Stereo Review's

$2.50

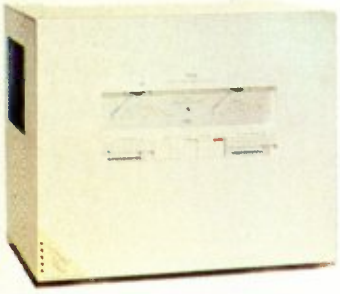
TAPE RECORDING & BUYING GUIDE® 1980

COMPLETE DIRECTORY OF TAPE MACHINES & ACCESSORIES
CASSETTE · OPEN REEL · CAR STEREO · VIDEO · MICROPHONES
LATEST PRICES · FEATURES · SPECIFICATIONS · PHOTOS

ALSO: SETTING UP A HOME RECORDING STUDIO
USING CASSETTES CREATIVELY · METAL TAPE UPDATE
TEST REPORTS...AND MORE

0 05
14024 14262
Tape Recording Guide

For those who seek perfection



STAX CLASS A

The first commercial class A's are now improved:
Faster slew rate
Better transient coupling
IM/HD of less than .007% at 20kHz.

DA-300(a): 150x2 rms watts. Discriminating power. (above)

DA-80M(a): 90 watts rms mono. The absolute ultimate sub-woofer amp. A pair does just about anything. (right)

DA-80(a): Dual power supply for discriminating audiophiles. 45x2 watts rms (left)

SR-44 Earspeakers (above): An outrageous bargain at $110. This electret outperforms others at twice the price.

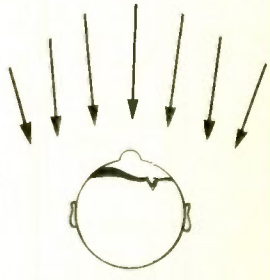
SR-X MkIII Earspeakers (right): The world's reference electrostatic headset.

UA-7cf Tonearm: Non-glorious excellence.

NEW CP-Y Capacitance Cartridge: Proper CP-Y setting renders all other cartridges to lifeless blah. $560 with power supply/adaptor

Introducing the **Stax SR-Sigma,** the Spatial Replication Earspeaker.

(a) Since music "touches" the ear from multiple directions, and since music is typically a "frontal" directional experience, (b) the "earmuff syndrome" of direct radiating headphones is non-physiological. The "orchestra-in-the-cranium" leaves reality far away, and instrument placement is impossible. (c) Enter the Stax SR-Sigma! It "presents" the program to the ears in an algebraically developed angle. Accurate tonal bases—instrument placement—physiological accuracy—all characterize the Stax SR-Sigma Electrostatics. $450 with SRD-7 adaptor.



American Audioport, Inc., Columbia, MO 65201.

STAX

CIRCLE NO. 12 ON READER SERVICE CARD

Secrets of the Tape of the Stars

High-tensile strength leader staking prevents leader/hub detachment.

Graphite-impregnated Teflon® friction plates for smooth tape wind.

Head-cleaning leader tape keeps recorder heads clean.

Felt pad and beryllium/copper spring assembly for precise tape to head contact.

Precision guide rollers with stainless steel pins provide smoother tape movement with minimal friction.

True-Track™ fore-and-aft guide system for precise azimuth control.

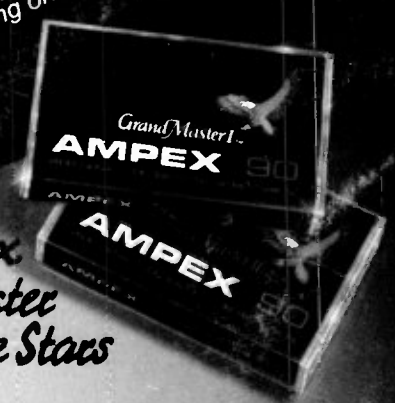
Revealed.

More top albums, by more top stars, are mastered on Ampex professional recording tape than on all other tapes combined. What's our secret? Star quality.

We invented Grand Master™ studio recording tape in 1973, to meet the super-critical demands of the most demanding professional recording engineers. Grand Master's unprecedented output sensitivity, ultra-wide dynamic range, improved signal-to-noise ratio and lower distortion quickly made it the unquestioned leader in its field.

Now Grand Master is available for home use, too. So you can take advantage of the bias flexibility, higher output and low distortion of today's dramatically improved home recording systems.

Get the same star quality at home that the top stars insist on in the studio. Whether you choose normal or high-bias cassette, you'll be recording on the one component that never needs upgrading. Ampex Grand Master tape.

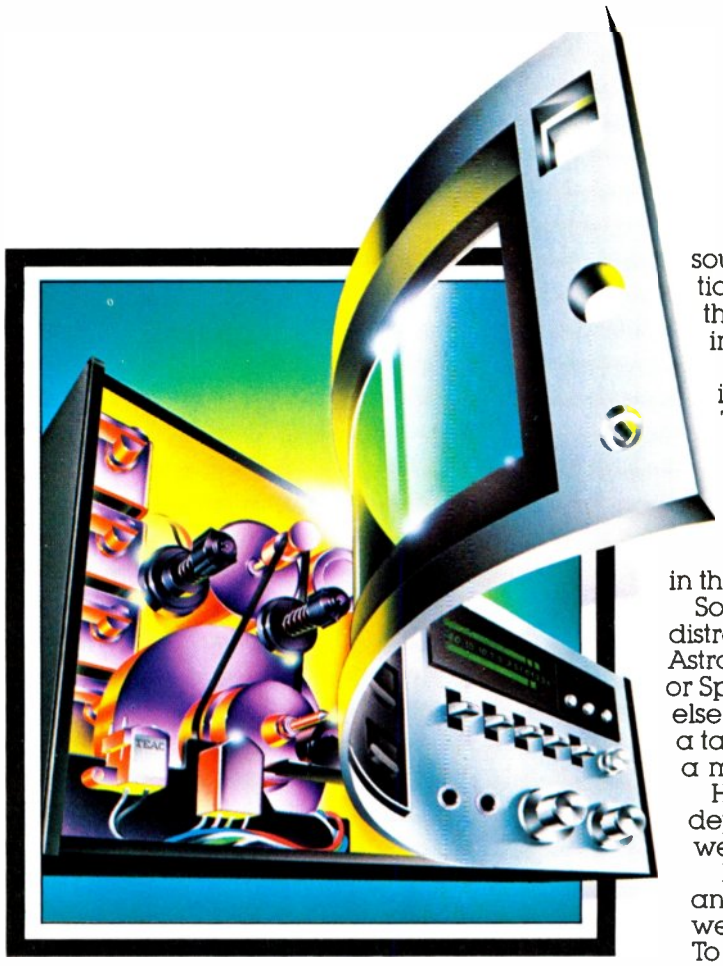


Ampex
Grand Master
The Tape of the Stars

CIRCLE NO. 22 ON READER SERVICE CARD

AMPEX CORPORATION Magnetic Tape Division Redwood City CA (415) 367-3888

WE'VE GOT THE GUTS.



Look inside any tape recorder and you'll find the parts that really matter. The parts that define the ultimate quality of your sound. The transport mechanism.

Transports must work in a world of micro-tolerances. A millionth of an inch error can ruin your audio quality. Because when the transport errs, no amount of electronic wizardry can replace the lost fidelity.

Consider the TEAC transport. Capstans formed on computer-controlled lathes and perfected on industrial micro-grinders. Massive flywheels, inertially balanced. Solenoids typically twice the size and power of those used in other decks. Belts that are tested for dimensional stability under the most severe temperature, humidity and atmospheric conditions.

The results of this specialized design and manufacturing technology are unusually high levels of accuracy, stability and durability. Proven qualities that make a TEAC sound better initially and maintain its sonic integrity after years of use.

Often, to reach these performance criteria, we've found current state-of-the-art concepts lacking. So through the years, we've introduced new technologies.

Like the first cassette deck with integral Dolby* noise reduction in 1971. And the first cassette transport to break the 0.1% wow & flutter barrier in 1973. Designs that helped make the cassette deck a respectable high fidelity component.

Today, we're producing cassette components with instrumentation drive systems. Mechanisms taken right out of our own data recorders. These transports are built to withstand continuous read/write use in computer installations. Where megadollars are at stake. And reliability is everything.

Soon you'll see the first popularly priced cassette decks with integral dbx** noise elimination. Originally designed for open reel recorders in professional recording studios, the dbx system gives you sound so quiet, so noise-free, it's scary.

Twenty-five years of specialization has taught us that design balance is critical for quality sound reproduction. So you'll find that balance in every TEAC.

The proof is in the results. That's why more professional recordists rely on TEAC machines than any other make in the world.

So next time you're distracted by an Astro-this, Fluoro-that or Spectro-something else, remember: a tape recorder is a machine.

How well it works depends on how well it's made.

Look into a TEAC, and you'll find that we've got the guts. To show you what's inside. To let you evaluate our performance. To make you the final judge.

To us, it's a matter of craftsmanship. To you, a matter of decision. Because when you peel away the bells and whistles, you find the real measure of every tape recorder. Especially ours.

For more information, see your TEAC Audio dealer.

Or write us at Dept. O-8.

*Dolby is a registered trademark of Dolby Laboratories.
**dbx is a registered trademark of dbx, inc.

TEAC®

10 BLANK TAPE & ACCESSORIES

SUPEREX

TSB-3 Graphic Tape Switching Console

Stereo tape switching console features color-coded tape duplication processes graphically illustrated on front panel; three-deck capability; functions include duplicating recordings or broadcasting on three tape decks, mixing two sources for documentary effect, and transfer of program material from one tape deck to another while monitoring and recording additional different program source; both inputs and outputs include stereo, one amplifier, and three tape decks or auxiliary components; dubbing bank for use with any stereo amplifier or receiver with monitoring facilities; controls include three input and three output toggle switches and one output line selector toggle switch; rear-panel phone jacks; 2¾" H × 6¼" W × 4¾" D $50.00

TDK

HD-11 Tape Head Demagnetizer

Portable hand-held universal tape head demagnetizer designed for open-reel or cassette tape decks; red LED "on" indicator and green LED "ready-to use" indicator; side-mounted activator switch; plastic-covered metal tips; included two 1.5 V dry-cell batteries $34.99

HD-01 Head Demagnetizer

Automatic head demagnetizer housed in transparent cassette shell with surface-mount LED indicator to show demagnetization is taking place; self-contained battery $21.99

HC-1 Head Cleaner

Cassette tape machine head cleaner $1.69

TAPE RECORDING & BUYING GUIDE 1980 ADVERTISERS INDEX

(Continued from p. 4)

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.
85 Oxford Dr., Moonachie NJ 07074

PIONEER ELECTRONICS OF AMERICA
1925 E. Dominguez St., Long Beach, CA 90810

POLYFUSION, INC
160 Sugg Rd., Buffalo, NY 14225

QUADRAFLEX
1301 65th St., Emeryville, CA 94608

QUASAR ELECTRONICS CORP.
9401 W. Grand Ave., Franklin Park, IL 60131

RCA
2000 Clements Bridge Rd., Deptford, NJ 08096

RCA (Video Cassette Recorders)
600 North Sherman Dr., Indianapolis, IN 46201

REALISTIC, Div. of Tandy Corp.
1400 One Tandy Center, Fort Worth, Tx 76102

RECOTON CORPORATION
46-23 Crane St., Long Island City, NY 11101

RHAPSODY, Aaron, Inc.
185 Park St., P.O. Box 550, Troy, MI 48084

RKO NATIONAL TAPE SERVICE INC.
3 Fairfield Crescent, West Caldwell, NJ 07006

ROTEL OF AMERICA, INC.
1055 Saw Mill River Rd., Ardsley, NY 10502

ROYAL SOUND COMPANY, INC.
248 Buffalo Ave., Freeport, NY 11520

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.
1250 Valley Brook Ave., Lyndhurst, NJ 07071

SANYO ELECTRIC INC.
1200 W. Artesia Blvd., Compton, CA 90220

SCHMEGG ELECTRONICS, INC.
8115 Berg St., Roseville, CA 95678

SCOTCH, 3M Company
3M Center, St. Paul, MN 55101

H.H. SCOTT, INC.
20 Commerce Way, Woburn, MA 01801

SENNHEISER ELECTRONIC CORP.
10 West 37th St., New York, NY 10018

SHARP ELECTRONICS CORP.
10 Keystone Place, Paramus, NJ 07652

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

SIGNET, Div. of Audio Technica US, Inc.
33 Shiawassee Ave., Fairlawn, OH 44313

SONTEC ELECTRONICS
10120 Marble Court, Cockeysville, MD 21030

SONY CORP. OF AMERICA
9 W. 57th St., New York, NY 10019

SOUND CONCEPTS INC.
P.O. Box 135, Brookline, MA 02146

SOUNDCRAFTSMEN
2200 So. Ritchey, Santa Ana, CA 92705

SOUND WORKSHOP
1324 Motor Parkway, Hauppauge, NY 11787

SPARKOMATIC CORP.
Milford, PA 18337

SPECTRO ACOUSTICS, INC.
3200 George Washington Way, Richland, WA 99352

SPEEDEX, Hydrometals, Inc.
400 South Wyman St., Rockford, IL 61101

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

STAX, American Audioport, Inc.
1407 N. Providence Rd., Columbia, MO 65201

STUDER/REVOX AMERICA, INC.
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

TAPCO
3810 148th Ave. N.E., Redmond, WA 98052

TAPE-ATHON CORPORATION
502 South Isis Ave., Inglewood, CA 90301

TASCAM SERIES by TEAC, 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, Div. of Matsushita Electric Corp. of America
One Panasonic Way, Secaucus, NJ 07094

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

TOSHIBA AMERICA, INC.
280 Park Avenue, New York, NY 10017

TRANSAUDIO, Quadraflex
1301 65th St., Emeryville, CA 94608

UHER BY WALTER ODEMER
1516 W. Magnolia Blvd., Burbank, CA 91506

WEI, Wallace Electronics, Inc.
4921 N. Sheridan Rd., Peoria, IL 61614

WHITE INSTRUMENTS, INC.
P.O. Box 698, Austin, TX 78767

YAMAHA INTERNATIONAL CORP.
Box 6600, Buena Park, CA 90620

ZENITH RADIO CORPORATION
1000 Milwaukee Ave., Glenview, IL 60025

requires PS-100 power supply; 2½" H × 7⅓" W × 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

QM333 The Splicer
Edits, repairs, or adds leader to magnetic tape; designed for ¼-in reel-to-reel, 8-track cartridge, and cassette tapes; slits tape; has pop-out tape guide $14.95

Professional Splicing Blocks
Grooved silver or gold anodized aluminum splicing blocks with two deep slits for straight and diagonal cuts; includes double-backed adhesive and stainless-steel cutting blade; 5¾" × 1" × 5/16".
QM-311. For ¼-in tapes $18.50
QM-312. For 0.150-in cassette tapes $18.50
QM-313. For ½-in video and audio tapes $28.00

Reel Tabs
Pre-cut Mylar or metal tabs in dispenser box; comes in quantities of 50, 200, or 1000.
QM521. ¼-in reel tabs; 50/package $3.40
QM522. Cassette reel tabs; 50/package $3.40
QM524. ¼-in metal-sensing reel tabs; 50/package $3.70

QM-707 Handylap
Kit includes lapping block with five 5 × 9-in coarse abrasive black lapping sheets of paper, five 5 × 9-in medium abrasive yellow sheets, and five 5 × 9-in fine abrasive red sheets $65.00

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 ½-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 Cycolac case; coiled cord $39.00

QM-230 Cassette Bulk Eraser
Self-powered hand-held unit completely erases cassette tapes; requires no batteries or external power source; contoured Cycolac case with wood grain finish $29.00

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; Cycolac case $19.20

QM-280A Cleaner/Demagnetizer
Removes residual magnetism and accumulated oxide and dirt deposits from 8-track heads; includes ac cord for 110-120 V ac operation, 50-60 Hz $19.60

Alignment Tapes
AT-210. For cassette recorders $10.00
AT-200B. Master recording provides zero reference, azimuth alignment, and DIN frequency response tests; includes 3000-Hz tone for speed and flutter $38.80
AT-820. For 8-track; 8-min cycle $10.50
AT-320. Designed for NAB-type endless-loop mono and stereo cartridge recorders/players; 7.5-ips master recording tests and adjusts head azimuth, program frequency response, program record level, stereo head phasing, cue tone sensitivity, and tape speed $46.20
AT-120. ¼-in reel-to-reel 7.5-ips master recording tape $43.60

Cassette Storage/Carrying Cases
Burl walnut vinyl book-like cassette case; cassettes and hubs lock in place.
QM408. Holds max. 8 cassettes $7.00
QM412. Holds max. 12 cassettes $7.80
QM416. Holds max. 16 cassettes $9.50

VCR Maintenance Products
QM-95. VCR maintenance kit includes spray head cleaner, cellular foam swabs, anti-static dustcloth, and screwdriver that removes headcover screws $12.80
VCR-211. Video bulk eraser erases Beta II and VHS-format cassettes; generates 60-Hz magnetic field; touch-activated microswitch that deactivates when put down; Cycolac case; includes ac power cord for 110-120 V ac operation, 50-60 Hz $39.00
VCR-313. Grooved anodized aluminum splicing block for repairing or editing ½-in video cassettes; two deep slits for straight or diagonal cuts; includes double-backed adhesive $28.00

Car Tape Maintenance Products
AS-9. 3-oz spray cleaner and 100 six-in cotton swabs $4.90
AS-141. Cassette life extender features non-abrasive cleaning belt; includes liquid cleaner $3.30
AS-183. 8-track head/capstan cleaner; designed for use every ten hrs; includes liquid cleaner $3.90
AS-206. 8-track/cassette head demagnetizer; plugs into car cigarette lighter $22.90

POLYFUSION

QP-1 Sound-A-Round
Quadraphonic panner; automatically or manually moves sound from channel to channel; permits control of shift speed, direction, and depth of motion effect; joystick included for manual panning; four LED quadrant level indicators; dynamic range 80 dB; S/N 70 dB; frequency response 10-50,000 Hz ±1 dB; THD less than 0.5%; max. input level 16 V p-p; input impedance 100,000 ohms; output level 0-100% of input; output impedance 600 ohms; speed range 0.05-6 Hz; depth range 0-120%; control input impedance 100,000 ohms; control input level 0 to +5 dc; 95-135 V ac, 60 Hz, 130 W max.; 4.5" H × 10" W × 8.5" D $299.95
FP-1. Foot pedal control voltage source $59.95

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 × 8.25" W × 6.25" D $99.95

RECOTON

V-100 Video Tape Storage Cabinet
Holds Betamax and VHS tapes; stores up to 18 video tapes in walnut finish cabinet $39.95

190TC Cartridge Carrying Case
Stores 24 8-track tapes in vinyl- or suede-covered case; padded handle; lock and key $15.95

196TC Cassette Attache Case
Stores 30 cassettes in individual compartments in suede- or vinyl-covered attache case $15.95

CS-8 Cartridge Carousel
Stores 24 8-track cartridges in individual compartments in plastic smoke-finish carousel $10.99

CS-1A Cassette Carousel
Stores 20 cassettes vertically in plastic smoke-finish carousel $5.99

RBM-44 Magicare Demagnetizer
8-track head demagnetizer and cleaner; designed for use after every 15-20 hrs of playing time; operates on standard 110 volt current; UL approved $9.99

RBM-45 Magicare Demagnetizer
Cassette demagnetizer designed for home use after 15-20 hrs of playing time; operates on 110 volt current $9.99

RBM-41 Magic Cartridge Kit
"Magic Cartridge" functions as head cleaner, capstan cleaner, track selector test, speaker phasing test, and channel balance test; includes ¾-oz Magic Tape Dew cleaning fluid and the Magic Wand Applicator with six replacement pads $6.99

RBM-40 Magic Cassette Kit
Includes 10-ft cassette head cleaner in plastic case, ¾-oz Magic Tape Dew cleaning fluid, and Magic Wand Applicator with six replacement pads $5.99

SANSUI

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 ±2 dB (at reverb time min.), 20-30,000 Hz ±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 15/16" H × 11 1/16" W × 10 7/16" D $190.00

SCOTCH

ERK-130 Cassette Edit/Repair Kit
Contains precision splicing block; spindle for manually winding cassette tape; six polyester picks (adhesive tipped for retrieval of tape ends lost in housing); 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
Car saddle $9.95

SPEEDEX

Tape Accessories
31-744. Magnetic tape eraser for reels, cassettes, cartridges, and video tapes; 117 V ac, 60 Hz, 4 A $16.90
31-742. Cartridge and cassette tape demagnetizer designed for use with home recorders and players using standard 4 or 8-track slip-in cartridge; 120 V ac, 50-60 Hz, 7.5 W $8.50
31-740. Tape head demagnetizer fits most reel-to-reel equipment; tip protected with resilient plastic; operates on house current $7.50
31-702. Non-abrasive cartridge head and drive cleaner $3.45
31-700. Cassette tape head cleaner $2.00
31-718. 2-oz bottles of head cleaner and lubricant with silicone; cotton swabs included $2.65

