recommended TDK SA and also with BASF Chromdioxid Super. Finally, the FeCr position was checked with the recommended Sony Ferrichrome and alternate Scotch Classic.

All measurements were made at a -20-dB recording level. At a 0-dB level

The tape transport worked smoothly and quietly. The unweighted rms flutter was only 0.09 per cent. In fast forward or rewind the machine covered a C-60 cassette in 90 seconds. The PAUSE control started up the tape with a short but perceptible "fade in" that effectively eliminated any transient start-up speed variation. The headphone volume, even with 200-ohm phones, was very good.

● **Comment.** Before making any measurements on the Akai GXC-725D, we connected it to a music system and put it into operation. Its quality was immediately audible, to the extent that the later measurements did not surprise us at all. For example, we could record interstation FM tuner hiss and hear almost no difference between the input and playback signals from the recorder at a -10-dB recording level. Instead of the usual dulling of the highs, the major change in the playback quality was a slightly heavier low end, perhaps from the cyclic response variations below

100 Hz. In this test, the performance of the GXC-725D was closer to that of an open-reel tape deck than to other cassette decks.

We noticed that recording levels can be set up without placing the machine in the record mode (or even loading a cassette). The "headroom" is considerably greater than is common in cassette recorders, so that it was safe to let the meters reach 0 dB regularly (which resulted in an occasional flash from the PEAK LEVEL light) when recording from FM or records. Of course, with live program material having greater dynamic range, one should keep the average levels a bit lower.

It was also apparent that the bias and equalization characteristics had been chosen to make the machine compatible with a variety of tapes, unlike some machines whose proper performance can be realized only with the specific type of tape for which they have been adjusted.

The GXC-725D lacks a few features found on some other deluxe cassette decks. For example, it has no

"memory rewind" or provision for unattended recording with a timer switch. Its Dolby circuits cannot be used to decode an FM Dolby broadcast for listening only. Some of these features may be of importance to some people. To us, in view of what the GXC-725D *did* do and how well it did it, their absence was hardly noticed.

The Akai GXC-725D is a rare combination of an absolutely first-rate recorder (which sounds every bit as good as it measures) with a highly affordable price tag. This caliber of performance is available in a very few other cassette decks, all of which are much more expensive than the GXC-725D. It is also worth mentioning that this machine met or surpassed—usually by a wide margin—every one of the ratings for which we were able to test, and it had not a single idiosyncrasy or "bug" that we could find. This might seem to be no more than one would expect from any well-made product, but it is nonetheless rare, and it contributed to our totally positive feeling about the GXC-725D.

Fisher CR-4025 Cassette Deck



THE Fisher Model CR-4025 cassette deck features a wireless remote control PAUSE function that permits recording and playing back of tapes to be interrupted and resumed from a location some distance from the deck. The front-loading deck also has a single governor-controlled dc motor and two tape heads. It has built-in Dolby B noise-reduction circuitry, tape bias and equalization switching for normal (ferri-oxide) and chromium-dioxide tapes, and selectable line and microphone inputs.

The deck measures 15 1/8"W × 11 7/8"D × 6"H (38.4 × 30.2 × 15.2 cm) and weighs 13 lb 10 oz (6.2 kg). Price: \$250.

The recording levels for the two channels are independently adjustable. However, the line and microphone inputs cannot be mixed. Playback level from the deck is fixed.

Illuminated VU meters permit monitoring of both the record and the playback levels over a range of -20 to +5 dB. (The standard Dolby reference mark is at the +3-dB point on the meter scales.) The microphone input and

stereo headphone output jacks are located on the front panel of the deck. On the rear apron are the phono-jack LINE inputs and outputs and a control shaft for adjusting the sensitivity of the remote-control system.

The transport controls are operated by mechanical levers located below the hinged door into which the cassette is placed. The levers can be operated in any sequence without having to go through STOP. The transport mechanism has an automatic shutoff and mechanical disengagements system at the end of the tape in the PLAY mode, but it does not operate in the fast-forward and rewind modes.

The STOP/EJECT lever stops tape motion when first operated. Releasing and operating it again causes the cassette door to pop open for easy removal of the tape from the deck.

The remote-control transmitter, which is about the size of a 100-mm cigarette package, contains an ultrasonic generator and transducer. A receiving module is located behind the front panel of the deck. When the transmitter is aimed at the deck and a button on its side is pressed, a solenoid in the deck energizes the PAUSE lever

and a red LED near the receiver's input grille comes on to indicate that the transport is in the pause mode. A second operation of the transmitter's button releases the solenoid and restores normal operation.

● **Laboratory Measurements.** Since the owner's manual makes no specific recommendations for tapes for which the deck has been matched, we initially ran a series of record/playback curves with tapes we had on hand. With the NORMAL setting of the BIAS switch, there was little difference between the curves we obtained with most tapes, including Scotch Dynarange and Master I, Memorex MRX2, BASF Professional I, and Maxell UD-XL I. The somewhat "hotter" TDK AD tape yielded a slightly rising high-end response, which other tapes did not produce. The flattest response, by a small margin, was obtained with Maxell UD-XL I tape, which we used for our subsequent tests with the NORMAL switch setting.

We made similar measurements with Scotch Master II, Maxell UD-XL II, TDK SA, Sony CrO₂ and BASF Professional II tapes for the CrO₂ setting of the bias switch. (Sony CrO₂ and BASF Professional II were the only

Professional II, the response was nearly the same, except that it was noticeably flatter throughout most of the high-frequency range. At 0 dB, the saturation we observed with the UD-XL I tape was typical of most two-head tape recorders. The response curve gradually fell beyond 6000 Hz and intersected the -20-dB curve at 11,700 Hz. As expected, the chrome tape was considerably better in its high-frequency saturation properties, so that the 0-dB curve dropped off more gradually and never intersected the -20 dB curve.

The "tracking" of the Dolby circuits was measured at recording levels of -20, -30, and -40 dB. The net change in frequency response, with the Dolby system in and out of the circuit, was quite noticeable at the two higher levels, amounting to 3 or 4 dB at most frequencies from 2000 or 3000 Hz up to about 13,000 Hz. (The Dolby Laboratories specifications allow a ± 2 dB variation.)

The playback equalization was measured with a TDK AC-337 test tape for NORMAL (120- μ s) equalization, and with the Teac 116SP tape for CrO₂ (70- μ s) equalization. The normal response was within +0.6 dB from 40 to 12,500 Hz, and the CrO₂ response was within ± 1 dB from 40 to 10,000 Hz.



Frequency response for two types of tape at 0 and -20 dB.

true chromium-dioxide tapes in the group.) The three "chrome equivalent" ferric-oxide and the Sony chrome tapes gave nearly identical response curves, but BASF Professional II was clearly the best of the group with our test deck. (Its excellent compatibility was later confirmed by Fisher.)

The frequency response at a -20-dB recording level, with Maxell UD-XL I tape, was within ± 1.5 dB from 60 to 14,500 Hz. With the chrome BASF

(These were the frequency limits of the test tapes.)

For a 0-dB recording level, a LINE input of 67 mV or a MIC input of 0.13 mV was required. The MIC input overloaded at a fairly low level of 23.5 mV. The playback level from a 0-dB recording was 0.80 volt with Maxell UD-XL I tape and 0.71 volt with BASF Professional II tape. The playback distortion (third harmonic) from 1000-Hz recordings at 0 dB were 0.63% and 1.8% re-

spectively, with these tapes. The reference distortion level of 3% was reached at recording inputs of +7 dB with UD-XL I and +3 dB with the BASF tapes. The S/N, relative to these levels, was 56.5 and 50.5 dB, respectively, in an unweighted measurement. With "A" weighting they improved to 61.5 and 59.5 dB. Finally, using the Dolby system and CCIR/ARM weighting, the S/N was a very respectable 66 dB with either tape. The noise level increased by 18 dB through the MIC inputs at maximum gain, but the increase was correspondingly less at reduced gain.

The weighted rms wow/flutter was 0.095%, and a weighted peak measurement (DIN) gave a $\pm 0.15\%$ reading. The speed of the tape transport was about 1% fast. In fast forward and rewind, a C60 cassette was moved from end to end in 82 and 85 seconds, respectively. The channel separation at 1000 Hz, measured with a TDK AC-352 tape, was 58 dB. The Dolby level calibrations on the meter were accurate to within 0.5 dB. The meters themselves proved to be very accurate and matched standard VU-meter ballistics exactly. They indicated 100% of steady-state on 0.3-second tone bursts. The headphone volume was low with 200-ohm phones, although it might have been adequate with 8-ohm phones. Rewind time for a C-60 cassette was 85 seconds; fast-forward time was 82 seconds.

● **User Comment.** The deck met or surpassed its specified performance ratings, which were typical of cassette decks in its price class. The major concessions to price in its design appear to be in the absence of such niceties as an end-of-play shut-off from high speed operation, memory rewind, mixing of recording inputs, and playback level adjustment. To compensate for these omissions, it has the remote PAUSE feature, which we found to be quite useful. It always worked well, with enough sensitivity to operate from anywhere in the room. As Fisher suggests, the remote PAUSE is especially convenient for recording off the air, allowing a certain degree of "editing" while recording without requiring the operator to be in two places at the same time.

Playing good recorded tapes, such as the Advent CR/70 series, the deck sounded first rate. Also, when we recorded interstation FM tuner hiss and compared the playback to the original, there was very little discernible difference between the two. When recording from FM broadcasts and records, the sound from the Model CR-4025 gave no hint that the playback was not from the original source.

Kenwood Model KX-1030 Cassette Deck



Kenwood's Model KX-1030 is a front loading cassette deck, with a single electronically controlled dc motor for its capstan and hub drives. It is a three-head machine, on which the program can be monitored directly from the tape as it is being recorded. A vernier bias adjustment on the front panel operates with two built-in test oscillators to allow the recording bias to be optimized for any tape formulation.

A genuine off-the-tape monitoring system requires separate Dolby circuits for recording and playback functions so that both can be used simultaneously, the KX-1030 has this "Double Dolby" feature. It also has a "memory rewind" that stops the tape automatically in rewind when the index counter returns to a previously set "000" reading, and a full mechanical disengagement and "autostop" at the end of the tape, in any operating mode. Separate front-panel switching is provided for three basic tape formulations: chrome, ferric, and ferrichrome. The bias and equalization are separately switchable (in addition to the vernier bias adjustment).

The Kenwood deck's control panel has a pale gold finish, with matching metal knobs, to match the appearance of other Kenwood components. The recorder's dimensions are 17" W x 6 1/2" H x 12 3/4" D (43 x 16.7 x 32.5 cm). Weight: 16.5 lb (7.5 kg). Price: \$425.

The tape transport is located at the left side of the recorder, and the bottom-hinged cassette door has guide slots into which the cassette is loaded. The door can be removed easily for access to the heads. Most of the cassette is visible through a large window in the door. It has the usual array of mechanical "piano key" operating levers, lo-

cated in a row below the cassette compartment. Unlike many cassette decks, the KX-1030 cassette door is not opened by pressing the STOP key or any other control. Instead, pressing in the upper portion of the cassette door and releasing it allows the door to spring open (the word PUSH appears at its upper left corner). This is similar to the "touch latch" found on some cabinet doors, which use no external hardware. In the KX-1030, the door cannot be opened unless the tape is at a stop.

A lever switch to the left of the door turns on the POWER to the recorder; below it is a stereo PHONE jack. Two large meters occupy the center of the panel with a red PEAK LED between them. Above the meters is the index counter and the MEMORY REWIND button, as well as a red RECORD light and a green DOLBY light. The recording level controls are below the meters. They consist of two concentric pairs of large knobs, one for the microphone inputs and the other for the line inputs. Slip-clutch couplings in each pair allow separate adjustment of recording levels in the two channels. To their right are lever switches for DOLBY and tape MONITOR functions (the latter connects the LINE outputs, in the rear of the recorder, to the SOURCE input signal or to the output of the TAPE playback amplifier). There is also a concentric pair of playback OUTPUT level controls and a pair of MIC jacks for medium impedance dynamic microphones.

At the upper right of the panel are the two TAPE SELECTOR switches, providing separate BIAS and EQUALIZATION settings marked CHROME, NORMAL, and RESERVE (for ferrichrome tape). To the left of the BIAS switch are two small concentric knobs that vary recording

bias separately for the two channels around the nominal values selected by the BIAS switch. Below them is a push-button switch marked osc.

To optimize recording bias for a specific tape, the machine is placed in a recording condition with the output set to maximum. The osc button is engaged, and the MONITOR switch is set to TAPE. The recorder's internal oscillators record tones of 400 Hz and 10,000 Hz, alternately, in bursts of about one-second duration. The red REC light glows when the 10,000 Hz tone is on, and is off when the 400-Hz tone is being recorded. The meters display, alternately, the playback output from these signals. If bias is set correctly, they will play back at the same amplitude, and the meter readings will not change as the tones are switched. The quality of the tape (presence of dropouts, etc.) may cause the higher frequency reading to fluctuate somewhat, but its average level should be the same as the 400-Hz tone. If not, the BIAS vernier knobs are adjusted separately for each channel until the meter reading does not change as the tones are switched. If the 10,000-Hz reading is higher than the 400-Hz reading, the bias control is turned clockwise to increase the bias and reduce the high-frequency response; if it is lower, the knob is turned counter-clockwise to reduce the bias.

The "three head" configuration used in the Kenwood KX-1030 has a combination record/playback head in which two electrically distinct heads, with separate and parallel gaps, are housed in a single case small enough to fit through the access hole in the edge of the cassette housing.

● **Laboratory Measurements.** The specifications of the Kenwood KX-1030 name the specific tape formulations used to establish its ratings. They are TDK SD (NORMAL), TDK SA (CHROME), and Sony Ferrichrome (RESERVE). We used these tapes to verify the machine's ratings except that, TDK SD having been discontinued, was replaced with a similar ferric tape, Scotch Dynarange.

Because of the ease of adjusting the KX-1030 for any tape, we actually measured the record/playback frequency response with some 15 different tapes. The differences between them were minor and confirmed that the ma-

chine can be adjusted to give perfectly satisfactory results with almost any tape sold today.

The playback frequency response (NORMAL, 120 μ s) was measured with a TDK AC-337 test tape. It was within +1, -2 dB over the 40-to-12,500-Hz range of the tape. The 70- μ s response, measured with the Teac 116SP tape, was within +1.5, -2 dB over the 40-to-10,000 Hz range of the tape. The record/playback frequency response, at a -20-dB recording level, was virtually identical for TDK SA and Scotch Dynarange tape. The recorder had a rather unusual configuration of low-frequency head contour response ripples, extending up to 400 Hz, but above that frequency, the response was extremely flat, varying by less than 1 dB overall

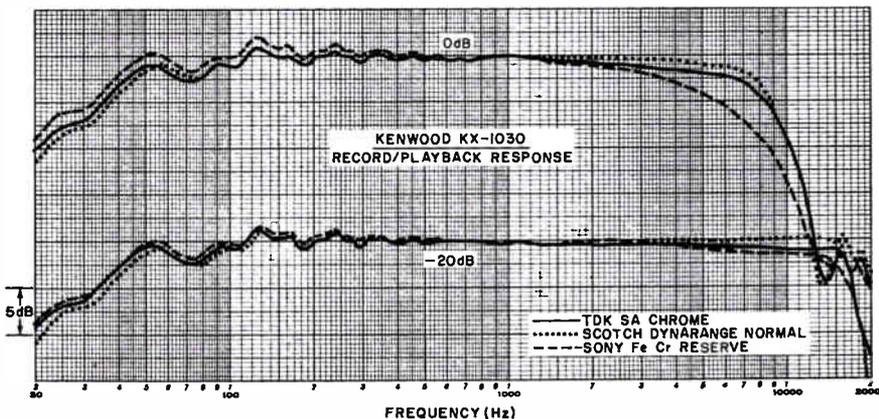
loaded at a rather low 15 mV. The resulting maximum playback output was in the range of 0.76 to 0.84 volts, depending on the tape used. Distortion (third harmonic) was from 0.5% to 1.1%. (Dynarange gave the lowest distortion and Ferrichrome the highest.) The headroom above 0 dB for a 3% playback distortion level was between 5 and 7 dB. Noise levels are given in the table of performance data, and were consistent with the performance of today's better cassette decks. The noise increased by 4.5 dB through the microphone input, at maximum gain.

The meters read about 85% of their steady-state readings when driven with 0.3-second tone bursts (this is somewhat slower than the VU standard, which requires a 99 to 100% reading

cord/playback heads, it does make it possible to optimize the recorder for any tape (within the limits of a bias-only adjustment). Lacking this feature, the user of a cassette recorder *must* use the specific tape for which his machine was set at the factory if he is to obtain the rated performance. This information is simply not available from many manufacturers, and is always subject to change without notice (or to obsolescence as new, improved tapes are developed).

When we recorded interstation FM tuner hiss at a level of about -15 dB and compared the playback to the input we could usually hear a trace of dulling at the highest frequencies. The effect was slight, to be sure, and could only be detected by a critical comparison to the original signal. We then trimmed the BIAS controls to minimize the audible difference, and found that an improvement was usually possible. In fact, this proved to be a more sensitive technique for setting the bias than using the recorder's own meters and test oscillators because we did not have to interpret the meter's fluctuating readings. That fluctuation, in itself, however, is a clue to one of the major advantages of the Kenwood bias adjustment system. It is an ideal way to evaluate the homogeneity of a tape. All else being equal (or even somewhat unequal in respect to frequency response, etc.), a tape with a steadier 10,000-Hz output in this adjustment has fewer dropouts and is likely to make a better-sounding recording than a "flatter" tape with a more irregular output.

Of course, most people who use the KX-1030 will select a suitable tape and set up the machine for it in the beginning. There will be no need for regular use of the bias adjustment feature, and the recorder can be used just like any ordinary machine (with the "plus" that one will always be able to hear the recording as it is made). In its overall listening quality, the KX-1030 is at least the equal of any other machine we've tested in its price class, as well as some at considerably higher prices. Its modest price for the performance it offers is made possible by the omission of a few refinements, we'd judge. For example, the transport control keys are stiff, requiring appreciable operating pressure. The single-motor transport, though adequate to move the tape smoothly at 17/8 ips, cannot match the fast speeds provided by some 2- or 3-motor transports. But these shortcomings are more than made up for, we believe, by the useful and novel features of this machine. We especially like the ability to adjust bias optimally according to the tape used.



Frequency response at two recording levels using three tape formulas.

up to 15,000 Hz and beyond. At a 0-dB recording level, the usual high-frequency tape saturation effect caused the response to drop off, so that it intersected the -20-dB curve at 12,500 Hz.

To our surprise, the Sony Ferrichrome tape's response had a slight downward slope with increasing frequency above 4000 Hz, and its 0-dB response curve showed noticeably greater saturation than the other tapes. Its overall numerical tolerances over the audio range were much the same as the others.

The Dolby-circuit tracking was outstanding. It exhibited less than 1 dB of difference between the frequency response curves made with and without the Dolby system at levels from -20 to -40 dB, up to 14,000 or 15,000 Hz. Crosstalk between channels, measured with a TDK AC-352 tape, measured -43 dB at 1000 Hz.

For a 0-dB recording input, the required input was 88 mV (LINE) and 0.19 mV (MIC). The microphone input over-

under these conditions). The PEAK light began to glow at +5 dB, so that it is an effective indicator of the maximum safe recording level with any tape. Headphone volume was quite good, even with 200-ohm phones, which cannot be driven to useful listening levels by the headphone outputs of many recorders.

The tape transport operated about 1% fast (a normal tolerance for a cassette deck). The flutter was 0.07% in a weighted rms measurement, and $\pm 0.1%$ in a DIN (weighted peak) measurement. The transport moved a C-60 cassette from end to end in 72 seconds.

● **User Comment.** The Kenwood KX-1030 offers a combination of features and performance not commonly encountered in its price class. Although the three-head configuration, per se, makes little difference in the actual performance of the machine as compared to one with first-class combination re-

Optonica RT-3535 Cassette Deck



OPTONICA'S Model RT-3535 tape deck features a novel Auto Program Locator Device (APLD) that can be used to cue rapidly to any of several selections recorded on a single cassette. To some extent, the APLD system overcomes a fundamental limitation of the tape medium, which usually cannot be readily accessed in a random manner as can be done with disc recordings.

The front-loading deck, which is the company's top-of-line model, features two tape heads and two motors. The capstan is driven by a dc servomotor/voltage-generator setup, while a high-torque dc motor drives the tape hubs.

The deck measures 18³/₈" W × 14" D × 5³/₄" H (466 × 356 × 146 mm) and weighs 22.4 lb (10.2 kg). Price: \$430.

At the left of the front panel is the tape compartment, below which is the usual row of control levers. Pressing the EJECT lever causes the cassette compartment door to swing upward into the machine. To load a cassette, it must be pushed into the loading ramp at a slight upward angle for a distance of about 2" (5.1 cm), which allows the cassette to drop easily into playing position.

The cassette compartment door must be closed manually. (It can also be left open during play.) If a cassette is already in the compartment, a firm pressure on the EJECT lever pops it out of the compartment for easy removal. Although the cassette compartment door has a window, the angle of the cassette and the lack of internal illumination make it difficult to determine visually the playing status of the tape.

The other levers in the grouping are for controlling tape motion stop/start, turning on and off the record circuits, switching to fast forward or reverse wind, and activating the pause function. It is possible to go from any oper-

ating mode to any other operating mode without stopping the tape. The one exception to this is that the tape must come to a stop before the EJECT lever is operated. There is an automatic mechanical disengagement of the capstan at the end of the tape.

To the left of the control levers are two microphone jacks, a stereo headphone jack and a pushbutton POWER switch. To the right of the cassette compartment are three pushbuttons labelled SPACE, INPUT and LIMITER, respectively. The SPACE button is used in connection with the APLD system to insert non-signal segments on the tape; the INPUT switch connects the recording preamplifier to either the LINE or the MICROPHONE sources (the two cannot be mixed); and pressing the LIMITER switch automatically prevents distortion from excessive signal levels when the recording level exceeds 0 dB. The index counter and its reset button are located immediately below these pushbuttons.

Three lever switches at the lower center of the panel permit adjustment of the deck's operating parameters for different tape formulations. The BIAS switch has positions labelled LOW, MED, and HIGH. The EQ (equalization) switch has two positions labelled 70 μ s and a third labelled 120 μ s. Between the BIAS and EQ switches are legends for NORM, FeCr, and CrO₂ that indicate the recommended settings for the three basic tape formulations. (A fourth formulation, low noise/high output, can also be obtained by changing switch positions.) The third switch controls the Dolby noise-reduction system that is built into the deck. It has an OFF and two ON positions, the uppermost connecting the MPX FILTER to remove any 19-kHz pilot carrier from FM signals in addition to providing noise reduction.

At the upper right of the panel are

two large illuminated dB meters, between which are a red RECORDING indicator and a green DOLBY indicator. At the bottom of the panel are the OUTPUT control (for adjusting the level of the playback signal simultaneously for both channels) and separate RECORD level controls for the two channels. Between the controls and meters is a row of 10 small black buttons numbered 1 through 9 and C, plus a button with no identification. These are the APLD system controls.

The APLD system functions in both the fast-forward and the rewind modes. It senses the absence of a recorded program between the selections recorded on the tape. As an example of how it works, assume you wish to hear the fifth selection on the tape, omitting the first four selections. A light touch on button number 4 will cause the deck to skip the first four selections and stop at the beginning of the fifth. Then, all you need do is operate the PLAY lever to hear the desired selection.

When the number 4 button is touched, the unidentified button proves to be a seven-segment numeric LED indicator that displays the number of the button activated (in this case, a numeral 4). Each time the fast-moving tape passes an interval between selections, the displayed number decrements by one digit.

The C button clears the APLD system's memory. This permits the user to resume normal operation of the deck. If C is pressed during a fast-speed search, the tape stops at that point.

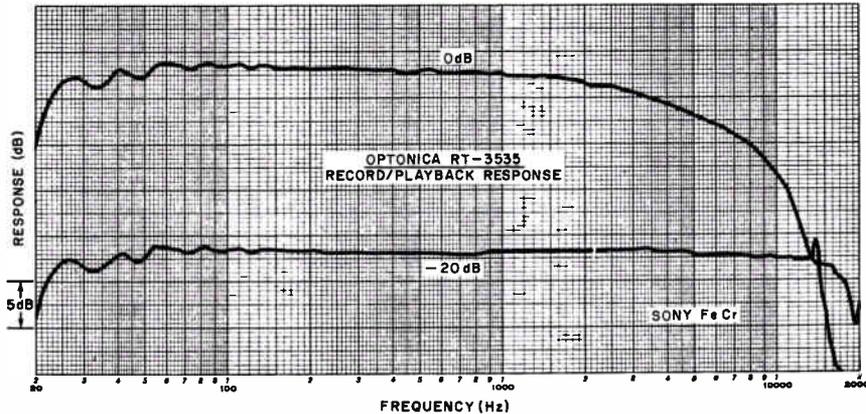
The proper operation of the APLD system depends on the absence of program material for a duration of at least 4 seconds between selections. When the user makes his own recordings, the deck is equipped to insert the necessary silent interval automatically. To accomplish this, the SPACE button is first depressed and at the end of each selection the PAUSE lever is operated. This immediately cuts off the recording signal but allows the tape to run for a few seconds to provide the silent interval.

The level meters are fast-responding, peak-indicating types to minimize the chances of overloading the tape on high-level transients. The tape heads are not accessible from the front. However, a small door on top of the deck can be removed to permit cleaning.

● **Laboratory Measurements.** We checked the playback equalization of the deck with TDK and Nortronics tapes for the "normal" (120- μ s) EQ setting and Teac tape for the 70- μ s setting. In both cases, the response was within ± 1 dB from 40 to 10,000 Hz. The overall record/playback response

tion of 30 to 17,000 Hz.

The Dolby circuits changed the high-frequency response by no more than 2 dB at a -20-dB level, and caused no measurable change at a -40-dB level. The MPX FILTER had less than a 1-dB effect on the response at 14,000 Hz, but it attenuated the incoming signals by



Record/playback response of Optonica RT-3535 with Sony FeCr tape.

was then measured with Maxell UD-XL (normal), TDK SA (CrO₂), and Sony Ferrichrome (FeCr), as recommended by Optonica. The "normal" response had a slightly depressed upper midrange output, but was with ± 2 dB from 21 to 15,000 Hz. The CrO₂ response was flatter, with a ± 2.5 -dB variation from 22 to just beyond 15,000 Hz. The best overall frequency response was with FeCr tape, which varied only ± 2 dB from 23 to 17,000 Hz, bettering the company's own specifica-

more than 20 dB at 16,500 Hz.

For a 0-dB recording level, the input was 72 mV through the LINE inputs and 0.185 mV through the MIC inputs. The playback output from a 0-dB recording depended on the tape used. It ranged from a maximum of 0.77 volt with TDK SA to a minimum of 0.53 volt with Sony FeCr tape. The limiter had no effect until the input level reached +1 dB, but an input of as much as +20 dB was held to an effective 2.7-dB increase in recording level, with only 3% play-

back distortion. The meters had a 10% to 15% overshoot on 0.3-second tone bursts and indicated +0.5 dB on a standard Dolby level tape of 200 nWb/m. (The calibrated Dolby level is at 0 dB.)

At a 0-dB recording level, the playback distortion was 0.71% with Maxell UD-XL, 2.5% with TDK SA, and 1.8% with Sony FeCr tapes. The reference 3% distortion level was reached at recording inputs of +6 dB, +1 dB, and +3 dB, respectively.

The IEC "A" weighted S/N reading (without Dolby) for the tapes, referred to the 3% distortion signal level, was 60.7 dB with UD-XL, 57.4 dB with SA, and 58.3 dB with FeCr tapes. With the Dolby system switched in and using CCIR weighting, these figures improved to 68.5, 66.4, and 67 dB. At maximum gain, the noise through the microphone inputs increased by 10 dB. But at usable gain settings, the noise increase was both inaudible and unmeasurable.

Although the headphone output was designed for 8-ohm phones, the volume level was adequate with 200-ohm phones as well.

The flutter was 0.13% on playback only in an unweighted rms measurement and 0.14% in a combined record/playback measurement. The transport operated smoothly and quietly. In its fast speeds, it moved a C60 cassette from end to end in about 82 seconds.

● **User Comment.** As our lab measurements reveal, this is a very good recorder, whose performance is generally of the caliber one would expect from a machine in its price class.

Pioneer RT-707 Open-Reel Tape Deck



MOST of today's open-reel tape recorders are as notable for their large size, weight, and price as they are for their generally outstanding performance. This might lead one to conclude that there is little market potential for more modestly endowed open-reel machines costing from \$500 to \$1,000, since that is a price range where the buyer also can choose among many deluxe cassette and elcaset decks.

Evidently Pioneer feels otherwise, judging by the appearance of the Model RT-707 recorder in their new product line. The RT-707 is an open-reel, four-

track stereo machine operating at $3\frac{3}{4}$ and $7\frac{1}{2}$ ips. It has the usual three-head format, plus a second playback head for use in the reverse direction of tape movement. It is equipped for automatic tape reversal, initiated by a piece of conducting-foil tape attached to the coated side of the magnetic tape, and it also can be reversed at any time by touching a button on the panel. It records only in the normal forward direction.

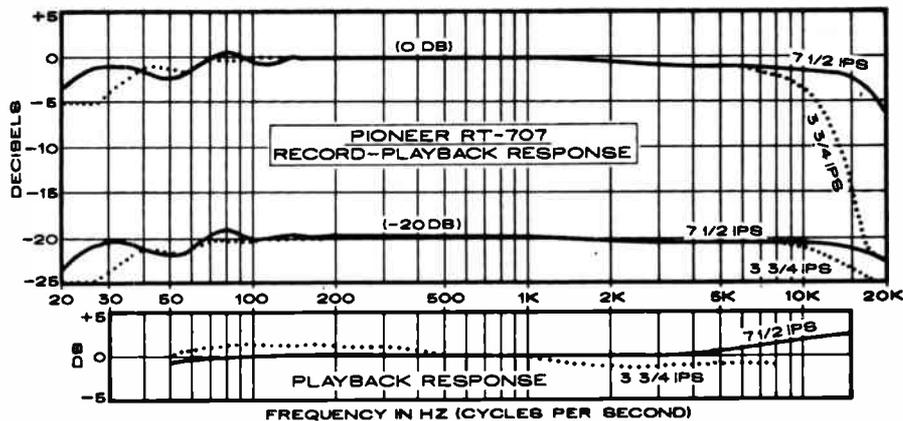
The Pioneer RT-707 has a three-motor tape transport with six-pole induction motors for each of the tape hubs and a direct-drive a.c. servomotor for the capstan. The use of a direct-drive capstan motor eliminates the belts and pulleys required to couple a high-speed motor to a slowly turning capstan, and with them go the periodic maintenance procedures and potential failures associated with such mechanical systems.

Most of the panel space of the RT-707 is devoted to the two 7-inch tape reels (a metal take-up reel is supplied with the recorder). Between them are two large illuminated level meters with vertically oriented scales. Between the meters, red and green LED's indicate when the machine is in the RECORD or PAUSE mode.

Above the meters are seven pushbutton switches. Two are REC MODE selectors for the two channels which must be engaged in order to make a recording (they thus serve as a safety device to prevent accidental erasure of a recorded tape). Since it is possible to record on one channel while playing the other, special-effects recordings such as sound-with-sound can be made with external jumper connections between the recorder's input and output jacks.

There are separate recording BIAS and equalization (EQ) buttons. Each has STD (standard) and LH (low-noise/high-output) positions; a table in the instruction manual lists recommended settings for most popular tapes. The MONITOR button channels either the SOURCE signal or the TAPE playback program to the line outputs. The remaining buttons are the SPEED selector and the POWER switch.

Below, the meters are the four-digit index counter, its reset button, a REPEAT button, and a PITCH control knob. The REPEAT function allows a tape, or any portion of it, to be repeated indefinitely by switching from forward to reverse playback when the metal foil is contacted and from reverse to forward when the index counter has returned to its "0000" setting. The PITCH knob is a speed vernier, operating only during playback, with a nominal ± 6 per cent range. It is detented at its center, which establishes the correct playing speeds.



The head assembly is flanked by two rubber rollers and tension arms. When the tension arms are raised to their uppermost (latching) positions, the tape can be loaded in a straight line across the heads. The single capstan is to the right of the heads and nearest the take-up reel in the forward direction of tape motion. Screwdriver access holes in the head cover permit easy azimuth adjustment of the recording and playback heads if required.

At the lower left corner of the panel are the microphone jacks and the headphone jacks plus separate recording-level controls for the microphone and line sources, which can be mixed. Each control is a concentric pair coupled by a slip clutch for individual adjustment of channel levels.

The tape-transport controls are grouped at the lower right of the panel. They are mechanical pushbuttons that actuate electrical solenoids. Although there is no remote-control facility in the RT-707, the controls can be preset so that unattended recording or playback can be initiated with an external timer switch in the a.c. power circuit. There are fast-speed buttons for both directions, a STOP button, and the PLAY and REC buttons that must be engaged simultaneously to make a recording. (By pressing them both while playing a tape, it is also possible to make a "flying start" recording.) Next to the PAUSE button are small playback-direction selectors on which illuminated arrows show the direction of tape travel.

The line inputs and outputs are in the rear of the recorder, with separate playback-level controls for each channel. These are detented at their midpoints. There is also a single unswitched a.c. outlet.

The Pioneer RT-707 has a distinctive size and shape, considerably more compact than the typical open-reel recorder. Its satin-finish aluminum panel

is 19 by 9 inches and is slotted for mounting a standard EIA equipment rack. The recorder is 14 inches deep and weighs $43\frac{1}{2}$ pounds. Price: \$600.

● **Laboratory Measurements.** Although the instruction manual lists Scotch 206 as the tape used for deriving the recorder's performance specifications, our test sample had been adjusted for TDK Audua tape. Both of these, plus several other comparable tapes, were used in our tests. The differences between them were slight, with Memorex Quantum giving the widest frequency response and Scotch 206 the best signal-to-noise (S/N) measurements. Since the TDK tape fell between these two in all respects and none of the differences were audibly significant, the following test data are based on the use of TDK Audua with LH bias and equalization settings. (Maxell gave essentially the same fine results.)

The playback frequency response, measured with Ampex test tapes, was within ± 1.5 dB from 50 to 7,500 Hz at $3\frac{3}{4}$ ips (the limits of the tape). At $7\frac{1}{2}$ ips, it was slightly different in the two directions of tape movement. In the forward direction, the response was within ± 0.5 dB from 50 to 5,000 Hz, rising to $+2.5$ dB at 15,000 Hz. In reverse, the response was ± 0.5 dB from 50 to 15,000 Hz.

A line input of 35 millivolts (mV) or a microphone input of 0.18 mV produced a 0-dB recording level at maximum gain settings. The resulting playback level was 580 mV with the controls centered and 800 mV with the maximum playback level setting.

At $3\frac{3}{4}$ ips and a -20 -dB recording level, the record-playback frequency response was down 4 dB at 30 and 14,000 Hz. At a 0-dB recording level, the high-frequency response was down 4 dB at 10,000 Hz due to tape saturation.

tion. At 7½ ips the response was ±2 dB from 20 to 24,500 Hz at a -20-dB level and from 20 to 18,000 Hz at a 0-dB level.

The playback distortion from a 0-dB recorded signal at 1,000 Hz was 0.23 per cent, and the level had to be increased to +12 dB (far off the meter scales) before the 3 per cent distortion-point reference was reached. The S/N referred to that level at 7½ ips was 63.3 dB in an unweighted rms measurement, 68.5 dB with IEC "A" weighting, and 65 dB with CCIR weighting. The S/N at 3¾ ips was about 3 dB worse, and the noise level increased by 8 dB through the microphone inputs at maximum gain. At more normal gain settings there was little added noise.

The wow was less than 0.01 per cent under all conditions. Unweighted rms flutter was 0.08 per cent at 3¾ ips and 0.065 per cent at 7½ ips in a combined record-playback measurement. With the Ampex flutter test tapes, we measured 0.09 per cent flutter at both speeds in the forward direction. In reverse play, which places the capstan between the supply reel and the heads, the flutter was 0.17 per cent at 3¾ ips and 0.12 per cent at 7½ ips.

The playback speed was exactly the same as the recording speed with the PITCH control set to its detented position. The playback speed could be var-

ied over a +9.2 to -7.6 per cent range. In the fast speeds, 1,800 feet of tape were moved forward in 89 seconds and rewound in 102 seconds. The 0-dB level of the meters corresponded to a 180-nW/m flux level, and the meters responded a little slower than a standard VU meter. Tone bursts of 0.3-second duration indicated about 10 per cent less than their steady-state levels. The headphone level is fixed and is adequate for general listening via 200-ohm phones.

● *Comment.* The Pioneer RT-707 sounded every bit as good as its excellent measurements suggest, and it was also an easy-to-use, smooth-handling machine. At 7½ ips it appeared to be essentially the equivalent of many other high-quality (and far more expensive) open-reel tape recorders designed for home use. And as with most of them, its performance at 3¾ ips is more comparable to that of a medium-price cassette deck, so that its advantages over a cassette machine at the lower speed are principally those of tape-editing convenience rather than basic recording quality. Nonetheless, it is interesting that this combination of versatility and performance is now available at a price hardly more than that of a good cassette recorder and actually far less than the cost of one of

the new top-of-the-line deluxe three-head cassette or elcaset decks.

In using the RT-707 with a number of tape formulations, we discovered that the recommended settings of the BIAS and EQ switches were not always optimum. The Pioneer manual suggests that if one is dissatisfied with the sound, other settings should be tried. We found that recording interstation FM tuner hiss at about a -10-dB level and comparing the incoming and playback signals with the MONITOR switch was the best way to establish the optimum tape bias and equalization. This should be done at 7½ ips, since there will always be a distinct dulling of the highs in such a comparison at 3¾ ips. At 7½ ips, the RT-707 is capable of virtually flawless reproduction of a random-noise signal—which is about as tough a test as can be made.

Since there is little difference in price or size among many good regular cassette decks, the lower-price elcaset decks, and the RT-707, the tape hobbyist is now free to make a choice of format solely on the basis of performance or convenience. Certainly one can no longer generally characterize open-reel recorders as large and expensive and cassette recorders as compact and inexpensive. We suspect that "low-profile" open-reel decks such as this one will become more popular in the future.

Sankyo STD-2000 Cassette Deck



THE Sankyo STD-2000 is a full-feature moderately-priced cassette deck whose performance matches its impressive array of operating conveniences. The STD-2000 is a front-loading recorder with an automatic tape-loading system similar to those of some other Japanese cassette machines. In

addition to the Dolby noise-reduction circuits found in any high-fidelity cassette deck, it has separate three-position bias and equalization switches that make it compatible with almost any type of tape.

The cassette compartment, at the left of the front panel, is normally covered

by a clear plastic door, below which is a row of piano-key operating levers. Pressing the EJECT lever causes the door to withdraw into the body of the machine and a cassette loading platform to appear, angled slightly upward to the rear, at the front of the compartment. When the cassette is placed on the platform, it moves up into the machine automatically, dropping the cassette into its playing position. The angle of the cassette, the front lighting, and the contrasting-color background make it easy to see how much tape is on the hubs at any one time.

The control keys perform the usual functions, and they can be operated in any sequence without going through STOP (although the tape must be halted before the RECORD key can be engaged). Whenever the EJECT key is pressed (even when the tape is in motion), the door flies open and the cas-

sette is moved forward to where it can be grasped.

To the left of the cassette compartment are the pushbutton power switch and a headphone jack. To its right are the index counter (which has a memory feature that stops the tape automatically in rewind when the counter returns to a 999 reading) and two microphone jacks. Small lights in a row in the center of the panel glow to show that the tape is in motion and whether it is at normal speed or in one of its fast-winding modes. A red RECORD and a green DOLBY light are nearby.

At the lower center of the panel is a row of four lever switches. One switches the recording inputs between LINE and MIC (or DIN) sources; the different sources cannot be mixed. The three-position DOLBY switch turns the Dolby system on when it is moved either up or down. In the up (MPX) position, it also inserts a low-pass filter in the recording amplifier to prevent interaction with a tuner's pilot-carrier leakage when recording FM.

The next two switches, BIAS and EQ, are tape-type selectors. They each have settings marked NORM, CrO₂, and FeCr, and they are normally set to the same point for a given tape. However, the separation of the functions does give the user some added flexibility. The EQ switch adjusts both recording and playback equalization, using the 120-microsecond characteristics for normal tape (ferric) and 70 microseconds for the others.

Continuing to the right, the next control is a small OUTPUT LEVEL knob, which adjusts the playback level ahead of the meters. To its right are concentric RECORD LEVEL knobs. At the upper right of the panel are two large, well-lit meters, calibrated with the standard Dolby level at their +3-dB marks. Between them is a red LED PEAK light that flashes at +3 dB. Phono-jack inputs and outputs and a DIN socket are in the rear of the recorder. The Sanyo STD-2000, including its standard simulated-walnut-veneer wooden side panels, is about 18 inches wide, 5½ inches high, and 11¾ inches deep. It weighs 18.3 pounds. Price: \$300.

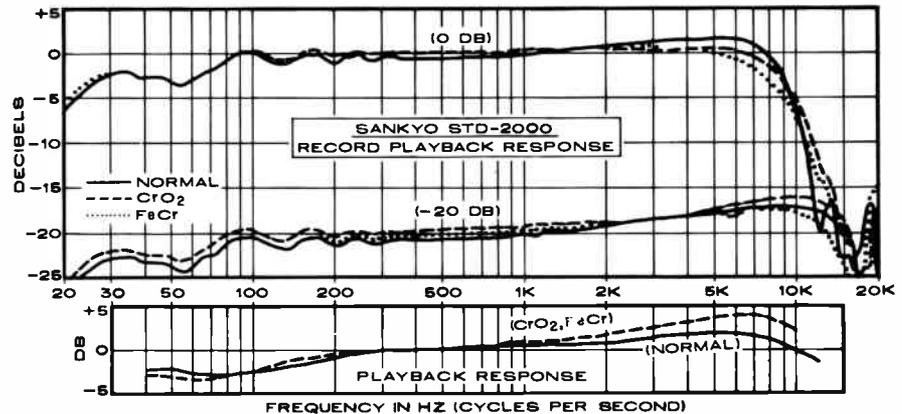
● **Laboratory Measurements.** The instruction manual does not recommend specific tapes to be used with the STD-2000, or even suggest bias and EQ settings for popular tapes. Therefore, we measured record-playback frequency response with a number of tapes, looking for the ones that gave the flattest and widest response with our particular machine.

Eventually, we chose Maxell UD-XL I for the normal tape, Sony CrO₂, and Sony FeCr (Scotch Classic was

slightly flatter in the FeCr category, but since it has been superseded by Scotch Master III, we did not base our measurements on it).

The UD-XL response was within ±1.5 dB from 25 to 14,000 Hz, Scotch Master (not the current version) and

livolts, and through the MIC input the sensitivity was 0.29 millivolt. The microphone input overloaded at a fairly safe 56 millivolts. The playback output level from a 0-dB recording varied from 0.42 volt with FeCr tape to 0.46 volt with UD-XL I tape.



Memorex MRX2 were nearly the same, with the high end rolling off above 12,500 Hz. TDK AD gave a slightly rising high-end response, varying ±3.5 dB from 25 to 16,500 Hz.

With CrO₂ settings, Sony CrO₂ tape gave a response within ±2 dB from 25 to 14,500 Hz. BASF Chromdioxid Super had a "hotter" top end; it was ±4 dB from 215 to 16,500 Hz. A popular "chrome-equivalent" tape, TDK SA, also had a rising high end; it was ±4 dB from 25 to 15,000 Hz. The similar Maxell UD-XL II showed a drop at the extreme high end in this machine. Sony FeCr had a slightly rising top end and was within ±3 dB from 25 to 15,500 Hz. Scotch Classic was extremely flat to 10,000 Hz, dropping off at higher frequencies to -5 dB at 15,000 Hz.

The Dolby system tracked within 2 dB (the change in response with Dolby in or out) at all frequencies at levels of -20, -30, and -40 dB, which meets Dolby specifications. The MPX filter began to take effect above 10,000 Hz. The playback frequency response was measured with some of the new TDK "AC" series of test tapes. It was within ±2.5 dB from 40 to 12,500 Hz with the TDK "AC" series of test tapes. It was within ±2.5 dB from 40 to 12,500 Hz with the TDK AC-337 test tape. The 70-microsecond equalization was measured with a Teac 116SP tape, giving an upward-sloping response of ±3.5 dB from 40 to 10,000 Hz.

For a 0-dB meter reading, the line input at maximum gain was only 25 mil-

The playback distortion (third harmonic of a 1,000-Hz signal) at a 0-dB recording level was 0.5 per cent with UD-XL I, 1 percent with CrO₂, and 1.3 per cent with FeCr. The respective 3 per cent distortion levels were reached with recording inputs of +9.5, +5, and +5 dB. The unweighted signal-to-noise (S/N) measurements, referred to the 3 per cent distortion level, were 55.5 dB with UD XL I, 52.2 dB with Sony CrO₂, and 51.3 dB with Sony FeCr. With IEC "A" weighting, these measurements improved to 61, 57.4, and 57 dB, respectively. With the CCIR weighting, and using the Dolby system, the respective S/N readings were 66.5, 63.6, and 63.3 dB. The noise increase through the microphone inputs, even at maximum gain, was a negligible 2dB.

The wow and flutter in a combined record/playback measurement was 0.08 per cent (unweighted rms). In fast forward or rewind, the recorder moved a C-60 cassette from end to end in about 82 seconds. The meters were slightly underdamped, with an overshoot of about 20 per cent on 0.3-second tone bursts. They were accurately calibrated in terms of standard recording levels, with the Dolby level of 200-nW/m reading +3 dB and the 250-nW/m reference of the TDK tapes reading +5 dB. The PEAK light began to glow at +3 dB. The headphone volume was excellent, even with 200-ohm phones, which often cannot be driven to usable volume levels by the headphone outputs of tape recorders.

● **Comment.** The sound of the Sankyo STD-2000, either on tapes recorded with it or using high-quality prerecorded tapes, was excellent, which is not surprising in view of its measurements. The "acid test"—recording FM-tuner interstation hiss at a -10-dB level and comparing the playback to the incoming signal—completely confirmed our test results and listening impressions. The input and output sounds were indistinguishable with Maxell UD-XL I and NORM settings or with Sony CrO₂ and using CrO₂ settings. Only a slight emphasis of extreme highs kept the TDK tapes and the Sony FeCr from doing as well.

The auto-load feature is convenient and works well, but it does take a little getting used to. In particular, when a cassette is ejected, one must be careful to grip its edge firmly for withdrawal. Even a slight inward pressure on the cassette will cause the machine to draw it back in, ready for operation.

When all aspects of the performance of the Sankyo STD-2000 are considered, it is clear that this is an above-average machine selling at an average price. Perhaps one can obtain more impressive measurements on some more expensive machines, but this one is the audible equal of any of them, at least when recording from FM or discs. We

did not try any "live" recording, but, noting the extremely low noise level of the microphone amplifiers, we suspect that it would do a fine job, especially with low-output microphones that could not overload its inputs.

We also found, as we have with some other recorders, that the best overall S/N performance is obtained with a good grade of ferric oxide tape. Chromium dioxide and ferrichrome may have slightly extended high-frequency response and slightly more headroom, but they distort at a lower level and thus do not have quite as great a margin between the overload point and the background noise.

Sanyo RD5300 Cassette Deck



THE Sanyo RD5300 is an inexpensive, compact, front-loading cassette deck with a combination of performance and features that is rarely found in its price range. A first impression of careful design and workmanship comes when the EJECT key (one of a row of conventional "piano key" transport controls below the cassette compartment) is pressed, causing the hinged door to swing open slowly and silently. The cassette loads into guides inside the door, which is then pushed flush with the panel for operation. Almost the entire cassette can be seen through the transparent window in the door, and an orange backing allows the user to see how much tape remains on each hub. The door front is designed to come off easily, providing access to the heads for cleaning and demagnetizing.

The door is flanked by a pushbutton power switch, the index counter, and a

lever marked **TIMER STAND BY**. This is used when one wishes to leave the machine in a ready-to-operate condition (in either recording or playback modes) to be started later by an external timer switch. When the controls have been set as desired, the **PAUSE** lever is pressed, then the **TIMER STAND BY** lever. This disengages the pressure roller; when power is again applied, the **PAUSE** function is released and the machine goes into operation.

At the upper right of the panel are two large illuminated meters. Below them is what appears to be a large knob. On closer examination, it proves to be a pair of concentric controls surrounded by an adjustable ring whose reference mark can be set against a calibrated scale on the panel. These controls serve a dual purpose, setting both the recording and playback levels (this is one of the few concessions to econ-

omy that we found in the RD5300). Since these settings are almost certain to be different for the two modes of operation, the reference ring can be set to match the knob index mark when recording. Then, regardless of where the controls are set for playback, it is easy to return them to the preset recording level.

The remaining controls are a row of push-buttons along the lower right portion of the panel. The RD5300 has separate recording-bias and equalization controls. The latter consist of two mechanically interlocked buttons marked **NORMAL** and **CrO₂/FeCr** (for 120- and 70-microsecond characteristics), and the former is a two-position button marked **HIGH** and **LOW**. Two red LED's above the EQ buttons show when correct recording conditions have been established for CrO₂ and FeCr tape (the latter uses **LOW** bias and 70-microsecond equalization).

Other buttons activate the recorder limiter (which goes into operation at levels above 0 dB to prevent distortion) and the Dolby system (a red LED shows when this is in use) and switch the recording inputs between **LINE** and **MIC** sources. There are two microphone jacks and a stereo-headphone jack on the front panel. The signal connectors, including a DIN socket, are on the rear of the machine. The Sanyo RD5300 is about 16½ inches wide, 10½ inches deep, and 6¼ inches high.

It weighs slightly more than 13 pounds. Price: \$190.

● **Laboratory Measurements.** Although the instruction manual for the Sanyo RD5300 does not specify the tapes for which it has been adjusted, a test curve supplied with our sample indicated that it had been set up for TDK

12,500-Hz range of the test tape. The CrO₂ (70-microsecond) playback response, measured with a Teac 116SP test tape, was within ± 1.5 dB from 40 to 10,000 Hz. The tracking of the Dolby circuits (the change in overall record-playback response, with and without the Dolby system in use) was acceptable, showing deviations of up to 2 dB

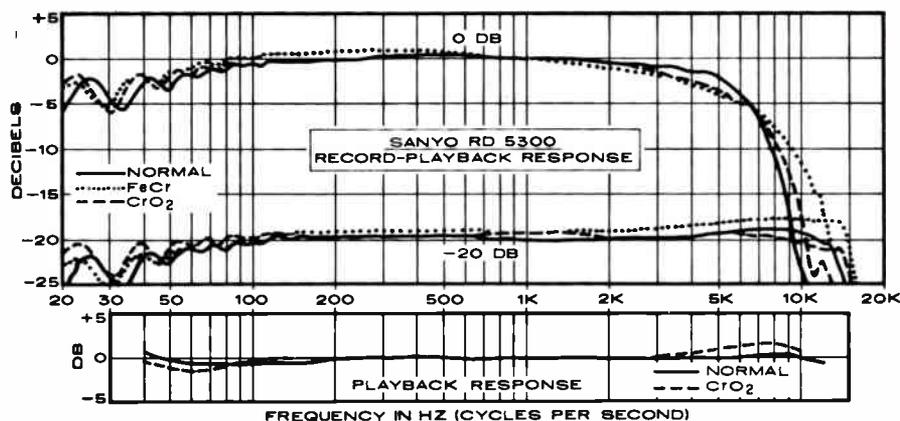
respectively, as follows: unweighted, 50 dB, 51.5 dB, 47 dB; IEC "A" weighted, 58.3 dB, 61 dB, 57.5 dB; CCIR/ARM weighted, 55 dB, 57.5 dB, 56 dB; and CCIR with Dolby, 64.7 dB, 66 dB, 61 dB. The noise level through the microphone inputs at maximum gain was 9 dB higher than through the LINE inputs, but at lower gain settings it was considerably less.

The unweighted rms flutter of the Sanyo RD5300 was 0.07 per cent both in a combined record-playback measurement and with an Aiwa test tape. The interchannel crosstalk with a TDK AC-352 tape was -50 dB at 1,000 Hz. The transport rewound a C-60 cassette in about 82 seconds. The headphone listening level, with 200-ohm phones, was reasonably good. It was not affected by the setting of the playback-level controls.

● **Comment.** To judge the value offered by the Sanyo RD5300, consider its features: a very smooth-working front-loading mechanism, timer operation, separate bias and equalization switches for the three basic tape formulations, a peak limiter, microphone inputs, headphone output, and Dolby noise reduction. This is what one might expect in a recorder twice the price of this one, and we were frankly surprised to find all these features in such an inexpensive product. Just about the only features found in some higher-price decks and not in this one are a memory-rewind system, separate recording- and playback level controls, and microphone-line mixing.

The Sanyo's features would be of little significance if the machine did not also perform well. It does—and not merely "well," but rivaling in most respects all but the most deluxe and expensive cassette recorders. For example, when we recorded interstation FM-tuner hiss at a -10-dB level, the playback sound was essentially indistinguishable from the input.

Because of its very flat response, low distortion, good signal-to-noise performance, and a flutter level well below what we have measured on some more costly machines, the Sanyo RD5300 left us with that pleased feeling that sometimes follows our product testing. We had found a component that not only did what was claimed for it, and more, but also did its job much better than one could reasonably expect from a unit in its price range. In fact, we have seen many recorders at twice the price that could not match this one in total performance. If we were inclined to give "best buy" ratings, this machine would most certainly qualify.



AD (NORMAL), TDK SA (CrO₂), and Sony FeCr (FeCr). It is our practice whenever possible to use the manufacturer's recommended tapes in our tests, but on measuring the response with TDK AD it was apparent that the machine was underbiased for it, thus giving a rising high-end response. Similar but slightly less extreme results were obtained with Scotch Master and Maxell UD-XL I. We obtained the flat-test frequency response with Memorex MRX₂, which was also used for our other tests.

The overall record-playback frequency response at a -20-dB level, with MRX₂ tape, was within ± 1 dB from 70 to 13,000 Hz. The rolloff of response at lower frequencies was gradual, but it dropped sharply above 13,000 Hz. With the CrO₂ settings the TDK SA gave a very flat response, within ± 1 dB from 40 to 14,000 Hz. Maxell UD-XL II was also tried; it had a marginally better high-end response extending to 15,000 Hz. A true CrO₂ tape, BASF Chromdioxid Super, gave a slightly peaked high-end response, reaching ± 3.3 dB at 14,000 Hz. Ferrichrome tape gave a response much like that of the CrO₂ tapes, within ± 1.5 dB from 60 to 15,000 Hz.

The playback frequency response (NORMAL) was measured with the new TDK AC-337 test cassette. It was within ± 0.7 dB over the 40-

up to around 12,000 to 13,000 Hz at levels of -20 and -40 dB.

For a recording level of 0 dB, a line input of 55 millivolts (mV) and a microphone input of 0.2 mV were required. The microphone input overloaded at a rather low 24 mV, suggesting a need for caution when making recordings of loud live performances with high-output microphones. The limiter worked effectively (although it would not affect microphone-amplifier overload). It had no effect until the level slightly exceeded 0 dB, yet reduced a +10-dB signal to the equivalent of 1.5 dB with negligible distortion. The meters had a 10 per cent overshoot on 0.3-second tone bursts.

From a 1,000-Hz signal recorded at 0 dB, the maximum playback level was 0.82 volt with MRX₂, 1.1 volts with TDK SA, and 0.86 volt with FeCr tape. The playback distortion (third harmonic) from a 0-dB signal level was 0.6 per cent with MRX₂, and 1.6 per cent with the other tapes. The reference level of 3 per cent distortion was reached with input levels of +5 dB, +2.5 dB, and +3 dB with the MRX₂, SA, and FeCr tapes. The standard Dolby level of 200 nW/M falls at a +2-dB meter reading, and the indicated level was within 0.5 dB of the correct value. The signal-to-noise ratio referred to the 3 per cent distortion condition for the above three tapes was,

Sharp RT-3388 Cassette Deck



THE Sharp Model RT-3388 is a basic cassette deck of conventional design and good quality. Where it differs from other cassette decks is in its built-in "computer control" system that gives it an operating flexibility and convenience previously unavailable in a consumer deck. The cassette deck proper is a two-head, single-motor transport with a servo-controlled dc motor. The front-loading mechanism provides excellent visibility of the entire cassette through its clear plastic window that makes up almost the entire cassette compartment door. The door can be removed by loosening two thumbscrews to provide complete access to the tape heads for cleaning and adjustment. The controls are mechanical "piano-key" levers that are solenoid assisted for certain functions.

The deck measures 17³/₈" W × 12⁷/₈" D × 5³/₈" H (44.1 × 32.7 × 13.7 cm) and weighs 20 lb (9.1 kg). Price: \$350.

The deck has separately switchable bias (HIGH/LOW) and equalization (70/120 μ s). The manual that accompanies the deck lists recommended settings for most popular tape brands and formulations. Unlike the case with most recorders, the manual also identifies the specific tapes for which the deck was adjusted at the factory. They are Maxell UD (normal), Maxell UD-XLII (HIGH/70 μ s), and Sony Ferrichrome (LOW/70 μ s).

The recorder has built-in Dolby noise reduction, separate microphone and line inputs that can be mixed, and large illuminated level meters supplemented by a PEAK LED indicator. While this is conventional, the rest of the deck is far from conventional, as is immediately obvious.

A "computer" keyboard and display panel dominate the center of the front panel. The "computer" that controls the operation of the deck provides memory functions for stopping the tape at a preselected point, either in normal or fast speeds. It also supplies the tape index counting function usually performed by a belt-driven mechanical counter. It controls Sharp's Automatic Program Locator Device (APLD) that can be set to skip any number of separately recorded selections (up to 19 in all) on a tape, stopping and playing a preselected piece that occurs later in the tape. The APLD contains a quartz controlled digital clock that is constantly in operation. When the machine is plugged into the power line, the clock is powered whether or not the recorder is turned on. Internal batteries can power the clock for up to a year without recourse to the ac power line. The clock can turn the deck (and anything plugged into its single switched outlet) on and off at preset times with split-second accuracy and time the running of a tape in minutes and seconds. It also provides the usual index-counter function. As a timepiece, it can be set for a 12- or a 24-hour format and automatically provides AM and PM identification in the 12-hour mode.

All the display functions appear on an LCD (liquid-crystal display) panel located above the keyboard. When the recorder is turned off, the display automatically reverts to its clock function. Seconds are indicated by the blinking of the colon that separates the hours and minutes digits. When the deck is turned on, the display becomes a tape counter, although any of its other functions can be selected at that time by

pressing the proper buttons. Arrows in the display indicate direction of tape motion and tape speed (the latter by blinking on and off when a fast speed is selected). A Dolby trademark symbol appears in the display when the DOLBY switch is on. Short bars above each column of keys indicate which function has been selected, and a letter M appears above a bar when specific memory data has been entered for a given function.

The timer serves as an alarm clock and sleep-time indicator. It also permits unattended recording and can switch on and off the tape deck and a device plugged into the deck's accessory outlet. The timer features two-stage operation: one for independent timer stop; the other for switching from timer start to timer stop and vice versa.

When the tape counter is set, the deck plays to the present point and automatically shuts off. Also in fast forward and rewind, the deck automatically stops at the preset point.

The tape counter keeps track of the tape passing the heads but cannot accurately register absolute values. A second counter is provided for more accurate indications.

Setting the number of a selection on the tape puts the deck into fast forward or rewind to locate the desired selection. This automatic locating device can be keyed for as many as 19 program steps ahead of or behind the desired selection.

The computer-controlled functions of the Model RT-3388 are so diverse that most of the very comprehensive instruction manual is devoted to them, with the aid of copious illustrations and photographs. Only nine of the 36 pages in the manual deal with normal tape recording functions. In general, the desired information, whether it be an index counter reading or a time, is fed into the computer by sequential operation of the keys, followed by a touch of the S (set) key. Previously set functions, which are not incompatible with the new one, remain unchanged and in use. Thus, one can switch between index counter, seconds counter, and actual time display at will while the tape is running without miscounting or affecting the operation of the machine. When the recorder is turned on, the LCD panel is back lit for full visibility. With the power switch off, a separate switch can be used to activate only the

display lights so that the clock can be used at any time.

The "computer" section is physically very similar to a hand-held calculator in its size and configuration of keyboard and display. It extends only about 1/2" (12.7 mm) behind the panel and cannot be seen without extensive disassembly. According to the manual, a single LSI chip supplies all computer functions. Most of the remaining electronic circuits are on a single large circuit board that is very clearly labelled with individual circuit reference symbols for all components and the function of each section of the board (Dolby, Preamplifier, etc.). A second large board contains the power supply and control circuitry. The tape transport occupies only a small fraction of the internal space of the recorder.

● **Laboratory Measurements.** Convenience features are the RT-3388's main talking point, but its performance is well worth discussing, too.

the factory-recommended NORMAL settings with FeCr tape yielded sharply rising high-frequency response.) Playback response was within ± 2 dB from 40-12,500 Hz using the 120 μ sec equalization and our TDK AC-337 test tape. At 70 μ sec, response was ± 0.5 dB from 40-10,000 Hz, using a Teac 116SP test tape.

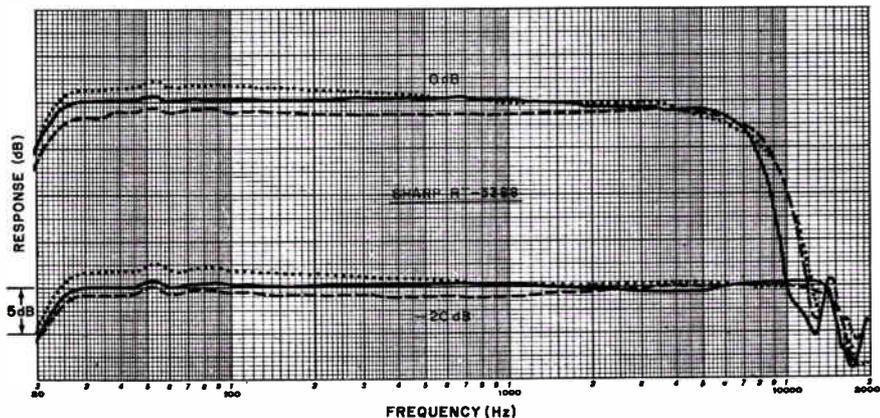
The rated 55 dB signal-to-noise ratio (without Dolby) was surpassed by our weighted measurements for UD-XL I and Sony FeCr tapes (56 dB each) and even more with Maxell UD-XL II (58.8 dB). With Dolby, weighted S/N was 65.6 dB for UD-XL I, 66.5 dB for UD-XL II, and 64.4 dB for the Sony FeCr. The unweighted signal-to-noise measurements, referred to the input level which produced distortion in playback, were 47.4 dB for UD-XL I, 45.3 dB for UD-XL II, and 44.7 dB for Sony FeCr. (With the MIC input set to maximum gain, noise increased by 6.5 dB).

Playback distortion at 0-dB recording level was 0.45% with UD-XL I

fers so much for such a moderate price without appearing to have sacrificed any significant aspect of its performance. The tape saturation characteristics at a 0-dB recording level, compared to the -20 dB response, suggest that the heads are of only ordinary efficiency, neither better nor worse than one would expect on a machine in the \$250 to \$300 price range. On the other hand, the measured wow and flutter were about as low as we have measured on any cassette recorder and are better than we would expect to find at this price.

The recorder delivered excellent sound quality, both from prerecorded tapes and from recordings we made off the air and from records. We also recorded FM tuner interstation hiss at a -10-dB level and compared the playback to the original sound. This test simultaneously checks frequency response and tape saturation effects and reveals even slight deviations from an accurate recording. With Maxell UD-XL I tape, the results were good, but not quite perfect; we could hear a slight dulling of the highest frequencies. The "chrome equivalent" Maxell UD-XL II, on the other hand, yielded perfect reproduction of the highest frequencies. In the case of ferrichrome tape, we are not certain how to judge the machine's performance. With the HIGH bias and 120- μ s equalization that gave flattest frequency response, we could hear a slight difference between the input and output of the recorder. Using the recommended settings of LOW bias and 70- μ s equalization, the results were audibly perfect, as good as with UD-XL II, in spite of the measured low-level frequency response being far from flat. Obviously, some user experimentation would be in order if FeCr tape is to be used. We also obtained completely acceptable results with a number of comparable tapes of all kinds, using the appropriate switch settings. The tapes chosen for testing were those specified by Sharp; they gave the flattest response in our tests.

The computer functions were fascinating to use. Space does not permit a full account of what this machine can do (many pages of the manual are devoted to that), but we were continually impressed by the accuracy with which it responded upon reaching a preset point on a tape, whether in a memory mode or on the APLD function. The latter counts the silent intervals between recorded selections to locate the desired point, so it cannot be "fool-proof" in its operation (when making one's own recordings, an EDITOR switch cuts off the program while a short blank section is recorded be-



Frequency response for three types of tape at 0 and -20 dB.

With Maxell UD-XL I ferric-oxide tape, best frequency response was obtained at the NORMAL (low) setting of the bias switch and the CrO₂ (120 μ sec) equalization setting. We measured it as 25-24,200 Hz ± 1 dB, a bit flatter than the rated ± 3 dB for the 30-13,000 Hz range. With UD-XL II, using the CrO₂ (high) bias setting and NORMAL (70 μ sec) equalization, response was ± 1 dB from 24-14,600 Hz—again a bit flatter than the rated 30-15,000 Hz ± 3 dB. With Sony FeCr tape, using the CrO₂ settings of both switches, response was 22-15,000 Hz ± 3 dB, a bit better in the bass and not quite as good in the treble as the rated ± 3 -dB range of 30-16,000 Hz. (Using

tape, 0.25% with UD-XL II and 0.80% for FeCr. Input sensitivity was 54 mV at the LINE inputs, 0.2 mV at the MIC jacks. Crosstalk was 51 dB down, and output level, rated at 775 mV for 0-dB recording level, varied with the tape used from 700 to 800 mV.

The recording level meters were calibrated with 0.5-dB accuracy, but exhibited 10% overshoot, compared to standard VU characteristics. The peak indicator will light when levels reach 6.5 dB above "0" recording level. Fast forward and rewind times were both 94 seconds for a C-60 cassette.

● **User Comment.** This is a most impressive product, largely because it of-

tween program segments). All in all, we found that the APLD worked correctly in the vast majority of cases, even with commercially recorded tapes. To fully utilize the capabilities of the deck, one must only study the manual carefully

and practice extensively with its controls to become familiar with it.

In sum, the Sharp Model RT-3388 is an above-average tape recorder for its price in all basic performance aspects and is unique at this time in its operat-

ing features. It is as much fun to use and to look at as it is for listening. Once you have been exposed to the LCD panel, mechanical counter and function display indicators on other recorders appear old fashioned.

Sony TC-880-2 Stereo Tape Deck



THE new Sony TC-880-2 open-reel tape deck has several features found in no other home machine. It has an extremely high level of performance, and is one of the most expensive tape recorders ever manufactured for home or nonprofessional use.

The TC-880-2 is basically a two-channel, half-track machine with an additional quarter-track playback head. Reels up to 10 $\frac{1}{2}$ inches in diameter can be used on the standard $\frac{1}{4}$ -inch-diameter reel shafts or with the NAB hub adapters furnished with the deck. The three-motor transport features a direct-drive capstan motor that is servo-controlled in a manner similar to that used for direct-drive record-player turntables. Actually, a dual-capstan drive system is used, maintaining a constant and controlled tension on the tape as it passes over the heads. The second capstan has a heavy flywheel that is belt-driven from the direct-drive motor. The index counter is a true running-time indicator, reading in minutes and seconds for 25-ips operation. At the re-

recorder's second speed of 7 $\frac{1}{2}$ ips, the counter's time indications must be doubled.

The TC-880-2 has Sony's "Syncro-Trak" synchronous recording system. Either track of the recording head can be used for playback while recording on the other track. This permits the user to add later material with both tracks in synchronism. For each channel, there is a three-position REC MODE lever switch to select play, record, or synchronous operation. A light above each switch indicates its status. Two TAPE SELECT switches provide a choice of normal or high bias levels and three recording-equalization characteristics, marked NORMAL, SPECIAL, and FRCR. The instruction manual recommends settings for most popular tapes. As the markings suggest, the TC-880-2 is compatible with Sony's new open-reel Ferrichrome tape, with which it delivers its maximum performance.

The recording-level controls, marked REC ATT, are step-type switches with 2-dB steps of attenuation for the first 34

dB, two larger steps to -50 dB, and a fully OFF position. The playback-level adjustment (PB ATT) is a step switch used in combination with a separate concentric, continuously adjustable FINE control. The attenuation settings correspond to those of the REC ATT switches, and the FINE vernier provides smooth control between steps and also permits channel levels to be balanced.

A PB HEAD switch connects the playback circuits to the output of either the half-track or quarter-track head. The headphone jack, driven by its own amplifier, has a separate level control. The recording inputs can be switched between LINE and MIC sources by a toggle switch, and a MIC ATT introduces either 15 or 30 dB of attenuation into the microphone inputs to prevent overload when recording high-level sounds. Dual low-impedance microphone inputs are provided, as are standard $\frac{1}{4}$ -inch jacks on the front panel for unbalanced microphones and Cannon-type connectors in the rear for balanced-line sources. The line inputs and outputs, in the rear, are through standard phono jacks.

The special meters of the Sony TC-880-2 are one of its most useful features, giving the user more information about program levels than any others we have seen. They are light-beam galvanometers in which the usual needle pointer is replaced by a narrow beam of light reflected from a mirror on the moving meter coil. Each channel has a horizontal scale about 4 inches long, calibrated from -40 to +15 dB. A narrow white light-beam "pointer" moves along the scale as the program level varies, changing color to red when it exceeds 0 dB. A switch to the left of the meters selects their three operating modes. The VU position gives the ballistic response of a true VU meter (which follows the general program level but normally indicates about 10 dB less than the maximum peak levels). In the PEAK position the meters are

fast-acting peak indicators with a response rise time of 1 millisecond and a decay time of 1 second. For all practical purposes, this mode shows the true maximum instantaneous peak program level. Finally, in the PEAK HOLD position, the meters lock in the highest peak readings attained during any operating interval. This can be used to predetermine the maximum peak level of any program so that any necessary recording-level adjustments can be made with complete assurance that the final recording will not exceed the desired level at any time.

Above the electronic section of the TC-880-2 are the transport controls. A push-button power switch at the left is flanked by two toggle switches that adjust tape tension for either 7- or 10¹/₂-inch reels and set the tape speed to either 7¹/₂ or 15 ips. A small knob, when pulled out slightly, supplies a vernier SPEED TUNING capability (in playback only) over a range of several per cent. Wherever the knob is set, pushing it in returns the machine to its correct, factory-set speed.

A group of square pushbuttons operates the transport through a logic system and electromechanical solenoids. They can be used in any sequence without damage to the tape. Each button lights when its function is selected. If either of the REC MODE switches is set to REC, the red circle on the recording-safety button flashes as a warning that the machine is ready to go into a recording mode. It is possible to make a "flying-start" recording, directly from the playback mode, by pressing the record and play buttons at the desired point. The PAUSE button is joined by a line on the control panel to the STOP button. This indicates that when the tape is stopped, pressing the PAUSE button releases the tape lifters so that the tape is in contact with the heads and the reels can be cued manually to any specific point on a recording.

Sony has designed the TC-880-2 to minimize the electrical phase shifts that make it impossible for most tape machines to record and play a reasonable facsimile of a square wave (and, by inference, other complex waveforms). According to Sony, the phase compensation in the recorder's playback amplifiers provides a more natural quality on live recordings, especially if they have been re-recorded several times in the Syncro-Trak mode, which can compound phase errors with each re-recording.

Another practical benefit of the phase compensator is that SQ or other matrixed quadrasonic programs can be recorded and played back (through a suitable decoder) without serious deg-

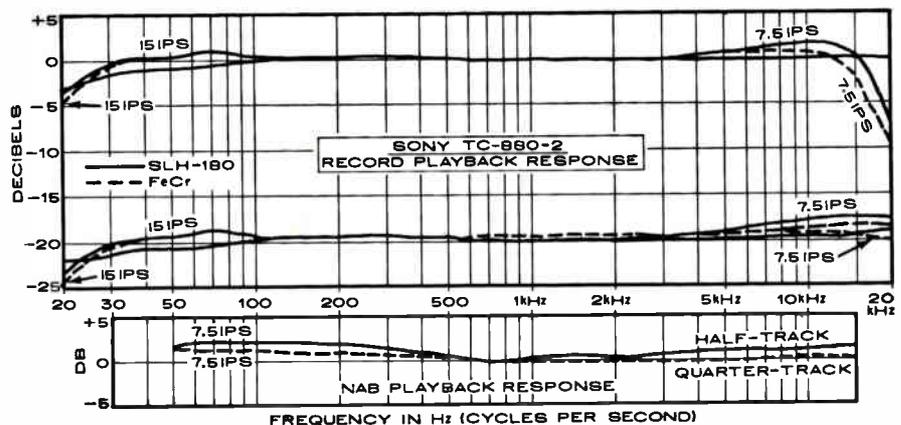
radation of their directional properties. In addition to the electronic phase compensation within each channel, the gaps of the "Ferric and Ferrite" heads have been designed to minimize phase shift between the channels.

The Sony TC-880-2 is a rather large recorder, 18¹/₂ inches wide, 20¹/₄ inches high, and 10¹/₂ inches deep. It weighs an impressive 80 pounds in its walnut-finish wooden case, which fortunately is fitted with sturdy carrying handles. Price: \$2495.