10 ACCESSORIES

Hz −1.5 dB at 7½ ips; recalibrates meter sensitivity due to headroom increase. Available for 3¾-7½ and 7½-15 ips A-77 models; factory-calibrated for bias, equalization at two speeds, record gain; user adjustable in conjunction with A 77 instruction manual.
RVR..... $375
RVP..... $400

AUDIOTEX

The company carries a complete line of tape accessories for use with open-reel, cassette, and 8-track equipment.
30-129. Tape Care Kit, Jr. contains head cleaner, cotton swabs, and cleaning cloth..... $2.70
30-630. "Blast-off" tape head cleaner, 3-oz aerosol can..... $2.00
30-128. Same as 30-630 except in 6-oz aerosol can..... $3.55
30-124-1. Recording head cleaner, 2-oz bottle $1.70
30-124-2. Recording head lubricant, 2-oz bottle $1.70

BIB

90AE Tape Head Demagnetizer
Tape head demagnetizer designed for reel-to-reel and cassette machines $19.95

115AE Tape Head Cleaner
Multi-angled tape head cleaner for use on all tape recorders; includes inspection mirror, cleaning brush, bottle of cleaning fluid, and replacement tips $10.50

24AE Cassette Tape Splicer
⅛-in cassette tape splicer suitable for recording tape of any thickness; makes diagonal or butt splices..... $13.95
¼-in recording tape splicer..... $13.95

CALECTRO

Tape Accessories
04-234. Standard demagnetizer fits most reel-to-reel and cassette equipment; operates on house current; tip protected with resilient plastic ... $7.50
04-235. Cartridge and cassette type demagnetizer designed for home recorders and players using the standard 4 or 8 track slip-in cartridge; operates on house current..... $8.50
04-238. Cassette tape head cleaner $1.55
04-239. Cartridge tape head cleaner; includes two additional belts..... $2.50
04-237. Tape recorder and player maintenance kit contains two 2-oz bottles of head cleaner and lubricant, cleaning brushes, and long handle cotton swabs..... $2.30
04-236. Tape head cleaner lubricant and cotton swabs..... $1.30
04-229. ¼-in tape splicer that makes diagonal splices..... $5.75
04-224. ⅛-in semi-automatic cassette tape splicer $5.75
04-225. ⅛-in cassette metal tape splicer; includes cutting blade..... $3.40
04-230. Metallic sensing tape for use on recorders with electronic switching controls; designed for contact or photo sensing recorders $1.50
04-231. Mylar splicing tape for any type of recording tape; ½" W × 100" L..... $0.88

EL TECH

Take-Finder
Electro-optically triggered tape location sensor system with remote readout and optional remote programmer; designed for commercial and professional reel-to-reel tape equipment. Sensor unit features adjustable elevation mechanism for ¼- to 2-in thick reels; sensor circuit reads motion in either direction; continuously variable sensitivity; has provision for optional remote control unit. Five-digit readout unit reads tape location and tape direction; features built-in memory stop that also triggers internal relay at any number or tape location selected; reset button. Plastic sensor can be mounted over or under tape machine reel; plugs into Search-to-Cue. $425.00
Search-to-Cue. Remote programmer for Take-Finder; automatically locates auto play from zero point and auto rewind from memory point; searches desired point in Take-Finder's stored memory and automatically stops on number $250.00

FIDELITONE

8503 Video Cassette Storage Chest
Solid walnut lacquer-finished partitioned storage chest holds up to 24 VHS video cassettes; thumb-slot opener, kerf-mounted hinge, and dado lid stop. $73.95
8504. Same as 8503 except holds up to 24 Beta video cassettes $69.95
3143. Similar to 8503 except holds up to 12 VHS or Beta video cassettes $54.95

8500 Audio Cassette Storage Chest
Solid walnut lacquer-finished cassette chest holds up to 64 cassettes; has two flocked-vacuum-formed insert trays; thumb-slot opener, kerf-mounted hinge, and dado lid stop..... $81.95

8512 Audio Cassette Carousel
Solid walnut lacquer-finished rotating cabinet holds up to 48 cassettes; has four 12-compartment flocked vacuum formed inserts $47.95

3135-01 Audio Cassette Storage Chest
Solid walnut lacquer-finished cassette chest holds up to 24 cassettes; has flocked-vacuum-formed insert, thumb-slot opener, kerf-mounted hinge, and dado lid stop $39.95
3135. Same as 3135-01 except holds up to 36 cassettes..... $47.95
8505. Similar to 3135-01 except holds up to 12 cassettes..... $21.95
8509. Similar to 8505 without lid; holds up to 36 cassettes..... $19.95
8508. Similar to 8509 except holds up to 24 cassettes..... $17.95
8507. Similar to 8508 except holds up to 18 cassettes..... $14.95
8506. Similar to 8507 except holds up to 12 cassettes..... $12.95

HANDY

96-1178 Magnetic Tape Eraser
Table or hand-held tape eraser for reel, cassette, cartridge, and video tapes; erases in seconds; UL and CSA approved $19.60

Demagnetizers
96-1174. For home cassette or 4 or 8-track recorders/players; plugs in wall outlet; long blunt tip $12.00
96-1172. Head demagnetizer for reel-to-reel and cassette players; plastic coated tip; plugs into house current..... $9.50

96-1150 Tape Splicer
¼-in semi-automatic tape splicer for reel-to-reel tape; cut position for diagonal splicing and trim position..... $6.35
96-1155. Splicing tape with DuPont Mylar base; ½" W × 100" L..... $1.00

Tape Reels
Styrene reels fit all tape recorders/players.
96-1182. Six 3-in reels..... $1.55
96-1184. Two 5-in reels..... $1.50
96-1185. Two 7-in reels..... $2.00

Cleaners
96-1194. Tape head spray cleaner for reel, cartridge, and cassette tapes; 3-oz spray can with 5-in extension tube..... $2.40
96-1196. Tape head cleaner; 1-oz bottle with supply of cotton swabs $1.45
96-1200. Cassette tape head cleaner $1.70
96-1201. 8-track cartridge tape head cleaner; includes two replacement cloth belts..... $2.85
96-1202. Dual-purpose cartridge cleaner cleans play/record heads and drives..... $3.15

LE-BO

VCM-1002 Video Cassette Module
Walnut-finished storage cabinet holds up to 12 VHS, Beta, or V-cord video cassettes in any mix and in or out of cardboard sleeves (slide-out insert accommodates VHS format); features ejector to remove individual cassettes from module; removable index insert; vertically or horizontally stacked; removable smoked plastic interior; 10¾" H × 15¾" W × 6⅞" D..... $46.95
VCM-1000. Storage module minus cabinet. $29.95
VCM-1001. Walnut-finished cabinet $15.95
TA-B1/V1. Four video cassette replacement sleeves for Beta and VHS formats..... $3.95
Company also manufactures an extensive line of cassette and 8-track carrying cases and storage units.

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-32. ½-in splicing tape..... $0.79
TA-30. ¼-in 8-track/open-reel splicing tape . $0.59
TA-31. ⅛-in cassette splicing tape $0.59

MAGNESONICS

Erase-Sure
Erases cassette or 8-track cartridge to 65 dB from 0 reference; includes four "AA" batteries; 2¾" H × 4" W × 3½" D $24.50

Rapid Rewind
Designed to check and test cassettes before recording for cassette tape tension stabilization, tape binding elimination, and uniform tape pack; winds C-60 cassette in 30 sec; includes four "AA" batteries..... $24.50

MR. AUDIO

1002 Tape Head Spray Cleaner
3-oz tape head spray cleaner loosens oxide and dust on tape heads; includes 5-in extension tube.. $2.11
1010. Similar to 1002 except in 1-oz bottle; includes cotton swabs..... $1.58

1015 Mylar Splicing Tape
Dupont Mylar splicing tape with cold setting; pressure-sensitive adhesive; ½" × 100"..... $0.91

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; 2½" H × 7½" W × 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 over 20-20,000 Hz;

1.5 mil $25.99

206-207 Open-Reel Tapes
Polyester base, "Posi-Trak" backing, leader, and trailer.
206. 7-in reel, 60 min at 7½ ips, 1.5 mil . $6.99
207. 7-in reel, 90 min at 7½ ips, 1.0 mil . $8.59

Dynarange Open-Reel Tapes
Provides high-fidelity recording even at 3¾ 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 7½ ips, 1.5 mil $3.59
7-in reel, 60 min $5.49
212. 5-in reel, 45 min at 7½ ips, 1.0 mil . $4.19
90 min, 7-in reel $7.19
213. 7-in reel, 120 min at 7½ ips, 0.5 mil tensilized $10.89
214. 5-in reel, 90 min at 7½ ips, 0.5 mil tensilized $7.19
180 min, 7-in reel $14.29

Highlander Open-Reel Tapes
All-purpose economy tape for vocals as well as speech.
228. 7-in reel, 60 min at 7½ ips, 1.5 mil . $4.79
229. 7-in reel, 90 min at 7½ ips, 1.0 mil . $6.59

Video Cassette Tape

VHS Video Cassettes
1-2 hrs $17.95
2-4 hrs $24.95

SONY

Microcassettes
3MC. 60 min $3.80
MC120. 120 min $3.80

Elcasets
Type-I; SLH tape.
LC-60. 60 min $8.00
LC-90. 90 min $10.60
Type-II; FeCr tape.
LC-60. 60 min $10.60
LC-90. 90 min $12.80

FeCr Series Cassettes
Normal or FeCr bias; FeCr equalization.
C-46. 46 min $4.20
C-60. 60 min $4.60
C-90. 90 min $5.90

EHF Series Cassettes
C-46. 46 min $3.60
C-60. 60 min $4.00
C-90. 90 min $5.60

SHF Series Cassettes
C-46. 46 min $3.30
C-60. 60 min $3.70
C-90. 90 min $5.00

HFX Series Cassettes
Normal bias; normal or 120 μsec equalization.
C-46. 46 min $2.90
C-60. 60 min $3.10
C-90. 90 min $4.40
C-120. 120 min $6.00

LNX Series Cassettes
Normal bias; normal or 120 μsec equalization.
C-46. 46 min $1.95
C-60. 60 min $2.15
C-90. 90 min $3.10
C-120. 120 min $4.00

8-Track Cartridges
8T-46HF. 46 min $3.30
8T-46HF-C. 46 min $3.30
8T-90HF. 90 min $4.20
8T-90HF-C. 90 min $4.20

Open-Reel Tapes
FeCr Series.
7-550BL. 90 min $14.00
11-1100BL. 180 min $39.00
ULH Series.
72-370BL. 60 min $9.00
7-550BL. 90 min $11.50
11-1100BL. 180 min $31.00

Video Cassette Tape

Video Cassettes
Betamax format.
L-125-C. 15/30 min $10.95
L-250-C. 30/60 min $12.45
L-500-C. 60/120 min $16.95
L-750-C. 90/180 min $20.95

STUDER/REVOX

621 Magnetic Tape
Low-noise high-output mastering tape; highly compliant; 3600 ft on silver or black NAB metal reel; packaged in Novodur library box $36.00

TDK

"MA-R Metal" Cassettes
Housed in die-cast metal shell; special bias/equalization.
MA-RC60. 60 min $12.99

"Super Avilyn" Cassettes
Features new magnetic particle (Avilyn); high S/N; low distortion; uses CrO_2 bias and equalization.
SA-C60. 60 min $3.99
SA-C90. 90 min $5.69

"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-C45. 45 min $2.89
AD-C60. 60 min $3.09
AD-C90. 90 min $4.49
AD-C120. 120 min $6.19

"Dynamic" Cassettes
Features dynamic performance and durable mechanics; polyester back.
D-C30. 30 min $1.79
D-C45. 45 min $1.99
D-C60. 60 min $2.19
D-C90. 90 min $3.09
D-C120. 120 min $3.79
D-C180. 180 min $5.39

"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 $4.19
EC-30S. 30 sec $4.29
EC-1. 1 min $4.39
EC-3. 3 min $4.49
EC-6. 6 min $4.99
EC-12. 12 min $5.99

"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 $4.09
8TR-90AD. 90 min $5.29

Dynamic 8-Track Cartridges
Full-fidelity 8 track cartridges.
8TR-45D. 45 min $3.29
8TR-90D. 90 min $3.99

"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 $7.59
L-1800. 1800-ft, 7-in reel $9.39
L-3600P. 3600-ft, 10½-in plastic reel .. $21.99
L-3600M. 3600-ft, 10½-in metal reel ... $26.59

"Audua-LB" Open-Reel Tape
Back-treated open-reel tape; high bias equalization.
LB-1800. 1800-ft, 7-in plastic reel $11.49
LB-3600. 3600-ft, 10½-in NAB metal reel $31.29

S Open-Reel Tape
Open-reel tape with reproduction characteristics of SD cassettes.
S-1200 ..... $6.89
S-1800 ..... $7.69

Video Cassette Tape

Super Avilyn VHS
VAT-120. 2-4 hr $27.95
VAT-90. 1½-3 hr $24.50
VAT-60. 1-2 hr $20.00
VAT-30. ½-1 hr $17.30

Super Avilyn Beta
BAL-500. 1-2 hr $19.95
BAL-250. ½-1 hr $14.95

10 ACCESSORIES

ALLSOP

Allsop 3 Cassette Deck Cleaner
Cassette deck cleaning kit designed to clean pinch roller, capstan, and head in 20-40 sec; cleaner has two non-abrasive felt pads and ribbonless wiper arm; includes cassette sized cleaner and cleaning solution $5.95

R.B. ANNIS

K20/B5 Han-D-Kit
Kit's purpose to measure and eliminate magnetism in recorder components before recorded tapes are damaged; includes gauss calibrated (5-0-5) pocket magnetometer that measures level of magnetism, magnetically soft and magnetically hard test sensor strips, 1¾-in clip-on extension probe, and dual-use demagnetizer with 350-oersted sine wave demagnetizing field strength ¼-in beyond tip of 2¼-in long probe $38.50
K25/S5. Same as K20/B5 except includes larger jewelled magnetometer with ten times calibration level; 400-oersted sine wave demagnetizing field strength $65.80

Company also sells individual components of kit separately as well as different gauss ranges of the 20 and 25 magnetometers.

ASPEN

The company carries a complete line of tape accessories for use with open reel, cassette and 8 track equipment
Head Cleaner Kit $3.29
Wipe Heads (25 per package) $0.99

Decktester
8-track cartridge for home and auto use to check 8-track tape decks for tape speed time, speaker rattle, speaker phasing, wow and flutter, head alignment, crosstalk, channel switching, and worn heads $8.95

AUDIONICS

RVR-RVP Series Drop-In Modules Kits
User-replacement electronics kits designed to improve noise specifications of the non-Dolbyized Revox A 77 tape decks by 1.5 dB; kits include record and playback drop in modules and externally fitted bias-trap network. A 77 improvements with modules: record amp overloads at min. 6 dB above saturation levels of any tape at any frequency; THD 0.2% at 6 dB above saturation; response at 20,000

10 BLANK TAPE

Low-Noise Open-Reel Tape
1. 5-mil polyester, (normal bias).
- LN-50-60. 1200-ft, 7-in reel $8.70
- LN-50-120. 2500-ft, 10½-in reel $24.70

1-mil polyester
- LN-35-90. 1800-ft, 7-in reel $10.00
- LN-38-180. 3600-ft, 10½-in reel $28.00

0.5-mil polyester
- LN-25-120. 2400-ft, 7-in reel $14.95
- LN-18-180. 3600-ft, 7-in reel $21.25

Ultra-Dynamic Open-Reel Tape
Ultra-dynamic, high-energy type, (normal bias).

1.5-mil polyester
- UD50-60. 1200-ft, 7-in reel $9.95
- UD50-120. 2500-ft, 10½-in reel $28.30

1-mil polyester
- UD35-90. 1800-ft, 7-in reel $11.50
- UD35-180. 3600-ft, 10½-in reel $31.90

Professional Epitaxial Open-Reel Tape
Back-coated, ultra-dynamic, high energy, normal bias type.

1.5-mil polyester
- UD-XL 50-60B. 1200-ft, 7-in reel $12.45
- UD-XL 50-120B. 2500-ft, 10½-in reel .. $33.75

1-mil polyester
- UD-XL 35-90B. 1800-ft, 7-in reel $14.00
- UD-XL 35-180B. 3600-ft, 10½-in reel .. $38.50

Tape Accessories
- 7-in plastic reel $4.75
- 7-in precision metal reel $10.50
- 10.5-in precision metal reel $16.50
- 12 cassette plastic storage box $5.95
- 12 8-track plastic storage box $5.95
- Tape recorder care kit $8.95
- Care kit replacement fluid and pads $3.49

Video Cassette Tape

VHS Epitaxial Videocassette
Cobalt-ferric oxide formulation; ½ in; mirror-finished tape surface and binder system keep head wear to a minimum.
- T-60. 1-2 hrs $19.95
- T-120. 2-4 hrs $28.50

U-matic Videocassette
¾ in.
- KCA-30. 30 min $28.50
- KCA-60. 60 min $41.50

Open Reel Video Tape
½ in EIAS Standard.
- VT-5B. 30 min $19.00
- VT-7B. 60 min $30.00

MEMOREX

HIGH BIAS Cassettes
Ferrite crystal oxide formulation for high bias (chrome/CrO_2) setting; 70-μsec equalization with 4-5 dB noise reduction at high frequencies; built-in hub lock design accepts cassette from either direction; case has snap-lock hinge and overlapping lid.
- HB-60. 60 min $4.39
- HB-90. 90 min $5.99

MRX_3 Cassettes
- C-30. 30 min. $2.59
- C-45. 45 min. $2.79
- C-60. 60 min. $2.99
- C-90. 90 min. $4.49
- C-120. 120 min. $5.99

8-Track Cartridges
- 45 min. $2.99
- 60 min. $3.29
- 90 min. $3.59

Accessories
- Tape recorder care kit $8.99
- 8-track head/capstan cleaner $3.29
- Cassette cleaning kit $2.99
- 8-track head cleaner $1.99
- Cassette head cleaner $1.99

Video Cassette Tape

VHS™ Video Cassettes
½ in; low video noise/high r-f output; high Chroma output/low Chroma noise; features dust-proof plastic case with pressure-sensitive labels and removable black sleeve.
- T-60. 1-2 hrs $19.99
- T-120. 2-4 hrs $27.99

NAKAMICHI

ZX Cassette Tape
Metalloy (metal-particle) formulation for use with metal-compatible decks only; features ultra-high coercivity and retentivity for improved distortion and MOL; 70 μsec equalization.
- C60 ..... $9.75

SX Cassette Tapes
Single-coated; ionized cobalt and ferric oxide formulation; high coercivity permits use of CrO_2 bias and equalization (70 μsec) for 4-5 dB better S/N.
- C60 ..... $5.50
- C90 ..... $7.20

EX II Cassette Tapes
Single-coated; ferricobalt formulation; same bias and equalization (120 μsec) as EX tape; extra-low noise, high output.
- C60 ..... $5.20
- C90 ..... $7.00

EX Cassette Tapes
Specially formulated ferrocrystal 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

PANASONIC

Video Cassette Tape

VHS Video Cassettes
- NV-T60. 1-2 hr $17.95
- NV-T120. 2-4 hr $24.95

QUASAR

Video Cassette Tape

VX-Format
- VC-60. 1 hr $18.95
- VC-120. 2 hr $26.95

VHS-Format
- VC-T60. 1-2-3 hrs $18.95
- VC-T120. 2-4-6 hrs $26.95

RECOTON

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

RKO TAPE

Broadcast I Cassettes
Ferric formulation; normal bias; 120 μsec equalization; housed in five-screw polystyrene shell with sealed hard plastic windows.
- C-60. 60 min $3.79
- C-90. 90 min $5.75

SCOTCH

Metafine Cassettes
Fine metal magnetic particle formulation; delivers max. output up to 10 dB better than typical chrome tapes and up to 7 dB greater than oxide tapes; low distortion, added high frequency response, and improved S/N.
- 45 min $6.25
- 60 min $6.95
- 90 min $8.95

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 $3.29
- 60 min $3.59
- 90 min $4.69

Master II Cassettes
Features chrome equivalent modified ferric oxide for use with recorders operating in the CrO_2 or 70 μsec equalization position; improved cassette shell for critical mechanical performance and three-head recorder equipment; 3-dB S/N improvement over current CrO_2 cassettes; album or "C-Box" packaging (40 cents additional for "C-box" packaging)
- 45 min (album only) $3.89
- 60 min $4.19
- 90 min $5.29

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) $3.89
- 60 min $4.19
- 90 min $5.29

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 $2.39
- 60 min $2.79
- 90 min $3.89
- 120 min $5.39

Highlander Cassettes
Low-noise oxide formulation for all-purpose cassette use; polyester base.
- 45 min $1.49
- 60 min $1.69
- 90 min $2.49
- 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 7½ ips, 1.5 mil $9.95
- M7R-2400. 7-in reel, 90 min at 7½ ips, 1.0 mil $12.95
- M10R-3600. 10½-in reel, 120 min at 7½ ips,

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✓41089 BUYING GUIDE TO AUTO SOUND EQUIPMENT
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✓41091 DIRECT-TO-DISC RECORDINGS
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10 BLANK TAPE

DENON

DX5 Cassettes
Ferric/cobalt formulation; 70-μsec equalization; ferri-chrome position.
- FC-46. 46 min $4.50
- FC-60. 60 min $5.00
- FC-90. 90 min $7.00

DX3 Cassettes
Double-coated ferric oxide formulation; 120-μsec equalization; normal position.
- NC-46. 46 min $3.50
- NC-60. 60 min $4.00
- NC-90. 90 min $5.60

DUPONT

Video Cassette Tape

Crolyn Video Cassettes
U-matic format; chromium dioxide; S/N 50 dB; audio output uniformity 1 dB; dropouts 20 per min; stop motion capable of exceeding 1 hour; tape life capable of exceeding 2000 passes.
- KCS-5. 5 min $18
- KCA-10. 10 min $20
- KCS-10. 10 min $20
- KCA-20. 20 min $25
- KCS-20. 20 min $25
- KCA-30. 30 min $30
- KCS-30. 30 min $35
- KCA-40. 40 min $34
- KCA-50. 50 min $38
- KCA-60. 60 min $40
- KCA-75. 75 min $45
- KC-90. 90 min $50

Prime Time Video Cassettes
Betamax format; chromium dioxide.
- L250. ½ hr $14
- L500. 2 hr $17
- L750. 3 hr $22

EMI by EMPIRE SCIENTIFIC

Hi Fidelity Cassette Tapes
Ferric-oxide formulation; normal bias; 120-μsec equalization; for mastering.
- 60 min $4.85
- 90 min $6.40
- 120 min $7.85

Super Cassette Tapes
Ferric-oxide formulation; normal bias; 120-μsec equalization; for music/mastering.
- 60 min $3.50
- 90 min $5.20
- 120 min $6.95

Standard Cassette Tapes
Ferric-oxide formulation; normal bias; 120-μsec equalization; for general and music purposes.
- 60 min $2.35
- 90 min $3.55
- 120 min $4.60

Super Open-Reel Tapes
Standard; for mastering purposes.
- 600-ft, 5-in reel $14.95
- 1200-ft, 7-in reel $24.95

Long-Play.
- 900-ft, 5-in reel $16.95
- 1800-ft, 7-in reel $25.95
- 3600-ft, 10½-in NAB reel $59.95

Double-Play.
- 1200-ft, 5-in reel $18.95
- 2400-ft, 7-in reel $27.95

EMI also manufactures special formulations for professional and semi-professional use in the 7- and 10½-in reel formats.

FUJI

Metal Tape
Very high output, ultra-low noise, 7-12 dB higher MOL than chrome; metal bias; 70 μsec equalization.
- C46. 46 min $8.80
- C60. 60 min $10.00

FX-I Premium Cassette Series
Pure Ferrix; normal bias; 120 μsec equalization.
- C46FX-I. 46 min $4.00
- C60FX-I. 60 min $4.70
- C90FX-I. 90 min $6.20

FX-II Premium Cassette Series
Beridox; high bias; 70 μsec equalization.
- C46FX-II. 46 min $4.40
- C60FX-II. 60 min $5.00
- C90FX-II. 90 min $6.90

FL Low-Noise Cassettes
- C46FL. 46 min $3.00
- C60FL. 60 min $3.40
- C90FL. 90 min $4.70
- C120FL. 120 min $6.50

8-Track Cartridges
- 8T-45 ..... $4.20
- 8T-90 ..... $5.60

FB-151 Master 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 $12.25
- 1800-ft, 7-in reel $15.85
- 3600-ft, 10½-in metal reel $43.20

Videocassette Tapes
VHS Beridox; high impact ABS housing.
- **T-120.** 2-4 hr $25.50
- **T-60.** 1-2 hr $18.35
- **T-30.** 0.5-1 hr $15.50

IRISH

Professional-Series Cassettes
In album/mailer.
- 261-C45. 45 min $1.95
- 261-C60. 60 min $2.20
- 261-C90. 90 min $3.00
- 261-C120. 120 min $5.30

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 $1.65
- 2000-C90B. 90 min $2.10

Low-Noise, Extended-Range Cassettes
Flip-top plastic box.
- 262-C60. 60 min $2.95
- 262-C90. 90 min $3.70

Cassettes in Polybag
- Three C60 ..... $2.95
- Two C90 ..... $2.95
- Three C90 ..... $3.49

8-Track Cartridges
- 8T45. 45 min. $3.00
- 8T90. 90 min. $3.80

Two 8-Track Cartridges in Box
- **2X42.** Two 42 min $3.90
- **2X84.** Two 84 min $4.40

270 Series Tape
Low-noise, high-output, back coated.
- 276-151. 1200-ft, 7-in reel $13.15
- 277-151. 1800-ft, 7-in reel $17.20

200 Series Professional Tape
Standard, 1½-mil, polyester base, ¼-in.
- 231-151. 1200-ft., 7-in reel $7.35

Extra-length, 1-mil, polyester base, ¼-in.
- 241-151. 1800-ft., 7-in reel $9.25

Double-length, ½-mil, polyester tensilized base.
- 251-151. 2400-ft., 7-in reel $16.10

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

LUX

XM Series
Magnetic tape features skew adjustment facility, stainless-steel metal tape guide, 7-mm wide pad, roll-spring holding mechanism, four-guideroller system, and sensing roller for transport time.
- C60 I. 60 min $6.25
- C90 I. 90 min $7.75
- C60 II. 60 min $6.75
- C90 II. 90 min $8.75

MAXELL

UD-XL-I Epitaxial Cassettes
Normal bias; 120 μsec equalization.
- C-60. 60 min. $5.25
- C-90. 90 min. $7.25

UD-XL-II Epitaxial Cassettes
Chrome type; high-level bias; 70 μsec equalization.
- C-60. 60 min. $5.25
- C-90. 90 min. $7.25

Ultra-Dynamic Cassettes
Normal bias.
- UD-46. 46 min. $3.70
- UD-60. 60 min. $4.00
- UD-90. 90 min. $5.90
- UD-120. 120 min. $7.90

Low-Noise Cassettes
Normal bias.
- LN-46. 46 min. $2.45
- LN-60. 60 min. $2.70
- LN-90. 90 min. $4.10
- LN-120. 120 min. $5.30

Ultra-Dynamic 8-Track
Normal bias.
- UD8T-46. 46 min. $5.20
- UD8T-90. 90 min. $6.50

8-Track Cartridges
Normal bias; low noise.
- LN8T-46. 46 min. $3.95
- LN8T-60. 60 min. $4.40
- LN8T-90. 90 min. $4.95

10 BLANK TAPE & ACCESSORIES

AMPEX

Grand Master II Series Cassettes
High bias; 70 μsec equalization.
- 366-C60. 60 min. ... $4.19
- 366-C90. 90 min. ... $5.29

Grand Master I Series Cassettes
Normal bias; 120 μsec equalization.
- 365-C60. 60 min. ... $3.69
- 365-C90. 90 min. ... $4.79

20/20+ Series Cassettes
- 364-C45. 45 min. ... $2.39
- 364-C60. 60 min. ... $2.69
- 364-C90. 90 min. ... $3.79
- 364-C120. 120 min. ... $5.29

Plus Series Cassettes
- 371-C45. 45 min. ... $1.39
- 371-C60. 60 min. ... $1.69
- 371-C90. 90 min. ... $2.79
- 371-C120. 120 min. ... $4.19

Low-Noise Series Cassettes
- 352-C45. 45 min. ... $0.89
- 352-C60. 60 min. ... $1.09
- 352-C90. 90 min. ... $1.69
- 352-C120. 120 min. ... $2.99

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 .. $8.69
- 357-1511J1. 1800-ft, 7-in reel, 1.0 mil .. $9.99
- 356-1731J1. 2500-ft, 10½-in NAB reel, 1.5 mil ... $22.99
- 357-1731J1. 3600-ft, 10½-in NAB reel, 1.0 mil ... $26.49

20/20+ Series Open-Reel Tapes
- 372-151111. 1200-ft, 7-in reel, 1.5 mil . $7.39
- 373-151111. 1800-ft, 7-in reel, 1.0 mil . $8.99

Plus Series Open-Reel Tapes
- 332-1511J1. 1200-ft, 7-in reel, 1.5 mil .. $5.89
- 342-1511J1. 1800-ft, 7-in reel, 1.0 mil .. $7.39

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

Video Cassette Tape

Beta-Format Videocassettes
- 101-L-250-1C. 30-60 min. ... $13.49
- 101-L-500-1C. 60-120 min. ... $16.95

BASF

Professional I Series Cassettes
Ferric-oxide; normal bias/equalization for imported decks.
- 60 min. ... $3.29
- 90 min. ... $4.79

Professional II Series Cassettes
Super-chrome; normal bias; 70 μsec equalization.
- 60 min. ... $3.89
- 90 min. ... $5.29

Professional III Series Cassettes
Ferrichrome for "third" switch position.
- 60 min. ... $3.89
- 90 min. ... $5.29

Studio I Series Cassettes
Normal bias/equalization.
- 60 min. ... $2.99
- 90 min. ... $4.49

Studio II Series Cassettes
High bias; chrome equalization.
- 60 min ... $3.29
- 90 min ... $4.79

Performance Series Cassettes
Normal bias/equalization; mirror-polished tape; snap-pack or mailer-box enclosure.
- 45 min. ... $2.29
- 60 min. ... $2.49
- 90 min. ... $3.59
- 120 min. ... $4.99

Studio Series 8-Track Cartridges
High output/low noise; mirror polished; boxed or carded enclosure.
- 45 min. ... $3.29
- 64 min. ... $3.59
- 90 min. ... $3.99

Performance Series 8-Track Cartridges
Low noise; back-lubricated tape.
- 45 min. ... $2.89
- 90 min. ... $3.49

Professional Series Open-Reel Tape
- 3600-ft, 10½-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, 10½-in reel ... $19.99

Performance Series Open-Reel Tapes
- 1800-ft, 7-in reel ... $7.19
- 2400-ft, 7-in reel ... $9.99
- 3600-ft, 7-in reel ... $15.99

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

Accessories
- 8-track headcleaner ... $1.99
- Cassette headcleaner ... $1.79
- 7-in plastic storage box ... $2.69
- 7-in plastic reel ... $1.59

Video Cassette Tape

Betamax Format
Chrome formulation.
- **L-500.** 1-2 hrs ... $16.95
- **L-750.** 1½-3 hrs ... $20.95

VHS Format
Chrome formulation.
- **T-60.** 1-2 hrs ... $17.95
- **T-120.** 2-4 hrs ... $24.95

CAPITOL

"The Music Tape" Cassettes
High-output low-noise with "cushion-aire" backing.
- C-45. 45 min. ... $1.99
- C-60. 60 min. ... $2.49
- C-90. 90 min. ... $3.69

"The Music Tape" Cartridges
High-output low-noise.
- 8T-45. 45 min. ... $2.49
- 8T-60. 60 min. ... $2.79
- 8T-90. 90 min. ... $2.99
- 8T-100. 100 min. ... $3.19
- 8T-120. 120 min. ... $3.79

CERTRON

High Energy Gamma
Oxide formulation; durable binder system.
- C-60 HE. 60 min ... $1.89
- C-90 HE. 90 min ... $2.39
- C-120 HE. 120 min ... $2.79

Low Noise
- C-30 LN. 30 min ... $0.79
- C-45 LN. 45 min ... $0.89
- C-60 LN. 60 min ... $0.99
- C-90 LN. 90 min ... $1.39
- C-120 LN. 120 min ... $1.59

High Density
- C-30 HD. 30 min ... $0.99
- C-45 HD. 45 min ... $1.19
- C-60 HD. 60 min ... $1.29
- C-90 HD. 90 min ... $1.69
- C-120 HD. 120 min ... $1.99

Memotape for Minicassette
- MT30. 30 min ... $3.99
- MT40. 40 min ... $4.99

8-Track Cartridges
- 8T-45. 45 min ... $1.49
- 8T-65. 65 min ... $1.69
- 8T-90. 90 min ... $1.89

Tape Accessories
- CHC. Cassette head cleaner ... $0.99
- 8T-HC. 8-track head cleaner ... $1.19

9 SIGNAL PROCESSORS

tridges with 0.28-300 mV output; 0-750 pF variable cartridge loading; pushbutton switching from one to six input sources through subsonic filter, two external processing loops, equalizer, and mono A+B mixer to two tape or two line outputs; three-way tape dubbing; two amplified headphone outputs from 8-2000 ohms; ±20 dB stepped level control; frequency response 5-100,000 Hz ±0.25 dB (hi level), 20-20,000 Hz ±0.5 dB (phono); THD and IM dist. 0.01% at 1 V; phono impedance 47k or 100k ohms switchable; phono S/N 97 dB at 10 mV in. Includes environmental test record and Computone charts; rack-mount brushed aluminum black and silver panel; 7" H × 19" W × 11" D $699

TG3044-R Third-Octave Equalizer

Third-octave stereo equalizer with 15 center frequencies set at 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, and 1000 Hz on ⅓ octave and six center frequencies set at 1600, 2500, 4000, 6300, 10,000, and 16,000 Hz on alternate ⅓ octaves, 22 dB boost or cut (controls full), 15 dB boost or cut (controls flat); features pushbutton EQ defeat, lo-shelf, and separate monitor input and output controls; LED unity gain input-to-output balancing indicators; separate zero-gain level controls; THD and IM dist. 0.01% at 2 V; S/N 114 dB at 10 V out, 100 dB at 2 V out; **input impedance 47k ohms; output impedance 600 ohms (balanced); in/out voltage 12 V;** black anodized aluminum front panel; 5¼" H × 19" W × 11" D $550

PE2217-R Preamp-Equalizer

Ten-band two-channel graphic equalizer/preamplifier. Equalizer: features ±12 dB boost or cut and 18-dB zero-gain/LED input-to-output level balancing; HD and IM dist. 0.05% at 1 V; S/N 106 dB at full output, 96 dB at 2 V. Preamp: features three-way dubbing and tape monitoring; line/tape equalizer circuitry; two separate stereo (or four mono) phono preamps with own left and right and phono 1/phono 2 circuitry; two high-impedance headphone outputs; reverse stereo/mono switching; frequency response 5-100,000 Hz ±0.25 dB (hi level), 20-20,000 Hz ±0.5 dB (phono); THD and IM dist. 0.01% at 1 V; phono impedance 47k ohms; output impedance 600 ohms. Includes environmental test record and Computone charts; rack-mount silver/black front panel; 5¼" H × 19" W × 11¼" D. $549

AE2420 Analyzer/Equalizer

Incorporates dc differential/comparator circuitry for EQ analysis and equalizer; comparator converts wave shapes of pink noise input signal and speaker output signal to dc levels with 0.1-dB accuracy; eliminates precisely-calibrated pink noise generator and provides user with complete system analysis and automatic cartridge adjustment; includes pink noise generator, 12-in pink noise test record, and Computone charts $499

RP2215-R Equalizer

Provides front-panel pushbutton control of line or tape equalization for conventional hi-fi systems or separate stereo outputs for multiple-system equalization; tape monitor circuit provides monitoring equalized program material during use. Features environmental test record for listening environment equalization; four LEDs for front-panel display controlled by zero-gain level controls for input vs output level balancing. S/N 114 dB; THD 0.01% at 2 V, 0.05% at 1 V (typical); ±15 dB boost or cut each octave; **600 ohm output;** black anodized aluminum panel; 5¼" H × 19" W × 11¼" D $370

RP2201-R. Similar to RP2215-R without LED/zero-gain balancing circuit; has 18-dB zero-gain controls; S/N 105 dB at 10 V out; ±12 dB boost or cut each octave $299

SE450. Same as RP2201-R without environmental test record, Computone charts, and line equalization; S/N 100 dB; available in brushed aluminum silver or black front panel with black vinyl cabinet; not rack-mountable $249

SOUND WORKSHOP

242C Stereo Reverb

Stereo reverberation system; **line and mic level inputs;** input level controls and peak-reading LEDs; 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); ±15 dB at 4300 Hz equalization; nominal 2.5-sec decay time; 117-V ac, 50/60 Hz; 3⅝" H × 19" W × 9" D. $400

SPECTRO ACOUSTICS

210R Ten-Band Stereo Equalizer

Provides ten bands of equalization with ±15 dB boost or cut in each of the ten 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 0.03% of 1 V (20-20,000 Hz) with any combination of equalization adjustments, 0.005% of 1 V with equalizer bypassed or set flat; S/N 90 dB below 1 V rms; **output impedance 600 ohms;** dynamic range: noise floor is over 100 dB below full output; 5¼" H × 19" W × 6¼" D $300

2102R. Same as 210R except 3½" H × 19" W × 7" D $225

TEAC

GE-20 Graphic Equalizer

Ten-band two-channel graphic equalizer with center frequencies set at 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000, and 16,000 Hz, ±10 dB boost or cut; each channel has 12 dB/octave high- (at 31.5 Hz) and low-pass (at 16,000 Hz) filters, input level control, and LED input overload indicator; unit features output level meter with output level control; operational amplifier-synthesized inductors. Frequency response 20-30,000 Hz ±0.5 dB; THD 0.03%; S/N 85 dB; input sensitivity/impedance 0.3 V, unbalanced/100k ohms; max. output level +18 dB at 8 V $350

TECHNICS by PANASONIC

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 ±1 dB; S/N 90 dB; 3³¹/₃₂" H × 19" W × 14¹¹/₃₂" D. $540

WHITE INSTRUMENTS

140 Sound Analyzer

Real-time spectrum analyzer features red 11 × 28-array LED graph that displays 27 channels on ⅓-octave centers from 40-16,000 Hz, plus one broad band channel, in 1- or 2-dB steps; double-tuned filters; built-in pink noise generator shaped for flat response from 40-16,000 Hz; rear-panel sync and log amplifier outputs for remote display on oscilloscope and line level input and noise output. Mic input: 2000 ohms, transformer coupled, standard XLR connector; dynamic mic input range 40-110 dB SPL; **line level input 20k ohms impedance,** 2.6 mV-2.6 V rms input range, **standard phone jack;** input attenuator 10 dB steps from 40-90 dB. Noise generator: max. output level 0.5 V rms; variable front-panel level switch with low level for driving mic input and high level for 5k-ohm or more driving impedances. 115/230 V ac, 50-400 Hz, 15 W; 3½" H × 19" W $2700

141. Micplexer for 140; three 150-200 ohm impedance dynamic microphones are plugged in, presenting single input to 140 ..... $402

4301 ¼-Octave Active Equalizer

Active monitor equalizer comprised of 28 ⅙-octave bands from 40-894 Hz and 13 ⅓-octave bands from 1000-16,000 Hz, ±10 dB boost or cut. Features front-panel EQ in/out bypass switch; high-pass filter variable from 20-160 Hz at 12 dB/octave rolloff; front-panel-accessible mid- and high-frequency output trimmer and input attenuation control (variable to 20 dB); **transformer isolated 20,000-ohm input;** three-buffered single-ended outputs for tri-amp operation; all negative feedback circuitry. Frequency response 20 (−3 dB) to 20,000 (−2 dB) Hz; dist. 0.2% to +18 dBV. noise −90 dBV at 20,000 Hz; **max. output +18 dBV into 600 ohms;** 115/230 V ac, 50-60 Hz; 5¼" H × 19" W × 9½" D $1190

4303. Same as 4301 except has **three transformer isolated 300-ohm outputs; max. output level +15 dBV into 600 ohms, +18 dBV into 5000 ohms** $1265

4004 ⅓-Octave Passive Equalizer

Passive ⅓-octave equalizer with 24 ISO center frequency bands from 63-12,500 Hz, 15 dB cut; filters are double-tuned constant-K sections with two precision LC pairs. Features plug-in crossover network socket for bi-amp output; high-cut and low-cut adjustable finishing filters; calibrated logging and resetting dials. Frequency response 0-20,000 Hz, flat setting; dist. 0.1% to +18 dBm in ⅓-octaves; low-cut filter adjustable from flat-40-160 Hz, 15-dB/octave cut; high-cut filter adjustable from flat-16,000-10,000 Hz, 18 dB/octave cut; **impedance 600-600 ohms,** less than 1 dB insertion loss; 3½" H × 19" W × 9" D $1100

4001 ⅓-Octave Active Equalizer

Active equalizer comprised of 27 ⅓-octave bands on ISO centers from 40-16,000 Hz, ±10 dB boost or cut on continuous control. Features variable 20-160 Hz high-pass filter with 12 dB/octave rolloff; filter Q; all negative feedback circuitry; field replaceable integrated circuits; EQ in/out bypass switch; dual buffered single-ended outputs for bi-amp operation; **transformer-isolated 20,000-ohm input;** accessory socket for bi-amp outputs. Frequency response 20 (−3 dB)-20,000 (−2 dB) Hz; dist. 0.1% from 20-20,000 Hz at 0 dBm; noise −90 dBV at 20,000 Hz bandwidth; **max. output level +18 dBV into 600 ohms;** 3.5" H × 19" W × 9.5" D. $730

4201 ⅓-Octave Active Equalizer

Active equalizer with 27 ⅓-octave bands from 40-16,000 Hz, 0 to −15 dB cut on continuous control. Features variable 20-160 Hz high-pass filter with 12 dB/octave rolloff; filter Q; all negative feedback circuitry; field-replaceable integrated circuits; **transformer isolated 20,000-ohm input;** two-buffered single-ended outputs; EQ in/out bypass switch. Frequency response 20 (−3 dB)-20,000 (−2 dB) Hz; dist. 0.1% from 20-20,000 Hz; noise −92 dBV at 20,000 Hz; **gain variable from unity to +10 dB;** max. output **+18 dBV into 600 ohms;** 3½" H × 19" W × 9" D $730

4203. Same as 4201 except has **two transformer-isolated 300-ohm outputs; max. output level +15 dBV into 600 ohms, +18 dBV into 5000 ohms** $780

4100 Active Stereo Octave Equalizer

Ten-band stereo active equalizer with center frequencies from 31.5-16,000 Hz, ±10 dB boost or cut. Each channel has input level control, high-pass filter, EQ in/out bypass controls, peak signal detector, and optional low-level crossover capability; all negative feedback circuitry. Frequency response 20 (−3 dB)-20,000 (−1 dB) Hz; THD 0.1% at +18 dBV; IM dist. 0.004% (SMPTE); noise −92 dBV at 20,000 Hz; **max. output level +18 dBV into 600 ohms;** 3.25" H × 19" W × 9" D $599

BOLDFACE indicates that the machine has professional qualities.