● **Laboratory Measurements.** The 7¹/₂-ips playback frequency response of the TC-880-2 was measured with the Ampex quarter-track test tape through the recorder's quarter-track head. It was flat within ±0.5 dB from 150 to 15,000 Hz, rising gently to +1.5 dB at

response figures are, they are overshadowed by the recorder's freedom from tape or head saturation, which usually causes a loss in high-frequency response at high recording levels. Only at 7¹/₂ ips was the 0-dB recording-level response curve significantly different from the -20-dB curve within the audible range. At 15 ips there was no detectable compression at 0 dB until we exceeded 25,000 to 30,000 Hz, regardless of the tape used. Although any good open-reel recorder, especially at 15 ips, is relatively free of high-frequency tape saturation, we hardly expected to find a bandwidth exceeding 40,000 Hz and essentially independent of recording level. To say we were impressed would be putting it mildly.

Recalling Sony's emphasis on linear phase response, we recorded and



50 Hz. The response to an Ampex full-track test tape through the half-track head was quite similar. The headphone listening volume was more than adequate even when high-impedance phones were used.

For overall record-playback frequency-response measurements we used Sony PR-150 as the "normal" tape, Sony SLH-180 as the "special," and the new Sony Ferrichrome as the FeCr tape. We achieved the following rather impressive results (at a -20-dB recording level, ±2-dB tolerance): PR-150 tape at 7¹/₂ ips, 20 to 20,700 Hz; at 15 ips, 20 to 36,500 Hz. With SLH-180 tape, response at 7¹/₂ ips was 20 to 26,000 Hz; at 15 ips, 23 to 40,000 Hz. The FeCr tape at 7¹/₂ ips gave 20 to 28,500 Hz; at 15 ips, 20 to 40,000 (!) Hz (our upper measurement limit is 40,000 Hz); the response may, in truth, have gone even higher). All our response measurements comfortably surpassed the manufacturer's ratings.

Remarkable as these frequency-re-

played back square waves at 1,000 and 5,000 Hz. With the MONITOR switch set to SOURCE, a small overshoot and a cycle or two of ringing, caused by the recording amplifier or the line-output amplifier, could be seen on the square wave. However, when we introduced the tape and heads into the signal path by switching to TAPE, the change in waveform was very small. The ringing on the 5,000-Hz square-wave output was at about 50,000 Hz, and the preservation of the rise and fall times of the waveform was consistent with an effective frequency response of about 50,000 Hz together with a linear phase-shift characteristic (constant time delay). At low audio frequencies the phase difference between the two channels was a few degrees, increasing to 30 degrees at 10,000 Hz, 50 degrees at 20,000 Hz, and 90 degrees at 33,000 Hz. This, too, is exceptional performance for a tape recorder.

An input of 38 millivolts (mV) at the LINE inputs, or 0.075 mV at the MIC

inputs, was needed for a 0-dB recording level. The playback output was between 0.38 and 0.43 volt, depending on the tape. The microphone inputs overloaded at a very good 200-mV input. The overload point could be increased to 1 volt or 6.3 volts by using the MIC ATT switch.

The playback distortion from a 0-dB recording level at 1,000 Hz (7½ ips) was 0.56 per cent with the SLH-180, 2 per cent with PR-150, and 0.4 per cent with FeCr tape. The 3 per cent distortion level was reached at about +8 dB. The unweighted signal-to-noise ratios (S/N) referred to that level were, respectively, 60.2, 62, and 63.2 dB with PR-150, SLH-180, and FeCr tapes. With IEC "A" weighting these figures were improved to 65.5, 68, and 70.3 dB. Through the MIC inputs the noise at maximum gain increased by 13.5 dB.

At 15 ips, the respective playback distortions were 1, 0.6, and 0.32 per cent at 0 dB. The 3 per cent distortion levels were +5, +6, and +7 with PR-150, SLH-180, and FeCr. The S/N at 15 ips measured 53, 56.5, and 59 dB unweighted for the three tapes, and 61, 65.5, and 67 dB with "A" weighting.

The wow and flutter (unweighted rms) in a combined record-playback measurement were the lowest we have ever seen from a tape recorder, and may well represent the limitations of

our test equipment. The wow reading of 0.015 per cent was absolutely unwavering (an unusual event in itself), and we would consider the flutter of this machine to be essentially zero. The reading was identical for both tape speeds. The speeds themselves were as accurate as could be measured within the ± 1 -count ambiguity of our frequency counter. The playback-speed vernier had a range of about ± 5 per cent at 7½ ips and ± 10 per cent at 15 ips. In the fast speeds 1,800 feet of tape was moved from end to end in 2 minutes.

In its PEAK mode, the movement of the meter light bar appeared to be virtually instantaneous, with no overshoot and with a slow decay that let it follow the crest of the program. In PEAK HOLD the maximum reading was retained for many minutes (switching to one of the other modes restored normal operation). When we drove the recorder with 0-dB tone bursts at a rate of once per second, a 100-millisecond burst gave a meter reading of -7 dB in the VU mode and +0.5 dB in PEAK (relative to the steady-state reading). Shortening the burst to 10 milliseconds gave a -21-dB VU reading, while the PEAK indicator read -1 dB.

● **Comment.** The performance and features of the Sony TC-880-2 set it

apart from almost every other high-quality home recorder we have seen. For example, it is definitely *not* (and does not pretend to be) a "professional" recorder, though it is certainly capable of professional-level performance and more. The linear phase response and wide frequency range of the TC-880-2 make it suitable for recording and playing back quadraphonic material in matrixed form. We confirmed this by taping SQ records with strong directional effects and playing back through a full-logic decoder. The directionality was affected only slightly by the record-playback process. Although Sony makes no claims in this regard, we also tried copying a CD-4 record and playing the tape back through a demodulator, but the phase-shift and time-delay characteristics of the recorder were not compatible with the exacting requirement of the CD-4 technique. We did obtain a good stereo playback, and the demodulator's CD-4 light turned on, but there was no front-to-back separation.

Mechanically, this machine is a gem. Its precision and operating "feel" are consistent with the finest home electronic equipment (as we have mentioned in recent reviews, some deluxe audio components are currently setting new standards of excellence for their light, positive control action).

Teac A-103 Cassette Deck



THE Teac A-103 is a moderately priced front-loading cassette deck with the dark-gray and black appearance currently popular in audio-component styling. The tape transport, which occupies most of the left side of the unit, uses a single d.c. servo-con-

trolled motor. The cassette itself loads into a slot in the door.

Almost the entire cassette can be viewed through a large, clear window in the door, and an orange backlight behind the cassette makes it easy to see how much tape is on each of its hubs.

The control keys can be operated in any sequence without going through STOP (except for the REC and EJECT functions). The cassette compartment is flanked by the pushbutton power switch on the left and the index counter on the right. Below the counter are two MIC jacks for medium-impedance (600 ohms or higher) microphones.

The right half of the panel carries a functional group of recording and playback controls and indicators. At the top are two large, well-illuminated level meters whose green-lit markings are clearly visible from a considerable distance. To their right are rectangular indicator lights (red and orange) that show when the record function or the Dolby system have been activated.

Below the meters are four bar-shaped push-buttons. One selects either the line or the MIC/DIN inputs (the two cannot be mixed). To its right are

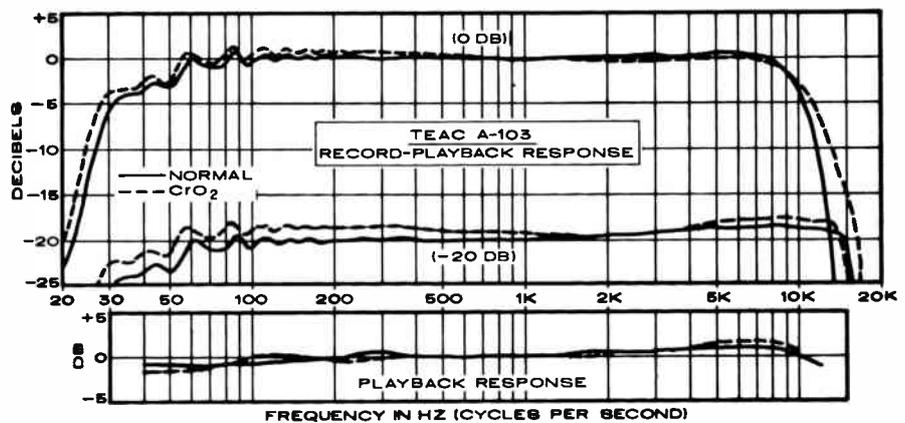
the separate BIAS and EQ switches, each marked for CrO₂ and "normal" tapes. The fourth button turns on the Dolby system. Below them are the two recording-level control knobs, and concentric with each is a clear plastic ring with a red index line that can be set to mark a preset recording-level adjustment. The headphone jack (for 8-ohm phones) is at the lower right of the panel. In the rear of the recorder are the line inputs and outputs and a DIN connector.

The specifications of the A-103 are not markedly different from those of many similar machines. The frequency response with a chromium-dioxide tape is stated to be 30 to 16,000 Hz, with no tolerance given. The signal-to-noise ratio (S/N) is rated at 55 dB without Dolby, and wow and flutter is rated at 0.1 per cent in a NAB-weighted measurement. The Teac A-103 is 16 inches wide, 6 1/4 inches high, and 11 1/4 inches deep. Weight: 15.4 pounds. Price: \$250.

● **Laboratory Measurements.** No specific recommendations are made for tapes compatible with the machine's adjustments. The instructions consist of a single folded sheet, but they are nevertheless adequate in most respects, listing many popular tapes and the corresponding settings for the bias and equalization switches. Lacking further information, we made frequency-response measurements with a number of presumably suitable tapes. With NORMAL bias and equalization, very similar results were obtained with Maxell UD-XL I, Scotch Dynarange, Memorex MRX₂, and BASF Professional I. The Maxell was used for our subsequent measurements with NORMAL tape settings, and most of the tests were also made with Dynarange, since it was very nearly like the UD-XL I. We also tried TDK AD and Scotch Master I, but the machine was evidently underbiased for them and the high-end response rose (though not to make their use impractical).

With the CrO₂ control settings, the Scotch Master II was the flattest by a small margin, although TDK SA and Maxell UD-XL II were almost identical to it. BASF Professional II, a true chrome tape, had a strongly rising high-end response.

The overall record-playback response at a -20-dB level was practically the same with any of the tapes we used. In general, the variation was about ±2 dB from about 40 to 15,000 Hz, with the usual low-frequency ripples in the response curve beginning at about 200 Hz. The frequency response at a 0-dB recording level revealed some



interesting facts about the recorder as well as the tapes. With the "normal" tapes, the 0-dB curve intersected the -20 dB curve at about 13,000 to 14,000 Hz (in contrast to the 10,000 or 11,000 Hz observed on many low-price cassette decks). This indicates relatively good high-frequency tape-saturation characteristics and, by inference, a relatively efficient head design. With the chrome-type tapes, whose high-frequency performance is inherently better than that of a standard ferric tape, the two curves never intersected, the 0-dB curve remaining well above the -20-dB curve at all times. The rapidity with which the high-frequency response drops above 15,000 Hz suggests that the recorder has a built-in low-pass filter to remove any 19-kHz pilot carrier from stereo FM programs.

The playback frequency response was measured with a TDK AC-337 test tape for NORMAL (120 μsec) equalization. It was flat within ±1 dB over the 40- to 12,500-Hz range of the tape. The CrO₂ (70 μsec) response was measured flat within ±1.5 dB over the 40- to 10,000-Hz range of the tape.

The tracking of the Dolby system was checked at recording levels of -20 and -30 dB. There was less than 1 dB of change in the frequency response with the Dolby system in or out of the circuit at any frequency, indicating very close matching of the Dolby recording and playback frequency-response curves. This would not have been possible without the recorder's very flat response.

A line input of 55 millivolts (mV) or a MIC input of 0.215 mV was sufficient for a 0-dB recording level. The MIC input overloaded at 30 mV, which suggests the need for caution when making live recordings unless a microphone with very low output (or an attenuator) is used. The playback output (which is at a fixed level) from a 0-dB recording was 325 mV with "normal" tape and 290 mV with CrO₂.

The playback distortion (third har-

monic) from a 0-dB recording at 1,000 Hz was about 0.8 per cent with Dynarange tape, 0.5 per cent with UD-XL I, and 1.8 per cent with Master II. The reference-distortion level of 3 per cent was reached with recording inputs of +6, +7, and +3 dB, respectively. The unweighted signal-to-noise ratio (S/N) referred to those recording levels was 50 dB with Dynarange, 52.7 dB with UD-XL I, and 48.5 dB with Master II. With CCIR/ARM weighting these readings improved to about 54, 54, and 55 dB, respectively. Finally, with the Dolby system in use, the weighted S/N was 64 dB with each of the tapes. The noise increased by 10 dB through the MIC input at maximum gain and proportionately less at lower settings.

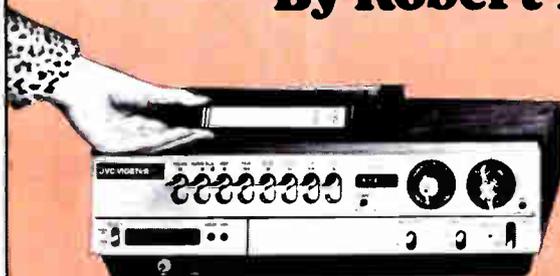
The combined wow and flutter, measured with a TDK AC-342 test tape, was 0.05 per cent with NAB weighting (average reading), and the same with a JIS reading (rms). A CCIR- or DIN-weighted peak-flutter measurement read ±0.1 per cent, as did an unweighted average measurement (0.1 per cent). The tape speed was about 1 per cent fast.

● **Comment.** Reviewing the test data and comparing it with what we have measured on a number of other cassette decks, it becomes clear that the Teac A-103 performs well above expectations for a machine of its price. The ultimate test must be in the listening, and here the A-103 acquitted itself beautifully. When we recorded interstation FM tuner hiss and compared the playback to the original (at a -10-dB level) the fidelity of the recording was virtually perfect. Needless to say, recording music off the air resulted in a playback that was indistinguishable from the original. The same applies to playing high-quality recorded cassettes such as the Advent CR/70 series. They sounded every bit as good as on machines costing two or three times the price of the A-103.

Video

ALL ABOUT HOME-VIDEO TAPE RECORDERS

By Robert N. Greene



JVC VIDSTAR
Videocassette Recorder



Quasar VH5000
Videocassette Recorder



Sony SL-8600
Videocassette Recorder



Videocassettes from left-to-right: Sony, RCA,
and Quasar, with Memorex audio cassette.

IN the beginning there was Betamax, and for quite a while there was *only* Betamax. Now, suddenly, we're inundated by other futuristic-sounding names: Vidstar, BetaVision, V-Cord, SelectaVision, the Great Time Machine, and even more. Are these invading alien creatures from another galaxy? No, they're invading video-cassette recorders from Japan. Their assault is already in progress all over the country, and, since they may possibly change your entertainment life radically, it's time you had some information about just what that change might involve.

Let's start back about twenty years ago, when the video-recording phenomenon really began. Audio tape recording had been around for some time, though even professional equipment was still relatively crude compared with today's best home units. It was still necessary to run 1/4-inch audio tape at a minimum of 15 inches per second to achieve a "hi-fi" frequency response, and the bandwidth necessary for video made audio recording look like child's play. It just wasn't practical—at least in terms of tape economy—to move the tape across the head fast enough to provide the frequency response needed to do the job. And so, engineering ingenuity to the rescue: a means was devised to move a system of multiple heads across the tape so that the combined speed of the tape *and* the heads provided a very high *effective* tape speed. In addition, a clever configuration of multiple, slanted recorded tracks made the most of every available square micron of tape surface. This arrangement worked quite well—so well, indeed, that tape virtually sounded the death knell for what has since become known as "the golden age of live TV."

So the technology for video recording has been in use for quite some time, but the process was too complicated and the equipment too bulky and expensive for the home. As an example, 2-inch-wide tape is used up at the rate of 30 square inches per second. Compare that with the 1.875 square inches per second—and half that for quarter-track recording—used by open-reel audio decks at 7 1/2 ips and you'll get the idea. The problem, then, was to arrive at the same result, or a reasonable approximation of it, in a format and at a cost compatible with home use. This proved even more of a challenge than getting hi-fi sound out of the little Philips cassette.

Over the past ten years or so a number of companies have announced development of one system or another

that would bring video recording into the home in tape (or disc) form, but until recently all of them ran into technical or financial problems before coming to market. Then, a few years ago, along came Sony with a system called "U-Matic." It utilized 3/4-inch tape in a cartridge about the size of a book. It was essentially a miniaturized, simplified version of the commercial 2-inch-tape decks—and it worked. It was too expensive for the home market, but it has found wide acceptance in the industrial and institutional areas.

Sony didn't rest on its laurels, but kept working on a practicable home unit and eventually came up with the now well-known Betamax system. This was the first unit to be widely marketed for the home. It uses 1/2-inch tape in a cassette about the size and weight of a paperback book; in its original form, the cassette would run for one hour. (It's now up to two hours, with a three-hour cassette as well as a cassette-changing device on the way.) Of course, other companies were working on the same problem, and the sudden appearance of a variety of video-cassette recorders (VCR's) means that a number of them have come up with a variety of solutions—which may in time give us some trouble with format compatibility.

The Machines

Undoubtedly, many of you reading this haven't yet encountered any of these VCR's "in person," so an introduction is in order. To begin with, yes, they *do* deliver what they promise. The image they produce, while very slightly below broadcast quality, is excellent, and most viewers would probably be hard put to tell the recording from the original tape except in a direct A-B comparison. It is possible, though, that the recording you make off the air will be superior to the picture your TV set delivers on the tube if the set itself is faulty: the recorder is inserted in the antenna line before the receiver, so it's dependent on it only for playback and not for recording quality. (Should you care some time to find out what any given deck is *really* doing, or to compare one against another definitively, use an Advent VideoBeam projection system for the playback. You will probably be surprised to see how good TV can look.)

The hookup of these units is quite easy; simply install them between the antenna—whatever kind it is—and the receiver and you're in business, with one exception. Households hooked up to a cable system that uses converter boxes will have a problem. These

boxes essentially replace the front end (tuning section) of the TV set; the set is left tuned to some unused local channel and is effectively a monitor rather than a full receiver. Now, if you want only to record what you're watching, or to record something while you're away (that is, if only one program at a time is involved), you're okay. However, if you want to record one program while watching another, the tape deck must be treated as a second television set and will require its own converter box. The monthly cost of the second converter box will be an important factor to consider.

As to appearance, these machines look rather like oversize audio cassette decks, their size, weight, and external appearance predictably varying somewhat from one brand to another. None of them could really be called portable, their weight being generally in the 30-pound range and their dimensions being fairly similar to those of a largish integrated amplifier.

One control that appears on some units may deserve a making-life-pleasanter award: it's a PAUSE function that enables you to stop the tape to avoid recording commercials.

The main controls amount to a combination of the tape-transport controls you'd find on an audio deck, in the usual piano-key or lever form (the transport functions are the same), and the channel-selector controls on a TV receiver. In addition, you'll find one or more controls for fine adjustment of tape playback, and some units have "memory" arrangements to expedite finding a given section of tape. Since changes in humidity and temperature can interfere with smooth tape motion, it is customary to provide some sort of warning indicator—or even a built-in dehumidifier.

The machines, being intended for the widest possible market, are simplicity itself to operate. (Perhaps at some future time they'll begin to incorporate additional gadgetry more appealing to those who love a panel full of controls.) Their external simplicity, however, belies an internal complexity that makes the most advanced audio deck seem elementary by comparison. The required *very* wide frequency response mentioned earlier is (and compare this with audio's 20 to 20,000 Hz) 20 to 6,000,000 Hz. The methods used to achieve this vary a bit from one manu-

facturer to another, but they come down to a simplified version of the commercial-unit arrangement of a rotating moving head (or heads) as well as a moving tape.

The 1/2-inch video tape passes either partially or fully around a spinning drum that contains one or two heads. The tape actually travels at a speed ranging from about 1/2 to 3 ips, depending on the specific machine and possibly the tape speed selected (several machines provide a choice of speeds). The "wrap" of the tape around the head drum is on a slant, so that the revolving heads sweep in a series of diagonal "slashes" across the tape instead of in a single continuous track. This technique, called "helical scan," fills up virtually the entire surface of the tape (except for a narrow strip along the edge that serves as an audio track) and permits an enormous amount of information to be packed on (in one system something over 430 of these slashes can be recorded on one inch of tape). Still, this high recording density is barely adequate for the huge bandwidth requirements of color video. And, needless to say, the mechanical tolerances have to be extraordinarily accurate for a piece of home equipment. Should you be interested in a more detailed technical discussion of the subject, pick up a text on the basic theory of color television—something far beyond the scope of this article—and work up from there. Meanwhile, the diagrams shown should help you visualize the whole thing.

IN an audio cassette machine, the tape remains within the cassette shell and follows a straight path across the heads, which protrude into the cassette's openings. Very straightforward. However, in all but one TV deck, when the cassette is put in place mechanical fingers enter it and pull the tape out to engage the external head drum. Of course, the specifics of the tape-extraction scheme and the design of the tape path vary from one manufacturer to another. The one exception (mentioned earlier) is the VR-1000 system, in which the tape always remains within the cassette.

There are presently four different VCR systems available. They are, with the names of the companies that developed and manufacture them:

Beta	Sony
Video Home Systems (VHS)	JVC
VR-1000	Matsushita (Quasar)

All of the units available as of this writing, regardless of the brand name on them or their external appearance, belong to one of these systems and are

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made by one of these companies. For example, the machines marketed by JVC, RCA, Magnavox, Panasonic, and a few others belong to the JVC VHS system.

To complicate matters further, Matsushita seems to be involved with two different systems. Panasonic, one of the brand names used in the U.S. by the Japanese company Matsushita, is marketing JVC's VHS design, JVC being partly owned by Matsushita. But Matsushita appears also as the manufacturer of the VR-1000, and this machine is marketed not by Panasonic but by Quasar, which used to be Motorola but is now owned by Matsushita. And Quasar also makes a VHS model.

announced the availability of consoles in predictable furniture styles.

Even if you buy just the deck, it won't be cheap. "List" prices range from \$995 to \$1,300. Discounting has already begun, however, so you may find some very substantial price breaks, depending on your locality. Sony units have already been advertised at prices as low as \$795 in New York City.

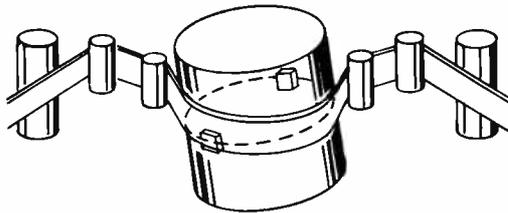
In any case, it would be advisable to check carefully on the availability of service in your area. These new devices are certainly beyond the experience of your neighborhood TV repairman, and probably even of the dealer selling them, unless he has undergone special training and stocks the necessary parts. There are special training courses being given by some manufacturers, and of course some repair people have already been exposed to the Betamax. But, if at all possible, don't put yourself in the position of having to ship your deck cross-country should it suddenly fail—and of course it's too

thing. This way you can see *Kojak* at another time when it's more convenient.

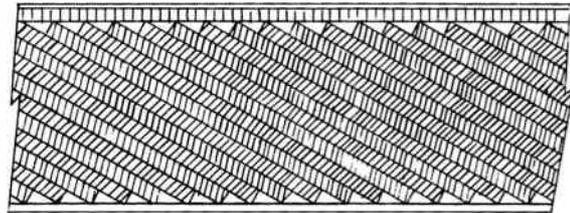
(b) Recording *Kojak* while you're watching *The Six Million Dollar Man*, or whatever. This way you can also see *Kojak* another time when it's more convenient.

What this comes down to is your having the ability to rearrange time, at least insofar as TV programming is concerned. You need no longer be victimized by the TV networks' competitive counter-programming—their practice of airing one popular program opposite another in the attempt to knock down the other's ratings. As unlikely as it might seem at the moment, if a large enough percentage of homes get these recorders, it could significantly alter the networks' programming practices and, possibly, their income. This might account for the networks' appearing to be something less than enamored of the whole VCR idea. And, of course, the consequences for the Nielsen rating system are mind boggling.

Another possible use for the VCR is to build up a tape library. Should you



The diagram above shows a typical tape/tape-head configuration for VCR's. Because of the relative tilt—in this case introduced by a tilted head drum—the two revolving heads trace diagonal paths across the more slowly moving tape.



The result is the above magnetic pattern on the tape. Note the different angles of the short lines within each track. These indicate different azimuth alignments for the two heads—a clever trick to permit close track spacing without crosstalk.

Clear? Anyway, you'll be finding something like a dozen and a half brand names to choose from, but all of them will be coming from only four manufacturers. Maybe this will help simplify things for you. Maybe not.

The Cost

The VCR's are being marketed in two different forms at the moment. You can buy just the deck itself and operate it in conjunction with an existing TV set, or you can buy a complete console incorporating both. Thus far only Sony, Zenith, and Curtis Mathes (a regional supplier in the Southwest) have

early to comment on the likelihood of such an event.

The Uses

Let's say for the moment that you've already gone out and plunked down a nice chunk of cash for one of these little beauties. Now what? The use the manufacturers seem to be pushing hardest is what they refer to as "time shift." This simply means watching a given piece of material at a time other than when it is originally broadcast. There are two subsections to this:

(a) Recording *Kojak* at home while you're out seeing *Star Wars* or bowling—or some-

decide (though I can't imagine why) that that episode of *Kojak* you recorded is really memorable, you can keep the tape and view it again—and again and again—whenever the mood strikes you.

Also, prerecorded material is being made available from a number of sources, and much more is bound to come. There's a fairly large variety of feature-length films, both old and recent, already or soon to be ready for sale or rental. There will also be sports material, how-to and medical information, porn (!), and other educational programming, as well as material originally presented on broadcast TV. Prices vary, depending on length and

recording format, but they *are* high. At the moment, a feature-length film goes for upward of fifty dollars. (One factor involved here is the lack of high-speed duplication of recorded tapes—an hour-long tape takes an hour to copy. This isn't expected to change for at least three years.)

Another VCR use that comes readily to mind involves the addition of a camera for what would amount to your own "instant" home movies. You'd be able to see immediately what you'd shot and even decide right then if it needed to be redone. What you might do with this capability we leave to your own imagination and inclinations: anything from the kiddies' birthday party and suchlike to

The Accessories

The prices mentioned earlier do not include accessories. Except for units listing the timer and microphone as optional, "accessories" means cameras. One of these can add quite a bit to the cost; most companies make available a black-and-white camera at \$300 to \$400. JVC lists two different *color* cameras, one at \$1,500 (more than the price of the deck), and another, fancier job at an interesting \$2,150! Toshiba also has a color camera at \$1,700.

These cameras are all small enough (in size, if not price) for easy home use. The black-and-white units are about the size of a home-movie camera, and the color units are not too much larger.

(While we're on the subject of the home-movie aspect of TV recording, one possible competitor, Polaroid, is now marketing a "Polavision" instant-movie system. It employs what looks like a standard home-movie camera except that it uses special film in a special cartridge. Once the film has been shot, the cartridge is placed in the Polaroid player, a projection device that has a built-in $9\frac{5}{8} \times 7\frac{1}{4}$ -inch screen, and the film is automatically processed and shown in about 90 seconds. In some large metropolitan areas, the \$995 Polavision system is being sold for about \$600—and, for many users, it will serve at least some of the same functions as a VCR.)

One final point about home movies: accessories and services will shortly be available for copying home-movie film and slides onto video tape. At least one company, Sony, has announced that it will have available a service to restore the color on old, faded movie film so that it will look like new in the tape rendition—and the tapes, of course, *won't* fade.

Incompatibility

In video, unlike audio, you can't willy-nilly transfer a cassette from one company's machine to another company's machine and expect it to work; it may, and then again it may not. While the machines all look pretty much alike on the outside, their innards vary. For example, the Sony system is not compatible with Quasar. Since a number of different brands are clustered under two of the four different systems listed earlier, there is a certain amount of compatibility between brands, if not between systems. Some companies already have plans under way to market more than one system, so this whole business may get *more* complicated before it gets any simpler. And simpler it will have to get in time. It seems rather unlikely that *four* different systems for achieving the same end can coexist on the market for very long.

Although many large companies are already deeply involved, it would be most surprising if one or more of the competing systems were not eventually withdrawn from the marketplace. How far out on a limb that would leave owners of any equipment made obsolete by such a withdrawal remains to be seen.

The Tape

We've talked a lot about the hardware, but what about the software (tape)? For those interested, there's the prerecorded material already mentioned, but most people will want blank tape to make their own recordings. A few of the companies marketing the decks will also distribute blank tapes under their respective labels. How much will these video cassettes set you back? Sony's two-hour tapes "list" for \$16.95, the one-hour at \$12.45. Quasar's cassettes will run \$24.95 for the two-hour length and \$16.95 for the one-hour. (Polavision's $2\frac{1}{2}$ -minute movie cartridge lists for \$9.95.) Some companies have announced lower prices, but the pricing, as is true of much of the equipment discussed in this article, is in a state of flux and subject to change.

The supply of blank tape from other familiar names may be a bit slower in coming. The manufacturers have to be licensed by the patent-holding developing companies, after first deciding if they even want to get into this field. Note that video tape isn't just audio tape packaged differently; it is a *completely different product*. 3M has begun distributing tape in the Beta format and at the time of this writing plans to intro-

duce a VHS tape under the Scotch label this year. TDK has already begun supplying JVC with private-label tape in the VHS format and will market under its own name in time. Maxell expects to market under its own name as well as that of Hitachi, the parent corporation. The other major tape manufacturers are holding off for the moment, perhaps to see how things go.

The Legal Questions

One interesting aspect of home video recording is that there is a vague possibility that the whole thing may one day be declared illegal! In a joint action, Walt Disney Productions and MCA's Universal City Studios have brought suit against Sony. The contention is that recording off the air is infringing on the copyrights of the owners of filmed material belonging to TV production companies. Such a suit, if successful, would be an effective roadblock for the entire industry.

The equipment manufacturers claim there's no legal basis for this action, but you'll notice that they're putting warning notices in their advertising to the effect that the video decks are intended only for "personal" use. This situation may take years to resolve.

The Video Disc

You say you don't care about recording, just playback of existing material? You don't feel like kicking in a grand or more for a machine? Well, fear not, we've got something for you, too (and it may even be available by the time you read this)—the video *disc*.

Until recently there were two major contenders for this market: RCA and MCA-Philips (in a combined effort with Magnavox). A third giant is now looming on the horizon, however, in the corporate personage of Matsushita.

In brief, the discs, regardless of the system involved, will have pretty much the superficial appearance of a standard LP. Don't expect, however, to be able to connect your present turntable to your TV, for these discs are as different from the audio version as video tape is from audio tape.

The MCA-Philips system, which is recorded from the center to the outside (as were some early phonograph records prior to the outside-in standardization required for record changers), utilizes a disc that rotates at 1,800 rpm and has the TV information encoded in tiny indentations, or "pits," in the record

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surface. This surface is coated over with a clear protective material (there are no "grooves" as we know them), and the information is read optically by a laser-beam arrangement. The obvious advantage of this is that there is no physical contact with the recorded material, hence no record or stylus wear.

It was originally intended that these discs would carry thirty minutes of program and that the system would be available by now with a player going for \$500. (The player is about the size of an ordinary turntable, but it is a lift-the-lid-and-slide-the-disc-in arrangement.) Some redesigning is being done to increase playing time to a full hour or more per disc, however, so a delay has been announced, the new scheduled availability being this fall.

When the players do become available, there will be material ready to play on them, this being MCA's part of the venture. Quite a number of films, ranging all the way from *Lives of a Bengal Lancer* and *All Quiet on the*

Western Front (can you ever forget that hand reaching for the butterfly?) to *Jaws* and *The Sting* have been put on discs, along with a variety of other material. The price is expected to be about \$10 or less per disc.

It's claimed that the MCA system will offer the advantages of slow motion, reverse, stop motion, and one-frame-at-a-time viewing. The RCA and Matsushita systems are somewhat similar to each other, but quite different from the MCA. They utilize variations of stylus and groove recording, the former being a variable-capacitance playback and the latter incorporating a "twist stylus" system that uses a special piezoelectric material for conversion of mechanical vibrations into voltage fluctuations. The Matsushita is recorded by the hill-and-dale (up-and-down rather than lateral stylus motion) method, again like old phonograph records. Both the RCA and Matsushita video discs (dubbed "Visc") rotate at 450 rpm.

Playing time will be thirty to sixty minutes per side, and the discs of both systems can be manufactured using the pressing-plant equipment that serves for standard audio discs, but the discs are *not* interchangeable between systems. Just when these might be available is not yet clear. But at least one

company, Magnavox, feels that the disc and tape systems will be able to coexist, as they do in audio, and is backing both. Incidentally, the MCA-Philips cooperative is now also working with Pioneer in Japan and may possibly come out before Magnavox with still another system, named Universal-Pioneer.

So there you have a picture of what may be the television picture in your future—or even present—depending on (1) what you do, (2) what the manufacturers do, (3) what the retailers do, and, most important, (4) what the buying public does.

MEANWHILE, back at the plant in Germany (not *everything* happens in Japan), the well-known tape manufacturer BASF is hard at work on a new system using *quarter-inch* tape cassettes. It turns out that BASF's major competition in this area may be our own Eastman Kodak, working through its French magnetic-tape facilities. And Sony is finally bringing to market (for \$3,000) the long-promised *audio* digital-recording adapter for its Betamax video recorder. What all this means for the future of home video and audio recording remains to be seen—and heard—but the next couple of years look *very* interesting. □

VIDEOCASSETTE SOFTWARE

THERE is no shortage of prerecorded video cassettes for those who want them. Here is a partial list of suppliers and their wares. Note that although addresses are included, these organizations generally work through dealers only, and not usually by mail-order.

● **Magnetic Video Corporation**, Industrial Park, Farmington Hills, Mich. 48024. The offering here is a list of fifty movie titles licensed from 20th Century Fox, including *Gentlemen Prefer Blondes*, *The Razor's Edge*, and *Patton*. On both VHS and Beta, two-hour cassettes retail for \$49.95, longer movies for \$69.95.

● **Entertainment Video Releasing**, 1 East 57th Street, New York, N.Y. 10022. This company makes available its 1978 Home Video Showcase Collection. This covers a wide variety of family, children's, and "adult" motion pictures. On both Beta and VHS formats (and U-Matic) are such general titles as *My Son the Vampire* and

The Jaws of Death. For children, *Pinocchio* and *Treasure Island*; for non-children, such titles as *1001 Danish Delights* and *Cry Uncle*. Children's and family titles retail from \$29.95 to \$49.95; adult titles (those "delights" aren't pastry!) for \$59.95.

● **Golden Tape**, 341 Foothill Road, Beverly Hills, Calif. 90210. This company offers a library of one-hour tapes concerned mainly with sports-car racing, rock-music concerts, and animated entertainment. Prices are about \$55; available on both VHS and Beta.

● **Sports World Cinema**, 2367 Murray Holladay Road, P.O. Box 17022, Salt Lake City, Utah 84177. Sports-oriented programs—motor sports, skiing, and football—as well as some "art appreciation" tapes such as "A Potter's Song" and "Creating with Clay." In both VHS and Beta, suggested retail price is \$60 per title.

● **Time-Life Video**, Time & Life Building, Rockefeller Center, New

York, N.Y. 10020. Seven hundred programs of "cultural entertainment" are offered for sale or rent to educational institutions by Time-Life Multimedia (P.O. Box 644, Paramus, N.J. 07652). Through Time-Life Video the home consumer can now acquire (from retailers or by mail order) the Great Programs collection, a set of eight videocassettes of approximately one hour each. The set costs \$300 and includes such titles as "Civilisation," "Life Goes to the Movies," and "Rose Kennedy Remembers." These are available at present only in Beta format, but VHS may be distributed later, and there are plans to add other programs in the future.

● **Video Film Service Corporation**, 6 Parker Place, 2600 S. Parker Road, Suite 164, Denver, Colo. 80232. Sports, comedy, and musical subjects are available in either VHS or Beta format for \$39.95 per two-hour program.

And good news for the home-video recordist: supplies of blank video tape for all formats are expected to be available from a variety of manufacturers—3M, Memorex, Sony, Maxell, Ampex, TDK, and Fuji.

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CASSETTE TAPE MACHINES

AIWA

AD-6800 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; dual-needle meters show VU (average) and peak level for each channel; selectable peak hold; front-panel bias adjust for three tape types, plus bias-calibration oscillator; two heads plus special bias-test head; servo capstan motor plus dc reel motor; wow and flutter 0.05% wrms; S/N 65 dB (Dolby on, FeCr tape); frequency response 20-19,000 Hz ± 3 dB (FeCr tape), 20-16,000 Hz ± 3 dB (LH tape); fast-winding time 90 sec (C-60); memory rewind; limiter; separate bias and equalization selectors; oil-damped cassette ejection; front-panel (DIN) record/play jack; separate record and output level controls; timer record provision; 6 $\frac{7}{16}$ " H \times 18 $\frac{1}{16}$ " W \times 13 $\frac{1}{4}$ " D..... \$700

AD-6550 Cassette Deck

Front-loading cassette deck with Dolby noise-reduction system and remaining tape time meter; 38-pulse FG servomotor; wow and flutter 0.05% wrms; S/N 65 dB (Dolby on, FeCr tape); frequency response 30-15,000 Hz ± 3 dB (FeCr and CrO₂ tape), 30-13,000 Hz ± 3 dB (LH tape); fast-winding time 90 sec (C-60); has Ferrite Guard head; bias fine adjuster and separate bias and equalization selectors; oil-damped cassette ejection; memory rewind; two VU meters and two-step peak indicator lamps; 5 $\frac{9}{16}$ " H \times 16 $\frac{1}{16}$ " W \times 13" D..... \$470

AD-6400 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; three-step tape selector switches; bias and equalizer selectors; LH bias fine tuning; 38-pulse FG servomotor; Ferrite Guard tape head; wow and flutter 0.05% wrms; S/N 65 dB (Dolby on, FeCr tape); frequency response 20-17,000 Hz (FeCr tape), 20-17,000 Hz (CrO₂ tape), 20-15,000 Hz (HL tape); fast-winding time 90 sec (C-60); two-step peak-level indicator lamps; front-panel VU meters; oil-damped cassette ejection; front-panel (DIN) record/play jack; separate record and output level controls; timer record provision; 5 $\frac{9}{16}$ " H \times 16 $\frac{1}{16}$ " W \times 13" D..... \$420

AD-6300 Cassette Deck

Front-loading cassette deck with Dolby noise-reduction system; dc servomotor; wow and flutter 0.09%; S/N 60 dB (Dolby on, FeCr tape); frequency response 30-14,000 Hz (LH tape), 30-16,000 Hz (CrO₂ and FeCr tapes); fast-winding time 85 sec (C-60); interlocked Dolby-MPX filter switch; three-step bias and equalization; oil-damped cassette ejection; peak level indicator signals +5 dB level; cue and review; full automatic stop; 6 $\frac{7}{16}$ " H \times 16 $\frac{7}{16}$ " W \times 11 $\frac{13}{16}$ " D \$260

SB-10E. Side wood panels for AD-6300 and AD-6500 \$18

AD-1250 Cassette Deck

Slant-type housing cassette deck with Dolby noise-reduction system; permalloy head; dc servomotor; wow and flutter 0.09%; S/N 60 dB (Dolby on, FeCr tape); frequency response 30-14,000 Hz (LH tape), 30-16,000 Hz (CrO₂ and FeCr tape); fast-winding

time 85 sec (C-60); three-step bias and equalization; oil-damped cassette ejection system; cue and review; full automatic stop mechanism; 5 $\frac{9}{16}$ " H \times 15 $\frac{9}{16}$ " W \times 10 $\frac{7}{16}$ " D..... \$240

AF-3030 AM-Stereo FM/Cassette Deck

Combines AM-FM stereo receiver and front-load cassette deck with Dolby noise-reduction; 13 W rms/ch at 8 ohms (20-20,000 Hz) at 0.3% THD; outputs: tape record, DIN, speaker 8 ohms, headphones 8 ohms; FM sensitivity 2.0 μ V (IHF), frequency response 30-15,000 Hz; FM stereo dist. 0.7%; stereo separation 38 dB at 1000 Hz; antenna 300 ohms (balanced), 75 ohms (unbalanced); cassette deck wow and flutter 0.1% wrms; tape counter; mechanical full-stop system; permalloy head; dc servomotor; 6 $\frac{7}{16}$ " H \times 18 $\frac{1}{16}$ " W \times 12 $\frac{1}{16}$ " D \$400

AKAI

GXC-570D Cassette Deck

Vertical-style front-loading stereo cassette deck with dual-process Dolby noise-reduction; GX combi-



nation record/playback head for tape/source monitoring plus one erase head; ac servo capstan motor plus two dc motors for fast-forward and rewind; closed-loop dual capstan drive system, Sensi-Touch; full-logic function controls; automatic playback repeat, pitch control for playback ($\pm 5\%$); meters switchable from VU to peak level; memory rewind; mic/line mixing; detent-type input/output controls; remote-control operation (with optional RC-18); electrically operated top control panel; damped cassette carriage; wow and flutter 0.06% wrms; S/N 62 dB (with Dolby above 5 kHz); frequency response 30-19,000 Hz (FeCr tape); dist. 1% (1000 Hz); 10" H \times 17.3" W \times 9" D..... \$900

GXC-730D Bidirectional Deck

Auto/manual reverse record and playback; GX head; Dolby noise reduction; ADR system; memory rewind; limiter; tape selector; auto-stop; locking pause; solenoid-assisted full-function change controls; illuminated direction indicators; VU meters; peak level indicator lamp; output level control; reverse selector switch for continuous play or shut-off; wow and flutter 0.08% wrms; S/N 50 dB at +3 VU; dist. 1.5% (1000 Hz 0 VU); Dolby improves up to 10 dB above 5000 Hz; 6.9" H \times 17.3" W \times 11.9" D..... \$585

GXC-725D Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; electronically controlled dc motor; GX record-play head and one erase head; wow and flutter 0.06% wrms; frequency response 35-16,000 Hz ± 3 dB (CrO₂ tape); dist. 1.2% (0 VU, 1 kHz); S/N 51 dB (Dolby off, +5 VU); two line out and one headphone jack; two mike and two line in jacks; four-position tape selector; peak level indicator; two VU meters; automatic stop; tape/source monitoring; multiplex filter; 6.5" H \times 17.3" W \times 11.2" D \$400

GXC-709D Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; one GX record/play head and one erase head; wow and flutter 0.06% wrms; frequency response 35-15,000 Hz ± 3 dB (CrO₂ tape); dist. 1.5% (0 VU, 1 kHz); S/N 51 dB (Dolby off, +3 VU); two line out and one headphone jack; two mike and two line in jacks; electronically controlled dc motor; automatic stop; multiplex filter; mike/line mixing; memory rewind; two peak-level indicators; two VU meters; 6.5" H \times 17.3" W \times 11.2" D \$360

CS-707D Cassette Deck

Front-loading stereo cassette deck with Dolby noise reduction; memory rewind; limiter; peak level indicator; full-release auto-stop; tape selector switch; locking pause; full-function operating controls; multiplex filter switch; vertical headblock assembly; illuminated VU meters; mike/line mixing; output level control; electronically controlled dc motor; wow and flutter 0.08% wrms; S/N 50 dB at +3 VU; dist. 1.5% (1000 Hz 0 VU); walnut-grained vinyl cover; 6.4" H \times 17.3" W \times 12.0" D..... \$280

ALARON

B-40 Mini-Cassette Recorder

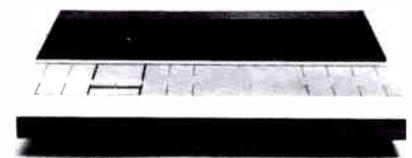
Shirt-pocket-size cassette recorder; built-in condenser mike; self-contained speaker; single-hand operation; play, rewind, record operation; ani; slide-open tape compartment door; jacks for earplug and footswitch; comes with carrying case, 30-min mini tape, batteries, earplug; 5 $\frac{1}{2}$ " H \times 2 $\frac{1}{2}$ " W \times 1 $\frac{3}{4}$ " D..... \$45

FS-40. Optional footswitch \$4

BANG & OLUFSEN

Beocord 5000 Cassette Deck

Top-loading stereo cassette deck with automatic Dolby noise-reduction system; dual capstan; two



servomotors; Sendust record/playback tape head; automatic bias selection; automatic tape head de-

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CASSETTE TAPE MACHINES

magnetization; stainless-steel touch plate control panel with on/off, Dolby out, fade in/out, record, eject, rewind, fast forward, and stop controls; left and right slide-lever volume controls; illuminated cassette tray; illuminated peak program meters (-25 to +3 dB); slide-rule type peak-reading all-electronic "meters"; wow and flutter (DIN) $\pm 0.1\%$; S/N (DIN) 57 dB (CrO₂ tape, Dolby off), 65 dB (CrO₂ tape, Dolby on); frequency range (DIN) 30-15,000 Hz; fast forward/rewind time 60 sec; speed deviation $\pm 0.5\%$; sleek wood grain and stainless-steel cabinet design; 3 $\frac{1}{8}$ " H x 18 $\frac{1}{2}$ " W x 11" D.... \$595

CENTREX by PIONEER

RK-888 Portable Cassette Recorder

Portable combines AM/FM radio with cassette recorder/player; frequency response 50-10,000 Hz (standard tape), 50-12,000 Hz (chrome tape); wow and flutter 0.1% rms; auto/manual recording; cue and review; pause control; sleep feature; automatic shut-off; built-in condenser mike; selector switch for chrome/standard tape; meter for tuning signal, recording level, battery life; memory tape counter; mike mixing with source and microphone separate level control; line-in, line-out and monitor jack; separate bass, treble, loudness controls; headphone jack; two-way speaker with 6 $\frac{1}{2}$ -in woofer; audio output 2 W at 1 kHz, 0.5% THD; three-way power: ac, battery, or car cigarette lighter; 9 $\frac{7}{8}$ " H x 14 $\frac{3}{8}$ " W x 4 $\frac{1}{2}$ " D; weight 10 lb, 2 oz..... \$180

RK-114 Portable Cassette Recorder

Portable cassette recorder with AM/FM radio; three-digit tape counter; play and record from radio and mike; headphone jack; 4 $\frac{7}{8}$ -in speaker; built-in condenser microphone; cue and review; record level/battery/tuning meter; auto shut-off in all modes; uses four "D" batteries; fast-winding time 80 sec (C-60); frequency response 80-10,000 Hz; S/N 46 dB; wow and flutter 0.2% wrms; 8" H x 12 $\frac{1}{2}$ " W x 3 $\frac{7}{8}$ " D..... \$130

RK-113 Portable Cassette Recorder

Portable cassette recorder with AM/FM radio; 4 $\frac{7}{8}$ -in speaker; built-in condenser microphone; three-way power; cue and review; automatic shut-off in record and play modes; three-position speaker monitor; uses four "D" batteries; frequency response 125-6,300 Hz; S/N 40 dB; wow and flutter 0.3%; fast-winding time 80 sec (C-60); 8" H x 12 $\frac{1}{2}$ " W x 3 $\frac{7}{8}$ " D..... \$110

KD-12 Portable Cassette Recorder

Provides two-way control of recording level; automatic or manual control of recording level; automatic shut-off in all modes; built-in condenser mike; cue and review, pause controls; digital tape counter; meter for recording level and battery condition; has tone control, headphone jack; operates from four "D" cells (not included) or 117-V ac (optional car battery adapter available); 3" H x 6 $\frac{1}{4}$ " W x 11 $\frac{1}{4}$ " D..... \$95
KD-11. Similar to KD-12 but LED indicator for recording level and battery condition; ac bias and erase; remote mike jack with on/off external speaker jack..... \$70

CHANNEL MASTER

HD-6007 Cassette Deck

Stereo cassette play/record deck; auto stop; lever controls for record, rewind, fast forward, play, pause, and stop/eject; separate right and left record level controls; illuminated record meters; digital tape counter; tape selector; jacks for microphones, aux. in, aux. out, and stereo headphones; 5 $\frac{7}{8}$ " H x 15" W x 10 $\frac{1}{2}$ " D..... \$140

CHELCO

TVR-707 Portable Cassette Recorder

Combines front-loading ac/dc cassette recorder with AM/FM/TV Sound/Weather radio and built-in condenser microphone; automatic stop; automatic level control; sleep switch; push-button tape controls; slide-lever tone and volume controls; slide-rule radio dial; telescopic antenna; will record direct from radio..... \$60

TR-404A Portable Cassette Recorder

Combines front-loading ac/dc cassette recorder with AM/FM radio and built-in condenser microphone; automatic stop; automatic level control; switchable sound monitor; push-button and toggle control switches; slide-lever volume and tone controls; jacks for external mike, earphone, and aux. input; black casing with aluminum trim..... \$55

TR-404 Portable Cassette Recorder

Combines front-loading ac/dc cassette recorder with AM/FM radio and built-in condenser microphone; records live or direct from radio; automatic stop; automatic level control; sound switch monitor; pause button; push-button and toggle control switches; slide-lever volume and tone controls; slide-rule type radio dial..... \$50

TR-505 Mini Cassette Recorder

Mini cassette recorder with AM/FM radio and built-in condenser microphone; ac/dc operation with optional adapter; pause control; fast forward; on/off sleep switch; LED indicator for recording, batteries and tuning; tape counter; automatic level control; sound switch monitor; earphone jack; will record direct from radio to tape; comes with telescopic antenna and wrist strap..... \$50

TR-500 Mini Cassette Recorder

Mini cassette recorder with AM/FM radio and built-in microphone; ac/dc operation with optional adapter; pause button; tape counter; automatic level control; earphone jack and earphone included..... \$30

DENON

DR-750 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; dual capstans; direct-detect servo motor system; $\frac{1}{4}$ -track; two heads; record/play head is Sendust tip ferrite; erase head is ferrite; four-position tape selector with full-range bias adjust control; muted recording/pause button; timer recording and timer playback feature; memory rewind; tape counter; MPX filter switch; microphone recording and line-mixing recording; two peak-reading VU meters; feather-touch button controls for pause/mute, record, play, stop, fast-forward, and rewind; wow and flutter 0.045% wrms; frequency response 35-18,000 Hz (CrO₂), 35-16,000 Hz (LH); fast-forward/rewind time 70 sec (C-60); S/N 65 dB (Dolby on, CrO₂ tape); input impedance 50k ohm, -20 dB; 12" H x 16 $\frac{1}{2}$ " W x 9" D..... \$1400

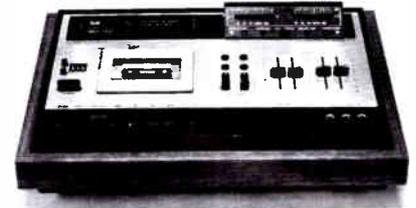
DR-350 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; electrical control dc motor system; $\frac{1}{4}$ -track; two heads; record/play head is hard permalloy; erase head is double-gap high-density ferrite; three-position equalizer; full-range bias fine adjust control; timer recording and timer playback feature; tape counter; light-touch stop control; when eject button is depressed the tape transport function comes to a full-stop during any of the operational modes; two peak-reading VU meters; wow and flutter 0.058% wrms; frequency response 35-15,500 Hz ± 3 dB (CrO₂), 35-15,000 Hz ± 3 dB (LH); fast-forward time 95 sec (C-60); fast rewind time 75 sec (C-60); S/N ratio 64 dB (Dolby on CrO₂ tape); input impedance 50k ohm, -21 dB; 6 $\frac{7}{8}$ " H x 17" W x 11 $\frac{1}{2}$ " D..... \$450

DUAL

939 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system and FM decoding; has auto re-



verse; continuous playback and bidirectional recording; variable fade/edit control permits fade out of recording errors during playback; continuous-pole sync motor with double capstan drive system; hard permalloy heads; LED level indicators switchable from VU to peak; separate bias and equalization controls for FeCr, CrO₂ and ferric-oxide tape; line and mike mixing; separate channel output and headphone level controls; selectable peak limiter; memory stop; wow and flutter 0.04% wrms; frequency response 20-16,000 Hz (ferric-oxide), 20-16,500 Hz (CrO₂), 20-17,000 Hz (FeCr); S/N 64 dB (Dolby on, ferric-oxide, CrO₂); HD 0.5% at 0 VU (FeCr); fast winding time 45 sec (C-60); 17.3" x 9" x 11.8"..... \$580

819 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; high-torque dc servo-control motor with integral frequency generator; direct gear-drive fast forward and rewind; hard permalloy record/playback head; memory operative in both directions; three-way bias and equalization control; electronic fade/edit control; level controls for headphone and output; equalized peak-reading meters with electronically-damped return; line/mic mixing; photo-electric tape-motion monitoring; switchable overload protection; wow and flutter 0.05% wrms; frequency response 20-16,000 Hz (ferric-oxide), 20-16,500 Hz (CrO₂), 20-17,000 Hz (FeCr); S/N 64 dB (Dolby on, ferric-oxide, CrO₂); HD 0.7%; fast winding time 65 sec (C-60); 17.5" x 6" x 14.5"..... \$430

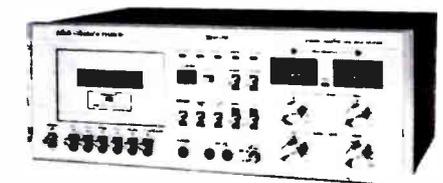
809 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; high-torque dc servo-control motor with integral frequency generator; hard permalloy record/playback head; separate three-way bias and equalization setting for all tape types; logic-controlled intermode switching; full automatic shut-off, all modes; wow and flutter 0.06% wrms; frequency response 20-15,500 Hz (ferric-oxide), 20-16,000 Hz (CrO₂), 20-16,500 Hz (FeCr); S/N 63 dB (Dolby on, ferric-oxide, CrO₂); HD 0.7%; fast winding time 110 sec (C-60); 17.5" x 6" x 14.5"..... \$300

FISHER

CR5120 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; one dc Hall Element servomotor



and one dc governor motor; three ferrite heads; wow and flutter 0.04% wrms; S/N 64 dB (Dolby on); channel separation 40 dB; signal crosstalk -70 dB; frequency response 30-15,000 Hz ± 3 dB (normal tape), 30-18,000 Hz ± 3 dB (CrO₂ tape); THD at 0 VU 1.4%; tape speed variation $\pm 0.8\%$; fast-winding time 84 sec; two VU meters and peak-indicating LED; input/impedance 0.2 mV/600 ohms (mike),

100 mV/100,000 ohms (aux., FM Dolby); output/impedance 1 V/5000 ohms (line), headphone jack; tape select switch for normal, CrO₂, and FeCr tape; memory rewind; walnut-grain vinyl veneer finish; 6 $\frac{1}{8}$ " H x 17 $\frac{1}{8}$ " W x 12 $\frac{1}{2}$ " D..... \$400

CR5115 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; one dc servomotor; three ferrite heads; wow and flutter 0.07% wrms; S/N 60 dB (Dolby on); channel separation 38 dB; signal crosstalk -70 dB; frequency response 30-14,000 Hz \pm 3 dB (normal tape), 30-17,000 Hz \pm 3 dB (CrO₂ tape); THD at 0 VU 1.5%; tape speed variation \pm 1%; fast-winding time 90 sec.; two VU meters; input/impedance 0.2 mV/600 ohms (mike), 100 mV/100,000 ohms (aux., FM Dolby); output/impedance 1 V/5000 ohms (line), headphone jack; tape select switch for normal, CrO₂, and FeCr tape; walnut-grain vinyl veneer finish; 6 $\frac{1}{8}$ " H x 16 $\frac{1}{8}$ " W x 11 $\frac{1}{4}$ " D..... \$300

ER8150 Cassette/8-Track Deck

Combination stereo cassette and 8-track deck; Cassette Section: front-loading; dc-governor motor; capstan drive; two heads, ferrite and super permalloy; wow and flutter 0.09% wrms; S/N 46 dB (Dolby off), 54 dB (Dolby on); frequency response 40-12,000 Hz \pm 3 dB; THD 1.8% at 0 VU; fast-forward/rewind time 100 sec.; 8-Track Section: front-loading; dc-governor motor; one permalloy head; wow and flutter 0.15% wrms; S/N 44 dB (Dolby off), 52 dB (Dolby on); frequency response 40-11,000 Hz \pm 3 dB; THD 1.0% at 0 VU; unit has two record level VU meters; two input level controls; FM Dolby decoder; 6" H x 20" W x 10 $\frac{1}{4}$ " D..... \$300

CR4025 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; dc-governor motor; capstan drive system; two heads, ferrite and Mu-Metal; tape selector switch for normal and CrO₂ tape; wireless remote control with pause function; two input level controls; twin VU meters; three-digit tape counter; wow and flutter 0.09% wrms; S/N 50 dB (Dolby off), 56 dB (Dolby on); frequency response 40-12,000 Hz \pm 3 dB (normal tape), 40-14,000 Hz \pm 3 dB (CrO₂ tape); THD 1.8% at 0 VU; fast-forward and rewind time 100 sec.; 6" H x 15 $\frac{1}{8}$ " W x 11 $\frac{1}{4}$ " D..... \$250

CD4015 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; dc-governor motor; capstan drive; two heads, one ferrite and one Mu-Metal; tape selector switch for normal and CrO₂ tape; two record level/VU meters; one dual input level control; wow and flutter 0.09% wrms; S/N 50 dB (Dolby off), 56 dB (Dolby on); frequency response 40-11,000 Hz \pm 3 dB (normal tape), 40-13,000 Hz \pm 3 dB (CrO₂ tape); THD 1.8% at 0 VU..... \$160

CR4015 Cassette Deck

Front-loading stereo cassette deck; dc-governor motor; capstan drive; two heads, one ferrite, one Mu-Metal; tape selector switch for normal and CrO₂ tape; two record level/VU meters; two input level controls; wow and flutter 0.09% wrms; S/N 50 dB; frequency response 40-11,000 Hz \pm 3 dB (normal tape), 40,12,500 Hz \pm 3 dB (CrO₂ tape); THD 1.8% at 0 VU..... \$130

HARMAN/KARDON

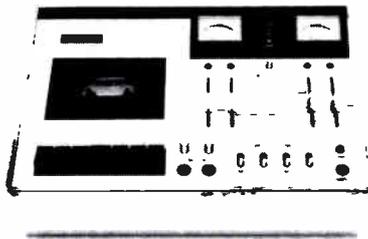
HK-471 Cassette Deck

Stereo cassette deck with Dolby noise-reduction system; dual permalloy record/play head for tape monitoring; twin peak-reading record/play VU meters; expanded range meters calibrated from -40 to +60 dB; two motors, capstan drive and fast forward/reverse; separate Dolby record and playback electronics; three-position bias and equalization controls; test signal generator for Dolby and bias calibration; two LED tape overload indicators; separate level controls for microphone input, line input, and playback; tape counter with memory control; tape motion indicator; headphone monitor ampli-

fier; spring-loaded record mute switch; variable speed control for playback; fast-winding time 75 sec (C-60); wow and flutter 0.05% wrms; frequency response 20-17,500 Hz (low-noise, FeCr, CrO₂); THD 1.2% (3 dB below Dolby level); S/N 61 dB; microphone sensitivity 0.5 mV; low-level line sensitivity 50 mV; high-level line sensitivity 200 mV; channel separation 36 dB; channel crosstalk 65 dB; microphone input impedance 600 ohms; aux. input impedance 30k ohms (low level), 50k ohms (high level); head phone impedance 8 ohms .. \$480

HK2000 Cassette Deck

Stereo cassette deck with built-in Dolby noise-reduction circuit; front-panel bias switch for stand-



ard, low-noise, and chromium-dioxide tapes; features memory relay, peak-reading VU meters, sliding controls for playback and record level, and mike/line mixing; response 30-17,000 Hz (CrO₂); wow and flutter 0.07% (weighted); speed variation 1%; hard permalloy head; peak-reading VU meters with LED overload indicator; 5 $\frac{1}{8}$ " H x 15" W x 10 $\frac{1}{4}$ " D..... \$400
In black finish..... \$420

HK-2500 Cassette Deck

Stereo cassette deck with Dolby noise-reduction system; dc servo-controlled motor; permalloy record/play head; twin peak-reading record/play VU meters; expanded range meters calibrated from -20 to +5 dB; separate record and playback level controls; three-position bias and equalization controls; bias trim control for tape calibration; two LED tape overload indicators; tape counter with memory control; tape motion indicator; headphone monitor amplifier; spring-loaded record mute switch; subsonic filter; flashing record "pause" indicator; Dolby FM filter "off" position for mic/phone recording; fast-winding time 90 sec (C-60); wow and flutter 0.07% wrms; frequency response 20-16,000 Hz \pm 3.5 dB (low noise, FeCr, CrO₂); THD 1.5% (3 dB below Dolby level); S/N 61 dB; sensitivity (microphone) 0.5 mV, (line) 50 mV; channel separation 34 dB; channel crosstalk 62 dB; microphone input impedance 1000 ohms; headphone impedance 8 ohms..... \$320

HK-1500 Cassette Deck

Stereo cassette deck with Dolby noise-reduction system; dc servo-controlled motor; permalloy record/play head; twin peak-reading record/play VU meters; expanded range meters calibrated from -20 to +5 dB; LED tape overload indicator; separate record and playback level controls; two-position bias and equalization controls; three-digit tape counter; tape motion indicator; headphone monitor amplifier; Dolby-on LED; record-on LED; two microphone inputs; fast-winding time 90 sec (C-60); wow and flutter 0.08% wrms; THD 1.5%; frequency response 30-15,000 Hz \pm 3.5 dB (low noise, CrO₂); S/N 61 dB sensitivity (microphone) 0.5 mV, (line) 50 mV; channel separation 32 dB; channel crosstalk 60 dB; microphone input impedance 1000 ohms; headphone impedance 8 ohms..... \$260

HITACHI

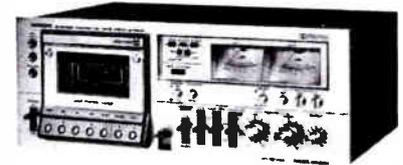
D-7500 Cassette Deck

Stereo cassette deck with "hall-effect" semiconductor element in the playback head; three-head design; full logic controls; peak-reading meters; black finish with rack mountable dimensions; in-

cludes handles..... \$700

D900 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; three-head system for tape moni-



toring; ferrite heads; full logic controls permit push-button shifting to any tape function instantly and smoothly without damaging tape; three-position bias and equalization; dual capstan motors, dc servo controlled; front-panel peak-reading VU meters; tape counter; input, source, output, record, and play indicator lamps; Dolby on/off switch; memory counter with on/off and reset controls; frequency response 20-15,000 Hz \pm 3 dB (normal tape), 30-18,000 Hz \pm 3 dB (CrO₂), 20-15,000 Hz \pm 3 dB (FeCr); S/N 63 dB (Dolby on), 55 dB (Dolby off); wow and flutter 0.05% wrms; 2% dist.; fast-forward/rewind time 100 sec (C-60); input sensitivity/impedance (Mic) 0.25 mV, 300-5k ohms, (line) 50 mV, 100k ohms, (DIN) 0.25 mV, 12k ohms; 7 $\frac{1}{8}$ " H x 17 $\frac{1}{8}$ " W x 10" D..... \$495

D850 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; three-head system for tape monitoring; ferrite tape heads; power-assisted controls; three-position bias and equalization; dual capstan servo motors; front-panel peak-reading VU meters; Dolby calibration control; Dolby FM broadcast decoder; tape counter; Dolby-on and record indicator lamps; frequency response 30-15,000 Hz \pm 3 dB (normal tape), 30-16,000 Hz (CrO₂), 30-15,000 Hz (FeCr); S/N 63 dB (Dolby on), 55 dB (Dolby off); wow and flutter 0.05% wrms; less than 2% dist.; fast-forward/rewind time 100 sec (C-60); input sensitivity/impedance (mic) 0.25 mV, 300-5k ohms, (line) 50 mV, 100k ohms, (DIN) 0.25 mV, 12k ohms; 5 $\frac{1}{8}$ " H x 17 $\frac{1}{8}$ " W x 10" D..... \$349

D720 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; three-head system for tape monitoring; record/playback head is hard permalloy, erase head is ferrite; dc servomotor; power-assisted controls; dynamic noise limiting circuit; full automatic stop on all functions; damped vertical transport; three-position bias and equalization; memory rewind counter; front-panel calibrated VU meters; frequency range 30-15,000 Hz \pm 3 dB (normal tape), 30-16,000 Hz \pm 3 dB (CrO₂), 30-16,000 Hz \pm 3 dB (FeCr); S/N 63 dB (Dolby/DNL on), 58 dB (Dolby on), 53 dB (Dolby off); wow and flutter 0.07% wrms; 10" H x 17 $\frac{1}{8}$ " W x 5 $\frac{1}{8}$ " D..... \$270

D550 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; record/playback head is super life permalloy, erase head is ferrite; dc servomotor; power-assisted controls; full automatic stop on all functions; three-position bias and equalization controls; damped vertical transport; tape rewind counter; calibrated VU meters; record and Dolby-on indicator lamps; frequency response 30-14,000 Hz \pm 3 dB (normal tape), 30-15,000 Hz \pm 3 dB (CrO₂), 30-15,000 Hz \pm 3 dB (FeCr); S/N 58 dB (Dolby on), 53 dB (Dolby off); wow and flutter 0.08% wrms; 1.8% dist.; fast-forward/rewind time 100 sec (C-60); input sensitivity/impedance (Mic) 0.26 mV, 300-5k ohms, (line) 60 mV, 100k ohms, (DIN) 0.25 mV, 2k ohms; 5 $\frac{1}{8}$ " H x 11 $\frac{1}{2}$ " W x 10" D..... \$220

D220 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; dc servomotor drive; two hard permalloy SL heads; frequency response 30-12,500 Hz \pm 3 dB (normal tape), 30-14,000

1

CASSETTE TAPE MACHINES

Hz \pm dB (CrO₂ and FeCr); S/N 58 dB (Dolby on), 53 dB (Dolby off); wow and flutter 0.09% wrms; 10" H x 15¹/₂" W x 5¹/₂" D..... \$170

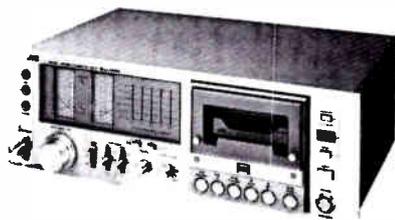
JVC

KD-3030 Cassette Deck

Front-loading stereo cassette deck with super ANRS noise-reduction system and recording equalizer circuit; independent drive motors: servo type for capstan, dc type for reel drive; two-head configuration: Sen-Alloy record/playback head, double-gap ferrite erase head; electronic solenoid operation; independent mic and line volume controls for mic/line mixing; twin VU level meters; five peak-reading LED indicators; three-position bias and equalization selection; automatic stop at end of tape in all modes; memory rewind; three-digit tape counter; built-in 400 Hz signal oscillator; frequency response 30-16,000 Hz \pm 3 dB (normal and chrome tape); S/N 56 dB, 66 dB (above 5 kHz with ANRS); wow and flutter 0.05% wrms; THD 0.4%; 8¹/₂" H x 8¹/₂" W x 13³/₄" D..... \$530

KD-85 Cassette Deck

Front-loading stereo cassette deck with super ANRS noise-reduction system and recording equalizer circuit;



independent drive motors: FG servo type for capstan, dc type for reel drive; two-head configuration: Sen-Alloy record/playback head, double-gap ferrite erase head; push-button full-logic solenoid operation; independent mic and line inputs; three-position bias and equalization selection; spectro-peak level indicator with 25 LEDs indicates the levels (-10, -5, 0, +3, +6, dB) of five frequency ranges (100, 300, 1000, 3000, 10,000 Hz); twin vertically-designed VU level meters; automatic stop; memory rewind; three-digit tape counter; frequency response 30-16,000 Hz \pm 3 dB (normal and chrome tape); S/N 56 dB, 66 dB (above 5 kHz with ANRS); wow and flutter 0.05% wrms; THD 0.4%; 6¹/₂" H x 17¹/₂" W x 12¹/₂" D..... \$500

KD-65 Cassette Deck

Front-loading stereo cassette deck with super ANRS noise-reduction system and recording equalization; FG dc servomotor; two-head configuration: Sen-Alloy record/playback head; double-gap erase head; independent mic and line inputs; three position bias and equalization selection; spectro-peak level indicator with 25 LEDs indicates the levels (-10, -5, 0, +3, +6 dB) of five frequency ranges (100, 300, 1000, 3000, 10,000 Hz); twin vertically-designed VU level meters; output level control; automatic tape-end stop; memory rewind; three-digit tape counter; frequency response 30-16,000 Hz \pm 3 dB (chrome tape); S/N 56 dB, 66 dB (above 5 kHz with ANRS); wow and flutter 0.06% wrms; THD 0.5%; 6¹/₂" H x 17¹/₂" W x 12¹/₂" D..... \$400

KD-2020 Cassette Deck

Front-loading stereo cassette deck with super ANRS noise-reduction system and recording equalizer; FG dc servomotor; two-head configuration: Sen-Alloy record/playback head, double-gap ferrite erase head; five LED multi-point peak level indicators;

twin VU level meters; three-position bias and equalization selection; separate mic/line controls for mic/line mixing; hall-element automatic tape-end stop; memory rewind; three-digit tape counter; frequency response 30-16,000 Hz \pm 3 dB (chrome tape); S/N 56 dB, 66 dB (above 5 kHz with ANRS); wow and flutter 0.06% wrms; THD 0.5%; 6¹/₂" H x 18¹/₂" W x 13³/₄" D..... \$400

KD-1636II Portable Cassette Deck

Top-loading portable stereo cassette deck with super ANRS noise-reduction system; electronic governor coreless dc motor; Sen-Alloy record/playback head; double-gap ferrite erase head; tri-color LED peak-level indicator; built-in monitor speaker with volume control; master record volume control for easier fade-in, fade-out; headphone amp with separate volume control; electronic automatic stop; twin wide-range VU meters and battery condition checker; bias and equalization selector switches; input selection for mic/DIN and line; -20 dB mic attenuator; stereo/mono mode switch; three-digit tape counter; frequency response 30-16,000 Hz \pm 3 dB (chrome tape); S/N 57 dB, 67 dB (above 5 kHz with ANRS); wow and flutter 0.08% wrms; THD 0.5%; three-way power flexibility: ac, 8-16 V dc, or batteries; 4" H x 14¹/₂" W x 9¹/₂" D..... \$360

KD-S201 Cassette Deck

Front-loading stereo cassette deck with super ANRS noise-reduction system; FG dc servomotor; Sen-Alloy record/playback head; double-gap ferrite erase head; push-button and slider controls; multi-point peak indicator system with five LEDs; two VU meters; separate mic and line inputs; photocell all-mode automatic stop; input selector; three-digit tape counter; frequency response 30-16,000 Hz \pm 3 dB (chrome tape); S/N 56 dB, 66 dB (above 5 kHz with ANRS); wow and flutter 0.06% wrms; THD 0.5%; 6¹/₂" H x 19¹/₂" W x 14¹/₂" D..... \$350

KD-1770II Cassette Deck

Top-loading stereo cassette deck with super ANRS noise-reduction system; FG dc servomotor; Sen-Alloy record/playback head; double-gap ferrite erase head; independent drive system for both capstan and reels; twin five-LED peak indicators for left and right channels; three-position (six push-buttons) bias and equalization selection; mic/line mixing; memory rewind; mirrored VU meters; photocell automatic tape-end stop; frequency response 30-16,000 Hz \pm 3 dB (chrome tape); S/N 56 dB, 66 dB (above 5 kHz with ANRS); wow and flutter 0.05% wrms; THD 0.5%; 4¹/₂" H x 16¹/₂" W x 10⁷/₈" D..... \$350

KD-55 Cassette Deck

Front-loading stereo cassette deck with super ANRS noise-reduction system and recording equalization; FG dc servomotor; Sen-Alloy record/playback head; double-gap ferrite erase head; five multi-point (-10, -5, 0, +3, +6 dB) peak level indicators; three-position bias and equalization selection; "one-touch" recording level setting; automatic input selector for mic and line inputs; automatic tape-end stop; two VU level meters; output level control; three-digit tape counter; frequency response 30-16,000 Hz \pm 3 dB (chrome tape); S/N 56 dB, 66 dB (above 5 kHz with ANRS); wow and flutter 0.06% wrms; THD; 0.5%; 5¹/₂" H x 16¹/₂" W x 10⁷/₈" D..... \$300

KD-25 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; FG dc servomotor; Sen-Alloy record/playback head; double-gap ferrite erase head; three-position bias and equalization selection; five LEDs for multi-point (-10, -5, 0, +3, +6 dB) peak level indication; automatic input selector mic and line inputs; dual rotary controls for left and right channel recording levels; automatic tape-end stop; two VU level meters; three-digit tape counter; frequency response 40-15,000 Hz \pm 3 dB (chrome tape); S/N 56 dB, 66 dB (above 5 kHz with Dolby); wow and flutter 0.06%; THD 0.5%; 5¹/₂" H x 16¹/₂" W x 10⁷/₈" D..... \$260

KD-15 Cassette Deck

Front-loading stereo cassette with Dolby noise-re-

duction; five-LED peak level indicators; timer recording facility; mic/line input selector switch; two position bias and equalization switches; VU meters; reed-type full automatic stop; frequency response 20-15,000 Hz (normal tape), 20-16,000 Hz (chrome tape); S/N 56 dB (from peak level) without Dolby, improved 5 dB at 1 kHz and 10 dB above 5 kHz with Dolby; wow and flutter 0.1% wrms; crosstalk -65 dB at 1 kHz; channel separation 35 dB at 1 kHz; 6¹/₂" H x 15¹/₂" W x 10¹/₂" D..... \$200

KENWOOD

KX-1030 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; electronically-controlled dc mo-



tor; 1/4-track two-channel stereo/mono recording/playback system; ac bias system (bias frequency 85 kHz); three ferrite heads for record, rewind, and erase; three-position bias selector (normal, chrome, reserve); three-position equalization selector (normal, chrome, reserve); fine bias adjustment controls with oscillator; full auto shut-off in all modes; mic/line mixing; memory rewind; LED peak and recording indicator; tape monitor; three-digit tape counter; two large illuminated VU meters; wow and flutter 0.06% wrms; S/N 65 dB (Dolby on, normal tape), 67 dB (Dolby on, CrO₂ tape); frequency response 35-15,000 Hz \pm 3 dB (normal tape), 35-18,000 Hz \pm 3 dB (CrO₂ tape), 35-17,000 Hz \pm 3 dB (Ferri-CrO₂ tape); HD 1.3% at 1 kHz, OVU with normal tape; fast-winding time 80 sec (C-60); line input #1-77.5 mV at 56k ohms; line input #2-0.1 mV at 1k ohm; line output 775 mV; headphone impedance 8-16 ohms; 6¹/₂" H x 16¹/₂" W x 13¹/₂" D..... \$425

KX-830 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; electronically-controlled dc motor; 1/4-track two-channel stereo/mono recording/playback system; ac bias system (bias frequency 85 kHz); hard permalloy recording/playback head; ferrite erase head; three-position bias selector (normal, chrome, reserve); three-position equalization selector (normal, chrome, reserve); three-position input selector (mic/DIN-line-ATT mic/DIN); full auto stop in all modes; memory rewind; LED peak and recording indicator; two-way tape loading system; three-digit tape counter; two large illuminated VU meters; wow and flutter 0.06% wrms, \pm 0.18% DIN; S/N 62 dB (Dolby on, normal tape), 64 dB (Dolby on, CrO₂ tape); frequency response 35-13,000 Hz \pm 3 dB (normal tape), 35-16,000 Hz \pm 3 dB (CrO₂ tape), 35-15,000 Hz \pm 3 dB (Ferri-CrO₂ tape); HD 1.3% at 1 kHz, 0 VU with normal tape; fast-winding time 80 sec (C-60); line input 77.5 mV at 100k ohms; line output 775 mV; headphone impedance 8-16 ohms; 6¹/₂" H x 16¹/₂" W x 13¹/₂" D..... \$315

KX-630 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; electronically-controlled dc motor; 1/4-track two-channel stereo/mono recording/playback system; ac bias system (bias frequency 85 kHz); hard permalloy record/playback head; ferrite erase head; three-position equalization selector (normal, chrome, reserve); two-position bias selector (normal, chrome); three-position input selector (mic/DIN-line-ATT mic/DIN); full auto shut-off in all modes; LED recording indicator; three-digit tape counter; two large illuminated VU meters; wow and flutter 0.07% wrms, \pm 0.18% DIN; S/N 62 dB (Dolby on, normal tape), 64 dB (Dolby on, CrO₂ tape); frequency response 40-13,000 Hz \pm 3 dB (normal tape), 40-15,000 Hz \pm 3 dB (CrO₂ tape),

40-15,000 Hz ± 3 dB (ferri-chrome tape); HD 1.5% at 1 kHz, 0 VU with normal tape; fast-winding time 85 sec (C-60); line input 77.5 mV at 80k ohms; line output 775 mV at 100k ohms; headphone impedance 4-16 ohms; 6 $\frac{1}{2}$ " H \times 16 $\frac{1}{4}$ " W \times 13 $\frac{1}{4}$ " D \$275

KX-530 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; electronically-controlled dc motor; $\frac{1}{4}$ -track, two channel stereo/mono recording/playback system; ac bias system (bias frequency 85 kHz); hard permalloy record/playback head; ferrite erase head; two-position bias selector (normal, chrome); two-position equalization selector (normal, chrome); full auto shut-off in all modes; LED recording indicator; three-digit tape counter; two large illuminated VU meters; wow and flutter 0.07% wrms, $\pm 0.18\%$ DIN; S/N 62 dB (Dolby on, normal tape); 64 dB (Dolby on, CrO₂ tape); frequency response 40-13,000 Hz ± 3 dB (normal tape), 40-15,000 Hz ± 3 dB (CrO₂ tape); HD 1.5% at 1 kHz, 0VU with normal tape; fast-winding time 85 sec (C-60); line input 77.5 mV at 100k ohms; line output 489 mV at 100k ohms; headphone impedance 8-16 ohms; 6 $\frac{1}{2}$ " H \times 14 $\frac{1}{32}$ " W \times 11 $\frac{1}{8}$ " D \$225

LAFAYETTE

RK-D600 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; electronically-controlled dc motor; three-head design; true monitoring off playback head; air-damped cassette eject system; "feather-touch" control keys; full auto stop; large VU meters with dual peak LED's; mic/line mixing; memory rewind; independent bias and equalization; monitor switch; MPX filter; output control; frequency response 40-17,000 Hz (CrO₂ tape); wow and flutter 0.06%; S/N -63 dB (Dolby on); less than 2% dist.; 5 $\frac{1}{2}$ " H \times 16 $\frac{1}{4}$ " W \times 11 $\frac{3}{4}$ " D \$280

RK-D225 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; dc servomotor; permalloy head; oil-damped cassette eject system; "feather-touch" control keys; built-in Dolby circuitry allows any receiver to decode Dolbyized broadcasts through tape monitor; left/right channel record and output controls; large VU meters with peak LED; auto shut-off; independent bias and equalization; memory rewind; frequency response 30-13,000 Hz (FeO₃ tape); wow and flutter 0.09%; S/N greater than 60 dB (Dolby on); 6 $\frac{1}{8}$ " H \times 17 $\frac{1}{8}$ " W \times 12" D \$200

RK-D150 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; auto shut-off; independent bias and equalization; independent record level controls; dual mic inputs; large VU meters; tape counter; frequency response 40-12,000 Hz; wow and flutter 0.15%; S/N 55 dB (Dolby off), 65 dB (Dolby on over 5 kHz); dist. 1.5%; 5 $\frac{1}{2}$ " H \times 16 $\frac{1}{2}$ " W \times 11 $\frac{1}{2}$ " D \$150

RK-735 Cassette Deck

Top-loading stereo cassette deck with low impedance amplifier for stereo headphone listening; standard/CrO₂ tape switch; record level meters; tape counter; left/right channel mic and input jacks; frequency response 50-13,000 Hz; wow and flutter 0.25%; walnut wood case; 3 $\frac{1}{8}$ " H \times 12 $\frac{1}{8}$ " W \times 9 $\frac{1}{8}$ " D \$100

RK-715 Cassette Deck

Top-loading stereo cassette deck designed for recording from consoles and phones; features record and output level controls; LED level indicator; frequency response 60-10,000 Hz; 3 $\frac{1}{8}$ " H \times 5 $\frac{1}{8}$ " W \times 8 $\frac{1}{8}$ " D \$80

LENCO

C-2003 Cassette Deck

Stereo cassette deck with Dolby noise-reduction system; wow and flutter 0.07% wrms; frequency

response 30-18,000 Hz ± 3 dB, 30-16,000 Hz ± 3 dB (with multiplex filter); dist. 1.5% (0 dB VU); S/N (DIN 45633) 56 dB (Dolby off), 65 dB (Dolby on); crosstalk -65 dB (opp. rec. direction), -40 dB (stereo rec.); fast-winding time 75 sec (C-60); inputs: 350 μ V at 1000 ohms (mike DIN), 8 mV at 22,000 ohms (DIN-plug input), 60 mV at 180,000 ohms (line); outputs: 0.75 V at 330 ohms (DIN and line), 6.7 mW at 8 ohms and 5.4 mW at 600 ohms (headphones); automatic tape selection switching for CrO₂ tape, manual for three others; switchable multiplex filter; mono switch; two peak level indicators; $\pm 2.5\%$ speed regulation during playback; has ferrite erase and record heads and hard permalloy play head; three-digit tape counter with "zero stop"; 85 mm H \times 285 mm W \times 460 mm D. \$795

RAC 10 Auto Cassette Changer

Automatic cassette changer with Dolby and monitor speaker; can play up to 10 cassettes in succession without interruption; output impedance 25 ohms; output 350 mV; changeover time 10 sec; has track 1, track 2, auto, and single play indicator lights; 495 mm \times 252 mm \times 210 mm \$695

1202 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; cue review in fast-forward/rewind mode; provision for auto-timeclock operation for attendant-less recording; Sendust heads; two large VU meters; LED's for Dolby, record and peak indication; three-digit tape counter with run feature; separate bias and equalization \$400

MARANTZ

5030B Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; dc servo-controlled motor; three super hard permalloy heads; tape speed 1 $\frac{1}{8}$ ips; tape/source monitoring capability; bias and equalization for CrO₂, FeCr, and standard tapes; mic/line mixing with master level control; 3-in VU meters; left and right channel peak-level indicators; defeatable peak limiter; tape counter with memory rewind; wow and flutter 0.05%; frequency response 35-17,000 Hz ± 3 dB (FeCr tape), 35-17,000 Hz ± 3 dB (CrO₂ tape), 35-14,000 Hz ± 3 dB (standard tape); S/N 58 dB (Dolby off), 64 dB (Dolby on); sensitivity -72 dBV; overload level -25 dBV; 5 $\frac{1}{2}$ " H \times 16 $\frac{1}{8}$ " W \times 11 $\frac{1}{8}$ " D \$420

5025B Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; dc servo-controlled motor; bias and equalization settings for standard, FeCr, and CrO₂ tapes; mic/line mixing with master level control; 3-in VU meters; left and right peak indicators; defeatable peak limiter; tape counter with memory rewind; tape speed 1 $\frac{1}{8}$ ips; wow and flutter 0.05%; frequency response 35-17,000 Hz ± 3 dB (FeCr and CrO₂ tape), 35-14,000 Hz ± 3 dB (standard tape); S/N 58 dB (Dolby off), 64 dB (Dolby on); sensitivity -72 dBV; overload level -25 dBV; 5 $\frac{1}{2}$ " H \times 16 $\frac{1}{8}$ " W \times 11 $\frac{1}{8}$ " D \$310

5010B Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; bias and equalization settings for standard, CrO₂, and FeCr tapes; super hard permalloy head; 3-in VU meters; defeatable peak limiter; tape counter; front-panel mike input and headphone jacks; tape speed 1 $\frac{1}{8}$ ips; wow and flutter 0.07% wrms; frequency response 35-16,000 Hz ± 3 dB (FeCr and CrO₂ tape), 35-14,000 Hz ± 3 dB (standard tape); S/N 58 dB (Dolby off), 64 dB (Dolby on); sensitivity -72 dBV; overload level -25 dBV; 5 $\frac{1}{2}$ " H \times 16 $\frac{1}{8}$ " W \times 11 $\frac{1}{8}$ " D \$270

NAKAMICHI

1000 II Cassette Deck

Three-head stereo record/play deck with Dolby noise-reduction system and DNL; Crystal Permalloy playback head; dual capstan, closed-loop transport with dc servomotor drive; wow and flutter 0.05% wrms, 0.1% weighted peak; S/N 65 dB (400 Hz,

3% THD, with Dolby and SX tape); THD less than 1.5% (400 Hz, 0 dB); frequency response 35-20,000 Hz ± 3 dB (with Dolby); inputs 0.2 mV at 10,000 ohms (mike), 50 mV at 50,000 ohms (line); outputs 1 V max. (line, variable), 300 mV/channel max. into 8 ohms (headphone); record head azimuth alignment beacon; full IC logic transport controls; auto shut-off; spill-proof system; memory and auto rewind; playback pitch control; two 50-dB range peak-reading meters; separate bias and equalization switches; left, right, and blend wide dynamic range mike inputs; phase-corrected low-noise electronics; 11 $\frac{1}{16}$ " H \times 20 $\frac{1}{16}$ " W \times 8 $\frac{1}{16}$ " D \$1650
700 II. Similar to 1000 II but without auto rewind or DNL; 10 $\frac{1}{16}$ " H \times 20 $\frac{1}{2}$ " W \times 5 $\frac{1}{8}$ " D \$1140
RC-1000. Remote control duplicates control systems of 1000 II and 700 II; controls all tape motion including record; 15-ft range \$60
HC-1000. Extra heavy duty carrying cabinet covered in leatherette; double-protected edges and corners; side-mounted folding metal carrying handles; front and rear covers for complete protection; accommodates one 1000 II or 1000 \$365
HC-700. Similar to HC-1000 but for 700 II or 700; rear cover attached; metal hinged door for connection access \$325
OS-200. Digital timer turns system on at present time; sleep timer function plays for 59 min. before shutdown; allows unattended recording of broadcasts with company's 1000, 700, and 600 cassette decks; self-repeating 24-hr basis; 2" H \times 12 $\frac{1}{2}$ " W \times 4 $\frac{1}{2}$ " D \$180

600 II Cassette Console

Two-head stereo record/play cassette deck; Crystal Permalloy record/play head; adjustable record level



and bias; two built-in test tones (400 Hz for record level, 10 kHz for bias); Dolby noise reduction; MPX filter switch; separate bias and equalization switches; 47-dB peak level meters; tape counter with memory; dc servomotor drive with self-start for unattended recording; frequency response 35-20,000 Hz ± 3 dB; wow and flutter 0.08% wrms, 0.12% weighted peak; S/N 63 dB (400 Hz, 3% THD, with Dolby); THD less than 1.5% (400 Hz, 0 dB); input 50,000 ohms, 50 mV; line output 580 mV; headphone output 45 mW/channel (400 Hz, 0 dB); 6 $\frac{1}{8}$ " H \times 15 $\frac{1}{4}$ " W \times 9 $\frac{1}{8}$ " D \$655
600 IIB. Same with matte black finish \$680
WC-600. Oiled walnut veneer cabinet supplied in easy-to-assemble kit form \$55

500 Cassette Deck

Two-head stereo record/play cassette deck; Crystal Permalloy record/play head; full-range 45-dB peak-reading meters; Dolby noise reduction system; dc servomotor drive; automatic shut-off and memory rewind; three-point sound pickup for live recording; peak limiter; three-position tape selector; variable output level control; frequency response 40-17,000 Hz ± 3 dB; wow and flutter 0.08% wrms, 0.13% weighted peak; S/N 63 dB (400 Hz, 3% THD, with Dolby and SX tape); THD 1.5% at 1 kHz, 0 dB; inputs: mike and blend mike, 600 ohms, 0.2 mV; line 150,000 ohms, 70 mV; outputs: line 1 V max., variable; headphones 8 ohms, 1 mW, 0 dB; 4 $\frac{1}{2}$ " H \times 15" W \times 10" D \$480
550. Similar but S/N 65 dB (SX tape with Dolby); outputs: line 580 mV; headphones 300 mW (1 kHz, 0 dB); three-way power supply (117 V ac, 12 V battery, car jack); tape-end alarm with preset timer; 3 $\frac{1}{2}$ " H \times 12 $\frac{1}{4}$ " W \times 13 $\frac{1}{4}$ " D; 11.15 lb (without battery) \$630
HC-550. Hard carrying case for 550 \$60

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CASSETTE TAPE MACHINES

350 Cassette Deck

Stereo record/play deck; Dolby noise reduction system; tape selector; full automatic shut-off; three low-impedance microphone inputs with mixing; dc servomotor drive; frequency response 40-15,000 Hz ± 3 dB; wow and flutter 0.08% wrms; S/N 58 dB (with Dolby); operates from ac power pack (included), 12-V dc source, or from battery supply in optional carrying case; 3 1/2" H \times 7 1/2" W \times 9 1/2" D..... \$440

MC-350. Carrying case with built-in 12-V lead-acid battery and recharging circuit; 12-hr charge for 6-hr continuous recording with 350; 10 1/2" H \times 9 1/2" W \times 3 1/4" D; 4.5 lb..... \$125

OLYMPUS

SD2 PearlCorder MicroCassette

Two-hour microcassette sound system; completely portable, battery powered; coreless motor; ferrite recording head; capstan drive (can drive a single 8-ohm 10-in woofer); auto shut-off mechanism; front-panel speed selector switch; cassette eject and LED battery check indicator; internal electret condenser microphone and 50 mm dynamic speaker; side-mounted record, stop, and pause buttons; four-way feature switch (cue, review, rewind, fast forward); includes voice actuator module; also available detachable AM and FM tuner modules and accessories..... \$280

SR501 PearlCorder MicroCassette

60-min microcassette; completely portable, battery powered; built-in AM/FM tuners; automatic noise filter; capstan drive; coreless motor; automatic noise filter; sleep switch for 30 min AM/FM radio play or recorded playback; built-in electret condenser microphone; digital tape counter; bass/treble control; master control switch for fast forward, cue, rewind, and review functions; pause button; 57 mm dynamic speaker; automatic voice level control; LED battery check; telescoping antenna and easel stand..... \$200

ONKYO

TA-630D Cassette Deck

Stereo cassette deck with Dolby noise-reduction system; PLL servo dc motor; Sundust record/playback head; ferrite core erase head; three-position tape selector (normal, FeCr, CrO₂); FM Dolby switch with MPX filter; record muting; memory winding; timer start; peak and full auto stop mechanism; input and output level controls; input selector mic or DIN/line; fast winding time 90 sec (C-60); wow and flutter 0.05% wrms nominal; frequency response 20-15,000 Hz (normal tape); 20-18,000 Hz (FeCr and CrO₂ tape); S/N ratio 58 dB (FeCr), 68 dB (FeCr with Dolby); input impedance 50k ohms (mike jacks), 50k ohms (line-in jacks), 5k ohms (DIN jack); 6 1/2" H \times 16 1/2" W \times 11 1/4" D..... \$350

OPTONICA

RT-3535 Mark II Cassette Deck

Stereo cassette deck with Dolby noise-reduction system; front-loading design; has voltage-generator control-type servomotor capstan drive and dc motor reel drive; Auto Program Locate Device (APLD) scans prerecorded tape and stops at desired program; has permalloy, ferrite, and APLD sensing heads; frequency response 30-15,000 Hz ± 3 dB (normal tape); 30-16,000 Hz ± 3 dB (CrO₂ tape), 30-17,000 Hz ± 3 dB (FeCr tape); S/N 64 dB with Dolby; input sensitivity/impedance 0.2 mV/70k ohms (mike), 70 mV/50k ohms (aux.); output level/impedance 580 mV/50k ohms (line), 2 mW/8 ohms (headphone); wow and flutter 0.04% wrms; 5.8" H \times 18.4" W \times 13.9" D..... \$430

RT-6501 Cassette Deck

Front-loading microprocessor-controlled cassette deck with Automatic Program Locate Device (APLD)



and Dolby noise-reduction system; five separate memory functions (can be directed to find start and automatically play any segment of tape by going either forward or in reverse; can be programmed to turn itself on and off, and repeatedly play a certain segment of a tape; has rewind and tape counter memory; frequency generator servomotor; permalloy head; Quartz digital clock and complete LCD display; LCD electronic tape and elapsed time displays; two VU meters; LED peak level, record and Dolby indicators; individual input level controls for mic and line; separate bias and equalization settings; Hall effect IC full automatic stop; illuminated tape compartment; tear-drop shaped control knobs; wow and flutter 0.058% wrms; frequency response 30-16,000 Hz ± 3 dB (FeCr); S/N 64 dB \$360

RT-2050 Mark II Cassette Deck

Stereo cassette deck with Dolby noise-reduction system; front-loading design; has voltage-generator control-type servomotor capstan drive and dc motor reel drive; Auto Program Find System (APFS) facilitates program selection; two peak-level meters; electronic auto stop; has permalloy, ferrite, and APFS sensing heads; frequency response 30-13,000 Hz ± 3 dB (normal tape), 30-15,000 Hz (CrO₂ and FeCr tapes); S/N 64 dB with Dolby; input sensitivity/impedance 0.2 mV/70k ohms (mike), 70 mV/50k ohms (aux.); output level/impedance 580 mV/50k ohms (line), 2 mW/8 ohms (headphone); wow and flutter 0.058% wrms; fast-winding time 100 sec (C-60); 5.8" H \times 18.4" W \times 13.9" D \$300

RT-1515 Cassette Deck

Stereo cassette deck incorporates Dolby noise-reduction system; front-loading design; dual adjustable bias and equalization controls; input level controls; electronic auto stop; single Micro Crystal Ferrite head; frequency response 30-12,500 Hz ± 3 dB (normal tape), 30-14,000 Hz ± 3 dB (CrO₂ tape), 30-15,000 Hz ± 3 dB (FeCr tape); S/N 62 dB with Dolby; input sensitivity/impedance 0.2 mV/6.8k ohms (mike), 50 mV/50k ohms (aux.); output level/impedance 500 mV/50k ohms (line), 0.5 mW/8 ohms (headphone); has dc electronic governor motor; wow and flutter 0.085% wrms; fast-winding time 100 sec (C-60); 6.3" H \times 16.3" W \times 9.6" D..... \$240

PHILIPS

N2535 Cassette Deck

Stereo cassette deck with Dolby noise-reduction system; bias/equalization switches for chromium dioxide, ferro-chrome, and ferrous oxide tapes; three-digit tape counter; automatic stop; multiplex filter; adjustable output level controls; illuminated recording level meters; record/overflow indicator; fool-proof selector switching enables speed and direction change without going through stop; wow and flutter 0.01%; frequency range 40-14,000 Hz ± 3 dB (ferro-chrome and chromium); 40-13,000 Hz ± 3 dB (ferro); S/N 56 dB (with Dolby); fast-winding time 90 sec (C-60); mike input sensitivity 1 mV/k ohm; 18" \times 5 1/4" \times 10 1/4"..... \$200

PIONEER

CT-F1000 Cassette Deck

Stereo cassette deck with Dolby noise-reduction system; front loading; monitoring-while-recording

capability; two-position bias and three-position equalization controls; automatic "chrome" tape sensing and switching; memory stop and play; separate log amp for each VU meter (two); MPX filter; mike/line mixing and recording; tape-end warning and auto stop; has electronically controlled dc motor capstan drive and dc fast-winding motor; "Single-Crystal Ferrite Solid" record/play head and ferrite erase head; fast-winding time 65 sec (C-60); wow and flutter 0.06% wrms; frequency response 30-15,000 Hz ± 3 dB (standard tape), to 17,000 Hz with CrO₂ and FeCr tapes; S/N 64 dB with Dolby (chrome tape); two mike, two line, and DIN inputs; two line, DIN, and headphone outputs; 7 1/4" H \times 16 1/2" W \times 14 1/4" D..... \$600

CT-F900 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; electronically controlled dc ser-



vomotor with built-in generator for capstan drive; Sundust record/playback head; ferrite erase head; three-head configuration; digital readout tape counter; memory/repeat functions; electronic microprocessor for record/play level display (20 segments in each channel, covering a range from -20 dB to 7 dB, can also show VU's and peak level); electronic tape transport with soft-touch controls; bias adjust facility; automatic chrome tape selection; add-on recording; timer start; fast-winding time 85 sec (C-60); wow and flutter 0.05% wrms; frequency response 30-15,000 Hz ± 3 dB (standard LH tape), 30-17,000 Hz ± 3 dB (chromium dioxide tape); S/N 54 dB (Dolby off), 64 dB (Dolby on); HD 1.3% at 0 dB; mike input sensitivity 0.3 mV/100 mV/30k ohms; 7 1/4" H \times 16 1/4" W \times 14 1/4" D..... \$475

CT-F700 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; electronically-controlled dc motor with built-in generator; ferrite solid record/playback head; ferrite erase head; three meters for dynamic level, bias for recording, and peak for playback; bias adjustment system; line/mic-DIN input selector; memory stop; soft-touch buttons; vertical-hold tape mounting; Dolby on/off with indicator lamp; tape selector (STD, FeCr, CrO₂); illuminated cassette compartment; fast-winding time 85 sec (C-60); wow and flutter 0.05% wrms; frequency response 30-14,000 Hz ± 3 dB, 40-13,000 Hz DIN (both with STD tape), 30-16,000 Hz ± 3 dB (FeCr tape), 30-16,000 Hz ± 3 dB, 40-14,000 Hz DIN (both with CrO₂ tape); S/N 54 dB (Dolby off), 64 dB (Dolby on); HD 1.5% at 0 dB; mike input sensitivity 0.3 mV/100 mV/10k ohms; 7 1/4" H \times 16 1/4" W \times 12" D..... \$375

CT-F6262 Cassette Deck

Front-loading cassette deck with Dolby noise-reduction system and exclusive vertical cassette holding mechanism so that tape movement and labels on all cassette tapes are visible during operation; flat belt drive and electronically controlled dc servomotor; hard permalloy record/playback head, ferrite erase head; fast winding 85 sec (C-60); wow and flutter $\pm 0.2\%$ (DIN), 0.08% wrms; frequency response 30-14,000 Hz (standard) 30-16,000 Hz (chrome and ferrichrome); S/N 52 dB (Dolby off), 62 dB (Dolby on); HD 1.7%; features Dolby on/off switch with indicator lamp, tape selector switch, tape compartment illumination; complete complement of inputs and outputs; 6 1/2" H \times 16 1/4" W \times 12 1/2" D..... \$270

CT-F4242 Cassette Deck

Stereo cassette deck with Dolby noise-reduction

system; front-loading design; three-step bias/equalization; full auto stop; electronically controlled dc motor; hard permalloy solid record/play head and ferrite erase head; fast-winding time 85 sec (C-60); wow and flutter 0.08% wrms; frequency response 40-13,000 Hz ± 3 dB (standard tape), to 15,000 Hz with CrO₂ and FeCr tapes; has oil-damped compartment door; full complement of inputs/outputs; 5⁷/₁₆" H \times 15" W \times 12¹/₄" D \$225

CT-F500 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; dc servomotor; hard permalloy recording/playback head; ferrite erase head; flywheel capstan drive; automatic shut-off in all modes; soft-damping cassette holder; three-mode tape bias/equalization switching; left/right mic jacks; two large VU meters; three-digit tape counter; record and Dolby on indicators; fast-winding time 90 sec (C-60); wow and flutter 0.05% wrms; frequency response 40-13,000 Hz ± 3 dB (STD tape), 40-15,000 Hz ± 3 dB (CrO₂ and FeCr tape); S/N 54 dB (Dolby off), 64 dB (Dolby on); HD 1.5%; mike input sensitivity 0.3 mV/110 mV/10k ohms; 5¹/₂" H \times 14¹/₁₆" W \times 10¹/₄" D \$175

REALISTIC

SCT-30 Cassette Deck

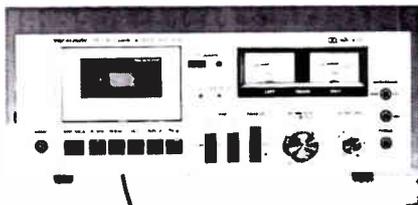
Front-loading stereo cassette deck with double Dolby noise-reduction system; three permalloy heads permit monitoring with or without Dolby while recording; dual capstan; servomotor; three-position bias and equalization; full auto-stop; power assist controls; record and output level controls; dual VU meters; headphone and left and right microphone jacks; push levers for fast forward, rewind, pause, stop, and eject; frequency response 30-16,000 Hz (CrO₂ tape); wow and flutter 0.06% wrms; S/N 61 dB; 5¹/₂" \times 17¹/₁₆" \times 10" \$380

SCT-16 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; permalloy record/play head; three-position bias and equalization; dual VU meters; full auto-stop; power assist controls; headphone and left/right microphone jacks; push levers for fast forward, rewind, pause, stop, and eject tape counter; frequency response 30-15,000 Hz; wow and flutter 0.07% wrms; S/N 60 dB; 5¹/₂" \times 15¹/₂" \times 11" \$260

SCT-18 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; dual VU meters; full auto-stop;



bias and equalization controls; record and output level controls; headphone and left/right microphone jacks; push lever stop/eject, rewind, fast forward, and pause; frequency response 30-14,000 Hz (CrO₂ tape); wow and flutter 0.12% wrms; S/N 59 dB; 5¹/₂" \times 15" \times 11" \$200

SCT-17 Cassette Deck

Top-loading stereo cassette deck with Dolby noise-reduction system; dual VU meters; full auto-stop; bias and equalization switch; tape counter; headphone and left/right microphone jacks; push-button rewind, fast forward, stop/eject, and pause; frequency response 40-12,500 Hz (CrO₂ tape); wow and flutter 0.19% wrms; S/N 53 dB; THD 2% at 1 kHz (0 VU); 3¹/₄" \times 11¹/₄" \times 9" \$140

RHAPSODY

RY-1226 Portable Cassette Recorder

Combines ac/dc cassette recorder with AM/FM radio and built-in condenser microphone; automatic shut-off; automatic level control; sleep switch; slide-lever tone and volume controls; slide-rule radio dial; telescopic antenna; jacks for aux. input, earplug, and optional plug-in microphone; C-cell batteries included; 11¹/₄" \times 7¹/₄" \times 3¹/₄" \$80

RY-1230 Portable Cassette Recorder

Combines AM/FM radio, cassette recorder, and built-in microphone; tapes can be recorded direct from radio; push-button controls; automatic stop; pause button; automatic level control; sleep switch; LED battery level/recording indicator; digital tape counter; eject cassette door; slide-lever volume control; jacks for earphone and external mike; 6-V dc power; comes with carrying case, C-30 tape, earphone, four penlite batteries, and plug for erasing; optional ac adapter and mike available \$70

RY-1227 Portable Cassette Recorder

Portable ac/dc cassette recorder with AM/FM radio and built-in condenser microphone; double face operation, cassette on one side, radio on the other; records direct from radio; automatic shut-off; automatic level control; tone and volume controls; slide rule radio dial; telescopic antenna; pop-open cassette door; jacks for aux. input, earplug and optional microphone; comes with C-30 tape; 9¹/₄" \times 3¹/₂" \times 7¹/₂" \$60

RY-46 Portable Cassette Recorder

Compact cassette recorder with built-in condenser microphone; automatic level control; single-hand push-button operation; play/record, rewind, fast forward, and pause controls; eject cassette door; jacks for earplug and optional foot switch; 6-V dc jack optional ac adapter; comes with wrist strap, carrying case, C-30 tape, earplug and four penlite batteries; 6" \times 4¹/₂" \times 1¹/₄" \$50

RY-292 Portable Cassette Recorder

Portable battery or ac operated cassette recorder; push-button controls; automatic level control; slide-lever volume control; eject button; jacks for aux. input, earplug, and optional plug-in external mike; slide-out handle; comes with four "C" cells, ac cord, earphone, C-30 tape; 2⁹/₁₆" H \times 5¹/₂" W \times 11" D \$30
Microphone \$4

ROTEL

RD-20 Cassette Deck

Stereo deck with Dolby noise-reduction system; permalloy record/play head and ferrite erase head; electronic governor dc motor; wow and flutter 0.07% (play); frequency response 22-16,000 Hz $+0/-3$ dB (CrO₂ tape); S/N 60 dB with Dolby; three-digit tape counter, memory function; limiter switch; tape selection switches for normal, CrO₂, and FeCr tapes; L/R slide controls for output level, record level, and mike level; headphone and two mike jacks \$370

RD-30F Cassette Deck

Stereo deck with Dolby noise-reduction system; ferrite record/play and erase heads; electronic governor dc motor; wow and flutter 0.07% (play); frequency response 20-17,000 Hz $+0/-3$ dB (CrO₂ tape); S/N 63 dB with Dolby; three-digit tape counter; headphone jack; three-position bias and equalization controls; L/R input and master output level controls; two VU meters; two mike inputs \$360

RD-12F Cassette Deck

Front-loading stereo deck with Dolby noise-reduction system; permalloy record/play and ferrite erase heads; electronic governor dc motor; wow and flutter 0.09% (play); frequency response 30-16,000 Hz $+0/-3$ dB (CrO₂ tape); S/N 60 dB with Dolby; has 120-min real time counter; three-digit tape counter; memory function; headphone jack; limiter switch; three-position tape select switch; two mike inputs; dual ganged concentric L/R mike, record, and output level controls; two VU meters; wood-grained vinyl clad cabinet \$340

RD-10F Cassette Deck

Stereo deck with Dolby noise-reduction system; permalloy record/play and ferrite erase heads; electronic governor dc motor; wow and flutter 0.08% (play); frequency response 30-14,000 Hz $+0/-3$ dB (CrO₂ tape); S/N 60 dB with Dolby; three-digit tape counter; headphone jack; two VU meters; two-position bias and equalization (70 and 120 μ sec) switches; two mike inputs; dual ganged concentric record level controls (L/R) \$230

SANKYO

STD-2000 Cassette Deck

Automatic front-loading stereo cassette deck with Dolby noise-reduction system; electronically-controlled dc motor; super-hard permalloy record/play and erase heads; total automatic shut-off; separate three-position bias and equalization switches; three-digit memory counter; peak indicator; twin illuminated VU meters; record, Dolby, and tape running indicators; line/mic/DIN input switch; mechanical pause; fast-winding time 90 sec (C-60); wow and flutter 0.065% wrms; frequency response 30-14,000 Hz (normal tape), 30-17,000 Hz (CrO₂ and FeCr tapes); THD less than 1.5%; S/N 56 dB (CrO₂ tape, with filter, Dolby off) improved by 5 dB at 5 kHz and 10 dB at 5 kHz cycle or more with Dolby; crosstalk 35 dB at channel, 55 dB at track; input sensitivity (DIN/mic) 0.5 mV, (line-in) 50 mV; input impedance (DIN/mic) 5k ohms, (line-in) 50k ohms; 5¹/₂" H \times 17" W \times 11¹/₄" D \$300
STD-1900. Similar but frequency response 30-13,000 Hz (normal tape), 30-16,000 Hz (CrO₂ and FeCr tapes); without peak and mode indicators and memory \$250

STD-1870 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; electronically-controlled dc motor; super-hard permalloy record/playback head; ferrite core erase head; automatic shut-off; record level controls; three-position tape selector switch (CrO₂, FeCr, normal); three-digit tape counter; memory switch; record/mute switch; input select switch; output level control; twin illuminated VU meters; fast-winding time 90 sec (C-60); wow and flutter 0.07% wrms; frequency response 30-14,000 Hz (normal tape), 30-16,000 Hz (CrO₂ and FeCr tapes); THD 2.0% with normal tape; S/N 55 dB (CrO₂ with filter, Dolby off) improved by 5 dB at 1 kHz and 10 dB at 5 kHz with Dolby on; input sensitivity (DIN/mic) 0.7 mV at 400 Hz; input impedance (DIN/mic) 10k ohms, (line-in) 50k ohms; crosstalk 50 dB at 1 kHz; separation 30 dB at 1 kHz; 5¹/₂" H \times 17¹/₁₆" W \times 9¹/₁₆" D \$240

STD-1850 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; electronically-controlled dc motor; super-hard permalloy record/play head; ferrite core erase head; three-position tape selector switch (CrO₂, FeCr, normal); record level controls; twin illuminated VU meters; three-digit tape counter; total automatic shut-off; dual microphone jacks; headphone jack; line in/out jacks; output level control; input selector switch; fast-winding time 90 sec (C-60); wow and flutter 0.07% wrms; frequency response 30-14,000 Hz (normal tape), 30-16,000 Hz (CrO₂ and FeCr tapes); THD 2.0% with normal tape; S/N 55 dB (CrO₂ with filter, Dolby off) improved by 5 dB at 1 kHz and 10 dB at 5 kHz with Dolby on; separation 30 dB at 1 kHz; crosstalk 50 dB at 1 kHz; input sensitivity (DIN/mic) 0.7 mV at 400 Hz; input impedance (DIN/mic) 10k ohms, (line-in) 50k ohms; 5¹/₂" H \times 15¹/₂" W \times 9¹/₁₆" D \$210

STD-1800 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; electronically-controlled dc motor; super-hard permalloy record/play and erase heads; total automatic shut-off; separate two-position bias and equalizer switch; record level control; twin illuminated VU meters; mechanical pause; limiter switch; rotary output level control; left/right microphone jacks; headphone jack; line in/out jack; five-pin DIN jack; fast-winding time 90 sec (C-60);

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CASSETTE TAPE MACHINES

wow and flutter 0.08% wrms; frequency response 40-12,500 Hz (normal tape), 40-15,000 Hz (CrO₂ and FeCr tapes); THD 2.0%; S/N 55 dB (CrO₂ with filter, Dolby off) improved by 5 dB at 5 kHz and 10 dB at 5 kHz cycle with Dolby; crosstalk 28 dB at channel, 55 dB at track; input sensitivity (DIN/mic) 0.5 mV, (line-in) 50 mV; input impedance (DIN/mic) 5k ohms, (line-in) 50k ohms; 5 7/8" H x 15 3/4" W x 9 1/4" D..... \$200

STD-1610 Cassette Deck

Stereo cassette deck with Dolby noise-reduction system; ferrite play/record head, permalloy erase head; dc servomotor; wow and flutter 0.09% wrms; S/N 55 dB (CrO₂ tape, Dolby on); dist. less than 1.5%; frequency response 30-14,000 Hz; input 350 mV at 200,000 ohms (line), 0.15 mV at 600 ohms (mic); output 0.58 V at 10,000 ohms (line), 0.07 V at 80 ohms (headphones); record/play DIN jack; total automatic shut-off; automatic and manual bias controls; two VU meters; peak indicator; separate input and output controls; pause control; limiter switch; three-digit tape counter; 3 1/2" H x 15" W x 10" D..... \$180

STD-1750 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; mechanical governor dc motor; super-hard permalloy record/playback head; ferrite core erase head; record level controls; three-digit tape counter; total automatic shut-off; two-position tape selector switch (Normal/CrO₂); dual microphone jacks; headphone jack; record indicator; fast-winding time 90 sec (C-60); wow and flutter 0.14% wrms; frequency response 30-14,000 Hz (normal tape), 30-16,000 Hz (CrO₂ tape); THD 2.0% with normal tape; S/N 55 dB (CrO₂ tape with filter, Dolby off) improved by 5 dB at 1 kHz and 10 dB at 5 kHz with Dolby on; separation 30 dB at 1 kHz; crosstalk 50 dB at 1 kHz; input sensitivity (mic) 0.7 mV at 400 Hz, (line-in) 50 mV at 400 Hz; input impedance (mic) 10k ohms, (line-in) 50k ohms; 5 1/2" H x 14 1/4" W x 9 1/4" D..... \$170

STD-1700 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; mechanical governor motor; super-hard permalloy record/play and erase heads; total automatic shut-off; record level control; twin VU meters; mechanical pause; three-digit tape counter; two-position tape selector switch; left/right microphone jacks; headphone jack; line in/out jack; five-pin DIN jack; fast-winding time 90 sec (C-60); wow and flutter 0.15% wrms; frequency response 40-12,000 Hz (normal tape), 40-14,000 Hz (CrO₂ and FeCr tape); THD 2.0%; S/N 55 dB (CrO₂ with filter, Dolby off), improved 5 dB at 5 kHz and 10 dB at 5 kHz cycle with Dolby; input sensitivity (DIN/mic) 0.5 mV, (line-in) 50 mV; input impedance (DIN/mic) 5k ohms, (line-in) 50k ohms; 5 7/8" H x 14 1/4" W x 9 1/4" D..... \$150

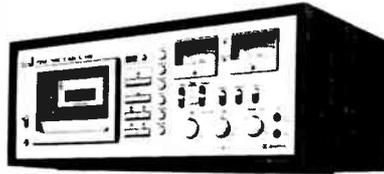
STD-1650 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; mechanical governor dc motor; super-hard permalloy record/playback head; ferrite core erase head; dual record level controls; automatic shut-off; microphone jacks; headphone jack; two-position tape selector switch; record indicator; fast-winding time 90 sec (C-60); wow and flutter 0.16% wrms; frequency response 40-13,000 Hz (normal tape), 40-15,000 Hz (CrO₂ tape); THD 2.2% with normal tape; S/N 53 dB (CrO₂ with filter, Dolby off) improved 5 dB at 5 kHz and 10 dB at 5 kHz with Dolby on; separation 30 dB at 1 kHz; crosstalk 50 dB at 1 kHz; input sensitivity (mic) 0.5 mV at 400 Hz, (line-in) 50 mV at 400 Hz; input impedance (mic) 5k ohms, (line-in) 50k ohms; 5 1/2" H x 14 1/4" W x 7 1/4" D..... \$120

SANSUI

SC-5100 Cassette Deck

"Direct-O-Matic" front-loading stereo cassette deck with Dolby noise-reduction system; ferrite heads;



FG servomotor capstan drive and dc winding motor for takeup; wow and flutter 0.05% ; frequency response 20-15,000 Hz (30-13,000 Hz \pm 3 dB) with normal tape, 20-17,000 Hz (30-14,000 Hz \pm 3 dB) with CrO₂ tape; S/N 57 dB before Dolby; features "Tape Lead-in" for bypassing leader; separate bias and equalization switches for CrO₂, normal, and FeCr tapes; mic/line mixing capability; peak level indicator; VU meters; built-in limiter circuitry; three-digit tape counter; automatic memory and repeat functions; simulated walnut grain finish; 8 1/4" H x 19 1/4" W x 12 1/4" D..... \$640
SC-5110. Same but with black matte finish; 7 1/4" H x 18 1/4" W x 12 1/4" D..... \$650

SC-3100 Cassette Deck

"Direct-O-Matic" front-loading stereo cassette deck with Dolby noise-reduction system; permalloy record/play head, ferrite erase head; FG-equipped servomotor drive; wow and flutter 0.06%; frequency response 25-14,000 Hz (30-13,000 Hz \pm 3 dB) with normal tape, 25-16,000 Hz (30-14,000 Hz \pm 3 dB) with CrO₂ tape; S/N 57 dB before Dolby; features "Tape Lead-in;" separate bias and equalization switches for CrO₂, normal, and FeCr tapes; automatic memory; mixing capability; VU meters; tape counter; simulated walnut grain finish; 7 1/4" H x 18" W x 12 3/4" D..... \$450
SC-3110. Same but with black matte finish and rack-mounting adapters; 6 3/4" H x 19" W x 13 3/4" D..... \$480

SC-2100 Cassette Deck

"Direct-O-Matic" front-loading stereo cassette deck with Dolby noise-reduction system; wow and flutter 0.08% frequency response 25-14,000 Hz (30-13,000 Hz \pm 3 dB) with normal tape, 25-16,000 Hz (30-14,000 Hz \pm 3 dB) with CrO₂ tape; S/N 57 dB before Dolby; features "Tape Lead-In;" three-position independent bias and equalization switches; VU meters; tape counter; simulated walnut grain finish; 7 1/4" H x 18" W x 12 3/4" D..... \$370
SC-2110. Same but with black matte finish and rack-mounting adapters; 6 3/4" H x 19" W x 13 3/4" D..... \$390

SC-1100 Cassette Deck

"Direct-O-Matic" front-loading stereo cassette deck with Dolby noise-reduction system; permalloy record/play head, ferrite erase head; frequency response 30-13,000 Hz (35-12,500 Hz \pm 3 dB) with normal tape, 30-16,000 Hz (35-13,000 Hz \pm 3 dB) with CrO₂ tape; S/N 54 dB before Dolby; features "Tape Lead-In;" tape selector switch for CrO₂, normal, and FeCr tapes; VU meters; three-digit tape counter; automatic shut-off at end of tape; 6 3/4" H x 17 1/4" W x 11 1/4" D..... \$270
SC-1110. Similar, with rack-mounting adapters; 6 3/4" H x 19" W x 11 1/4" D..... \$250

SANYO

RD5350 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; PLL dc servomotor with 34 stator and 34 rotor poles; permalloy recording head; LED peak indicators; separate calibrated input and output level controls; two large lighted VU meters; record mute; standby timer; full automatic stop; lock-

ing pause; separate bias and equalization switching (CrO₂ and normal); separate left and right micro-



phone jacks; headphone jack; digital tape counter; Dolby on/off switch; line-in, mic/DIN input button; frequency response up to 17,000 Hz with CrO₂ and FeCr tape; S/N 64 dB (Dolby on); simulated walnut covered metal cabinet \$200

RD8400 Cassette/8-Track Deck

Front-loading unit combines cassette record/play deck with 8-track cartridge record/play deck; permits recording either on cassette or 8-track and transferring from one to the other; cassette section: frequency response 60-12,000 Hz; S/N 45 dB; wow and flutter 0.25% rms; speed accuracy \pm 2.5%; CrO₂/standard tape selector; tape counter; pause control; 8-track section: frequency response 30-12,000 Hz; S/N 42 dB; wow and flutter 0.25% rms; lighted program indicators; LED record and end-of-tape indicators; locking pause; two lighted VU meters; separate record-level controls..... \$190

RD5300 Cassette Deck

Front-loading stereo cassette recorder deck with Dolby noise-reduction circuit; frequency response 30-14,000 Hz; S/N 57 dB (Dolby out), 63 dB (Dolby in); wow and flutter 0.10% rms; separate input and output level controls; CrO₂/standard tape pushbutton equalization control and LED indicators; bias high/low control; limiter on/off control; two large VU meters \$190

RD5250 Cassette Deck

Stereo record/playback cassette deck with Dolby noise-reduction system; tape selector; permalloy recording head; calibrated input/output level controls; separate LED record-on and Dolby-on indicators; two large VU meters; locking pause control; bias/equalization switching; full automatic stop; viscous damped cassette door \$170

RD5030 Cassette Deck

Front-loading stereo record/playback deck with Dolby noise-reduction system; tape select switch for normal, CrO₂, and FeCr tape; pause control; calibrated level controls; separate bias/equalization switching; full automatic stop; left and right mike inputs; frequency 30-16,000 Hz; wow and flutter 0.08%; S/N 62 dB (Dolby on) \$140

SHARP

RT-3388 Cassette Deck

Microprocessor-controlled stereo cassette deck with Automatic Program Locate Device (APLD) and Dolby noise-reduction system; front-loading; servo-controlled dc motor; hard permalloy record/playback head; ferrite erase head; has five forms of memory, can be programmed to find the start and automatically play any segment of cassette tape by going either forward or in reverse, can turn itself on and off, has both rewind and tape counter memory, and can be programmed to repeatedly play a certain segment of tape; Quartz digital clock and complete LCD display; LCD electronic tape and elapsed time displays; two VU meters; LED peak level, record and Dolby indicators; individual input level controls for mic and line; separate bias and equalization settings; Half effect IC full auto stop; illuminated tape compartment; pause control; wow and flutter 0.06% wrms; frequency response 30-16,000 Hz (FeCr tape); S/N 64 dB (Dolby on) \$350

GF-9090 Portable Cassette Recorder

Portable stereo cassette recorder with AM/FM Stereo FM radio with two shortwave bands; Automatic Program Search System (The Sharp Eye); VU meters for each channel that double as tuning and

battery check indicators; bias/equalizer switch; narrow gap head; mechanical pause control; extra-large stop button; two built-in condenser (electret) microphones; cue/review system; LED FM stereo indicator; two powerful amplifiers; built-in two-way speaker system with two 6 1/2-in woofers and two horn tweeters; stereo expander switch; balance control; individual bass and treble controls; left/right separate recording level controls; dial light; mic mixing control \$340

RT-1165 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; Automatic Program Search System (The Sharp Eye); servo-controlled dc motor; narrow gap permalloy head; two VU meters; LED peak level indicator; mic/line mixing with individual level controls; separate bias and equalization switches; automatic end-of-tape shut-off; mechanical pause control; digital tape counter; mic/line selector and editor button; wow and flutter 0.085% wrms; frequency response 30-14,000 Hz; S/N 62 dB \$210

RT-1157 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; Automatic Program Search System (The Sharp Eye); servo-controlled dc motor; narrow gap permalloy head; two VU meters; LED peak level indicator; individual bias and equalization switches; automatic end-of-tape shut-off; mechanical pause control; line/mic input selector switch; front panel inputs for stereo headphones; digital tape counter; wow and flutter 0.09% wrms; frequency response 40-14,000 Hz; S/N 62 dB \$190

RT-1125 Cassette Deck

Front-loading stereo cassette deck with noise reduction; Automatic Program Search System (The Sharp Eye); servo-controlled dc motor; narrow gap permalloy head; two VU meters; LED record indicator; individual bias and equalization switches; automatic end-of-tape shut-off; mechanical pause control; front panel inputs for stereo headphones and microphones; digital tape counter; wow and flutter 0.09% wrms; frequency response 40-13,000 Hz; S/N 56 dB \$150

SONY

TC-K8B Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; FG servo-controlled motor for capstan drive; separate spooling motor; ferrite-and-ferrite record/playback head; two LCD peak reading record level meters; manual and automatic peak hold capability; switchable FM multiplex filter; three-position bias and equalization switches (standard, FeCr, CrO₂); solenoid-assisted mode selection; mic/line mixing; separate level control for each channel; record-mute switch; timer standby capability; front-panel line output and headphone level controls; wow and flutter 0.045% wrms; frequency response 30-16,000 Hz ± 3 dB; S/N 60 dB \$850

TC-K711 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; dc servo-controlled motor with frequency generator; two-motor transport system; ferrite-and-ferrite heads; bias and equalization settings for standard, FeCr, and CrO₂ tape; switchable FM multiplex filter; three LEDs measure varying peak levels; direct-coupled amplifier; full-logic solenoid controls; line and microphone mixers with separate level controls for each channel; tape counter with memory circuit; full-function remote control with optional RM-30 remote control unit; wow and flutter 0.045%; frequency response 30-16,000 Hz ± 3 dB (FeCr tape); S/N 60 dB; THD 1.3% \$500

TC-K6 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; frequency-generator servo-controlled motor for capstan drive; separate spooling motor; ferrite-and-ferrite record/playback head; two

VU meters; three LED peak level indicators; switchable FM multiplex filter; three-position bias and equalization switches for standard, FeCr, and CrO₂ tape; solenoid-assisted mode selection; automatic shut-off in all modes; logic-controlled tape transport; record-mute switch; timer standby capability; line and microphone mixing with separate level controls for each channel; line output/headphone level control; wow and flutter 0.05% wrms; frequency response 30-16,000 Hz ± 3 dB; S/N 59 dB (Dolby off, FeCr) \$400

TC-158SD Portable Cassette Deck

Portable stereo cassette deck with Dolby noise-reduction system; dc servo-controlled motor; ferrite-



and-ferrite heads; bias and equalization settings for standard, FeCr, and CrO₂ tape; two illuminated VU meters; peak-reading LED; automatic end-of-tape shut-off; can be operated with four different power sources (ac, batteries, rechargeable battery pack, and optional Sony DCC-129 car/boat battery cord); wow and flutter 0.08% frequency response 30-15,000 Hz ± 3 dB (FeCr tape); S/N 59 dB (Dolby off, FeCr); THD 1.3%; weight 11 lb 9 oz \$380

TC-K5 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; frequency-generator servo-control motor; ferrite-and-ferrite record/playback head; two VU meters; three LED peak-level indicators; switchable FM multiplex filter; three-position bias and equalization switches (standard, FeCr, CrO₂); automatic shut-off in all modes; automatic tape-repeat mechanism; record-mute switch; timer standby capability; front-panel line output/headphone level control; wow and flutter 0.05% wrms; frequency response 30-16,000 Hz ± 3 dB; S/N 59 dB (Dolby off, FeCr) \$300

TC-K2A Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; advanced servo-controlled motor; ferrite-and-ferrite record/playback head; two VU meters; three-position tape selector (standard, FeCr, CrO₂); automatic shut-off in all modes; tape-repeat mechanism; wow and flutter 0.06% wrms; frequency response 50-13,000 Hz ± 3 dB; S/N 57 dB (Dolby off, FeCr) \$200

SUPERSCOPE

CR-3520 Radio/Cassette Recorder

Radio/cassette recorder with two-way speaker system; separate woofer and tweeter; full mixing with mic level control; auto stop; cue and review; pause; tape speed control; tape selector; three-digit tape counter; three-way powering; LED tuning indicator; separate bass and treble controls; dial light; line input and output jacks \$210

CD-304 Cassette Deck

Top-loading stereo cassette deck with Dolby noise-reduction system; super hard permalloy record/playback head; auto-stop; separate left and right record level controls; peak limiter; locking pause control; three-digit tape counter; dual calibrated VU meters; front panel headphone and mic jacks; rear panel line input and output jacks; wow and flutter 0.15% wrms; frequency response 40-12,000 Hz ± 3.5 dB (standard tape), 40-14,000 Hz ± 3.5 dB (CrO₂ and FeCr tape); S/N 48 dB (Dolby off), 54 dB (Dolby on); 3 1/4" H x 13 3/4" W x 9 1/4" D \$160
CD-303. Similar except without Dolby noise-reduction system \$115

C-105 Cassette Recorder

Professional three-head cassette recorder with built-in condenser microphone; four-way powering (ac, dc, optional car adapter, optional rechargeable battery); inputs for remote control mic and external speaker; automatic record level; PA/play mix mode; cue and review; manual record level control; ambient noise control; peak limiter; vari-speed pitch control; dual flywheel mechanism; three-digit tape counter \$160

CRS-2100 Radio/Cassette Recorder

Stereo radio/cassette recorder; one-touch record; pause control; total mechanism shut-off; cue and review; tone control; sleep timer switch; two built-in 5-in speakers; variable sound monitor; two built-in condenser microphones; three-digit tape counter; super hard permalloy head; three-way powering; FM stereo LED; afc switch; automatic record level; record/battery/tuning meter; 1/4-in stereo headphone jack; external speaker jacks \$160

C-104 Cassette Recorder

Built-in condenser microphone; four-way powering (ac, dc, optional car adapter, and optional rechargeable battery); inputs for remote control mic and external speaker; automatic record level; PA/play mix mode; cue and review; total mechanism shut-off; vari-speed pitch control; locking pause control; dual flywheel mechanism; three-digit tape counter \$115

CR-1200 Radio/Cassette Recorder

One-touch record; total mechanism shut-off; sleep timer switch; automatic record level; pause; variable sound monitor; two-way powering \$80

C-190 Cassette Recorder

Portable cassette recorder; servo-controlled motor; vari-speed control; PA/play mix; automatic/manual/limiter record level switch; record/battery meter; cue and review; built-in condenser microphone; pause control; headphone, remote control, and external speaker jacks \$80

CR-1050 Radio/Cassette Recorder

One-touch record; total mechanism shut-off; two-way powering; automatic record level; record monitor; automatic frequency control; built-in condenser microphone; external microphone input; comes with ac cord and erase plug \$70

C-180 Cassette Recorder

Portable cassette recorder; cue and review; LED record level and battery indication; ac, battery, and external dc operation; built-in condenser microphone; pause control; headphone, remote control, and external speaker jacks \$65

C-170 Cassette Recorder

Portable cassette recorder; built-in condenser microphone; pause control; headphone, remote control, and external speaker jacks; ac or battery operation \$50

TANDBERG

TCD-340A Cassette Deck

Actilinear recording system; three-motor, servo-controlled dual capstan drive system; solenoidless operation; three separate heads \$1150
 Also available as TCD 340AM with four-position bias/equalization circuitry for use with Metafine-type tape.

TCD-330 Cassette Deck

Stereo record/play cassette deck with Dolby noise-reduction system; three heads (for tape/source monitoring during recording); three-motor, dual-capstan, closed-loop drive system, hysteresis synchronous record/play motor; wow and flutter 0.12% (wrms), 0.18% (DIN 45500); S/N (Dolby on, ref. 3% third harmonic dist.) 64 dB (DIN 45500, IEC A curve rms), 52 dB (DIN 45500, IEC linear); 0.3% dist. (electronic with 0-dB rec. level); frequency response 20-20,000 Hz (DIN 45500), 30-18,000 Hz ± 3 dB (FM/MPX filter off); channel separation 60 dB (side 1/side 2), 35 dB (track 1/track 2) at 1

1

CASSETTE TAPE MACHINES

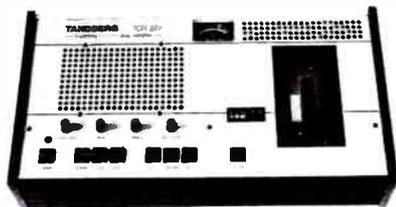
kHz; input sensitivity 0.15-20 mV (mic), 0.08-10 V (line), 0.008-1 V (radio); input impedance automatically adjusts 100-800 ohms (mic), 470,000 ohms (line), 47,000 ohms (radio); output 775 mV unloaded, 5000-ohm impedance (radio), 1.5 V unloaded, 100-ohm impedance (line), 5 mW at 8 ohms (headphone); 230-V ac, 50 Hz or 115-V ac, 60 Hz, 40 W; 4 1/8" H x 18 1/2" W x 9 1/8" D ... \$1000

TCO 310 Mk II Cassette Deck

Stereo record/play cassette deck with Dolby noise-reduction system; three-motor, dual-capstan, closed-loop drive system, synchronous record/play motor; wow and flutter 0.2% (DIN 45500 weighted peak); S/N (Dolby on, ref. 3% third harmonic dist., Tandberg Tape) 65 dB (DIN 45500, IEC A curve), 55 dB (DIN 45500, IEC linear rms); 0.3% dist. (electronic with 0-dB rec. level); frequency response 30-16,000 Hz (DIN 45500, MPX filter off); channel separation 60 dB (side 1/side 2), 35 dB (track 1/track 2) at 1 kHz; input sensitivity 0.15-0.20 mV (mic), 0.04-5 V (line), 0.008-1 V (radio); input impedance automatically adjusts 100-800 ohms (mic), 220,000 ohms (line), 47,000 ohms (radio); output 775 mV at 10,000 ohms (radio/line), 2 mW at 8 ohms (headphone); 240-V ac, 50 Hz or 115-V ac, 60 Hz, 34 W; 4 1/8" H x 17" W x 9 1/8" D \$600

TCR-222 Cassette Deck

Top-loading cassette deck for mono recording and playback; three-motor system, one synchronous



hysteresis motor for recording and playback and two servo dc motors for fast winding; dual-capstan closed-loop drive system; peak-reading meter; tape counter; output and input level controls; bass and treble controls; large built-in speaker and amplifier with output power of 12 W rms; wow and flutter (DIN) 0.2%; frequency response 40-14,000 Hz (DIN); S/N (DIN) 58 dB; max. dist. 3% at 0 dB; mic input suitable for dynamic microphone with impedance less than 700 ohms; mic input sensitivity 0.1 mV to 17 mV at 200 ohms \$600

TEAC

C-1 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; three-motor and three-head dual-capstan transport system; logic operation control with LSI; pitch control to vary tape speed up to $\pm 4\%$; double-action input controls; two peak-program VU meters; three-position bias and equalization switch; interchangeable bias/equalization card, CX-8; three-position monitor switch; switchable Dolby/dbx noise reduction system; input selector switch for mic/mic-with-attenuation/line; memory function for auto-stop/repeat; timer control switch; wow and flutter 0.04% (NAB weighted); frequency response 31.5-18,000 Hz ± 3 dB (CrO₂), 31.5-16,000 Hz ± 3 dB (Hi-Fi); S/N 60 dB, improved 5 dB at 1 kHz and 10 dB over 5 kHz with Dolby fast-winding time 100 sec (C-60); two mic inputs -72 dB (0.25 mV), 600-ohm impedance; two line inputs 60 mV, 50,000-ohm impedance; available in champagne or brown; 6 1/2" H x 19" W x 13 1/8" D \$1300

A-800 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; FG servo-controlled dc capstan



motor; one mechanically governed dc reel motor; three heads for erase, record, and playback; logic-controlled transport with optional remote control; optional dbx noise-reduction system interface; three-position bias and equalization selectors; two peak-reading VU meters; mic/line mixing; record/mute switch; memory stop rewind switch; three-digit tape counter; timer switch; lighted cassette compartment; fast-winding time 90 sec (C-60); wow and flutter 0.05% (NAB weighted); frequency response 30-18,000 Hz ± 3 dB (CrO₂ and FeCr tape), 30-16,000 Hz ± 3 dB (hi-fi tape); S/N 58 dB, improved 5 dB at 1 kHz and 10 dB over 5 kHz with Dolby; two mic inputs 0.25 mV (-72 dB) 600-ohm impedance; two line inputs 60 mV at 50,000-ohm impedance; one stereo headphone jack 8-ohm impedance; 7" H x 17 1/8" W x 12 3/8" D \$725

A-601R Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; FG servo-controlled dc motor; two heads for erase and record/playback; newly developed transport for reverse playback; easy change of direction by touching electronic button; record, Dolby, and record/mute indicators; three-position bias and equalization switch; memory function; mic/line mixing; peak-level meters; timer switch for automatic record-start; 1/mono mic input jack; fast-winding time 100 sec (C-60); wow and flutter 0.08% (NAB, weighted); frequency response 30-16,000 Hz (CrO₂), 30-13,000 Hz (hi-fi); S/N 55 dB, improved 5 dB at 1 kHz and 10 dB over 5 kHz with Dolby; two mic inputs 0.25 mV (-72 dB) at 600-ohm impedance; two line inputs 60 mV at 50,000-ohm impedance; 6 1/8" H x 17 1/8" W x 13 3/8" D \$600

A-700 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; FG servo-controlled dc capstan motor; dc reel motor; two heads for erase and record/playback; optional remote control; twin peak-level meters; three-position bias and equalization switches; record/mute; recording level and balance controls; memory stop switch; three-digit counter; timer switch; front-panel microphone and headphone jacks; line/mic input selector switch; fast winding time 90 sec (C-60); wow and flutter 0.05% (NAB, weighted); frequency response 30-16,000 Hz (CrO₂), 30-14,000 Hz (hi-fi); S/N 57 dB, improved 5 dB at 1 kHz and 10 dB over 5 kHz with Dolby; two mic inputs 0.25 mV (-72 dB)/600-ohm impedance; two line inputs 60 mV at 50,000-ohm impedance; 7" H x 17 1/8" W x 12 3/8" D \$550

A-303 Cassette Deck

Front-load stereo cassette deck with Dolby noise-reduction system; two-head design; wow and flutter 0.06%; frequency response 30-16,000 Hz (CrO₂ or FeCr tape); S/N 57 dB (Dolby out), improved by 10 dB at 5 kHz with Dolby in; record/mute function; memory switch for easy search of recorded material; photo-transistor-controlled auto-stop; three-step independent bias and equalization switches; timer control permits automatic recording or playback \$400

A-105 Cassette Deck

Stereo cassette deck with Dolby noise-reduction system; two permaflux heads; wow and flutter 0.09%; frequency response 30-15,000 Hz (CrO₂ tape); S/N 53 dB (Dolby out), improved by 10 dB at 5 kHz with Dolby in; two-step bias and equalization

switches; separate left and right record level controls; mic/line input switch; pause control; three-digit tape counter; VU meters; 7 1/8" H x 17 1/8" W x 9 1/8" D \$300

A-103 Cassette Deck

Front-load stereo cassette deck with Dolby noise-reduction system; two permaflux heads; wow and flutter 0.1%; frequency response 30-14,000 Hz (CrO₂ tape); S/N 50 dB (Dolby out), improved by 10 dB at 5 kHz with Dolby in; two-step bias and equalization switches; three-digit tape counter; two VU meters; separate left and right record level controls; mic/line input switch; 7 1/8" H x 17 1/8" W x 9 1/8" D \$250

TECHNICS by PANASONIC

RS-677US Cassette Deck

Vertical design with front-loading; features Dolby circuit (including switch selector and calibrator for pre-encoded Dolby FM broadcasts); two motors including electronic control for capstan drive; solenoid operation; hot-pressed ferrite head; meter peak-check switch; selectable MPX filter; chromium-dioxide/normal tape selector (either manual or automatic); full auto-stop in any mode; mechanical pause; single level control for record mode with aux. left/right balancer; digital counter; memory rewind with automatic replay; mike/line/tuner inputs with a mic level control for mixing; remote-control box included; vinyl-over-wood cabinet; guaranteed minimum specifications: record/play frequency response 30-15,000 Hz ± 3 dB (chromium-dioxide tape); 30-17,000 Hz ± 3 dB (standard tape); wow and flutter 0.07% wrms; S/N 52 dB (Dolby out), 65 dB (Dolby in); RP-9275 complete six-function remote control included; 5 1/8" H x 17 1/8" W x 13 1/8" D \$500

RS-631 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system; IC-controlled FG servo dc motor; two-head system (HPF record/playback head); memory auto play; separate three-position bias and equalization selectors; built-in muting circuit; peak level check meters plus three-stage (0, 3, 6 dB) LED peak warning indicators; mic/line mixing; full auto stop; timer stand-by mechanism; remaining tape indicator scale; cue and review function; output level control; left and right microphone input jacks; recording indicator lamp; tape counter and reset button; fast-winding time 90 sec (C-60); wow and flutter 0.06% wrms; frequency response 30-17,000 Hz (CrO₂ and FeCr tape), 30-14,000 Hz (normal tape); S/N 67 dB (Dolby on), 57 dB (Dolby off); mic input sensitivity 0.25 mV, impedance 400-20,000 ohms; line sensitivity 60 mV, input impedance 33,000 ohms; 5 1/8" H x 18" W x 10 1/2" D \$300

RS-630TUS Cassette Deck

Four-track stereo record/play front-loading cassette deck with Dolby noise-reduction system; Super-Alloy head for record/play, ferrite head for erase; wow and flutter 0.09% wrms; S/N 63 dB (CrO₂ tape, above 5 kHz, Dolby in), 50 dB (normal tape, Dolby out); frequency response 30-16,000 Hz (CrO₂ tape), 30-14,000 Hz (standard tape); fast-winding time 90 sec (C-60); input 0.25 mV at 600-20,000 ohms (mike), 60 mV at 47,000 ohms (line); output 0.42 V (0 VU) at 50,000 ohms (line), 60 mV at 8 ohms (headphone); automatic play/record with timer stand-by mechanism; left/right dual-level input/output controls; bias and equalization settings for all major tapes; digital tape counter; pause control; 5 1/8" H x 17 1/8" W x 12 3/8" D \$260

RS-615US Cassette Deck

Four-track stereo record/play front-loading cassette deck with Dolby noise-reduction system; Super-Alloy head for record/play, ferrite head for erase; wow and flutter 0.1% wrms; S/N 63 dB (CrO₂ tape, Dolby in), 50 dB (standard tape, Dolby out); frequency response 30-15,000 Hz (CrO₂ tape), 30-14,000 Hz (standard tape); fast-winding time 90 sec (C-60); input 0.25 mV at 600-20,000 ohms (mike), 60 mV at 47,000 ohms (line); output 0.42

V at 50,000 ohms (line), 65 mV at 8 ohms (head-
phone); three-position tape selector; timer stand-by
mechanism; pause control; level meters; 41-step L/
R dual input control; auto stop; recording indicator
lamp; tape counter; 5 1/2" H x 16 1/8" W x 12" D
\$200

Professional Series

RS-9900US Cassette Deck

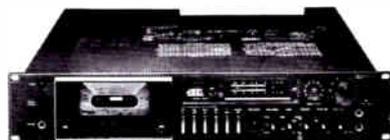
Incorporates closed-loop, double-capstan, three-
motor drive, separate amplifier unit, and Dolby
noise-reduction system; memory play/rewind; pitch
control; remaining tape time meter; calibration con-
trols for Dolby play and record, bias, equalization;
tape/source monitoring; mike attenuator; tape se-
lection switch; 400- and 8-Hz test oscillators; MPX
filter; amp unit: S/N 67 dB with Dolby; 55-dB dy-
namic range (mike amp recording capacity); tape
transport; wow and flutter 0.04% wrms; frequency
response 25-18,000 Hz ± 3 dB (normal tape), to
20,000 Hz with CrO₂ tape; fast-winding time 70 sec
(C-60); two HPF record/play heads and ferrite erase
head; tape transport: 7 3/8" H x 19" W x 14 3/4" D;
amp: 6 1/8" H x 19" W x 14 3/4" D \$1500

RS-7500US Elcaset Deck

Three-head design with automatic tape selection;
full-stop mechanism; memory rewind; timer record-
ing and play; tape monitoring; mike/line mixing;
click and pop muting; two VU meters; separate out-
put level control; wow and flutter 0.06% wrms; fre-
quency response 25-20,000 Hz ± 3 dB (tape type
1), to 22,000 Hz (tape types 11 and 111); S/N 63
dB (tape types II and III); 0.8% dist. with tape type
III; output level/impedance 580 mV/22k ohms
(line), 60 mV/8 ohms (headphone); input sensitivity/
impedance 0.25 mV/400-20,000 ohms (mike),
60 mV/100k ohms (line); has FG servo-controlled
dc motor; 10" H x 17 1/2" W x 13 3/4" D \$680

RSM-85 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-
reduction system; vertical hold, flat component



style; quartz-locked-planer-opposed dc brushless,
coreless, slotless direct drive capstan motor with
servo-controlled circuit; separate coreless reel mo-
tor; full IC logic control; laminated Sendust head;
low noise equalizer and high linearity amplifier;
MPX filter; fluorescent electronic bar graph peak
meters; three-position tape selector; fine bias ad-
justment; electronic full auto-stop; record muting;
mic/line mixing; memory rewind; left and right
channel microphone jacks; stereo headphone jack;
electronic muting circuit; wow and flutter 0.035%
wrms; speed deviations 0.3%; fast-winding time 80
sec (C-60); frequency response 30-16,000 Hz ± 5
dB (CrO₂ and FeCr tape), 30-14,000 Hz ± 3 dB
(normal tape); S/N 59 dB (Dolby off), 69 dB (above
5 kHz, Dolby on); mic input sensitivity 0.25 mV;
microphone impedance 400-10,000 ohms; 3 1/4" H
x 19" W x 15 1/4" D \$650

RS-686DS Portable Cassette Deck

Four-track stereo record/play portable cassette deck
with Dolby noise-reduction system; HPF head for
record/play, Super-Alloy head for monitoring, ferrite
head for erase; wow and flutter 0.07% wrms; S/N
63 dB (above 5 kHz, Dolby in), 53 dB (Dolby out);
frequency response 50-16,000 Hz (CrO₂ tape),
50-14,000 Hz (standard tape); fast-winding time
80 sec (C-60); input 0.25 mV at 400-10,000 ohms
(mike), 60 mV at 100,000 ohms (line); output 0.42
V at 22,000 ohms (line), 0.2 W (monitor speaker),
65 mV at 8-125 ohms (headphone), 65 mV at 8

ohms (earphone); bias and equalization selectors;
left/right peak-check indicators; tape selector/mon-
itor switch; mike attenuator; audio-stop and tape-
end alert eye (silent); 9-V dc (battery, car or ac
adapter); 3" H x 9" W x 7 1/2" D \$600

TOSHIBA

PC-5460 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-
reduction system; servo dc motor; all Sendust re-
cord/playback head; ferrite erase head; three-level/
six-way independent bias equalization; twin, triple
function meters (VU, peak-level, and peak-hold);
editor volume control; mic and line mixing with sepa-
rate right and left channel volume controls; output
level control; timer recording; Dolby FM in/out
switch; tape counter; feather-touch controls; wow
and flutter 0.06% wrms; frequency response
20-17,000 Hz ± 3 dB (chrome tape); S/N 69 dB
(Dolby on, chrome tape); 6" H x 16 1/2" W x 11" D
\$330

PC-4460 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-
reduction system; dc servomotor; hard permalloy re-
cord/playback head; ferrite erase head; three-level/
six-way independent bias equalization selectors;
twin VU meters; +6 dB LED peak indicator; left/
right record level controls; output level control;
switchable MPX filter; timer recording; feather-
touch controls; wow and flutter 0.06% wrms; fre-
quency response 30-16,000 Hz ± 3 dB (chrome
tape); S/N 69 dB (Dolby on, chrome tape); 6" H x
16 1/2" W x 11" D \$260

PC-3460 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-
reduction system; dc servomotor; hard permalloy re-
cord/playback head; ferrite erase head; large twin
VU meters; +6 dB LED peak indicator; three-level/
six-way independent bias equalization selectors;
left/right record level controls; output level control;
switchable MPX filter; cue and review; feather-
touch controls; wow and flutter 0.06% wrms; fre-
quency response 30-16,000 Hz ± 3 dB (chrome
tape); S/N 67 dB (Dolby on, chrome); 5 1/4" H x
16 1/2" W x 11" D \$200

PC-2460 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-
reduction system; dc servomotor; permalloy record/
playback head; ferrite erase head; two wide-range
peak-reading level meters; two-level four-way sepa-
rated bias/equalization controls; left/right record
level controls; built-in MPX filter; wow and flutter
0.1% wrms; frequency response 30-14,000 Hz ± 3
dB (chrome tape); S/N 65 dB (Dolby on, chrome
tape); 6 1/2" H x 16 1/2" W x 11" D \$150

UHER

CG-362 Cassette Deck

Stereo record/play cassette deck with Dolby noise-
reduction system; three-motor drive system; wow
and flutter 0.15% wrms; S/N 68 dB (Dolby on,
chrome tape); frequency response 20-18,000 Hz
(MPX filter off); DNL; switchable MPX filter; auto-
matic bias and equalization switch; three-position
tape selector; RCA and DIN input-output connec-
tors; digital IC logic controls; digital tape counter;
auto-stop; tape-flow control; input mixing and
three-position replay program selector; aux. output
(0.5 W at 4 ohms) for driving motional feedback
speakers \$945

CR-240 Portable Cassette Deck

Compact front-loading portable cassette deck with
Dolby noise-reduction system; collectorless, low-
wear motor with electronic control; two contrarota-
ting flywheels; built-in loudspeaker for mono moni-
toring; automatic start after fast-forward or rewind;
automatic end-of-tape shut-off; switchable a/c;
remote control accessory; clock timer operation; sepa-
rate or tandem (mechanical coupling) record level
controls; twin peak-reading level meters for record
and playback with meter illumination and three LED

function indicators; battery check with quick-action
switch; built-in condenser microphone; linear
stereo power amplifier; stereo headphone jack
socket; joy stick control for selection of three tape
transport functions; wow and flutter 0.2% (DIN);
frequency response 30-16,000 Hz; S/N 58 dB
(Dolby off, FeCr), 66 dB (Dolby on, CrO₂ and FeCr),
65 dB (Dolby on, Fe₂O₃); crosstalk at 1 kHz, -70
dB (reverse track), -45 dB (stereo); mic input 0.2
mV at 500 ohms source impedance; power: ac
mains, dry cells, rechargeable, or car battery; 9 1/2"
x 2 1/2" x 7 1/4" \$780

CR-210 Portable Cassette Recorder

Four-track mono/stereo record/play cassette recor-
der; wow and flutter 0.12% wrms; S/N 58 dB
(chrome tape); frequency response 20-16,000 Hz
(chrome tape); built-in condenser microphone; self-
contained power stage; internal monitor speakers;
photoelectric tape-drive control; on/off a/c switch;
automatic bias switching for CrO₂ tape; operates
from 115-V ac or 12-V battery supply \$664

CG-332 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-
reduction system; hard permalloy tape head; sepa-
rate left and right channel level controls, plus com-
bined master control; adjustable headphone power
stage; three-position tape type selector switch (Fe,
Cr, FeCr); three-digit memory tape counter; tape
run indicator; automatic end-of-tape shut-off; twin
moving-coil VU level meters; LED peak indicator;
wow and flutter 0.13%; frequency response
40-14,000 Hz, 40-17,000 Hz (Cr tape),
40-18,000 Hz (FeCr tape); S/N 56 dB (Dolby off),
62 dB (Dolby on); crosstalk 60 dB (reverse track),
25 dB (stereo); mic input sensitivity 0.2 mV/500
ohms; separate sockets for headphones, left and
right microphones, DIN input/output, line output,
line input; 3.9" H x 15" W x 10.1" D \$399

BR-211 Bracket/Stereo Preamp

Bracket mounted stereo preamplifier for use with
model CR-210 portable cassette recorder; mounts
in car, boat or plane; has bass, treble, balance, and
volume controls; LED on/off indicator; built-in noise
filtering system; frequency response 20-20,000 Hz
 ± 1 dB; THD 0.1%; S/N better than -80 dB below
.775 V rms; radio input impedance greater than
10,000 ohms; 3.25" H x 7.5" W x 8.1" D \$250

WEBCOR

102 Cassette Deck

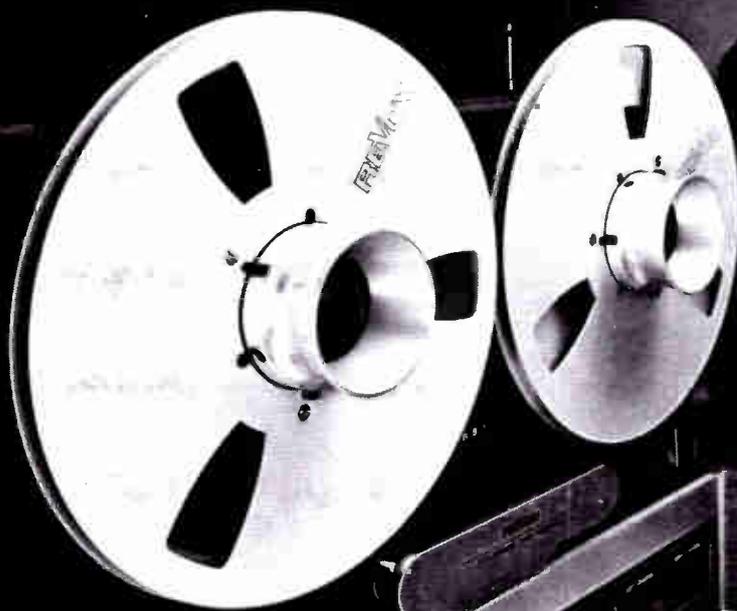
Front-loading stereo cassette deck with Dolby noise-
reduction system; features fast-forward; pause;
capstan drive; ac bias recording; ac erase; mechani-
cal auto stop on record/play; twin VU meters; tape
counter; Dolby on/off switch; separate bias and
equalization selectors; left and right channel vol-
ume controls; two mike jacks; headphone jack; fast-
winding time 100 sec (C-60); wow and flutter
0.25% rms; frequency response 40-10,000 Hz
(Dolby off), 40-12,500 Hz (Dolby on); S/N 40 dB
(Dolby off), 50 dB (Dolby on); microphone input
level -70 dB; 5 1/2" H x 15 1/4" W x 10" D \$170

YAMAHA

TC-800GL Cassette Deck

Cassette deck with Dolby noise-reduction system
designed to operate from ac and 12-volt battery;
super permalloy record/playback head; two meters
(display from -40 dB to +6 dB); push-button tape
selector switches bias, equalization, and record-
level automatically; line and mike mixing circuit;
memory rewind; variable pitch control $\pm 3\%$; built-
in headphone amplifier; fully automatic shut-off;
wow and flutter 0.06% wrms; speed fluctuation
1.0%; fast-forward and rewind; frequency response
30-13,000 Hz (standard), 30-15,000 Hz (chromi-
um-dioxide); 3 3/4" H x 12 1/4" W x 12 1/4" D \$390
TC-800D. Same as TC-800GL except ac operation
only; meter display from -20 dB to +3 dB \$310

real to reel...



sounds best on ReVox B77

Real to reel means live performance recording, and that's where the ReVox B77 dramatically demonstrates its superiority over other tape recorders. Only the B77 has the wide dynamic range and generous record headroom you need to capture without compromise the full detail and dimension of live music.