(reciprocal) equalization range, 0.5-5.0 adjustable Q; S/N 76 dB (weighted); 115/230-V ac 50/60 Hz, 10 W; 3½" H × 19" W × 12" D..... $749

516EC Dynamic Sibilance Controller

De-esser designed for vocal tracks with 8000-Hz min. bandwidth; three independent de-essing channels; threshold (with frequency-selective 18 dB/octave filter) and in/out controls for each channel; **5400-ohm (unbalanced) input impedance; output impedance, 1 ohm, will drive 500-ohm or higher;** 0 dB ±1 dB gain (below de-essing threshold), can be modified to +10 dB; +19-dBm min. output clipping point; output noise −80 dBm max.; 107-dB typical dynamic range; frequency response (below de-essing threshold) 20-20,000 Hz ±0.5 dB; attack time 1 msec; release time 15 msec; THD 0.5% at 18 dBm into 600 ohms, 20-20,000 Hz; max. gain reduction 25 dB; LED de-essing indicator; 115/230-V ac 50/60 Hz, 7 W; requires 1¾-in rack space, **standard 19-in relay rack**..... $629

672A Graphic Equalizer

Eight-band graphic quasi-parametric equalizer with balanced input buffer amplifier, eight equalization amps connected in series, and tunable low- and high-pass positive-feedback 12 dB/octave filters. Tuning ranges set at 20-60, 40-150, 110-310, 230-750, 480-1900, 1100-4500, 2800-9000, and 5900-21,000 Hz with ±16-dB peaking equalization ranges. Controls include equalization, tuning, and bandwidth for each band, x1 and x10 tuning range, EQ in/out bypass switch, filter in/out for each filter, and gain; LED overload indicator. **Input impedance 100k ohms load (parallel with 1000 pF, electronically balanced), 600 ohms, balanced or unbalanced (driving); nominal input level −10 to +4 dBm; output impedance 47 ohms source (parallel with 1000 pF, unbalanced), 600 ohms (load); nominal output level +4 dBm;** frequency response 20-20,000 Hz ±0.25 dB; +12-dB gain; slew rate 6-13 V/μsec; THD 0.05% from 20-20,000 Hz; noise −84 dBm at output; overload/noise 113 dB/filter; dual-range low-pass filter from 200-2000 and 2000-20,000 Hz; high-pass filter range from 20-200 and 200-2000 Hz; 115/230 V ac, 50-60 Hz, 6 W; 5¼" H × 19" W × 5¼" D $499

526A Dynamic Sibilance Controller

Single-channel de-esser features **transformer-balanced input and output with r-f suppression; mike and line level inputs;** five-element LED peak-reading level display; dual-LED gain reduction (Normal/Heavy) meter; threshold control; variable gain control. **Mic input impedance 1k ohms, balanced (load), −60 to −35 dBm (nominal); line input impedance 10k ohms, balanced (load), −20- +4 dBm (nominal); output impedance 600 ohms, transformer balanced and floating (source), +20 dBm into 600 ohms (nominal);** frequency response 20-20,000 Hz ±1 dB; max. voltage gain +56 dB (mic), +22 dB (line); input level range 15 dB; THD 0.1% from 30-20,000 Hz (de-essing defeated), 0.5% at 6000 Hz (de-essing in); noise −80 dBm at output; attack time 1 msec; recovery time 10 msec; 115/230 V ac ±10%, 50-60 Hz, 8 W; 1¾" H × 19" W × 5¼" D.. ..... $399

245E Stereo Synthesizer

Creates pseudo-stereo from any mono signal by dividing mono source signal into five frequency bands with three bands placed in one stereo output channel and two in other channel; has lower midrange, upper midrange, separation, and gain controls and stereo/mono switch. Frequency response of stereo sum signal 20-20,000 Hz ±1 dB; THD 0.5% max. at +19 dBm, 20-20,000 Hz; noise −78 dBm max. (unweighted, 30-18,000 Hz); 9-dB available gain; **input 25,000 ohms unbalanced; output 1 ohm unbalanced, will drive +21 dBm into 500 ohms or greater;** 115/230-V ac 50/60 Hz, 2 W; requires 1¾-in of vertical **space in standard 19-in rack**..... $349

PIONEER

SG-9800 Audio Frequency Equalizer

Stereo graphic octave equalizer for tone control with 12 elements: 16, 32, 64, 125, 250, 500, 1000, 2000, 4000, 8000, 16,000, and 32,000 Hz; level control range ±10 dB; frequency response 5-100,000 Hz +0/−3 dB; S/N 92 dB; output impedance 600 ohms max.; THD 0.006% at 1 V from 20-20,000 Hz; max. output 7.5 V; 5⅞" H × 16½" W × 14" D..... $395

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 ±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; 5⅞" H × 16½" W × 13½" D..... $345

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); 5³ ₁₆" H × 15³ ₄" W × 10¹³/₃₂" D..... ..... $295

RG-2 Dynamic Range Expander

Dynamic processor provides improvements in dynamic range to enhance realism in reproduced music and in noise reduction to eliminate unwanted tape and record noise; automatic operation; max. output 6.5 V; THD 0.05% at 1 V; dynamic expansion 4, 7, 10, 13, 16 dB; impulse response: attack time 0.3 msec; release time 120 msec; input impedance 50,000 ohms; output impedance 300 ohms; residual noise 10 μV; S/N 100 dB (1 kHz, dynamic expansion 16 dB); twin Fluroscan meters; 3⅞" H × 16½" W × 13¼" D..... $195

ROTEL

RC-2000 Stereo Equalizer

Ten-band stereo octave equalizer with center frequencies at 32, 63, 125, 250, 500, 1000, 2000, 4000, 8000, and 16,000 Hz, ±12 dB boost or cut. Features coil-less circuitry; metalized film capacitor for output coupling; AMP-type constant voltage limiter in addition to current limiter circuits in power supply; tape dubbing facility; record/play and EQ bypass switches. Frequency response 0-100,000 Hz +0/−1 dB; THD 0.005%; S/N 100 dB (IHF "A"); input sensitivity/impedance 0.775 V/56,000 ohms; 150 mm H × 485 mm W × 320 mm D.$370

SAE

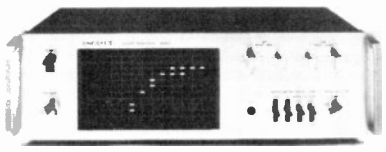
2800 Stereo Parametric Equalizer

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 8³ ₄" × 19"; chassis depth 3¹ ₂-in ..... $600 **1800.** Similar to 2800 except two band..... $350

H.H. SCOTT

830Z Audio Analyzer

Audio analyzer indicates acoustical changes in speaker system's location, optimizes tape deck bias, equalization, record levels, and tape compatibility, and measures peak sound pressure level and dynamic range of program material; hooks into amplifier, receiver, or tape deck input. Features 110-LED visual display grid covering 32-16,000 Hz



in 2, 3, or 4 dB range switch; ten-octave band oscillator level control; SPL, flat, A weighting, and C weighting mode switch; external mic/internal mic/aux./calibration input select switch; independent mic and line level controls; LED dimmer; includes remote condenser microphone; optional 19" rack-mount handle..... $600

SONTEC

HF-230 Stereo Parametric Equalizer

Three-band discrete parametric equalizer with separately-tuned 10-800/100-8000/400-25,000 Hz ranges; infinitely variable slope from 4-14 dB/octave; infinitely variable amplitude ±12 dB in mirror image; switchable upper and lower sections; no transformers, capacitors, or ICs in signal path; usable dynamic range 110 dB; noise 84 dB below 1 V out; **THD and IM dist. 0.002% from −30 to 24 dBV;** slew rate 200 V/μsec; black anodized rack mount aluminum case; 1¾" H × 19" W × 6" D..... $990

SOUND CONCEPTS

SD550 Ambience Restoration 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 20-10,000 Hz +1, −3 dB with 5 msec delay and zero dB high frequency rolloff; S/N 85 dB min., 90 dB weighted; 1% max. dist. at 1 kHz and 1 V rms, consisting almost entirely of 2nd harmonic; 3½" H × 15½" W × 9" D... ..... $700

SOUNDCRAFTSMEN

EA5003 Power Amp-Qualizer

Incorporates Class "H" integrated amplifier and ten-band two-channel graphic octave equalizer. Equalizer: center frequencies set at 30, 60, 120, 240, 480, 960, 1920, 3840, 7680, and 15,360 Hz, ±12 dB boost or cut; 18-dB zero-gain level controls/ch; EQ defeat; HD and IM dist. 0.01% at 2 V; S/N 105 dB at 10 V output. Amplifier: analog logic design; each channel features LED clipping, vari-portional, and overload indicators and gain controls; speaker switching; non-limiting circuitry and "Auto-Crowbar" protection circuitry with auto reset; output 250 W continuous into 8 ohms; THD 0.1%, IM dist. 0.05%, TIM dist. 0.02%; S/N 105 dB; frequency response 20-20,000 Hz ±0.25 dB; slew rate 50 V/μsec; damping factor 100; input sensitivity/impedance 1.28 V rms/15-50,000 ohms. Includes environmental test record and Computone charts; walnut-grain side panels; rack handles; 7" H × 19" W × 15" D $949

SP4002 Signal Processor/Preamp

Ten-band two-channel graphic equalizer/preamplifier. Equalizer: center frequencies set at 30, 60, 120, 240, 480, 960, 1920, 3840, 7680, and 15,360 Hz, ±15 dB boost or cut; features LED input-to-output balancing indicators and 18-dB zero-gain control; HD and IM dist. 0.01% at 2 V; S/N 114 dB at 10 V out, 100 dB at 2 V output. Preamp: features two stereo or four mono phono preamps, each with inputs, outputs, and independently variable ±20 dB gain stage; accepts moving-coil, variable-reluctance, or moving magnet car-

9 SIGNAL PROCESSORS

controls plus mixed output; delay-setting memory for permanent or semi-permanent installations; lockout switch; remote capability. Analog section: **input impedance 10k ohms nominal (electronically balanced); input level at limiting +4- +30 dBm adjustable; output impedance 20 ohms nominal (electronically balanced); output level at limiting +4- +20 dBm adjustable;** dynamic range 90 dB; frequency response 30-15,000 Hz +1 dB; total dist. products 0.1% at 1000 Hz full drive. Digital section: sampling frequency 50,000 Hz; MRA connector has 15-bit data control bus, 6-bit data timing control, write inhibit, and 12-bit user-definable controls. 115 V or 230 V ac, 50-60 Hz; 3" H × 19" W × 10.5" D $4900
323-msec version with 3k ROM and 224k RAM capacity $4750
163-msec version with 3k ROM and 112k RAM capacity $4600

DN36 Analogue Time Processor

Dual-channel voltage-controlled time delay system with manual or automatic controls and built-in modulator. Each channel features input, feedback, cross-channel feedback, and master gain levels with LED array level indicators; delay control; modulator switch; modulator depth control. Output section has two clean feed outputs and one mixed output with pan control. Modulator has rate control and waveform and invert "A" switches. Delay time 0.5-50 msec, continuously variable; frequency response 20-15,000 Hz; internal modulator range 0.1-10 Hz continuously variable; dynamic range 90 dB; dist. at 1000 Hz 0.2% typically, 0.5% at 3 dB below clipping; **input impedance 10k ohms (balanced or unbalanced); input sensitivity -10- +20 dBm; output impedance 50 ohms; output level adjustable to +22 dBm at clipping** $1600

DN34 Analogue Time Processor

One-channel time delay system features two discrete, independently controlled delay sections that can be coupled in series or parallel through front-panel switch. Additional features include comprehensive mixing and phase controls on unit; automatic or manual delay length settings by internal modulator; step, linear, and logarithmic sweeps; input and output level controls, input level indicator, input limiter, and gain stage controls. Dynamic range 90 dB, 95 dB typical; THD 0.2% typically, 0.5% max., at 1000 Hz; bandwidth 20-16,000 Hz; delay time 0.38-53 msec continuously variable; continuous time sweep range 70:1 over six octaves; sweep speed 0.04-13 Hz; flange notch cancellation 90 dB; **input impedance 20k ohms nominal (electronically balanced or unbalanced); output impedance 30 ohms into 600-ohm load (electronically balanced or unbalanced); nominal input level +4 dBm; output level +4- +18 dBm adjustable;** 115 V or 230 V, 50-60 Hz, 15 W; 3.48" H × 19" W × 10.3" D $1600

DN22 Graphic Equalizer

Eleven-band two-channel stereo graphic equalizer features eleven slide potentiometers/channel, ±12 dB boost or cut at eleven center frequencies with center detent, separate low and high pass filters/channel, bypass switch/channel, level controls (up to 6-dB gain), and LED power. Center frequencies set at 50, 90, 160, 300, 500, 900, 1600, 3000, 5000, 9000, and 16,000 Hz with ±2% center frequency accuracy; frequency response 20-20,000 Hz ±0.5 dB; output clipping +21 dBm into 600 ohms; dist. **0.01% at 1 kHz at +4 dBm into 600 ohms, 0.05% from 20-20,000 Hz at +18 dBm into 600 ohms;** input noise -95 dBm; input impedance 10k ohms nominal; output source impedance 10 ohms, short circuit protected; 200-240 V ac, 50-60 Hz; 5.4" H × 19" W × 8.4" D $840
DN22B. Balanced version of DN22 ..... $1075

DN27 Graphic Equalizer

27-band one-third-octave graphic equalizer features 27 slide potentiometers with ±12 dB boost or cut and center detent, bypass switch, level control (up to 6-dB gain), and power switch with LED. Center frequencies set at 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, 10,000, 12,500, and 16,000 Hz with accuracy better than ±2%; frequency response 20-20,000 Hz ±0.5 dB; **output clipping +21 dBm into 600 ohms; dist. 0.01% at 1000 Hz at +4 dBm into 600 ohms, 0.05% from 20-20,000 Hz at +18 dBm into 600 ohms;** equivalent input noise -90 dBm from 20-20,000 Hz; input impedance 10k ohms; output source impedance 10 ohms, short circuit protected; 200-240 V ac, 50-60 Hz; 5.4" H × 19" W × 8.4" D $780
DN27B. Balanced version of DN27 ..... $900

MXR

One-Third Octave Equalizer

31-discrete-band one-channel ⅓-octave equalizer with center frequencies set at 20, 25, 31.5, 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, 10,000, 12,500, 16,000, and 20,000 Hz, ±12 dB boost or cut; EQ in/out switch; dynamic range 108 dB; THD and IM dist. 0.01% at 0 dBV; frequency response 5-40,000 Hz -3 dB; max. slew rate 7 V/μsec; **max. input level +18 dBV; input impedance 40k ohms; output impedance 100 ohms;** equiv. input noise -90 dBV; **includes rack mounting hardware;** walnut side panels $350

Fifteen-Band Equalizer

Fifteen-band stereo graphic equalizer, spaced ⅔-octave apart, with center frequencies set at 25, 40, 63, 100, 160, 250, 400, 630, 1000, 1600, 2500, 4000, 6300, 10,000, and 16,000 Hz, ±12 dB boost or cut; tape monitor and in/out switches; THD 0.02% at 0 dBV from 20-20,000 Hz, IM dist. 0.01% at 0 dBV from 60-7000 Hz; frequency response 5-60,000 Hz -3 dB; **max. input +18 dBV; input impedance 40k ohms; output impedance 100 ohms;** equiv. input noise -95 dBV; max. slew rate 7 V/μsec; **includes rack mounting;** walnut side panels $325

Stereo Graphic Equalizer

Ten-band two-channel graphic equalizer with center frequencies 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. 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 dBV; frequency response 20-20,000 Hz +1 dB at 0 dBV; THD 0.05% at 0 dBV (20-20,000 Hz); IM 0.05% at 0 dBV (60/7000 Hz 4:1) $220

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 $150

NAKAMICHI

T-100 Audio Analyzer

Measures and verifies performance of tape decks, microphones, amplifiers, preamplifiers, turntables, 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 μV; features non-mechanical bar-graph display and logic-controlled FET switching; supplied with carrying case; 3" H × 13½" W × 9½" D; 9.5 lb $800

ONKYO

E-30 Audio Equalizer

Stereo equalizer with center frequencies set at 63 (45/32 switchable), 125, 250, 500, 1000, 2000, 4000, 8000, and 16,000 Hz; max. switchable range ±5 or +10 dB in 0.5 or 1 dB steps; African wood veneer over Lauan plywood, 3¼" H × 17¾" W × 14⁹⁄₁₆" D $550

OPAMP LABS

1155 Mono Reverb Spring System

Comprised of dual 14-in reverb spring assembly for **line-level operation;** bandwidth 50 cycles to 6000 Hz; input fed to amplitude limiter and constant current generator; insertion loss amplifier uses mic preamp; **bipolar 24-V Model 522 power supply operates system;** aluminum enclosure; 3¼" H × 17" W × 9" D $275

ORBAN

418A Stereo Limiter/Compressor

Stereo limiter/compressor comprised of left and right ganged output and input attenuators. Features release time control; switchable high-frequency limiter time constant (75, 50, 37.5, 25 μsec, flat); multifunction meter reads 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; 3½" H × 19" W × 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/μsec; 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; 3.5" H × 19" W × 5.2" D. $749
622A. Single-channel version of 622B $479

111B Dual Spring Reverb

Independent two-channel dual reverb with four springs/channel; each channel has controls for bass and midrange equalization and bandwidth, in/out attenuation, floating output switch, and LED fixed mode indicator. Delay time 30 msec between direct sound and first reflection; **accepts input levels from -30 to +4 dBm;** limiter control overloads up to 25 dB before clipping and distortion; 10,000 ohms unbalanced input impedance; output level nominally 0 dBm; **600-ohm output impedance;** limiter attack time 100 μsec; fixed mode compression rat o 10:1, limiter-induced harmonic dist. 0.2% at 5000 Hz; shelving type bass equalizer, 500-Hz turnover frequency, ±12 dB (reciprocal) equalization range; quasi-parametric peaking mid-range equalizer, 1.5-5.5 kHz variable peaking frequency, ±12 dB

controls one H910; enables user to play various harmonies in real time $500

FL201 Instant Flanger
Oscillator, manual, remote, and envelope controls may be used in any configuration; features time delay circuitry, effect modifier block (designed to imitate motor or servo hunting bounce), and depth control (effects percentage of direct vs. delayed signal and relative phase of each); line in/out control and LED indicator; high level input and output (optional balanced line in/out available); LED mode indicators. Frequency response 50-15,000 Hz +1 dB (direct channel), 50-10,000 Hz +1.5 dB (delayed channel); dist. 0.05% below clipping (direct channel), 1.0% from 0 to +8 dBm input (delayed); dynamic range 112 dB at 15,000 Hz (direct), 75 dB (delayed); delay time variable between 200 μsec-10 msec; **input/output level 0 to +4 dBm; input impedance 10k ohms unbalanced;** 3.5" H × 19" W × 9" D $615

2830 Omnipressor
Dynamic modifier combines functions of compressor, expander, noise gate, and limiter. Features continuously variable expansion/compression control (10:1 gate to 10:1 abrupt reversal); attenuation and gain limit controls (60 dB to +1 dB); variable time constant controls (1000:1); bass/cut switch; logarithmic input/output/gain meter; in/out bypass switch. Frequency response 20-16,000 Hz +0/-0.5 dB; **input/output level 0 to +8 dBm nominal; input impedance 10k ohms electronically balanced; output impedance 600 ohms nominal;** gain unity, +10, +20 dB (agc disabled); compression continuously variable from 1:1 to unity to 10:1; expansion continuously variable from 1:1 to 10:1; S/N −90 dBm at unity gain; attack time continuously variable 100 μsec-100 msec; release time continuously variable from 1 msec-1 sec; 115 V ac, 50-60 Hz +12% or 230 V ac, 50-60 Hz +12%; 3.5" H × 19" W × 9" D $600