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If you're thinking of upgrading your real to reel performance, try the ReVox B77. It's available in half or quarter track, 3 $\frac{3}{4}$ -7 $\frac{1}{2}$ or 7 $\frac{1}{2}$ -15 IPS. For complete information and list of demonstrating dealers, circle reader service number or contact us at the address shown below.

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OPEN-REEL TAPE MACHINES

AKAI

PRO-1000 Stereo Tape Deck

Three-speed (15, 7½, and 3¾ ips); ½-track record/play and ¼-track play two-channel stereo system;

AKAI PRO 1000



will handle up to 10½-in reels; double-capstan closed-loop drive system; features one ac servomotor for capstan drive and two six-pole eddy current motors for reel drive; has three GX heads and one full-track erase head; has illuminated VU meters with changeover switch for reading peak/VU and bias; built-in mixing of four different inputs with pan-pots; input selector switch with 30 dB microphone attenuator; full mic/line mixing capability; tape/source monitoring; remote control and timer operation (with optional RC-17 or RC-18); feather-touch full logic solenoid control system; NAB playback standards; recording input level control; independent left and right output volume controls; wow and flutter 0.025% wrms (15 ips), 0.04% wrms (7½ ips), 0.08% wrms (3¾ ips); frequency response 50-20,000 Hz ±1 dB (15 ips), 40-24,000 Hz ±3 dB (7½ ips), 60-12,000 Hz ±3 dB (3¾ ips); THD 1%, 1 kHz, 0VU; S/N 60 dB; fast-forward and rewind time is within 120 sec (1800-ft tape); 16½" H × 18" W × 8" D \$1895

GX-650D Stereo Tape Deck

Three-speed (15, 7½, and 3¾ ips), ¼-track two-channel stereo/mono system; will handle up to 10½-in reels; features closed-loop double capstan mechanism; three motors with ac servo-controlled capstan drive; glass and crystal ferrite heads; response 30-30,000 Hz ±3 dB at 15 ips, 30-26,000 Hz ±3 dB at 7½ ips (both with LN-150 tape); dist. 0.4% at 15 and 7½ ips (1000 Hz, 0 VU); has line/mike mixing; sound-on-sound recording facilities; dual-monitoring system; remote control (with optional RC-17 accessory); automatic stop; pause lever switch; cue switch; individual line-output volume control; tape selector switch (low noise/wide range); four-digit tape index counter; two VU me-

ters; two mike input jacks; stereo headphone jack; RCA-type line input and output jacks; record and pause indicator lamps; 20.6" H × 17.4" W × 10" D \$1195

GX-630D Stereo Tape Deck

Two-speed (7½ and 3¾ ips), ¼-track, two-channel stereo/mono system; will handle up to 10½-in reels; features direct capstan-drive ac servomotor; three-motor tape transport; glass and crystal ferrite heads; response 30-25,000 Hz ±3 dB at 7½ ips (LN 150 tape); dist. 0.5% at 7½ ips (1000 Hz, 0 VU); has dual monitoring system; line/mike mixing; individual recording-mode selector buttons; automatic stop; line-output level control; pause lever switch; two VU meters; headphone output jack; two mike input jacks; recording indicator lamp; DIN connector; RCA-type line input and output jacks, 18.3" H × 17.4" W × 9.4" D \$895

GX-265D Stereo Tape Deck

Two-speed (7½ and 3¾ ips), ¼-track, two-channel stereo mono system; will handle up to 7-in reels; features automatic reverse record and playback; direct capstan-drive ac servomotor; three-motor transport; six-head function; dual monitoring system; glass and crystal ferrite heads; line/mike mixing; individual recording safety-lock buttons; pause lever switch; automatic stop; line-output volume control; four-digit tape index counter; DIN connector; RCA-type line input/output jacks; stereo headphone jack; two mike inputs; two VU meters; directional indicator lamps in recording and playback modes; 15.9" H × 17.4" W × 8.2" D \$795

GX-270D. Similar to GX-265 but with three heads (four-head function); peak-level indicator lamp; add-on recording; 15.9" H × 17.4" W × 8.3" D \$735

GX-230D Stereo Tape Deck

Two-speed (7½ and 3¾ ips), ¼-track, two-channel stereo system; will handle up to 7-in reels; glass and crystal ferrite heads; features automatic and manual reverse playback; automatic stop; pause control; tape selector switch; output level control; expanded VU meters; dual monitoring; independent line/mike controls; sound mixing; 15.6" H × 17.3" W × 8.1" D \$635

4000 DS Mk-II Stereo Tape Deck

Two-speed (3¾ and 7½ ips), ¼-track, two-channel stereo; wow and flutter 0.07% rms at 7½ ips; response 30-26,000 Hz ±3 dB at 7½ ips; THD 1.5%; S/N 50 dB; bias frequency 100 kHz; has separate record, play, and erase heads; line output 1.23 V; inputs: mike (0.8 mV) and line (60 mV); features selector switch for regular or low-noise tape; sound-on-sound; sound-with-sound; mixing; automatic shut-off; pause control; 12.4" H × 16" W × 7.7" D \$385

4000DB. Same as 4000DS but with Dolby built in \$460

1722W Tape Recorder

Two speed (3¾ and 7½ ips), ¼-track, two-channel stereo; wow and flutter 0.14% rms at 7½ ips; response 30-21,000 Hz ±3 dB at 7½ ips; THD 2%; S/N 50 dB; bias frequency 63 kHz; has one record/

playback and one erase head; inputs: mike (0.5 mV) and line (150 mV); two built-in 5" × 7" speakers; features PA capability, automatic shut-off, equalizer preamp for direct phono input, selector switch for regular or low-noise tape; 14.1" H × 14" W × 9.8" D \$435

4-Channel

GX-630DSS 4-Channel Tape Deck

Four-channel or stereo record and playback; features four GX glass and single crystal heads; A-B monitoring in either mode; two-speed (7½ and 3¾ ips); full-logic function controls; "Quadra-Sync" recording; mic/line mixing; left/right track selector; pitch control (±5%); tape select switch; line output control; auto-stop, pause control with lock; will handle up to 10½-in reels \$1175

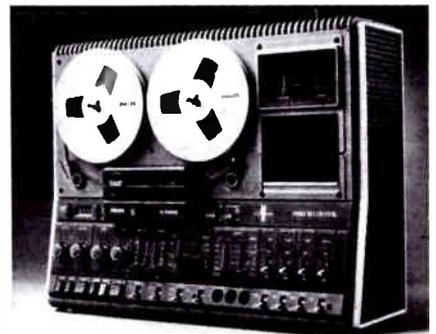
GX-270DSS 4-Channel Tape Deck

¼-track, four and two channel record/play deck; will handle 7-in reels; ac servo direct-drive capstan motor plus two eddy current motors for fast-forward and rewind; four GX heads; three-head function; full logic solenoid function controls; automatic stereo reverse playback; tape/source monitoring; "Quadra-Sync" recording; pitch control for record/playback (±5%); line output control; mic/line mixing; auto stop; tape speed: 7½ and 3¾ ips; wow and flutter 0.07% rms (7½ ips); S/N 54 dB (measured via tape with peak recording level of +6 VU); frequency response 30-21,000 Hz ±3 dB; distortion 1% (1000 Hz, 0 VU); 18.3" H × 17.3" W × 7.5" D \$995

PHILIPS

N4506 Tape Recorder

Three-motor, three-head, peramplified tape recorder; dynamic noise limiter; A-B monitor switch; two



peak-reading meters; direct switchable tape direction; input selection and level adjustment of phono, tuner, aux., and line; three speeds (7½, 3¾, 1½ ips); max. reel diameter 7-in; frequency response 35-11,500 Hz (7½ ips), to 20,000 Hz (3¾ ips), to 26,000 Hz (1½ ips); S/N (without DNL) 60 dB (7½ and 3¾ ips), 58 dB (1½ ips); wow and flutter 0.05% (7½ ips), 0.07% (3¾ ips), 0.2% (1½ ips);

2

OPEN-REEL TAPE MACHINES

fast-winding time 180 sec (1800 ft); channel separation 30 dB; track separation 60 dB; full complement of inputs/outputs; 17" H x 21 3/4" W x 8 1/4" D \$650

N4504 Tape Recorder

Three-motor, three-head tape recorder; two peak-reading meters; direct switchable tape direction; A-B monitor switch; dynamic nose limiter; three speeds (7 1/2, 3 3/4, 1 7/8 ips); max. reel diameter 7-in; frequency response 35-11,500 Hz (1 7/8 ips), to 20,000 Hz (3 3/4 ips), to 26,000 Hz (7 1/2 ips); S/N (without DNL) 60 dB (7 1/2 and 3 3/4 ips), 58 dB (1 7/8 ips); wow and flutter (wrms) 0.05% (7 1/2 ips), 0.07% (3 3/4 ips), 0.2% (1 7/8 ips); fast-winding time 180 sec (1800 ft); channel separation 25 dB; track separation 60 dB; full complement of inputs/outputs; 16 3/4" H x 16 3/8" W x 7 1/4" D \$450

PIONEER

RT-2022 Stereo Tape Deck

Two-speed (7 1/2 and 15 ips), 1/2-track, three-motor, three-head stereo deck; will handle up to 10 1/2-in reels; 1/4 pole hysteresis synchronous motor; two six-pole inner-rotor induction motors for reel drive; solenoid-operated direct-change function buttons; separate transport and amplifier units; plug-in head assembly; scrape filter; continuously variable tape bias, two-step tape equalizer and tape selector with time-constant switch mechanism for use with all types of tape; wide-dynamic-range playback amplifier; independent recording amplifier for line and mike input/output; "synchromonitor" mechanism for sound-on-sound, sound-with-sound; wow and flutter 0.04% wrms at 15 ips, 0.08% wrms at 7 1/2 ips; S/N 55 dB; THD 0.8% max. at 15 ips, 1.0% max. at 7 1/2 ips; response 30-28,000 Hz ± 3 dB at 15 ips, 40-20,000 Hz ± 3 dB at 7 1/2 ips; full complement of inputs and outputs; 21 1/2" H x 18 1/8" W x 10 13/16" D \$1250

RT-1050 Stereo Tape Deck

1/2-track, two-speed (15 and 7 1/2 ips), three-motor, three-head stereo deck; has 1/4 pole, two-speed hys-



teresis synchronous motor (capstan drive) and six-pole inner-rotor induction motor (reel drive); response 30-22,000 Hz ± 3 dB at 15 ips; 40-20,000 Hz ± 3 dB at 7 1/2 ips; wow and flutter 0.04% wrms at 15 ips, 0.08% wrms at 7 1/2 ips; S/N 57 dB; stereo channel separation 53 dB at 1000 Hz; 125 kHz bias frequency; features three-step bias selector; four-step EQ selector; dual-scale level meters; recording peak indicator; lockable electronic controls (including pause); two pairs of line inputs; full complement of inputs and outputs; 17 1/8" H x 18 1/8" W x 9 5/8" D \$800

RT-1011L Stereo Tape Deck

1/2-track, two-speed (7 1/2 and 3 3/4 ips), three-motor,

three-head stereo deck; 1/4 pole hysteresis synchronous motor; two six-pole inner-rotor induction motors for reel drive; solenoid-operated direct-changeable function buttons; mechanically lockable function buttons for automatic recording facility; wow and flutter 0.08% wrms (7 1/2 ips), 0.1% (3 3/4 ips); frequency response 40-20,000 Hz ± 3 dB (7 1/2 ips), 40-12,000 Hz ± 3 dB (3 3/4 ips); S/N 55 dB; dist. 1%; crosstalk -50 dB; has full complement of inputs and outputs; will handle up to 10 1/2-in reels; 16 7/8" H x 16 7/8" W x 8 3/8" D \$675

RT-707 Stereo Tape Deck

Auto-reverse playback stereo reel to reel tape deck; two speed (3 3/4 and 7 1/2 ips); speed accuracy ± 0.5%; three-motor, four-head, 1/2-track, two-channel design; handles 7-in reels; FG servo ac direct drive motor for capstan drive; two six-pole inner-rotor induction motors for reel drive; solenoid operated, direct switchable function buttons and preset function buttons for timer record and play; wow and flutter 0.05% wrms (7 1/2 ips), 0.08% wrms (3 3/4 ips); S/N 58 dB; dist. 1% max. (7 1/2 ips); fast rewind 100 sec (7-in reel); frequency response 30-24,000 Hz ± 3 dB (7 1/2 ips), 30-16,000 Hz ± 3 dB (3 3/4 ips); crosstalk -50 dB; channel separation 50 dB; pitch control ± 6% (playback only); auto and manual reverse play; auto repeat play; independent L/R recording mode selectors; two bias and two equalization tape selection; full complement of inputs/outputs; 9 1/8" H x 18 29/32" W x 14 1/32" D \$600

RT-701 Stereo Tape Deck

Two speed (3 3/4 and 7 1/2 ips) design; speed accuracy ± 0.5%; three-motor, three-head design; FG servo ac direct drive motor for capstan drive; two six-pole inner-rotor induction motors for reel drive; solenoid operation; direct switchable function buttons and preset function buttons for timer record and play; permalloy heads; 7-in reel capacity; fast rewind 100 sec; wow and flutter 0.05% wrms (7 1/2 ips), 0.08% wrms (3 3/4 ips); S/N 58 dB; dist. 1% (7 1/2 ips); frequency response 30-24,000 Hz ± 3 dB (7 1/2 ips); 30-16,000 Hz ± 3 dB (3 3/4 ips); crosstalk -50 dB; channel separation 50 dB; pitch control ± 6% (playback only); line/mike mixing; two bias and two equalization tape selectors; full complement of inputs/outputs; 9 1/8" H x 18 29/32" W x 14 1/32" D \$525

4-Channel

RT-2044 4-Channel Tape Deck

Same as RT-2022 stereo deck except with two TAU-11 amplifier units; 37 1/16" H x 18 1/8" W x 10 13/16" D \$1625

RT-1020L 4-Channel Tape Deck

Three-motor, three-head stereo tape deck with four-channel reproduction capability; has 1/4 pole two-speed hysteresis synchronous motor (capstan drive) and two six-pole inner-rotor induction motor (reel drive); operates at 7 1/2 and 3 3/4 ips; wow and flutter less than 0.08% wrms at 7 1/2 ips, less than 0.1% wrms at 3 3/4 ips; S/N 55 dB; dist. less than 1%; response 40-20,000 Hz ± 3 dB at 7 1/2 ips; crosstalk 60 dB, stereo channel separation 50 dB both at 1000 Hz; inputs; mike 0.25 to 80 mV; line 50 mV to 25 V; DIN 15 mV to 1.5 V outputs: line 316 mV; DIN 316 mV; headphone 40 mV (4 to 16 ohms); features three-position bias selector, two-position equalizer selector, lockable pause lever, four-digit tape counter, independent left/right tape monitor switches, four-ch/two-ch playback mode selector, independent right/left recording mode selectors, four-channel front, rear monitor mode selectors, independent mike and line recording level controls, output level controls; will accept up to 10 1/2-in reels \$750

SONY from SUPERSCOPE

TC-880-2 Open-Reel Deck

Two-speed (15, 7 1/2 ips) two-track (rec/play), four-track (play), stereo record/play deck; ac servomotor

capstan drive, induction motor reel drive; wow and flutter 0.02% wrms (15 ips), 0.03% wrms (7 1/2 ips); S/N 59 dB (standard tape), 62 dB (SLH-180 tape), 65 dB (FeCr tape); frequency response 25-30,000 Hz ± 2 dB (15 ips), to 20,000 Hz (7 1/2 ips) with standard tape; 20-45,000 Hz ± 2 dB (15 ips), 25-25,000 Hz (7 1/2 ips) with SLH-180 tape; 20-47,000 Hz ± 2 dB (15 ips) with FeCr tape; fast-winding time 150 sec (2400 ft); bias frequency 160 kHz; input 0.06 V at 100,000 ohms (line), -72 dB (lo-Z mike); output 0.435 V at 10,000 ohms (line), 8-ohm headphone; 10 1/2-in max. reel size; four-head (ferrite-and-ferrite) design; "Symphase" recording capability; three-position equalization selection; two position bias selection; VU meters (VU, peak, peak hold modes); four-digit tape counter; pause control; 20 3/8" H x 18 1/8" W x 10 1/4" D \$2495

TC-766-2 Open-Reel Deck

Two-speed (15, 7 1/2 ips) two-track (rec/play), four-track (play), stereo record/play deck; ac servomotor capstan drive; wow and flutter 0.018% wrms (15 ips), 0.04% wrms (7 1/2 ips); S/N 64 dB (FeCr tape); frequency response 30-22,000 Hz (15 ips), to 18,000 Hz (7 1/2 ips) with standard tape; 30-30,000 Hz (15 ips), to 25,000 Hz (7 1/2 ips) with SLH and FeCr tape; fast-winding time 150 sec (2400 ft, 10-in reel); bias frequency 160 kHz; input 0.06 V at 100,000 ohms (line), 72 dB (lo-Z mike); output 0.435 V at 10,000 ohms (0.775 V when PB level is set to detented position), 8-ohm headphone; 10 1/2-in max. reel size; four head (ferrite-and-ferrite) design; "Symphase" recording capability; three-position equalization and bias switches; illuminated VU meters; four-digit tape counter; pause control; 20 3/8" H x 17 1/2" W x 9 1/4" D \$1195

TC-758 Stereo Tape Deck

Three-motor, automatic-reverse stereo tape deck; 7 1/2 and 3 3/4 ips speeds; will handle up to 10 1/2-in reels; response 30-20,000 Hz ± 3 dB (standard tape), 30-25,000 Hz ± 3 dB (SLH-180 tape), both at 7 1/2 ips; features 4-digit counter; illuminated pause control with lock; illuminated VU meters; full complement of inputs and outputs; ferrite-and-ferrite heads; walnut base. 17 1/8" H x 17 3/4" W x 8 3/4" D \$1150

TC-765 Open-Reel Deck

Two-speed (7 1/2, 3 3/4 ips) four-track stereo record/play deck; three-motor drive system, ac servo control motor; wow and flutter 0.08% (3 3/4 ips), 0.04% (7 1/2 ips); S/N 61 dB (FeCr tape); frequency response 30-18,000 Hz (7 1/2 ips) and 30-15,000 Hz (3 3/4 ips) with standard tape, 30-25,000 Hz (7 1/2 ips) and 30-18,000 Hz (3 3/4 ips) with SLH tape, 30-25,000 Hz (7 1/2 ips) and 30-18,000 Hz (3 3/4 ips) with FeCr tape; fast-winding time 150 sec (2400 ft, 10-in reel); bias frequency 160 kHz; input 0.06 V at 100,000 ohms (line), 72 dB (lo-Z mike); output 0.435 V (0 VU) at 10,000 ohms (0.775 V max. when PB level is set to detented position), 8-ohm headphone; 10-in max. reel size; three-head (ferrite-and-ferrite) design; "Symphase" recording capability; three-position bias and equalization selection; calibrated VU meters; pause control; four-digit tape counter; sound-on-sound; 110 W; 20 3/8" H x 17 1/2" W x 9 1/4" D \$1125

TC-377 Open-Reel Deck

Three-speed (7 1/2, 3 3/4, 1 7/8 ips) four-track stereo record/play deck; three-head design; one induction motor; wow and flutter 0.09% (7 1/2 ips); S + N/N 52 dB (standard tape), 55 dB (SLH-180 tape); frequency response 30-20,000 Hz ± 3 dB (7 1/2 ips); bias frequency 160 kHz; input 0.06 V (aux.), -72 dB (mike); output 0.775 V (line); VU meters; mike-line record level mixing controls; tape select switch for Sony standard or low-noise, high-output tape; pause control; automatic total mechanism shutoff; reversible base for vertical or horizontal operation; 8 3/8" H x 16 1/2" W x 15 1/2" D \$450

TC-105A Open-Reel Monaural Recorder

Three-speed (7 1/2, 3 3/4, 1 7/8 ips) four-track record/monaural recorder; two-head design; one induction motor; wow and flutter 0.12% (7 1/2 ips),

0.15% (3 $\frac{3}{4}$ ips), 0.2% (1 $\frac{1}{2}$ ips); S/N 46 dB (standard tape); frequency response (standard tape) 40-18,000 Hz (7 $\frac{1}{2}$ ips), 40-13,000 Hz (3 $\frac{3}{4}$ ips), 50-60,000 Hz (1 $\frac{1}{2}$ ips); fast-winding time 140 sec (1200 ft); 7-in max. reel size; input 0.034 V at 100,000 ohms (aux.), -77 dB (lo-Z mike); output 5 W rms at 8 ohms (extension speaker), 3.5 V at 10,000 ohms (earphone/monitor); VU meter; built-in speaker; PA capability; pause control; three-digit tape counter; automatic shutoff; 13 $\frac{3}{8}$ " H x 14 $\frac{1}{2}$ " W x 7 $\frac{1}{2}$ " D..... \$370

4-Channel

TC-788-4 Quadradial Deck

Two-speed (15, 7 $\frac{1}{2}$ ips) four-track quadradial, stereo, mono open-reel deck; three-head design; ac



servomotor capstan drive; wow and flutter 0.04% (15 ips), 0.06% (7 $\frac{1}{2}$ ips); S/N 53 dB (standard tape), 56 dB (SLH-180 tape); frequency response 20-30,000 Hz (15 ips), 30-22,000 Hz \pm 3 dB (15 ips), 20-23,000 Hz (7 $\frac{1}{2}$ ips), 30-17,000 Hz \pm 3 dB (7 $\frac{1}{2}$ ips) all with standard tape, 20-35,000 Hz (15 ips), 30-28,000 Hz \pm 3 dB (15 ips), 20-28,000 Hz (7 $\frac{1}{2}$ ips), 30-23,000 Hz \pm 3 dB (7 $\frac{1}{2}$ ips) all with SLH-180 tape; fast-winding time 150 sec (2400 ft); bias frequency 160 kHz; input 0.06 V at 100,000 ohms (line), -72 dB (lo-Z mike); output 0.775 V at 10,000 ohms (max. PB volume), 8-ohm headphones; 10 $\frac{1}{2}$ -in max. reel size; tape/source monitoring; record equalization selector switch; VU meters; pause control; four-digit tape counter; automatic total mechanism shutoff; "Syncro-Trak"; mechanical memory capability; four record mode switches and pan pots; 22" H x 17 $\frac{3}{8}$ " W x 8 $\frac{1}{2}$ " D..... \$1595

TC-388-4 Quadradial Deck

Two-speed (7 $\frac{1}{2}$, 3 $\frac{3}{4}$ ips) four-track quadradial, stereo, mono open-reel deck; three-head design; one induction motor; wow and flutter 0.09% wrms (7 $\frac{1}{2}$ ips), 0.12% wrms (3 $\frac{3}{4}$ ips); S/N 52 dB (standard tape), 55 dB (SLH-180 tape); frequency response 20-25,000 Hz (7 $\frac{1}{2}$ ips) and 30-17,000 Hz (3 $\frac{3}{4}$ ips) with standard tape, 20-30,000 Hz (7 $\frac{1}{2}$ ips), 20-25,000 Hz \pm 3 dB (7 $\frac{1}{2}$ ips), 30-19,000 Hz (3 $\frac{3}{4}$ ips) with SLH-180 tape; fast-winding time 100 sec (1800 ft); bias frequency 160 kHz; input 0.06 V at 100,000 ohms (line), -72 dB (lo-Z mike); output 0.775 V at 10,000 ohms (line), 8-ohm headphone; 7-in max. reel size; tape/source monitoring; record equalization selector switch; illuminated VU meters; pause control; four-digit tape counter; pan pot on/off switch; automatic total mechanism shutoff; vertical or horizontal operation; 19 $\frac{1}{4}$ " H x 16 $\frac{1}{8}$ " W x 8 $\frac{1}{2}$ " D..... \$680

TC-277-4 Quadradial Deck

Three-speed (7 $\frac{1}{2}$, 3 $\frac{3}{4}$, 1 $\frac{1}{2}$ ips) four-channel open-reel deck; wow and flutter 0.12% (7 $\frac{1}{2}$ ips); S/N 52 dB; frequency response 50-16,000 Hz \pm 3 dB (7 $\frac{1}{2}$ ips); two-head design; four inputs; four line outputs (one per channel); input sensitivity 0.06 V; 15 $\frac{1}{2}$ " H x 15 $\frac{3}{4}$ " W x 7 $\frac{3}{4}$ " D..... \$470

STUDER/REVOX

A700 Stereo Tape Recorder

Three-motor, three-speed (15, 7 $\frac{1}{2}$, 3 $\frac{3}{4}$ ips) recorder; features computer-type digital control logic with memory circuits; quartz-crystal speed-control reference; frequency and phase servo system for capstan speed control; two tape-tension sensors governing servo-controlled reel motors; has logic-controlled tape tension which is automatically maintained even with mixed reel sizes; electronic tape-motion sensor; minutes and seconds readout on tape counter; plug-in head assembly (1 $\frac{1}{4}$ or 1 $\frac{1}{2}$ track available); three heads (with fourth control head optional); fail-safe auto stop logic to eliminate possibility of tape breakage; electronic pause control operating on all functions; instant repeat play control; continuous unattended record or play function; solid-state switching of audio circuits; features built-in four-input mixer; switched selection of 12 input sources including four balanced hi/lo mike inputs; built-in magnetic phono preamp; master record-level slide fader; stereo echo; five independent stereo outputs; standard zero-level line outputs and level and tone-controlled outputs; VU meters with instantaneous over-modulation indicators; variable speed (+ or - 7 halftones with remote-control accessory); variable speed (2.5 to 21.5 ips with external oscillator); input or off-tape metering \$2495

B-77 Stereo Tape Recorder

Three-motor, two-speed (3 $\frac{3}{4}$ and 7 $\frac{1}{2}$ ips) recorder; handles up to 10 $\frac{1}{2}$ -in reels; features integrated



drive logic, operation by computer-type pushpoint keys, and built-in tape cutter close to headblock; dual VU meters with peak level indicators; remote control of all functions and electric timer operation possible; wow and flutter (DIN) 0.1% at 3 $\frac{3}{4}$ ips, (IEEE) 0.08% at 7 $\frac{1}{2}$ ips; winding time approx. 135 sec for 3600-ft tape; frequency response 50-10,000 Hz \pm 1.5 dB at 3 $\frac{3}{4}$ ips, 50-15,000 Hz \pm 1.5 dB at 7 $\frac{1}{2}$ ips; S/N at 1 $\frac{1}{2}$ -track 63 dB (3 $\frac{3}{4}$ ips), 66 dB (7 $\frac{1}{2}$ ips), at 1 $\frac{1}{4}$ -track 59 dB (3 $\frac{3}{4}$ ips), 62 dB (7 $\frac{1}{2}$ ips); microphone input impedance, (position lo) 0.15 mV/2.2k ohms for 50-600 ohm mikes, (position hi) 2.8 mV/110k ohms for microphone impedances up to 20k ohms; connectors for remote control of tape transport functions, remote control of variable tape speed, slide projector or crossfade unit; 16.3" H x 17.8" W x 8.14" D..... \$1295

A77 MkIV 1102 Tape Deck

Two-speed (1 $\frac{1}{4}$ /3 $\frac{3}{4}$, 3 $\frac{3}{4}$ /7 $\frac{1}{2}$ or 7 $\frac{1}{2}$ /15 ips), 1 $\frac{1}{2}$ -track, three-motor, three-head deck; will handle up to 10 $\frac{1}{2}$ -in reels; response 30-20,000 Hz \pm 2.5 dB at 7 $\frac{1}{2}$ ips; wow and flutter 0.08% peak at 7 $\frac{1}{2}$ ips; (S + N)/N 61 dB at 7 $\frac{1}{2}$ ips; has a servo braking system, VU meters, automatic shut-off, relay and solenoid operation, full remote control, and off-the-tape monitoring; options include plug-in power amplifiers, a suitcase version with built-in speakers, metal cage for rack or custom mounting; 16 $\frac{1}{2}$ " H x 14 $\frac{3}{8}$ " W x 7 $\frac{1}{2}$ " D..... \$999

Model A77 MkIV 1104. A 1 $\frac{1}{4}$ -track version of Model 1102; same options available \$999
A77 MkIV Dolby B Deck. Same as 1102 or 1104 but with Dolby B noise-reduction system; has separate compressors and expanders for each channel; (S + N)/N 70 dB (ASA A curve weighted) at 7 $\frac{1}{2}$ ips, 1 $\frac{1}{2}$ -track \$1199

TANDBERG

TD 20A "Baron" Open-Reel Deck

Actilinear recording system; active transconductance circuit for lower intermodulation; Sel Sync



built-in; four-motor solenoidless operation; phase linearity network; push-button operation with LED indicators, including "Free" position for easy tape editing and threading; stand-by position with LED when one or both record buttons are engaged; electronically-governed speed; optional infrared (wireless) remote control or conventional cord remote control; four line inputs and master control for fading in/out; two-step front panel switch for mic attenuation (25 dB); very wide scale, peak-reading VU meters; front panel accessible bias adjustment; available in three versions:

7 $\frac{1}{2}$ and 3 $\frac{3}{4}$ ips; 1 $\frac{1}{4}$ -track..... \$1200
15 and 7 $\frac{1}{2}$ ips; 1 $\frac{1}{4}$ -track..... \$1250
15 and 7 $\frac{1}{2}$ ips; 1 $\frac{1}{2}$ -track..... \$1300
Carrying case with/without wheels \$160/\$130

Series 15 Open-Reel Recorder

Three-speed (7 $\frac{1}{2}$, 3 $\frac{3}{4}$, 1 $\frac{1}{2}$ ips), mono record/play open-reel recorder; wow 0.1% at 7 $\frac{1}{2}$ ips; frequency response 40-18,000 Hz \pm 2 dB at 7 $\frac{1}{2}$ ips; S + N/N 55 dB at max. record level; 5 W/channel continuous, both channels driven; preamp output 0.75 V; low-Z mic; high- and low-level inputs; 6 $\frac{3}{4}$ " H x 13 $\frac{3}{8}$ " W x 11 $\frac{1}{8}$ " D.

1541 F, 1521 F. 1 $\frac{1}{4}$ -track; 1 $\frac{1}{2}$ -track \$600

TEAC

A-6600 Stereo Tape Deck

Two speed (7 $\frac{1}{2}$ and 3 $\frac{3}{4}$ ips), 1 $\frac{1}{4}$ -track, two-channel deck; will handle reels up to 10 $\frac{1}{2}$ -in; four heads



(erase, record, play, reverse playback); features auto-reverse and counter repeat; two capstans, one for each direction; tape guide rollers; cueing facility for both forward and reverse tracks; record mode indicator lights; auto spacer for inserting blank spaces between selections; separate left and right level controls; master gain controls for mic and line in-

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OPEN-REEL TAPE MACHINES

puts; hi and low bias and equalization settings; three-position monitor switch; peak LEDs flash at 10 VU (7 1/2 ips) and 8 VU (3 3/4 ips); remote control with optional RC-80..... \$1400

A-6100 Mark II Stereo Tape Deck

Two speed (15 and 7 1/2 ips), 1/2-track, two-channel deck; will handle reels up to 10 1/2-in; four heads (erase, record, play, 1/4-track playback); features two peak-reading LED level indicators; timer control; servo-controlled supply reel; manual cue lever which defeats tape lifters during last modes for fast search, cueing, and editing; flip-up hinged head cover; memory stop function..... \$1350

A-6300 Stereo Tape Deck

Two-speed (7 1/2, 3 3/4 ips), 1/4-track, two-channel stereo with four heads (erase, record, playback, reverse playback), three motors; will handle 10 1/2-in and 7-in reels; features auto-reverse, mike/line mixing, automatic repeat by memory counter, total remote-control capability; response 40-24,000 Hz; wow and flutter 0.06% both at 7 1/2 ips; S/N 65 dB (wtd at 3% THD)..... \$1150

A-6100 Stereo Tape Deck

Two-speed (15, 7 1/2 ips), 1/2-track, two-channel stereo with four heads (erase, record, playback, four-track playback); three motors; will handle 10 1/2-in and 7-in reels; features cue button and flip-up head cover for easy editing; auto stop counter; mike attenuation control; LED peak level indicators; response 30-26,000 Hz at 15 ips; wow and flutter 0.04% at 15 ips; S/N 67 dB (wtd at 3% THD); 20 1/2" H x 17 3/4" W x 8 1/4" D..... \$1150

A-3300SX-2T Tape Deck

Two-speed (15, 7 1/2 ips), 1/2-track, two-channel stereo or mono deck; one dual-speed hysteresis synchronous capstan motor; two eddy-current induction reel motors; three heads; will handle 7-in and 10 1/2-in reels; wow and flutter 0.04% (15 ips), 0.06% (7 1/2 ips) NAB weighted; S/N 60 dB; frequency response 30-26,000 Hz ±3 dB at 15 ips, 30-24,000 Hz ±3 dB at 7 1/2 ips; THD 1% at 1 kHz; independent left/right channel source/tape selectors; VU-type level meters; manual cue lever; separate bias and equalization selectors; 17 3/8" H x 17 1/2" W x 8 3/4" D..... \$1000

A-3300SX Stereo Tape Deck

Two-speed (7 1/2, 3 3/4 ips), 1/4-track, two-channel deck; will handle up to 10 1/2-in reels; offers remote-control capability; push-button transport control with logic circuitry; dual level bias oscillator for low-noise recording; dc-coupled equalization network; features dual VU meters; pause control with indicator light; separate mic/line level controls; tape/source monitor switch; stereo headphone jacks; four-digit resettable tape counter; response 40-24,000 Hz at 7 1/2 ips; 40-16,000 Hz at 3 3/4 ips; wow and flutter 0.06% at 7 1/2 ips; S/N 65 dB (wtd at 3% THD); 17 3/8" H x 17 1/2" W x 8 3/4" D. \$900

A-4300SX Stereo Tape Deck

Two speed (7 1/2, 3 3/4 ips), 1/2-track, two-channel stereo deck; dual-speed hysteresis synchronous capstan motor; two eddy current induction reel motors; four heads (erase, record, forward play, and reverse play); features auto-reverse, will handle 7-in and 5-in reels; wow and flutter 0.06% at 7 1/2 ips; S/N 58 dB; frequency response 30-28,000 Hz; 40-24,000 Hz ±3 dB at 7 1/2 ips; THD 1% at 1 kHz; VU-type level averaging meters; automatic reverse; independent level controls for mic/line mixing; left/right channel record mode selectors for making mono recordings and adding sound-on-sound effects with external equipment; 17 3/8" H x 19 1/4" W x 8 1/2" D..... \$900

A-2300SD Dolbyized Stereo Deck

Two-speed (7 1/2, 3 3/4 ips) 1/4-track, two-channel deck; features push-button transport control with

logic circuitry; dual VU meters; separate bias/equalization switches; record/pause lights; total remote-control capability; Dolby noise-reduction circuitry and lights; three motors; response 40-24,000 Hz at 7 1/2 ips; wow and flutter 0.08% at 7 1/2 ips; S/N 74 dB (wtd, at 3% THD, with Dolby); 17 3/8" x 15 3/4" x 8 1/2"..... \$800

A-2300SX Stereo Tape Deck

Two-speed (7 1/2, 3 3/4 ips), 1/4-track, two-channel stereo deck; dual-speed hysteresis synchronous capstan motor; two eddy-current induction reel motors; three heads; will handle 7-in reels; wow and flutter 0.08% wrms at 7 1/2 ips; S/N 58 dB; frequency response 40-24,000 Hz ±3 dB at 7 1/2 ips; THD 1% at 1 kHz; two-position bias and equalization selectors; independent dual-concentric input level controls for mic/line mixing; VU-type level averaging meters; 15 7/8" H x 17 3/8" W x 8 3/4" D..... \$700

A-2300SR. Similar, but with auto-reverse..... \$800

4-Channel

A-3440 4-Channel Tape Deck

Multi-channel, three-motor, three-head, 1/4-track tape deck with 15 and 7 1/2 ips tape speeds; features "Simul-Sync"; function select and output select switches; micro-switch transport controls; headphone monitor select; manual cueing; pitch control; independent mic/line input selectors; four wide-range VU meters; independent output level controls; optional dbx noise-reduction interface; front-panel input jacks for four unbalanced low or high impedance microphones; LED function indicators; will take 7-in and 10 1/2-in reels; wow and flutter (NAB, weighted) 0.04% at 15 ips, 0.06% at 7 1/2 ips; frequency response 40-22,000 Hz ±3 dB (15 ips, 0 VU), 40-20,000 Hz ±3 dB (7 1/2 ips, 10 VU); S/N 65 dB (3% THD level weighted); 0.8% harmonic dist.; stereo channel separation 45 dB at 1 kHz; fast-winding time 140 sec with 1800-ft tape; four mic inputs 0.25 mV (-72 dB)/600 ohms; 20 1/2" H x 17 1/2" W x 9 1/4" D..... \$1500

A-2340SX Multichannel Tape Deck

Two-speed (7 1/2, 3 3/4 ips), 1/4-track with "Simul-Sync"; one dual-speed hysteresis synchronous capstan motor; two eddy-current induction reel motors; three heads; will handle 7-in and 5-in reels; wow and flutter 0.08% at 7 1/2 ips; S/N 55 dB; frequency response 30-22,000 Hz at 7 1/2 ips; THD 1.0% at 1 kHz; independent source/tape output selector each channel; four VU-type level averaging meters; four independent record mode selectors; four front-panel mic inputs; two stereo headphone jacks; independent input level controls for mic/line mixing for each of four channels; record indicator lights for each channel; digital tape counter; 2-channel/4-channel playback selector; 17 3/8" H x 18 3/4" W x 8 3/4" D..... \$1125

TECHNICS by PANASONIC

RS-1520US Open-Reel Deck

Compact professional tape deck; 1/2-track, two-channel recording/playback and 1/4-track, two chan-



nel playback; four head system; three speeds (15, 7 1/2, 3 3/4 ips); quartz control phase-locked dc brush-

less servo direct-drive capstan motor; reel tables; two-tape tension controlled dc brushless direct drive motors; isolated loop direct-drive transport system; full IC logic tape transport functions; direct switching from mode-to-mode without tape strain; separate left and right bias and equalization controls; left and right VU meters; built-in stroboscope; wow and flutter 0.018% wrms (15 ips), 0.3% wrms (7 1/2 ips); fast-winding time 150 sec with 2500-ft tape; frequency response 30-30,000 Hz ±3 dB (15 ips), 30-25,000 Hz ±3 dB (7 1/2 ips); S/N 60 dB; 0.8% dist.; 50 dB channel separation; mic input sensitivity 0.25 mV (-72 dB); microphone impedance 200-10,000 ohms; 17 1/2" H x 18" W x 10 1/4" D..... \$1900

RS-1506US. Similar to RS-1520US except 1/4-track, two-channel recording/playback and 1/2-track, two-channel playback..... \$1600

RS-1700US. Similar to RS-1506US except auto-reverse in both recording and playback modes; 1/4-track, two-channel; six-head system..... \$1700

UHER

SG-631 Logic Open-Reel Deck

Three-speed (7 1/2, 3 3/4, 1 1/8 ips) two- or four-track stereo record/play deck; Omega looping system eliminates pinch roller, drive couplings, springs, and function wheels, four-motor drive system includes two dc hub motors, an electronically regulated capstan drive, and a servo-motor to form the Omega loop; wow and flutter 0.02%; S/N 67 dB (two-track at 7 1/2 ips); built-in strobe disc; speed control; peak-reading meter; built-in "Dia-Pilot" for recording signal impulses and automatic slide-projector control; switchable peak-level limiter; separate stereo headphone power with volume, bass, and treble controls; A/B monitoring; remote-control facilities; 10 1/2-in reel, max..... \$1665

SG-560 Open-Reel Recorder

Four speed (7 1/2, 3 3/4, 1 1/8, 1/4 ips) two- or four-track stereo record/play recorder; wow and flutter 0.02%; S/N 68 dB (rms A curve at 7 1/2 ips); frequency response 20-22,000 Hz; reverberation and concert-hall effects; sound-on-sound; sound-with-sound; two integrated stereo input mixing facilities; built-in "Dia-Pilot" for recording signal impulses and automatic slide-projector control; electronic section (with tape drive system off) serves as stereo amplifier (10 W/ch continuous power output); 7-in. max. reel size; four-digit counter..... \$1050

4200 Report IC Recorder

Four-speed (7 1/2, 3 3/4, 1 1/8, 1/4 ips) two-track stereo record/play recorder; wow and flutter 0.2% (DIN), 0.15% (rms); S/N 62 dB (rms A curve); frequency response 35-20,000 Hz (all at 7 1/2 ips); input 0.12-40 mV at 200 ohms (mic), 2.4-700 mV (radio), 0.045-20 V at 2 megohms (phono); three-digit counter; direct tape monitoring with earphones or speaker; electronic start and stop with remote switch, manual, or foot-switch operation; 5-in. max. reel size; 12-V dc powered portable..... \$768

4400. Same as 4200 but four-track; S/N 54 dB (DIN weighted), 62 dB (weighted rms A curve)..... \$768

SG-520 Four-Speed Recorder

Four-speed (7 1/2, 3 3/4, 1 1/8, and 1/4 ips) recorder; interchangeable head assemblies for two- or four-track operation; remote capability for start/stop; can be sound-activated; end-of-tape stop; on/off automatic level control switch; bass and treble controls; four-digit index counter; frequency response 30-20,000 Hz, wow and flutter 0.02% wrms (both at 7 1/2 ips); 6 wrms/channel into 8 ohms (30-20,000 Hz) at 1% THD; S/N 65 dB (two-track at 7 1/2 ips); can be operated vertically or horizontally..... \$700

SG-510 Stereo Recorder

Four-track, two-speed (7 1/2 and 3 3/4 ips) recorder; will handle 7-in reels; frequency response 40-20,000 Hz (7 1/2 ips); wow and flutter 0.08%; S/N 58 dB; built-in speakers; amplifier power 4 W/channel at 4 ohms; features peak-reading meters; automatic end-of-tape shut off..... \$412

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8-TRACK TAPE MACHINES

AKAI

CR-83D 8-Track Deck

Recorder/player features illuminated elapsed-time record indicator, locking pause, fast-forward, inde-



pendent dual-record level controls, combination record/play and erase head, auto stop, and continuous playback selector switch; dc motor; illuminated record interlock; automatic ac on when cartridge is inserted; wow and flutter 0.15% rms; S/N 48 dB; frequency response 60-14,000 Hz \pm 3 dB (low-noise tape); dist. 2% at 3 $\frac{3}{4}$ ips; 4 $\frac{1}{4}$ " H \times 16 $\frac{1}{2}$ " W \times 9 $\frac{1}{2}$ " D \$220

ALARON

B-848 Portable 8-Track Player

Portable recorder/player with AM/FM radio and built-in condenser microphone; records directly from built-in radio without microphone; features auto stop; automatic level control; sound-on-sound mixer; slide lever tone and volume controls; slide rule radio dial; automatic and push-button track changer; telescopic antenna; microphone has remote switch for mixing and outside recording; jacks for aux. input and external speaker; 12-V dc cigarette lighter cord for car/boat; built-in ac cord; comes with earplug and C-cell batteries; plastic cabinet; 12 $\frac{1}{2}$ " \times 4 $\frac{1}{2}$ " \times 12" \$110

BSR McDONALD

TD8SW-2 8-Track Deck

Stereo 8-track player; straight-line stepping cam tape-head mounting for intimate contact with tape;

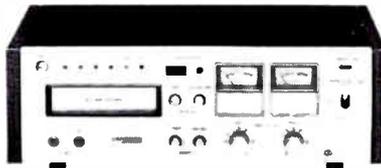


simulated walnut-grained cabinet; comes with connecting cables; 8 $\frac{1}{8}$ " H \times 10 $\frac{1}{4}$ " W \times 3 $\frac{7}{8}$ " D \$40

CENTREX by PIONEER

RH-65 8-Track Deck

Record/playback deck with Dolby noise-reduction system; frequency response 30-15,000 Hz; wow



and flutter 0.15% wrms; S/N 45 dB; time counter; three-position function switch; two VU record level meters; fast-forward and pause controls; illuminated track indicator; automatic or manual track change; dual mike jacks; 4 $\frac{1}{2}$ " H \times 14 $\frac{3}{4}$ " W \times 10 $\frac{7}{8}$ " D \$255
RH-60. Similar to RH-65 except frequency response 70-13,000 Hz; no Dolby circuitry; 4 $\frac{1}{2}$ " H \times 14 $\frac{3}{4}$ " W \times 10 $\frac{1}{2}$ " D \$250

TH-30 8-Track Deck

Playback deck; frequency response 30-12,000 Hz; wow and flutter 0.25%; S/N 40 dB; automatic/manual track change; illuminated track indicators; vertical headshift mechanism for positive tape/head contact; 4 $\frac{3}{8}$ " H \times 7 $\frac{7}{8}$ " W \times 10 $\frac{7}{8}$ " D \$60

CHANNEL MASTER

HD-6005 8-Track Deck

Stereo 8-track record/play deck; push-button auto stop; push-button controls for fast forward, pause, record, and track selection; separate right and left record level controls; illuminated record meters; jacks for microphones, aux. in, aux. out, and stereo headphones; 5" H \times 15 $\frac{1}{4}$ " W \times 10" D \$120

CHELCO

TR-900 Portable 8-Track Player

AM/FM portable 8-track tape player; automatic and manual program changer; ac/dc (car and boat) operation; program selector; program indicator; sing along feature; rod antenna \$40

TR-800 Portable 8-Track Player

8-Track portable tape player; automatic and manual program changer; ac/dc (car and boat) operation; sing along feature \$30

FISHER

ER8130 8-Track Deck

Incorporates Dolby noise-reduction system; wow and flutter 0.15% wrms; fast-winding time 3.3 min (45-min cartridge); auto or manual end of tape shutoff; frequency response 35-11,000 Hz; S/N 52 dB with Dolby; crosstalk -55 dB; channel separa-

tion 40 dB (1 kHz); 5" H \times 14 $\frac{3}{8}$ " W \times 10" D.. \$250

ER8120 8-Track Deck

Wow and flutter 0.15% wrms; fast-winding time 3.3 min (45-min cartridge); auto or manual end of tape shutoff; frequency response 45-11,000 Hz; S/N 44 dB; crosstalk -55 dB; channel separation 40 dB (1 kHz) \$170

ER8110 8-Track Deck

Wow and flutter 0.15% wrms; fast-winding time 3.3 min (45-min cartridge); auto or manual end of tape shutoff; frequency response 35-11,000 Hz; S/N 44 dB; crosstalk -55 dB; channel separation 40 dB (1 kHz) \$130

LAFAYETTE

RK-899 8-Track Deck

Stereo 8-track deck; selectable auto stop for play/record modes; dual record level meters; left/right



mic input jacks; record level controls; pause control; frequency response 50-10,000 Hz; wow and flutter 0.3%; walnut vinyl covered wood cabinet; 4 $\frac{1}{8}$ " H \times 16 $\frac{1}{2}$ " W \times 18 $\frac{1}{4}$ " D \$150

MERITON

HD-830 8-Track Deck

8-track play/record deck features pause control switch; two illuminated VU meters; eject button; program selector switch; vertical-slide record level controls for left/right channels; automatic shut-off; continuous play switch; fast forward; response 40-13,000 Hz; wow and flutter 0.15% wrms (playback), 0.25% wrms (record/playback); S/N 45 dB; has stereo headphone and mike jacks; walnut cabinet with brushed chrome face; 5 $\frac{3}{8}$ " H \times 14 $\frac{1}{4}$ " W \times 9 $\frac{5}{8}$ " D \$120

PANASONIC

RS-808 8-Track Deck

Stereo 8-track deck; left and right channel level meters; minute/second time counter; level controls for recording and playback; locking fast forward and pause controls; auto-stop; record function includes stop after one channel or stop after all channels \$115

REALISTIC

TR-802 8-Track Deck

Record/play deck features digital timer; push-button control of continuous play, program repeat, au-

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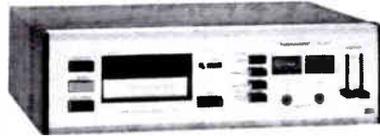
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CIRCLE NO. 23 ON READER SERVICE CARD

3

8-TRACK TAPE MACHINES



to-stop, push-button eject, program change, fast-forward, and pause; response 50-12,000 Hz; wow and flutter 0.2%; front-panel mike input for live recording; walnut wood cabinet; 4³/₄" x 16¹/₂" x 10" \$180

TRC-883 8-Track Deck

Record/play deck features dual VU meters; level controls; push-button fast forward, pause, and record interlock; program select button; auto stop button; stereo headphone jack; left and right microphone jacks; timer; program indicators; frequency response 50-8000 Hz; wow and flutter 0.2%; walnut-finish wood-grain case; 4³/₄" x 14" x 8³/₄" \$130

TRC-884 8-Track Deck

Record/play deck features dual VU meters; level controls; push-button fast forward and record interlock; program select button; stereo headphone jack; left and right microphone jacks; program indicators; frequency response 100-8000 Hz; wow and flutter 0.15%; walnut-finish wood-grain case; 13¹/₂" x 8¹/₂" x 5" \$90

SANYO

RD8020 8-Track Deck

8-track record/play deck; frequency response 30-12,000 Hz; S/N 42 dB; wow and flutter 0.3%; features automatic stop at program-start point; two calibrated VU meters; latching fast-forward control; latching pause control; restart button; lighted channel indicators; inputs for right/left mike and aux.; 5" H x 12¹/₂" W x 10" D \$100

SHARP

RT821 8-Track Deck

Incorporates Auto Program Search System (APSS); auto or manual program changing; two VU meters; mechanical pause; digital time display tape counter; two mike and two line inputs; two line and headphone outputs; wow and flutter 0.25% wrms; frequency response 50-10,000 Hz; S/N 45 dB \$170

TELEX

TMS-100 Music Machine

Automatic stereo 8-track cartridge changer switches and selects 12 tape cartridges for uninterrupted music; two push-button sequences permit playing of each cartridge completely or intermixing programs from different cartridges; automatic gain control; load and reject push-buttons; power on/off and stereo/mono switches; frequency response 60-10,000 Hz; S/N 38 dB; HD less than 2% at 10 W/channel; flutter 0.3% weighted, DIN; 8-ohm speaker terminals; includes power amplifier and smoked dust cover; 9³/₈" H x 18¹/₄" W x 16¹/₄" D ...

..... \$590
TMS-101. With pre-amplifier only \$495

WEBCOR

101 8-Track Recorder/Player

Stereo 8-track recorder/player; illuminated VU level indicating meters; built-in preamp; capstan drive; ac bias recording; ac erase; will repeat selection at end of each recording and at end of fourth recording; tape channel selector; power on/off switch; individual level controls for left and right channels; LED record indicator light; two microphone jacks for left and right channels; simulated wood-grain case with silver front; 4¹/₄" H x 13³/₄" W x 9³/₄" D .. \$120

ZENITH

JR638W 8-Track Deck

8-track play/record deck; one-button record capability; auto stop function; automatic level control; program indicator lights; supplied with two microphones with stands; simulated grained walnut cabinet \$80

NOTICE TO READERS

We consider it a valuable service to our readers to continue, as we have in previous editions of Tape Recording & Buying Guide, to print the price set by the manufacturer or distributor for each item described as available at presstime. However, almost all manufacturers and distributors provide that prices are subject to change without notice.

We would like to call our readers' attention to the fact that during recent years the Federal Trade Commission of the U.S. Government has conducted investigations of the practices of certain industries, in fixing and advertising list prices. It is the position of the Federal Trade Commission that it is deceptive to the public, and against the law, for list prices of any product to be specified or advertised in a trade area, if the majority of sales of that product in that trade area are made at less than the list prices.

It is obvious that our publication cannot quote the sales price applicable to each trading area in the United States. Accordingly, prices are listed as furnished to us by the manufacturer or distributor. It may be possible to purchase some items in your trading area at a price that differs from the price that is reported in this edition.

The Publisher

4

AUTOMOBILE TAPE EQUIPMENT

Tape Machines • Speaker Systems • Accessories

AUDIOMOBILE

ST770A AM-FM-MPX/Cassette Player

In-dash unit combines AM/FM/MPX radio and stereo cassette deck with Dolby noise-reduction system; built in preamplifier; bass, treble, volume, and balance controls; local/distance switch; Dolby on/off switch; preamp and line out connections; cassette has Sen Alloy tape head; frequency response 30-16,000 Hz \pm 3 dB; wow and flutter. 18% wrms; S/N -52 dB (normal), -60 dB (with Dolby); has adjustable shafts; 2" H \times 7" W \times 4 1/2" D \$250

AUDIOVOX

CAS-600 AM-Stereo FM/Cassette

In-dash unit combines AM/FM/MPX radio and stereo cassette player with Dolby noise-reduction system; power output 10 W/channel; locking fast-forward/rewind, bass, treble, mono/stereo, local/distant, and power booster on/off controls \$300

CAS-500 AM-Stereo FM/Cassette

In-dash unit combines AM/FM/MPX radio and stereo cassette player; auto reverse; four-way stereo balance; power output 4 W rms; mono/stereo, program select, local/distant, eject, and locking fast-forward controls \$280

CAS-300 AM-Stereo FM/Cassette

In-dash unit combines AM/FM radio and stereo cassette player; fast-forward, rewind, local/distant, mono/stereo, and eject controls; power output 5 W/channel; 2 3/16" H \times 7" W \times 5 1/2" D \$170

C-981 Cassette Player

Auto-reverse cassette player; volume, tone, balance, fast-forward, and rewind controls; has tape direction indicators; power output 5 W/channel; accepts 4-8 ohm speakers; mounts under dash; 1 3/4" H \times 5 1/2" W \times 6 3/4" D \$130

C992 Stereo FM/Cassette Player

Under-dash unit combines stereo FM radio and cassette player; rewind, fast-forward, and local/distant controls; power output 4 W/channel into 4 ohms; S/N 40 dB; wow and flutter 0.3%; 2" H \times 6 1/2" W \times 6 1/2" D \$130

TPB-4000 AM-Stereo FM/8-Track

Combines AM/Stereo FM radio and 8-track player with built-in power booster; four-way stereo balance; power output 20 W/channel \$300

C-993 Stereo FM/8-Track

Under-dash unit combines Stereo FM radio and 8 track player; has slide volume tone and balance controls; FM local/distant switch; power output 4 W/channel rms; 2" H \times 6 3/8" W \times 6 1/4" D \$120

AUTOMATIC RADIO

RCD-3349 AM-FM/Cassette Player

Combines stereo cassette player with AM/Stereo FM radio, LED digital clock; locking fast forward and rewind; automatic tape eject; fader control; balance

control; AM/FM mode selector; Stereo FM indicator; FM local/distance switch; volume, tone, and tuning controls; digital station readout; hr/min adjustment; automatic clock when tape is inserted; adjustable shafts; auto antenna lead; LED dimmer controlled with car instrument panel dimmer; 4-8 ohm impedance; audio output 10 W rms; 14.4 V dc; 2 3/4" H \times 7" W \times 5" D \$280

CTH-2392 AM-FM-MPX/Cassette Player

Combines stereo cassette player with AM/Stereo FM/MPX radio; locking fast forward and rewind; fader control; treble control; bass control; tape indicator light; quickset push-button tuning; muting; left/right balance control; stereo indicator light; mono/stereo selector; tape end eject; power-off eject; 4-8 ohm impedance; audio output 25 W rms; 14.4 V dc; 2 3/4" H \times 7" W \times 5" D \$236

ACR-3720 AM-FM/Cassette Player

Combines stereo cassette player with AM/Stereo FM radio; automatic tape reverse; slide-loading cassette; fast-forward and rewind controls; tape eject; tape indicator light; stereo indicator light; AM/FM indicator lights; volume, tone and tuning controls; local/distance switch; adjustable shafts; 4-8 ohm impedance; output power 8 W rms; 12 V dc negative ground; 2 3/4" H \times 7" W \times 5" D \$206

IDC-3224K AM-FM/Cassette Player

In-dash unit combines stereo cassette player with AM/FM/MPX radio; "custom" dash installation kit allows factory-like installation; variable tone, volume and balance controls; illuminated dial scale with vernier tuning; Stereo FM indicator light; radio/tape selector switch; fast-forward control; push-button tape eject; tape speed 1 7/8 ips; fast-forward speed 37.5 ips; 4-8 ohm impedance; wow and flutter 0.3% wrms; 2" H \times 7" W \times 6 3/4" D \$125

CUD-3230 Cassette Player

Compact cassette tape player; slide-bar volume, tone and balance controls; push-button tape eject; fast-forward tape control; power-on light; tape speed 1 7/8 ips; wow and flutter 0.3% wrms; 4-8 ohm impedance; 12 V dc negative ground; 2 3/8" H \times 4 7/8" W \times 7 1/2" D \$51

RED-3335 AM-FM/8-Track Player

In-dash stereo 8-track player with AM/Stereo FM radio and LED digital clock; fader control; balance control; volume, tone and tuning control; AM/FM mode control; Stereo FM indicator light; FM local/distance switch; stereo channel indicator lights; key-off tape eject; digital station readout; hr/min adjustment; clock and radio dial lock; adjustable shafts; auto antenna lead; 4-8 ohm impedance; audio output 10 W rms; 14.4 V dc \$260

PBH-2385 AM-FM/8-Track Player

Combines stereo 8-track player with AM/Stereo FM radio; locking fast forward; separate bass and treble controls; fader control (four-way speaker balance); left/right balance control; program repeat; tape eject; mono/stereo selector; stereo channel indicator lights; power indicator light; manual channel selector; pre-set push-button tuning, local/distance switch; adjustable shafts; 4-8 ohm impedance; au-

dio output 25 W rms; 14.4 V dc \$226

NPW-6025 AM-FM/8-Track Player

In-dash unit combines stereo 8-track player and AM/Stereo FM radio with 25 W amplifier; five quick-set push-button tuning; four-way balance control; AM/Stereo FM indicator lights; stereo channel indicator lights; FM local/distance switch; automatic tape switching; adjustable shafts; 4-8 ohm impedance; audio output 25 W rms; 12 V dc negative ground; 2 3/4" H \times 7 1/8" W \times 6 1/4" D \$215

NPB-2408 AM-FM/8-Track Player

In-dash unit combines stereo 8-track player with AM/Stereo FM radio; five quick-set push-button tuning; four-way balance control; AM/Stereo FM indicator lights; stereo channel indicator lights; FM local/distance switch; automatic tape switching; adjustable shafts; 4-8 ohm impedance; audio output 10 W rms; 12 V dc negative ground; 2 3/4" H \times 7 1/8" W \times 6 1/4" D \$160

UPX-3327 AM-FM/8-Track Player

In-dash unit features stereo 8-track player with AM/Stereo FM radio; channel selection control; channel light; automatic channel changing; variable tone control; slide-bar AM/FM band selector; stereo radio beacon; left/right balance control; local/distance switch; adjustable trimplate and matching knobs; adjustable shafts; 4-8 ohm impedance; audio output 8 W rms; 12 V dc negative ground; 2 1/4" H \times 7 1/4" W \times 7 1/2" D \$108

PST-1210 FM-MPX/8-Track Player

Combines stereo 8-track player with FM-MPX radio; push-button channel selector with lights; slide-bar controls; FM local/distance control; Stereo FM selector; illuminated slide-rule dial; 12 V dc negative ground \$63

SSS-2595 8-Track Player

Compact stereo 8-track player for use on cars and boats; slide bar volume and tone controls; rotary balance control; tape program selector with channel lights; tape speed 3 3/4 ips; wow and flutter 0.3% wrms; 4-8 ohm impedance; 12 V dc negative ground; 2 1/4" H \times 5" W \times 7 3/4" D \$53

STS-2450 8-Track Player

Compact stereo 8-track player; variable tone control; channel lights; slide bar volume and balance controls; manual channel selector; 12 V dc negative ground; 2 1/4" H \times 5 1/2" W \times 6 1/4" D \$37

BRISTOL

KD-3534 AM-FM/Cassette Player

In-dash unit combines digital AM/FM radio, stereo cassette player, and digital clock; fast forward and rewind; local/distance push-button; fader/balance controls for four-speaker systems; afc; automatic power-off tape eject; adjustable shafts; 4 W/channel power output \$230

CLARION

AM-FM-MPX/Cassette Player

4

AUTOMOBILE TAPE MACHINES

In-dash unit combines AM/FM/MPX radio with stereo cassette player; five push-button tuning;



Dolby noise-reduction on both cassette and FM; locking fast forward and rewind; separate bass and treble controls; 12 W rms/channel; front-to-rear fader; left-to-right balance control; FET front end; cassette eject button; stereo indicator light; cassette program change button; Dolby indicator lights; Dolby switch; features smaller chassis to fit over 90% of all U.S. and foreign cars \$340

PE-684A FM-MPX/Cassette Player

Under-dash unit combines FM/MPX radio with stereo cassette player; powerful amplifier with 12 W rms/channel; auto reverse; Dolby on both FM and cassette; locking fast forward and rewind; push to eject button; program change switch; punch sound; FM tuner sensitivity switch; switchable Dolby; Dolby and stereo indicator lights; program indicator lights; separate bass and treble controls; front-to-rear fader; left-to-right balance control; FET front end in FM tuner section \$250

PE-838A. Similar except without FM tuner \$220

PE-453A 8-Track Player

Under-dash stereo 8-track player; power amplifier with 12 W rms/channel; separate bass and treble controls; left-to-right balance control; program change switch; program repeat switch; punch sound; muting; loudness button \$150

CONCORD

HP-350 AM-FM Cassette

In-dash unit combines AM/FM stereo receiver with Dolbyized cassette deck and power amplifier; Receiver: 1.8 μ V sensitivity; 55 dB image rejection; S/N 68 dB; AM/FM push-button selector; local/distance switch; Cassette: wow and flutter 0.15% wrms; frequency response 40-15,000 Hz \pm 2 dB; S/N 48 dB (Dolby off), 54 dB (Dolby on); Dolby on/off switch; latching fast forward and rewind; automatic cassette eject at end of tape and automatic eject when power is cut off; Sen-Alloy playback head; Amplifier: power output 20 W rms min. per channel into 4 ohms; less than 0.3% dist. frequency response 20-20,000 Hz \pm 2 dB; output impedance 4-8 ohms; tone controls: bass \pm 10 dB boost or cut; treble \pm 10 dB boost or cut; 2 1/2" H \times 7" W \times 4 3/4" D \$300

HP-100 AM-FM/Cassette Player

In-dash unit combines AM/FM radio and stereo cassette player; features station lock tuning; local/distance control; volume control with on/off switch; treble boost/cut control; bass boost/cut control; AM/FM selector; tape play indicator; stereo indicator; fast-forward and rewind control; automatic tape eject with power off; Receiver: 2 μ V sensitivity; 55 dB image rejection; S/N 68 dB; stereo separation 35 dB; Cassette: Sendust-Alloy playback head; wow and flutter 0.15% wrms; frequency response 40-15,000 Hz \pm 1 dB; S/N 50 dB; Monitor Amp: power output 5 W rms/channel; frequency response 40-18,000 Hz; max. dist. 2%; has line output jacks for connection to HPA-40 power amplifier 2" H \times 7" W \times 4 3/4" D \$170

CRAIG

T631 AM-FM/Cassette Player

In-dash stereo cassette player with AM/FM radio; digital channel display; preset tuning for five stations; separate balance and fader controls; automatic rewind at end of tape; stereo/mono pushbutton; fast forward and locking rewind; wow and flutter 0.3% rms; frequency response 40-10,000 Hz; stereo separation 35 dB; S/N 40 dB; audio output 4 W average continuous sine wave per channel \$270

T600 AM-FM/Cassette Player

AM/Stereo FM radio with cassette player; auto-reverse; stereo/mono switch; manual eject; separate balance and fader controls; wow and flutter 0.2% rms; audio output 3.5 W average continuous sine wave per channel; frequency response 40-10,000 Hz; S/N 50 dB; crosstalk -40 dB; channel separation 35 dB; 12-V dc negative ground; supplied with customizer trim plate, gasket, hardware, and knobs; in-dash mounting; 2" H \times 7 1/4" W \times 8 1/2" D \$180

T680 AM-FM/Cassette Player

Combines AM/Stereo FM radio and cassette tape player; locking fast forward and rewind; automatic



eject when power is removed from unit; automatic eject at end of cassette; wow and flutter 0.3% rms; frequency response 40-10,000 Hz; stereo separation 35 dB; S/N 40 dB; audio output 12 W average continuous sine wave per channel \$180

T605 AM-FM/Cassette Player

Combines AM/Stereo FM radio with cassette tape player; separate balance and fader controls; automatic rewind at end of tape; stereo/mono pushbutton; fast forward and rewind; wow and flutter 0.3%; frequency response 70-10,000 Hz; stereo separation 35 dB; S/N 40 dB; audio output 4 W average continuous sine wave per channel \$160

T281 FM/Cassette Player

Combines Stereo FM radio and cassette tape player; fast forward and rewind; end-of-tape indicator light; stereo matrix circuitry for four-channel effect; wow and flutter 0.3% rms; audio output 12 W average continuous sine wave per channel; S/N 40 dB; stereo separation 30 dB; crosstalk -35 dB; 12-V dc negative ground; size (bracket with unit) 2 1/4" H \times 8 1/2" W \times 10 1/4" D \$160

3514 AM-FM/Cassette Player

Combines AM/Stereo FM radio with cassette player; automatic shut-off at end of tape; in-dash mounting; mono/stereo switching; illuminated tape/stereo indicators; momentary and locking fast forward; stereo matrix circuitry for four-channel effect; wow and flutter 0.3% rms; audio output 4 W continuous per channel; frequency response 70-10,000 Hz; S/N 40 dB; crosstalk -40 dB; channel separation 35 dB; 12-V dc negative ground; supplied with trim panel, gasket, and knobs; 2" H \times 7" W \times 5 1/4" D \$150

T601 AM-FM/Cassette Player

Combines AM/Stereo FM radio with cassette tape player; automatic shut-off at end of cassette; locking fast forward and rewind; in-dash mounting; stereo matrix circuitry for four-channel effect, wow

and flutter 0.3% rms; audio output 4 W average continuous per channel; frequency response 70-10,000 Hz; S/N 40 dB; crosstalk -40 dB; channel separation 35 dB; 12-V dc negative ground; supplied with customizer trim plate, gasket, knobs, and hardware; 1 9/16" H \times 6 13/16" W \times 5 1/4" D \$150

T202 FM/Cassette Player

Combines Stereo FM radio and cassette tape player; separate balance and fader controls; locking fast forward and rewind; slide-out mounting bracket; stereo matrix circuitry for four-channel effect; wow and flutter 0.2% rms; frequency response 40-10,000 Hz; stereo separation 35 dB; S/N 50 dB; audio output 4 W average continuous sine wave \$150

T180 Cassette Player

Cassette tape player with auto-reverse; reversible quick-release slide-out bracket; illuminated direction signals; auto and manual program change; separate bass and treble controls; manual or automatic eject; locking fast forward; loudness pushbutton; wow and flutter 0.25% rms; frequency response 70-10,000 Hz; S/N 45 dB; stereo separation 30 dB; crosstalk 45 dB; audio output 12 W average continuous sine wave per channel (5% THD, 4-ohm load, both channels driven); 12-V dc negative ground; 3 7/8" H \times 7" W \times 8 1/2" D \$130

T200 FM/Cassette Player

Combines Stereo FM radio and cassette tape player; locking fast forward and rewind; LED stereo and end-of-tape indicators; stereo matrix circuitry for four-channel effect; wow and flutter 0.3% rms; S/N 35 dB; stereo separation 35 dB; crosstalk -35 dB; audio output 4 W average continuous sine wave per channel; 12-V dc negative ground; supplied with quick-release bracket and mounting hardware; 2 1/4" H \times 7 3/4" W \times 7" D \$130

T102 Cassette Player

Quick-mount cassette tape player; automatic reverse; locking fast forward and rewind; separate balance and fader controls; stereo matrix circuitry for four-channel effect; wow and flutter 0.2% rms; frequency response 40-10,000 Hz; S/N 50 dB; stereo separation 35 dB; audio output 4 W average continuous sine wave per channel \$110

T201 FM/Cassette Player

Stereo cassette player and FM radio; slide-out bracket; volume, balance, and tone controls; locking fast forward; tape running indicator \$110

T100 Cassette Player

Quick-mount cassette tape player; locking fast forward; end-of-tape indicator; locking rewind; quick-release bracket; stereo matrix circuitry for four-channel effect; audio output 4 W average continuous sine wave per channel; frequency response 40-10,000 Hz; stereo separation 35 dB; crosstalk -35 dB; S/N 40 dB; 12-V negative ground; supplied with quick-release bracket and mounting hardware; 2 1/4" H \times 5" W \times 5" D \$90

3517 FM/Cassette Player

Combines FM radio and cassette tape player; ultra-compact size; fast forward; LED tape running indicator; tone switch; illuminated stereo indicator; fast forward time 200 sec (C-60); wow and flutter 0.3% rms; power output 3.5 W continuous sine wave per channel; frequency response 50-10,000 Hz; stereo separation 40 dB; crosstalk -50 dB; S/N 45 dB; 12-V dc negative ground; supplied with mounting bracket and hardware for console or under-dash mounting; 1 7/8" H \times 7 1/4" W \times 6 1/4" D \$80

T101 Cassette Player

Ultra-compact cassette tape player; slide-out bracket; volume, balance, and tone controls; manual eject; locking fast forward; tape running indicator \$70