FOSGATE ELECTRONICS

Tetra II Tetrasound
Multi-channel sound decoder system converts two-channel stereo, SQ, and CD4 program material into four separate channels producing 360-degree spatial sound field; Tate decoder incorporates automatic dimension control, phase corrector, and base combination circuitry. Features decode mode switch; LED peak-level input, output, and logic signal indicators with LED peak-reading display on/off switch; left/right input balance, front left/right balance, and rear left/right balance slide controls; input balance adjust; front-to-rear fader; two- and four-channel inputs; input level trimmer posts; remote control input with on/off switch; tape monitor switch; normal/line level output switch; master volume control. Separation 35 dB between all channels; THD 0.05% typically, 0.15% max. from 20-20,000 Hz at 0.5 V rms; max. output 2.25 V rms; noise −80 dB at full level $995

HEATH

AD-1304 Active Audio Processor Kit
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. $200

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 and tape monitor; 4 3/32" H × 17 1/4" W × 8" D $130

KLARK-TEKNIK

DN70 Digital Time Processor
652-msec max. time delay system features digital readout in msec of each output (three main outputs) and quasi 15-bit analogue-to-digital converter with 3k ROM and 448k RAM capacity. Additional features include front-panel mixing and regeneration

9 SIGNAL PROCESSORS

treble tone control +4/−7 dB at 7000 Hz; 3½" H × 15" W × 19½" D..... $585
AP52. Speaker system designed for Model Two Digital Time-Delay System..... $114

BIAMP

SR/240 Stereo Reverberation System
Stereo reverberation system with two type-9 Accutronics three-spring assemblies. Features automatic hard limiter with LED; two-position reverb-send attack limiter switch; transformerless balanced or unbalanced outputs; EQ blend system includes four frequency controls. THD 0.01% dry signal; slew rate 13 V/μsec dry signal; S/N at unity gain −89 dB from 20-100,000 Hz, 0 dB, −76 dB at 0 dB with blend control at max. reverb, all EQ controls set at 50%; input impedance 10k ohms min.; decay time 2.5 sec; 3½" H × 19" W × 10" D..... $489

EQ/270A Graphic Equalizer
27-band 1/3-octave graphic equalizer with center frequencies set from 40-16,000 Hz with ±12 dB boost or cut. Features EQ bypass switch; LED overload indicator; **transformer-type connectors and phone jacks on inputs and outputs; transformerless balanced lines in and out;** combining filters. Frequency response 10-90,000 Hz ±1 dB, 15-30,000 Hz ±0.1 dB; THD and IM dist. 0.0075%; hum and noise −90 dB at 0 dB V reference, 115 dB below rated output; filter bandwidth 1/3 octave at 3-dB point with 6 dB attenuation; frequency tolerance ±2% of band centers; input impedance 600 ohms/500 ohms switchable; max. input +24 dB; slew rate 8 V/μsec; 3½" H × 19" W × 10" D..... $459

EQ/210 Graphic Equalizer
Ten-band two-channel graphic equalizer with center frequencies at 32, 64, 125, 250, 500, 1000, 2000, 4000, 8000, and 16,000 Hz, ±15 dB boost or cut. Each channel has ten sliders, gain slider, EQ bypass switch, and LED overload indicator; **four ¼-in phone jacks/ch for unbalanced/balanced input/output lines.** Frequency response 6-45,000 Hz +0/−1 dB (control set flat); THD and IM dist. 0.005%; gain −3 dB unbalanced, 0 dB balanced; slew rate 1 V/μsec; **output load impedance 600 ohms;** input impedance 50,000 ohms, balanced or unbalanced; max. output +24 dBm at 8 V, unbalanced; S/N 84 dB below 1 V out; 3½" H × 19" W × 5¼" D... $269
EQ/110R. One-channel version of EQ/210..... $175
EQ/110. Same as EQ/110R without rack mount..... $165

Quad Limiter
Multi-channel limiter/compressor features four front-panel threshold controls with LED for four independent channels. Threshold variable from −40 to +18 dB; **output impedance 600 ohms unbalanced or balanced; input impedance 25k ohms unbalanced, 50k ohms balanced;** frequency response 20-25,000 Hz ±0.5 dB; THD 0.03% at 1000 Hz; attack time 1 msec; release time 150 msec to 1.5 sec; S/N 102 dB; slew rate 8 V/μsec; 1¾" H × 19" W × 5½" D... $249

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 readouts; 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 μV rms 20 Hz to 20 kHz; has 8 phono jacks and tape deck connectors; 2⅞" H × 17½" L × 8¼" D..... $379

TNE 7000 Transient Noise Eliminator
Impulse suppressor reduces or eliminates medium and small clicks, pops and ticks from turntable or tape deck; has defeat, tape monitor, threshold, and sensitivity controls; LED indicators for transient noise elimination and high-frequency calibration; frequency response 20-20,000 Hz ±0.5 dB; distortion 0.1% (THD), 0.5% (IM); internal noise 40 μV rms; 2⅞" H × 16¾" W × 7⅝" D..... $299

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; 5¼" H × 19" W (rack mount) × 17¼" D (incl. knobs)..... $600

CROWN

RTA-2 Real-Time Audio Analyzer
Real-time spectrum analyzer in ⅓- and full-octave bands, switch selectable; consists of 32 single-pole-pair ⅓-octave bandpass filters centered on ⅓-octave intervals. Features 5-in scope; lighted graticule; built-in pink-noise generator; 800-20,000 Hz and 16-630 Hz fast/slow integration rate select controls; 5 or 10 dB/division select control; 0-70 dB input level control in 10-dB steps, 40-dB range vernier; internal balanced-input gain control. Frequency response 16-20,000 Hz; **sensitivity at full-scale indication 15.2 mV-150 V, max. in (unbalanced), 0.76 mV-3 V, max. in (balanced);** scans 32 channels in 16.6 msec; max. output 1.1 V rms **min.; balanced output 600 ohms/50 ohms (male XLR front connector), unbalanced output 300/25 ohms** (¼-in phone jack front and rear panel connector); 7" H × 19" W × 15" D..... $2595

EQ-2 Synergistic Equalizer
Eleven-band two-channel octave center equalizer with center frequencies set at 20, 40, 80, 160, 320, 640, 1250, 2500, 5000, 10,000, and 20,000 Hz, ±15 dB boost or cut; each channel features octave frequency adjust controls; ±20 dB tone controls with bass hinge points adjustable from 180-1800 Hz and treble hinge points adjustable from 1000-10,000 Hz; equalizer cancel and tone cancel master controls; and overload indicators. Rear panel has unbalanced inputs, balanced inputs with switchable unity/+10 dB gain selection, screwdriver-adjusted attenuation controls, and normal/inverted outputs. Frequency response 10-100,000 Hz +0.3 dB, 20-20,000 Hz ±0.1 dB, controls flat with IHF load; hum and noise 90 dB below rated output, 20-20,000 Hz bandpass; IM dist. 0.01% at rated output; rated output 2.5 V rms into IHF load; **input impedance 25,000 ohms unbalanced, 20,000 ohms balanced (transformerless); output impedance 300 ohms (normal), 600 ohms (balanced);** satinized aluminum front panel with grey Lexan inlay; 7½" H × 19" W × 14½" D..... $1095

dbx

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
Model 124. Four-channel switchable record or play..... $399
Model 128. Two-channel switchable record or play plus linear and above-threshold expander/compressor..... $450

155 Noise-Reduction System
Professional format, 4-channel tape noise-reduction system gives 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

Dynamic Range Expanders
Permits listener to restore up to 20 dB of the dynamic range missing from records, tapes, or FM broadcasts.
3bx. Three-band linear expander with 30 gain-change LEDs in −20 to +12 dB range..... $650

3bx-R. Remote control for 3bx; provides remote control of transition level, release time, and expansion ratio; system master volume; fade control..... $149
2bx. Two-band linear expander with 20 gain-change LEDs and program-dependent release rate..... $450
1bx. Single-band linear expander with ten gain-change LEDs and program-dependent release rate..... $245
118. Compressor/expander with peak limiting/unlimiting capability; allows recordist to make full dynamic range tapes on moderately-priced recorders and obtain 20 dB or more improved (S+N)/N; LED indicator light..... $199

EVENTIDE

1745M Digital Delay System
Electronically-controlled RAM digital delay system features Signal Doubling (doubles voice or instrument sound signals by insertion of 12-40 msec delay) and Audio Recirculation (traps and continuously repeats 640-msec of signal) switches; front-panel instant-zeroing switches of all delays; input level control; optimum level indicator; two solid-state digital readouts for two outputs (up to three additional outputs are available). Delay 320 msec/output in 20-μsec steps; frequency response 30-16,000 Hz ±1 dB (standard delay), 30-8000 Hz (double delay); 90-dB dynamic range; dist. 0.3% at 1000 Hz. **input signal level from −10 dBm to +24 dBm; output impedance 150 ohms nominal, 300 ohms driving;** S/N 78 dB; 115 V ac, 50-60 Hz ±5% or 230 V ac, 50-60 Hz; 5¼" H × 19" W × 15" D..... $4100
03. Extra outputs, fully switchable..... $550 ea.
08. Variable pitch/delay output with high-resolution readout..... $850
09. Remote control, GPIB compatible..... $550

H910 Harmonizer
Multipurpose unit functions independently as digital delay, two-octave pitch changer, and anti-feedback, and creates special effects with use of all functions. Input impedance 10k ohms nominal; **input level range −10 dBm to +24 dBm; output impedance 150 ohms nominal;** dist. 0.2% at 1000 Hz; dynamic range 90 dB from clipping to noise floor; delay 0, 30, 60 msec (pitch mode), 0-112.5 msec in 7.5-msec steps (delay mode), 0-82.5 msec in 7.5-msec steps (optional output); frequency response 20-20,000 Hz +1 dB at any delay; input provided to phase-lock unit to synthesizer 115 V ac, 50-60 Hz +5% or 230 V ac, 50-60 Hz; 3½" H × 19" W × 9" D..... $1500
02. Digital pitch ratio readout..... $125
03. Balanced in/out transformer coupling..... $40
04. Extra variable delay output..... $240
05. Two-octave (C to C) phase-locked keyboard;

9 SIGNAL PROCESSORS

ADC PROFESSIONAL PRODUCTS

Sound Shaper Two MkII Equalizer

Twelve-band stereo frequency equalizer with center frequencies set at 30, 50, 90, 160, 300, 500, 900, 1600, 3000, 5000, 9000, and 16,000 Hz, ±12 dB boost or cut; each band/ch has linear potentiometer control with center detent. Features internal switching and monitoring with pushbutton line record and tape monitor controls; pushbutton equalization bypass; dual seven-segment ±12 dB LED meter with 1-dB adjust switch and two channel LEDs; rear-panel variable frequency spectrum level balancing controls/ch; two main and two tape monitor inputs; two main and two tape outputs. Frequency response 5-100,000 Hz ±1 dB; unity gain ±1 dB; output 9 V rms into 10k ohms; HD and IM dist. 0.02%; hum and noise 85 dB; **output impedance 10 ohms at 1000 Hz;** input impedance 75k ohms; 6¼" H × 16⅜" W × 6¾" D..... $330

Sound Shaper One Ten Equalizer

Ten-band stereo frequency equalizer with center frequencies set at 31, 62, 125, 250, 500, 1000, 2000, 4000, 8000, and 16,000 Hz, ±12 dB boost or cut; each band/ch has linear sliding controls with center detent. Features power, line record, tape monitor, and EQ bypass pushbutton controls; two main and two tape monitor inputs; two main and two tape outputs. Frequency response 5-100,000 Hz +0/−1 dB; unity gain ±1 dB; output 10 V rms min. into 10k ohms; HD and IM dist. 0.02%; hum and noise 80 dB; **output impedance 10 ohms at 1000 Hz;** input impedance 75k ohms; 6¼" H × 14¾" W × 6¾" D..... $230

Sound Shaper One. Similar to One Ten except five-band, two channel equalizer with center frequencies set at 60, 240, 1000, 3500, and 10,000 Hz; frequency response 5-100,000 Hz +0.5/−1 dB; no line record or EQ bypass control; 5⅝" H × 10 31/32" W × 6 11/16" D..... $120

AUDIOARTS ENGINEERING

4200 Parametric Equalizer/Preamplifier

Four-band two-channel parametric equalizer/preamplifier features four dual-range filter sections

with separate equalization bypass switches and one master equalization bypass switch. Each section also has continuously variable center frequency controls ranging from 22 300 and 220-3000 Hz (Sections 1 and 2), 100-1000 and 1000-10,000 Hz (Section 3), and 180 2100 and 1800 21,000 Hz (Section 4), variable bandwidth controls from 2 to 1/6 octave range, and boost/cut controls at ±16 dB. Additional features include LED overload indicators, **line level input jack (balanced, +20 dBm)** and instrument preamp input jack (unbalanced), **line output jack (+20 dBm into 600 ohms),** and gain controls for each channel. Frequency response 20-100,000 Hz ±0.5 dB; THD 0.005% from 20-20,000 Hz at +18 dBm; IM dist. 0.002% at +18 dBm (SMPTE); S/N 110 dB, 113 dB typical; slew rate 12 V/μsec; output level +21 dBm into 600 ohms; output impedance 6 ohms; input level +20 dB (+26 dB available); input impedance 100,000 ohms; gain 0 dB line in, +27 dB preamp in; 110-125 V ac, 50-60 Hz. **Includes 3½-in rack mount;** 3.5" H × 19" W × 9.375" D..... $599

4100. One-channel version of 4200; includes 1.75-in rack mount; 1.75" H × 19" W × 8.5" D..... $332

AUDIO CONTROL

C-101 Equalizer/LED Spectrum Analyzer

Ten-band two-channel graphic equalizer features 101 LED spectrum analyzer display. LED spectral display operates on various levels: shows controllable peak reading modes (fast or slow); horizontal LEDs which indicate sound pressure level with external microphone or VU meter readings; switchable calibration levels from 2 dB/LED (analyzes pink noise and microphone) to 4 dB/LED (displays wider dynamic range). Center frequencies set at 32, 60, 120, 480, 960, 1920, 3840, 7680, and 15,500 Hz with ±15 dB range, 1 dB subsonic rolloff at 25 Hz, 3 dB rolloff at 20 Hz, and 21 dB rolloff at 10 Hz. Other features include continuously variable input level sensitivity with calibration; **automatic mic/line input switching; built-in pink noise generator;** stereo paired equalizer sliders; equalization tape button; 18 dB/octave subsonic filter; phase correlation rumble reducer circuit. Frequency response 3-100,000 Hz ±0.75 dB; dist. 0.025% at 1 V from 20-20,000 Hz; hum and noise 96 dB at 1 V, 10,000-Hz bandwidth; max. input 7 V; **input impedance 100k ohms; max. output 7 V; output impedance 680 ohms;** 3.5" H × 19" W × 6.5" D..... $549

C-25 Octave Equalizer

Ten-band two-channel octave equalizer features built-in **pink noise generator.** Center frequencies set at 32, 60, 120, 480, 960, 1920, 3840, 7680, and 15,500 Hz with ±15 dB range, 1 dB subsonic rolloff at 25 Hz, 3 dB rolloff at 20 Hz, 21 dB rolloff at 10 Hz. Other features include stereo paired sliders, 18 dB/octave subsonic filter, equalization tape button, and phase correlation rumble reducer circuit. Frequency response 3-100,000 Hz ±0.75 dB; dist. 0.025% at 1 V from 20-20,000 Hz; hum and noise 96 dB at 1 V; max. input 7 V; **input impedance 100k ohms; max. output 7 V; output impedance 680 ohms;** 3.5" H × 19" W × 6.5" D..... $299

C-22. Similar to C-25 without pink noise generator; frequency response 3-100,000 Hz ±1 dB; dist. 0.04% at 1 V from 20-20,000 Hz..... $229

520B Equalizer/Speaker Control System

Five-band equalizer/speaker control system with 18 dB/octave subsonic filter. Center frequencies set at 36, 60, 120, 1000, and 15,500 Hz; equalization range ±12-15 dB. Features tape monitor loop and separate function switches; l/r tape inputs/outputs and l/r main inputs/outputs. Frequency response 15-30,000 Hz ±1 dB; dist. 0.04% from 20-20,000 Hz, 1 V; hum and noise −96 dB at 2 V out, −90 dB at 1 V; max. input 7.5 V rms; input impedance 470k ohms; max. output 7.0 V rms; output impedance 600 ohms; 2.6" H × 12.3" W × 5" D..... $119

AUDIO PULSE

1000 Digital Time Delay System

Digital time delay system with built-in dynamic range expander with LED gain display; features delay/decay time digital display; rear-panel jacks for remote ambience defeat switch; extra external long/short outputs for 6- or 8-channel operation; LED input level display; automatic defeat of ambience system; built in headphone amplifier with ambience mix control; ambient signal mix in front channels; tape monitor facilities; separate rear-channel ambience control; individual secondary input/output level controls. Six initial delays continuously variable from 7-95 msec; ambience control 0.0-1.2 sec variable; frequency response 20-10,000 Hz ±3 dB (delay mode); THD 0.5% at 1000 Hz; S/N 75 dB (IHF). Dynamic range expander: expansion ratio 1.0 1.5; S/N 80 dB (IHF); headphone output 100 mW at 8 ohms; 110/220 V dc; black anodized finish; 3½" H × 17" W × 12" D..... $950

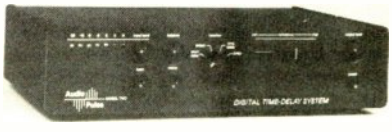
AP102. Secondary speaker system designed for use with 1000; has four drivers, including rear-facing tweeter, in 35" H × 8¾" square column enclosure..... $350 pr.

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 ±½ dB (direct), 20-8000 Hz ±3 dB (delayed); output noise 75 dB (direct), 65 dB (delayed); THD 0.05% (direct), 1% (delayed)..... $749

Model Two Digital Time-Delay System

Recreates multidimensional paths of live sound by electronically duplicating delayed reflected sounds;



audio signals encoded digitally and fed into random access memory device at three different stages to recover audio signal. Features built-in 25-W/ch integrated amplifier for precise adjustment of secondary channels and bass and treble controls; input and output level controls with LED peak level indicators; long/short delay and direct/defeat function selector. Short initial delay 19, 33 and 51 msec, long delay 39, 66, and 103 msec; reverb decay time variable from 0.1-0.6 sec; input sensitivity for 0 dB 50 mV-3.3 V variable at 1000 Hz (low level), 1.2-60 V variable at 1000 Hz (high level); input impedance 47,000 ohms (low level), 470,000 ohms (high level); output 0-1.5 V/16,000 ohms (aux.); output noise from 20-20,000 Hz unweighted 80 dB below rated out (direct), 72 dB below rated out (delayed); bass tone control ±2.5/−12.5 dB at 70 Hz,

How can equipment designed for an average listening room perform optimally in your environment?

There's nothing particularly wrong with your stereo system. It's just that different rooms have different acoustics.

Of course, you could build a room specifically designed around the needs of your speakers, and you could rebuild it every time you upgrade your system. But we have an easier way; an MXR Graphic Equalizer that enables you to achieve maximum performance from *your* system, in *your* room . . . without moving walls.

Our equalizers allow you to critically adjust the frequency balance throughout the entire musical spectrum. They can help to correct certain audible inconsistencies common in many of today's records and tape recordings. You can choose the MXR equalizer that best suits your needs. We make three models that differ in flexibility and precision/ sophistication, but each is built to the same exacting specifications and all three share MXR's reputation, in the professional field, for reliability and integrity.

Our popular ten band stereo EQ has one band per octave. Our stereo fifteen band model allows even greater control with two-thirds octave per slider; and for the true audiophile, the MXR thirty-one band equalizer provides ultimate control with one-third octave per slider.

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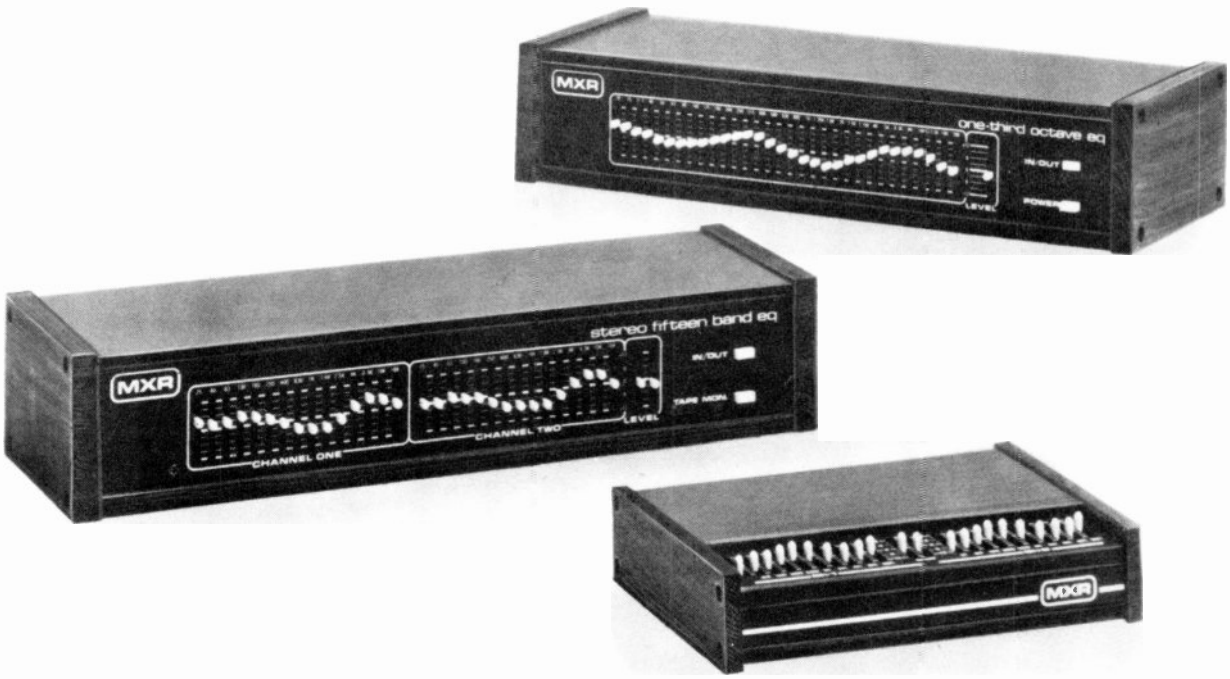


associated Shure mixer or battery power supply $239

SONY

MX-20 Professional Microphone Mixer

Eight-channel in/four-channel out microphone mixer for studio or sophisticated amateur recordings. Features 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; pan pot and dead center controls; slide master fader; slanted front panel with carrying handle; four VU meters; abundant output level. Mic input sensitivity −72 dB (0.2 mV), low impedance; 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 13/16" H × 18 5/16" W × 16 3/4" D..... $1275

MX-650 Microphone Mixer

Six in/two out channel microphone mixer for sophisticated two-channel recording; each input channel can be set to feed left or right line output and each output channel can be Y-ed to left and right line outputs simultaneously. Features 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), low impedance; 100,000 ohms line-in impedance, sensitivity −22 dB (60 mV); phono in impedance 50k ohms, sensitivity −51 dB (2.2 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 3/8" H × 17 7/8" W × 10" D..... $310

MX-510 Microphone Mixer

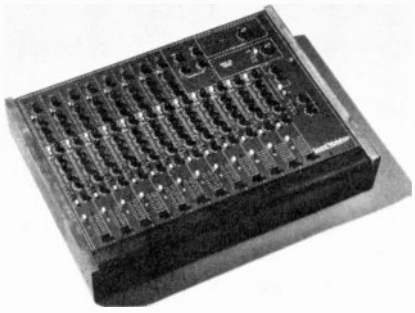
Five channel inputs; two channel outputs. Features two-way (battery/ac current) power source; five mic inputs for low impedance mikes; three line inputs for tape recorder, tuner or amplifier; two phono inputs for record player; pan pot control; slide master fader control pre-set indicators; two VU meters. Sensitivity −72 dB at 0.2 mV (mic in, low impedance), −22 dB at 60 mV (line in), −51 dB at 2.2 mV (phono in, RIAA); impedance 100k ohms (line in), 50k ohms (phono in); mic attenuation off −20 dB; output level/impedance −5 dB at 0.435 V/10k ohms (line), −24 dB at 49 mV/8 ohms (headphone); frequency response 30-25,000 Hz; S/N 60 dB; 3" H × 13 3/4" W × 9 1/2" D..... $225

As of June 1979, Sony will introduce the MX-7, MX-5, and MX-670 microphone mixers at $70, $45, and $425, respectively. For more information, write directly to Sony.

SOUND WORKSHOP

1280 Recording Console

12-in/8-out recording console; 8 × 2 stereo control room monitor mix; 8 × 1 musician's 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 1/2" H × 27" W × 20" D..... $2900

1280B. Same as 1280 but with studio-quality balanced transformer mic-pres $3280

TAPCO

Catalina Series C-12 Mixing Console

12-in/four sub-group direct out/stereo and mono out sound reinforcement/mixing console; features

mic/line switching; front-panel patching system; switchable metering of all outputs; two pannable effects returns; three separate sub-busses comprising monitor, pre EQ/channel gain, pre or post aux. buss, and post effects buss; full priority solo system; headphone monitor system; ±18 dB bass, ±12 dB midrange, and ±18 dB treble EQs/input channel; 100-mm slide-gain controls; front-panel mounted patchbay; +48-V phantom power for high-quality condenser microphone..... $1999

TASCAM by TEAC

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 +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 1/2" H × 23 3/8" W × 24 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 ±2 dB; S/N 60 dB weighted min.; crosstalk −60 dB at 1

kHz; 0.3% THD max.; 117-V ac, 60 Hz, 18 W; 6 1/4" H × 18 1/4" W × 20 1/2" D..... $990

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 ±1 dB; crosstalk −50 dB at 1 kHz; 0.3% THD max.; 117-V ac, 60 Hz, 8 W; 4 3/8" H × 17 1/8" W × 4" D..... $160

MB-20 Meter Bridge

TEAC meter bridge; four VU meters with LED peak-level indicator; built-in 4 × 2 monitor mixer, headphone amp, independent monitor switches, and a variable input sensitivity selector $250

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 buss 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 17/32" H × 13 7/16" W × 14 9/16" D..... $475

MB-20 Meter Bridge

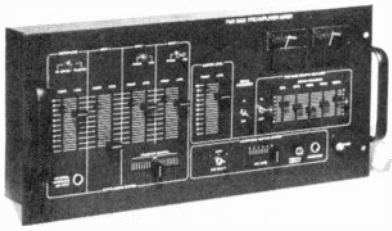
For line-level applications; complements Model 2A Audio Mixer; four VU meters; LED peak-level indicator; built-in 4 × 2 monitor mixer; headphone amp; independent monitor switches; variable input sensitivity selector $250

8 MIXERS

1010. Audio processor for 3990; features complete tape facilities with two sets of tape monitor dubbing, low-noise three-band active equalizer, and electronic logic patching for stereo reverse, mono, and other combinations; frequency response 20-20,000 Hz ±0.25 dB; IM and HD 0.01%; S/N 90 dB; slew rate 9 V/μsec; illuminated VU meters with sensitivity adjust; rack mountable 3½" H × 19" W..... $310

PMX-9000 Mixer/Equalizer

Combination mixer/graphic equalizer. Mixer: features two sets of switchable line and phono inputs



each with slide level control and crossfader transition slider and mic input channel with standby and talkover; complete cueing facilities with level and selector controls; S/N 76 dB below 10 mV (phono), 75 dB below clipping (mic), 85 dB (aux.); max. input 220 mV at 1000 Hz (phono), 200 mV (mic), 10 V (aux.); input impedance 47k ohms (phono), 600 ohms (mic); phono subsonic filter 18 dB/octave at 30 Hz; mic talkover 14 dB program level reduction. Five-band graphic equalizer with center frequencies at 60, 250, 1000, 3500, and 12,000 Hz, ±12 dB boost or cut; has bypass switch and switchable signal processor loop. Other features include illuminated VU meters with calibrated sensitivity control (−20 to +3 dB range); master level control; two sets of stereo main outputs; preset level indicators for all inputs and main outputs; rack mountable 8¾" H × 19" W..... $400

JVC

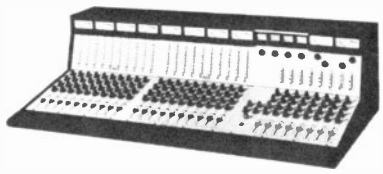
MI-5000 Master Mixer

Six-channel master mixer; each channel features 10-dB input level slide controls with 20-dB master input level control, independent pan pots, LED overload indicators, four-position mic/att/phono/line select switches, and echo switches with three-sec variable echo level control. Additional features include mix out/tape in monitor select switch; two VU meters; input jacks for phono, line, tape, and mic; recording, monitor, and headphone jacks. Min. input/impedance 0.2 mV/200-5000 ohms (six-channel mix), 1.4 mV/47k ohms (phono), 80 mV/100k ohms (line and tape); rated output level/impedance 0.3 V/600 ohms (rec and monitor), 0.3 mW/8-1000 ohms (headphones); frequency response 20-30,000 Hz −3 dB (mic and line), 30-20,000 Hz ±0.5 dB (phono RIAA), 10-25,000 Hz −1 dB (tape in); dist. 0.5%; S/N (IHF A) 56 dB (mic), 67 dB (line), 65 dB (phono); 127 mm H × 482 mm W × 347 mm D..... $430

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 4½-in lighted VU meters for output assign channels, two 4½-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. Wired version..... $9700

1010 Matrix Transformer

Pushbutton 10-input × 10-output lighted-switch matrix transformer; input impedance 10k ohms; gain 0 dB; load impedance 600 ohms; +24 dBm output; isolation 80 dB between inputs; plug-in solid-state amplifiers and transformers; barrier terminals on rear for input and output; 7" H × 19" W × 14" D $2200

ROTEL

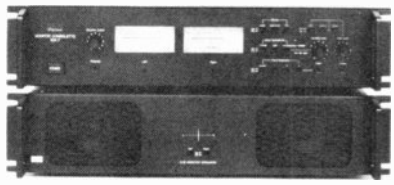
RZ-8 Play Mixer

Stereo mixer with built-in electronic rhythm maker and echo chamber; designed to produce endless series of rhythm backups for solo instrumentalist or provide ambience for singer with electronic echo chamber. Mixer: seven-input mix includes two turntable, two tape deck, and three mic/guitar inputs with individual volume level control, 600/50,000/200,000 ohm impedance selector, and professional fader; inputs can be headphone-monitored. Rhythm section: produces up to ten different rhythms with selection of nine different instruments; solid-state echo chamber with blend controls. Frequency response 5-50,000 Hz (line and rhythm inputs), 5-30,000 Hz (mic); THD 0.04% and 0.05% (line, phono, and guitar inputs), 0.15% (mic in); S/N 80 dB (line in), 75 dB (other sections), 60 dB (mic in); two VU meters..... $620

SANSUI

MA-7 Monitor Consolette

Monitor consolette features dual-function peak-hold meters reading watts or VU dBs and separate left/



right full-range cue monitor speakers; has adjustable input sensitivity buttons (−20 to +20 dB) with variable level control; monitor level control; built-in 400 and 10,000 Hz calibration oscillator with oscillator level control; amplifier for headphones or speakers; rack-mountable $330

AX-7 Mixer/Recording Consolette

Four-input stereo mixer with built-in reverb unit features 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 control; 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 47k ohms at 0.1% THD..... $300

SHURE

700 Pro Master Sound System

Six balanced low-level transformer-coupled input channels, each with pre-fader monitor send, effects/reverb send, high- and low-frequency equalization, pan pot, input attenuator, LED clipping indicator, and volume control; master controls; handles condenser microphones through built-in 24-V simplex power supply; two additional aux. level inputs for channels 7 and 8. Feedback finder ten-band stereo equalizer with ISO center frequencies set at 63, 125, 250, 500, 1000, 2000, 4000, 8000, and 16,000 Hz ±10 dB boost or cut. LED status, peak-reading, power amp overload, and temperature warning indicators; rear-panel patch block; frequency response 40-20,000 Hz ±2 dB..... $990
701. Speaker system for 700; has 15-in woofer and high-frequency horn; handles 150 W continuous; SPL 100 dB at 4 ft with 1 W; high-frequency horn has 60-degree long-throw and 120-degree wide-angle dispersion; ⅝-in plywood and structural foam enclosure..... $495

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 ±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; 3½" H × 15" W × 10" D $500

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 +10%, 50/60 Hz; 2¾" H × 11⅜" W × 7½" D..... $256

M677 Accessory Mixer

Transistorized six-input accessory mixer for use with Shure models M67 and SE30; obtains power from

ALWAYS.....

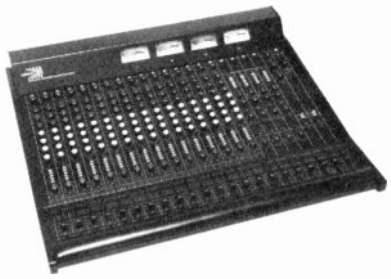
take along your copy of this Guide when shopping for hi-fi components. It is a comprehensive reference to complete technical details and prices.

8 MIXERS

BIAMP

1642 Professional Mixing Console

Professional mixing console comprised of 16 inputs, four equalization bands, four separate echo/



line channel returns, four submaster outputs, two main outputs, three auxiliary busses, and headphone monitoring. Input section includes low-impedance mic/high-impedance line switching; trim rotary controls continuously variable from 0 to 40 dB; aux. buss pre/post switch; aux. buss control; post-fader, post-EQ echo buss; monitor (adjustable to pre-fader, pre-EQ monitor buss); equalization controls set at 12,500, 3700, 250, and 80 Hz with ±18 dB boost or cut; post-fader and post-EQ solo; mute; channel assignment switches; pan (auto odd-even scheme); dual-color LED indicators; input channel fader; wrist pad. Submaster section: channel inputs (17-20) with own level control; line record switch; sub send control; left/right program solo; sub master faders; sub master pan. Left main section: aux. buss, echo, and monitor solo and level controls; meter 3 assign; left main solo and fader controls. Right main section: phantom power (+48 V of power to mic inputs of 16 channels); headphone level control; meter 4 assign; right main solo. Other features include four lighted VU meters, LED overload indicators for each channel, mute on each channel, and priority solo system for instant monitoring. Frequency response 15-33,000 Hz ±1 dB; THD 0.02%; IM dist. 0.01%; slew rate 8 V/μsec; S/N 80 dB; crosstalk 75 dB at 1000 Hz, 60 dB at 10,000 Hz; 9½" H × 36¼" W × 31½" D.... $2495

1682 Stereo Mixing Console

Stereo mixing console comprised of 16 inputs/stereo outputs, three equalization bands, left and right main master section, prefader, pre-equalization monitor, and built-in Accutronics reverb system. Input section features slide fader, pan, monitor, low-mid-high equalization with center frequencies set at 100, 2500, and 10,000 Hz, ±18 dB boost or cut, reverb/effects, and attenuator. Left/right main master section features monitor/effects send, reverb and aux. level/pan, and low frequency filter. Rear panel features left/right main balanced and unbalanced, monitor out balanced and unbalanced, effects send/aux. input pan, left and right aux. in, stacking inputs for monitor and effects busses, low-impedance transformer inputs, high impedance line input, and channel patching. Frequency response 15-45,000 Hz ±1 dB; THD 0.02%; IM dist. 0.01%; slew rate 8 V/μsec; S/N 80 dB at 20-20,000 Hz balanced; crosstalk 75 dB at 1000 Hz; max. input level +10 dB (low impedance), +30 dB (line in); output levels 8 V rms into 600 ohms (balanced), 6 V rms into 600 ohms (unbalanced); 5¾" H × 32½" W × 16½" D..... $1165

1282. Similar to 1682 but has 12 inputs/stereo outputs; no channel patching; 5¾" H × 27" W × 16½" D $939

8802. Similar to 1282 but has eight inputs/stereo outputs; 5¾" H × 20¾" W × 16½" D..... $721

6702 Stereo Mixing Console

Stereo mixing console with six inputs/stereo outputs, two-band equalizer, prefader pre-EQ monitor, and built-in Accutronics reverb. Input channels feature rotary fader, pan, monitor, low and high EQ, reverb/effects, and attenuation controls. Left/right main master sections feature monitor effects send and reverb and aux. level/pan controls. Right and left main (unbalanced) rear panel features monitor unbalanced, effects send/aux. in pan, left and right aux. in, low-impedance transformer inputs, and high-impedance line input. Has lighted VU meter. Frequency response 15-45,000 Hz ±1 dB; THD 0.02%; IM dist. 0.01%; slew rate 8 V/μsec; S/N 80 dB from 20-20,000 Hz balanced; crosstalk 75 dB at 1000 Hz; max. input level +10 dB (low impedance), +30 dB (line in); output levels 9 V rms into 10,000 ohms, 6 V rms into 600 ohms (unbalanced); 6" H × 19" W × 12" D..... $432

6702B. Balanced version of 6702; output levels 8 V rms into 600 ohms, 17 V rms into 10,000 ohms.... ..... $498

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; Autofade 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; 1½" H (less feet and knobs) × 19" W × 8" D..... $714

DUBIE

CD-35 Sound Control System

Sound control system integrates up to six recorders, two turntables, four signal processors, and amplifier/receiver through one-time hookup of patch cords; multiple operations for recording, dubbing, mixing sound-on-sound, playback, fade, monitor on 12 different channels, fade from one turntable to another, and use of signal processors for sound enhancement. Front-panel controls include 12 patch devices for signal processors, two fade controls for amplifier/receiver and one for two turntables, two dub switches, 12-position monitor switch and five solid-state four-position recorder controls plus auxiliary switch for sixth recorder; rear panel connections for patch cord devices from signal processors, turntables, recorders, and receiver/amplifier; aluminum front and rear panels with walnut vinyl cabinet. Max. input signal 10 V at 1000 Hz; frequency response 0-100,000 Hz on all functions; 8" H × 16¾" W × 5½" D..... $400

CD-10 Sound Control System

Sound control system integrates up to six recorders and receiver/amplifier through one-time patch cord hookup; dubs, records, plays back, mixes sound-on-sound, monitors, and fades; six solid-state four-position recorder controls; eight-position monitor select control; two fade controls; rear-panel connections for recorders and amplifier/receiver. Max. input signal 10 V at 1000 Hz; frequency response 0-100,000 Hz on all functions; 4" H × 13¹³/₁₆" W × 5¾" D $150

CD-5. Similar to CD-10 except three-recorder capacity; 4" H × 9⅜" W × 4⅞" D..... $100

GLI

3990 Preamplifier/Mixer

Preamp/mixer designed for creative audio, disco, and disco-format broadcast use. Phono/aux. section: features two sets of line and phono inputs with own rotary level control and crossfader transition slide; special-effects third set of line/phono inputs; master level control with complete cueing capabilities; two sets of stereo main outputs and mono output; frequency response 20-20,000 Hz ±0.25 dB (phono and aux.); HD and IM 0.01% (phono and aux.); S/N 80 dB below 10 mV unweighted (phono), 90 dB (aux. inputs 1 and 2), 96 dB (aux. input 3); overload 320 mV at 1000 Hz (phono), 7 V (aux.); slew rate 9 V/μsec (phono and aux.); input impedance 47,000 ohms (phono), 40,000 ohms (aux. inputs 1 and 2), 50,000 ohms (aux. input 3); phono subsonic filter 18 dB/octave at 18 Hz. Microphone section: features balanced differential input, bass equalization, and optoelectronic talkover with adjustable program mute attenuator; frequency response 20-20,000 Hz ±0.25 dB; bass equalization ±8 dB at 80 Hz; S/N 80 dB below 10 mV; HD and IM dist. 0.01%; gain 60 dB (signal processor out), 80 dB (main out), 32 dB (input), 20 dB (equalizer gain), 6 dB (mix), 20 dB (line amp); overload 315 mV; slew rate 9 V/μsec; program attenuation talkover −2 to −20 dB. Signal processor section: features switchable signal processor loop; input S/N 100 dB below 100 mV; input impedance 100k ohms; output 1.75 V at 600 ohms and 10 V at 10k ohms; output impedance 500 ohms; output S/N 107 dB below 2 V out; output dist. 0.005%. Audition output section: can be directly connected to integrated or power amplifier; output 2 V at 600 ohms and 7 V at 10k ohms; HD and IM dist. 0.01% from 20-20,000 Hz; talkover muting 10.5 dB with audition output muted. Headphone amp: S/N 95 dB below 2 W into 9 ohms; max. output 3 W continuous into 8 ohms with 0.1% HD and IM; slew rate 12 V/μsec; frequency response 20-20,000 Hz ±0.1 dB; rack mountable 7" H × 19" W $615

7 MICROPHONES

ECM-50PS Electret Condenser Mike
Professional omnidirectional electret condenser microphone with miniature design; frequency response 40-14,000 Hz; 250-ohm output impedance; S/N 66 dB; max. SPL 126 dB; dynamic range 98 dB; phantom power supply or internal battery; non-reflective satin nickel finish; comes with windscreen, carrying case and tie clip; fixed mike connector; 10-ft cable; 7/16" diameter × 13/16" L.... $225

F-115 Dynamic Microphone
Omnidirectional dynamic microphone for outdoor use in all weather conditions; built-in waterproof screen; also has doubly-structured accessory windscreen; frequency response 40-12,000 Hz; 600-ohm output impedance; vibration-proof rubber mounting; balanced output with "Cannon" plug; fixed mike connector; 20-ft cable; 1 3/16" diameter × 6 7/8" L..... $160