3515 Cassette Player

Miniature stereo cassette tape player; fast forward; LED tape running indicator; manual eject; tone switch; fast forward time 200 sec (C-60); wow and

flutter 0.3% rms; power output 3.5 W continuous sine wave per channel; frequency response 50-10,000 Hz; stereo separation 40 dB; crosstalk -50 dB; S/N 45 dB; 12-V dc negative ground; supplied with mounting bracket and hardware for console or under-dash mounting; 1 7/8" H x 5 3/4" W x 5 7/8" D \$50

S681 AM-FM/8-Track Player

Combines AM/Stereo FM radio, emergency and weather information channel, and 8-track tape player; automatic or manual program change; repeat pushbutton for continuous program play; in-dash mounting; cartridge program indicators; wow and flutter 0.3% rms; audio output 12 W continuous sine wave per channel; frequency response 40-10,000 Hz; stereo separation 30 dB; crosstalk -35 dB; S/N 40 dB; power source 12-V dc negative ground; supplied with customizer trim plate, gasket, mounting hardware, and knobs; 2 3/4" H x 7" W x 5 1/4" D (main unit), 1 3/4" H x 4 3/4" W x 4 3/4" D (amplifier unit) \$220

S280 FM/8-Track Player

Combines Stereo FM radio with 8-track tape player; illuminated Powerplay and numbered program indicators; manual and automatic eject when power to unit is removed; separate balance and fader controls; manual and automatic program changing; stereo indicator light; loudness pushbutton; fast forward with muted sound; repeat pushbutton; separate bass and treble controls; wow and flutter 0.3% rms; S/N 40 dB; crosstalk -35 dB; frequency response 40-10,000 Hz; 12-V dc negative ground; supplied with reversible quick-release bracket and mounting hardware; 3 1/2" H x 9 3/4" W x 10 1/4" D \$190

S630 AM-FM/8 Track Player

Combines AM/Stereo FM radio, emergency and weather information channel, and 8-track tape player; separate balance and fader controls; illuminated program indicators; automatic or manual program selection; repeat button; wow and flutter 0.3% rms; audio output 4 W average continuous sine wave per channel; frequency response 40-10,000 Hz; stereo separation 30 dB crosstalk -35 dB; S/N 40 dB; 12-V dc negative ground, 2.5-A max. current drain; supplied with customizer trim plate, gasket, mounting hardware, and knobs; 2 1/4" H x 7" W x 5 1/4" D \$180

S680 AM-FM/8-Track Player

Combines AM/FM radio and 8-track tape player; automatic or manual tape program change; Powerplay booster; illuminated program indicators for 8-track cartridges; separate volume, balance, tone, and sensitivity controls; wow and flutter 0.3% rms; audio output 12 W continuous sine wave per channel (5% THD, 4-ohm load, both channels driven); frequency response 40-10,000 Hz; stereo separation 30 dB; crosstalk -35 dB; S/N 40 dB; 12-V dc negative ground, 2.5-A max. current drain; supplied with customizer trim plate, gasket, mounting hardware, Powerplay booster, and knobs; 1 1/2" H x 7 1/4" W x 5 1/4" D (main unit), 1 3/4" H x 4 1/4" W x 4 1/4" D (booster) \$160

S281 FM/8-Track Player

Combines FM radio and 8-track player; stereo matrix circuitry for four-channel effect; fast forward; numbered program indicators; manual and automatic program changing; repeat push-button; wow and flutter 0.25% rms; audio output 12 W continuous sine wave per channel (5% THD, 4-ohm load, both channels driven); frequency response 50-10,000 Hz; S/N 40 dB; crosstalk -45 dB; stereo separation 30 dB; supplied with quick-release slide-out bracket; 12-V dc negative ground; 2 1/2" H x 8 1/2" W x 10 1/4" D (bracket with unit) \$140

S601 AM-FM/8-Track Player

Combines AM/FM radio and 8-track player; stereo matrix circuitry for four-channel effect; repeat push-button; four LED program indicators; manual and automatic eject when power is removed from unit; separate balance and fader controls; wow and flutter 0.3% rms; audio output 4 W average continuous

sine wave per channel; frequency response 70-8000 Hz; stereo separation 35 dB; crosstalk -40 dB; S/N 50 dB; 12-V dc negative ground, 2.5-A max. current drain; supplied with customizer trim panel, gasket, knobs, and hardware; 1 7/8" H x 7" W x 5 1/4" D \$140

S600 AM-FM/8-Track Player

Combines AM/FM radio and 8-track stereo tape player; separate volume, balance, tone, and sensitivity controls; illuminated program indicators; automatic or manual program change; wow and flutter 0.3% rms; audio output 4 W average continuous sine wave per channel; frequency response 40-10,000 Hz; stereo separation 30 dB; crosstalk -35 dB; S/N 40 dB; 12-V dc negative ground, 2.5-A max. current drain; supplied with customizer trim plate, gasket, mounting hardware, and knobs; 1 7/8" H x 7 1/4" W x 5 1/4" D \$120

S180 8-Track Player

Quick-mount Powerplay 8-track stereo player; manual and automatic eject when power is removed from unit; locking fast forward; automatic and manual program changing; repeat mode; loudness button; separate balance and fader controls; illuminated program indicators; separate bass and treble controls; wow and flutter 0.3% rms; frequency response 40-10,000 Hz; S/N 40 dB; stereo separation 30 dB; crosstalk -35 dB; audio output 12 W continuous sine wave per channel (5% THD, 4-ohm load, both channels driven); 12-V dc negative ground; supplied with reversible quick-release bracket for console or under-dash mounting; 2 3/4" H x 6 1/2" W x 9 3/4" D \$110

S200 FM/8-Track Player

Combines FM radio and 8-track stereo tape player; stereo matrix for four-channel effect; repeat mode; fast forward; numbered program indicators; manual and automatic program change; wow and flutter 0.25% rms; output power 4 W average continuous sine wave per channel; frequency response 50-10,000 Hz; S/N 45 dB; crosstalk -45 dB; stereo separation 40 dB; supplied with quick-release slide-out bracket; 12-V dc negative ground, 1.5-A max. current drain; 2 1/4" H x 7 1/2" W x 7" D \$110

S101 8-Track Player

Stereo 8-track tape player; stereo matrix for four-channel effect; repeat mode; fast forward; wow and flutter 0.3% rms; frequency response 40-10,000 Hz; S/N 40 dB; stereo separation 35 dB; audio output 4 W average continuous sine wave per channel; ultra-compact size \$90

3143 8-Track Player

8-track stereo tape player; illuminated program indicators; repeat and fast forward; power-off eject; wow and flutter 0.25% rms; output power 7 W per channel; frequency response 70-10,000 Hz; S/N 45 dB; crosstalk -40 dB; stereo separation 35 dB; 12-V dc negative ground 2.8-A max. current drain; supplied with quick-release mounting; 2 1/2" H x 7" W x 8" D \$70

S100 8-Track Player

8-track stereo tape player; numbered program indicators; stereo matrix for four-channel effect; automatic and manual program changing; repeat mode; locking fast forward; wow and flutter 0.3% rms; S/N 45 dB; audio output 4 W average continuous sine wave per channel; frequency response 100-8000 Hz; stereo separation 35 dB; crosstalk -40 dB; 12-V dc negative ground, 1.5-A max. current drain; supplied with quick-release bracket and mounting hardware; 2 3/4" H x 4 3/4" W x 7" D \$70

DYUSA

M-70 AM-FM-MPX/Cassette Player

In-dash unit combines AM/FM/MPX radio and stereo cassette player; full automatic auto-reverse, fast forward, and rewind with lock; manual program change switch and eject; tape-playing and stereo-receiving indicator lamps; local/distance switch; wow and flutter 0.3% rms; audio output 7 W rms

per channel; 1 7/8" H x 6 1/4" W x 5 1/4" D \$180

M-50 AM-FM-MPX/Cassette Player

In-dash unit combines AM/FM/MPX radio with stereo cassette player; fast-forward and eject button; balance control; electronic auto stop; adjustable shafts; wow and flutter 0.3% rms; audio output 7 W rms per channel; 2" H x 6 1/4" W x 4 1/4" D \$120

M-5F AM-FM-MPX/8-Track Player

In-dash unit combines AM/FM/MPX radio and stereo 8-track player; fader-controlled four speaker system; adjustable shafts; wow and flutter 0.3%; audio output 7 W rms per channel; 2" H x 6 1/4" W x 4 1/4" D \$110

M-5 AM-FM-MPX/8-Track Player

In-dash unit features AM/FM/MPX radio and stereo 8-track player; adjustable shafts; wow and flutter 0.3%; audio output 7 W rms per channel; 2" H x 6 1/4" W x 4 1/4" D \$100

KRACO

KID-588 AM-Stereo FM/Cassette Player

In-dash/under-dash unit combines AM/FM reverse stereo radio and automatic FM cassette stereo tape player; variable tone control; power switch and volume control; stereo indicator lamp; AM/FM radio selector switch; tape eject button; cassette tape slot with dust cover; AM/FM radio dial plate; locking fast forward and rewind; tape direction indicator lamps; cassette programmer selector switch; local/distance switch; stereo balance control \$208

KID-587 AM-Stereo FM/Cassette Player

In-dash/under-dash unit combines AM/FM Stereo FM radio and stereo cassette player; continuously variable tone control; fast forward and eject switch; AM/FM radio dial plate; AM/FM selector or switch; FM stereo indicator lamp; five AM or FM pre-set push-buttons; stereo balance control; AM/FM radio manual tuning; cassette play indicator lamp .. \$176

KID-585 AM-FM-MPX/Cassette Player

In-dash unit combines AM/FM/MPX radio and stereo cassette player; FM stereo indicator light; cassette stereo on light; AM/FM slide control; locking fast forward and eject selector button; tone control; manual AM/FM tuning; local/distance selector button; stereo balance control; adjustable antenna trimmer in front; Kraco trimplate with three pairs of wood grain inserts \$145

KS-960A Cassette Player

Super mini cassette player with auto stop; under-dash mounting; straight-line slide controls for tone, balance and volume; fast forward and eject button; tape playing indicator lamp \$62

KID-575 AM-FM-MPX/8-Track Player

In-dash unit combines AM/FM/MPX push-button radio and stereo 8-track player; radio dial flips up for 8-track cartridge play; power on/off volume control; 8-track channel selector push; illuminated AM/FM dial in door; tone control; five AM or FM push buttons; local/distance selector; stereo balance control; built-in fader control; AM light, FM light, stereo light; manual tuning; Kraco trimplate with three pairs wood grain inserts \$166

KID-566 AM-FM-MPX/8-Track Player

In-dash/under-dash unit combines AM/FM/MPX radio with 8-track stereo player; radio dial flips up for 8-track cartridge play; illuminated AM/FM dial in door; LED dial pointer/stereo indicator; built-in automatic frequency control; repeat/local switch; continuously variable tone control; power on/off/volume control/tape program selector; stereo balance control; manual tuning \$145

KID-565A AM-FM-MPX/8-Track Player

In-dash unit combines AM/FM/MPX radio with stereo 8-track player; AM/FM radio dial flips up for cartridge play; illuminated radio dial in door; FM stereo indicator light; built-in automatic frequency control; repeat/local switch; power on/off/volume

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AUTOMOBILE TAPE MACHINES

control/tape program selector; continuously variable tone control; stereo balance control; manual tuning \$135

KID-560D AM-FM-MPX/8-Track Player

In-dash unit combines AM/FM/MPX radio with stereo 8-track player; on/off volume control with 8-track channel selector; tone control; channel indicator lights; AM/FM selector button; local/repeat button; manual tuning; stereo balance control; Kraco trimplate with three pairs black inserts. \$131

KS-699 Stereo FM/8-Track Player

Under-dash unit combines Stereo FM radio and 8-track player; FM radio on/off switch; straight-line slide controls for tone, balance, and volume; tape program repeat button; local/distance switch; channel dial indicator lights; 8-track dial in door; FM manual tuning \$114

KS-890 8-Track Player

Stereo 8-track cartridge player; 16 W music power; compact size; manual program select button; tape light button; program repeat; locking fast forward; manual cartridge eject; individual program indicator lights; straight-line slide volume, balance and tone controls \$104

KS-980 8-Track/Cassette Player

Under-dash deluxe 8-track and cassette stereo tape player combination; slide volume, tone and balance controls; continuous play; program selector button; individual program selector lights; 8-track and cartridge eject \$83

KS-480 8-Track Player

Under-dash 8-track cartridge player with four-channel speaker matrix system; compact size; continuous play; four-channel effect from two-channel tapes; manual program select button; program repeat button; individual program indicator lights; straight-line volume control for each channel; slide control for front-to-rear balance; wired for burglar alarm \$72

KS-440 8-Track Player

Under-dash stereo 8-track cartridge player with 12-W amplifier; compact size; manual program select button; individual program indicator lights; slide controls for volume, tone and balance; program repeat button; continuous play operation; wired for burglar alarm \$62

KS-400C 8-Track Player

Under-dash 8-track cartridge player; compact size; manual program select button; program indicator lights; slide controls for volume, tone and balance; continuous play operation \$52

KS-340 8-Track Player

Under-dash 8-track cartridge player; compact size; manual program select button; individual channel volume controls; pilot light; high/low tone switch; continuous play operation \$40

MARANTZ

420 AM-FM/Cassette Player

In-dash unit combines AM/Stereo FM radio with cassette player; AM/FM stereo Computuner with quartz-controlled synthesized digital tuning and microprocessor which provides electronic search plus instant access to 12 user programmable stations (six AM and six FM); auto-reverse cassette player with locking fast forward and rewind; wow and flutter 0.18%; tape frequency range 30-12,000 Hz; 40 W rms max. output power; FM sensitivity 1.1 μ V at 75 ohms (12 dBf); capture ratio 1.5 dB; FET r-f amplifier; PLL for stereo separation; fader control; FM muting; local/distance switch; bass and treble controls; loudness control; antenna trimmer; ad-

justable shaft spacing; quartz clock; 1 $\frac{3}{4}$ " H x 7 $\frac{1}{4}$ " W x 5 $\frac{7}{8}$ " D; nose dimensions 1 $\frac{3}{4}$ " H x 4 $\frac{1}{8}$ " W (DIN standard) \$400

410 AM-FM/Cassette Player

In-dash unit combines AM/FM radio and stereo cassette player; AM/FM stereo Computuner with quartz controlled synthesized digital tuning and microprocessor which provides electronic station search plus instant access to 12 user programmable stations (six AM and six FM); auto-eject cassette player with locking fast forward and rewind; wow and flutter 0.18%; tape frequency range 30-12,000 Hz; 12 W rms max. output power; FM sensitivity 1.1 μ V at 75 ohms (12 dBf); capture ratio 1.5 dB; FET r-f amplifier; PLL for stereo separation; FM muting; local/distance switch; tone control; antenna trimmer; power antenna wire; adjustable control shaft spacing; quartz clock; 1 $\frac{3}{4}$ " H x 7 $\frac{1}{4}$ " W x 5 $\frac{7}{8}$ " D; nose dimensions 1 $\frac{3}{4}$ " H x 4 $\frac{1}{8}$ " W (DIN standard) .. \$320

350 AM-FM/Cassette Player

In-dash AM/Stereo FM receiver and auto-reverse cassette player; locking fast forward and rewind; power-off eject; FET r-f amplifier; PLL for stereo separation; FM muting; local/distance switch; tone control; antenna trimmer; adjustable control shafts; wow and flutter 0.18%; tape frequency range 30-12,000 Hz; 12 W rms max. output power; capture ratio 2 dB; FM sensitivity 1.5 μ V at 75 ohms; 1 $\frac{3}{4}$ " H x 7 $\frac{1}{4}$ " W x 5 $\frac{3}{4}$ " D; nose dimensions 1 $\frac{3}{4}$ " H x 4 $\frac{1}{4}$ " W (DIN standard) \$230

MOTOROLA

TC887AX AM-FM/Cassette Player

In-dash unit features AM/FM radio and stereo cassette player; 8 W rms total system power; AutoRe-



verse sensor automatically plays second side of tape; locking fast forward and rewind buttons; FM local/distance switch; tape direction switch and light; stereo indicator lights; left/right balance controls; front-rear fader; mono/stereo switch; hard permalloy head; 2.6" H x 7.1" W x 5.3" D \$300

TC888AX AM-FM/Cassette Player

In-dash unit combines AM/FM radio and stereo cassette player; 8 W rms total system power; AutoCue control positions tape in either forward or reverse mode; push-button tuning; separate fader control; locking fast forward and rewind buttons; tape eject; tone, balance, and volume controls; local/distance and mono/stereo switches; stereo indicator light \$220

TC885AX AM-FM/Cassette Player

In-dash unit designed for compact cars combines AM/FM radio and stereo cassette player; 8 W rms total system power; AutoReverse; hard permalloy tape head; controls for tone, balance, and volume; locking fast forward and rewind; tape eject; local/distance switch; stereo indicator light \$180

TC883AX AM-FM/Cassette Player

In-dash unit combines AM/FM radio and stereo cassette player; 8 W rms total system power; push-button tuning; front-to-rear fader; controls for tone, balance and volume; locking fast forward and rewind; tape eject; local/distance switch \$170

TC881AX AM-FM/Cassette Player

In-dash unit combines AM/FM radio and stereo cassette player; 8 W rms total system power; AutoEject; front-to-rear fader; front-loading installation; controls for tone, balance, and volume; locking fast forward and rewind; local/distance switch; stereo indicator light \$140

TC879AX AM-FM/Cassette Player

In-dash unit combines AM/FM radio and stereo cassette player; 8 W rms total system power; short chassis depth; locking fast forward and rewind; volume, tone and balance controls; tape eject; tape run light; manual tuning; local/distance switch; stereo indicator light \$100

Under-Dash Cassette Players

All models feature locking fast forward and rewind buttons; tape eject; tape run lights; controls for volume and left/right balance; U-tracks for easy mounting.

TC344S. Total output 24 W rms; rotary bass and treble controls; loudness contour control; hi-filter, power meter \$140

TC334S. Total output 8 W rms; AutoReverse; tape direction switch and light \$100

TC324S. Total power output 8 W rms \$70

TF882AX AM-FM/8-Track Player

In-dash unit combines AM/Stereo FM radio and 8-track player; 24 W rms total system power; balance and volume controls; push-button or manual tuning; local/distance switch; mono/stereo and program select switches; stereo and program indicator lights; separate controls for bass, treble, and front-to-rear fader; loudness button \$190

TF880AX AM-FM/8-Track Player

In-dash unit combines AM/Stereo FM radio and 8-track player; 8 W rms total system power; push-button or manual tuning; volume, tone and balance controls; front-to-rear fader; local/distance, mono/stereo and program select switches; stereo and program indicator lights \$150

TF850AX AM-FM/8-Track Player

In-dash unit combines AM/Stereo FM radio and 8-track player; 8 W rms total system power; manual tuning; controls for tone, volume and balance; stereo and program indicator lights; local/distance switch \$100

TM428S 8-Track Player

Under-dash 8-track tape player; 24 W rms total system power; separate controls for bass, volume, treble, and balance; loudness button; fast forward, channel select, and program repeat switches; lighted channel indicator \$100

TM228S 8-Track Player

Under-dash 8-track tape player; 8 W rms total system power; treble, bass, fast forward, volume, and balance controls; channel select switch; lighted program indicator \$70

TM125S 8-Track Player

Under-dash 8-track tape player; 8 W rms total system power; controls for tone, volume, and balance; program repeat and channel select switches; lighted channel indicator \$50

NAKAMICHI

250 Cassette Player

Designed for use with ADS subminiature biampified speaker systems; Dolby noise reduction circuit-



ry; selectable playback equalization; full auto shut-off; dc servomotor drive; volume, tone, and balance controls; supplied with bracket for under-dash

mounting and cable for interfacing with DS system; playback frequency response 40-17,000 Hz \pm 3 dB; wow and flutter 0.08% wrms; S/N 62 dB (with Dolby); output 580 mV; 9 $\frac{1}{2}$ " \times 7 $\frac{1}{2}$ " \times 3 $\frac{1}{2}$ "... \$310
250\$. Same but with ac power supply \$335

PANASONIC

CQ-6700 AM-Stereo FM/Cassette Player

In-dash unit combines AM/Stereo FM radio and stereo cassette player; compact size for installation in most dashboards; fast-forward control; automatic tape eject; local/distance switch; automatic stereo/mono change circuit; FM stereo indicator light; tone, volume and balance control; output power 4 W/channel max.; THD 10% at 3.5 W/channel; 4 to 8 ohm impedance; frequency response 50-10,000 Hz; wow and flutter 0.4% wrms; S/N 40 dB; 1 $\frac{3}{4}$ " H \times 7" W \times 5 $\frac{1}{8}$ " D \$160

CX-7100 Cassette Player

Component Systems stereo cassette player; under-dash installation; automatic and manual reverse; two-stage preamp and dual channel amplifier; separate left/right tone controls; locking fast forward, rewind, and eject on one lever; program indicator lamp; direction indicator; balance control; power output 4.8 W/channel with 10% THD, 3.6 W with 1% THD; 4 to 8 ohm impedance; frequency response 50-10,000 Hz; wow and flutter 0.3% wrms; S/N 40 dB; 2 $\frac{1}{2}$ " H \times 7 $\frac{1}{2}$ " W \times 5 $\frac{1}{8}$ " D \$120

CX-5100 Cassette Player

Component Systems stereo cassette player with Repeat track; under-dash installation; two-stage preamp and dual channel amplifier; separate left/right tone controls; locking fast forward, rewind, and tape eject on one lever; balance control; play indicator; volume control; output power 4.8 W/channel with 10% THD, 3.6 W with 1% THD; 4 to 8 ohm impedance; frequency response 50-10,000 Hz; wow and flutter 0.3% wrms; S/N 40 dB; 2 $\frac{1}{2}$ " H \times 7 $\frac{1}{2}$ " W \times 5 $\frac{1}{8}$ " D \$90

CX-233 Cassette Player

Under-dash compact stereo cassette player; auto stop; manual eject; push-button fast-forward and eject controls; slide-rule volume, balance, and tone controls; max. output power 4 W/channel; THD 10% at 3.5 W; 4 to 8 ohm impedance; frequency response 50-10,000 Hz; wow and flutter 0.4% wrms; S/N 40 dB; 2" H \times 4 $\frac{3}{4}$ " W \times 6 $\frac{1}{16}$ " D \$70

CQ-1851 Stereo FM/8-Track Player

Under-dash unit combines stereo FM radio and stereo 8-track tape player; distance/local switch; automatic frequency control; automatic mono/stereo change circuit; FM stereo indicator; radio dial in cartridge door; separate controls for bass, treble, balance, and volume; tape program selector; VU meter; output power 10 W/channel with 10% THD; 8-ohm impedance; wow and flutter 0.4% wrms; S/N 35 dB; 2 $\frac{1}{8}$ " H \times 9 $\frac{7}{16}$ " W \times 7 $\frac{13}{16}$ " D \$150

CQ-2700 AM-FM/8-Track Player

In-dash unit combines AM/Stereo FM radio and stereo 8-track tape player; radio dial in cartridge door; vertical head movement; two-stage preamp and dual channel amplifier; continuous volume and tone; distance/local switch; stereo indicator; volume, balance and tone controls; tape program selector; output power 3.5 W/channel with 10% THD; 4 to 8 ohm impedance; frequency response 50-10,000 Hz; wow and flutter 0.3% wrms; S/N 37 dB; 2" H \times 7" W \times 6" D \$140

CX-1100 8-Track Player

Under-dash Component System stereo 8-track tape player; two-stage preamp and dual channel amplifier; vertical head movement; continuous volume and tone controls; separate left and right tone controls; automatic and manual program selection; balance control; output power 4.8 W/channel with 10% THD, 3.6 W with 1% THD; 4 to 8 ohm impedance; frequency response 50-10,000 Hz; wow and flutter 0.3% wrms; S/N 40 dB; 2 $\frac{1}{2}$ " H \times 7 $\frac{1}{2}$ " W \times 6 $\frac{3}{32}$ " D \$70

CX-385 8-Track Player

Under-dash compact 8-track tape player; slide-rule volume control; program change push button; tone control; thumbwheel balance control; illuminated program indicators; output power 3.5 W/channel with 10% THD; 4 to 8 ohm impedance; frequency response 50-10,000 Hz; wow and flutter 0.3% wrms; S/N 40 dB; 2" H \times 4 $\frac{3}{4}$ " W \times 6 $\frac{1}{16}$ " D \$55

CX-7100 AM/FM Tuner

Component Systems AM/Stereo FM tuner to be used



in conjunction with Component Systems tape players \$85

PIONEER

KE-2000 AM-Stereo FM/Cassette

In-dash AM/FM Supertuner with stereo cassette player; pulse synthesizer electronic preset tuning; tone control; release/eject button; LED tuning scale; rewind/fast-forward lever; volume and balance control; memory button; five AM/FM preset buttons; local/distance switch; FM muting; FM stereo/mono and AM selector; tuner capture ratio 1.7 dB; Tape Player: fast-winding time 100 sec (C-60); wow and flutter 0.28% wrms; frequency response 30-12,000 Hz \pm 3 dB; S/N 45 dB; 2" H \times 7 $\frac{1}{8}$ " W \times 6" D; nose 1 $\frac{3}{4}$ " H \times 4 $\frac{1}{8}$ " W \times 1 $\frac{1}{8}$ " D \$290

KPX-9000 AM-Stereo FM/Cassette

In-dash AM/FM Supertuner with stereo cassette player; volume and balance control; release/eject button; LED tuning scale; rewind/fast-forward lever; separate bass and treble controls; loudness contour switch; three AM/FM preset buttons; tape play indicator; FM muting; FM stereo/mono switch; tuner capture ratio 1.7 dB; Tape Player: fast-winding time 120 sec (C-60); wow and flutter 0.13% wrms; frequency response 30-15,000 Hz \pm 3 dB; S/N 46 dB; 2" H \times 7 $\frac{1}{8}$ " W \times 5 $\frac{1}{8}$ " D; nose 1 $\frac{3}{4}$ " H \times 4 $\frac{1}{8}$ " W \times 1 $\frac{1}{8}$ " D \$270

KP-8005 AM-Stereo FM/Cassette

In-dash AM/FM stereo receiver with cassette player; 8 W max. rms output power; FM usable sensitivity 1.1 μ V at 75 ohms (12 dBf); 50 dB quieting sensitivity 1.4 μ V at 75 ohms (14.3 dBf); alternate channel selectivity 74 dB; capture ratio 1.7 dB; five-station preset tuning; volume/tone/balance controls; FET r-f amplifier; PLL for stereo separation; muting switch; tape frequency range 30-12,000 Hz; wow and flutter 0.25%; 2" H \times 7 $\frac{1}{8}$ " W \times 5 $\frac{1}{4}$ " D; nose dimensions 1 $\frac{3}{4}$ " H \times 4 $\frac{1}{8}$ " W \times 1 $\frac{1}{8}$ " D \$250
KP-8000. Same except designed to DIN standard to fit European cars; nose dimension 1 $\frac{3}{4}$ " H \times 4 $\frac{1}{8}$ " W \times 1 $\frac{3}{4}$ " D; shaft spacing 5 $\frac{1}{8}$ " in \$250
KP-5005. Same as KP-8005 but with manual tuning \$220

KP-500 Stereo FM/Cassette

Under-dash FM stereo receiver with cassette player; PLL multiplex demodulator; automatic stereo/mono switching; local/distance switch; loudness and muting switches; separate bass and treble controls; 8 W max. rms output power; FM usable sensitivity 1.1 μ V; 50 dB quieting sensitivity 1.4 μ V; alternate channel selectivity 74 dB; capture ratio 1.7 dB; automatic eject; fast forward and rewind; wow and flutter 0.3%; brushed aluminum panel; 3" H \times 7 $\frac{1}{8}$ " W \times 7 $\frac{1}{2}$ " D \$210
KP-250. Similar to KP-500 except separate bal-

ance/tone/volume control; stereo/mono switch; frequency range 40-10,000 Hz; 2" H \times 6 $\frac{1}{8}$ " W \times 6 $\frac{1}{4}$ " D \$160

KP-4000 AM-Stereo FM/Cassette

In-dash AM/FM stereo receiver with cassette player; 8 W max. rms output power; tape frequency response 40-10,000 Hz; wow and flutter 0.3%; automatic stop and eject; rotary mode selector; local/distance switch; FM stereo indicator; tape play lights; 2" H \times 7 $\frac{1}{8}$ " W \times 6 $\frac{1}{4}$ " D; nose dimension 1 $\frac{3}{4}$ " H \times 4 $\frac{1}{8}$ " W \times 1 $\frac{3}{8}$ " D \$200

KPX-600 Stereo FM/Cassette

Under-dash FM Supertuner with stereo cassette player; automatic replay; locking fast forward and



rewind; electronic governor motor; volume, bass, treble, and balance controls; release/eject button; FM muting; loudness contour switch; FM stereo indicator; tape-play indicator; FM stereo/mono switch; FM tuner: 50 dB quieting sensitivity; S/N 68 dB; capture ratio 1.7 dB; stereo separation 32 dB (65 dBf, 1 kHz); Tape Player: fast-winding time 120 sec (C-60); wow and flutter 0.13% wrms; frequency response 30-15,000 Hz \pm 3 dB; S/N 52 dB; 2 $\frac{1}{8}$ " H \times 7 $\frac{1}{8}$ " W \times 6 $\frac{1}{8}$ " D \$200

KP-88G Cassette Player

Under-dash stereo cassette player with Dolby noise-reduction system; electronic governor motor; automatic replay; loudness contour switch; locking fast forward and rewind; Dolby on/off switch; separate bass and treble controls; balance control; Dolby on and tape play indicators: fast-winding time 120 sec (C-60); wow and flutter 0.13% wrms; frequency response 30-15,000 Hz \pm 3 dB; S/N 60 dB (Dolby on), 52 dB (Dolby off); 2" H \times 5 $\frac{1}{8}$ " W \times 6 $\frac{1}{8}$ " D \$170

KP-66G. Similar to KP-88G except without Dolby; 2" H \times 4 $\frac{1}{8}$ " W \times 6 $\frac{1}{8}$ " D \$140

KP-292 Cassette Player

Under-dash cassette system with locking fast-forward and rewind; automatic replay after rewind; automatic eject; tone and balance controls; loudness switch; slide volume control; 8 W min. rms output power; frequency range 30-12,000 Hz; wow and flutter 0.3%; 2" H \times 4 $\frac{1}{4}$ " W \times 6 $\frac{1}{8}$ " D \$130
KP-212. Similar to KP-292 except side load; on/off indicator light; frequency range 40-10,000 Hz; 2" H \times 5 $\frac{1}{8}$ " W \times 16 $\frac{1}{8}$ " D \$105

TP-9006 AM-Stereo FM/8-Track

In-dash AM/FM stereo receiver with 8-track player; 8 W max. rms output power; FM usable sensitivity 1.1 μ V at 75 ohms; 50 dB quieting sensitivity 1.4 μ V at 75 ohms; alternate channel selectivity 74 dB; capture ratio 1.7 dB; wow and flutter 0.25% wrms; ten-station preset pushbutton tuning; 3 $\frac{1}{4}$ " H \times 7 $\frac{1}{8}$ " W \times 6 $\frac{1}{8}$ " D; nose size 3" H \times 4 $\frac{1}{8}$ " W; designed primarily for GM cars \$260
TP-9005. Similar except designed primarily for Ford cars \$260
TP-9004. Similar except designed primarily for Chrysler cars \$260

TP-7006 AM-Stereo FM/8-Track

Combines AM/FM stereo receiver with 8-track player; 8 W max. rms output power; FM usable sensitivity 1.1 μ V at 75 ohms; 50 dB quieting sensitivity 1.4 μ V at 75 ohms; alternate channel selectivity 74 dB; capture ratio 1.7 dB; tape frequency response 30-15,000 Hz; wow and flutter 0.25%; five-station preset tuning; automatic stereo/mono switching; local/distance switch; separate bass and treble controls; 3" H \times 7 $\frac{1}{8}$ " W \times 6 $\frac{1}{8}$ " D; nose size 3" H \times 4 $\frac{1}{8}$ " W; designed primarily for GM cars \$240

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AUTOMOBILE TAPE MACHINES

TP-7005. Similar except designed primarily for Ford cars \$240

TP-7004. Similar except designed primarily for Chrysler cars \$240

TP-900 Stereo FM/8-Track

Under-dash FM stereo with 8-track; PLL multiplex demodulator; FET front end; local/distance switch; loudness switch; muting; separate bass, treble, balance controls; FM usable sensitivity 1.1 μ V; 50 dB quieting sensitivity 1.4 μ V; alternate channel selectivity 74 dB; capture ratio 1.7 dB; automatic stereo/mono switching; tape frequency response 30-15,000 Hz; wow and flutter 0.25%; fast forward; program repeat; 3" H \times 7 $\frac{1}{2}$ " W \times 7 $\frac{1}{2}$ " D.....

..... \$200
TP-200. Similar to TP-900 but automatic/manual program change; frequency range 40-10,000 Hz; illuminated track indicator; 2 $\frac{1}{2}$ " H \times 7 $\frac{1}{2}$ " W \times 7 $\frac{1}{2}$ " D..... \$120

TP-7000 AM-Stereo FM/8-Track

In-dash AM/FM stereo receiver with 8-track player; 8 W max. rms output power; frequency response 40-10,000 Hz; wow and flutter 0.3%; pushbutton tuning; volume/balance/tone controls; lighted FM and stereo indicators; stereo/mono switch; 2" H \times 7 $\frac{1}{8}$ " W \times 6 $\frac{1}{4}$ " D; nose dimension 1 $\frac{1}{4}$ " H \times 4 $\frac{1}{4}$ " W \times 1 $\frac{1}{8}$ " D..... \$190

TP-6001. Similar to TP-7000 except automatic and manual program change; nose dimension 4 $\frac{3}{4}$ " \times 1 $\frac{1}{8}$ "..... \$140

TP-727 8-Track Player

Under-dash 8-track player; 8 W max. rms output power; frequency range 30-10,000 Hz; wow and flutter 0.25%; separate bass and treble controls; loudness switch; fast-forward; automatic/manual program change; repeat option; 2 $\frac{3}{8}$ " H \times 6 $\frac{1}{2}$ " W \times 6 $\frac{1}{4}$ " D..... \$115

TP-252. Similar to TP-727 but frequency range 40-10,000 Hz; slide volume and tone controls; separate balance control; 2" H \times 4 $\frac{3}{4}$ " W \times 6 $\frac{1}{8}$ " D..... \$60

RCA

20C505 AM-FM-MPX/Cassette Player

In-dash unit combines AM/FM/MPX radio and stereo cassette player; five \times five AM/FM slidebar



switching; five quick-set push-button tuning; local/distance switch; automatic frequency control; stereo balance control; fader control; dial light dimmer control lead; automatic power antenna activator lead; 10 W rms/channel; frequency response 30-20,000 Hz; 4-8 ohm impedance; adjustable shafts; 2 $\frac{3}{16}$ " H \times 7" W \times 6" D..... \$200

12R210 AM-FM-MPX/Cassette Player

In-dash unit combines AM/FM/MPX radio and stereo cassette player; compact installation for use in small domestic and foreign cars; solid state circuitry; built-in afc; automatic tape shut-off; stereo fader and balance controls; FM stereo indicator light; tape indicator light; fast-forward and eject button; 9 W rms/channel; frequency response 30-15,000 Hz; 3-8 ohm impedance; adjustable shafts; 1 $\frac{3}{8}$ " H \times 6 $\frac{1}{16}$ " W \times 4 $\frac{3}{8}$ " D..... \$145

12R150 Cassette Player

Stereo cassette tape player with automatic reverse; under-dash installation; slide controls for volume and tone; thumbwheel balance control; tape direction indicator lights; program selection push button; eject button; front-loading design; 20 W total peak power; frequency range 50-10,000 Hz; 3-8 ohm impedance; wow and flutter 0.44% rms; 2 $\frac{1}{8}$ " H \times 5 $\frac{1}{2}$ " W \times 6 $\frac{1}{8}$ " D..... \$100

12R206 Cassette Player

Under-dash compact cassette player; fast forward and rewind; automatic and manual tape eject; power on/off indicator; slide controls for volume, balance, and tone; 9.5 W/channel; frequency response 80-18,000 Hz; 3-8 ohm impedance; wow and flutter 0.25%; 2" H \times 5 $\frac{1}{4}$ " W \times 6 $\frac{1}{2}$ " D..... \$65

12R704 AM-FM-MPX/8-Track Player

In-dash unit combines AM/FM/MPX radio and stereo 8-track player; radio dial in cartridge door; five quick-set tuning push buttons; cartridge eject; local/distance switch; stereo fader and balance controls; dial light dimmer control lead; afc; program indicator lights; FM stereo indicator light; 10 W/channel; frequency response 30-20,000 Hz; 3-8 ohm impedance; adjustable shafts; 2 $\frac{1}{2}$ " H \times 7" W \times 6" D..... \$190

12R710 AM-FM-MPX/8-Track Player

In-dash unit combines AM/FM/MPX radio and stereo 8-track player; radio dial in cartridge door; short chassis only 4 $\frac{3}{4}$ " in deep; AM/FM slidebar switching; local/distance switch; stereo fader and balance controls; afc push button; tape program indicator lights; 10 W/channel; frequency response 30-10,000 Hz; 3-8 ohm impedance; adjustable shafts; 2" H \times 7 $\frac{1}{8}$ " W \times 4 $\frac{3}{4}$ " D..... \$140

12R904 Stereo FM/8-Track Player

Under-dash unit combines Stereo FM radio and 8-track tape player; non-glare numbered program indicator lights; push-button tape program selection; sliding volume, balance, and tone controls; FM stereo indicator light; front-loading with dust cover; compact size for installation in small cars, boats or RV's; 14 W power output; frequency range 80-8000 Hz; wow and flutter 0.3% rms; 3-8 ohm impedance; 2" H \times 6 $\frac{3}{4}$ " W \times 6 $\frac{3}{4}$ " D..... \$90

12R305 8-Track Player

Under-dash stereo 8-track player; solid state circuitry; fast-forward push button; automatic repeat; automatic on/off; program indicator lights; program selector; volume, balance, and tone controls; 9.5 W/channel; frequency response 80-9500 Hz; wow and flutter 0.3%; 2" H \times 5 $\frac{1}{2}$ " W \times 6 $\frac{3}{4}$ " D..... \$65

12R903 8-Track Player

Under-dash stereo 8-track player; non-glare numbered program indicator lights; push-button program selection; sliding volume, balance, and tone controls; automatic on/off switch; front-loading with dust cover; 14 W power output; frequency range 80-8000 Hz; 3-8 ohm impedance; wow and flutter 0.3% rms; 2" H \times 5 $\frac{1}{2}$ " W \times 6 $\frac{3}{4}$ " D..... \$55

12R902 8-Track Player

Under-dash compact stereo 8-track tape player; sliding, volume, balance, and tone controls; automatic on/off switch; push-button program selection; 14 W power output; frequency range 80-8000 Hz; 3-8 ohm impedance; wow and flutter 0.3% rms; 2" H \times 5 $\frac{1}{2}$ " W \times 6 $\frac{3}{4}$ " D..... \$45

RHAPSODY

RY-702/A AM-FM/Cassette Player

In-dash stereo cassette player with AM/FM-MPX radio; adjustable shafts; lighted slide-rule dial; slide-in cassette; eject button; fast forward, balance, and tone controls; front-end head alignment; antenna trimmer; mounting hardware and universal face trim plates included; optional RY-10 and RY-16 speakers available; 7" \times 6 $\frac{1}{4}$ " \times 2 $\frac{1}{8}$ "..... \$90

RY-862 AM-FM/8-Track Player

In-dash stereo 8-track player with AM/FM-MPX radio; lighted slide-rule dial on tape opening cover; automatic and push-button track changer with numbered indicator lights; repeat switch; balance and tone controls; front-end alignment; antenna trimmer; mounting hardware and universal face trim plates available; optional RY-10 and RY-16 speakers available; 7" \times 6 $\frac{1}{4}$ " \times 2 $\frac{1}{8}$ "..... \$80

RY-879 8-Track Player

Compact stereo 8-track player; slide lever volume, balance and tone controls; numbered channel indicator lights; mounting hardware included; optional RY-10 and RY-16 speakers available; 7 $\frac{1}{4}$ " \times 5 $\frac{1}{2}$ " \times 2"..... \$30

ROYAL SOUND

RS-3110 AM-FM/Cassette Player

In-dash unit combines automatic electronically tuned AM/FM stereo receiver with cassette tape



player; LED dial illumination; LED stereo, AM, and FM indicator lights; automatic tape reverse for continuous play and locking fast forward/fast rewind controls; tape frequency range 40-12,000 Hz; power output 2 \times 7 W; wow and flutter 0.45% wrms; S/N 35 dB; 4-8 ohm output impedance; 52 mm H \times 180 mm W \times 165 mm D..... \$550

PSA-5. Optional remote five-station preset adaptor \$60

SHARP

RG-5252 AM-Stereo FM/Cassette Player

In-dash stereo cassette player with FM/AM/Stereo FM radio; Automatic Program Search System (The



Sharp Eye); tape end LED indicator; automatic end-of-tape shut-off; simplified slot loading; illuminated slide-rule tuning dial; band switch for AM/FM/Stereo FM; balance control; fast-forward and reverse lever; variable tone control; solid state stereo amplifier; PLL/FM stereo circuitry; agc and afc; stereo indicator lamp \$170

RG-5702 AM-Stereo FM/Cassette Player

FM/AM/Stereo FM radio with stereo cassette player; automatic reverse feature that plays cassette to end of one side, reverses automatically and plays side two; simplified slot loading; illuminated slide-rule tuning dial; band selector for AM/FM/Stereo FM; balance control; variable tone control; fast forward and rewind; solid state stereo amplifier; PLL/FM stereo circuitry; afc and agc; stereo indicator lamp \$150

RG-5202 AM-Stereo FM/Cassette Player

FM/AM/Stereo FM radio with stereo cassette player; built-in automatic eject mechanism; simplified slot loading; illuminated slide-rule tuning dial; band selector switch; balance control; variable tone control; fast forward and rewind; PLL/FM stereo circuitry; afc and agc; stereo indicator lamp \$130

SONY from SUPERSCOPE

TC-34 AM-FM/Cassette Player

In-dash AM/FM radio with stereo cassette player; stereo indicator light; illuminated dial scale; rotary tuning; volume, tone, and balance controls; built-in afc; mono/stereo switch; antenna trimmer adjustment; manual direction change; auto reverse in fast-forward, play, and rewind modes; cassette actuated tape/radio switching; power-on indicator lamp; locking fast forward and rewind; manual cassette eject; tape run indicator light; adjustable shafts; wow and flutter 0.3%; frequency response 120-8,000 Hz; 2" H x 7" W x 4" D \$250

TC-28 AM-FM-MPX/Cassette Player

In-dash AM/FM/MPX radio with stereo cassette player; stereo indicator light; automatic FM-FM Stereo switching; illuminated dial scale; rotary tuning; volume, tone, and balance controls; switchable afc; mono/stereo switch; local/distance switch; PLL multiplexing IC; locking fast forward and rewind; auto eject at end-of-tape in fast forward and play; manual cassette eject; tape run indicator light; adjustable shafts; wow and flutter 0.25%; frequency response 50-10,000 Hz; 1.69" H x 7.09" W x 8.39" D \$200

TC-30 Cassette Player

Car stereo cassette player with automatic reverse; dual capstan tape drive; wow and flutter 0.25%; frequency response 50-10,000 Hz (standard tape); S/N 50 dB (standard tape); tape pilot directional lamp; individual tone, volume, and balance controls; locking fast-forward and rewind buttons; dual differential-balanced flywheels; supplied with spare fuse and mounting hardware; 12-V dc negative ground; 2¹/₁₆" H x 7¹/₁₆" W x 9³/₁₆" D \$200

TC-26F FM/Cassette Player

Car stereo FM radio and cassette player; wow and flutter 0.22%; frequency response 50-10,000 Hz (standard tape); S/N 50 dB (standard tape); mono/stereo FM; tape indicator; fast-forward and rewind buttons; tone, volume, and balance controls; supplied with spare fuse, mounting hardware, and antenna cord; 12-V dc negative ground; 2¹/₁₆" H x 8" W x 8³/₁₆" D \$170

TC-24FA AM-FM/Cassette Player

In-dash car cassette tape player with AM/FM stereo radio; wow and flutter 0.35% rms; frequency response 125-8000 Hz (standard tape); S/N 43 dB (standard tape); stereo balance, tone, and volume controls; automatic shut-off in forward tape mode; locking fast forward; tape travel indicator; mono/stereo switch; 1⁷/₁₆" H x 6⁷/₁₆" W x 5⁷/₁₆" D (body), 1¹/₁₆" H x 3⁷/₁₆" W x 3¹/₁₆" D (nose) \$150

TC-17 Cassette Player

Under-dash stereo cassette player; locking fast forward and rewind; auto shut-off; tape run indicator light; automatic cassette eject at end-of-tape; manual eject; straight-line slide volume, tone, and balance controls; wow and flutter 0.25%; frequency response 50-10,000 Hz; S/N -49 dB; 1³/₁₆" H x 6¹/₂" W x 7¹/₂" D \$120

SUPERSCOPE

CA-20 AM-FM/Cassette Player

In-dash AM/FM radio with stereo cassette deck; auto-stop at end of tape; tape indicator light; pushbutton fast-forward and rewind; manual stop/eject; 1³/₁₆" H x 7" W x 5³/₁₆" D \$160

CA-15 Cassette Player

Under-dash cassette player; auto-reverse; locking fast-forward and rewind pushbuttons; manual tape direction switch; tape direction indicator lights; manual stop/eject pushbutton; straight-line tone, volume, and balance controls; 2¹/₂" H x 6³/₁₆" W x 6⁷/₁₆" D \$120

CA-10 Cassette Player

Under-dash cassette player; locking fast-forward; straight-line volume, tone, and balance controls; manual eject; 2¹/₁₆" H x 5³/₁₆" W x 6³/₁₆" D \$60

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AUTOMOBILE SPEAKER SYSTEMS

ADS

2002 Car Speaker

4-in ultra-long acoustic-suspension excursion woofer with narrow-gap high-temperature voice coil, 1.5-ohm impedance, and 30 W rms power rating; 1-in acoustical suspension soft-dome tweeter with single-layer high-temperature voice coil, 4-ohm impedance, and 10 W rms power rating; frequency response 85-17,000 Hz \pm 3 dB, 55-20,000 Hz \pm 5 dB; system (pair) undistorted acoustical output 103 dB SPL at 1 meter; dispersion (-3 dB) 120 degrees at 12.5 kHz; input impedance 47,000 ohms; S/N 90 dB; solid black anodized brushed aluminum construction; mounts on swivel bracket with quick-disconnect screws; 4.25" H x 6.85" W x 5.4" D (price/pair) \$450

300C Car Speaker

Acoustic-suspension speaker; ultra long excursion 5.25-in woofer; 1-in soft dome tweeter; frequency response 40-23,000 Hz; for surface mounting on quick-disconnect swivel bracket; satin finished aluminum housing is black anodized; 8.5" H x 5.8" W x 5.25" D \$150

200C Car Speaker

1-in diameter soft-dome acoustic suspension tweeter with single-layer high-temperature metal voice coil; 4-in diameter super-long excursion woofer with high-temperature metal voice coil; frequency response 85-20,000 Hz \pm 3 dB, 55-22,000 Hz \pm 5 dB; 4-ohm impedance; 30 W rms power rating; solid, brushed and anodized aluminum cabinet available in black only; swivel bracket supplied for surface mounting; 6.85" H x 4.25" W x 4.65" D \$115

ADVENT

EQ-1 Car Speaker System

Frequency-equalized amplifier/speaker system for rear-deck mounting; 6" x 9" loudspeaker drivers



with integral power amplifiers; may be used with any car radio or tape sound source; frequency-equalized specifically for rear-deck mounting; has remote power on/off switch; wiring, hardware and grilles included \$180

AUDIOVOX

TRYVOX-20 Car Speaker

Three-way 6" x 9" auto speaker system; 20-oz ceramic magnet; 3-in midrange; 2-in tweeter; max. input 30 W; frequency response 60-15,000 Hz; 8-ohm impedance \$90

TRYVOX-25 Car Speaker

Three-way auto speaker system; 5¹/₂-in woofer; 1¹/₂-in midrange; 1-in tweeter; 20-oz ceramic magnet; input 15 W; 8-ohm impedance; mesh grilles \$80

COID-69/20 Car Speaker

Coaxial 6" x 9" auto speaker system; 3-in tweeter; 20-oz ceramic magnet; frequency response 60-18,000 Hz; input 20 W; 8-ohm impedance; chrome-accented padded vinyl grilles \$60

COID-57/20 Car Speaker

Coaxial 5" x 7" auto speaker system; 2-in tweeter; 20-oz ceramic magnet; max. input 20 W; frequency response 100-16,000 Hz; 8-ohm impedance; diffuser grilles \$55

AVANTI

30-2656 Car Speaker

6" x 9" three-way speaker; 1-in tweeter; 3-in midrange; 20-oz ceramic magnet; 30 W peak power rating; 40-20,000 Hz frequency range; 4-8 ohm impedance; two per kit \$88

30-2654 Car Speaker

6" x 9" coax speaker; 3-in tweeter; 25-oz ceramic magnet; 35 W peak power rating 40-18,000 Hz frequency range; 4-8 ohm impedance; two per kit \$82

30-2644 Car Speaker

5¹/₄-in coax speaker; 1³/₄-in piezo tweeter; 20-oz ceramic magnet; 25 W peak power rating; 50-20,000 Hz frequency range; 4-8 ohm impedance; two per kit \$70

30-2653 Car Speaker

6" x 9" coax speaker; 3-in tweeter; 20-oz ceramic magnet; 25 W peak power rating; 45-18,000 Hz; 4-8 ohm impedance; two per kit \$69

CLARION

SK-103 Car Speaker

Independently-mounted three-way speaker; 6" x 9" woofer with 20-oz magnet; separate dome midrange and tweeter speakers; speaker measures 7" x 13" but will fit standard 6" x 9" mounting \$150

CRAIG

9413 Car Speaker

4-in rectangular flush-mount speaker with black padded vinyl grille; 3.6-oz magnet; 8 W music power rating; 4-ohm impedance; 3³/₄-in diameter voice coil; 11.7-ft. detachable connecting leads; 3³/₄-in diameter cut-out size, 1¹/₁₆ in deep; two per kit \$20

9414 Car Speaker

5¹/₄-in round flush-mount speaker with black padded vinyl grille; 3.6-oz magnet; 8 W music power rating; 4-ohm impedance; 3¹/₂-in diameter voice coil; 11.7-ft detachable connecting leads; 5-in diameter cut-out size, 1³/₁₆ in deep; two per kit \$23

9420 Car Speaker

5¹/₄-in square flush-mount speaker with black grille; 11-oz magnet; 25 W music power rating; 8-ohm impedance; 1-in diameter voice coil; 16¹/₂-ft detachable connecting leads; 5-in diameter cut-out size, 2 in deep; two per kit \$40

9422 Car Speaker

6 in x 9 in oval flush-mount speaker; 11.6-oz magnet; 25 W music power rating; 8-ohm impedance; 1-in diameter voice coil; 16¹/₂-ft detachable connecting leads; 6 in x 9 in oval cut-out size, 3¹/₁₆ in deep; two per kit \$40

9425 Car Speaker

6¹/₂-in surface-mount enclosed speaker; 10-oz magnet; 25 W music power rating; 8-ohm impedance; 1³/₁₆-in diameter voice coil; 16¹/₂-ft detachable connecting leads; enclosure size 5¹/₁₆" H x 9⁵/₁₆" W x 9¹/₂" D; two per kit \$45

9426 Car Speaker

4-in rectangular flush-mount speaker with black grille; 5.4-oz magnet; 10 W music power rating;

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AUTOMOBILE SPEAKER SYSTEMS

4-ohm impedance; 3/4-in diameter voice coil; 16-ft detachable connecting leads; 3 3/4-in diameter cutout size, 1 1/8 in deep; two per kit \$25

EPI

LS70 Car Speaker

6" x 9" stereo car speaker system; 1-in air spring tweeter; 6-in long transverse woofer; drivers are positioned side-by-side; 70-20,000 Hz frequency range, 4-8 ohm impedance; acoustically transparent perforated metal grille; versatile mounting; two per kit \$150

HART

Car Speaker Systems

Each speaker system features two-way speaker design with 6-in woofer and 2 1/2-in tweeter; 12-oz magnet; heat-treated voice coil; acoustical foam grilles; frequency response 90-10,000 Hz ± 2 dB; crossover frequency 5 kHz; 4 or 8 ohm impedance; 35 W continuous power capacity.

RVS-1. Compact walnut-grain cabinet; wall and ceiling mounting in vans, campers, and trailers; 13 3/4" x 9" x 6 3/8" \$140

RVS-2. For wall mounting in vans, campers, and trailers; 7 1/2" x 11 1/2" \$100

RVS-3. For front-door mounting in car, van or camper; separate tweeter can be mounted high in door panel; woofer with frame 6 3/4-in diameter; tweeter with frame 3 3/4-in diameter \$100

RVS-4. For rear-deck mounting in cars, or panel mounting in vans; 6 1/4" x 10 1/4" (mounting plate allows for adjustable mounting size) \$100

JENSEN

J1001 Car Speaker

Three-way auto speaker system; woofer: 6" x 9", 20-oz magnet, frequency response 35-1000 Hz; midrange: 3 1/2-in, 3-oz magnet, 1-4000 Hz frequency response; tweeter: 2-in, 3-oz magnet; 4-20,000 Hz frequency response; input 35 W; 4-8 ohm impedance; midrange and frequency controls; comes with custom grilles, wiring, and hardware \$160

Triaxial Car Speaker Systems

Three-way speaker systems with 4-8 ohm impedance, custom grilles, wiring, and hardware.

C9945. 6" x 9" woofer; 3-in midrange; 2-in tweeter; 3 1/2-in deep; input 30 W; 20-oz magnet; frequency response 40-20,000 Hz \$120

C9991. 4" x 10" woofer; 2-in midrange; 2-in tweeter; 3 1/2-in deep; 20-oz magnet; input 30 W; 45-20,000 Hz frequency response \$120

C9999. 5 1/4-in woofer; 2-in midrange; 2-in tweeter; 2 1/2-in deep; 20-oz magnet; input 30 W; 60-20,000 Hz frequency response \$118

Coaxial Car Speaker Systems

Two-way speaker systems with 4-8 ohm impedance, custom grilles, wiring, and hardware.

C9740. 6" x 9" woofer; 3-in tweeter; 3 3/4-in deep; 20-oz magnet; input 25 W; 40-18,000 Hz frequency response \$74

C9994. 4" x 10" woofer; 2-in tweeter; 3 1/2-in deep; 20-oz magnet; input 25 W; 45-18,000 Hz frequency response \$74

C9943. 5" x 7" woofer; 2-in tweeter; 3 1/4-in deep; 20-oz magnet; input 25 W; 50-15,000 Hz frequency response \$73

C9852. 5 1/4-in woofer; 2-in tweeter; 2 1/4-in deep; 20-oz magnet; input 25 W; 60-15,000 Hz frequency response \$72

C9853. 5 1/4-in woofer; 2-in tweeter; 2 1/4-in deep; 10-oz magnet; input 25 W; 60-15,000 Hz frequency response \$62

C9851. 4-in woofer; 2-in tweeter; 1 3/4-in deep; 10-oz magnet; input 20 W; 70-15,000 Hz frequency response \$61

KLH

693DMSC Car Speaker System

Three-way, wide-dispersion, 6" x 9" auto speaker system with Controlled Acoustic Compliance woofer



ers with printed Kapton diaphragms and 30-oz samarium cobalt magnets; hemispherical soft-dome mid-range; frequency response 40-30,000 Hz, 2 3/4-in depth \$215

692DT Car Speaker System

Two-way, wide-dispersion, 6" x 9" auto speaker system with Controlled Acoustic Compliance woofers with 30 oz magnets; hemispherical soft dome tweeter; frequency response 40-20,000 Hz; 2 3/4-in depth \$145

692CT Car Speaker System

Two-way, wide dispersion, 6" x 9" auto speaker system with Controlled Acoustic Compliance woofers with 30 oz magnets; high-efficiency cone tweeter; frequency response 40-20,000 Hz; 2 3/4-in depth \$120

Headliner Car Speakers

Tweeter/midrange that uses solid-state barium titanate crystals instead of voice coil magnets; each speaker is 4 1/2" H x 6" W x 1/2" D; mounts in front of car at head level.

Headliner III. For installation in an already existing system; includes two headliners with variable tone control adjustable in both channels \$120

Headliner V. Includes two headliners and two 6" x 9" Controlled Acoustic Compliance woofers with 20 oz magnets; has variable tone control adjustable in both channels \$170

KRACO

MAG IV Car Speaker Systems

Three-way/four speaker sound system; two 6" x 9" three-way speakers; two tweeters; tweeter-efficient dome/horn combination; direct-radiating midrange; acoustic foam grille; speaker cable and mounting hardware included.

TRI-4699CF. Wedge or flush mount \$104

TRI-469. Flush mount \$100

TRI-369 Car Speaker System

Three-way speaker system; two 6" x 9" three-way speakers; tweeter efficient dome/horn combination; direct-radiating midrange; acoustic foam grille; includes speaker cable and mounting hardware \$100

TRI-359. Similar except has two 5 1/4-in round speakers \$90

PBS-90 Car Speaker System

Includes two power speakers with individual amplifiers; power control box with "boomer" on/off switch and thumbwheel volume control \$100

K-269-20-F Car Speaker

6" x 9" rear-deck speaker set; 20-oz magnet; 8-ohm impedance; air suspension tweeter \$70

CX-269-20-F Car Speaker

6" x 9" rear-deck air-suspension speakers; built-in

coaxially mounted tweeter; padded black vinyl with chrome trim; 20 oz magnet; 8-ohm impedance \$60

SST-101-F Car Speaker

Flush mount Super Sound speaker; in-door, rear deck, or front kick panel mounting; deluxe press-on grille; 10-oz magnet; 8-ohm impedance; air suspension with tweeter \$40

KRIKET

Klassic Series Car Speakers

Each kit contains two speakers, two grilles, two 15-ft cables with quick connect terminals, mounting instructions, and hardware; incorporate 10-oz ceramic magnets and 1-in voice coils; 8-ohm impedance.

2821. 8-in pincushion dual-cone design; 5-oz ceramic magnet; 3/4-in voice coil; input 18 W rms; frequency response 85-15,000 Hz \$15

2831. 8-in round dual cone design; input 30 W rms; frequency response 50-15,000 Hz \$20

2031. 4" x 10" dual cone design; input 25 W rms; frequency response 55-16,000 Hz \$18

2032. 4" x 10" coaxial design; input 25 W rms; frequency response 55-18,000 Hz \$25

2731. 5" x 7" dual cone design; input 25 W rms; frequency response 60-16,000 Hz \$18

2732. 5" x 7" coaxial design; input 25 W rms; frequency response 60-18,000 Hz \$25

8231. 5 1/4-in dual cone design; max. input 12 W rms; frequency response 55-15,000 Hz \$45

8232. 5 1/4-in coaxial design; max. input 12 W rms; frequency response 15-17,500 Hz \$65

8531. 5 1/4-in coaxial design; max. input 10 W rms; frequency response 65-15,000 Hz \$45

8931. 6" x 9" dual cone design; max. input 18 W rms; frequency response 45-15,000 Hz \$50

8932. 6" x 9" coaxial design; max. input 18 W rms; frequency response 45-18,000 Hz \$70

8971. 6" x 9" dual cone design; max. input 30 W rms; frequency response 40-15,000 Hz; 20-oz ceramic magnet; 1 1/4-in voice coil \$60

8972. 6" x 9" coaxial design; max. input 30 W rms; frequency response 40-18,000 Hz; 20-oz ceramic magnet; 1 1/4-in voice coil \$80

MOTOROLA

Pow-R-Handlers Car Speakers

Professional series car speakers; all models feature 1-in voice coils, rolled cloth edges, one-piece magnets, and ABS plastic mounting bases. Two per kit.

M4-8C. Two-way flush mount speaker; 8 oz ceramic magnet; 15 W input; 1 3/4-in deep \$40

M5-10C. Two coaxial 5 1/4-in flush mount speakers; 10 oz ceramic magnets; formed cloth grilles; 2-in deep; 20 W input \$63

M5-20C. Two coaxial 5 1/4-in flush mount speakers; 20 oz magnets; formed cloth grilles; 2-in tweeters 25 W input \$73

M69-20C. Two coaxial 6" x 9" speakers for flush mounting on rear decks; integral 2-in tweeters; 20 oz ceramic magnets; formed cloth grilles; top or bottom loading installation; 25 W power input \$80

M69-20T. Two three-way 6" x 9" speakers for flush mounting on rear decks; integral 2 1/2-in midrange and 2-in tweeters; 20 oz ceramic magnets; formed cloth grilles with wedge type extender; top or bottom loading installation; 25 W power input \$120

PANASONIC

"Sound Pumps" Car Speakers

Dual cones; equalizer; aluminum voice coil; 4-ohm impedance; 20 W max. power.

EAB-771. 6" x 9"; 10-oz magnet \$20

EAB-772. 6" x 9"; 20-oz magnet \$30

EAB-773. 5 1/4-in; 10-oz magnet; two per kit \$40

EAB-774. 5 1/4-in; 20-oz magnet; two per kit \$50

EAB-551. Easy-mount 5-in speaker; 8-ohm impedance; two per kit \$20

PIONEER

Surface and Rear-Deck Speakers

TS-X9. Two-way, surface-mount speakers; 3³/₄-in bass speaker; 1-in treble dome radiator; 50-22,000 Hz; 4-ohm impedance; 40 W power; die-cast aluminum enclosure..... \$230
TS-X6. Two-way surface-mount speakers; 4-in bass speaker; 4-in passive radiator; 2³/₄-in treble driver; 80-20,000 Hz; 4-ohm impedance; 20 W power; black molded enclosure with chrome handles. \$120
TS-35. Door and surface mount speakers; 5¹/₄-in single cone; 80-13,000 Hz; 40 W power; 4-ohm impedance; black and chrome finish..... \$45
TS-22. Two-way surface-mount speakers; coaxial design; 4-in high-compliance woofer; 2³/₄-in tweeter; tweeter port; 100-15,000 Hz; 8 W power; 4-ohm impedance; black and chrome finish..... \$45
TS-5. Door and surface mount speakers; 5¹/₄-in single cone; 2.9 oz magnet; 70-10,000 Hz; 8 W power; 4-ohm impedance; black and chrome finish..... \$25

RCA

12R406 Car Speaker

6" x 9" dual cone speaker; 21.2-oz ceramic magnet; 8-ohm impedance; frequency response 50-15,000 Hz; max. input 10 W; black metal rectangular grille; two per kit..... \$32

12R405 Car Speaker

6" x 9" dual cone speaker; 12-oz ceramic magnet; 8-ohm impedance; frequency response 50-15,000 Hz; max. input 10 W; black metal rectangular grille; two per kit \$25

12R408 Car Speaker

6¹/₄-in round speaker for flush-mount installation; 10-oz ceramic magnet; 8-ohm impedance; frequency response 80-11,000 Hz; max. input 16 W; foam-padded with textured black finish; two per kit \$22

12R400 Car Speaker

5³/₄-in speaker for flush or surface mounting; 4.6-oz ceramic magnet; 3.2-ohm impedance at 400 Hz; frequency response 50-10,000 Hz; max. input 7 W; black plastic case with chrome trim; two per kit \$18

12R401D Car Speaker

5³/₄-in flush-mount speaker; 4.6-oz ceramic magnet; 3.2-ohm impedance at 400 Hz; frequency response 50-10,000 Hz; max. input 7 W; black metal rims and grilles; two per kit..... \$18

RHAPSODY

RY-10 Car Speakers

5¹/₄-in round door-type speakers; heavy-duty removable chrome grille; 8-ohm impedance; cables and mounting screws included..... \$10

RY-16 Car Speakers

Rear or dash-mount square speakers; heavy-duty high-impact plastic cabinet; 8-ohm impedance; cables and mounting screws included; 5¹/₂" x 5³/₄" x 3¹/₄"; two per kit..... \$8

SPARKOMATIC

LC-100 Amplified Car Speaker System

Full-range amplifier, two 6" x 9" air suspension woofers with coaxial high-frequency tweeters; separate slide controls for bass and treble; standard boost and tone boost switches; power meter; 18 W/channel at 10% THD into 3 ohms; channel separation more than 45 dB; amplifier frequency response 2-20,000 Hz -3 dB; input impedance 27 ohms; woofers have 10-oz magnets; speaker frequency response 45-20,000 Hz ±3 dB..... \$80



AUDIOMOBILE

SA1500A Power Amplifier

Power output 75 w/channel minimum continuous into 4 ohms, both channels driven; distortion 0.2% (THD), 0.25% (IM); frequency response 20-20,000 Hz ±1 dB; input impedance 10k ohms (low level), 100 ohms (high level); S/N 80 dB below 75 W; 4¹/₄" H x 7³/₄" W x 7³/₄" L \$250

SA460 Amplifier/Equalizer

Mobile integrated power amplifier with six-band equalizer; adjustable preamp input with radio/tape switch; hi/lo input impedance; on/off switch; power-on indicator; power output 60 W rms; distortion 0.5% (THD), 0.5% (IM); frequency response; 20-20,000 Hz ±1 dB; input impedance -10k ohms (low level), 100 ohms (high level); equalizer controls ±15 dB at following frequencies: 40 Hz, 100 Hz, 350 Hz, 1000 Hz, 3500 Hz, 10,000 Hz; 1¹/₄" H x 5¹/₂" W x 5¹/₄" D \$190

AUDIOVOX

AMP-1000 Stereo Power Amplifier

Amplifier mounts remotely; has control head with slide controls for volume, bass, treble, and mid-range; power output 22 W/channel; accepts 4 or 8 ohm speakers; 12 V dc \$130

CLARION

300-EQB Power Booster/Equalizer

Power booster/graphic equalizer; 30 W rms/channel; front-to-rear fader; power switch; LEDs show power output for each channel; five slide controls (60 Hz, 250 Hz, 1 kHz, 3.5 kHz, 10 kHz) \$170

CONCORD

HPA-40 Stereo Power Amplifier

Stereo power amplifier for mobile use; 18 W rms min. power output per channel into 4 ohms; 25 W rms min. per channel into 2 ohms; less than 0.3% THD; power bandwidth 10-35,000 Hz; input sensitivity: high-level 2V, low-level 200 mV; 2-8 ohm output impedance; 2¹/₂" H x 6" W x 5¹/₂" D \$100

CRAIG

R500 Powerplay Booster

Powerplay booster offers 25 W continuous sine wave per channel; automatic power switching; for use with any Craig unit; compatible with stereo matrix systems; dist. 1%; frequency response 50-10,000 Hz; S/N 50 dB; crosstalk -70 dB; input 4 ohms; output 4 ohms; 10-dB gain; 12-V dc, 5-A max. current drain; 2¹/₄" H x 6¹/₂" W x 5¹/₂" D \$65

KRACO

KE-5 Graphic Equalizer

Graphic equalizer with fader control; 30 W rms/channel max. output power; five equalizer controls (60 Hz, 250 Hz, 1 kHz, 3.5 kHz, and 10 kHz); LED power-on indicator; variable fader control with specially engineered heatsink; power on/off switch \$124

MOTOROLA

EQB-3000 Graphic Equalizer/Booster

Graphic equalizer/booster; 30 W rms total power output; HD 1% at 10 W; slide controls for each of five bands; front-rear fader; LED power indicators; for use with either two or four speakers \$120

PA4000 Stereo Amplifier

Stereo power amplifier; 40 W rms power output at 4-ohm load; THD less than 1% at 1 kHz at 30 W rms; audio by-pass switch; bass boost and treble boost switches; dc to dc converter \$90

PA2400 Stereo Amplifier

Stereo power amplifier; 24 W rms power output at 4-ohm load; THD less than 2% at 1 kHz at 20 W; 50-16,000 Hz frequency response..... \$60

PANASONIC

CJ-3510 Power Booster

Component Systems power booster; under-dash installation; on/off switch; separate bass and treble tone controls; power indicator; 12-V dc negative ground; 10 W output power with 1% THD; frequency response 40-30,000 Hz; 4-ohm impedance; 4" H x 2³/₄" W x 8³/₄" D \$85

CJ-155Z Sound Charger

Boosts power more than 10 W/channel; connects between car unit and speakers; 12-V dc negative ground; input sensitivity 1.4 V at 4 W, 2.3 V at 10 W; 4 to 8 ohm impedance; max. output power 19 W/channel; THD 10% at 10 W; in-dash installation; 1¹/₄" H x 3¹/₂" W x 5¹/₄" D \$40

PIONEER

AD-50 Graphic Equalizer/Amplifier

Five-band stereo graphic equalizer/amplifier; 50 W; five frequency band tone controls; fader control; 10-LED power level display (five LED's per channel); 25 W rms/channel max., 15 W with 1% dist. at 1 kHz into 4 ohms; frequency response 30-30,000 Hz -3 dB; S/N 65 dB; ±12 dB equalization range; equalization frequencies 60 Hz, 250 Hz, 1 kHz, 3.5 kHz, 10 kHz \$200

ROYAL SOUND

EA-400 Graphic Equalizer Amplifier

Mobile high fidelity graphic equalizer amplifier; five-band equalizer control console with vertical slide controls (60 Hz, 250 Hz, 1 kHz, 3.5 kHz, 15 kHz); on/off push-button; LED power indicator light; 20 W rms/channel; frequency response 10-40,000 Hz; THD 0.03% \$180

A-300 Power Amplifier

Mobile high fidelity power amplifier; 15 W/channel power output; 1% dist.; S/N 77 dB; frequency response 20-25,000 Hz..... \$150

SOUND CONCEPTS

AD1060 Concert Machine

Automotive delay system for use with car radio or tape deck; on/off switch; rear level and continuously-variable delay controls; delay control allows user to select a delay setting from 5 to 70 msec corresponding to sound path lengths of 5-70 ft; contains two 10-W amplifiers; 3" H x 7" W x 7" D \$290

SPARKOMATIC

GE-500 Graphic Equalizer Booster

Car stereo booster amplifier produces visual response curve on illuminated screen; slide controls for five frequency bands (60 Hz, 250 Hz, 1000 Hz, 3.5 kHz, 10 kHz); front-to-rear fader control; power indicator light; audio by-pass switch; 20 W rms/channel; frequency range 20-20,000 Hz; for use with all tape decks and radios, and speakers with power handling capability of 15 W or greater; 2" H x 6³/₁₆" W x 6¹/₂" D \$80

LC-50 Power Booster

18 W/channel at 10% THD into 4 ohms; channel separation more than 45 dB; frequency response 20-20,000 Hz -3 dB; input impedance 27 ohms; output impedance 4-8 ohms; 13.8 V dc; 1¹/₄" H x 4" W x 5" D \$26

5

COMPACT TAPE SYSTEMS

AIWA

AF-5080A Compact Music System

Combines record player, cassette recorder/player, and AM/FM receiver; Amplifier Section: continuous power output 22 W/ch min. rms at 8 ohms over 40-20,000 Hz with 1% THD; FM Tuner Section: sensitivity 13.2 dBf (2.5 μ V); dist. 0.4% (mono), 0.7% (stereo); stereo separation 38 dB (1kHz); AM Tuner Section: sensitivity 300 μ V/m; Cassette Deck Section: allows direct automatic recording from turntable to deck; features Dolby noise-reduction system; wow and flutter 0.1% wrms; frequency response 30-12,000 Hz (normal tape), 30-16,000 Hz (CrO₂ and FeCr tape); S/N 58 dB (Dolby on, FeCr tape); Record Player Section: belt drive with automatic arm return; wow and flutter 0.1% wrms; S/N 45 dB; Shure M-91ED cartridge; 8 $\frac{1}{16}$ " H \times 23 $\frac{1}{4}$ " W \times 16 $\frac{1}{16}$ " D \$570
Hardwood decorator cabinet \$80

AF-3030 Receiver/Cassette Deck

Combines AM/FM receiver and record/play cassette deck; Amp Section: continuous power output 13 W/ch min. rms at 8 ohms over 40-20,000 Hz with 1% THD; FM Tuner Section: sensitivity 31.2 dBf (2.5 μ V); dist. 0.4% (mono), 0.7% (stereo); stereo separation 38 dB (1 kHz); AM Tuner Section: sensitivity 300 μ V/m; Cassette Deck Section: features Dolby noise-reduction system; wow and flutter 0.1% wrms; frequency response 30-12,000 Hz (normal tape), 30-16,000 Hz (CrO₂ and FeCr tape); S/N 58 dB (Dolby on, FeCr tape); 6 $\frac{3}{8}$ " H \times 18 $\frac{1}{16}$ " W \times 12 $\frac{1}{16}$ " D \$400

CENTREX by PIONEER

RH-7744 AM-FM/8-Track/Phono

Combines AM/FM stereo receiver, 8-track record/playback, and three-way speaker system; 12 W rms min./ch into 8 ohms from 40-30,000 Hz at 0.8% THD; FM usable sensitivity 1.9 μ V; FM muting; fly-wheel tuning; center tuning meter; stereo/mono switch; loudness contour; click-stop bass and treble; A + B selector; headphone jack; 11-in, three-speed automatic changer; moving magnet cartridge; diamond stylus; 45 rpm adapter; sleep feature; damped cue lever; tape deck has twin VU meters, dual mike jacks, aux. input, resettable time counter and program indicator, function switch for selecting one or four programs or endless playing; 10-in three-way speaker system; Speakers 13" H \times 22 $\frac{1}{2}$ " W \times 10 $\frac{1}{2}$ " D; Control Center 10" H \times 20" W \times 15" D \$450

KH-5511 Compact Music System

Combines AM/FM receiver, cassette player, record changer, and two-way speaker system, PLL multiplex demodulator; two large VU meters; pause and fast-forward controls; full-size automatic changer; magnetic cartridge with diamond stylus; four-pole induction motor; cueing and pause control; calibrated stylus pressure gauge; wow and flutter 0.25% wrms; S/N 40 dB; Speakers 22 $\frac{1}{2}$ " H \times 13" W \times 8" D; Control Center 9 $\frac{3}{8}$ " H \times 20 $\frac{1}{8}$ " W \times 15" D \$350

KH-505 Compact Music System

Incorporates AM/FM stereo, cassette player/recorder, and two speakers; continuous power output 4 W/ch rms into 8 ohms over 70-20,000 Hz with 2% THD; crosstalk -50 dB; S/N 40 dB; has mike, line, and phono inputs; tape player; wow and flutter 0.25% wrms; fast-winding time 95 sec (C-60); Tuner: sensitivity 2.5 μ V FM (IHF), 300 μ V/m AM (with bar antenna, IHF); Speakers: infinite baffle bookshelf system with 8-in woofer and 2 $\frac{3}{4}$ -in tweeter; 8-ohm impedance; Speakers 22 $\frac{1}{2}$ " H \times 13" W \times 8" D \$310

CHANNEL MASTER

HR-6882 Compact Music System

Compact music system combines stereo 8-track recorder/player with AM/Stereo FM receiver, and de-



lux automatic record changer with magnetic cartridge; Receiver Section: illuminated dual function AM/FM tuning and record meters; vernier flywheel tuning; LED function indicator lights; separate tensioning detent treble and bass controls; FM muting switch; loudness control; separate high and low cut filters; A-B speaker selector switch; continuous power output 7 W rms at 8 ohms from 100-20,000 Hz with no more than 1.0% total harmonic distortion; 8-Track Section: record level controls and VU record meters; auto stop - end of all, end of each; push-button controls for fast forward, repeat, auto stop, pause, record and manual track select; LED track, recording and pause indicators; Record Changer Section: magnetic cartridge with diamond stylus; calibrated and adjustable anti-skate; cue and pause control; calibrated stylus pressure gauge; four-pole motor; Speaker System: 20 W bass reflex ported system; 8-in woofer, 3-in tweeter; acoustically tuned port; system comes with pair of recording microphones and stands; Receiver (with cover) 10" H \times 23 $\frac{3}{8}$ " W \times 16 $\frac{1}{4}$ " D; Speakers 23" H \times 12" W \times 9 $\frac{1}{2}$ " D \$400

HQ-6869 Compact Music System

Compact music system combines stereo cassette and 8-track player/recorders with AM/Stereo FM receiver and automatic record changer; Receiver Section: large illuminated tuning meter; FM muting; A-B speaker switch; Cassette Player/Recorder: built-in automatic level control; fast-forward, rewind, play, record, stop/eject, and pause controls; digital tape counter; 8-Track Player/Recorder: built-in automatic level control; automatic stop, fast forward, pause, and record; LED program indicators;

Record Changer: full-size changer; cue and pause control; stylus pressure control; anti-skate mechanism; ceramic cartridge; diamond stylus; Speaker System: bass reflex ported system; 8-in full-range speaker; acoustically tuned port; system comes with pair of recording microphones and stands; Receiver (with cover) 10" H \times 21 $\frac{1}{4}$ " W \times 16 $\frac{1}{4}$ " D; Speakers 23" H \times 12" W \times 7" D \$330

HC-6867 Compact Music System

Compact music system combines cassette recorder/player with AM/Stereo FM receiver and automatic record changer; Receiver Section: large illuminated tuning meter; FM muting; built-in afc; four-dimensional sound switch; Cassette Section: built-in automatic level control; fast forward, rewind, play, record, stop/eject, and pause controls; digital tape counter; Record Changer: full-size changer; cue and pause control; stylus pressure control; anti-skate mechanism; ceramic cartridge; diamond stylus; Speaker System: bass reflex ported system; 8-in full-range speaker; acoustically-tuned port; system comes with pair of recording microphones and stands; Receiver (with cover) 10" H \times 21 $\frac{1}{4}$ " W \times 16 $\frac{1}{4}$ " D; Speakers 23" H \times 12" W \times 7" D \$290

HR-6844 Compact Music System

Music system includes stereo 8-track player/recorder with AM/Stereo FM receiver and automatic record changer; Receiver Section: phase locked loop FM stereo circuitry; lighted slide-rule vernier tuning; rotary controls for volume, base, treble, balance, and tuning; push-button function selectors for AM, FM, tape and, phono/aux.; built-in afc; four-dimensional sound capability; 8-Track Section: built-in automatic level control; fast forward, pause, repeat and record controls; LED program indicators; LED record light; manual track selector; Record Changer: full-size changer; cue and pause control; stylus pressure control; anti-skate mechanism; ceramic cartridge; diamond stylus; Speaker System: bass reflex ported system; 6 $\frac{1}{2}$ -in full-range speaker; acoustically tuned port; Receiver (with cover) 9 $\frac{3}{8}$ " H \times 20 $\frac{1}{2}$ " W \times 16" D; Speakers 20" H \times 11 $\frac{1}{4}$ " W \times 7" D \$240

HITACHI

SDP/9600 Compact Music System

Combines record/play stereo cassette deck, AM/FM stereo receiver, BSR record changer with ADC magnetic cartridge, and two three-way speakers (8-in woofer, 8-in passive radiator, and 3-in tweeter); two recording VU meters; five function LED indicators; pause control; three-digit tape counter \$300

SDT/8700H Compact Music System

Combines record/play stereo cassette deck, AM/FM stereo receiver, BSR C-123R2 record changer and ceramic cartridge with diamond/sapphire stylus, and two three-way bass reflex speakers (8-in woofer, 2-in tweeter); aux. frequency response 40-18,000 Hz; left and right channel VU meters and record controls; pause control; digital tape counter; automatic stop; supplied with dust cover, microphone, and 45 rpm spindle; speaker size 23" H \times 13" W \times 8" D; unit size (with dust cover) 8 $\frac{3}{8}$ " H \times 23 $\frac{3}{8}$ " W \times 15 $\frac{1}{8}$ " D \$280

MERITON

HF-2105/SP-3000 Music System

Incorporates AM/Stereo FM receiver, BSR automatic/manual turntable, cassette recorder, and speaker system; power output 6 W/ch rms into 8 ohms over 60-12,000 Hz with 2% THD; has bass and treble tone controls; tuner sensitivity 4 μ V/m FM, 400 μ V AM; S/N 60 dB FM, 40 dB AM; Tape Recorder: wow and flutter 0.25% wrms; frequency response 60-10,000 Hz; Speakers: two-way tuned port speaker system with 8-in woofer and 2 1/2-in tweeter; 8-ohm impedance; Control Center 10 1/2" H x 21 1/2" W x 16 1/2" D; Speakers 22 3/4" H x 13" W x 9" D..... \$260

OPTONICA

SG-400 Stereo Component System

Incorporates AM/FM, LW, and SW receiver, semi-automatic belt-drive turntable, and cassette deck with Dolby noise-reduction system; FM tuner; sensitivity 2 μ V; S/N 57 dB; capture ratio 1.5 dB; i-f response -80 dB; image response -50 dB; stereo separation 40 dB; AM tuner: sensitivity 250 μ V/m; i-f response -50 dB; image response -46 dB; LW band: 150-370 kHz; sensitivity 200 μ V/m; SW band: 5.95-18 MHz; sensitivity 63 μ V/m; power output 15 W/channel rms into 4 ohms over 60-20,000 Hz with 1% THD; turntable: 33 1/3 and 45 rpm speeds; wow and flutter 0.15%; cassette deck: frequency response 30-15,000 Hz (CrO₂ tape); S/N 46 dB; wow and flutter 0.2%; fast-winding time 90 sec (C-60); channel separation 20 dB; 7.1" H x 29.6" W x 13.9" D..... \$500

PANASONIC

SE-5808 Compact Music System

FM/AM Stereo FM radio with built-in stereo 8-track player/recorder, three-speed automatic record changer and two Panasonic Thrusters Multidriver speakers; PLL multiplex circuitry; 10 W/channel rms at 8 ohms from 70 Hz-20,000 Hz; 2% dist.; FET r-f tuner with IC and ceramic filter; illuminated linear tuning dial; flywheel tuning; afc on FM; loudness control; manual recording level controls; auto stop in record mode; auto eject; level meter; tape counter; repeat, fast-forward, and pause controls; magnetic cartridge with diamond stylus; auto shut-off; speaker selector switch A or B; dust cover; includes 45 rpm adaptor..... \$430

SE-5508 Compact Music System

FM/AM/Stereo FM radio with stereo cassette player/recorder, three-speed automatic record changer and two Panasonic Thrusters Multidriver speakers; PLL multiplex circuitry; 10 W/channel rms at 8 ohms from 70-20,000 Hz; 2% dist.; FET r-f tuner with IC and ceramic filter; illuminated tuning dial; afc on FM; loudness control; CrO₂/normal tape selector; automatic/manual recording level; auto stop; two VU meters; magnetic cartridge with diamond stylus; auto shut-off; speaker selector switch for A or B; dust cover; includes 45 rpm adaptor..... \$430

SE-1260D Compact Music System

FM/AM/Stereo FM radio with stereo cassette player/recorder, built-in three-speed automatic record changer and two Panasonic Thrusters Multidriver speakers; FET r-f tuned FM tuner with IC and ceramic filter; front-loading cassette system; PLL multiplex circuitry; 41 click stop volume control; auto recording level; auto stop; three-digit tape counter; auto shut-off; includes dust cover and 45 rpm adaptor..... \$350

SE-1160D Compact Music System

FM/AM/Stereo FM radio with stereo cassette player/recorder, built-in three-speed automatic record changer with cueing control, and two Panasonic Thrusters Multidriver speakers; IC FM tuner with ceramic filter; PLL multiplex circuitry; separate bass, treble, balance, and volume controls; auto recording level; auto stop; three-digit tape counter; front-loading cassette system; fast forward and rewind; includes 45 rpm adaptor..... \$310

RHAPSODY

RY-481 Compact Music System

Combines AM/FM-MPX radio, 8-track recorder/player, cassette stereo recorder/player, full-size automatic phono changer, and LED digital alarm clock; radio has built-in afc, slide-rule dial, black-out dial scale, lighted dial pointer, lighted stereo indicator, and volume, bass, treble and balance controls; 8-track includes automatic record level control, pause and fast forward switches, auto stop, four numbered light tracks, lighted recording indicator, and auto and manual track selection; cassette portion includes automatic record level control, piano key controls, pause and auto shut-off, tape counter with reset button, and cassette storage tray; phono has 11-in turntable with three speeds, stylus pressure adjustment, rear cue/pause lever, record size selector, and automatic tone armlock; clock includes red LED digital display, 24-hour cycle alarm timer, fast and slow time settings, and 59-min sleep switch; unit includes two speakers with formed fronts, two microphones, and full-size dust cover; unit size 18 1/2" H x 19 1/2" W x 24 1/2" L; speaker size 18" H x 10" W x 5" D..... \$300

SANYO

GXT-500 Compact Music System

Deluxe music system combines AM/FM/SW1/SW2 receiver, stereo cassette deck with Dolby noise-reduction system, turntable with magnetic cartridge, and two SX830 acoustic suspension speakers; 25 W/channel at 1% THD; frequency response 20-20,000 Hz; features varactor touch tuning for up to seven FM stations; has four separate meters; memory digital counter; calibrated bass, treble, volume, loudness and balance controls; FM muting; FM/stereo/mono switching; A+B speaker select; separate signal strength; cassette deck records from discs, AM/FM or external source; tape deck has separate level controls, tape select switch, ac bias erase, locking pause, left and right VU meters, and permalloy tape heads; record changer has adjustable stylus and drop weight, anti-skate, viscous damped cueing up and down, magnetic stylus, and detachable head shell; speakers contain 8-in rolled fiber flex suspension woofer and 2 1/2-in hardened conical high-frequency dispersion tweeter, and three tuned ports; comes with dust cover..... \$650

SHARP

SG-200 Compact Music System

Incorporates AM/FM stereo receiver, front-loading cassette deck, 8-track record/playback deck, built-in automatic record changer, and Tower I SP-3000 speakers; features Automatic Program Search System (The Sharp Eye); professional, attenuator-type volume control; individual rotary balance, bass, and treble controls; speaker selector switch; LED indicator on dial pointer for precise tuning; LED FM indicator; push-button function selector switches; two VU meters; automatic level control; pause control; automatic shut-off in record/play mode; PLL multiplex circuitry; recording from cassette to 8-track or vice versa..... \$360

SG220 Compact Music System

Incorporates AM/FM stereo receiver, front-loading cassette, built-in automatic record changer, and Tower 1, SP4000, or SP3000 Sharp Tri-Bass Accelerator speakers; has Auto Program Search System; two VU meters; automatic level control; center detent bass, treble, and balance controls; tuning meter; switchable loudness control; cue/review; price with SP-3000 speakers..... \$360
SC210. Similar but without built-in record changer..... \$310

SUPERSCOPE

C-510 Compact Music System

Compact system combines AM/FM stereo receiver with front-loading cassette deck, BSR automatic re-

cord changer, and two large external speakers; Receiver Section: 7 W/channel into 8 ohms min. continuous power output from 70-20,000 Hz with no more than 10% THD; PLL circuitry; afc; on/off push-switch; back-lighted slide-rule dial scale; AM/FM signal strength tuning meter; separate bass and treble controls; LED tuning indicator for FM stereo; loudness control switch; Cassette: auto shut-off; record, rewind, fast-forward, play, mechanical pause, and stop/eject push-switches; separate left and right level controls; two VU meters; record LED indicator; three-digit tape counter; tape storage tray; Record Changer: three-speed; automatic shut-off; cue control; diamond stylus; adjustable tracking force; ac synchronous motor; Speakers: acoustic suspension design; 8-in woofer; 2 1/2-in tweeter; speaker size 24" H x 14" W x 8 1/2" D; overall cabinet size 10 7/8" H x 22 3/4" L x 14 1/8" D..... \$330
C-506. Similar except with 8-track tape recorder; LED program indicators for each channel; push-button channel selector; tape stop switch with LED indicator; separate left and right record level controls; record LED indicator; two VU meters; record function switch; fast-forward push-switch; pause push-switch..... \$330
C-502. Similar to C-506 except only with LED program indicators and push-button channel selector..... \$300

TELEX

TXC 1201 AM-Stereo FM/8-Track

Combines an AM/Stereo FM receiver and 8-track tape player, with pair of speakers; receiver has FM stereo light, AFC blackout dial with slide-rule indicator; selector switch for phono, tape, aux., multiplex, FM and AM; frequency response 20-20,000 Hz; dist. 2% at rated output; manual track selection for tape player; slide controls for loudness, balance, bass, and treble; each speaker contains 8-in duocone; 18" H x 10" W x 6 1/2" D; control center 4 1/2" H x 22 1/2" W x 11 1/2" D..... \$175
TXC 1200. Similar to TXC 1201 except includes automatic record changer; tinted hinged dust cover; 8-track storage compartment; 4 1/2" H x 22 1/2" W x 14 1/8" D..... \$220
TXC R1200. Same as TXC 1200 but with 8-track recorder/player..... \$250

WEBCOR

111 AM-FM Stereo/8-Track/Cassette

Combines AM/FM stereo receiver with single receptacle which accepts both 8-track and cassette tapes; 5 W/channel output; comes with two speakers; wood-grain case with silver front..... \$160
112. Same as 111 except includes built-in turntable and dust cover..... \$200

121 AM-FM Stereo/8-Track

Combines AM/FM stereo receiver with built-in 8-track record/play deck; features afc, 1.5 W/channel output; two mike plugs, PA recording facilities; wood-grain cabinet with silver front and two built-in speakers..... \$140
122. Same as 121 except includes turntable and dust cover..... \$190

ZENITH

JR596W Compact Music System

Incorporates modular AM/FM stereo receiver with phonograph and built-in cassette player/recorder; receiver has tuning meter, loudness and balance slide controls, afc on FM, FM muting, high and low filters, separate bass and treble slide controls; stereo record changer has four-pole induction motor and viscous-damped cueing; supplied with Shure magnetic cartridge with 0.6 mil diamond stylus; with two J3000W speakers; 10" H x 26" W x 18 1/2" D..... \$530
 With J2000W speakers..... \$500
J596W. Same but with 8-track player; two J3000W speakers..... \$470
 With J2000 speakers..... \$440



Revolutionary! Sound-shaping taping mike.



Never before — a single microphone that gives you the versatility of 16 microphones! Four tiny frequency filter switches built into the new Shure 516EQ E-Qualidyne Microphone let you tailor sound for studio effects in virtually any recording situation: flick a switch to add sizzle to vocals . . . flick another switch to highlight the sound of a bass drum. You can even compensate for the acoustic response of a room — *right from the microphone!* In all, the 516EQ creates 16 different response variations that can add a new, professional sound to every tape you make. Available singly or in pairs for stereo recording. Ask to hear a recorded demonstration at your participating Shure dealer.

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6

HEADPHONES & MICROPHONES

AKG

K-240 Free-Field Headphones

Free-field stereo headphones; dynamic moving-coil transducer and six passive radiators; frequency response 16-20,000 Hz; 600 ohms $\pm 20\%$ impedance over 16-20,000 Hz; sensitivity 13 $\mu\text{bar/V}$ (96.5 dB SPL at 1 μV) per channel; power requirements 1 mW (0.775 V) for 10 μbar (94 dB SPL) per channel, 50 mW (5.5 V) for 72 μbar (111 dB SPL) per channel; max. continuous power for 1% THD or less at 100 Hz 200 mW (11 V) for 143 μbar (117 dB SPL) per channel; supplied with 3-m four-conductor cable and 1/4-in phone plug; 295 g..... \$79

K-140S Stereo Headphones

Stereo headphones with dynamic sound transducers; frequency response 20-20,000 Hz; 600 ohms



$\pm 20\%$ impedance over 20-20,000 Hz; sensitivity 15 $\mu\text{bar/V}$ (97.5 dB SPL); power requirements 0.75 mW (0.67 V) for 10 μbar (94 dB SPL), 50 mW (5.5 V) for 80 μbar (112 dB SPL); max. continuous power for 1% THD or less at 100 Hz 240 mW (12 V) for 119 dB SPL per system; supplied with 3-m four-conductor cable and 1/4-in phone plug; 175 g... \$49

K-40 Stereo Headphones

Ultra-lightweight supra-aural stereo headphones; matches 4-200 ohm outputs; 9.8-ft four-conductor cable; three-conductor stereo phone plug; 4 1/2 oz..... \$24

AUDIO-TECHNICA

AT-706 Headphones

Electret condenser headphones; frequency response 10-22,000 Hz ± 2 dB; sensitivity 98-dB SPL at 1 kHz (0 dB 0.0002 $\mu\text{bar/V}$); max. output 114 dB; impedance 4-16 ohms; includes impedance-matching adapter with headphone/speaker switching; 6-ft cord; adapter size 3 1/4" H \times 3 1/8" W \times 8 1/2" D; headset weight (less cord) 9 oz..... \$150

AT-705 Headphones

Electret condenser headphones; frequency response 20-22,000 Hz ± 3 dB; sensitivity 98-dB SPL at 1 kHz; max. output 110 dB; impedance 4-16 ohms; includes impedance-matching adapter with headphone/speaker switching; 6-ft cord; adapter size 1 3/4" H \times 3" W \times 3 3/8" D; headset weight (less cord) 9 oz..... \$100

AT-703 Headphones

Dynamic headphones; frequency response 20-20,000 Hz; sensitivity 94-dB SPL at 1 kHz; impedance 16 ohms; 10.5 oz..... \$80

AT-702 Headphones

Dynamic headphones; frequency response 25-20,000 Hz; sensitivity 97-dB SPL at 1 kHz; impedance 4-16 ohms; 10.5 oz..... \$60

AT-701 Headphones

Dynamic headphones; frequency response 30-20,000 Hz; sensitivity 97-dB SPL at 1 kHz; impedance 4-16 ohms; 10.5 oz..... \$40

ATH-7 Stereophones

Electret condenser stereophones; frequency response 20-22,000 Hz ± 2 dB; sensitivity 98 dB SPL at 1 kHz (0 dB 0.0002 $\mu\text{bar/V}$); impedance 4-16 ohms; includes impedance-matching adapter with headphone/speaker switching and normal/high-level LED indicators; 6-ft cord; adapter size 3 1/2" H \times 2 3/8" W \times 7" D; headset weight (less cord) 7.4 oz..... \$150

ATH-6 Stereophones

Electret condenser stereophones; frequency response 20-22,000 Hz; sensitivity 98 dB SPL at 1 kHz; impedance 4-16 ohms; includes impedance-matching adapter with headphone/speaker switching; 6-ft cord; adapter size 1 3/4" H \times 3" W \times 3 3/8" D; headset weight (less cord) 7.4 oz..... \$100

ATH-5 Stereophones

Moving coil dynamic stereophones; frequency response 20-20,000 Hz; sensitivity 96 dB SPL at 1 kHz; impedance 4-16 ohms; 7.25 oz..... \$80

ATH-3 Stereophones

Moving coil dynamic stereophones; frequency response 25-20,000 Hz; sensitivity 94 dB SPL at 1 kHz; impedance 4-16 ohms; 7.25 oz..... \$60

ATH-1 Stereophones

Planar moving coil dynamic stereophones; frequency response 30-20,000 Hz; sensitivity 93 dB SPL at 1 kHz; impedance 4-16 ohms; 4.75 oz. \$30

AUDIOTEX

Professional Stereo Headphones

Frequency response 30-20,000 Hz; impedance 8-16 ohms; padded earpieces with adjustable padded headband; comes with 10-ft coiled cord, black vinyl carrying case. 30-5207..... \$41

Deluxe Stereo Headphones

Frequency response 20-25,000 Hz; impedance 8 ohms; adjustable padded headband; padded earpieces; matches amps with output from 4 to 16 ohms; comes with 10-ft coiled cord, black vinyl carrying case. 30-5203..... \$36

Marquis Stereo Headphones

Open-air, lightweight design; response 20-20,000 Hz; 8-ohm impedance; matches all amplifier 4-16 ohm outputs; 6-ft cord and plug; cushioned earpieces and adjustable padded headband. 30-5205

..... \$33

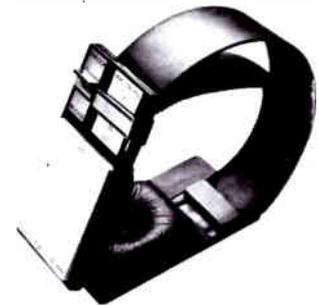
Headphone Remote Control

Plugs directly into amplifier to control volume and balance of headphones; noise-free slide controls for each earpiece permit adjustment of volume and balance; special switch allows for mono/stereo selection; has 5-ft cord and 3-conductor stereo phone plug. 30-5250..... \$12

BANG & OLUFSEN

U-70 Headphones

Orthodynamic stereo headphones; frequency response 16-20,000 Hz; sensitivity 8 mW for 94-dB



SPL; continuous load 2 W; dist. 1% max.; 140-ohm impedance; 10-ft straight cord with three-conductor phone jack; 10.6 oz..... \$85

BEYER/DYNAMIC

ET-1000-N Electrostatic Headphones

Electrostatic headphones; frequency response 10-25,000 Hz; come with sintered bronze cover plates and power supply..... \$280

DT-48 Dynamic Headphones

Moving-coil type dynamic headphones; frequency response 16-20,000 Hz ± 2 dB; supplied with 10-ft cord..... \$190
DT-48-K. Same but with coiled cord..... \$195

DT-480 Dynamic Headphones

Moving-coil type dynamic headphones; frequency response 20-18,000 Hz; sensitivity 1 mW at 400 Hz for 115 dB (re 2×10^{-1} μbar); 25-200 ohms impedance; 1 W max. input per phone..... \$115

DT-100 Dynamic Headphones

Moving-coil type dynamic headphones; frequency response 30-18,000 Hz; sensitivity 1 mW at 400 Hz for 110 dB (re 2×10^{-1} μbar); 5-100-400-2000 ohms impedance; max. input 1 W per phone..... \$90

DT-202 Dynamic Headphones

Moving-coil type dynamic headphones; frequency response 20-20,000 Hz; sensitivity 1 mW for 100 dB; 400-ohm impedance; max. input 100 mW (for 120-dB SPL)..... \$80

6

HEADPHONES

DT-96-A Dynamic Headphones

Moving-coil type dynamic headphones; frequency response 30-17,000 Hz; sensitivity 1 mW at 400 Hz for 110 dB (re 2×10^{-5} bar); 50-200 ohms impedance; max. input 100 mW per phone; 5-ft cord; 8 oz \$75

DT-220 Dynamic Headphones

Closed-ear dynamic headphones; frequency response 20-20,000 Hz; sensitivity 1 mW for 100 dB; 600-ohm impedance; max. input 42 mW (for 116-dB SPL); 260 g (without cable) \$60

DT-440. Similar to DT-220 but open high-velocity type \$60

DT-441. Same as DT-440 but with different casing style \$70

DT-302 Lightweight Headphones

Connects directly to high- or low-impedance outputs; frequency response 20-20,000 Hz; rated power 7 mW (2.1 V) for 600 ohms; sponge ear cushions; stereo phone jack plug; 2.3 oz (without cord) \$28

4-Channel

DT-204 4-Channel Headphones

Frequency response 20-20,000 Hz; impedance 4×200 ohms (4-channel), 2×100 ohms (stereo), independent volume controls for each front channel; four-channel/stereo slide switch; 10-ft detachable cable with two plugs \$140

BURWEN RESEARCH

PMB 8 Orthodynamic Headphones

Around-the-ear style with leatherette foam ear cushions; max. SPL 112 dB (1 kHz); 150-ohm impedance; max. input 2 W; sensitivity 130 mW for 100-dB SPL (1 kHz); 0.3% THD at 100-dB SPL (1 kHz); frequency response 15-26,000 Hz; has 10-ft cord; 12 oz \$110

PMB 6 Orthodynamic Headphones

On-the-ear style with leatherette foam ear cushions; max. SPL 121 dB (1 kHz); 140-ohm impedance; max. input 2 W; sensitivity 7 mW for 100-dB SPL (1 kHz); 0.3% THD at 100-dB SPL (1 kHz); frequency response 16-23,000 Hz; has 10-ft cord; 9 oz \$90

PMB 4 Dynamic Headphones

Around-the-ear style with leatherette foam ear cushions; max. SPL 114 dB (1 kHz); 400-ohm impedance; max. input 0.1 W; sensitivity 4 mW for 100-dB SPL (1 kHz); 0.3% THD at 100-dB SPL (1 kHz); frequency response 20-20,000 Hz; has 10-ft cord; 7.5 oz \$75

PMB 40 Dynamic Headphones

On-the-ear style with reticulated foam ear cushions; max. SPL 128 dB (1 kHz); 400-ohm impedance; max. input 0.1 W; sensitivity 0.2 mW for 100-dB SPL (1 kHz); 0.3% THD at 100-dB SPL (1 kHz); frequency response 20-20,000 Hz; has 10-ft cord; 7.5 oz \$65

PMB 20 Dynamic Headphones

On-the-ear style with reticulated foam ear cushions; max. SPL 118 dB (1 kHz); 400-ohm impedance; max. input 0.1 W; sensitivity 2 mW for 100-dB SPL (1 kHz); 0.3% THD at 100-dB SPL (1 kHz); frequency response 20-20,000 Hz; has 10-ft cord; 3.9 oz \$50

ERCONA

D-42 Headphones

Dynamic stereo/mono headphones; supplied with detachable, washable soft rubber ear cushions; frequency response 30-20,000 Hz; output impedance 2×200 ohms (stereo), 100 or 400 ohms (mono);

power/voltage at normal listening 0.3 mW/0.25 V; 100-dB SPL with 0.3 mW input; 5 mW max. power with 2% dist.; supplied with 6-ft unterminated 2×2 cable; 9.5 oz \$50

RDF-224 Dynamic Headphones

Dynamic stereo/mono headphones; removable soft-foam-padded vinyl ear cushions; supplied with 8-ft coiled cable and three-conductor phone plug; frequency response 20-18,000 Hz; output impedance 8 ohms $\pm 20\%$ (1 kHz); output level 100 dB (1 kHz); max. input 100 mW; 12 oz \$26

INFINITY

ES-1 Stereo Headphone System

System consists of one headphone set and walnut-enclosed adapter housing power supply and matching transformers; front-panel output accommodates two headset; frequency response 20-25,000 Hz ± 2 dB; THD 0.3% at 100 dB SPL; sensitivity 98 dB SPL (2 V at 1000 Hz); max. output 118 dB SPL at 1000 Hz; max. input 50 W at 100 Hz; impedance 4-16 ohms; phones operate in push-pull mode; polyurethane diaphragms; adjustable headband; 98-in headphone cord; adapter size $3" \text{ H} \times 5\frac{1}{4}" \text{ W} \times 7\frac{1}{4}" \text{ D}$ \$275

JENSEN

230 Stereo Headphones

Frequency response 15-22,000 Hz; 0.8% HD at 1 kHz, 100-dB SPL; max. input power 50 mW; impedance 4-600 ohms; ambient noise isolation 40 dB at 1 kHz; patented dual cavity; liquid-filled ear cushions; volume control for each earphone; 14-ft coiled cord with strain relief; chrome-plated headband; 19 oz without cord \$60

220. Similar to 230 except frequency response 18-20,000 Hz; 0.9% HD; weight 18 oz \$50

210 Stereo Headphones

Frequency response 20-18,000 Hz; 0.9% HD at 1 kHz, 100-dB SPL; max. input power 50 mW; impedance 4-600 ohms; ambient noise isolation 18 dB at 1 kHz; foam-filled ear cushions; polypropylene headband; 14-ft coiled cord \$30

JVC

HM-200E Headphone/Microphone

Designed for binaural recording and monitoring; matched electret condenser mike with simulated auricle in each earpiece; mikes powered by AA cells contained in earpieces; three-way headphone level selector; mike tone selector; supplied with dummy head for off-the-operator recording; Mikes: sensitivity -67 dB ± 2 dB; output impedance 600 ohms; S/N 45 dB; frequency response 50-10,000 Hz ± 10 dB; Headphone: 8-ohm impedance; 96-dB sensitivity; frequency response 50-10,000 Hz; 2-m cord with two phone-type mike plugs and stereo-type headphone plug; mike stand screw sockets ($\frac{3}{16}"$, $\frac{3}{8}"$, $\frac{1}{2}"$, $\frac{3}{4}"$); 1.32 lb \$100

KOSS

ESP/10 Electrostatic Stereophones

Electrostatic design with energizer; headset bandpass response 10-22,000 Hz ± 2 dB; sensitivity for 100-dB SPL; 1.9 V rms at 1 KHz into E/10 energizer, 2.0 V rms pink noise; THD at 1 kHz and 100 dB SPL 0.5%; radiating surface area of electrostatic element 25 cm²/ch; semivented design; black with silver accents; energizer bandpass response 3 dB down at 15 Hz and 24 kHz; hum and noise 75 dB below sensitivity reference level (100 dB SPL); phase response at 20 Hz +30 degrees, at 15 kHz -30 degrees; input impedance 3 ohms min. at 20 Hz and 20 kHz, 180 ohms max. at 800 Hz; min. recommended amp power 35 W/ch; overload voltage (for relay cut-out) 5.3 V rms pink noise into energizer; semi-peaked-reading VU meters; LED overload indicators; automatic overload detector; wood-grain trim \$300

ESP/9B. Similar to ESP/10 except frequency range 15-15,000 Hz ± 5 dB; sensitivity for 100-dB SPL 6.15 V rms at 1 kHz; energizer connects directly to low-Z speaker terminals; Pneumalite ear cushions; adjustable stainless-steel headband; self-adjusting yokes; 2-m cord; weight 19.3 oz (less cord) ... \$200

Phase/2 Stereophones

Frequency response 10-22,000 Hz; will operate from outputs of 3.2 to 600 ohms; dist. 1% at 100-dB SPL; will handle 5 V rms continuous with provision for 14-dB SPL transient peaks; Pneumalite ear cushions for high-ambient noise isolation; two rotary panoramic source controls on each earcup; slide-type ambience expander on right earcup; comparator switch on left earcup; extendible stainless steel headband with self-adjusting pivoting yokes \$85

Technician/VFR Stereophones

Stereo headphones with variable-frequency-response controls; slide-type controls at base of each earcup permit fine tuning the shape of the response curve; frequency response 10-22,000 Hz; THD 0.3% at 1 kHz (100-dB SPL); features Pneumalite ear cushions to exclude outside sounds; wide vinyl headband with self-adjusting yoke; black and chrome; equipped with boom microphone mount for professional applications; 4-conductor coiled cord; 16.8 oz (less cord) \$80

PRO/4AAA Dynamic Stereophones

Frequency response 20-22,000 Hz; dist. less than 0.5% at 1 kHz, 100-dB SPL; impedance 220 ohms at 1 kHz; supplied with Pneumalite ear cushions for noise isolation and 10-ft coiled cord; 15.5 oz ... \$75

HV/1A Stereophones

Features low-mass "Decilite" driver elements for coverage 15-30,000 Hz; will operate from outputs of 3.2 to 600-ohms; dist. 0.5% at 100-dB SPL; will handle 5 V rms continuous with provision for 14-dB SPL transient peaks; acoustical sponge ear cushions; extendible headband with self-adjusting, pivoting yokes and soft padded vinyl cover; 3-conductor coiled cord (10-ft extended); 10 oz \$55

HV1LC. Same except volume/balance control per earcup; 10.8 oz \$60

K/145 Dynamic Stereophones

Features 1.5-in polyester driver; frequency response 20-20,000 Hz impedance 90-ohms at 1 kHz; level controls; Pneumalite ear cushions; padded simulated leather earcups, adjustable brushed stainless steel yokes and sidebars; 10-ft coiled Y cord; molded plug; sensitivity at 100-dB SPL 0.25 V rms sine wave at 1 kHz, 0.10 V rms pink noise; THD 0.5% at 1 kHz for 100-dB SPL; weight (less cord) 12.6 oz \$50

K/135. Similar to K/145 except response 10-18,000 Hz; 2.5-in dynamic elements; impedance 100 ohms at 1 kHz; sensitivity at 100-dB SPL



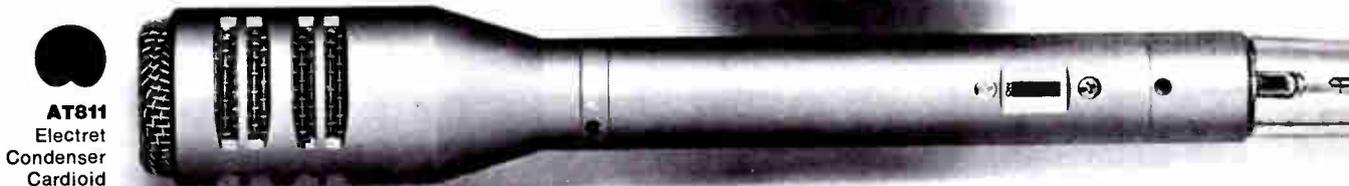
0.09 V rms sine wave, 0.11 V rms pink noise; THD 1% at 1 kHz for 100-dB SPL; weight (less cord) 13.4 oz \$40

K/125. Similar to K/135 except response 10-16,000 Hz; sensitivity at 100-dB SPL 0.14 V

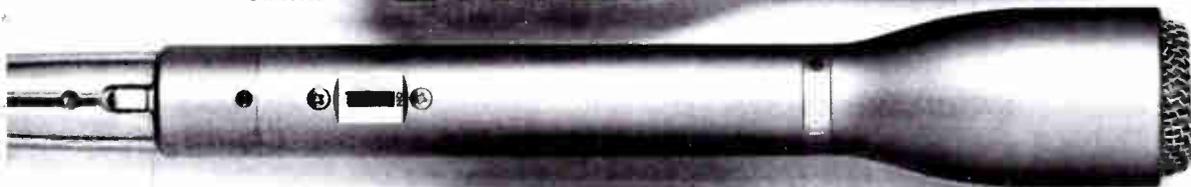
Audio-Technica announces a creative new start toward better sound.



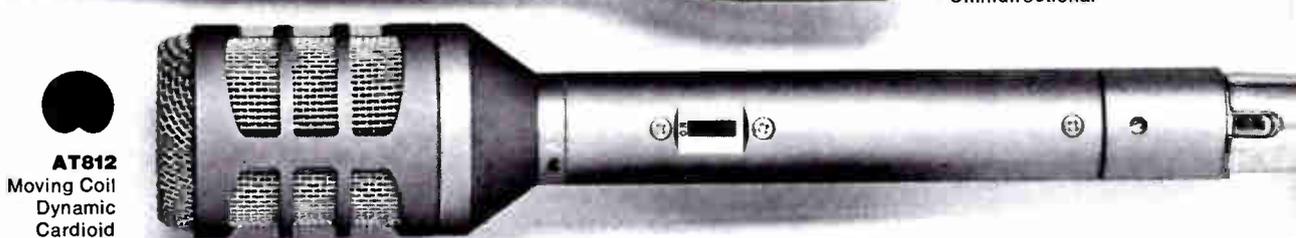
AT813
Electret
Condenser
Cardioid



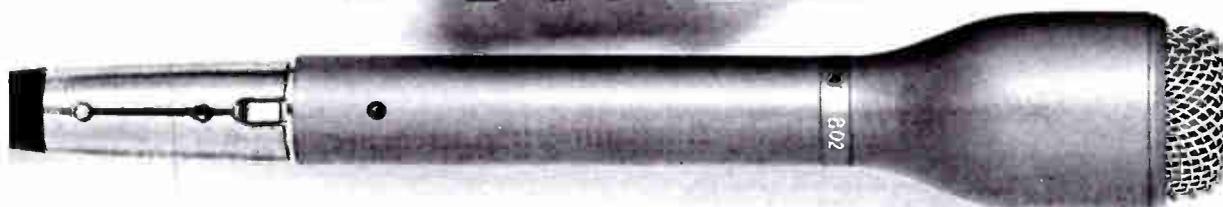
AT811
Electret
Condenser
Cardioid



AT801
Electret
Condenser
Omnidirectional



AT812
Moving Coil
Dynamic
Cardioid



AT802
Moving Coil
Dynamic
Omnidirectional

Every "live" recording has an excitement all its own. You must capture sound that will never be heard exactly the same again. And in some cases the recording is literally a once-in-a-lifetime chance. With no opportunity to remake the tape or disc.

Your creativity, your knowledge and experience are on the line. Now is when you appreciate the precision of Audio-Technica microphones. Performance is consistent. With results that help you extend your personal standards.

Audio-Technica gives you a choice of superb new electret condenser or moving coil dynamic microphones. A choice of omnidirectional or cardioid (unidirectional) pickup patterns. With smooth, extended response that complements the finest recorders. Audio-Technica microphones look, sound, and act very, very professional.

Add more than a little creative excitement in your life, with Audio-Technica microphones, today.



audio-technica® *Great sound. right from the start!*

6

HEADPHONES

rms sine wave, 0.13 V rms pink noise; weight (less cord) 12.8 oz \$30

HV/1 Dynamic Stereophones

Has 2-in dia. driver and will operate from 3.2 to 600 ohm outputs; response 20-20,000 Hz; capacity 5 V continuous with provision for 14-dB SPL transient peaks; 10 oz; 10-ft coiled cord \$45

KO/727B Dynamic Stereophones

Frequency response 10-18,000 Hz; THD 1.0% at 100-dB SPL; 3.2 to 600 ohms impedance; 10-ft coiled cord; 16.5 oz; black \$40

K/6ALC Dynamic Stereophones

Frequency response 10-16,000 Hz; THD less than 1% at 1 kHz, 100-dB SPL; impedance 94 ohms at 1 kHz; individual volume controls; supplied with 10-ft coiled cord; 14 oz \$36
K/6A. Same but without volume controls \$26

K/7 Stereophones

Lightweight dynamic stereo headphones; features shockproof, polypropylene construction; one-piece flexible headband; foam-filled vinyl ear cushions; will operate from outputs with source impedances of 3.2-600 ohms; response 20-16,000 Hz; sensitivity 0.39 V rms sine wave at 1 kHz (100-dB SPL); 4-conductor Y cord; 10.3 oz \$18

4-Channel

Phase/2 + 2 Quadraphones

Incorporates one Decilite driver element and one high-velocity dynamic element in each earcup; response 20-20,000 Hz; programmer permits 127 personal listening perspectives in 4-channel sound without adjusting amp controls; features comparator switch for normal 4-channel mode vs Phase/2 + 2 mode; soft acoustical sponge ear cushions; vinyl-covered headband with pivoting self-adjusting yokes; 17.3 oz \$155

K/6LCQ 4-Channel Quadrafones

Can be used for either 2- or 4-channel operation; dual 1 1/2-in dynamic drivers in each earpiece; 3.2-600-ohm impedance; dist. 0.5% at 109-dB SPL; capacity 5 V continuous, 14 dB transient peaks; response 20-17,000 Hz; foam-filled vinyl ear cushions for average 18 dB ambient noise isolation; 21.6 oz \$60

LAFAYETTE

F-780 Stereo Headphones

Professional-style two-way stereo headphones with separate woofer and tweeter in each earpiece; lightweight open-air design; frequency response 20-20,000 Hz; max. input 0.1 W; 4-150 ohm impedance \$50

SP-78 Stereo Headphones

Deluxe closed-acoustic stereo headphones; two-way design; independent volume control on each earpiece; 15-ft coiled cord; frequency response 18-24,000 Hz \$35

F-700 Stereo Headphones

Lightweight headphones feature ultra-thin diaphragm with rare-earth-magnet transducer; adjustable vinyl leatherette headband; foam-padded earcups; frequency response 18-22,000 Hz; max. input 100 mW; 4-150 ohm impedance; 6 1/2-ft cord with 1/4-in plug; 4.6 oz \$35

MURA

SP-205 Dynamic Headphones

Stereo headphones; Mylar cone elements; separate volume and tone controls on each earcup; stereo/mono switch; frequency response 30-20,000 Hz

±5 dB; impedance 8 ohms; padded adjustable headband, cushioned earcups, 15-ft coiled cord with plug \$63

HB-1500 Polymer Headphones

Stereo headphones; high-polymer diaphragm transducers; sensitivity: 100 dB SPL/1 mW; frequency response 18-22,000 Hz; impedance 8 ohms; open-air design; max. input 0.1 W; 10-ft coiled cord with plug; 4 ounces \$60

SP-505 Dynamic Headphones

Stereo headphones; 3-in dynamic speakers; separate volume and tone controls on each earcup; stereo/mono switch; frequency response 20-20,000 Hz; impedance 8 ohms; padded headband, vinyl-covered earcups, 10-ft coiled cord with plug \$40

SP-504 Dynamic Headphones

Stereo headphones; 3-in dynamic speakers; separate slide-type volume and tone controls; stereo/mono switch; frequency response 20-18,000 Hz; impedance 8 ohms; adjustable padded headband, 10-ft coiled cord with plug \$30
SP-502. Similar to SP-504 but without tone controls; cushioned headband and earcups; response 30-18,000 Hz \$20

SP-94 Stereo Headphones

Lightweight dynamic headphones; 2 1/4-in speakers; frequency response 35-15,000 Hz; impedance 8 ohms; 8-ft cord with plug \$10

4-Channel

QP-280 Quad Headset

Two 2 1/4-in dynamic speakers in each earcup; stereo/quad switch; frequency response 20-20,000 Hz; max. input 0.2 W; 8 ohms impedance; adjustable padded headband and earcups; 10-ft coiled cord with coded dual plugs \$40

NAKAMICHI

HF-100 Monitor Headphones

Dynamic headphones; frequency response 20-20,000 Hz; impedance 8 ohms ±20% at 1 kHz; 90-dB SPL output (±3 dB) per mW at 1 kHz; channel balance within 3 dB at 1 kHz; vinyl-covered, foam-padded earpieces; adjustable headband; supplied with 8-ft coiled cord with molded plug and strain relief; 14.3 oz \$55

PANASONIC

EAH-520 Headphones

Duo-cone headphone system; high efficiency; lightweight; separate bass and treble controls; adjustable head cushion; high-velocity design; 10-ft coiled line cord; bronze and chrome finish \$60

EAH-510. Similar to EAH-520 except straight line cord; black and chrome finish \$50

EAH-500. Similar to EAH-520 except straight line cord; gray and chrome finish \$40

PICKERING

OA-7 Headphones

Lightweight open-audio design; REE used in permanent magnet compound; foam-cushioned headband; earpiece yokes incorporate pivoting system enabling snug fit; nominal input impedance 100 ohms; frequency response 20-22,000 Hz ±5 dB sensitivity 110-dB SPL at 0.2 V; max. input 0.1 W rms; dist. 0.5% at 110-dB SPL; supplied with flat 10-ft cord; 6 oz \$70

OA-3A Headphones

Lightweight open-audio design; 15 ohms ±10% at 1 kHz; input 0.2 W rms/channel; sensitivity 100 dB SPL at 0.10 V input at 1 kHz for each channel; frequency response 20-20,000 Hz; dist. less than 1/2% at 110 dB SPL; comes with extended-adjustable headband with pivot yokes and padded vinyl cover; 10-ft four-conductor cord with molded no-break connector; 8.5 oz \$45

PIONEER

SE-700 Stereo Headphones

Features high-polymer driver elements; frequency range 20-20,000 Hz; matching impedance 4 to 16 ohms; sensitivity 100 dB/3 V \$80

Monitor 10 Stereo Headphones

Dynamic type covering a frequency range of 20-20,000 Hz, with 2 1/4-in free-edged polyester-film cone speaker in each earpiece; sensitivity 100 dB/mW; max. input power 700 mW/ch; comes with 16-ft, 5-in coiled cord; 23 oz \$70

SE-505 Headphones

Two-way stereo dynamic design with a woofer and tweeter in each phone; 8 ohms each channel; response 20-20,000 Hz; sensitivity 108 dB/0.3 V; features both tone and volume controls on each phone; max. input 500 mW each phone; 16-ft coiled cord \$65

SE-500 Stereo Headphones

Incorporates high-polymer film diaphragm; frequency range 20-20,000 Hz; sensitivity 100 dB/3V; max. input power 30 V/channel; resistant to temperature/humidity changes; plugs directly into headphone jack of any amplifier or receiver \$50

SE-4 Hear-Through Headphones

Features super-thin polyester film dome drivers; frequency range 20-20,000 Hz; hear-through earpads; impedance 250 ohms; sensitivity 96 dB/mW (1000 Hz); max. input power 200 mW/channel; comes with 9-ft, 5-in Y-type cord; weight 7 1/8 oz without cord, 9 1/8 oz with \$50

SE-405 Stereo Headphones

Dynamic type covering a frequency range of 20-20,000 Hz; 8 ohms impedance; input power 500 mW each channel; unit features polyester-film diaphragm; special ear pads with sliding-type adjusting headband and clickstops for easy listening; volume controls for both left and right channels; 16 1/2-ft coiled cord \$45

SE-305 Stereo Headphones

Dynamic type covering a frequency range of 20-20,000 Hz; 8-ohm impedance each channel; matching impedance 4 to 16 ohms; max. input power 500 mW each channel; comes with 16-ft, 5-in coiled cord; 15 oz \$35

SE-205 Stereo Headphones

Dynamic type covering a frequency range of 20-20,000 Hz; cone-type speaker in each earpiece; matching impedance 4 to 16 ohms; max. input power 500 mW each channel; comes with 8.2-ft cable; 16 oz \$25

REALISTIC

PRO-II Stereo Headphones

Air-filled ear cushions; 12 sq in mylar diaphragm speakers with 1-in voice coil; adjustable padded headband; frequency response 10-22,000 Hz; comes with 10-ft coiled cord and standard 1/4-in plug; 4-16 ohms impedance; 19 oz \$50

LV-10 Stereo Headphones

Features electroacoustical design with 2-in. dynamic elements; frequency response 20-20,000 Hz; dist. 0.5%; acoustical sponge earpieces and soft vinyl-covered headband with self-adjusting yokes; 4- to 16-ohm impedance; 10-ft coiled cord and plug \$40

PRO-10 Stereo Headphones

Open back design; polyester-film dynamic elements; vinyl headband with self-adjusting yokes; sponge ear cushions; frequency response 20-20,000 Hz; 10-ft coiled cord and standard 1/4-in plug; 4-16 ohms impedance; 10 oz \$40

Nova-Pro Stereo Headphones

Stereo dynamic design; volume controls on each earcup; frequency response 20-20,000 Hz; 8-ohm impedance; 10-ft coiled cord \$35

PRO-20 Stereo Headphones

Dynamic-type; frequency response 20-20,000 Hz; 4-16 ohm impedance; base port \$24

Nova-30 Headphones

3 1/2-in speakers for wide response; frequency response 30-18,000 Hz; separate controls on each earcup; soft cushion earcups, padded adjustable headband; 4- to 16-ohm impedance; supplied with 10-ft coiled cord and 1/4-in plug \$22

Nova-14 Stereo Headphones

Has Glide-Path volume/balance controls; frequency response 50-15,000 Hz; cushioned aluminum earcups with 2-in speakers; adjustable padded headband; has 7-ft cord and 1/4-in plug; 4-16 ohm impedance \$17

Nova-10 Stereo Headphones

Has cushioned earpads with 2-in speakers; adjustable vinyl headband; frequency response 50-15,000 Hz; has cord and 1/4-in plug; 4-16 ohm impedance \$13

RECOTON

ST-33 Stereo Headphones

High-velocity stereo headphones with super thin diaphragms; leather adjustable headband; frequency response 20-20,000 Hz; 50-ohm impedance; 4-150 ohms matching impedance; sensitivity 103 dB at 1000 Hz; max. input 20 mW; 10-ft coiled cord with stereo phone plug; 5 oz \$33

ST-22 Stereo Headphones

Dynamic stereo headphones; all aluminum ear cases; leathery-soft ear cushions and headband; volume control for each channel; frequency response 20-22,000 Hz; 8-ohm impedance; 4-16 ohms matching impedance; sensitivity 110 dB at 1000 Hz with 1m W; max. input 0.5 W; 3-in dynamic speakers; 10-ft coiled cord with stereo phone plug \$25

ST16 Stereo Headphones

Volume control for each channel; stereo-mono slide switch; frequency response 20-18,000 Hz; 8-ohm impedance; soft adjustable padded headband; soft ear cushions; 10-ft coiled cord with stereo phone plug \$18

ROBINS

47-921 Stereo/Mono Headphones

Deluxe headphones; stereo/mono switch; each earcup has imprinted left/right positioning with individual volume controls; 3-in dynamic speakers; lightweight foam-padded headband with ear cushions; frequency response 20-20,000 Hz; 8-ohm impedance; 9-ft coiled cord with 1/4-in phone plug \$20

47-901 Stereo Headphones

Stereo headphones; frequency response 30-18,000 Hz; 8-ohm impedance; 2 1/4-in speakers; padded earcups; 6-ft cord with 1/4-in stereo phone plug. \$11

SANSUI

SS100 Stereo Headphones

Omni-dynamic driver full-range speaker in each earpiece; matching amp impedance 4-100 ohms, 600 ohms nominal; frequency response 20-20,000 Hz; HD 0.3% at 94 dB SPL; max. input power 250 mW; sensitivity 94 dB/mW (at 200 Hz); 6.5-ft cord; weight 13.2 oz \$118

SS-80 Headphones

Two-way thin film headphones; has 50- μ -thick polyester diaphragms (2 1/4-in wide); sensitivity 108 dB/mW; 200-ohm impedance; separate volume and tone controls for each channel; frequency response 20-20,000 Hz; adjustable stainless steel headband; 17.3 oz \$72

SS-60 Headphones

Has 50- μ -thick polyester diaphragms (2 1/4-in wide); max. input 500 mW; separate volume controls for each channel; frequency response 20-20,000 Hz; 25-ohm impedance; 15 oz \$54

SS-40 Headphones

Thin polyester 2 1/4-in wide dynamic drivers; frequency response 20-20,000 Hz; 25-ohm impedance; 13.1 oz \$42

SS-30 Headphones

Thin polyester 2 1/4-in wide dynamic cones; frequency response 20-20,000 Hz; max. input 500 mW; 8-ohm impedance; 11.5 oz \$30

SENNHEISER

HD424 Headphones

Deluxe "open aire" design dynamic headphones; frequency response 15-20,000 Hz; sensitivity 17.7 μ bar/V; 1 mW (1.41 V) per channel for SPL of 102 dB; dist. 1% at 22 V, 1 kHz; 2000-ohm impedance per channel; removable head and ear cushions; 10-ft cable; 6.5 oz (without cable) \$101

HD414 Headphones

"Open aire" design dynamic headphones; frequency response 20-20,000 Hz; sensitivity 17.7 μ bar/V; 1 mW (1.41 V) per channel for SPL of 102 dB; dist. 1% at 22V, 1 kHz; 2000-ohm impedance per channel; 10-ft cable; 5 oz (without cable) .. \$67

HD400 Headphones

"Open aire" design dynamic headphones; frequency response 20-18,000 Hz; sensitivity 1 mW for SPL of 88 dB; 600-ohm impedance per channel; 10-ft cable; 3 oz (without cable) \$40

HD44 Headphones

"Open aire" design dynamic headphones; under-the-chin configuration; frequency response 52-10,000 Hz; 600-ohm impedance per channel; 10-ft cable; 1.2 oz (without cable) \$36

STANTON

Stereo/Wafers XXI Headphones

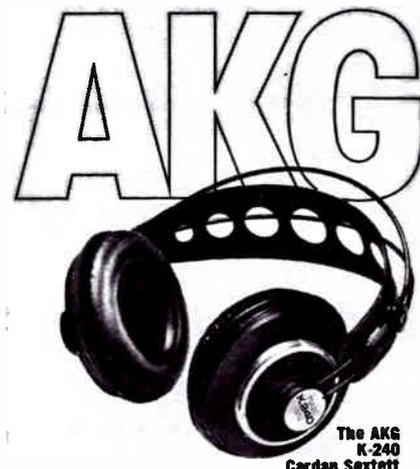
Ultra-lightweight professional-standard headphone; frequency response 20-22,000 Hz \pm 4 dB; sensitiv-



ity 2 V for 100 dB; max. power input 0.1 W rms; dist. 0.5% at 200-dB SPL; 100-ohm impedance at 1 kHz; brushed blue denim finish; supplied with 10-ft flat cord with heavy-duty plug; 5.9 oz \$70

Dynaphase 35 Headphones

Dynamic headphones with open-audio construction and 1 1/2-in Mylar diaphragm; 15-ohm impedance; frequency response 20-20,000 Hz; sensitivity 0.1 V for 100-dB SPL at 1 kHz; 0.5% dist. at 110-dB SPL; max. input 0.2 W rms/channel; extend-adjustable headband with pivot yokes, padded vinyl cover, and vinyl-covered foam cushions; supplied with



The AKG K-240
Cardan Sextett

**"Extra wide response ...
low distortion ...
reminiscent of the very
best electrostatics!"**

Now you can take a giant step closer to reality by recreating the depth and dimension of the original performance with remarkable fidelity ... *before* the sound enters your ear. Even the best phones around today put left channel sound through the left earpiece ... right channel sound through the right earpiece. Good sound, yes ... but certainly not the sound you'd expect from an expensive, top-line speaker system.

Now listen to the AKG K-240 Sextett. Hear the difference. **Six passive (slave) diaphragms surround a main driving transducer** to reproduce in depth the sound of a live performance with a special quality that you've never heard from headphones.

Len Feldman (Feldman Report, *Tape Deck Quarterly*) writes "... the AKG headphones tend to minimize exaggerated and unnatural stereo effects ... a listening quality reminiscent of what we hear (with) the very best electrostatic headphones around. Considering cost, that's quite an accomplishment."

And they're light on your head, too. Ultra-soft pads assure virtually no wearer fatigue. Earcups are fitted to the AKG auto-adjust headband. For modest budgets listen to the AKG K-140.

At selected dealers everywhere.



PHILIPS AUDIO VIDEO SYSTEMS CORP.
A NORTH AMERICAN PHILIPS COMPANY
91 McKee Drive, Mahwah, N.J. 07430 • (201) 529-3800

THE LEAST EXPENSIVE ALTERNATIVE TO A MORE EXPENSIVE SYSTEM.

Sennheiser headphones deliver such vastly improved sound from most amplifiers and receivers, they're an economical alternative to a more expensive system.

Their wide response, unusual smoothness and superior transient abilities have been compared with the finest loudspeakers. But they don't need monster power for optimal results.

For a gradual way to move up, first add a pair of Sennheiser headphones to your present system. Then add an expensive amp or receiver to your Sennheiser headphones.

(Finally, if you feel the need, add expensive speakers. Or spend the money on a hundred or so albums.)

Since there are three models to choose from, all featuring our uniquely comfortable Open-Aire® design, even our alternative has alternatives.



HD-400
\$40.25*

HD-414
\$67.00*

HD-424
\$101.00*

SENNHEISER

10 West 37th Street, New York 10018 (212) 239-0190
Manufacturing Plant: Bissendorf/Hannover, West Germany

*Manufacturer's suggested list

CIRCLE NO. 24 ON READER SERVICE CARD

6

HEADPHONES

10-ft cord and molded connector; 7 oz (less cord) .. \$45

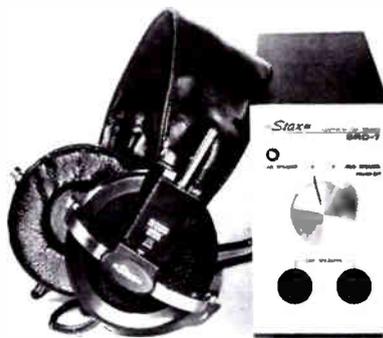
STAX

SR-Σ Earspeakers

Panoramic sound headphones; electrostatic push-pull type; frequency response 30-35,000 Hz; max. sound pressure 103 dB..... \$450

SRX-III Earspeakers

Electrostatic push-pull type; response 20-27,000 Hz ± 1 dB; SPL 95 dB at 100 V rms input; maxi-



mum level 115 dB; weight 370 g including cord; comes with SRD-7 energizer, a polarizing supply and signal source; response 10-30,000 Hz ± 2 dB; dist. 0.02% at 1 W, 1000 Hz; 4 3/4" H × 2 7/8" W × 8" D..... \$270

SR-5 Earspeakers

Electrostatic push-pull type; response 30-25,000 Hz ± 1 dB; SPL 95 dB at 50 V rms input; maximum level 115 dB; weight 432 g including cord; comes with SRD-6 energizer, a polarizing supply and signal source; response 20-20,000 Hz ± 1 dB; dist. 0.1% at 1 W, 1000 Hz; overall size 2 3/4" H × 2 11/16" W × 6 1/2" D..... \$150

SR-44 Earspeakers

Electret condenser system combines SR-40 headphones with SRD-4 adapter; features wide-latitude in headband adjustment; requires ac power source..... \$90

SRA-12S Headphone Preamp/Amp

Input sensitivity: phono 2.0 mV, tuner, tape, aux. 250 mV; phono overload 100 mV; hum and noise: phono 58 dB, tuner, aux. 80 dB; frequency response 10-60,000 Hz ± 1.5 dB; THD 0.05%; DIN output jacks; preamp can be used separately; designed specifically for use with Stax Earspeakers..... \$550

SUPEREX

PEP-81 Electrostatic System

Consists of PEP-81 headphones and CC-81 control console; headphone frequency response



15-18,000 Hz ± 2 dB; 10-22,000 Hz ± 5 dB; dist. 0.2%; impedance-matched to CC-81 for 4-16 ohms; isolation-type headphones with fully adjustable vinyl-covered headband and foam cushions and 15-ft coiled cord; control console has level controls for both channels (20-dB range), speaker/phone rocker, on/off switch; can accommodate two sets of headphones; requires 5 W per channel min. drive; console size 11" × 3 1/4" × 6 1/2"..... \$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 dist.; impedance-matched to CC-79F for 4-16 ohms; trans-air lightweight headphones with fully adjustable vinyl-covered headband and foam cushions and 15-ft coiled cord; control console is designed for use with main amp level controls, has self-protecting circuits; console size 2 1/2" H × 7" W × 4" D..... \$90

SM-700 Headphones

Dynamic headphones with 2 3/4-in Mylar diaphragm; 35-ohm impedance; frequency response 10-20,000 Hz ± 3 dB; sensitivity 10 mW (0.6 V) for 110 dB at 400 Hz; 0.25% dist. at 400 Hz, 110-dB SPL; padded, fully adjustable steel and aluminum headband with foam-filled vinyl cushions; supplied with 15-ft cable, clothing clip, and molded stereo plug; 10 oz (less cable)..... \$65

PRO B VI Stereophones

Each earcup features dynamic woofer, ceramic tweeter, and L/C crossover; impedance 4-16 ohms; frequency response 15-22,000 Hz; fully adjustable, vinyl-covered and padded spring steel headband with vinyl covered urethane foam cushions; supplied with 10-ft coil cord with molded stereo plug..... \$60

Classic CL-1 Headphones

Lightweight, isolating type headphones; frequency response 10-20,000 Hz; 35 ohm impedance; 0.3% dist. at 110-dB SPL (400 Hz); sensitivity 10 mW (0.6 V) for 110-dB SPL at 400 Hz; padded fully adjustable steel and aluminum headband with foam-filled vinyl cushions; 15-ft (extended) retractable cable with clothing clip and molded stereo plug; 10.6 oz (without cable)..... \$55

TRL-99 Headphones

Dynamic headphones with 2 3/4-in Mylar diaphragm; 35-ohm impedance; frequency response 15-20,000 Hz ± 4 dB; sensitivity 6 mW for 100-dB SPL; 0.4% dist. at 400 Hz, 110-dB SPL; padded, fully adjustable, aluminum and steel headband with fabric-faced, foam-filled cushions; supplied with 15-ft cable, clothing clip, molded plug, and strain relief; 10 oz (less cable)..... \$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; 80-ohm impedance; 0.6% dist. at 110 dB (400 Hz); sensitivity 6 mW for 100-dB SPL; max. input 5 V; padded, fully adjustable aluminum and steel headband; urethane foam, snap-on cushions; 15-ft (extended) retractable cable with clothing clip, molded plug, and strain relief; 8.5 oz (without cable)..... \$40

TRL-77 Trans-Linear Headphones

Open design headphones; frequency response 45-20,000 Hz; 80-ohm impedance; max. input 5 V; adjustable, continuous padded stainless steel headband and open foam; snap-on cushions; 7-ft Y cord with molded plug and strain relief; 11.5 oz (without cable)..... \$30

DP-903 Monitor Phone

Single hand-held earphone with swivel grip; blends left and right channels into single earphone; frequency response 20-19,000 Hz; 180-ohm impedance; brown with gold trim; 7-ft cord with stereo plug..... \$20

TRL-66 Headphones

Dynamic headphones with 6-mm transducer;

8-ohm impedance; frequency response 40-15,000 Hz; high impact unbreakable plastic headband with padding and foam-filled vinyl cushions; supplied with 7-ft Y cord with molded plug; 9 oz (less cable).
..... \$20

SC-3 Control Box

For use with receivers and amps without headphone jacks; left and right channel level controls; speaker/headphone switch; speakers off when phones are on
..... \$10

STEX-10R Coiled Cord

15-ft extension coiled cord for stereo headsets; supplied with special stereo jacks and plugs \$6.00

STEX-20 Cord

20-ft extension cord for stereo headsets; supplied with special stereo jacks and plugs \$5.00

TECHNICS by PANASONIC

EAH-830 Linear-Drive Headphones

Low-distortion high power-handling capacity; frequency range 15-35,000 Hz; max. input power 3000 mW; 125-ohm impedance; 0.3% dist.; 3-meter coiled cord; Supra-Aural ear pads; precise fit, soft, wide-contact leather head pads; 450 g \$80

EAH-820 Linear-Drive Headphones

High power handling capacity; frequency range 15-30,000 Hz; max. input power 3000 mW; 125-ohm impedance; 0.3% dist.; 3-meter coiled cord; Supra-Aural ear pads; precise fit, soft, wide-contact leather head pads; 430 g \$60

EAH-810 Linear-Drive Headphones

Open-environment waveform response at eardrum; frequency range 20-25,000 Hz; max. input power 1000 mW; 63-ohm impedance; 0.5% dist. at 100 dB; 3-meter cord; Supra-Aural ear pads; precise-fit, soft, wide-contact leather head pads; 230 g \$40

TOSHIBA

HR-811 Headphones

Complementary back electret push-pull, full-face drive system; 2.5-micron diaphragm; frequency response 20-30,000 Hz; 8.4 oz; comes with adaptor plugs \$70

HR-X1 Headphones

Complementary back electret push-pull, full-face drive system; 2.5-micron diaphragm; frequency response 20-20,000 Hz; 5.6 oz; comes with adaptor plugs \$60

UHER

Featherweight Stereo Headphones

Lightweight (2.2 oz) stereo headphones with 8-ft coiled cord; frequency response 20-20,000 Hz; 200-ohm impedance (1 kHz); has lightweight adjustable headband and yellow foam-cushioned earpieces.

W674. With two-pin plug for Uher open-reel decks \$55

W675. With five-pin plug for Uher cassette recorders \$55

W676. With phone plug for amplifiers \$55

YAMAHA

HP-1 Stereo Headphones

Lightweight "Orthodynamic" design featuring sintered ferrite disc magnets with combination voice-coil diaphragm between; frequency response 20-20,000 Hz; output 96 dB/mW SPL; 3 W rated input; max. input 10 W; HD 0.3% at 90 dB SPL, 3.0% at 120 dB SPL; impedance 150 ohms; soft leather strap distributes weight over entire head; 7-ft, 10.5-in straight cord; weight 0.64 lb with cord \$65

HP-2. Same except output 93 dB/mW SPL; weight 0.51 lb \$50

ZENITH

839-50 Stereo Headphones

Dynamic stereo headphones; 8-ohm impedance; max. input power 200 mW; frequency response 20-20,000 Hz; sensitivity 108 dB \pm 3 dB at 200 Hz; "open" earphones; 6 $\frac{1}{2}$ -ft cord; 12 oz \$43

839-32 Stereo Headphones

Dynamic stereo headphones; 8-ohm impedance; max. input power 500 mW; frequency response 20-19,000 Hz; sensitivity 104 dB \pm 3 dB at 200 Hz; 10-ft coiled cord; 11 oz \$40

839-43 Stereo Headphones

Dynamic stereo headphones; 8-ohm impedance; max. input power 300 mW; frequency response 20-18,000 Hz; sensitivity 106 dB \pm 3 dB at 200 Hz; separate volume control on each earpiece; 10-ft coiled cord; 12 $\frac{1}{2}$ oz \$32

839-42 Stereo Headphones

Dynamic stereo headphones; 8-ohm impedance; max. input power 300 mW; frequency response 20-18,000 Hz; sensitivity 106 dB \pm 3 dB at 200 Hz; 10-ft coiled cord; 12 oz \$26

839-49 Stereo Headphones

Dynamic stereo headphones; 8-ohm impedance; max. input power 200 mW; sensitivity 110 dB \pm 3 dB at 200 Hz; frequency response 20-18,000 Hz; 6 $\frac{1}{2}$ -ft cord; 11 oz \$20



MICROPHONES

AKG

D-140E Cardioid Microphone

Cardioid dynamic microphone for the professional entertainer or recording studio; frequency range 30-17,000 Hz \pm 2.5 dB; sensitivity -52 dBm; 200-ohm impedance; less than 1% dist. up to 128 dB; wire mesh windscreen; -10 dB bass attenuation switch; supplied with SA-25/1 stand adapter and case; 1 $\frac{1}{4}$ " dia. \times 6" L; 6 $\frac{1}{4}$ oz. \$155

D-2000E Super Cardioid Microphone

Super cardioid dynamic microphone for the professional entertainer or recording studio; frequency range 35-17,000 Hz \pm 3 dB; sensitivity -52 dBm ASA; 200-ohm impedance; adjustable bass response; B-M-off switch; immune to handling noise; supplied with SA-12/1 stand adapter and case; nickel-plated finish; 2 $\frac{1}{8}$ " dia. \times 6 $\frac{1}{2}$ " L; 11 oz. \$125

D-200E Cardioid Microphone

Cardioid dynamic microphone for the semi-professional recordist and musician; frequency range 25-16,000 Hz \pm 3 dB; sensitivity -56 dBm ASA; 200-ohm impedance; supplied with SA-20 stand adapter, wire mesh grille, cotton-fiber screen and case; 1 $\frac{1}{8}$ " dia. \times 7 $\frac{7}{8}$ " L; 8 $\frac{1}{2}$ oz. \$105

D-170E Super Cardioid Microphone

Super cardioid dynamic microphone; shock-suspended transducer and wire-mesh windscreen for close vocal pick-up; frequency range 50-15,000 Hz; sensitivity -53.5 dBm; 200-ohm impedance; supplied with SA-12/1 stand adapter and case; 2 $\frac{1}{8}$ " dia. \times 6 $\frac{1}{2}$ " L; 12 oz \$105

D-1000E Cardioid Microphone

Rugged cardioid dynamic microphone doubles as both a studio mike and in-the-field mike; has B-M-S mode switch which provides up to 13 dB bass rolloff at 100 Hz and up to 6 dB midrange shelf attenuation at 1000 Hz; frequency range 40-17,000 Hz \pm 3 dB; sensitivity -52 dBm; 200-ohm impedance; supplied with bronze windscreen, SA-12 stand

adapter and case; 1 $\frac{1}{8}$ " dia. \times 6 $\frac{1}{8}$ " L; 8 $\frac{1}{2}$ oz. ... \$85

D-190 E Cardioid Microphone

Cardioid dynamic microphone for speech or music performing and recording use; frequency range



30-15,000 Hz; sensitivity -52 dBm; 200-ohm impedance; supplied with bronze wind/pop filter, SA-11 stand adapter and case; 1 $\frac{1}{8}$ " dia. \times 6 $\frac{1}{8}$ " L; 6 $\frac{1}{2}$ oz \$75

D-190ES. Same as D-190E but with on/off switch \$80

D-109 Lavalier Microphone

Lightweight lavalier dynamic microphone designed specially for "hands free" use; frequency range 70-12,000 Hz; sensitivity -58 dBm; 200-ohm impedance; supplied with 29 $\frac{1}{2}$ -ft non-detachable lightweight cable, lavalier clip with tie clasp, lavalier cord and case; nickel-plated brass finish; 1 $\frac{1}{8}$ " dia. \times 2 $\frac{3}{4}$ " L; 5 $\frac{1}{2}$ oz (including cable) \$70

D-120E Cardioid Microphone

Cardioid dynamic microphone for general-purpose applications; lightweight, rugged construction with integral windscreen/shock mounting; withstands "close-talking" applications; frequency range 100-17,000 Hz; sensitivity -54 dBm; 200-ohm impedance; supplied with SA-23/2 snap-out stand adapter and case; 2 $\frac{1}{8}$ " dia. \times 6 $\frac{1}{8}$ " L; 5 $\frac{1}{4}$ oz. \$65

D-120ES. Same except with on/off switch \$70

Electret Condenser Mike System

Modular system consisting of one basic powering module, six interchangeable capsules, and accessories; powering module has battery compartment for 5.6-V battery, on/off switch for shifting battery to clean contact points, 550-hour continuous operation, and adaptability for phantom powering off dc supply; interchangeable capsules include: CE-1 cardioid capsule plus condenser mike preamp; CE-2 omnidirectional capsule with preamp; CE-5 cardioid capsule with integral suspension and wire mesh screen plus preamp; CE-8 electret-condenser capsule with integral FET preamp; CE-10/1 miniature lavalier electret-condenser capsule with preamp and non-detachable 4-ft cable with adapter; CE-10/7 miniature lavalier electret-condenser capsule with non-detachable 23-ft cable with adapter.