ECM-990F Electret Condenser Mike
Single-point stereo back electret condenser microphone for studio-quality performance; unidirectional; frequency response 40-16,000 Hz; 200-ohm output impedance; S/N 64 dB; max. SPL 126 dB; dynamic range 96 dB; back electret/FET impedance translator; axis selector to adjust directional quality; low-cut switch; LED battery power indicator; Sony type mike connector; 10-ft cable; includes windscreen and mic holder; 3 1/2" diameter × 8 1/4" L $150

ECM-30 Condenser Microphone
Professional omnidirectional condenser microphone with ultra-miniature design; frequency response 50-14,000 Hz; 250-ohm output impedance; S/N 60 dB; max. SPL 117 dB; dynamic range 83 dB; battery power; balanced output with "Cannon" XLR; fixed mike connector; 10-ft cable; includes carrying case, windscreen, and tie clip; 11/32" diameter × 19/32" L $105

ECM-23F Electret Condenser Mike
Unidirectional back electret condenser microphone; 20-20,000 Hz frequency response; 250-ohm output impedance; S/N 66 dB; max. SPL 130 dB; dynamic range 102 dB; output for both balanced and unbalanced circuit; FET impedance translator; battery power; low-cut switch; pad switch; comes with windscreen, carrying case, mike cable, and mike holder; XLR-3 mike connector; 20-ft cable; 1 1/16" diameter × 7 1/2" L $100
ECM-33F. Similar to ECM-23F except battery or phantom powered; max. SPL 126 dB; dynamic range 98 dB; 1 1/16" diameter × 6 15/16" L $185

ECM-41 Electret Condenser Microphone
Unidirectional electret condenser microphone designed for studio interviews; telescopic design; frequency response 50-13,000 Hz; 250-ohm output impedance; S/N 63 dB; max. SPL 126 dB; dynamic range 95 dB; satin nickel finish; fixed mic connector; 8-ft cable; XLR-3 connector; battery-powered; includes windscreen and mic holder; 3/4" diameter × 10 3/4-19 9/16" L adjustable $95

F-560 Dynamic Microphone
Unidirectional dynamic microphone designed for vocal, PA, and outdoor use; frequency response 80-13,000 Hz; 200-ohm impedance; low-cut switch; diecast aluminum body; XLR-3 mic connector; 6-ft 5-in cable; includes mic holder; 1 5/8" diameter × 6 7/16" L..... $90

ECM-170A Electret Condenser Mike
Omnidirectional electret condenser microphone for semi-professional use; good for recording or lecturing outdoors; frequency response 20-16,000 Hz; 200-ohm output impedance; S/N 64 dB; max. SPL 126 dB; dynamic range 96 dB; low-cut switch; output for both balanced and unbalanced circuits; detachable windscreen; FET impedance translator; easy-to-hold grip; satin nickel finish; Sony type mike connector; 16-ft cable; includes mic cable, mic holder, and carrying case; 1" diameter × 6 1/16" L..... $75

ECM-150 Electret Condenser Mike
Omnidirectional electret condenser microphone with miniature design; frequency response 40-13,000 Hz; 250-ohm output impedance; S/N 60 dB; max. SPL 117 dB; dynamic range 83 dB; plug adaptor for mini and phone connections; on/off switch; includes windscreen, case with mike stand, tie clip, and battery; fixed mike connector; 6-ft 5-in cable; 11/32" diameter × 19/32" L..... $65

ECM-260F Electret Condenser Mike
Unidirectional back electret condenser microphone; frequency response 50-14,000 Hz; 200-ohm output impedance; S/N 66 dB; max. SPL 126 dB; dynamic range 98 dB; battery-powered; 16-ft cable with phone cable plug; includes windscreen, battery, mic holder, stand adaptor, and carrying case; 1 1/2" diameter × 7 1/16" L..... $63

ECM-99A Electret Condenser Mike
One-point stereo electret condenser microphone for semi-professional and amateur stereo recording; two unidirectional microphone capsules in one housing; frequency response 50-12,000 Hz; 250-ohm output impedance; S/N 60 dB; comes with windscreen, carrying case, mike holder and battery; satin nickel finish; fixed mike connector; 10-ft cable; 2 3/4" diameter × 7 11/16" L..... $60

ECM-31M Electret Condenser Mike
Unidirectional electret condenser microphone designed for indoor/outdoor interviews; telescopic design; frequency response 50-13,000 Hz; 250-ohm output impedance; battery-operated; 8-ft cable with mini cable plug; includes urethane windscreen and mic holder; 3/4" diameter × adjustable 10 3/4-19 9/16" L..... $55

F-540 Dynamic Microphone
Unidirectional dynamic microphone for amateur vocal, single instrument or speech recording; frequency response 80-13,000 Hz; 300-ohm output impedance; talk switch; built-in windscreen; easy-to-hold tapered grip; fixed mike connector; 16-ft cable; 1 5/8" diameter × 7" L..... $45

ECM-16 Electret Condenser Microphone
Omnidirectional electret condenser lavalier microphone designed for interviews or conferences; features FET impedance translator; frequency response 50-13,000 Hz; 250-ohm output impedance; 6-ft cable; battery-operated; includes clip holder; 9/16" diameter × 1 9/16" L $38

ECM-210M Electret Condenser Mike
Unidirectional electret condenser microphone for general-purpose recording; frequency response 50-12,000 Hz; output impedance 200 ohms; S/N 64 dB; battery powered; fixed mike connector; mini plug fits most portable tape recorders; 8-ft cable; 1 1/2" diameter × 7 1/4" L..... $32
ECM-210S. Similar to ECM-210M except has dual-pin plug for use with tape recorders that offer remote start and stop capability..... $35

F-99M Stereo Dynamic Microphone
One-point stereo dynamic microphone for hi-fi recording; frequency response 80-12,000 Hz; 200-ohm output impedance; mini-plugs connect to hi-fi system mic inputs; fixed mike connector; 5-ft cable; 1 1/8" diameter × 6 1/4" L..... $30

F510 Dynamic Microphone
Unidirectional microphone for general amateur application; frequency response 80-12,000 Hz; 320-ohm output impedance; talk switch; built-in windscreen; rugged aluminum alloy construction; fixed mike connector; 10-ft cable; comes with mike stand and plug adaptor; 1 3/4" diameter × 7 3/8" L..... $28

F-500 Dynamic Microphone
Unidirectional microphone for general use; frequency response 80-12,000 Hz; 320-ohm output impedance; mini-plug connections; fixed mike connector; 8-ft cable; 1 7/8" diameter × 7 1/16" L..... $22
F-500S. Similar to F-500 except has dual plugs for connection to recorders that feature remote start and stop capability; start/stop switch is on microphone body..... $24
As of June 1979, Sony will introduce the ECM-220FA electret condenser microphone at $50 and two wireless microphone systems. For more information, write directly to Sony.

STUDER/REVOX

M3500 Dynamic Microphone
Dynamic unidirectional moving-coil type; hypercardioid 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; all-metal construction with matte black chromium finish. $160

TEAC

ME-120 Dynamic Microphone
Cardioid or omnidirectional dynamic electret microphone; 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 as ME-120 except response 50-16,000 Hz..... $90
ME-50. Same as ME-80 except cardioid; unbalanced or balanced 10,000 or 200-ohms; response 50-14,000 Hz..... $50

TECHNICS by PANASONIC

RP-3540E Cardioid Microphone
Electret-condenser cardioid microphone; 600-ohm output impedance; −68 dB sensitivity; frequency response 40-14,000 Hz; requires "AA" batteries; comes with stand, mike holder, 3/8-in adaptor, and 5-meter cable; 42 • 227 mm $70

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 × 60 × 185 mm... ..... $60

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 × 208 mm $60

RP-3330 Cardioid Microphone
Dynamic cardioid microphone; 400-ohm output impedance; −78 dB sensitivity; frequency response 50-12,000 Hz; comes with stand, mike holder, 3/8-in adaptor and 3-meter cable; 50 × 165 mm... $30

UHER by WALTER ODEMER

M 645 Electret Condenser Microphone
Electret condenser cardioid microphone; frequency response 30-20,000 Hz; sensitivity 3.5 mV/Pa; 280-ohm impedance; supplied with table stand and windscreen; powered by internal primary battery or from recorder's mike cable with 8-pole plug... $158

M 634 Dynamic Microphones
Stereo-pair dynamic shot-gun-type cardioid microphones with stereo-bar; all-metal design; frequency response 50-16,000 Hz; sensitivity 2.3 mV/Pa; low-resistive impedance; includes collapsible table stand and storage case $151
M 534. Similar to M 634 except single microphone for desk use $76

M 138 Dynamic Microphone
Omnidirectional dynamic hand-held microphone; frequency response 50-15,000 Hz; sensitivity 3.2 mV/Pa; low-resistive impedance; includes detachable table stand..... $32

579SB "Vocal Sphere" Microphone
Omnidirectional pattern; power level −57 dB; response 50-15,000 Hz; low impedance; 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.. $67

585SA "Unisphere A" Microphone
Cardioid pattern; power level −61 dB; response 50-13,000 Hz; high impedance; 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..... $67
585SAV. Similar to 585SA but has volume control on microphone barrel $73
585SB. Same as 585SA but low impedance $67

589S "Unidyne C" Microphone
Unidirectional dynamic type; power level −61 dB; response 90-13,000 Hz; dual 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" × 1 9/16"; weight 12 oz less cable $67

588SA "Unisphere B" Microphone
Cardioid pattern; power level −60 dB; response 80-13,000 Hz; high impedance; 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..... $57
588SB. Same as 588SA but low impedance $57

Semi-Professional Microphones

SM7 Dynamic Microphone
Unidirectional microphone with flat, bass rolloff, presence boost, and bass rolloff/presence boost switches; power level −57 dB (0 dB = 1 mW/10 μbar); frequency response 40-16,000 Hz; impedance 150 ohms for inputs rated at 19-300 ohms; dark gray foam windscreen and dark gray enamel finish $335

SM81 Condenser Microphone
Unidirectional low-noise, low-distortion microphone; power level −39.5 dB; frequency response 20-20,000 Hz; impedance 150 ohms; low r-f susceptibility; selectable 10-dB attenuator; three-position low frequency response switch; range of power sources 12 to 48 volts; supplied with attenuator lock, stainless steel windscreen, swivel adapter and cable; metallic vinyl finish..... $225

SM53 Dynamic Microphone
Unidirectional microphone with built-in shock mount and hum rejection system; bass rolloff switch; power level −60 dB; frequency response 70-16,000 Hz; impedance 150 ohms; supplied with 20-ft cable and swivel adapter; neutral matte metallic finish $224

SM33 Ribbon Microphone
Super-cardioid ribbon microphone for speech, instrumental and vocal recordings; bass response selector switch; power level −59 dB; frequency response 40-15,000 Hz; dual impedances 38 and 150 ohms; dark gray non-glare finish $219

SM59 Dynamic Microphone
Unidirectional microphone with cartridge shock mount design; built-in pop filter; power level −61 dB; frequency response 50-15,000 Hz; impedance 150 ohms; aluminum, zinc, and stainless-steel construction; champagne enamel finish..... $144

SM58 Dynamic Microphone
Unidirectional microphone designed for close-working studio recording; built-in removable spherical windscreen; power level −57.5 dB; frequency response 50-15,000 Hz; dual impedances 38 and 150 ohms; dark gray finish $138

SM57 Dynamic Microphone
Cardioid microphone for percussion instruments, pianos and string basses; power level −56 dB; frequency response 40-15,000 Hz; dual impedances 38 and 150 ohms; non-glare dark gray finish . $108

SM61 Dynamic Microphone
Omnidirectional microphone with built-in shock mount; "Blast Barrier" noise filter; power level −60.5 dB; frequency response 50-14,000 Hz; impedance 150 ohms; matte metallic finish $97

SM17 Dynamic Microphone
Miniature omnidirectional microphone designed for acoustic stringed and other instruments; power level −64 dB; frequency response 50-15,000 Hz; impedance 150 ohms; supplied with expansion and clip-mounting options, cable clips, and 10-ft attached cable $70

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 × 11 3/8" W × 5 1/4" D; weight 4 lb.
M68. Input connections are male professional three-pin audio connectors for 120 V ac ±10%, 50/60 Hz..... $139
M68FC. Input connections are female professional three-pin connectors for 120 V ac ±10%, 50/60 Hz $150
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..... $154

Accessories

A15 Series In-Line Adapters
Modifies mic response; three-pin male output and female input connectors.
A15AS. Microphone attenuator $22
A15PRS. Phase reverser $22
A15HP. High-pass filter $22
A15LP. Low-pass filter..... $22
A15PA. Presence adapter..... $22
A15RS. Response shaper $22
A15LA. Line input adapter..... $22
A15BT. Bridging transformer..... $22
A15TG. Tone generator $29

A95 Series Line Matching Transformers
Connect low-impedance microphone to high-impedance input or vice versa; for use with most microphones and input jacks.
A95A. Lo-Z: 3-pin male; Hi-Z: Amphenol male. $18
A95F. Lo-Z: 3-pin female; Hi-Z: Amphenol-type female $21
A95P. Lo-Z: 3-pin male; Hi-Z: 1/4-in phone plug $20
A95FP. Lo-Z: 3-pin female; Hi-Z: 1/4-in phone plug $23
A95D. Lo-Z: 3-pin male; Hi-Z: 1/4-in phone jack $20
A95FD. Lo-Z: 3-pin female; Hi-Z: 1/4-in phone jack.. ..... $23
A95U. Lo-Z: 3-pin male; Hi-Z: 1/4-in plug and jack $20
A95UF. Lo-Z: 3-pin female; Hi-Z: 1/4-in plug and jack $23

A97A Line Matching Transformer
Matches low-impedance (150 to 600 ohms) microphone outputs to medium-impedance (1000 to 10,000 ohms) inputs; three-pin male low-impedance connector; male Amphenol-type medium-impedance connector..... $18

SONY

C-47 Condenser Microphone
Professional switchable omnidirectional/unidirectional condenser microphone designed for critical studio recording applications; features two-stage FET impedance translator (complementary source follower circuit and buffer circuit); frequency response 30-18,000 Hz ±2.5 dB; 50-ohm output impedance; S/N 70 dB at 1000 Hz, 10 μbar; max. SPL 154 dB; dynamic range 130 dB; fully regulated ac/dc power supply or battery operation; fixed mic connector; 10-ft cable; output XLR-3 mic connector; includes power adapter, 57-ft extension cable, carrying case, mic cover, four-conductors, screwdriver, and two 0.25-A fuses; 2 1/16" diameter × 7 7/8" L $1075

C-76 Condenser Microphone
Unidirectional gun-type condenser microphone designed for theatrical use; frequency response

40-16,000 Hz; 250-ohm impedance; S/N 60 dB; sensitivity −58 dB; max. SPL 126 dB; dynamic range 112 dB; low-cut switch; battery-powered with optional external ac/dc power supply provision; LED battery indicator; XLR-3 mic connector; includes urethane windscreen; 1" diameter × 26 3/4" L . $750
C-74. Similar to C-76 except designed for media use; 1" diameter × 16 7/8" L..... $635

C-38B Condenser Microphone
Professional condenser microphone with switchable omnidirectional or unidirectional characteristics; features directivity switch and five-position function switch for mic adjustment; internal battery or phantom power; frequency response 30-16,000 Hz ±2.5 dB; 250-ohm output impedance; S/N 70 dB; max. SPL 140 dB; dynamic range 116 dB; high-cut switch; pad switch; FET circuit; windscreen and shock mounting; fixed mike connector; 20 ft cable; comes with carrying case; 3" diameter × 8 11/16" L.... ..... $505
C-37P. Similar to C-38B without high-cut switch and internal battery power; max. SPL 154 dB; dynamic range 130 dB; 1 7/8" dia. × 7 5/16" L $455

ECM-53FP Cardioid Microphone
Unidirectional cardioid back electret condenser microphone designed for desk or podium use; frequency response 40-15,000 Hz; 250-ohm output impedance; S/N 66 dB; max. SPL 126 dB; dynamic range 98 dB; movable head; battery-powered (optional ac/dc operation available); fixed mic connector; 10-ft cable; XLR-3 mic connector; includes windscreen, carrying case, battery, and stand adaptor; 13/16" diameter × 10 3/4" L $285

F-660 Dynamic Microphone
Unidirectional dynamic microphone for vocal/orchestral recording; frequency response 100-10,000 Hz; 250-ohm output impedance; safety lock; XLR-3 mike connector; includes double windscreens and mic holder; 1 1/2" diameter × 6 1/2" L..... ..... $250

ECM-56F Electret Condenser Mike
Back electret condenser microphone; unidirectional; frequency response 20-20,000 Hz; 250-ohm output impedance; S/N 66 dB; max. SPL 134 dB; dynamic range 106 dB; low-cut switch; external phantom power system or battery power; battery check lamp; 90 degree adjustable angle; rubber cushion in mounting reduces vibration; fixed mike connector; 20-ft cable; 2" diameter × 8 1/4" L $245

ECM-65F Electret Condenser Mike
Hand-held professional back electret condenser microphone for stage, broadcasting, or studio use; unidirectional; frequency response 70-20,000 Hz; 250-ohm output impedance; S/N 66 dB; max. SPL 137 dB; dynamic range 109 dB; double windscreen; phantom power system or battery power; XLR-3 mike connector; 20-ft cable; 1 1/2" diameter × 7" L $235
ECM-64P. Similar to ECM-65F except omnidirectional mike for outdoor use; frequency response 40-20,000 Hz..... $235

7 MICROPHONES

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..... $40

"All-Pro" Cardioid Microphone
Cardioid microphone; frequency response 30-15,000 Hz; 600-ohm impedance; supplied with 10-ft cord, ¼-in plug, desk stand adapter, mike stand adapter, and "AA" 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..... $30

Omnidirectional "On-Stage" Mike
Omnidirectional microphone; frequency response 30-15,000 Hz; 600-ohm impedance; supplied with windscreen, stand adapter, 10-ft cord, ¼-in plug, and battery..... $30

Featherweight Condenser Microphone
Electret condenser-type featherweight omnidirectional microphone; frequency response 20-13,000 Hz; ultra-slim design, 9/16-in diameter; supplied with windscreen, 9-ft cable, ¼-in plug, battery, and stand, 2.8 oz..... $20

RECOTON

MM-630 Cardioid Microphone
Unidirectional cardioid electret microphone designed for music groups, recording studio, TV, and radio work; sensitivity −66 dB; frequency response 30-16,000 Hz; low impedance (200-600 ohms); operates on 1.5-V AA battery; supplied with 18-ft shielded cable, XL type connector, swivel mike stand, and vinyl case; satin gold finish..... $50

MM-620 Cardioid Microphone
Unidirectional cardioid electret microphone designed for performing, broadcast, PA, and home recording; sensitivity −68 dB; frequency response 30-16,000 Hz; low impedance (200-600 ohms); operates on 1.5-V AA battery; supplied with 18-ft shielded cable with standard phone plug, swivel mike adapter, and vinyl case; satin gold finish.. $40

MM-610 Cardioid Microphone
Unidirectional cardioid electret microphone designed for performers; sensitivity −66 dB; frequency response 40-15,000 Hz; low impedance (200-600 ohms); operates on 1.5-V AA battery; supplied with 18-ft shielded cable with standard phone plug, swivel microphone adapter, windscreen, and vinyl case; satin gold finish..... $37

MM-330 Cardioid Microphone
Unidirectional dynamic cardioid microphone designed for performers; features built-in hi/lo and on/off switch; bull-head design; triple-mesh construction; includes 18-ft shielded cable with standard phone plug, swivel mike adapter, and vinyl case; silver finish..... $34

MM-600 Cardioid Microphone
Unidirectional cardioid electret microphone designed for tape recordists and PA systems; frequency response 50-13,000 Hz; low impedance (200-600 ohms); operates on 1.5-V AA battery; on/off switch; includes swivel stand adaptor, windscreen, 9-ft cable with standard phone plug, and vinyl case; satin gold finish..... $27

MM-750 Condenser Microphone
Electret condenser lavalier microphone designed for lecturers; sensitivity −72 dB; frequency response 50-12,000 Hz; low impedance (600 ohms); powered by 1.5-V Mallory MS76B or equivalent; includes 20-ft cable with 3.5-mm mini plug; 5/8" diameter × 1¾" long..... $24

MM-760 Electret Microphone
Omnidirectional tie clip electret microphone; output level 65 dB; frequency response 30-16,000 Hz; powered by 1.5-V AA battery (incorporated in plug assembly); includes 15-ft shielded cable, standard phone plug, and vinyl case; brush gold finish; 3/8" diameter × 5/8" long..... $22

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 Mic Stand
Microphone boom stand with arm for stereo pairing; mike-mount holes at both ends of adjustable boom; boom is 34 1/16-in long and rotatable over 360 degrees; supplementary bar is included to extend boom to 43 11/16-in; collapsible stand; four mike-mounting screws (5/16", 3/8", 5/8", 1/2"); matte black finish..... $200

SENNHEISER

MD 441 U Dynamic Microphone
Super cardioid dynamic microphone; frequency response 30-20,000 Hz; sensitivity 0.2 mV/μbar ±3 dB; brilliance switch for nominal 5-dB boost at 5 kHz; five-position bass attenuator; front-to-back ratio 20 dB, −3 dB; supplied with cable and quick-release mount for floor stand or MZT-441 table stand; takes MZW-441 windscreen; 1.3" H × 1.4" W × 9.6" L.
With low-impedance cable..... $418
With high-impedance cable..... $447