SE-5E Powering module \$70

CE-1 \$55

CE-2 \$55

CE-5 \$65

CE-8 \$95

CE-10/1 \$95

CE-10/7 \$100

C-501E. For cardioid operation; consists of CE-1 capsule; SE-5E powering module; SA-11/1 stand adapter; W-20 windscreen; battery and case .. \$135

C-502E. For omnidirectional operation; consists of CE-2 capsule; SE-5E powering module; SA-11/1 stand adapter; W-20 windscreen; battery and case .. \$135

C-505E. For cardioid operation; consists of basic microphone body; integral suspension; CE-5 capsule; SE-5E powering module; SA-11/1 stand adapter; windscreen/pop filter; battery and case \$140

C-510E. For lavalier operation; consists of CE-10/1 lavalier element and SE-5E powering module; two W-6 windscreens; battery and case \$165

AUDIO-TECHNICA

AT 813 Unidirectional Microphone

Incorporates electret condenser permanently polarized element; frequency response 20-20,000 Hz; sensitivity -55 dB; 600-ohm nominal impedance; max. input SPL 155 dB; S/N 50 dB (1 kHz, 1 μ bar); AA penlight battery powered; supplied with 16.5-ft cable with professional 3-pin connector, slip-in stand clamp, carrying case, and battery.. \$95

AT803S Sub-Miniature Microphone

Electret condenser permanently charged element; omnidirectional pattern; frequency response 50-15,000 Hz; sensitivity -57 dB; 600-ohm impedance; balanced output; battery holder/belt clip with on/off switch; uses AA penlight battery; includes clothing clip, windscreen, battery, and carrying case; 16 1/2-ft cable; 0.4" diameter x 0.8" L... \$80

AT812 Unidirectional Microphone

Incorporates moving-coil dynamic element; frequency response 50-18,000 Hz; sensitivity -60 dB; 600-ohm nominal impedance; supplied with 16.5-ft cable with professional 3-pin connector, slip-in stand clamp, and carrying case..... \$80

AT811 Unidirectional Microphone

Incorporates electret condenser permanently polarized element; frequency response 50-20,000 Hz; sensitivity -54 dB; 600-ohm nominal impedance; max. input SPL 130 dB; S/N 50 dB (1 kHz, 1 μ bar); battery powered; supplied with 16.5-ft cable with professional 3-pin connector, slip-in stand clamp, carrying case, and battery..... \$80

AT802 Omnidirectional Microphone

Incorporates moving-coil dynamic element; frequency response 50-16,000 Hz; sensitivity -54.4 dB; 600-ohm nominal impedance; supplied with 16.5-ft cable with professional 3-pin connector, slip-in stand clamp, and carrying case..... \$60

AT801 Omnidirectional Microphone

Incorporates electret condenser permanently polarized element; frequency response 40-18,000 Hz; sensitivity -48 dB; 600-ohm nominal impedance max. input SPL 122 dB; S/N 50 dB (1 kHz, 1 μ bar); AA penlight battery powered; supplied with 16.5-ft cable with professional 3-pin connector, slip-in stand clamp, carrying case..... \$60

AT805S Miniature Microphone

Electret condenser permanently charged element; omnidirectional pattern; frequency response 50-15,000 Hz; sensitivity -57 dB; 600-ohm impedance; unbalanced output; built-in on/off switch; uses E675 battery; includes clothing clip, lavalier cord, windscreen, belt clip, battery, carrying case, and 16 1/2-ft cable; 0.6" diameter x 2" L.. \$50

AUDIOTEX

Electret Condenser Microphone

Unidirectional pattern to minimize pickup from rear and sides; on/off slide switch; frequency response 50-13,000 Hz; impedance 600 ohms; sensitivity -69 dB (1 kHz); comes with 20-ft cable, desk stand, black vinyl storage case. 30-2316..... \$60

Dynamic Microphone

For recording groups and soloists; cardioid pattern; wide, flat frequency response 50-13,000 Hz; output -58 dB (on high impedance); rugged construction, built-in windscreen. 20-ft cable with standard phone plug and adapter for floor or desk stand; built-in volume control with on/off switch; dual (hi/lo) impedance. 30-2314..... \$34

Omnidirectional Microphone

Response 55-13,000 Hz; output -62 dB (on high

impedance); rugged construction; comes with 15-ft cable, standard phone plug, swivel holder, on/off slide switch, and windscreen for outdoor use; dual (hi/lo) impedance. 30-2312..... \$28

Omnidirectional Microphone

Response 80-13,000 Hz; high impedance; comes with 10-ft cable with standard phone plug, on/off slide switch, desk stand; sensitivity -58 dB. 30-2310..... \$26

Tie Tack Lapel Microphone

For PA and voice taping; frequency response 40-16,000 Hz; impedance 1000 ohms; sensitivity -65 dB \pm 3 dB; comes with 13-ft cord with mini-plug, tie-tack holder, mercury battery. 30-2318... \$21

Microphone Mixer

Allows combination of up to four mikes or two mikes to each stereo channel; separate control for each mike; on/off switch; stereo/mono selector switch; 9-volt battery operated; standard 1/4-in phone jack inputs, phono pin jack outputs. 30-2320..... \$26

Folding Microphone Stand

Folds and unfolds in seconds; weight 3 1/2 pounds; chrome-plated tubing extends to 60 in; folded size 33 in; legs have rubber tips to prevent skidding and scratching. 30-2362..... \$23

Floor-Type Stand

Heavy cast-iron, self-leveling base with polished chrome-plated telescoping tubing; adjusts from 34 in to 64-in; top of tubing has 3/8-27 thread to fit all standard mikes. 30-2360..... \$22

Microphone Boom

Fits all standard mike floor stands; has adjustable counterweight; movable clamp and hinge design for any desired position; standard 3/8-27 thread; 31-in long. 30-2370..... \$20

BEYER/DYNAMIC

M-160 Double-Ribbon Microphone

Super-cardioid dynamic type; frequency response 40-18,000 Hz \pm 2.5 dB; sensitivity -152 dBm (EIA); 200-ohm impedance; low sensitivity at 120 degrees to axis; suitable for stereo recording; Cannon XLR termination..... \$334

M-88 Moving-Coil Microphone

Super-cardioid dynamic type; frequency response 30-20,000 Hz \pm 2.5 dB; sensitivity -144 dBm (EIA); special transducer mounting eliminates body noise; will withstand rough handling, humidity and temperature changes; for studio work, recording artists, and instrumentalists..... \$300

M-500 Dynamic Ribbon Microphone

Super-cardioid design; frequency response 40-18,000 Hz \pm 2.5 dB; sensitivity -153 dBm (EIA); 200-ohm impedance; has four-stage integral blast filter and Cannon XLR termination; specially designed for rock vocals; low pop and breath noises even when singer's lips touch microphone..... \$205

M-260-S Dynamic Ribbon Microphone

Super-cardioid design; frequency response 50-18,000 Hz \pm 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..... \$189

M-101 Moving-Coil Microphone

Omnidirectional type; frequency response 40-20,000 Hz; sensitivity -150 dBm (EIA); 200-ohm impedance; withstands pressures associated with modern music (modulated voltages up to 2 V); low handling noise; 4 1/2" x 7/8"; Cannon XLR termination..... \$189

M-201 Moving-Coil Microphone

Super-cardioid dynamic type; frequency response 40-18,000 Hz; sensitivity -149 dBm (EIA); 200-ohm impedance; 6" x 1 1/2"; Cannon XLR ter-

mination; comes with clamp and presentation case..... \$179

M-69 Moving-Coil Microphone

Dynamic cardioid design; frequency response 50-16,000 Hz \pm 3 dB; sensitivity -144 dBm (EIA); 200-ohm impedance; for indoor/outdoor applications; unaffected by temperature or humidity..... \$150

M-69-SM. Same as M-69 but with on/off and bass-cut switch..... \$160

X1N "Soundstar" Dynamic Microphone

Dynamic cardioid design; frequency response 30-18,000 Hz \pm 2.3 dB; sensitivity -146 dBm (EIA); 200-ohm impedance; front-to-back attenuation greater than 20 dB; for tape recording, music, and vocals; has built-in pop screen and hum compensation coils; Cannon XLR termination..... \$135

X1HL "Soundstar". Same as the X1N except with high/low impedance switch..... \$155

M-810-N Moving-Coil Microphone

Dynamic cardioid design; frequency response 50-16,000 Hz; sensitivity -148 dBm; suits all impedances; designed for tape recording applications; comes with windshield, clamp, and detachable 16-ft cable with jack, all housed in lined case..... \$100

M-550S Moving-Coil Microphone

Omnidirectional dynamic type; frequency response 70-18,000 Hz; for tape recording and general applications; sensitivity -152 dBm (EIA); will work with all impedances; suitable for use indoors and outdoors; comes with clamp, table stand, cable with jack plug, on/off switch and presentation case.. \$50

ELECTRO-VOICE

1777 Cardioid Microphone

Cardioid microphone with electret element; frequency response 60-18,000 Hz; -54 dB output; 150-ohm impedance; EIA sensitivity -144 dB; powered by 4.5 V internal battery or 24-28 V phantom supply; built-in Acoustifoam filter; supplied with 15-ft cable, A3F connector, and stand adapter; zinc and aluminum with non-reflecting gray finish.. \$128

1776 Cardioid Microphone

Single-D cardioid electret condenser microphone; frequency response 60-18,000 Hz; 50 dB output; low impedance; on/off switch; A3M-type mike connector and 15-ft cable with matching connector; supplied with stand adapter; nonreflective gray finish..... \$105

1776P. Same but with 25-ft cable with two professional connectors..... \$111

644 Cardiline Microphone

Cardiline very directional dynamic microphone; flat response 40-12,000 Hz; -53 dB output; switch-



able high and low impedance; on/off switch; MC4F-type mike connector and 15-ft cable with matching connector; gray finish..... \$140

672 Cardioid Microphone

Single D cardioid dynamic microphone; shaped response 60-14,000 Hz; -61 dB output (hi-Z), -60

Studio quality microphones that don't need a studio to survive.

The CS15P condenser cardioid

microphone is equally at home in a recording environment or broadcast studio. When hand-held it puts sex appeal in a voice with its bass-boosting proximity effect. With shaped high-frequency response and its ability to handle high sound pressure levels (140dB with 1% THD at 1kHz), the CS15P is ideal for close-up vocal or solo instrument miking applications.

When boom mounted, the CS15P has better gain-before-feedback and a better signal-to-noise ratio than most shot-guns. It's phantom powered and it's rugged.

The CO15P condenser omni

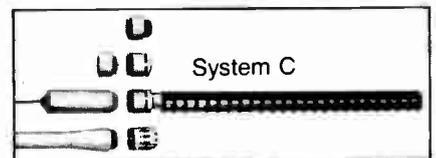
extends frequency response to the very limits of audibility, 20 to 20,000 Hz. Unlike other "omni's," the CO15P maintains its omnidirectional polar pattern at the very highest frequencies. Perfect for the distant miking of an entire orchestra as well as up close on individual instruments. And like the CS15P, it's phantom powered and it's rugged.

The Electro-Voice warranty

Electro-Voice backs up these two microphones with the only unconditional warranty in the business: for two years we will replace or

repair your CS15P or CO15P microphone, when returned to Electro-Voice for service, at no charge – no matter what caused the damage!

We can do this because we build these microphones to meet our standards for performance, ruggedness and durability. We accept nothing less, and if you're a professional, buying a professional quality microphone, you shouldn't either.



EV **Electro-Voice**[®]
a gulton company

600 Cecil Street, Buchanan, Michigan 49107

CIRCLE NO. 18 ON READER SERVICE CARD

6

MICROPHONES

dB output (lo-Z); switchable high and low impedance; on/off switch; A3M-type mike connector and 15-ft cable with matching connector; supplied with integral windscreen/pop filter; satin chrome finish \$87

670A Cardioid Microphone

Single-D cardioid dynamic microphone; shaped response 60-14,000 Hz; -61 dB output (hi-Z), -60 dB output (lo-Z); switchable high and low impedance; on/off switch; A3M-type mike connector and 15-ft cable with matching connector; supplied with stand clamp; gray finish \$84
670AP. Same but with 25-ft cable with two professional connectors \$87

636 Omnidirectional Microphone

Omnidirectional dynamic microphone; flat response 60-13,000 Hz; -58 dB output; switchable high and low impedance; on/off switch; MC4F-type mike connector and 15-ft cable with matching connector; satin chrome finish \$81

664A Super Cardioid Microphone

Continuously Variable-D super cardioid dynamic microphone; shaped response 90-13,000 Hz; -56 dB output; switchable high and low impedance; A3M-type mike connector and 15-ft cable with matching connector; satin chrome finish \$80
664AA. Same but gray finish \$80

660 Super Cardioid Microphone

Continuously Variable-D super cardioid microphone; shaped response 90-13,000 Hz; -56 dB output; switchable high and low impedance; A3M-type mike connector and 15-ft cable with matching connector; supplied with stand clamp; satin chrome finish \$78
660A. Same with gray finish \$78
660P. Same as 660 but with 25-ft cable with two professional connectors \$81

671A Cardioid Microphone

Single-D cardioid dynamic microphone; shaped response 60-14,000 Hz; -56 dB output (hi-Z), -57 dB output (lo-Z); switchable high and low impedance; on/off switch; A3M-type mike connector and 15-ft cable with matching connector; supplied with stand clamp and integral windscreen/pop filter; satin chrome finish \$81
671AP. Same but with 25-ft cable with two professional connectors \$84

647A Omnidirectional Microphone

Omnidirectional dynamic microphone; shaped response 60-12,000 Hz; -60 dB output; high- and low-impedance models available; integral cable; supplied with lavalier neckcord, belt clip, and stand clamp; gray finish \$75

630 Omnidirectional Microphone

Omnidirectional dynamic microphone; flat response 60-11,000 Hz; -55 dB output; switchable high and low impedance; on/off switch; MC4F-type mike connector and 15-ft cable with matching connector; satin chrome finish \$68

627C Cardioid Microphone

Single-D cardioid dynamic microphone; shaped response 60-13,000 Hz; -58 dB output; switchable high and low impedance; on/off switch; A3M-type mike connector and 15-ft cable with matching connector; supplied with stand clamp; satin chrome finish \$60
627CP. Same but with 25-ft cable with two professional connectors \$63

631B Omnidirectional Microphone

Omnidirectional dynamic microphone; frequency response 80-13,000 Hz; -56 dB output; switchable high and low impedance; on/off switch; A3M-type mike connector and 15-ft cable with matching

connector; satin chrome finish \$57
631BP. Same but with 25-ft cable with two professional connectors \$60

607L Noise-Cancelling Microphone

Noise-cancelling dynamic microphone; shaped response 200-4000 Hz; 54 dB output; cancels sound more than 1/4-in from face; low-impedance; MC1M-type connector and 15-ft cable with matching connector; gray finish \$54

626A Cardioid Microphone

Single-D cardioid dynamic microphone; shaped response 70-12,000 Hz; -56 dB output; switchable high and low impedance; on/off switch; integral cable; supplied with stand clamp; non-reflective fawn beige finish \$49
626AP. Same but with 25-ft cable with two professional connectors \$51

1724 Lavalier Microphone

Omnidirectional microphone with electret element; frequency response 50-15,000 Hz; -68 dB output; 1000 ohm impedance; EIA sensitivity -148 dB; battery powered; supplied with 13-ft cable and tie clasp; aluminum alloy case with oxide anodized nickel tone and black finish \$43

634BSRL Omnidirectional Microphone

Omnidirectional dynamic microphone; shaped response 70-10,000 Hz; -57 dB output; low impedance; on/off switch with relay contacts; integral cable; supplied with windscreen; gray finish \$39

634B Omnidirectional Microphone

Omnidirectional dynamic microphone; shaped response 70-10,000 Hz; -57 dB output; high- and low-impedance models available; integral cable; gray finish \$33

Professional Microphone Systems

CL42S Condenser Shotgun System

Cardiline hypercardioid (distributed front above 1 kHz) microphone with electret element; frequency response 90-12,000 Hz; -33 dB output; 250 ohm impedance; A3M-type connector and small coil cord; supplied with shock mount, handle, and Acoustifoam windscreen; fawn beige micromatte finish \$634

CH15S Hypercardioid Microphone

Hypercardioid microphone with electret element; frequency response 55-13,500 Hz; 150 ohm impedance; supplied with miniature shock mount, utility storage case, and windscreen; fawn beige micromatte finish \$488

DL42 Cardiline Microphone

Cardiline very directional dynamic microphone; shaped response 50-12,000 Hz; -50 dB output; long-reach pickup; low impedance; integral cable; supplied with carrying case, windscreen, shock mounting, and handle; nonreflective fawn beige finish \$378

RE250 Cardioid Microphone

Continuously Variable-D cardioid dynamic microphone; flat response 45-18,000 Hz; -57 dB output; built-in shock mounting and electrical shield; low impedance; bass tilt-down switch; A3M-type mike connector and 15-ft cable with matching connector; supplied with metal carrying case and stand adapter; nonreflective fawn beige finish \$330

667A Cardioid Microphone

Continuously Variable-D cardioid dynamic microphone; shaped response 40-10,000 Hz; -51 dB output; boom or fishpole use; low impedance; passive equalizer switch provides three LF and two HF variations; A3M-type mike connector and 15-ft cable with matching connector; supplied with integral windscreen/pop filter and shock mount; gray finish \$324

CS15P Microphone

Consists of Single-D cardioid element and PE15 preamplifier; frequency response 40-18,000 Hz; -45 dB output; 150 ohm impedance; PE15 re-

quires phantom power method, 8-50 V dc; supplied with windscreen, stand clamp, case, and 15-ft cable; fawn beige micromatte finish \$236

CS15P Cardioid Microphone

Single-D cardioid dynamic microphone; shaped response 40-18,000 Hz; -45 dB output; remote powering or use PS8 battery supply; low impedance; A3M-type mike connector and 15-ft cable with matching connector; supplied with windscreen, stand clamp, and metal carrying case; non-reflective fawn beige finish \$234

RE55 Omnidirectional Microphone

Omnidirectional dynamic microphone; flat response 40-20,000 Hz; -55 dB output; low impedance; A3M-type mike connector and 15-ft cable with matching connector; supplied with stand clamp and metal carrying case; nonreflective fawn beige finish \$219

RE16 Super Cardioid Microphone

Continuously Variable-D super cardioid dynamic microphone; shaped response 80-15,000 Hz; -56 dB output; low impedance; bass tilt down switch; A3M-type mike connector and 15-ft cable with matching connector; supplied with stand clamp, metal carrying case, and integral windscreen/pop filter; nonreflective fawn beige finish \$198

CO85 "Tie-Tac" Microphone

Omnidirectional condenser element, electret microphone; shaped response 70-16,000 Hz; -56 dB output; battery housing/cable connector may be clipped to belt; low impedance; A3M-type mike connector and 15-ft cable with matching connector; supplied with windscreen, belt clip, tie clasp assembly, and metal carrying case; nonreflective fawn beige finish \$162

RE51 Omnidirectional Microphone

Omnidirectional dynamic microphone; shaped response 60-10,000 Hz; output -54 dB; hands-free use; amplifier clips on belt; cough button, battery light, level adjustment, and on/off switch; low impedance; A3M-type mike connector and 15-ft cable with matching connector; supplied with preamplifier and headband; black finish \$144

RE11 Super Cardioid Microphone

Continuously Variable-D super cardioid dynamic microphone; shaped response 90-13,000 Hz; -56 dB output; bass tilt down switch; low impedance; A3M-type mike connector and 15-ft cable with matching connector; supplied with stand clamp, metal carrying case, and integral windscreen/pop filter; nonreflective fawn beige finish \$132

CO90 Miniature Microphone

Miniature omnidirectional microphone with electret element; frequency response 40-15,000 Hz; -57 dB output; 150 ohm impedance; EIA sensitivity -148 dB; battery powered; supplied with windscreen, belt clip, storage pouch, and 6-ft cable; fawn beige micromatte finish \$113

DS35 Cardioid Microphone

Single-D cardioid dynamic microphone; shaped response 60-17,000 Hz; -61 dB output; low impedance; A3M-type mike connector and 15-ft cable with matching connector; supplied with stand clamp, metal carrying case, and integral windscreen/pop filter; nonreflective fawn beige finish \$108

DO54 Omnidirectional Microphone

Omnidirectional dynamic microphone; flat response 50-18,000 Hz; -58 dB output; low impedance; A3M-type mike connector and 15-ft cable with matching connector; supplied with stand clamp and metal carrying case; nonreflective fawn beige finish \$105

RE50 Omnidirectional Microphone

Omnidirectional dynamic microphone; shaped response 80-13,000 Hz; -55 dB output; double-wall, shock-isolated case and special cable for noise-free operation; low impedance; A3M-type mike connector and 15-ft cable with matching con-

nector; supplied with stand clamp, metal carrying case, and integral windscreen/pop filter; nonreflective fawn beige finish \$99

RE85 Omnidirectional Microphone

Omnidirectional dynamic microphone; shaped response 90-10,000 Hz; -61 dB output; isolated shock-mounted construction and special cable for noise-free operation; low impedance; integral cable; supplied with lavalier neckcord, tie clasp assembly, carrying pouch, and belt clip; champagne finish \$99

649B Omnidirectional Microphone

Omnidirectional dynamic microphone; shaped response 70-10,000 Hz; -61 dB output; low impedance; integral cable; supplied with lavalier neckcord, belt clip, stand clamp, and carrying pouch; nonreflective fawn beige finish \$96

635A Omnidirectional Microphone

Omnidirectional dynamic microphone; shaped response 80-13,000 Hz; 55 dB output; low impedance; A3M-type mike connector and 15-ft cable with matching connector; supplied with stand clamp; nonreflective fawn beige finish \$66

ERCONA

DC-21 Cardioid Microphone

Cardioid condenser microphone; SYMSI 48 powering; frequency response 30-20,000 Hz \pm 3 dB; sensitivity -44 dB/Pa (over 200 ohms at 1 V); output 6.3 mV/Pa (over 200 ohms at 1 V); noise 25 dB (re 2×10^{-12} Pa, A wtd.); 122-dB dynamic range; output impedance 200 ohms; operating voltage +48 +6/-8; current consumption 0.8 mA; satin chrome finish; supplied with stand adaptor and 33-ft cable \$230

DC-20. Similar but omnidirectional design; sensitivity -46 dB/Pa; output 5 mV/Pa; noise 26 dB; 124-dB dynamic range \$215

LAFAYETTE

MU-101 Dynamic Microphone

Unidirectional pickup; output 56 dB; response 200-10,000 Hz; user selects high or low impedance; hand-held with Switchcraft connector to body; on/off switch; shock-mounted transducer and Mylar diaphragm for rugged use; use for speech, rock vocals, and tape recording; cable end free; die-cast case; non-glare finish \$38

Electret Condenser Microphone

Unidirectional cardioid pattern with high front-to-back rejection ratio and flat frequency response from 30-16,000 Hz; impedance 600 ohms but can be used with inputs up to 20,000 ohms; FET circuitry; powered by one "AA" penlite cell; foam windscreen, 20-ft shielded cable, standard 1/4-in phone plug, metal tripod-type desk stand, floor-stand adapter, and battery are included \$35

Cardioid Dynamic Microphone

Dual-impedance, general-purpose microphone; unidirectional pickup; response 100-10,000 Hz; output level -57 dB; dual impedance switch selected; on/off switch; chrome finish; pop-proof wire mesh grille; 20-ft detachable cable; stand swivel adapter; 8" long \times 1" diameter \$27

Deluxe Ball Dynamic Microphone

General-purpose, omnidirectional, dual-impedance (50,000 and 250 ohms), selectable at cable end; output at high impedance -59 dB; frequency response 100-10,000 Hz; has on-off switch; includes ball screen, 20-ft cable, phone plug, black metal desk stand, and floor-stand adapter; die-cast case finished in satin aluminum; case is 6 1/4" long \times 2 1/4" max. diameter of ball \$27

ML-1 Lavalier Condenser Microphone

Omnidirectional tie-clasp lavalier microphone; response 50-15,000 Hz; -80 dB output; tie-clasp holder; noise-reducing cable to FET preamp and power supply; 600-ohm output impedance; 1 1/2" \times

3/8" diameter comes with "AA" battery, shielded cable, phone plug \$20

MERITON

DNM-20 Dynamic Microphone

Omnidirectional dynamic unit; features polyester film diaphragm; built-in on/off switch; response 70-12,000 Hz; impedance 250 ohms (unbalanced) comes with table stand; 1 1/2" dia. \times 5 7/8" H \$20

DNM-10 Dynamic Microphone

Omnidirectional replacement unit for use with cassette recorders; response 100-10,000 Hz; impedance 250 ohms (unbalanced); comes with table stand, windscreen, mini plug; 1" dia. \times 4 1/4" H \$10

MURA

DX-30V Cardioid Microphone

Electret condenser microphone; battery powered; output impedance 600 and 50,000 ohms; frequency response 20-18,000 Hz; sensitivity -48 dB (high impedance), -62 dB (low impedance); on/off mike switch; supplied with 20-ft cable with 1/4-in phone plug, battery, microphone holder, and styrofoam case with sleeve \$70

DX-20V Cardioid Microphone

Slimline design; impedance 600 and 50,000 ohms; frequency response 60-15,000 Hz; sensitivity -56 dB (high impedance), -74 dB (low impedance); on/off mike switch; supplied with 20-ft cable with 1/4-in phone plug, microphone holder, and styrofoam case with sleeve \$50

DX-129 Cardioid Microphone

Ball-type cardioid dynamic mike; dual impedance 600/50 k; on-off switch; sensitivity: -58 dB at 1000 Hz; frequency response 40-14,000 Hz; built-in pop and blast filters; comes with stand adapter, 20-ft cable; black satin and chrome finish \$42

DX-285 Electret Condenser Microphone

Omnidirectional pattern; for general recording and vocal work; frequency response 50-13,500 Hz \pm 3 dB; impedance 600 ohms; sensitivity: -71 dB at 1000 Hz (0 dB 1 V/1 μ bar); removable windscreen; comes with 1.5-V battery, 20-ft cable with 1/4-in phone plug, desk stand \$40

DX-247 Dynamic Microphone

Omnidirectional pattern; for vocals and recording; dual impedance 600/50 k (sw. on mike); sensitivity -57 dB at 1000 Hz; frequency response 50-14,000 Hz; removable windscreen; on/off switch; comes with 20-ft cable with 1/4-in phone plug; black satin/chrome finish \$40

EX-279 Lapel Microphone

Electret condenser lapel microphone; has clothing clip; omnidirectional pattern; frequency response 30-16,000 Hz; 600-ohm impedance; supplied with 10-ft cable with mini-plug and battery \$30

NAKAMICHI

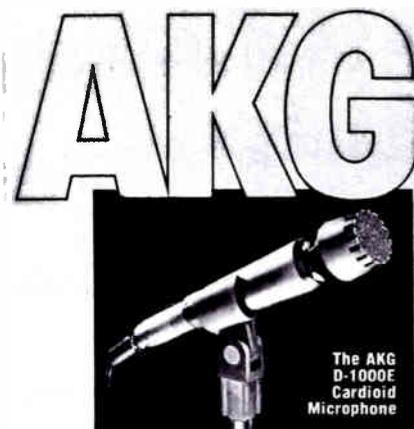
CM-1000 Condenser Microphone

Condenser microphone with interchangeable capsules; temperature and humidity resistant; supplied with battery power supply, CP-101 unidirectional capsule, windscreen, cables with XLR connectors, case, 10- and 20-dB attenuators, and proximity effect compensator; frequency response 20-20,000 Hz \pm 2.5 dB; impedance 600 ohms balanced; sensitivity -67 dB; \pm 1.5 dB; 139-dB SPL max. with 3% dist., dynamic range 116 dB; S/N 50 dB (weighted) \$355

CP-102. Optional super-omni capsule \$125

DM-1000 Dynamic Microphone

Cardioid, moving-coil microphone with low-mass diaphragm and voice coil for extended high-end response; designed especially for vocals; triple metal screen pop, blast, and wind filter; double casing



Top performers depend on AKG microphones. They know the sound they get is the sound they want.

Professional performers will tell you that a microphone is like a musical instrument... a valuable tool that must respond predictably to your demands. They'll tell you, too, to select your microphone with the same care that you'd use in selecting a musical instrument.

Many professional people prefer AKG microphones... and for many reasons. Take our D-1000E cardioid, for instance. Its built-in flexibility allows a variety of options for a more "personal" sound in recording and live performance situations. The D-1000E's Bass-Medium-Sharp equalization switch says that the sound you get is the sound you want... even in acoustically poor environments.

Or consider the D-120E cardioid, a rugged, high-quality microphone that's designed for the roughest, toughest handling you can give it. It's ideal for rock and contemporary music, recording and "live."

Your AKG dealer can show you a wide variety of AKG microphones, each designed to your personal taste and particular budget. Visit him today... and pick up your copy of AKG's informative *Guide to Microphone Selection and Application*. It's free for the asking!



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6

MICROPHONES

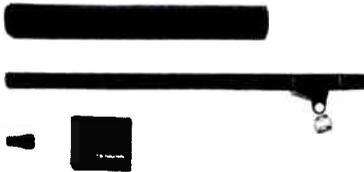
and foam suspension reduce sensitivity to vibration; immune to hum and magnetic fields; frequency response 30-20,000 Hz ± 3.5 dB; sensitivity -76 dB at 1 kHz (0 dB = 1 V/ μ bar); impedance 250 ohms; supplied with Cannon-type XLR-3 connector; anodized black matte finish; 10.4 oz \$245

CM-700 Electret Condenser Microphone
Studio electret condenser microphone with 16-mm diameter element; built-in low-noise FET preamp; powered by 6-V battery; 15-dB attenuator pad; interchangeable cardioid and omnidirectional capsules; frequency response 20-20,000 Hz ± 3 dB; impedance 600 ohms; sensitivity -65 dB, ± 2 dB; 130-dB SPL max. with 3% dist., 142 dB with pad; 121-dB dynamic range; S/N 49 dB (weighted) \$185

CP-703. Optional super-directional (shotgun) capsule \$85

CM-50 Miniature Microphone
Miniature electret microphone with built-in, low-noise FET preamp; powered by 6-V battery; supplied with tie clasp holder and windscreens; frequency response 20-18,000 Hz ± 3.5 dB; impedance 250 ohms; sensitivity -75 dB, ± 2.5 dB; 125-dB SPL max. with 3% dist.; dynamic range 100 dB; S/N 48 dB; 0.5" diameter \times 1.375" long. \$135

CM-300 Electret Condenser Microphone
Studio-type system with interchangeable capsules; basic set comes with CP-1 cardioid and CP-2 omni-



directional capsules, windscreen, 15-ft cable, XLR connector, battery, and stand adapter; built-in 10-dB attenuator pad; low-cut proximity effect compensator; frequency response 30-18,000 Hz (CP-1), 20-15,000 Hz (CP-2), 20-18,000 Hz (CP-3), 30-20,000 Hz (CP-4), all ± 3.5 dB; impedance 200 ohms balanced; sensitivity -76 dB, ± 2.5 dB (CP-1, CP-2, CP-4), -74 dB, ± 2.5 dB (CP-3); 138-dB SPL max. (CP-1, CP-2), 136-dB SPL max. (CP-3), 118-dB SPL max. (CP-4), all with 3% dist.; dynamic range 114 dB (CP-1, CP-2), 107 dB (CP-3), 94 dB (CP-4) \$135

CP-3. Optional small-diameter, super omnidirectional capsule \$40

CP-4. Optional super-directional (shotgun) capsule \$60

CM-300T. Tri-microphone system with three CM-300 microphone sets; designed for use in company's trimicrophone recording system; supplied with carrying case with space for headphones, cables, and accessories \$365

CM-100. Similar to CM-300 but powered by 1.5-V cell; 118-dB SPL max. with 3% dist.; dynamic range 94 dB; supplied with CP-1 cardioid capsule; accepts CP-2, CP-3, and CP-4 \$85

DM-500 Dynamic Microphone
Dynamic moving-coil microphone; built-in windscreen; super cardioid polar pattern; frequency response 50-15,000 Hz ± 5 dB; impedance 250 ohms; sensitivity -73 dB, ± 2.5 dB \$85

NEUMANN

fet-80 Condenser Microphones

A line of studio microphones that come in many configurations from omni, figure-8, cardioid, multi-

ple pattern to multiple pattern stereo; all can be either battery or phantom (separate power supplies) powered.

KM-83. Omnidirectional \$298

KM-84. Cardioid \$298

KM-85. Cardioid, with low-frequency roll-off .. \$298

KM-86. Three-pattern, switchable \$871

N-80. 117-V ac portable power supply for powering one or two fet-80 microphones \$60

PIONEER

CM-1 Electret Microphone
High molecular diaphragm electret condenser element; selectable omni- or uni-directional pattern; response 40-20,000 Hz (uni), 20-20,000 Hz (omni); output impedance 600 ohms unbalanced; sensitivity -69 dB (uni), -74 dB (omni) (both 0 dB = 1 V/ μ bar); 126 dB max. SPL; 1.5-V "AA" cell power supply; 1.42" dia. \times 8.37" long; weight 10.56 oz; comes with 18-ft cable \$100

CM-2S Electret Microphone
Dual-element electret condenser unit; hypercardioid pattern; response 20-20,000 Hz; output impedance 1000 ohms; sensitivity -68 dB at 1 kHz (0 dB = 1 V/ μ bar); max. SPL 126 dB; S/N 46 dB; 1.5-V "AA" cell power supply; 6.06" H \times 4.33" W; weight 11.2 oz; 21-ft cable; pair comes mounted on desk stand \$60

REALISTIC

Dual-Response Cardioid Microphone
Cardioid microphone; frequency response 80-15,000 Hz; output level 76 ± 3 dB; 200 ohms; with XLR connector, cable, 1/4-in plug, and mike holder \$60

Highball Dynamic Microphone
Dynamic cardioid microphone; frequency response 80-13,000 Hz; switchable impedance, 50-250 and 50,000 ohms; on/off switch; ball screen pop filter; Cannon-type connector; 15-ft cable with plug \$50

"All-Pro" Cardioid Microphone
Cardioid microphone; frequency response 30-15,000 Hz; 600-ohm impedance; supplied with 10-ft cord, 1/4-in plug, desk stand adapter, mike stand adapter, and "AA" battery \$30

Dual Pattern Stereo Microphone
Features switchable wide and normal pickup patterns; two internal electret/condenser capsules; frequency response 30-15,000 Hz; sensitivity -72 dB ± 3 dB; 600-ohm impedance; 2000-hour battery \$30

Super Cardioid Dynamic Microphone
Cardioid dynamic microphone; frequency response 80-12,000 Hz; switchable impedance, 600 and 50,000 ohms; on/off switch; output levels -77 dB (low), -60 dB (high); supplied with cable, slip on stand adapter, and plug \$28

Omnidirectional "On-Stage" Mike
Omnidirectional microphone; frequency response 30-15,000 Hz; 600-ohm impedance; supplied with windscreen, stand adapter, 10-ft cord, 1/4-in plug, and battery \$27

Featherweight Condenser Microphone
Electret condenser-type featherweight omni-directional microphone; frequency response 20-13,000 Hz; ultra-slim design, 9/16-in diameter; supplied with windscreen, 9-ft cable, 1/4-in plug, battery, and stand, 2.8 oz \$18

RECOTON

MM740 Dynamic Microphone
Cardioid pattern; selection switch to shape response characteristics; 600 ohms; sensitivity 71 dB; frequency response 50-15,000 Hz; brushed gold finish; comes with 18-ft cord with plug and desk stand \$60

ish; comes with 18-ft cord with plug and desk stand \$60

MM730 Dynamic Microphone
Features boom and feedback suppression; 600 ohms; sensitivity 69 dB; frequency response 50-15,000 Hz; brushed gold finish; comes with 18-ft cord with plug and desk stand \$55

MM720 "Echo" Microphone
Features reverb volume control for special effects; unidirectional; 600 ohms; sensitivity 74 dB; frequency response 20-10,000 Hz; reverb time 1.5 sec at 1 kHz; 15-ft cord with plug and desk stand \$45

MM220 Dual-Impedance Microphone
Dynamic type; 500 ohm/50,000 ohm impedance; pop-proof wire mesh grille; frequency response 100-10,000 Hz; sensitivity 58 dB at 50,000, 74 dB at 600 ohms; comes with 20-ft cable, 3/8 \times 27 adapter \$36

SANSUI

DM11 Dynamic Microphone
Unidirectional dynamic microphone; frequency response 100-15,000 Hz; 600-ohm output impedance; -76 dB sensitivity (frontal); meshed windscreen eliminates popping; ideal as vocal microphone; 6 meter cord \$110

EM1 Electret Condenser Microphone
Unidirectional electret condenser microphone; frequency response 50-15,000 Hz; 600-ohm output impedance; sensitivity -71.5 dB (frontal); music/vocal/off switch; three urethane foam windscreens in orange, blue and black for quick channel identification; 1.5 V dc "AA" penlight battery; 6 meter cord with phone plug \$80

MS1 Multi-Purpose Mike Stand
Microphone boom stand with arm for stereo pairing; mike-mount holes at both ends of adjustable boom; boom is 34 1/8-in long and rotatable over 360 degrees; supplementary bar is included to extend boom to 43 1/8-in; collapsible stand; four mike-mounting screws (3/16", 3/8", 3/8" 1/2"); matte black finish \$200

SENNHEISER

MD441 Dynamic Microphone
Super cardioid dynamic microphone; frequency response 40-20,000 Hz; sensitivity 0.2 mV/ μ bar ± 3 dB; brilliance switch for nominal 5-dB boost at 5 kHz; five-position bass attenuator; front-to-back ratio 20 dB, -3 dB; supplied with cable and quick-release mount for floor stand or MZT-441 table stand; takes MZW-441 windscreen; 1.3" H \times 1.4" W \times 9.6" L \$371

MD-211U Dynamic Microphone
Omnidirectional dynamic microphone; frequency response 40-20,000 Hz; sensitivity -58 dBm (0.13 mV/ μ bar) ± 2.5 dB; supplied with Cannon XLR connector and cable; 1" diameter \times 4 3/4" L \$290

MD421U Dynamic Microphone
Cardioid dynamic microphone; 200-ohm impedance; frequency response 30-17,000 Hz ± 5 dB; sensitivity 0.2 mV/ μ bar ± 3 dB at 1 kHz; EIA rating -145.8 dB; output level -53 dBm (1 mW/10 dynes/cm²); front-to-back ratio 18 dB, -2 dB; variable bass attenuator; supplied with XLR connector and cable; 7" \times 1 7/8" \times 1 1/2" \$265

MD416 Dynamic Microphone
Cardioid dynamic microphone; designed for close miking; frequency response 50-15,000 Hz; sensitivity 0.13 mV/ μ bar ± 3 dB; 200-ohm impedance; built-in isolation system to eliminate handling noise; built-in pop filter, outdoor pop filter; supplied with Cannon XLR connector, threaded stand

mount with quick-release clip, and cable \$244

Electret Condenser Mike System

One common powering module in balanced version (K2U) or unbalanced version (K1) serves three different compact heads: ME20 omnidirectional head, response 50-15,000 Hz, sensitivity 49 dBm, S/N 64 dBm min; ME40 super-cardioid head, response 50-15,000 Hz, sensitivity 49 dBm, S/N 64 dBm min.; ME80 shotgun head, response 50-15,000 Hz, sensitivity 45 dB, S/N 70 dB min.

K2U. Powering module \$101
K1. Powering module \$101
ME20. Omnidirectional head..... \$71
ME40. Super-cardioid head \$100
ME80. Shotgun head..... \$140

SHURE

300 Ribbon Microphone

Sensitivity -153 dB (EIA); response 40-15,000 Hz; user selects high or low impedance; bi-directional; hinge mount to stand; use for speech and music; has 20-ft cable and connector; gray.... \$138

546 "Unidyne III" Microphone

Dynamic type; sensitivity -154 dB (EIA); response 50-15,000 Hz; user selects high or low impedance; cardioid pattern; hinge mount to stand; use for speech, rock vocals, and music; comes with 20-ft cable and connector; chrome finish \$122

548SD "Unidyne IV" Microphone

Dynamic type; sensitivity -141 dB (EIA); response 40-15,000 Hz; user selects high or low impedance; cardioid pattern; hand-held with slip-in stand attachment; use for speech and music; has on-off switch, 15-ft cable, and connector; chrome finish .. \$96

565 "Unisphere 1" Microphone

Dynamic type; sensitivity -148.5 dB (EIA); response 50-15,000 Hz; user selects high or low impedance; cardioid pattern; hinge mount to stand; use for speech, rock vocals, and music; has pop or blast filter, 15-ft cable, and connector; chrome finish..... \$85

565SD. Same as Model 565 except has on-off switch and professional three-pin connector \$89

566. Similar to Model 565 except with shock mount..... \$130

516EQ Dynamic Equalizer Microphone

Unidirectional type designed for tape recording; complete equalization and response-shaping control; four switches (on mike handle) provide up to 16 different combinations of special effects, ranging from eliminating nasal and sibilant sounds to emphasizing various instruments; frequency response 50-15,000 Hz; impedance 150 ohms for connection to mike inputs rated at 25 to 3000 ohms; comes with foam wind-screen, swivel adaptor, cable, mini-plug adapter cable, and carrying case..... \$84

516EQ-PR. Two 516EQ microphones \$151

545 "Unidyne III" Microphone

Dynamic type; sensitivity -149 dB (EIA); response 50-15,000 Hz; user selects high or low impedance; cardioid pattern; with slip-in stand attachment and hinge mount to stand; designed specifically for speech, music, and tape recording; supplied with 15-ft cable and Amphenol-type MC4M connector; chrome finish..... \$75

545S. Similar to Model 545 but has cable connection through hinge and on-off switch in upright \$80

545SD. Same as Model 545 but has on-off switch on microphone barrel and professional three-pin connector..... \$80

545L. Similar to Model 545 but has lavalier cord, clip, and permanently attached cable..... \$63

55S "Unidyne II" Microphone

Sensitivity -148 dB (EIA); response 50-15,000 Hz; user selects high or low impedance; cardioid pattern; hinge mount to stand; use for speech and music; supplied with Amphenol-type MC3M con-

necter and 15-ft cable..... \$77

55SW. Same as Model 55S except has built-in on-off switch \$77

578 "Omnidyne" Microphone

Sensitivity -154 dB (EIA); response 50-15,000 Hz; user selects high or low impedance; omnidirectional pattern; hand-held; use for speech and music; has on-off switch, a 15-ft cable, and connector; chrome finish..... \$72

578S. Similar to Model 578 except has swivel assembly with on/off switch..... \$80

579SB "Vocal Sphere" Microphone

Sensitivity -151 dB (EIA); response 50-15,000 Hz; low impedance; omnidirectional pattern; has slip-in stand attachment, on-off switch, pop or blast filter; use for speech, rock vocals, and music; supplied with 20-ft cable and connector; chrome finish \$61

585SA "Unisphere A" Microphone

Sensitivity -151 dB (EIA); response 50-13,000 Hz; user specifies high or low impedance; cardioid



pattern; hand-held with slip-in stand attachment; use for speech, rock vocals, and music; has pop or blast filter, on-off switch; supplied with 15-ft cable and connector; chrome finish..... \$61

585SAV. Similar to Model 585SA but has volume control on microphone barrel..... \$67

585SB. Same as 585SA but low impedance \$61

589S "Unidyne C" Microphone

Unidirectional dynamic type; response 90-13,000 Hz; 150 ohm impedance to match any input from 20-200 ohms, also high impedance; built-in on-off switch with lockplate; internal rubber vibration-isolator shockmount; 15-ft two-conductor shielded cable with 3-pin female connector on mike end; zinc die-cast housing with silver-metallic finish, stainless-steel grille; 7" x 1 7/16"; weight 12 oz less cable \$61

588SA "Unisphere B" Microphone

Sensitivity -155 dB (EIA); response 80-13,000 Hz; user specifies high or low impedance; cardioid pattern; hand-held with slip-in stand attachment; use for speech, rock vocals, and music; has pop or blast filter, on-off switch; comes with 15-ft cable and connector; chrome finish..... \$52

588SB. Same but low impedance..... \$52

Microphone Mixers

All models have independent volume controls and a master volume control which simultaneously controls the gain of all inputs; 2 3/4" H x 1 1/4" W x 5 1/4" D; weight 4 lb.

M68. Input connections are male professional three-pin audio connectors for 120 V ac $\pm 10\%$, 50/60 Hz..... \$211

M68FC. Input connections are female professional three-pin connectors for 120 V ac $\pm 10\%$, 50/60 Hz \$227

M68FCE. Similar to M68FC, but for both 105-130 V ac, 50/60 Hz and 210-260 V ac, 50/60 Hz with three conductor cable..... \$233

SONY

C-38B Condenser Microphone

Professional condenser microphone with switchable omni-directional or uni-directional characteristics; internal battery or phantom power; frequency response 30-16,000 Hz ± 2.5 dB; 250-ohm output impedance; S/N 70 dB, high-cut switch; pad switch; FET circuit; windscreen and shock mounting; fixed mike connector; 20 ft cable; comes with

carrying case; 3" diameter x 8 1/16" L \$460

C-37P. Similar except without pad switch and internal battery power; 1 7/8" diameter x 7 1/4" L \$410

F-660 Dynamic Microphone

Uni-directional dynamic microphone for vocal/orchestral recording; frequency response 100-10,000 Hz; 250-ohm output impedance; XLR-3 mike connector; 1 1/2" diameter x 6 1/2" L \$250

ECM-56F Electret Condenser Mike

Back electret condenser microphone; uni-directional; frequency response 20-20,000 Hz; 250-ohm output impedance; S/N 66 dB; low-cut switch; external power system or battery power; battery check lamp; 90 degree adjustable angle; rubber cushion in mounting reduces vibration; fixed mike connector; 20-ft cable; 2" diameter x 8 1/4" L \$220

ECM-65F Electret Condenser Mike

Hand-held professional electret condenser microphone for stage, broadcasting, or studio use; uni-directional; frequency response 70-20,000 Hz; 250-ohm output impedance; S/N 66 dB; double windscreen; phantom power system or battery power; XLR-3 mike connector; 20-ft cable; 1 1/2" diameter x 7" L..... \$210

ECM-64P. Similar except for out-door use; omnidirectional; frequency response 40-20,000 Hz \$210

STUDER/REVOX

3500 Dynamic Microphone

Dynamic unidirectional moving-coil type; cardioid pattern; response 40-18,000 Hz; impedance 600 ohms; comes with windscreen, clamp, table stand, and case; Cannon XLR connector; each unit supplied with own frequency-response curve \$130

SUPERSCOPE

EC-9P Cardioid Microphone

Professional cardioid electret condenser microphone; low-cut filter; standard Cannon XLR-12C output; internal battery operation or 10 dB pad; on/off switch; optional phantom powering \$100

TEAC

ME-120 Microphone

Electret microphone; cardioid or omnidirectional; two-position response switch, 40-18,000 Hz (cardioid), 30-16,000 Hz (omnidirectional); supplied with stand attachment, two wind-screens, and 15-ft cable..... \$120

ME-80. Same except response 50-16,000 Hz.. \$80

ME-50. Same except cardioid; unbalanced or balanced 10,000 or 200-ohms; response 50-14,000 Hz \$50

109-A Mike Input Transformer

Matches low-impedance makes to high-impedance inputs; will terminate low-impedance balanced signal to allow interfacing with most consumer tape recorders and mixes \$20

TECHNICS by PANASONIC

RP-3210E Cardioid Stereo Microphone

Electret-condenser cardioid stereo microphone; 600-ohm output impedance; -70 dB sensitivity; frequency response 50-12,000 Hz; "AA" batteries required; comes with stand, mike holder, 3/8-in adaptor, and 3-meter cable; 40 x 60 x 185 mm... \$70

RP-3500E Cardioid Microphone

Electret-condenser cardioid microphone; 600-ohm output impedance; -68 dB sensitivity; frequency response 50-12,000 Hz; requires "AA" battery; comes with stand, mike holder, 3/8-in adaptor, and 5-meter cable; 46 x 208 mm \$60

An ant in trouble screams for help. BASF's New Professional Series Cassettes can prove it.



Sensitive Sound.

Using an anechoic chamber, the finest sound equipment available, and the most sensitive tape ever made, we were able to record the sound of a desert ant in distress ... a call that sounds amazingly like a fire alarm.

More sensitivity for more music.

It is a startling demonstration of the sensitivity of our New Professional Series Cassettes. You get more headroom, greater dynamic range, a better signal-to-noise ratio and unheard of sensitivity. And that's why you hear music the way you have never heard it before on cassette.

Sounds of other worlds.

Visit your BASF dealer soon and ask him about the New Professional Series, including Professional I, our new ferric formulation, Professional II, our new second generation chrome formulation, and Professional III, our new ferrichrome formulation that is ideal for auto cassette players.

If you would like to discover the sounds of an ant in distress, an eye winking, a butterfly in flight, and other never-before-recorded sounds, send \$3.50 to BASF OTHER WORLDS, Box 18367, Boston, Mass. 02118.

We will send you a \$4.99 Professional II C-90 cassette with these sounds. This offer will be available while supplies last. Please allow 4 weeks for delivery.



BASF

Sensitive Sound. From The People Who Invented Magnetic Tape.

CIRCLE NO. 1 ON READER SERVICE CARD

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BLANK TAPE & ACCESSORIES

AMPEX

Grand Master II Series Cassettes

High bias; 70 μ sec equalization.

366-C60. 60 min.....	\$3.79
366-C90. 90 min.....	\$4.79

Grand Master I Series Cassettes

Normal bias; 120 μ sec equalization.

365-C60. 60 min.....	\$3.29
365-C90. 90 min.....	\$4.29

20/20+ Series Cassettes

364-C45. 45 min.....	\$2.19
364-C60. 60 min.....	\$2.49
364-C90. 90 min.....	\$3.49
364-C120. 120 min.....	\$4.99

Plus Series Cassettes

371-C45. 45 min.....	\$1.29
371-C60. 60 min.....	\$1.49
371-C90. 90 min.....	\$2.49
371-C120. 120 min.....	\$3.79

Chrome Series Cassettes

363-C60. 60 min.....	\$2.49
363-C90. 90 min.....	\$3.49

Low-Noise Series Cassettes

350-C45. 45 min.....	\$.79
350-C60. 60 min.....	\$.99
350-C90. 90 min.....	\$1.49
350-C120. 120 min.....	\$2.79

Grand Master Series Cartridges

389-45. 45 min.....	\$3.29
389-90. 90 min.....	\$3.99

20/20+ Series Cartridges

388-45. 45 min.....	\$2.79
388-90. 90 min.....	\$3.49

Plus Series Cartridges

382-45. 45 min.....	\$2.29
382-90. 90 min.....	\$2.79

Low-Noise Cartridges

381-45. 45 min.....	\$1.59
381-90. 90 min.....	\$1.99

Grand Master Series Open-Reel Tapes

356-1511J1. 1200-ft, 7-in reel, 1.5 mil..	\$7.99
357-1511J1. 1800-ft, 7-in reel, 1.0 mil..	\$9.49
356-1731J1. 2500-ft, 10 $\frac{1}{2}$ -in NAB reel, 1.5 mil.....	\$21.49
357-1731J1. 3600-ft, 10 $\frac{1}{2}$ -in NAB reel, 1.0 mil.....	\$24.99

20/20+ Series Open-Reel Tapes

372-151111. 1200-ft, 7-in reel, 1.5 mil..	\$6.39
373-151111. 1800-ft, 7-in reel, 1.0 mil..	\$7.69
373-173111. 3600-ft, 10 $\frac{1}{2}$ -in NAB reel, 1.0 mil.....	\$19.99

Plus Series Open-Reel Tapes

332-1511J1. 1200-ft, 7-in reel, 1.5 mil..	\$4.89
342-1511J1. 1800-ft, 7-in reel, 1.0 mil..	\$6.39

Accessories

E3220BL. Demagnetizer/head cleaner for cassette players/recorders.....	\$4.69
E3228BL. Demagnetizer/head cleaner for 8-track cartridge players/recorders.....	\$5.59
ST-1. Cassette storage unit.....	\$1.49

AUDIOMAGNETICS

High-Performance Cassettes

C-60. 60 min.....	\$1.99
C-90. 90 min.....	\$2.99

BASF

Professional I Series Cassettes

Ferric-oxide; normal bias.

60 min.....	\$3.29
90 min.....	\$4.79

Professional II Series Cassettes

Super-chrome; normal bias.

60 min.....	\$3.49
90 min.....	\$4.99

Professional III Series Cassettes

60 min.....	\$3.49
90 min.....	\$4.99

Chromium-Dioxide Cassettes

60 min.....	\$2.99
90 min.....	\$4.49
120 min.....	\$5.99

Studio Series Cassettes

60 min.....	\$2.99
90 min.....	\$4.49
120 min.....	\$5.99

Performance Series Cassettes

45 min.....	\$2.29
60 min.....	\$2.49
90 min.....	\$3.59
120 min.....	\$4.99

Studio Series Cartridges

45 min.....	\$3.29
64 min.....	\$3.59
90 min.....	\$3.99

Performance Series Cartridges

45 min.....	\$2.89
64 min.....	\$3.19
90 min.....	\$3.49

Professional Series Open-Reel Tapes

1800-ft, 7-in reel.....	\$14.99
3600-ft, 10 $\frac{1}{2}$ -in reel.....	\$29.99

Studio Series Open-Reel Tapes

1800-ft, 7-in reel.....	\$9.99
2400-ft, 7-in reel.....	\$14.99
3600-ft, 10 $\frac{1}{2}$ -in reel.....	\$19.99

Performance Series Open-Reel Tapes

1800-ft, 7-in reel.....	\$7.49
2400-ft, 7-in reel.....	\$9.99

3600-ft, 7-in reel.....	\$15.99
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Accessories

8-Track headcleaner.....	\$1.99
Cassette headcleaner.....	\$1.79
7-in plastic storage box.....	\$2.69
7-in plastic reel.....	\$1.59

CAPITOL

Capitol 1 Cassettes

C-45. 45 min.....	\$0.89
C-60. 60 min.....	\$0.99
C-90. 90 min.....	\$1.49
C120. 120 min.....	\$1.99
C-60. Three pack.....	\$2.39
Cassette head cleaner.....	\$0.99

"The Music Tape" Cassettes

High-output low-noise with "cushion-aire" backing.

C-45. 45 min.....	\$1.79
C-60. 60 min.....	\$2.19
C-90. 90 min.....	\$3.29

Chromium-Dioxide Cassettes

C-60. 60 min.....	\$2.79
C-90. 90 min.....	\$4.09

Capitol 1 8-Track Cartridges

45 min.....	\$1.79
60 min.....	\$1.99
90 min.....	\$2.19
Four pack 45 min.....	\$4.99
Four pack 60 min.....	\$5.49
Four pack 90 min.....	\$5.99
Cartridge head cleaner.....	\$1.09

"The Music Tape" Cartridges

High-output low-noise.

8T-45. 45 min.....	\$2.29
8T-60. 60 min.....	\$2.49
8T-90. 90 min.....	\$2.69

COLUMBIA

Cassette Tapes

Each side color-coded for easy identification; high-output/low-noise gamma-ferric oxide; response 20-20,000 Hz; tensitized polyester base; Delrin rollers; constant-tension pressure pad for consistent tape-to-head contact; mounted in three-sided Mu-metal shield to prevent pickup of hum and noise; two re-recording labels included.

2CB-80040. 40 min.....	\$1.99
2CB-80060. 60 min.....	\$2.29
2CB-80090. 90 min.....	\$3.49
2CB-80012. 120 min.....	\$4.49
2CB-800HC. Head cleaner.....	\$1.49

8-Track Tapes with "ConvertaQuad"

Back-lubricated high-output/low-noise gamma-ferric oxide tape; response 20-20,000 Hz; three-point Delrin tape suspension; silicone/rubber pinch roller; foam pressure pad; one-piece hub; features "ConvertaQuad" slug.

8CB-80740. 40 min.....	\$2.29
8CB-80750. 50 min.....	\$2.59

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BLANK TAPE

8CB-80780. 80 min.....	\$2.99
8CB-80710. 100 min.....	\$3.49
8CB-807HC. Head cleaner.....	\$1.49

FUJI

FX-I Audiophile Cassette Series

Pure Ferris; normal bias; 120 μ sec equalization.

C46FX-I. 46 min.....	\$3.25
C60FX-I. 60 min.....	\$3.75
C90FX-I. 90 min.....	\$5.10

FX-II Audiophile Cassette Series

Beridox; high bias; 70 μ sec equalization.

C46FX-II. 46 min.....	\$3.25
C60FX-II. 60 min.....	\$3.75
C90FX-II. 90 min.....	\$5.10

FL Low-Noise Cassettes

C60FL. 60 min.....	\$2.50
C90FL. 90 min.....	\$3.60
C120FL. 120 min.....	\$5.00

8-Track Cartridges

8T-45.....	\$3.20
8T-90.....	\$4.15

FB-151 Audiophile Open-Reel Tapes

Ultra-low-noise, high-output, back-coated master recording tape; for use on tape recorders equipped with bias selector.

1200-ft, 7-in reel.....	\$8.50
1800-ft, 7-in reel.....	\$11.00
3600-ft, 10 $\frac{1}{2}$ -in metal reel.....	\$30.00

FG High Fidelity Open-Reel Tapes

$\frac{1}{2}$ -inch, 1.0-mil mastering tapes.

1200-ft, 7-in reel.....	\$5.95
1800-ft, 7-in reel.....	\$7.95
3600-ft, 10 $\frac{1}{2}$ -in metal reel.....	\$22.50

FM Open-Reel Tapes

Low noise/high output; 1.0 mil; $\frac{1}{2}$ -in tapes.

900-ft, 5-in reel.....	\$5.00
1200-ft, 7-in reel.....	\$5.65
1800-ft, 7-in reel.....	\$6.45

FB-101 Professional Tape

Backcoated high-speed mastering tape; $\frac{1}{2}$ -in, 1.5 mil.

2400-ft, 10 $\frac{1}{2}$ -in reel.....	\$24.00
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IRISH

Professional-Series Cassettes

In album/mailler.

261-C45. 45 min.....	\$1.95
261-C60. 60 min.....	\$2.15
261-C90. 90 min.....	\$2.95
261-C120. 120 min.....	\$4.10

In flip-top plastic box.

2000-C30. 30 min.....	\$1.40
2000-C60. 60 min.....	\$1.60
2000-C90. 90 min.....	\$2.05

In flip-top plastic box and polybag.

2000-C60B. 60 min.....	\$1.75
2000-C90B. 90 min.....	\$2.20

Low-Noise, Extended-Range Cassettes

Flip-top plastic box.

262-C60. 60 min.....	\$2.95
262-C90. 90 min.....	\$3.70

Chromium-Dioxide Cassettes

Flip-top plastic box.

263-C60. 60 min.....	\$5.30
263-C90. 90 min.....	\$7.85

Cassettes in Polybag

Three C60.....	\$2.95
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Two C90.....	\$2.95
Three C90.....	\$3.49

8-Track Cartridges

8T45. 45 min.....	\$2.05
8T90. 90 min.....	\$2.35

270 Series Tape

Low-noise, high-output, back coated.

276-151. 1200-ft, 7-in reel.....	\$11.70
276-173. 2500-ft, 10 $\frac{1}{2}$ -in NAB aluminum reel.....	\$30.35
276-273. 2500-ft, 10 $\frac{1}{2}$ -in NAB aluminum reel.....	\$51.20
277-151. 1800-ft, 7-in reel.....	\$15.55
277-173. 3600-ft, 10 $\frac{1}{2}$ -in NAB aluminum reel.....	\$40.60

200 Series Professional Tape

Standard, $\frac{1}{2}$ -mil, polyester base, $\frac{1}{4}$ -in.

231-131. 600-ft., 5-in reel.....	\$4.75
231-151. 1200-ft., 7-in reel.....	\$7.10

Extra-length, 1-mil, polyester base, $\frac{1}{4}$ -in.

241-131. 900-ft., 5-in reel.....	\$5.30
241-151. 1800-ft., 7-in reel.....	\$8.90

Double-length, $\frac{1}{2}$ -mil, polyester tensilized base.

251-151. 2400-ft., 7-in reel.....	\$15.50
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0.5-mil, polyester tensilized base, $\frac{1}{4}$ -in.

261-151. 3600-ft., 7-in reel.....	\$15.90
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LAFAYETTE

Criterion XHE Series Cassettes

Low-noise, (XHE) extra high energy, high output; wide dynamic range with high-frequency response of 30-20,000 Hz; gamma ferric-oxide formulation; hard clear plastic storage box.

C-60. 60 min.....	\$2.29
C-90. 80 min.....	\$3.29
C-120. 120 min.....	\$3.99

Criterion Cassettes

C-60. 60 min.....	\$1.69
C-90. 80 min.....	\$2.19
C-120. 120 min.....	\$2.69

Low-Noise Cassettes

C-60. 60 min.....	\$1.19
C-90. 80 min.....	\$1.69
C-120. 120 min.....	\$2.19

Criterion XHE 8-Track Cartridges

45 min.....	\$2.69
90 min.....	\$3.39

Low-Noise 8-Track Cartridges

45 min.....	\$1.99
90 min.....	\$2.49

Criterion XHE Open-Reel Tapes

On plastic reels; for recorders with switchable bias and equalization.

1200-ft, 7-in reel, 1.5 mil.....	\$5.99
1800-ft, 7-in reel, 1.0 mil.....	\$7.29

MAXELL

UD-XL Epitaxial Cassettes

Normal bias; 120 μ sec equalization.

C-60. 60 min.....	\$5.00
C-90. 90 min.....	\$6.95

UD-XL-II Epitaxial Cassettes

Chrome type; high-level bias; 70 μ sec equalization.

C-60. 60 min.....	\$5.00
C-90. 90 min.....	\$6.95

Ultra-Dynamic Cassettes

Normal bias.

UDC-46. 46 min.....	\$3.50
UDC-60. 60 min.....	\$3.80
UDC-90. 90 min.....	\$5.70
UDC-120. 120 min.....	\$7.50

Low-Noise Cassettes

Normal bias.

LNC-46. 46 min.....	\$2.30
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LNC-60. 60 min.....	\$2.55
LNC-90. 90 min.....	\$3.90
LNC-120. 120 min.....	\$5.20

Ultra-Dynamic 8-Track

Normal bias.

UD8T-46. 46 min.....	\$4.50
UD8T-90. 90 min.....	\$5.50

8-Track Cartridges

Normal bias.

LN8T-46. 46 min.....	\$3.35
LN8T-60. 60 min.....	\$3.70
LN8T-90. 90 min.....	\$4.15

Low-Noise Tape

1. 5-mil polyester, (normal bias).

LNE-50-60. 1200-ft, 7-in reel.....	\$7.75
LNE-50-120. 2500-ft, 10 $\frac{1}{2}$ -in reel.....	\$21.50

1-mil polyester

LNE-35-90. 1800-ft, 7-in reel.....	\$9.00
LNE-38-180. 3600-ft, 10 $\frac{1}{2}$ -in reel.....	\$24.50

0.5-mil polyester

LNE-25-120. 2400-ft, 7-in reel.....	\$13.75
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0.5-mil polyester

LNE-18-180. 3600-ft, 7-in reel.....	\$18.95
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Back-Coated Extended-Range

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

1. 5-mil polyester

UD-XL 50-60B. 1200-ft, 7-in reel.....	\$10.95
UD-XL 50-120B. 2500-ft, 10 $\frac{1}{2}$ -in reel.....	\$30.00

1-mil polyester

UD-XL 35-90B. 1800-ft, 7-in reel.....	\$12.50
UD-XL 35-180B. 3600-ft, 10 $\frac{1}{2}$ -in reel.....	\$34.00

Extended-Range Tape

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

1. 5-mil polyester

UD50-60. 1200-ft, 7-in reel.....	\$9.00
UD50-120. 2500-ft, 10 $\frac{1}{2}$ -in reel.....	\$25.50

1-mil polyester

UD35-90. 1800-ft, 7-in reel.....	\$10.50
UD35-180. 3600-ft, 10 $\frac{1}{2}$ -in reel.....	\$28.50

MEMOREX

Chromium-Dioxide Cassettes

C-45. 45 min.....	\$2.99
C-60. 60 min.....	\$3.19
C-90. 90 min.....	\$4.69

MRX, Cassettes

C-30. 30 min.....	\$2.29
C-45. 45 min.....	\$2.49
C-60. 60 min.....	\$2.69
C-90. 90 min.....	\$3.99
C-120. 120 min.....	\$5.39

8-Track Cartridges

45 min.....	\$2.99
60 min.....	\$3.29
90 min.....	\$3.59

"Quantum" Open-Reel Tape

90. 1800-ft, 7-in reel.....	\$8.59
120. 2400-ft, 7-in reel.....	\$11.39
180. 3600-ft, 10 $\frac{1}{2}$ -in reel.....	\$21.49

Low-Noise, High-Output Tape

Standard play, 1.5-mil polyester, $\frac{1}{4}$ -in.

1200-ft, 7-in reel.....	\$5.49
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Long-play, 1-mil polyester, $\frac{1}{4}$ -in.

1800-ft, 7-in reel.....	\$6.59
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Double-play, tensilized polyester, $\frac{1}{4}$ -in.

2400-ft, 7-in reel.....	\$8.99
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Accessories

Tape recorder care kit.....	\$8.99
8-track capstan cleaner.....	\$3.19
Cassette cleaning kit.....	\$2.79
8-track head cleaner.....	\$1.99
Cassette head cleaner.....	\$1.99

MERITON

Ferri-Chrome Cassette

Upgrade Your Hi Fi. Fuji-Fi.



The specifications of your cassette deck may look outstanding. But its actual performance — the quality of your music reproduction — can only be as good as the tape you use. To ensure optimum performance, all of the time, you need Fuji cassettes.

Consistency. Cassette tape performance can vary with each cassette tape. Consistent performance, however, can only be guaranteed by a company which produces all the elements that go into their tape. A company like Fuji. We make our own base film and our own binder material. We produce our own oxide and do our own coating. Stringent quality control, including factory testing of each cassette, further assures you of total reliability and highest fidelity, always.

Versatility. The new Fuji FX-I 120 μ s normal-bias formulation is ideal for use with home, portable and car decks; because Fuji FX-I is completely compatible with every normal-bias machine.

Bias Acceptability. To ensure perfect compatibility between your machine's factory-set bias and your tape, you need a tape with a wide range of bias acceptability. Like the new Fuji FX-II 70 μ s Beridox cassette. Its bias latitude is much greater than most other high-bias formulations.

Wow and Flutter. The friction created by conventional cassette housings may adversely affect the wow and flutter performance of your cassette machine. So Fuji designed a new housing for the FX-I and FX-II tapes. With unique teflon coated wafered slip sheets, convex guide rollers (for more accurate tracking) and improved pressure pad, the new Fuji housing substantially reduces friction.

So to get the best possible performance from your cassette machine, to make your music sound clean, clear and crisp, visit your Fuji dealer today. Tell him you want to upgrade your hi-fi. Tell him you're ready to Fuji-Fi.

MAGNETIC TAPE DIVISION/FUJI PHOTO FILM U.S.A., INC.
Empire State Building/New York, N.Y. 10001
CIRCLE NO. 25 ON READER SERVICE CARD

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FeCr C-60. 62 min. \$3.79

Chromium-Dioxide Cassette

CrO₂ C-60. 62 min. \$3.19

Low-Noise, High-Output Cassettes

LH C-60. 62 min. \$2.49
LH C-90. 92 min. \$3.59

Low-Noise Cassettes

LN C-60. 62 min. \$1.49
LN C-90. 92 min. \$2.29
LN C-120. 122 min. \$3.49

NAKAMICHI

SX Cassette Tapes

Single-coated; ionized cobalt and ferric oxide formulation; high coercivity permits use of CrO₂ bias and equalization (70 μs) for 4-5 dB better S/N.

C60 \$5.50
C90 \$7.20

EX II Cassette Tapes

Single-coated; ferricobalt formulation; same bias and equalization (120 μs) as EX tape; extra-low noise, high output.

C60 \$5.20
C90 \$7.00

EX Cassette Tapes

Specially formulated ferrocystal tape for improved frequency response, S/N ratio, and dynamic range; special binder for even particle distribution and reduced head wear.

C60 \$4.50
C90 \$5.80

SCOTCH

Master I Cassettes

Features premium grade, low-noise ferric oxide; for use with recorders in the normal or 120 μsec equalization position; album or "C-box" (40 cents additional) packaging; improved shell for critical mechanical permanence and three-head recorder equipment.

45 min \$2.99
60 min \$3.29
90 min \$4.29

Master II Cassettes

Features chrome equivalent modified ferric oxide for use with recorders operating in the CrO₂ or 70 μsec equalization position; improved cassette shell for critical mechanical performance and three-head recorder equipment; 3-dB S/N improvement over current CrO₂ cassettes; album or "C-Box" packaging (40 cents additional for "C-box" packaging).

45 min (album only) \$3.69
60 min \$3.99
90 min \$4.99

Master III Cassettes

Features improved FeCr dual-layer construction which provides 3-dB improvement in output at low frequencies, 2-dB boost at high frequencies over existing tapes; improved cassette shell for critical mechanical performance and three-head recording equipment; album or "C-Box" packaging (40 cents additional for "C-Box" packaging).

45 min (album only) \$3.69
60 min \$3.99
90 min \$4.99

Dynarange Cassettes

High-output, low-noise ferric oxide cassette featuring full dynamic range throughout the audible sound spectrum; special back treatment for improved mechanical performance; album package.

45 min \$2.29

60 min \$2.59
90 min \$3.69
120 min \$5.19

Highlander Cassettes

Low-noise oxide formulation for all-purpose cassette use; polyester base.

45 min \$1.39
60 min \$1.59
90 min \$2.39
120 min \$3.79

Master 8-Track Cartridges

Features high-output low-noise ferric-oxide coating for high-frequency sensitivity of 6 dB higher, S/N at low frequencies 6 dB higher than standard cartridges; fully compatible, oxide coating heavy-duty lubricated polyester backing.

M-8TR-45. 45 min \$3.99
M-8TR-90. 90 min \$4.69

Dynarange 8-Track Cartridges

Features low-noise ferric oxide; fidelity uniform throughout audible frequency range; heavy-duty binder; lubricant system; precise tape-to-head alignment.

S-8TR-45. 45 min \$2.99
S-8TR-90. 90 min \$3.69

Master Open-Reel Tapes

Features mastering quality tape for critical music applications.

M7R-1800. 7-in reel, 60 min at 7 1/2 ips, 1.5 mil \$9.95
M7R-2400. 7-in reel, 90 min at 7 1/2 ips, 1.0 mil \$12.95
M10R-3600. 10 1/2-in reel, 120 min at 7 1/2 ips, 1.5 mil \$24.70

206-207 Open-Reel Tapes

Polyester base, "Posi-Trak" backing, leader, and trailer.

206. 7-in reel, 60 min at 7 1/2 ips, 1.5 mil \$6.59
207. 7-in reel, 90 min at 7 1/2 ips, 1.0 mil \$8.19

Dynarange Open-Reel Tapes

Provides high-fidelity recording even at 3 3/4 ips; multi-purpose tape providing full dynamic range throughout audible spectrum; S/N is 4 to 6 dB better than standard tapes.

211. Polyester backing, white yellow trailers, 5-in reel, 30 min at 7 1/2 ips, 1.5 mil \$3.29
7-in reel, 60 min \$4.89
212. 5-in reel, 45 min at 7 1/2 ips, 1.0 mil \$3.79
90 min, 7-in reel \$6.59
213. 7-in reel, 120 min at 7 1/2 ips, 0.5 mil tensilized \$9.89
214. 5-in reel, 90 min at 7 1/2 ips, 0.5 mil tensilized \$6.59
180 min, 7-in reel \$13.19

Highlander Open-Reel Tapes

All-purpose economy tape for vocals.

228. 7-in reel, 60 min at 7 1/2 ips, 1.5 mil \$4.39
229. 7-in reel, 90 min at 7 1/2 ips, 1.0 mil \$5.99

SONY

Elcasetts

Type-I; SLH tape.

LC-60. 60 min \$7.49
LC-90. 90 min \$9.99

Type-II; FeCr tape.

LC-60. 60 min \$9.99
LC-90. 90 min \$11.99

Ferri-Chrome Cassettes

Normal or FeCr bias; FeCr equalization.

C-46. 46 min \$3.99
C-60. 60 min \$4.49
C-90. 90 min \$5.59

Chrome Cassettes

High or CrO₂ bias; CrO₂ or 70 μsec equalization.

C-60. 60 min \$3.49
C-90. 90 min \$4.79

Hi-Fidelity Cassettes

Normal bias; normal or 120 μsec equalization.

C-46. 46 min \$2.49
C-60. 60 min \$2.79
C-90. 90 min \$3.79
C-120. 120 min \$4.99

Low-Noise Cassettes

Normal bias; normal or 120 μsec equalization.

C-30. 30 min \$1.59
C-60. 60 min \$1.89
C-90. 90 min \$2.69
C-120. 120 min \$3.79

SONY from SUPERSCOPE

Professional Recording Tape

Extra-heavy formula Oxi-coat homogenized oxide coating; polyester back; "lubri-cushion" impregnated lubricant.

PR-150-3. 300-ft, 3 1/4-in reel, 1.0 mil \$1.99
PR-150-9. 900-ft, 5-in reel, 1.0 mil \$3.49
PR-150-18. 1800-ft, 7-in reel, 1.0 mil \$6.49
PR-150-36. 3600-ft, 10 1/2-in reel, 1.0 mil \$17.95

Low-Noise, High-Output Tape

On 1.0 mil polyester base.

SLH-180-18. 1800-ft, 7-in reel \$7.99
SLH-180-36. 3600-ft, 10 1/2-in reel \$22.95

TDK

"Super Avilyn" Cassettes

Features new magnetic particle (Avilyn); high S/N; low distortion; uses CrO₂ bias and equalization.

SA-C60. 60 min \$3.49
SA-C90. 90 min \$4.99

"Audua" Cassettes

Normal bias tape with superior performance; added high-end brilliance; broad dynamic range; high output; minimum noise; uses high or normal bias and equalization settings.

AD-C60. 60 min \$2.69
AD-C90. 90 min \$3.99

"Dynamic" Cassettes

Features dynamic performance and durable mechanics; polyester back.

D-C30. 30 min \$1.49
D-C45. 45 min \$1.69
D-C60. 60 min \$1.89
D-C90. 90 min \$2.59
D-C120. 120 min \$3.29
D-C180. 180 min \$4.79

"Endless" Cassettes

Endless-loop design with safety features to prevent accidental reversal; usable in conventional cassette machines; polyester backing; packed in plastic boxes.

EC-20S. 20 sec \$3.99
EC-30S. 30 sec \$3.99
EC-1. 1 min \$3.99
EC-3. 3 min \$4.19
EC-6. 6 min \$4.59
EC-12. 12 min \$5.49

"Audua" 8-Track Cartridges

Full-fidelity 8-track cartridges with gamma ferric oxide; frequency response 20-23,000 Hz; high saturation and output level (MOL); has broad dynamic range; high S/N; minimum distortion.

8TR-45AD. 45 min \$3.49
8TR-90AD. 90 min \$4.49

Dynamic 8-Track Cartridges

Full-fidelity 8-track cartridges.

8TR-45D. 45 min \$2.79
8TR-90D. 90 min \$3.49

"Audua-L" Open-Reel Tape

High-density ferric-oxide coating for high output, low noise, stability, and durability.

L-1200. 1200-ft, 7-in low-torque reel \$6.49
L-1800. 1800-ft, 7-in reel \$7.99

- L-3600P. Plastic reel..... \$18.95
- L-3600M. Metal reel..... \$22.95

"Audua-LB" Open-Reel Tape

Back-treated open-reel tape; high bias/equalization.

- LB-1800. 1800-ft, 7-in plastic reel..... \$9.89
- LB-3600. 3600-ft, 10 1/2-in NAB metal reel..... \$26.95

S Open-Reel Tape

Open-reel tape with reproduction characteristics of SD cassettes.

- S-1200..... \$5.89
- S-1800..... \$6.59
- S-3600P. Plastic reel..... \$15.95
- S-3600M. Metal reel..... \$19.95

HC-1 Head Cleaner

Cassette tape machine head cleaner \$1.49



ADC PROFESSIONAL PRODUCTS

Sound Shaper Two Frequency Equalizer

Stereo frequency equalizer; 24 operative bands each with center detent-position; each stereo channel is controlled in 12 frequency ranges ± 12 dB; frequency response 5-100,000 Hz ± 1 dB; control frequencies 30, 50, 90, 160, 300, 500, 900, 1600, 3000, 5000, 9000, 16,000 Hz; HD 0.02% at 1 V output (20-20 kHz); IM 0.02% at 1 V output; inputs: two main and two tape, monitor; outputs: two main and two tape out; controls: power, line-record, monitor, eq-bypass, meter; 6 1/2" H x 16 3/4" W x 6 1/4" D..... \$249.95

Sound Shaper One Frequency Equalizer

Stereo frequency equalizer has five frequency ranges from 60-10,000 Hz, each with separate linear sliding controls; controls are marked in 3 dB increments totalling ± 12 dB; frequency response (flat) 5-100,000 Hz; control frequencies 60, 240, 1000, 3500, 10,000 Hz; HD 0.02% at 2 V output (20-20 kHz); IM 0.02% at 2 V output; inputs: two main and two tape monitor; outputs: two main and two tape out; controls: power switch, tape monitor; 5 9/16" x 10 1/32" x 6 1/16"..... \$119.95

ASPEN

The company carries a complete line of tape accessories for use with open-reel, cassette and 8-track equipment.

- Head Cleaner Kit..... \$2.95
- Wipe Heads (25 per package)..... \$9.95

Decktaster

8-track cartridge for home and auto use to check 8-track tape decks for tape speed-time, speaker rattle, speaker phasing, wow and flutter, head alignment, crosstalk, channel switching, and worn heads \$8.95

AUDIO PULSE

Model One Digital Time-Delay System

Ambience simulator using multiple recycling of signal through a digital delay line; initial delays 8 to 94 msec (four chosen in combination for recycling); decay time 0.2 sec to 1.2 sec (switched); echo density 20 msec max (10 msec typical); frequency response 20-40,000 Hz $\pm 1/2$ dB (direct), 20-8,000 Hz ± 3 dB (delayed); output noise 75 dB (direct), 65 dB (delayed); THD 0.05% (direct), 1% (delayed)..... \$650.00

AUDIOTEX

The company carries a complete line of tape accessories for use with open-reel, cassette, and 8-track

equipment.

- 30-126. Kleentape for open-reel recorder heads..... \$3.55
- 30-129. Tape Care Kit, Jr. contains head cleaner, cotton swabs, and cleaning cloth..... \$2.70
- 30-830. "Blast-off" tape head cleaner, 3-oz aerosol can..... \$2.00
- 30-128. Same except in 6-oz aerosol can..... \$2.80
- 30-124-1. Recording head cleaner, 2-oz bottle..... \$1.70
- 30-124-2. Recording head lubricant, 2-oz bottle..... \$1.70
- 30-636. Tape player care kit contains cleaner and head lubricant, two 6-in brushes, 10 plastic pouches to protect tape reels, cassettes, or cartridges..... \$4.15

BURWEN

DNF 1201A Dynamic Noise Filter

Processes any two-channel or matrix encoded material from turntable, tape deck, cassette deck, receiver or tuner; pushbutton controls select proper noise reduction; sensitivity control with LED read-outs; frequency response (min. bandwidth) -3 dB at 500 Hz, -10 dB at 1 kHz, -20 dB at 2.5 kHz; (max. bandwidth) ± 0.5 dB max. 10 Hz to 20 kHz, -3 dB at 30 kHz, -25 dB at 100 kHz; attenuation rate 9 dB/octave; noise reduction levels up to 30 dB above 5 kHz, 14 dB above 400 Hz; HD 0.2% max.; 0.0 dB gain at 1 kHz adjustable to 10 dB; internal noise 100 μ V rms 20 Hz to 20 kHz; has 8 phono jacks and tape deck connectors; 2 7/8" H x 17 1/2" L x 8 1/4" D..... \$379.00

CERWIN-VEGA

GE-2 Stereo Graphic Equalizer

Covers 13 frequency bands (from 31.5 Hz to 16,000 Hz) ± 12 dB; response 20-20,000 Hz ± 1 dB with equalizer controls at center detent; rated output 2 V rms (2000 ohms or greater load impedance); control accuracy within 1 dB of calibrations; hum and noise less than 100 mV equivalent input noise; distortion (harmonic or IM) less than 0.05%; inputs: two each source and tape input, line; tape output (phono jack); half-octave control below middle C, octave control above; 5 1/2" H x 19" W (rack mount) x 17 1/4" D (incl. knobs)..... \$470.00

dbx

118 Dynamic Range Enhancer

A compressor/expander that permits listener to restore up to 20 dB of the dynamic range missing from records, tapes, or FM broadcasts; as a classical compressor/expander, allows the recordist to make full dynamic range tapes on moderately priced recorders and obtain 20 dB or more improvement (S + N)/N; has peak limiting/unlimiting above user-selected threshold; LED indicator light.... \$199.00

120 Series Noise Reduction Systems

Provides 30 dB noise reduction and 10 dB additional headroom when recording with open-reel, cartridge, or cassette recorders; eliminates tape hiss and noise in live recording; prevents additional noise build-up in tape duplicating or recording off-the-air; also decodes dbx encoded discs.

- Model 122. Two-channel switchable record or play..... \$275.00
- Model 124. Four-channel switchable record or play..... \$399.00
- Model 128. Two-channel linear and above threshold expander/compressor..... \$450.00

155 Noise Reduction System

Professional format, 4-channel tape noise reduction system giving 30 dB of tape noise reduction at all levels over the entire audio spectrum with an additional 10 dB recording level; true rms detection for accurate encode/decode tracking; linear decibel compression/expansion over 100 dB range; no pilot tones or level match adjustments necessary; front-panel record and play level adjust; user changeable

modular circuit boards for each channel (spares available)..... \$457.00

DUBIE

CD-5 Recording Control System

Combines mixing, fading facilities to integrate up to three recorders; frequency response dc to 100 kHz on all functions; input and output impedance for use with most amp/recorder combinations; max. input signal 10 V at 1 kHz; recorder control: four-position rotary control with off/amp in/out positions for each recorder for signal routing; monitor control: five position, select control, off/record, #1, #2, #3/mix; fade control: two separately controllable stereo inputs; no patchcords required; 4" H x 9 1/4" W x 4 1/2" D..... \$79.95

EAGLE RESEARCH

SC48W Cassette Storage Cabinet

Simulated walnut cabinet stores 48 cassette tapes; sliding doors for easy access; programmer included for identification; 17 1/4" x 10 1/4" x 6 1/2"..... \$50.00

XT36W. Similar except holds 36 8-track tapes..... \$51.00

SC30M Cassette Storage Unit

Modular storage for up to 30 cassettes; self-standing; white with black keys, smoked finish with white keys, or brown with beige keys; 10 1/2" x 5 1/2" x 8 3/4"..... \$20.00

XT24 8-Track Storage Unit

Stores 24 8-track tapes in brown plastic cabinet with beige pushbuttons; 13 1/4" x 11 3/4" x 6 1/4"..... \$19.00

XT20. Similar except stores 20 8-track tapes; 10 7/8" x 11 1/4" x 6"..... \$17.50

SC12A Auto Cassette Storage Unit

Stores 12 cassettes in compact cabinet; fits in mount holder that adjusts to auto; fully portable with programmer in drop door lid; push-button selection..... \$15.00

SC12D Cassette Storage Unit

Stores 12 cassettes in compact desk-top cabinet; programmer in drop-down lid; available in brown; 7 3/8" x 5 9/16" x 4 3/4"..... \$12.50

SC12B Cassette Storage Unit

Cassette storage unit has the look of a book; easy-opening door has index space on inside panel; push-button selection; stores 12 tapes; 5 1/8" x 4 1/2" x 8 3/4"..... \$12.50

SC8B. Similar except stores eight tapes; 5 1/8" x 3 1/2" x 8 3/4"..... \$10.00

SP10 "Swinger" 8-Track Storage Unit

Stores ten 8-track cartridges in portable unit with woodgrained handle and sides; push-button selection system..... \$12.00

EDITALL

KP-2 Editing Kit

Complete kit includes plastic splicing block, 30 CX-1 EDItabs; for 1/4-in audio tape..... \$4.50

KS-2 Editing Kit

For 1/2-in tape, includes a 4" x 3/4" x 1 1/2" block, 30 CX-1 EDItabs..... \$12.00

KS-3 Editing Kit

Same as KS-2 except includes larger block (5 3/4" x 1" x 3/8") with countersunk mounting holes. \$14.00

KS-1 Editing Kit

For cassettes, 0.150 mil audio tape; S-1 aluminum splicing block (5 3/4" x 1" x 3/8"); 30 CX-3 EDItabs..... \$14.00

HEATH

AD-1304 Active Audio Processor Kit

7

ACCESSORIES

Adds a total of 17 dB dynamic range to program sources; 7 dB dynamic range expansion; 10 dB noise reduction; input impedance 100k ohms; max. input 5 V; output impedance 500 ohms... \$199.95

AD-1305 Stereo Equalizer Kit

Five-band, two-channel graphic equalizer kit; matches Heath AP-1615 preamp; HD and IM less than 0.05%; hum and noise 90 dB below rated output; slide control switches for tone flat, tape monitor, 4 $\frac{1}{32}$ " H x 17 $\frac{1}{32}$ " W x 8" D..... \$119.95

KLARK-TEKNIK

DN22 Equalizer

Eleven-band stereo graphic equalizer; separate high- and low-pass filters for each channel; harmonic dist. less than 0.05%; frequency response 20-20,000 Hz; S/N 90 dB; up to 6-dB gain..... \$799.00

DN27 Equalizer

One-third octave graphic equalizer; harmonic dist. less than 0.05%; frequency response 20-20,000 Hz; S/N 90 dB; 27 controls centered on ISO frequencies; up to 6-dB gain \$749.00

LE-BO

The company offers a complete line of tape care products for cassettes and 8-track cartridges.

- TA-99. Cassette maintainer \$4.95
- TA-111. Cartridge maintainer..... \$4.95
- TA-24. Auto tape maintenance kit \$3.50
- TA-87. Cartridge cleaner \$2.95
- TA-90. 8-Track maintenance kit..... \$2.95
- TA-92. 8-Track test cartridge \$2.95
- TA-89. Cassette maintenance kit..... \$2.95
- TA-22. Tape head cleaner and lubricant kit... \$2.50
- TA-38. Cassette head cleaner..... \$1.95
- TA-26. 8-Track head and capstan cleaner..... \$1.95
- TA-32. $\frac{1}{2}$ -in splicing tape..... \$0.79
- TA-30. $\frac{1}{4}$ -in 8-Track/open-reel splicing tape... \$0.59
- TA-31. $\frac{1}{2}$ -in cassette splicing tape \$0.59

Company also manufactures an extensive line of cassette and 8-track carrying cases and storage units.

MURA

Muradapter

Converts cassette into 8-track cartridge; cassette loads directly into unit, which then functions as regular 8-track cartridge; includes fast-forward..... \$59.95

MXR

Stereo Graphic Equalizer

Dynamic range 110 dB; control range ± 12 dB; gain: unity ± 1 dB (controls centered); max. output level: +15 dBm (600 ohms), +22 dBm (unloaded); input impedance 47k; equivalent input noise -95 dBm; frequency response 20-20,000 Hz ± 1 dB at 0 dBm; THD 0.05% at 0 dBm (20-20,000 Hz); IM 0.05% at 0 dBm (60/7000 Hz 4:1); center frequencies (per channel) 31, 62, 125, 250, 500, 1000, 2000, 4000, 8000, and 16,000 Hz; eight rear-panel phono jacks; two inputs, two low-impedance outputs, two tape-record outputs, two tape-monitor inputs; two switches control tape monitor function and equalizer bypass \$199.95

Compander

Can be used with open-reel and cassette decks; dynamic range 100 dB; max. signal level +12 dBV (compress in, expand out); output impedance will drive 600 ohms or higher; 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% (200 Hz-20 kHz) 0.75% at 0 dBV (50-200 Hz); IM 0.75% at 0 dBV (60 Hz/7 kHz, 4:1); level match range +6 dB to infinity; compatible with dbx encoded material; bypass switch for cutting unit out of system; black anodized aluminum housing with walnut side panels \$129.95

NAGY

TS250 Shearing Tape Splicer

Semi-automatic $\frac{1}{4}$ -in magnetic tape splicer; cuts by shearing positions and cuts measured amount of $\frac{1}{32}$ -in splicing tape and simultaneously cuts magnetic tape; self-sharpening shears; adjustable; supplied with mount holes and rubber base; aluminum block $\frac{1}{4}$ " x $1\frac{1}{2}$ " x $3\frac{1}{4}$ " \$54.95
TS150. Same but for cassette tape \$59.95
TS500. Same but for $\frac{1}{2}$ -in tape \$69.95

H-50-S Shearing Tape Splicer

Designed to splice $\frac{1}{2}$ -in magnetic tape; cuts by shearing; Teflon-coated flat springs insure proper tape positioning; non-slip rubber base and counter-sunk mounting holes; aluminum block $\frac{1}{2}$ " x $1\frac{1}{2}$ " x $3\frac{1}{4}$ " \$27.95

NAKAMICHI

MX-100 Microphone Mixer

Provides left, right and blend inputs, and two outputs; 10,000-ohm input for low to medium impedance microphones; sensitivity 0.2 mV; overload 1 V (+74 dB); less than 0.05% THD up to 10 kHz; requires PS-100 power supply; 2 $\frac{1}{2}$ " H x 7 $\frac{1}{2}$ " W x 4" D \$85.00

LA-100 Line Amplifier

Provides 0, +6, +12, and +18 dB gain at line level to correct mismatches in component impedance and sensitivity; frequency response 10-75,000 Hz +0, -0.5 dB; S/N better than 100 dB at +18 dB gain; less than 0.005% THD up to 20,000 Hz; requires PS-100 power supply; 2 $\frac{1}{2}$ " H x 7 $\frac{1}{2}$ " W x 4" D \$75.00

PS-100 Power Supply

Provides ± 10 V dc for Nakamichi BlackBox Series components; can power up to six components \$75.00

DM-10 Head Demagnetizer

Slim-line, easy-to-use recorder head demagnetizer; specially designed for company's cassette decks.... \$20.00

NORTRONICS

QM-211 Bulk Eraser

Bulk eraser generates a 60 Hz magnetic field which completely erases pre-recorded reels, cassettes and 8-track cartridges up to $\frac{3}{4}$ -in wide; features touch-control Microswitch that activates on fingertip pressure and deactivates when unit is put down; built-in thermal overload protect circuit; hand-contoured Cyclocac case; coiled cord \$30.00

QM-230 Cassette Bulk Eraser

Self-powered hand-held unit completely erases cassette tapes; requires no batteries or external power source \$24.00

QM-202 Head Demagnetizer

Head demagnetizer for use with reel-to-reel, cassette, and 8-track recorders; features long, flexible, plastic covered probe that reaches the most inaccessible heads; leaf switch activates with fingertip pressure and deactivates when unit is put down; built-in thermal overload protect circuit \$18.50

PIONEER

SG-9500 Audio Frequency Equalizer

Stereo graphic octave equalizer for tone control with ten elements: 32, 64, 125, 250, 500, 1000, 2000, 4000, 8000, 16,000 Hz; level control range ± 10 dB; frequency response 5-70,000 Hz $\pm 0/-1$ dB; S/N 90 dB; input impedance 200,000 ohms; output impedance 600 ohms; THD 0.04% at 1 V (20-20,000 Hz); max. output 6 V; 5 $\frac{7}{16}$ " H x 16 $\frac{1}{2}$ " W x 13 $\frac{7}{16}$ " D \$300.00

RG-1 Dynamic Range Expander

Dynamic processor provides improvements in dynamic range to enhance realism in reproduced music and noise reduction to eliminate unwanted tape and record noise; automatic operation; max. output 6.5 V; THD 0.1% at 1 V; dynamic expansion 6, 8, 10, 12, 14 dB; impulse response: attack time 0.5 msec; release time 80 msec; input impedance 70,000 ohms; output impedance 300 ohms; constant loss -3 dB; residual noise 65 μ V; S/N 100 dB (1 kHz, dynamic expansion 14 dB); twin meters; 5 $\frac{13}{32}$ " H x 13 $\frac{27}{32}$ " W x 12 $\frac{19}{32}$ " D..... \$195.00

MA-62A 6-Channel Mixing Amp

Has input facilities for up to six mikes; each channel has alternative terminal for line or phono inputs; two channels equipped with pan pots, four with location switches; mike attenuators for each channel; low-cut filters for mike input; portable design; has two stereo output terminals; pointer-index markers for each of the six long-throw faders (plus master volume faders); 5 $\frac{7}{16}$ " H x 15 $\frac{1}{4}$ " W x 10 $\frac{19}{32}$ " D..... \$250.00

SR-202W Reverberation Amp

Double-scatter system blends direct signals from source with reverb effect; reverb time 0-2.5 seconds at 1 kHz; HD less than 0.2% at 1 kHz reverb time; minimum output level 330 mV; response 20-35,000 Hz ± 2 dB (min. reverb time); and 20-50,000 Hz ± 10 dB (max. reverb time); S + N/N 65 dB at 330 mV output; universal power supply..... \$150.00

POLYFUSION

SP-1 Sound-A-Round

Stereo panner; automatically moves sound from channel to channel; variable pan speed and depth; includes footswitch to turn effect on and off; battery powered; dynamic range 80 dB; S/N 70 dB; frequency response 10-25,000 Hz ± 1 dB; THD less than 0.5%; input impedance 100,000 ohms; output impedance 600 ohms; signal input level +12 dBm max.; signal output level 0 to 100%; control speed range 0.1 Hz to 14 Hz; control depth range 0 to 100%; control input impedance 100,000 ohms; control input level 0 to +5 V; ± 9 V dc batteries; 2.5" H x 8.25" W x 6.25" D..... \$99.95

POWERCOM

Program Control Center

Program control center has 10 switchable inputs and four output channels; inputs and outputs may be reversed; mono/stereo switch; output level switch; accepts standard phono-type plugs..... \$19.95

ROBINS

24-017 Bulk Tape Eraser

Universal bulk tape eraser; handle has momentary contact switch; background noise levels are erased to below normal erase head level; 110-120 V ac operation; 4" x 2 $\frac{1}{2}$ " x 4 $\frac{1}{2}$ " \$25.00

25-011 Universal Head Demagnetizer

Universal head demagnetizer with changeable tips permit use with reel-to-reel, cassette, and cartridge equipment; 110-120 V ac, 50/60 Hz operation..... \$14.00

RUSSOUND

TMS-2 Tape Recorder Selector

Allows up to five tape recorders or other signal

sources to be interfaced through the tape input/output of a single receiver or amplifier; record or play any or all, at the same time, in any combination; use for tape duplicating, editing, mixing, program production; also interconnects graphic equalizers, Dolby and dbx devices, sound-effects generators, echo chambers, delay lines, and synthesizers; walnut cabinet..... \$69.95
TMS-1. Simplified economy model in utility steel cabinet..... \$39.95

SANSUI

QSD-1 Four-Ch Decoder/Synthesizer
 Features three separate QS "Vario-Matrix" decoders; 20 dB separation between adjacent channels, 30 dB across diagonally opposite channels; QS synthesizer for deriving four-channel sound from stereo records, tapes, and FM stereo signals; frequency response 20-30,000 Hz; dist. 0.1% (1000 Hz); 3 1/2" H x 19" W (rack mount) x 12" D..... \$350.00

QSD-2 Vario-Matrix Decoder
 Decoder/synthesizer adapter; permits any four-channel receiver/amplifier to be used for Type-A QS decoding of QS-encoded sources, including FM broadcasts; master volume control for all four channels; source/playback jacks; function control; two channel QS synthesizer-hall, QS synthesizer-surround, QS, SQ; frequency response 20-30,000 Hz; dist. 0.1% at 1000 Hz; separation 20 dB (adj. channels), 30 dB (diagonal channels); 4 1/2" H x 5" W x 11 1/4" D..... \$140.00

RA-700 Reverberation Amplifier
 Continuously adjustable reverb time with visual indication; can handle two tape recorders simultaneously; adds echo effects during recording or playback; frequency response 20-30,000 Hz \pm 2 dB (at reverb time min.), 20-30,000 Hz \pm 10 dB (reverb max.); S/N 65 dB at 300-mV output; reverb time 1.9-3.2 sec (at 1000 Hz); input/output jacks; tape recording A and B, tape playback A and B, load impedance 100,000 ohms; simulated walnut-grain enclosure; 4 1/4" H x 11 1/4" W x 10 7/8" D..... \$180.00

SCOTCH

ERK-130 Cassette Edlt/Repair Kit
 Contains precision splicing block; spindle for manually winding cassette tape; six polyester picks (adhesive tipped for retrieval of tape ends lost in housing); six 130-mil splicing tabs; detailed instruction booklet..... \$2.99

Pre-Cut Tabs
SPT-7/32-36. 36 pre-cut 1.0-mil polyester splicing tabs..... \$1.19
SST-7/32-18. 18 pre-cut aluminized sensing tabs..... \$1.19
SK-7/32. 12.5 ft of 1.9 mil polyester splicing tape in dispenser kit..... \$1.99

Head Cleaners
S-C-HC. Cassette head cleaner..... \$1.69
S-8TR-HC. 8-track head cleaner..... \$2.99

C-Box Cassette Storage System
 Stackable/interlocking cassette storage/carrying boxes with pushbutton drawers; easy access and index label for quick identification.
 Sleeve of three empty C-Box units..... \$2.49
 C-Box wall bracket..... \$1.69
 C-Box carrying handle..... \$1.69
 Box of 10 empty "C-Box" units with handle and bracket..... \$9.99
 25 drawer labels and insert cards..... \$1.99

SOUND CONCEPTS

SD550 Audio Delay System
 Dual-channel audio delay system; continuous delay variation from 5 to 100 msec; continuous reverb variation from 0 to 100%; high frequency rolloff

from -3 to +6 dB; front mix level from 0 to 100%; rear level 0 to 100%; 50 or 100 msec delay range; rear output delay or quad direct; front output direct or delay mix; input front or quad rear; input impedance 60,000 ohms min.; output impedance 300 ohms max.; frequency response 20-5000 Hz \pm 1 dB with 5 msec delay and zero dB high frequency rolloff; S/N B5 dB min., 90 dB weighted; 1% max. dist. at 1 kHz and 1 V rms, consisting almost entirely of 2nd harmonic; 3 1/2" H x 15 1/2" W x 9" D..... \$675.00

SOUNDCRAFTSMEN

RP2215R Equalizer
 Provides front-panel push-button control of line or tape equalization for conventional hi-fi systems or separate stereo outputs for multiple-system equalization; tape monitor circuit provides monitoring equalized program material during use; environmental test record for listening environment equalization; four LED's for front-panel display controlled by zero-gain level controls for input vs output level balancing; S/N 114 dB; THD 0.01% at 2V, 0.05% at 1 V (typical); \pm 15 dB boost or cut each octave; 600 ohm output; black anodized aluminum panel 19" wide for rack mounting..... \$370.00

RP-2204 Tape Playback Equalizer
 Can be used for equalization of tape recordings; environmental test record included for listening environment equalization; designed to be connected to tape monitor circuit of any stereo receiver or preamp; has tape monitor inputs and outputs with front-panel pushbuttons; two separate 10-octave equalization panel with \pm 12 dB boost and cut for each octave; separate equalized-signal zero-gain controls for exact balancing of input-to-output levels within an 18 dB range; S/N 96 dB; THD 0.1% at 2 V; walnut vinyl case..... \$329.50

SOURCE

Noise Suppressor
 Suppresses noise independently in three frequency bands; provides 20-dB quieting at 10 kHz and 17 dB at 4 kHz with no signal, 20 dB at 12 kHz and 14 dB at 4 kHz with 300-3000 Hz signal, 15 dB over 9-20 kHz with 300-7000 Hz signal; masking isolation 30 dB at 1 kHz for 3-7 kHz, 30 dB at 3 kHz for over 7 kHz; suppression range -60 to -20 dB; insertion gain/loss (-60 to -30 dB settings) 0 dB \pm 1 dB; dist. (-60 dB setting) less than 0.1% THD products below 20 kHz, less than 0.1% IM at 60 and 7000 Hz (4:1); internal noise (20-20,000 Hz) at least 20 dB below setting; input impedance 51,000 ohms; HF output impedance 100 ohms; min. recommended load resistance 22,000 ohms; ref. level (0 dB) 0.316 V rms..... \$285.00

UEA Equalizing Amplifier
 Provides high-level outputs from modern stereo magnetic cartridges for reproduction of 78's, radio transcription discs, as well as fine-groove records; five-position mode switch and variable treble control allow wide variety of equalization patterns to be obtained; ref. gain (1 kHz) 39 dB/channel (RIAA), 29 dB (other modes, common L and R); input impedance 75,000 ohms/channel (RIAA), 37,000 ohms (other); overload 80 mV at 1 kHz and 450 mV at 10 kHz (RIAA), 250 mV at 1 kHz and 250 mV (max. treble) or 1.2 V (min. treble) at 10 kHz (other); bass hinge frequency standard (RIAA), A mode 500 Hz, B mode, ffr 250 Hz, acoustic none; noise (ref. 10 mV input)-76 dB; THD and IM dist. less than 0.1%; may be powered from Source Noise Suppressor or 22-33-V dc source, 5 mA current drain; 2 1/4" x 3 1/2" x 2 1/8"..... \$86.00

SPECTRO ACOUSTICS

210 Ten-Band Stereo Equalizer
 Provides 10 bands of equalization with \pm 15 dB boost or cut in each of the 10 audible octaves; uses gyrator synthesized inductors; features full line or

tape equalization with lockout to prevent program destruction; unity gain controls for each channel or audible adjustments; distortion 0.1% of 1 V (20-20,000 Hz) with any combination of equalization adjustments, 0.05% of 1 V with equalizer bypassed or set flat; S/N 90 dB below 2 V rms; output impedance 600 ohms; dynamic range: noise floor is over 100 dB below full output; 6" H x 17" W x 7" D..... \$295.00

TEAC

Model 2A Audio Mixer
 Features six inputs (mike or line in any combination), four outputs; level controls for each input channel; master output level control; cue out jack on each input channel; accessory send/receive patch points on each output bus for reverb units, graphic equalizer, limiters, compressors, noise-reduction units, other signal processing equipment; four aux. outputs in parallel with four line outputs; selectable high-cut filters at 5 kHz or 10 kHz; low-cut filters at 100 Hz or 200 Hz; color-coded push-push channel assignment buttons with pan on each channel; 3 1/2" H x 13 1/2" W x 10 1/4" D..... \$450.00

MB-20 Meter Bridge
 For line-level applications; four VU meters; LED peak-level indicator; built-in 4 x 2 monitor mixer; headphone amp; independent monitor switches; variable input sensitivity selector..... \$250.00

TECHNICS by PANASONIC

SH-9090P Frequency Equalizer
 Single-channel octave equalizer with 12 bands covering 10 to 32,000 Hz, 12-dB boost or attenuation at each frequency point; center frequency of each band variable by one octave in either direction; bandwidth ("Q") continuously variable for each band; equalizer in/out for comparisons; frequency response (at 0 dB levels) 20-20,000 Hz +0/-0.5 dB (balanced); 15-30,000 Hz +0/-0.5 dB (unbalanced); THD 0.05%; input impedance 100,000 ohms (balanced), 50,000 ohms (unbalanced); output impedance 20 ohms (balanced), 10 ohms (unbalanced); maximum output voltage +24 dBm (balanced), +20 dBm (unbalanced); master level control +6 dB; 6 1/4" H x 18 7/8" W x 14 1/4" D..... \$999.95

SH-9010 Frequency Equalizer
 Stereo universal frequency equalizer offers variable center frequencies; five slide pots provided for each channel (60 Hz variable between 20-180 Hz, 240 Hz variable between 80-720 Hz, 1 kHz variable between 333-3000 Hz, 4 kHz variable between 1.3-12 kHz, 16 kHz variable between 5.3-48 kHz); equalizer in/out switch; power on/off switch; one pair input and two pair output jacks provided; rated output voltage/impedance 1 V/300 ohms (1 kHz); THD 0.02%; input sensitivity/impedance 1 V/47k ohms (1 kHz); frequency response 10-20,000 Hz +0, -0.2 dB, 10-70,000 Hz +0, -3 dB; gain 0 \pm 1 dB; S/N 90 dB; 3 1/2" H x 19" W x 14 1/2" D..... \$499.95

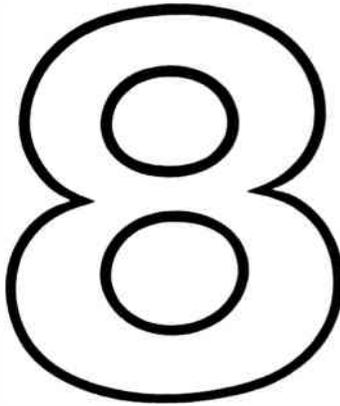
VOR

501 "Reelclean"
 Cassette head cleaner removes oxides and cleans both heads and capstan roller..... \$2.59

502 "Head Sweeper"
 8-track head cleaner..... \$2.59

NEED MORE INFORMATION?

Write direct to the manufacturer or distributor. A list of names and addresses starts on page 4.



SMALL STUDIO & SEMI-PRO TAPE EQUIPMENT

BPI

1000C Wow and Flutter Analyzer

For testing and servicing of audio and video record/playback equipment; phase lock loop circuitry; accessory ac voltmeter; scope output; weighted and unweighted measurements; measures wow and flutter and speed/drift simultaneously; wow and flutter to 0.01%, speed/drift in percent; monitor speaker; dB meter with 94 dB dynamic range; two low-distortion internal oscillators (3 kHz and 3.15 kHz); 7 1/4" H x 17" W x 12" D..... \$645

1600. Similar except includes three weighting standards (NAB, DIN, JIS); standard and 1 mV full-scale voltmeter; dB meter with 94 dB and 124 dB dynamic range..... \$795

CERWIN-VEGA

DM-1 Audio Mixer

For pro and semi-pro recording setups; frequency response 20-20,000 Hz ± 1 dB (RIAA phono inputs), 20-20,000 Hz ± 0.5 dB (line inputs); THD 0.05% at rated output at any frequency; IM 0.05% at rated output (SMPTE standard); noise (ASA standard "A" weighting, shorted inputs) high-level inputs 85 dB; phono inputs 80 dB both below full output; impedance 47k (RIAA phono inputs), 100k (line inputs); output level/impedance 2.5 V rms (program and monitor), clipping level 8.7 V rms (+21 dBm), load impedance 2k, output source impedance 100 ohms or less; tone controls ± 10 dB at 50 Hz, and 5k, turnover frequency 500 Hz; Auto-fade rate variable from 2 to 20 sec typically; talkover/mute; mute level 0-20 dB typically, on/off rate 2 sec typically; headphone output 1 W into 4 ohms; meter calibration +3 dB at 2.0 V rms at program output; illuminated VU meters for both output channels; bass/treble/stereo balance controls; 1 1/2" H (less feet and knobs) x 19" W x 8" D..... \$649

NAKAMICHI

T-100 Audio Analyzer

Used to measure and verify performance of tape decks, microphones, amplifiers, preamplifiers, turntables, microphones, etc.; combines functions of oscillator, VTVM, distortion analyzer, and wow/flutter meter; oscillator has 21 discrete frequencies between 20 and 20,000 Hz plus wideband pink noise; measures distortion from 0.01% to 3% at 400 Hz; measures level with either peak or average ballistics; measures speed accuracy and wow/flutter (weighted or unweighted); measures noise inputs down to 10 μ V; features non-mechanical bar-graph display and logic-controlled FET switching; supplied with carrying case; 3" H x 13 1/2" W x 9 1/2" D; 9.5 lb..... \$800

OPAMP LABS

1204RS Recording Studio Console

12-in/4-out, four-echo buss, 8-track mixdown-monitor system; input channels: mix slide pot (film type) with 90-dB attenuation; input select: 0, -10,

-20, -30 dB and mike level, line 1, 2, and 3; 12 echo send, four echo return, four echo return assign controls for four echo busses; low-frequency equalization (+12 dB): 1500 Hz (peaking), 3000 Hz (peaking), 5000 Hz (peaking), and 10,000 Hz (shelf); four output assign lighted alternate action switches; four 4 1/2-in lighted VU meters for output assign channels, two 4 1/2-in lighted VU meters for stereo mixdown; four master pots; eight mono earphone pots; eight mixdown concentric pan-gain pots; talkback and slate pushbuttons; mike gain controls; built-in 1000 Hz oscillator; stereo record and monitor amps; external rack-mounted power supplies..... (kit) \$6100

1204RS. Same but wired \$9700

ORBAN

418A Stereo Limiter

Stereo limiter/compressor; left and right ganged output and input attenuators; release time control; switchable high-frequency limiter time constant (75, 50, 37.5, 25 μ sec, flat); multifunction meter (left and right input and output, gain reduction, ± 15 -V power supply); overload indicator; frequency response 20-20,000 Hz ± 0.5 dB; high frequency limiter controls HF peaks attempting to exceed a threshold defined by single-time-constant roll-off; broadband limiter: 1-2 msec attack time, program-controlled release time, 15-dB gain reduction range, 200:1 compression ratio, ± 1.5 dB max. interchannel tracking; 50-dB separation at 20-20,000 Hz; noise -75 dB max. below limiting threshold at 100 Hz, 20-20,000 Hz bandwidth; 115/230-V ac 50/60 Hz, 6 W; 3 1/2" H x 19" W x 10" D \$795

622B Parametric Equalizer

Two-channel parametric equalizer allows continuously variable control over entire frequency, bandwidth, and amount of peak or dip; controls: equalization, equalization in/out, bandwidth, and tuning for each of four bands, master equalization in/out, gain, power on/off; frequency response 20-20,000 Hz ± 0.25 dB; +12 dB available gain adjustable to infinity; input impedance 100k in parallel with 1000 pF, electronically balanced; output 47 ohms in parallel with 1000 PF unbalanced; slew rate 6 V/ μ sec; THD less than 0.025%, 20-20,000 Hz; noise (equalization controls flat) less than -84 dBm, -87 dBm typical; interchannel crosstalk less than -90 dB, 20-20,000 Hz; Q range 0.29 to 3.2; equalization range +16 dB to infinity; tuning range 20-500 Hz, 68-1700 Hz, 240-5850 Hz, 800-20,000 Hz; tuning dials calibrated at ISO preferred frequencies..... \$750

622A. Same but single channel \$480

OTARI

MX-5050-2SH Tape Recorder

Two-channel, 1/2-track recorder/reproducer with 1/4-track reproduce capability; two speeds (15 and 7 1/2 ips); hysteresis synchronous capstan motor; two induction torque reel motors, handles 10 1/2-in EIA or NAB reels, and 5-in or 7-in plastic reels; four head stacks 1/2 erase, 1/4 reproduce, 1/2 record, 1/2 repro-

duce; rewind time less than 90 sec (2500-ft reel); wow and flutter 0.05% at 15 ips, 0.06% at 7 1/2 ips; connectors: line three-pin XLR, mike standard 1/4-in phone jack; inputs: line 15 dBm unbalanced 50k ohms, balanced 600 ohms with optional transformer; mike 70 dBm unbalanced, nominal 50k ohms; outputs: line variable or fixed level, headroom 19 dBm before clipping; headphone jack -24 dBm, nominal 8 ohms; NAB standard equalization; S/N 65 dB weighted, 63 dB unweighted (at 15 ips), 65 dB weighted, 63 dB unweighted (at 7 1/2 ips); frequency response 50-22,000 Hz ± 2 dB, 35-25,000 Hz ± 3 dB (both at 15 ips), 50-18,000 Hz ± 2 dB, 30-20,000 Hz ± 3 dB (both at 7 1/2 ips); distortion less than 1% at 1000 Hz at 185 nWb/m; vertical or horizontal operation; walnut cabinet; 21 1/4" H x 21 1/4" W x 7 1/4" D..... \$1645

MX-5050-2SL. Same as above except 7 1/2 and 3 1/2 ips..... \$1645

MX-5050-2SHO. Same as MX-5050-2SH except dc capstan-servo system \$1795

4-Channel

Mark II Four-Channel Recorder

Incorporates features of MX-5050 plus separately packaged transport and electronics, dc capstan servo with pitch control, plug-in electronics, complete accessibility to electronics adjustments, and interface jack for adding dbx or Dolby noise-reduction system; tape speeds 15 and 7 1/2 ips; heads, three four-track in line stacks for erase, record, reproduce; wow and flutter 0.05% at 15 ips, 0.06% at 7 1/2 ips; frequency response 50-20,000 Hz ± 2 dB, 35-25,000 Hz ± 3 dB (15 ips at OVU), 50-18,000 Hz ± 2 dB, 40-20,000 Hz ± 3 dB (7 1/2 ips at -10 dB); 10 1/2 in NAB reels; 1/2-in tape, 0.075-in track width; 25 1/4" x 19" standard rack mount \$3395

Two-Channel. Same as Mark II but uses 1/2-in tape; will handle 5- and 7-in plastic reels or 10 1/2-in EIA or NAB; 21 1/4" x 19" standard rack mount... \$2395

SAE

2800 Stereo Parametric Equalizer

Four-band parametric equalizer system with control over cut/boost plus bandwidth frequency; separate controls for each channel; input level controls and peak indicators; tape equalization facilities for pre-equalized tape recordings; control functions are divided into four frequency bands (LO, LO-MID, HI-MID, HI); continuously variable frequency adjustment within each band covering 10-320 Hz, 40-1200 Hz, 240-7600 Hz, 1200-15,000 Hz; each band has slider control that adjusts gain over ± 16 dB range, detent at center (0-dB) setting; bandwidth adjustment is slider control calibrated in octaves from 0.3-3.6; each channel has master-level slider providing up to 70 dB of attenuation; max. output before clipping 9 V into 10,000 ohms; input impedance 100,000 ohms; output impedance 500 ohms; nominal rated output 2.5 V; frequency response (controls at flat) 20-12,000 Hz ± 0.25 dB; clipping level 8.5 V at 1000 Hz; THD 0.01% at 2.5 V, 0.028% at 8.5 V; -0.9 dB gain; front panel 8 3/4" x 19"; chassis depth 3 1/2-in... \$600

1800. Similar except two band..... \$350

SANSUI

AX-7 Disco Mixer/Control Amplifier

Disco mixer/control amplifier with built-in reverb unit; monitor selector (source, mixing out, tape 1, 2, 3); front-panel jacks for connection of portable stereo tape deck, etc.; recording mode (tuner, AM/FM, mixing out, source/tape, three-position tape copy); mixing selector (source, tape 1, 2, 3, and off); mixing balance (source/tape); master volume control; reverberation selector permits addition of "reverb" to input connected microphones, guitars, and/or line sources; reverberation control (0-3.2 sec); input selector (line, guitar, and mic with sensitivities 1 mV, 20 mV, 150 mV); panpots left and right for each channel; level controls; attenuator; low-cut switch; frequency response (source/tape) 20-20,000 Hz +0 dB, -0.5 dB, (mic/guitar/line) 20-20,000 Hz +0 dB, -1 dB; THD 0.1% at or below 2 V rms; IHF hum and noise (mic) 61 dB, (guitar) 58 dB, (line) 69 dB, (source) 78 dB; channel separation (source) 70 dB at 1000 Hz, (tape) 70 dB at 1000 Hz; max. output 5 V into 47 k ohms at 0.1% THD.....\$280

SHURE

SE30 Gated Compressor/Mixer

High-quality gated memory compressor combined with a self-contained portable three-input mixer and remote amplifier; frequency response 30-20,000 Hz \pm 2 dB; gain below compression threshold, output terminated, (line) 600 ohms, (microphone) 150 ohms, (aux.) 47k ohms; input noise -129.5 dBV; dist. 0.5% THD at +15 dBm output, 30-20,000 Hz; compression ratio 10:1 typical from 10 to 20 dB compression, 5:1 min. from 10 to 30 dB compression; compression threshold (mike) -96 dBV at max. input gain, (line) -48 dBV; recovery time adjustable from 100 msec to 8 sec; attack time same as recovery time for increases up to 12 dB; gated memory less than 20 dB gain recovery after 1 min in "hold" condition; 108-132 V ac, 50/60 Hz, 3 $\frac{1}{2}$ " H x 15" W x 10" D.....\$455

M67 Professional Mixer

Professional mixer; provides four low-impedance transformer-coupled balanced microphone inputs (one convertible to line input); balanced 600-ohm line and microphone level outputs; illuminated VU meter calibrated for +4 and +10 dB out; extremely low noise and r-f susceptibility; 120 V ac \pm 10%, 50/60 Hz; 2 $\frac{1}{4}$ " H x 11 $\frac{1}{2}$ " W x 7 $\frac{1}{2}$ " D.....\$388

M677 Accessory Mixer

Transistorized six-input accessory mixer for use with Shure models M67, M68, M63, or SE30; obtains power from associated Shure mixer or battery power supply.....\$362

SONY

MX-20 Professional Microphone Mixer

Eight-channel microphone mixer for studio or sophisticated amateur recordings; three-position mic input attenuator; balanced mic input and output with XLR connectors; cascade connector for coupling two MX-20's to produce 16-channel input mixer; five-step equalization control in channels one through six; slanted front panel with carrying handle; four VU meters; abundant output level; mic input sensitivity -72 dB (0.2mV); line-in impedance 100,000 ohms, sensitivity -22 dB (60 mV); mike attenuation off, -15 dB, -30 dB, -45 dB; output impedance (line-out) 600 ohms balanced, 10,000 ohms unbalanced; output impedance (headphone) 8 ohms; frequency response 30-20,000 Hz +0 dB, -1.5 dB; S/N 65 dB; 7 $\frac{1}{2}$ " H x 18 $\frac{1}{2}$ " W x 16 $\frac{1}{4}$ " D.....\$1200

MX-650 Microphone Mixer

Six-channel microphone mixer for sophisticated two-channel recording; six input channels, each can be set to feed left or right line output, each output channel can also be Y-ed to left and right line outputs simultaneously; pan pot control; two-position

mic input attenuator; pre-set indicators; cascade connector; built-in oscillator; master fader; mic input sensitivity -72 dB (0.2 mV); 100,000 ohms line-in impedance, sensitivity -22 dB (60 mV); mic attenuation off, -15 dB, -30 dB; output impedance (line-out) low, more than 600 ohms, high, more than 10,000 ohms; output impedance (headphone) 8 ohms; frequency response 30-25,000 Hz; S/N 60 dB; 3 $\frac{1}{4}$ " H x 17 $\frac{1}{2}$ " W x 10" D.....\$275

SOUND WORKSHOP

1280 Recording Console

12-in/8-out recording console; 8 x 2 stereo control room monitor mix; 8 x 1 musicians' cue mix; independent 2-track mixdown buss; each input has three-band equalization, 35 dB trim control, push-button track assign, full panning, echo send, locking solo and mute switches, straight-line fader, and pre- and post-fader patch points; Tri-Lite LED read-out for all 10 output busses; 105-125-V ac, 50/60 Hz, 20 W; 5 $\frac{1}{2}$ " H x 27" W x 20" D.....\$2900
1280B. Same but with studio-quality balanced transformer mic-pres.....\$3280
1280 Expander. Provides additional 12 inputs for 1280.....\$2200
1280B. Expander. Same but with mic input transformers.....\$2580

242C Stereo Reverb

Stereo reverberation system; line and mic level inputs; input level controls and peak-reading LED's; active input mix allows mixing of one or two mono signals while creating true stereo effect; output mixing allows any ratio of dry to reverberant signal; independent channel equalization; full drive level into 600 ohms; equalized drivers and preamps; noise level -70 dBm (20-20,000 Hz); \pm 15 dB at 4300 Hz equalization; nominal 2.5-sec decay time; 117-V ac, 50/60 Hz; 3 $\frac{1}{2}$ " H x 19" W x 9" D.....\$399

TASCAM

80-8 Recorder/Reproducer

$\frac{1}{2}$ -in, 8 tracks; will take up to 10 $\frac{1}{2}$ -in reels NAB hub only; 15 ips tape speed; function select panel; full IC logic tape transport; memory stop function; digital counter; integrated dbx noise reduction; line input -10 dB (0.3 V), impedance greater than 20,000 ohms, unbalanced; line output -10 dB (0.3 V), load impedance greater than 10,000 ohms, unbalanced; record level 0 VU referenced to 3 dB above; wow and flutter 0.04% rms (NAB, weighted), 0.06% peak (ANSI, weighted); fast-winding time 120 sec with 240-ft tape; frequency response 40-18,000 Hz \pm 3 dB; S/N 65 dB weighted, 60 dB unweighted; dist. 1.0% at 400 Hz, 0 VU; overall THD 3.0% at 10 dB above 0 VU; crosstalk greater than 45 dB at 400 Hz; 21" H x 17 $\frac{1}{2}$ " W x 12" D.....\$3500

25-2 Recorder/Reproducer

Two-track, two-channel open-reel recorder/reproducer; 15 and 7 $\frac{1}{2}$ ips tape speeds; direct-drive dc servo-controlled capstan motor and two eddy current induction reel motors; integral dbx noise-reduction system; independent three-position bias and equalization switches; built-in 4-in/2-out mixer for remote recording applications; switchable 20-dB attenuation pad for each pair of mic inputs; tape-only outputs; cue and edit controls; \pm 5% variable speed operation; wow and flutter 0.05% at 7 $\frac{1}{2}$ ips; frequency response 25-30,000 Hz and 30-28,000 Hz \pm 3 dB at 15 ips, 25-28,000 Hz and 30-24,000 Hz \pm 3 dB at 7 $\frac{1}{2}$ ips; overall S/N 100 dB with dbx, 65 dB without dbx; overall harmonic dist. 0.4% with dbx, 0.8% without dbx (1 kHz); stereo channel separation 80 dB with dbx, 50 dB without dbx (1 kHz); fast-winding time 150 sec (1800 ft); inputs four line 100 mV/50,000 ohms, four mic 0.1 mV (-58 dB)/600 ohms or more; outputs two line 0.3V/10,000 ohms, one 8-ohm stereo headphone jack; 117-V ac, 60 Hz, 83 W; transport size 17 $\frac{1}{2}$ " H x 18 $\frac{1}{2}$ " W x 11 $\frac{1}{2}$ " D, amp size 8 $\frac{1}{2}$ " H x 18 $\frac{1}{2}$ " W x 12 $\frac{1}{2}$ " D.....\$1900

40-4 Recorder/Reproducer

Four-track, $\frac{1}{4}$ -in recorder/reproducer; will take up to 10 $\frac{1}{2}$ -in reels NAB hub only; 15 and 7 $\frac{1}{2}$ ips tape speeds; includes function select panel; full IC logic tape transport; memory stop function; digital counter; integrated dbx noise-reduction system; line input -10 dB (0.3 V) impedance greater than 20,000 ohms, unbalanced; line output -10 dB (0.3 V) load impedance greater than 10,000 ohms, unbalanced; wow and flutter 0.04% rms NAB at 15 ips; fast-winding time 120 sec for 2500-ft tape; frequency response 40-20,000 Hz \pm 3 dB (15 ips), 40-15,000 Hz \pm 3 dB (7 $\frac{1}{2}$ ips); S/N 63 dB weighted, 58 dB unweighted at 15 ips, 65 dB weighted, 60 dB unweighted at 7 $\frac{1}{2}$ ips; overall dist. 1% at 400 Hz, 0 VU at 9 dB; crosstalk greater than 50 dB at 400 Hz; 21" H x 17 $\frac{1}{2}$ " W x 12" D.....\$1600

Model 5A Mixing Console

8-in/4-out mixing console; input module: 0, 20, or 40 dB of mic padding; 0-20 dB mic, tape, or line trim; foldback pre EQ and fader cue; foldback post EQ and fader echo; 15 dB boost or cut at 3 or 10 and 75 or 200 Hz; pan automatically engages for multi-output assignment; LED overload indicator; straight-line fader; submaster module: buss tape monitor; tape cue; monitor gain and pan; echo receive; submaster fader; master module: 400-Hz test tone; four-channel monitor; studio monitoring; control room monitoring; solo level control; master fader; VU-type level-averaging meters and peak-indicating LEDs; optional talkback module available; frequency response 30-20,000 Hz \pm 2 dB; S/N 75 dB weighted (one input, mic or line), 65 dB weighted (8 inputs, mic or line); crosstalk -60 dB at 1 kHz; 0.3% THD max.; 117-V ac, 60 Hz, 40 W; 7 $\frac{1}{2}$ " H x 23 $\frac{1}{4}$ " W x 24 $\frac{1}{2}$ " D.....\$1900

Model 3 Mixing Console

8-in/4-out mixing console; input section: 0, 20, or 40 dB of mic padding; mic/line input selector; 15 dB boost or cut at 3 or 10 and 75 or 200 Hz; pan automatically engages for multi-output assignment; straight-line fader; three-position output-to-headphone (off/monitor/submix); master fader; PA mixing capability; six lo-Z balanced mic inputs; two hi-Z unbalanced mic inputs; aux. outputs in parallel with line outputs; accessory send and receive; VU-type level averaging meters and LED peak indicators; frequency response 30-20,000 Hz \pm 2 dB; S/N 60 dB weighted min.; crosstalk -60 dB at 1 kHz; 0.3% THD max.; 117-V ac, 60 Hz, 18W; 6 $\frac{1}{2}$ " H x 18 $\frac{1}{4}$ " W x 20 $\frac{1}{2}$ " D.....\$950.00

Model 1 Mixer

8-in/2-out line level mixer; independent gain and pan for each input channel; master gain; foldback for each channel; aux. outputs in parallel with line outputs; separate buss inputs; contains 1-W amp with level control for two stereo headphone feeds; S/N 78 dB weighted; frequency response 30-20,000 Hz \pm 1 dB; crosstalk -50 dB at 1 kHz; 0.3% THD max.; 117-V ac, 60 Hz, 8 W; 4 $\frac{1}{2}$ " H x 17 $\frac{1}{4}$ " W x 4" D.....\$160.00

TELEX

Telex/Magnecord 1400 Series

Three-speed (15, 7 $\frac{1}{2}$, 3 $\frac{1}{4}$ ips) open-reel tape recorder; reel sizes 5, 7, or 8 $\frac{1}{4}$ in EIA; available with a variety of head configurations allowing single-, two-, or four-track mono or stereo operation; brushless dc servo ball bearing drive system; wow and flutter 0.35% at 3 $\frac{1}{4}$ ips, 0.24% at 7 $\frac{1}{2}$ ips, 0.17% at 15 ips (all DIN weighted), 0.25% at 3 $\frac{1}{4}$ ips, 0.17% at 7 $\frac{1}{2}$ ips, 0.12% at 15 ips (all rms unweighted); S/N 60 dB (NAB weighted); frequency response 30-10,000 Hz \pm 3 dB (3 $\frac{1}{4}$ ips), 30-18,000 Hz \pm 3 dB (7 $\frac{1}{2}$ ips), 35-22,000 Hz \pm 3 dB (15 ips, two-track); crosstalk ratio 50 dB at 1 kHz (two-track head); fast-winding time 80 sec (1200 ft, 7-in reel, 1.5 mil tape); inputs: 150-ohm microphone, balanced bridge, unbalanced bridge, mixing bridge, and aux. bridge; outputs: 150/600 ohm balanced, +4 dBm, aux. A and B unbalanced; VU meters for each channel; mike and line input separate gain controls plus master gain control; catenary head block design and hyperbolic contour heads insure intimate tape/head contact; 110/130-V ac, 50/60 Hz, 180 W.....\$1675



VIDEO CASSETTE RECORDERS

AKAI

VT-350 Video Cassette Recorder

Portable black-and-white videocassette recorder with vertical-interval editing, variable speed frame control, and still frame; 1/2-in cassette format; 30-min recording time; tape speed 2 3/4-in/sec; twin rotating head, frequency modulation recording system; audio dubbing; includes black and white video camera with "C" lens mount; VF-300E electronic viewfinder; 8:1 (11.5 to 90 mm) zoom lens; battery or ac power; recorder dimensions 5" H x 9.75" W x 11.5" D; camera dimensions 3.6" H x 4.3" W x 7.8" D \$2150

VT-300 Video Cassette Recorder

Portable black-and-white videocassette recorder with 3-in detachable monitor; 1/2-in cassette format; 30-min recording time; 2 3/4-in/sec tape speed; twin rotating head, frequency modulation recording system; ac or battery operated; includes black-and-white portable video camera with 500 lines of resolution, built-in microphone that automatically adjusts volume levels, detachable 1.5-in electronic viewfinder; 8:1 (11.5 to 90 mm) zoom lens; recorder dimensions 5" H x 9.75" W x 11.5" D; camera dimensions 8" H x 2.6" W x 6.5" D \$1995

CURTIS MATHES

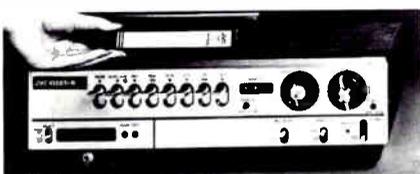
C718 Video Cassette Recorder

VHS four-hour color videocassette recorder; built-in pause feature; two or four hour recording and playback; electronic digital clock timer built-in (can be set up to 24 hrs in advance); memory counter; remote control cable for pause; auto-stop at end of tape; audio dubbing button; plug for video camera; VHF/UHF tuners; automatic gain control of audio and video levels; tracking control for fine tuning; r-f converter; automatic fine tuning; automatic tape loading; direct drive head; video and audio input and output jacks; aluminum die-cast chassis; 7 1/4" H x 19 3/32" W x 16 1/16" D \$1095

JVC

VIDSTAR Video Cassette Recorder

VHS 2-hour color videocassette recorder/player system; 1/2-in cassette format; rotary slant azimuth,



two-head helical scan recording system; search control; pause control; audio dubbing control; microphone jack; digital tape counter; built-in two-hour timer; built-in r-f modulator switch for channel 3/4; VHF and UHF channel selectors; tracking control

permits picture adjustment during playback; 5 3/16" H x 17 7/8" W x 13 1/16" D \$1050

GC-3300U Color Video Camera

Two-tube system portable color video camera; two 2/3-in electrostatic focus/electromagnetic deflection vidicons; built-in electret condenser microphone; optical viewfinder; four-position color compensator; optional 1.5-in electronic view finder with aux. lighting clip; optional 6:1 zoom lens; 120 V ac, 60 Hz; 9 3/8" H x 3 7/16" W x 10 7/16" D \$1500

MAGNAVOX

8200 Video Cassette Recorder

VHS four-hour color videocassette recorder; features remote-control editing; built-in electronic



timer; integral VHF/UHF tuner; built-in search; memory switch and tape counter; two or four hour recording and playback \$1095
Optional monochrome camera with built-in microphone \$300

PANASONIC

OmniVision IV Video Cassette Recorder

VHS four-hour color videocassette player/recorder; compatible with black-and-white or color television systems; 1/2-in cassette format; direct drive motor and capstan servo system; built-in electronic digital clock with 24-hour timer; automatic stop and shut-off at end of tape; remote pause control; built-in VHF/UHF tuners; automatic fine tuning switch; auto stop and memory rewind functions; audio dub feature; LED dew detector; annealed die-cast aluminum chassis \$1095
Optional black and white hand-held camera with built-in microphone \$300

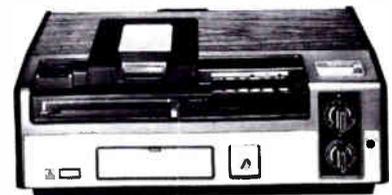
QUASAR

VH5000 Video Cassette Recorder

VHS four-hour color videocassette recorder; will record up to four hours in long play mode and two hours in standard play mode; features built-in electronic digital clock/timer; audio dubbing; memory rewind; remote pause; video and audio input/output jacks; automatic fine tuning; 1/2-in cassette format; two rotary head, azimuth, helical scanning recording system; VHF/UHF tuners; 6 7/8" H x 19 1/4" W x 15 1/2" D \$1100

VH1000 Video Cassette Recorder

Two-hour color videocassette recorder/player; features "AlphaScan" single head video recording system;



1/2-in cassette format; antenna switch; pause mode; remote pause; programmed recording with optional timer; video head dehumidifier; memory-set controls; 22 1/2" x 16 1/8" x 8 1/2" \$1000

RCA

SelectaVision Video Cassette Recorder

VHS four-hour video cassette recorder; direct-drive motor; memory tape counter; tracking control; two



or four hour recording and playback; dew indicator light; audio dubbing; remote pause control; built-in electronic digital clock/timer; rotary two-head helical scan recording system; solid die-cast aluminum base; 7" H x 19 1/8" W x 15" D \$1000
BW002. Optional black-and-white video camera with zoom lens, through-the-lens view finder, and built-in microphone \$400
BW001. Optional black-and-white video camera with flip-up view finder and built-in microphone \$300
MC001. Optional microphone \$11

SANYO

Betacord Video Cassette Recorder

Color videocassette recorder with Beta cassette format for one hour, two hour, or three hour recording/playback; one-touch push-button operation; built-in digital clock/timer; memory digital tape counter; instant editing with pause control; built-in all-channel tuner; lighted channel indicators; automatic fine tuning; camera and microphone inputs; video inputs/outputs; automatic shut-off with sleep switch; rotary two-head helical scan, recording system; 7.7" H x 19.5" W x 14.6" D \$995

Directory Of Manufacturers

(Continued from page 4)

JC PENNY

1301 Ave. of the Americas, New York, NY

JENSEN SOUND LABORATORIES, Div. of Pemcor, Inc.

4310 Trans World Rd., Schiller Park, IL 60176

J. I. L. CORP. OF AMERICA

737 W. Artesia Blvd., Compton, CA 90220

JVC AMERICA INC.

58-75 Queens Midtown Expressway, Maspeth, NY 11378

KENWOOD ELECTRONICS, INC.

Watson Industrial Center, 1315 East Watsoncenter Rd.,
Carson, CA 90745

KLARK-TEKNIK, Hammond Industries, Inc.

155 Michael Dr., Syosset, NY 11791

KLH RESEARCH & DEVELOPMENT CORP.

145 University Ave., Westwood, MA 02090

KOSS CORPORATION

4129 Port Washington Ave., Milwaukee, WI 53212

KRACO ENTERPRISES, INC.

505 E. Euclid Ave., Compton, CA 90224

KRIKET, Acoustic Fiber Sound Systems, Inc.

Box 50829, Indianapolis, IN 46250

LAFAYETTE RADIO ELECTRONICS CORP.

111 Jericho Turnpike, Syosset, NY 11791

LE-BO PRODUCTS CO., INC.

58-60 Grand Ave., Maspeth, NY 11378

LENCO, Neosonic Corporation of America

180 Miller Place, Hicksville, NY 11801

MAGNAVOX COMPANY

1700 Magnavox Way, Fort Wayne, IN 46804

MARANTZ CO., INC., Subs. Superscope, Inc.

P.O. Box 99, Sun Valley, CA 91352

MATRECS INDUSTRIES

805 Woodman Ave., Winslow, IL 61809

MAXELL CORP. OF AMERICA

60 Oxford Dr., Moonachie, NJ 07074

MEMOREX CORPORATION

P.O. Box 420, Santa Clara, CA 95052

MERITON ELECTRONICS, INC.

P.O. Box P62, Woodridge, NJ 07075

MITSUBISHI AUDIO SYSTEMS, Melco Sales Inc.

3030 E. Victoria St., Compton, CA 90221

MOTOROLA INC.

1299 E. Algonquin Rd., Schaumburg, IL 60196

MURA CORP.

177 Cantigue Rock Rd., Westbury, NY 11590

MXR INNOVATIONS INC.

P.O. Box 722, Rochester, NY 14603

NAGY RESEARCH PRODUCTS

P.O. Box 289, McLean, VA 22101

NAKAMICHI RESEARCH (USA), INC.

220 Westbury Ave., Carle Place, NY 11514

NEUMANN, Gotham Audio Corp.

741 Washington St., New York, NY 10014

NORTRONICS COMPANY, INC.

8101 Tenth Ave. N., Minneapolis, MN 55427

OLYMPUS CORPORATION OF AMERICA

2 Nevada Dr., New Hyde Park, NY 11040

ONKYO U.S.A. CORP.

42-07 20th Ave., Long Island City, NY 11105

OPAMP LABS INC.

1033 N. Sycamore Ave., Los Angeles, CA 90038

OPTONICA, Sharp Electronics

10 Keystone Pl., Paramus, NJ 07652

ORBAN ASSOCIATES INC.

645 Bryant St., San Francisco, CA 94107

OTARI CORPORATION

981 Industrial Rd., San Carlos, CA 94070

PANASONIC, Matsushita Electric Corp. of America

One Panasonic Way, Secaucus, NJ 07094

PHILIPS HIGH FIDELITY LABS, LTD.

P.O. Box 2208, Ft. Wayne, IN 46801

PICKERING AND COMPANY, INC.

101 Sunnyside Blvd., Plainview, NY 11803

PIONEER, U.S. Pioneer Electronics Corp.

75 Oxford Dr., Moonachie, NJ 07074

PIONEER ELECTRONICS OF AMERICA

1925 E. Dominique St., Long Beach, CA 90810

POLYFUSION, INC

160 Sugg Rd., Buffalo, NY 14225

POWERCOM CORPORATION

P.O. Box 454, Troy, NY 12181

QUASAR ELECTRONIC CORP.

9401 W. Grand Ave., Franklin Park, IL 60131

RCA

2000 Clements Bridge Rd., Deptford, NJ 08096

REALISTIC, Radio Shack

2617 W. 7th Street, Fort Worth, TX 76107

RECOTON CORPORATION

46-23 Crane St., Long Island City, NY 11101

RHAPSODY, Alaron, Inc.

185 Park St., Troy, MI 48084

ROBINS INDUSTRIES CORP.

75 Austin Blvd, Commack, NY 11725

ROTEL OF AMERICA INC.

2642 Central Park Ave., Yonkers, NY 10710

ROYAL SOUND COMPANY, INC.

409 N. Main St., Freeport, NY 11520

RUSSOUND/FMP, INC.

Foot of Canal St., North Berwick, ME 03906

SAE, Scientific Audio Electronics, Inc.

701 E. Macy Street, Los Angeles, CA 90012

SANKYO SEIKI (AMERICA) INC.

149 Fifth Ave., New York, NY 10010

SANSUI ELECTRONICS CORP.

55-11 Queens Blvd., Woodside, NY 11377

SANYO ELECTRIC INC.

1200 W. Artesia Blvd., Compton, CA 90220

SCOTCH, 3M Company

3M Center, St. Paul, MN 55101

SEARS ROEBUCK & CO.

Sears Tower, Chicago, IL 60684

SENNHEISER ELECTRONIC CORP.

10 West 37th St., New York, NY 10018

SHARP ELECTRONICS

10 Keystone Place, Paramus, NJ 07652

SHURE BROTHERS, INC.

222 Hartrey Ave., Evanston, IL 60204

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Directory Of Manufacturers

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SONY CORP. OF AMERICA
9 W. 57th St., New York, NY 10019

SONY FROM SUPERSCOPE, Superscope, Inc.
20525 Nordhoff St., Chatsworth, CA 91311

SOUND CONCEPTS INC.
P.O. Box 135, Brookline, MA 02146

SOUNDCRAFTSMEN
1721 Newport Circle, P.O. Box 2361, Santa Ana, CA 92705

SOUND WORKSHOP
1324 Motor Parkway, Hauppauge, NY 11787

SOURCE ENGINEERING
Box 506, Wilmington, MA 01887

SPARKOMATIC CORP.
Milford, PA 18337

SPECTRO ACOUSTICS, INC
1308 E. Spokane St., Pascoe, WA 99302

STANTON MAGNETICS, INC.
Terminal Dr., Plainview, NY 10803

STAX, American Audioport, Inc.
1407 N. Providence Rd., Columbia, MO 65201

STUDER/REVOX
1819 Broadway, Nashville, TN 37203

SUPEREX ELECTRONICS CORP.
151 Ludlow St., Yonkers, NY 10705

SUPERSCOPE, INC.
20525 Nordhoff St., Chatsworth, CA 91311

TANDBERG OF AMERICA INC.
Labriola Court, Armonk, NY 10504

TASCAM, Teac Corporation of America
7733 Telegraph Rd., Montebello, CA 90640

TDK ELECTRONICS CORP.
755 Eastgate Blvd., Garden City, NY 11530

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

TECHNICS BY PANASONIC
One Panasonic Way, Secaucus, NJ 07094

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

TOSHIBA AMERICA, INC.
280 Park Avenue, New York, NY 10017

TURNER DIV., Conrac Corp.
909 17th Street, N.E., Cedar Rapids, IA 52402

UHER OF AMERICA INC.
85 Laurence St., Hackensack, NJ 07604

VOR INDUSTRIES
1440 S. State College Blvd., Unit 5-H, Anaheim, CA 92806

WEBCOR, Leisurecraft Products Ltd.
Plainview, NY 11803

YAMAHA INTERNATIONAL CORP.
Box 6600, Buena Park, CA 90620

ZENITH RADIO CORPORATION
1000 Milwaukee Ave., Glenview, IL 60025

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BASF Studio C-90	2.39
BASF Professional II or III C-90	2.99
Maxell UDXL I or II C-90	2.47
Maxell UDXL I or II C-90	3.47
Maxell UD C-90	2.84
Memorex C-90 3 pk.	5.99 for 3
Scotch C-90 3 pk.	4.99 for 3
Scotch Master II or III C-90	3.25
Sony Ferracore C-90	2.22

Write for our SUPER low prices on other Maxell Tapes not listed.
Minimum Order 12 Tapes - 100% Guaranteed.

CARTRIDGES
audio-technica.

AT-20 SLA	120.00
AT-15 SLA	78.00
AT-14 SLA	45.00
AT-12 SLA	28.00
AT-10	12.00

STANTON

8815	72.50
8815EE S	54.00
8815EE	42.50
880EE	26.50
500EE	14.40

EMPIRE

2000Z	60.00
2000T	30.00
2000H	18.25
2000II	15.00

SHURE

V15 Type IV	90.00
V15 II	63.50
M56ED	26.50
M57ED	21.00

PICKERING

XSV 3000	42.95
XV-15 1200E	34.40
XV-15 625E	19.18
XV-15 400E	18.35

HEADPHONES
audio-technica.

AT 701	28.40
AT 702	38.40
AT 703	51.20
AT 705	63.90
AT 706	95.88

SHURE

SHURE	24.99
HD 414X	38.97
HD 424X	59.95

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(212) 732-8600—Write For Free Catalog.

CIRCLE NO. 3 ON READER SERVICE CARD

9 VIDEO CASSETTE RECORDERS

SEARS

Betavision Video Cassette Recorder

Color videocassette recorder with Beta cassette format for three-hour recording; built-in digital clock/timer with LED read-out; remote pause control; flashing pause indicator; switchable r-f; one-lever record operation; memory control with digital timer; tracking control; microphone jack; lighted VHF and UHF channel selectors with fine tuning controls; walnut-woodgrained vinyl-on-metal cabinet; optional black-and-white video camera available..... \$985

SONY

Betamax SL-8600 VCR

Color video cassette recorder with Beta cassette format for three-hour recording; LED clock timer; record/pause indicator; remote pause with 20-ft cord; tape counter with memory; VHF and UHF channel selectors with numeral read-out; rotary two-head helical scan recording system; optional black-and-white sound camera available; 7 1/8" H x 18 3/4" W x 16 1/8" D..... \$1095
SL-8200. Similar except two-hour recording \$1055

TOSHIBA

V-5310 Video Cassette Recorder

Color videocassette recorder with Beta cassette format for three-hour recording; built-in fully electronic LED timer; remote pause control; audio-voice dubbing control; capstan-servo drive mechanism..... \$995
With optional IK-12 color video camera with built-in condenser microphone, vidicon pick-up tube, and low-light F/0.85 lens..... \$1700

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INTRODUCING THE TEAC C-1.

We took a data recorder made for computers and built a cassette deck made for connoisseurs.



If you're critical about what you listen to, you should see the new TEAC C-1.

The C-1 has a transport directly derived from recorders built by our Instrumentation Division for the world's major computer manufacturers.

Its motors are rated for thousands of hours of continuous use. Servo controls have a reliability factor of 10^9 and function switches are built to withstand repeated use in excess of 100,000 times.

WHY THE TRANSPORT IS SO IMPORTANT

For the C-1 to deliver the kind of virtuoso performance we promise, it has to meter—not pull—tape with the utmost reliability. And that's a matter of mechanics, not electronics.

The sad fact is, many tape recorders are built by electronics companies with a short history of transport design. And transport mechanics is where most tape recorders break down.

Transport design—using materials that move and interact—is no simple science. It's an art that takes a long time to learn.

The art of mechanical design is one we've been practicing for

more than 25 years. And it reaches a high point with the C-1.

THE TRANSPORT

The C-1 transport is a 3-motor/3-head dual capstan system. The closed loop dual capstans are linked with twin belts to produce a wow and flutter spec of just 0.04%. The capstan motor is phase-locked loop, so it's free from voltage and frequency fluctuations.

C-1 pinch rollers are self-adjusting to get optimum tape pressure onto the capstans. Transport controls are LSI logic-operated and positive. Separate right and left input controls are cross-gearred with friction coupling for one-hand control of channels.

A pitch control lets you vary tape speed up to $\pm 4\%$ (because tapes you get from others may not be as accurately recorded as those you give).

THE ELECTRONICS

There isn't a cassette deck made that can beat this combination of specs: overall frequency response with CrO₂—20-20kHz, other—20-18kHz; Wow and Flutter—0.04% NAB, weighted; and Signal-to-Noise ratio—-70dB with Dolby at 5kHz and up to -90dB with optional dbx interface module (Rx-8).

Another unique feature to the C-1, are plug-in bias EQ/cards that let you optimize the electronics to a specific brand of tape. Additional cards are available for various brands of tape. For distortion-free recording, peak program meters respond to signals with an attack time of 10 milliseconds in all audio frequencies and give you an accurate display of peak level up to +5dB.

Other C-1 features include an input selector switch for Mic/Mic-with-attenuation (20dB pad)/Line; a timer control for automatic record/playback start; a memory function for Auto-Stop/Repeat; and a folding stand for vertical or angled use. Naturally, the C-1 can also be rack mounted.

HOW MUCH

The TEAC C-1* has a suggested list price of \$1300, a lot of money by some standards. But when you consider its computer/instrumentation heritage—and what that means in terms of how long and how well it will run—it could be the most inexpensive tape recorder you can buy.

TEAC®

First. Because they last.

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*Also available in brushed aluminum.

TEAC Corporation of America • 7733 Telegraph Road • Montebello, CA. 90640 • In Canada TEAC is distributed by White Electronic Development Corporation (1966) Ltd.

CIRCLE NO. 14 ON READER SERVICE CARD

THE JVC CASSETTE DECK.

It gives you more of what the others wish they could.

Cassette recording takes a giant step forward with the new series of JVC cassette decks. Each is designed to give you everything you need to get the most out of any tape. And there are totally new features to help you make better-sounding cassettes.

Exclusive Spectro Peak Indicator System.

With almost recording studio vigilance, 25 instant-responding LED indicators offer fail-safe protection against distortion produced by tape over-saturation. For the first time, you can constantly visually monitor the levels of five low-to-high musical frequency ranges. Then, on playback, the Spectro Peak Indicator actually lets you see how accurately the deck has performed.

Expanded Dynamic Range and Better Noise Reduction.

Our Super ANRS circuitry applies compression in recording and expansion in playback to improve dynamic range at higher frequencies. So distortion is eliminated in sudden high peaks of any musical

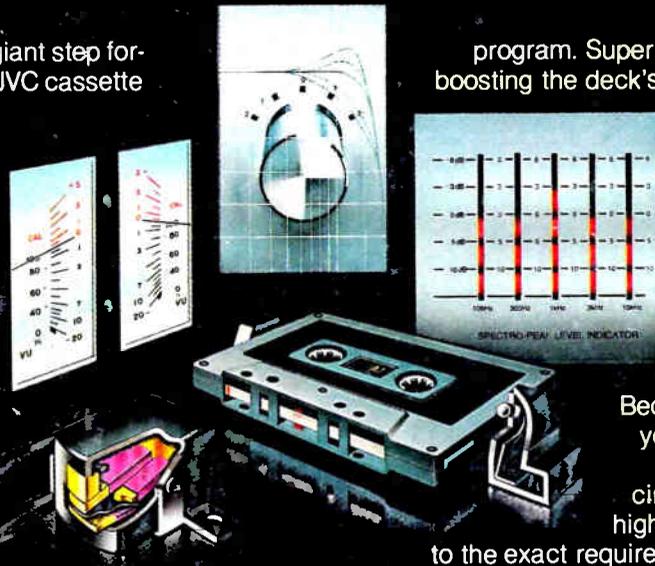
program. Super ANRS also reduces tape hiss by boosting the deck's signal-to-noise ratio by as much as 10dB over 5000Hz.

New Head Design.

Our refined Sen-Alloy head gives you the sensitive performance of permalloy head construction, combined with the extreme longevity of ferrite, for bright, full-sounding recordings.

Get the most out of any tape

Because whichever type you select, you'll extract the most from it with our special recording equalizer circuit that lets you "fine tune" the high frequency response of the deck to the exact requirements of the tape. These innovations alone set JVC cassette decks apart from all the others. Then, when you consider our other refinements, like precision-ground capstans, gear/oil-damped cassette doors, multi-peak LED indicators, independent drive mechanisms, plus top performance specifications, you can understand why we say that JVC gives you more of what other decks wish they could. Visit your JVC dealer and you'll hear why.



Top: KD-65, KD-55, KD-25. Bottom: KD-10, KD-1770 II, KD-1636 II. Not shown: KD-2, KD-3030, KD-S201.

JVC
We build in what the others leave out.