MD 431 U Dynamic Microphone
Super cardioid dynamic vocal microphone; frequency response 40-16,000 Hz; sensitivity 1.4 mV at 94 dB SPL; output −55.5 dB at 1 mW/10 dynes/cm²; 200-ohm source impedance at 1000 Hz; built-in bass/proximity cut-off and pop filters; on-off switch with lock; metal housing with replaceable stainless-steel grille screen; double-housed and shock-mounted; can be used in mobile situations; includes quick-release clip with lock, XLR connector, 16-ft cable, and phone plug..... $339

MD 211 U Dynamic Microphone
Omnidirectional dynamic microphone; frequency response 40-20,000 Hz; sensitivity −58 dBm (0.13 mV/μbar) ±2.5 dB; supplied with Cannon XLR connector and cable; 1" diameter × 4¾" L.
With low-impedance cable..... $327
With high-impedance cable..... $356

MD 421 U Dynamic Microphone
Cardioid dynamic microphone; 200-ohm impedance; frequency response 30-17,000 Hz ±5 dB; sensitivity 0.2 mV/μbar ±3 dB at 1 kHz; EIA rating −145.8 dB; output level −53 dBm (1 mW/10 dynes/cm²); front-to-back ratio 18 dB, −2 dB; variable bass attenuator; supplied with XLR connector and cable; 7" × 1 7/8" × 1 13/16".
With low-impedance cable..... $300
With high-impedance cable..... $329

MD 416 U Dynamic Microphone
Cardioid dynamic microphone; designed for close miking; frequency response 50-15,000 Hz; sensitivity 0.13 mV/μbar ±3 dB; 200-ohm impedance; built-in isolation system to eliminate handling noise; built-in pop filter, outdoor pop filter; supplied with Cannon XLR connector, threaded stand mount with quick-release clip, and cable.
With low-impedance cable..... $276
With high-impedance cable..... $305

Electret Condenser Mike System
One common powering module in balanced version (K3U) 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.
K3U. Powering module..... $135
K1. Powering module..... $112
ME20. Omnidirectional head..... $80
ME40. Super-cardioid head..... $113
ME80. Shotgun head..... $158

SHURE

300 Ribbon Microphone
Power level −57.5 dB (0 dB = 1 mW/10 microbar); 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..... $151

546 "Unidyne III" Microphone
Dynamic cardioid type; power level −58 dB; response 50-15,000 Hz; dual low impedance; hinge mount to stand; use for speech, rock vocals, and music; comes with 20-ft cable and connector; chrome finish..... $133

548SD "Unidyne IV" Microphone
Dynamic cardioid type; power level −56 dB; response 40-15,000 Hz; user selects high or low impedance; hand-held with slip-in stand attachment; use for speech and music; has on-off switch, 15-ft cable, and connector; chrome finish..... $104

565D "Unisphere 1" Microphone
Dynamic cardioid type; power level −57 dB; response 50-15,000 Hz; user selects high or low impedance; hinge mount to stand; use for speech, rock vocals, and music; has pop or blast filter, 15-ft cable, and connector; chrome finish..... $95
565SD. Same as 565D except has on-off switch and professional three-pin connector..... $97
566. Similar to 565D except with dual low impedance and shock mount..... $142

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 adapter, cable, mini-plug adapter cable, and carrying case..... $92
516EQ-PR. Two 516EQ microphones..... $165

545D "Unidyne III" Microphone
Dynamic cardioid type; power level −58.5 dB; response 50-15,000 Hz; user selects high or low impedance; with slip-in stand attachment and hinge mount to stand; designed specifically for speech, music, and tape recording; supplied with 15-ft cable; chrome finish..... $86
545SD. Same as 545D but has on-off switch on microphone barrel and three-pin connector..... $88
545L. Similar to 545D but has low impedance; supplied with lavalier cord, clip, and permanently attached cable..... $68

578 "Omnidyne" Microphone
Omnidirectional pattern; power level −60 dB; response 50-15,000 Hz; user selects high or low impedance; hand-held; use for speech and music; has on-off switch, a 15-ft cable, and connector; chrome finish..... $79

high impedance; 20-ft detachable cable with heavy duty Cannon-type connector $69

M200 Cardioid Microphone
Cardioid dynamic microphone; frequency response 60-13,000 Hz ±3 dB; sensitivity 61 dB ±3 dB (high impedance), 80 dB ±3 dB (low impedance); 10-ft heavy duty detachable cable $51

M50 Dynamic Microphone
Dynamic microphone; frequency response 60-13,000 Hz ±3 dB; sensitivity 61 dB ±3 dB high impedance; 10-ft heavy duty cable $35

M30 Dynamic Microphone
Dynamic microphone; frequency response 70-12,000 Hz ±3 dB; sensitivity 56 dB high impedance; 10-ft heavy duty cable $23

MR. AUDIO

1150 Tape Recorder Microphone
Tape recording microphone designed for low- or medium-priced later-model solid-state tape recorders; frequency response 100-8000 Hz; output −77 dB; 200-ohm impedance; includes 4½-ft cord with dual 3½- and 2½-mm plugs $5

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 ±2.5 dB; impedance 600 ohms balanced; sensitivity −67 dB ±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 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/μbar); 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 windscreen; 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 × 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 omnidirectional 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 tri-microphone 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, multiple pattern to multiple pattern stereo; all can be either battery or phantom (separate power supplies) powered.
KM-83. Omnidirectional $340
KM-84. Cardioid $340
KM-85. Cardioid, with low-frequency roll-off .. $340
KMS-84. Pop-proof cardioid $880
U-47FET. Cardioid $920
KMR-82. Shotgun $815
KM-86. Three-pattern, switchable $925
KM-88. Three-pattern $965
U-87. Three-pattern $1015
U-89. Five pattern $1130
N-80. 117-V ac portable power supply for powering one or two fet-80 microphones $65

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. × 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 × 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, ¼-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 .. $55

7 MICROPHONES

RE18 Cardioid Microphone
Variable-D dynamic cardioid microphone; flat response 80-15,000 Hz; 150-ohm impedance; −57 dB output; integral shock mount; low-profile blast

filter; A3F-type mike connector with 15-ft cable; supplied with stand adapter and vinyl carrying pouch..... $225

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; A3F-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 $210

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; A3F-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..... $164

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; A3F-type mike connector and 15-ft cable with matching connector; supplied with preamplifier and headband; black finish $153

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; A3F-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 $141

DS35 Cardioid Microphone
Single-D cardioid dynamic microphone; shaped response 60-17,000 Hz; −61 dB output; low impedance; A3F-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 $116

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, tie clasp, and 6-ft cable; fawn beige micromatte finish..... $113

DO54 Omnidirectional Microphone
Omnidirectional dynamic microphone; flat response 50-18,000 Hz; −58 dB output; low impedance; A3F-type mike connector and 15-ft cable with matching connector; supplied with stand clamp and metal carrying case; nonreflective fawn beige finish $113

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; A3F-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 $107

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 $107

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 $102

DO56 Omnidirectional Microphone
Shock-mounted dynamic omnidirectional microphone; shaped vocal response 80-18,000 Hz; 150-ohm impedance; −61 dB output; Acoustifoam™ blast filter; A3F-type mike connector with 15-ft cable; supplied with stand adapter and vinyl carrying pouch..... $100

635A Omnidirectional Microphone
Omnidirectional dynamic microphone; shaped response 80-13,000 Hz; −55 dB output; low impedance; A3F-type mike connector and 15-ft cable with matching connector; supplied with stand clamp; nonreflective fawn beige finish $70

ERCONA

DC-21 Cardioid Microphone
Cardioid condenser microphone; SYMSI 48 powering; frequency response 30-20,000 Hz ±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 $^{-5}$ 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 $250
DC-20. Similar to DC-21 but omnidirectional design; sensitivity −46 dB/Pa; output 5 mV/Pa; noise 26 dB; 124-dB dynamic range $240

HANDY

96-1056 Cardioid Microphone
Unidirectional dynamic cardioid microphone has built-in windscreen and on-off switch; frequency response 50-13,000 Hz; output −58 dB; impedance 50k ohms; includes 10-ft cord with plug and lavalier strap; brushed satin finish $48

96-1058 Dynamic Microphone
Omnidirectional dynamic microphone designed for recording, broadcasting, and PA; has built-in pop and windscreen filters; built-in on-off switch; frequency response 55-13,000 Hz; dual impedance 200/50,000 ohms; output −85 dB (low impedance), −62 dB (high impedance); includes swivel holder with 15-ft cable $43

96-1063 Matched-Pair Stereo Mikes
Omnidirectional microphones designed for voice and stereo recordings; on-off remote control switch; built-in windscreen; frequency response 70-10,000 Hz; impedance 500 ohms; sensitivity −75 dB; includes desk stand and 4-ft cord with plug..... $22

96-1067 Replacement Microphone
Replacement microphone designed for recent low-impedance tape recorders; on/off remote control switch; frequency response 80 Hz; output −56 dB; 200-ohm impedance; includes folding desk stand and dual plugs..... $7

96-1062 Low-Impedance Microphone
Low-impedance microphone designed for recent tape recorders; frequency response 100-8000 Hz; output −77 dB; impedance 200 ohms; includes removable desk stand, 4½-ft cord with dual 3½- and 2½-mm plugs..... $6

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 ¼-in phone plug, metal tripod-type desk stand, floor-stand adapter, and battery are included $38

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 × 1" diameter..... $30

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 6¼" long × 2⅛" 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; 1½" × ⅔" diameter; comes with "AA" battery, shielded cable, and phone plug $20

MARLBORO SOUND WORKS

M900 Cardioid Microphone
Unidirectional dynamic cardioid microphone; built-in spherical wind screen; frequency response 50-17,000 Hz; output at 1000 Hz 74.6 dB (low impedance), 58.7 dB (high impedance); 200-ohm low impedance, 20,000-ohm high impedance; 16-ft detachable cable with XLR-connector ... $147

M500 Cardioid Microphone
Unidirectional dynamic microphone for acoustic instruments; frequency response 50-16,000 Hz; output level at 1000 Hz 76 dB (low impedance), 56 dB (high impedance); 200-ohm low impedance, 20,000-ohm high impedance; 16-ft detachable cable with XLR-connector..... $144

M400 Cardioid Microphone
Cardioid condenser microphone; electret element; built-in FET preamp and 1½-V battery; frequency response 40-18,000 Hz ±3 dB; sensitivity 51 dB ±3 dB high impedance; 20-ft detachable cable with heavy duty Cannon-type connector $81

M300 Cardioid Microphone
Cardioid dynamic microphone; frequency response 60-15,000 Hz ±3 dB; sensitivity 58 dB ±3 dB

switch; windscreen; frequency response 70-10,000 Hz; impedance 500 ohms; sensitivity −75 dB; includes desk stand and 4-ft cord with plug..... $17

Q4-165 Dynamic Microphone
Unidirectional dynamic microphone for recording, broadcast or public address; removable black metal windscreen; on/off switch; frequency response 50-10,000 Hz; impedance 600 ohms; sensitivity −82 dB; includes desk stand and 6-ft cord with plug; brushed satin finish metal housing..... $16

Q4-142 Lavalier Microphone
Hand-held lavalier microphone; frequency response 100-15,000 Hz; output −59 dB; impedance 30,-000 ohms; includes 3-ft cord with miniature phone plug..... $12

Q4-144 Replacement Microphone
Dynamic remote control microphone for portable recorders; frequency response 100-8000 Hz; output −77 dB; impedance 50,000 ohms; dual plugs, desk stand, and concentric adaptor to modify microphone connector included..... $8
Q4-146. Similar to Q4-144 except impedance 200 ohms; 4' ₂-ft cord with dual plugs..... $5

CERWIN-VEGA

Professional Series

UE-1 Electret Microphone
Uni-electret microphone for stage instruments; frequency response 80-20,000 Hz; dual 600- and 10,000-ohm impedances; sensitivity −70 dB ±3 dB into 600 ohms (0 dB = 1 V/1 μbar); built-in pop filter; on-off and tone impedance switches; includes 16-ft cable with ¼-in three-conductor phone plug and Cannon XLR-3-11C equivalent connector; 1.930" × 7.914"..... $125

OE-1 Electret Microphone
Omnidirectional electret microphone designed for loud or deep bass instruments; frequency response 50-20,000 Hz; dual 600- and 10,000-ohm impedances; sensitivity −70 dB ±3 dB into 600 ohms (0 dB = 1 V/1 μbar); built-in pop filter; on-off and tone switches; includes 16-ft cable with ¼-in three-conductor phone plug and Cannon XLR-3-11C equivalent connector; 1.93" × 7.914"..... $115

UD-1 Dynamic Microphone
Unidirectional dynamic microphone for live vocal application or studio use; frequency response 70-15,000 Hz; 600-ohm impedance; sensitivity −73 dB ±3 dB (0 dB = 1 V/1 μbar); built-in pop filter; on-off switch; includes 16-ft cable with ¼-in three-conductor phone plug and Cannon XLR-3-11C equivalent connector; 1.575" × 7.323"..... $100

ELECTRO-VOICE

644 Cardiline Microphone
Cardiline very directional dynamic microphone; flat response 40-12,000 Hz; −53 dB output; switchable high and low impedance; on/off switch; MC4F-type mike connector and 15-ft cable with matching connector; gray finish..... $148

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..... $134

1776 Cardioid Microphone
Single-D cardioid electret condenser microphone; frequency response 60-18,000 Hz; −50 dB output; low impedance; on/off switch; A3F-type mike connector and 15-ft cable with matching connector; supplied with stand adapter; nonreflective gray finish..... $112
1776P. Same as 1776 but with 25-ft cable with two professional connectors..... $118

672 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; A3F-type mike connector and 15-ft cable with matching connector; supplied with integral windscreen/pop filter; satin chrome finish..... $93

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; A3F-type mike connector and 15-ft cable with matching connector; supplied with stand clamp; gray finish..... $89

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; A3F-type mike connector and 15-ft cable with matching connector; supplied with stand clamp and integral windscreen/pop filter; satin chrome finish..... $86
671AP. Same as 671A but with 25-ft cable with two professional connectors..... $89

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..... $86

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; A3F-type mike connector and 15-ft cable with matching connector; satin chrome finish..... $84
664AA. Same as 664A but gray finish..... $84

660 Super Cardioid Microphone
Continuously Variable-D super cardioid microphone; shaped response 90-13,000 Hz; 56 dB output; switchable high and low impedance; A3F-type mike connector and 15-ft cable with matching connector; supplied with stand clamp; satin chrome finish..... $83
660A. Same as 660 with gray finish..... $83
660P. Same as 660 but with 25-ft cable with two professional connectors..... $86

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..... $80

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..... $72

627C Cardioid Microphone
Single-D cardioid dynamic microphone; shaped response 60-13,000 Hz; −58 dB output; switchable high and low impedance; on/off switch; A3F-type mike connector and 15-ft cable with matching connector; supplied with stand clamp; satin chrome finish..... $64
627CP. Same as 627C but with 25-ft cable with two professional connectors..... $67

631B Omnidirectional Microphone
Omnidirectional dynamic microphone; frequency response 80-13,000 Hz; −56 dB output; switchable high and low impedance; on/off switch; A3F-type mike connector and 15-ft cable with matching connector; satin chrome finish..... $61
631BP. Same as 631B but with 25-ft cable with two professional connectors..... $64

607L Noise-Cancelling Microphone
Noise-cancelling dynamic microphone; shaped response 200-4000 Hz; −54 dB output; cancels sound more than ¼-in from face; low-impedance; MC1M-type connector and 15-ft cable with matching connector; gray finish..... $58

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..... $52
626AP. Same as 626A but with 25-ft cable with two professional connectors..... $54

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..... $42

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..... $35

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; A3F-type connector and small coil cord; supplied with shock mount, handle, and Acoustifoam windscreen; fawn beige micromatte finish..... $637

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..... $491

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..... $400

RE20 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; A3F-type mike connector and 15-ft cable with matching connector; supplied with metal carrying case and stand adapter; nonreflective fawn beige finish..... $349

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; A3F-type mike connector and 15-ft cable with matching connector; supplied with integral windscreen/pop filter and shock mount; gray finish..... $346

CS15P Cardioid Microphone
Single-D cardioid dynamic microphone; shaped response 40-18,000 Hz; −45 dB output; remote powering; low impedance; A3F-type mike connector and 15-ft cable with matching connector; supplied with windscreen, stand clamp, and metal carrying case; nonreflective fawn beige finish..... $237

RE55 Omnidirectional Microphone
Omnidirectional dynamic microphone; flat response 40-20,000 Hz; −55 dB output; low impedance; A3F-type mike connector and 15-ft cable with matching connector; supplied with stand clamp and metal case; nonreflective fawn beige finish.... $232

7 MICROPHONES

μbar); battery powered; supplied with 16.5-ft cable with professional 3-pin connector, slip-in stand clamp, carrying case, and battery..... $85

AT802 Omnidirectional Microphone
Incorporates moving-coil dynamic element; frequency response 50-16,000 Hz; sensitivity −56 dB; 600-ohm nominal impedance; supplied with 16.5-ft cable with professional 3-pin connector, slip-in stand clamp, and carrying case..... $70

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 125 dB; S/N 50 dB (1 kHz, 1 μbar); AA penlight battery powered; supplied with 16.5-ft cable with professional 3-pin connector, slip-in stand clamp, carrying case..... $70

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 16½-ft cable; 0.6" diameter × 2" L.. $50

Artist Series Microphones

ATM91 Unidirectional Microphone
Cardioid microphone with permanently polarized fixed-charged condenser element; 4-micron gold vaporized diaphragm; designed for vocal applications; frequency response 70-18,000 Hz; sensitivity −56 dB; EIA sensitivity −150 dB; 600-ohm nominal impedance; max. input SPL 130 dB; S/N 50 dB at 1000 Hz, 1 μbar; leakproof UM3 AA battery-powered; includes slip-in stand clamp and carrying case..... $170

ATM41 Unidirectional Microphone
Cardioid microphone with moving-coil dynamic element; frequency response 50-16,000 Hz; sensitivity −56 dB; EIA sensitivity −150 dB; 600-ohm impedance; includes slip-in stand clamp and carrying case..... $165

ATM21 Unidirectional Microphone
Cardioid microphone with moving coil dynamic element; designed for instrumental applications; frequency response 50-18,000 Hz; sensitivity −60 dB; EIA sensitivity −154 dB; 600-ohm impedance; includes slip-in stand clamp and carrying case..... $145

ATM31 Unidirectional Microphone
Cardioid microphone with permanently polarized fixed-charge condenser element; 4-micron gold vaporized diaphragm; frequency response 40-20,000 Hz; sensitivity −55 dB; EIA sensitivity −149 dB; 600-ohm impedance; max. input SPL 125 dB; S/N 60 dB at 1000 Hz, 1 μbar; leakproof AA battery-powered; includes slip-in stand clamp and carrying case..... $138

ABOUT PRICES. . .

With repeal of Fair Trade Laws, manufacturers are now providing "Suggested Retail" or "Fair Retail Value" figures for the guidance of their dealers and customers. Prices in this Directory are those provided by the manufacturers under these conditions.

ATM11 Unidirectional Microphone
Cardioid microphone with permanently polarized fixed-charge condenser element; designed for instrumental applications; frequency response 50-20,000 Hz; sensitivity −56 dB; EIA sensitivity −150 dB; 600-ohm impedance; max. input SPL 130 dB; S/N 50 dB at 1000 Hz, 1 μbar; leakproof UM3 AA battery-powered; includes slip-in stand clamp and carrying case..... $138

ATM10. Similar to ATM11 but omnidirectional pattern; frequency response 40-18,000 Hz; sensitivity −48 dB; EIA sensitivity −142 dB; max. input SPL 125 dB..... $120

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..... $57

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..... $39

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..... $34

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..... $32

Tie Tack Lapel Microphone
For PA and voice taping; frequency response 40-16,000 Hz; impedance 1000 ohms; sensitivity −65 dB ±3 dB; comes with 13-ft cord with miniplug, tie-tack holder, mercury battery. 30-2318. ..... $23

Microphone Mixer
Allows combination of up to four mikes mono or two mikes to each stereo channel; separate control for each mike; on/off switch; stereo/mono selector switch; 9-volt battery operated; standard ¼-in phone jack inputs, phono pin jack outputs. 30-2320..... $26

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 ⅝-27 thread to fit all standard mikes. 30-2360..... $22

Folding Microphone Stand
Folds and unfolds in seconds; weight 3½ pounds; chrome-plated tubing extends to 60 in, folded size 33 in; legs have rubber tips to prevent skidding and scratching. 30-2362..... $21

Microphone Boom
Fits all standard mike floor stands; has adjustable counterweight; movable clamp and hinge design for any desired position; standard ⅝-27 thread; 31-in long. 30-2370..... $20

BEYER/DYNAMIC

M-160 Double-Ribbon Microphone
Super-cardioid dynamic type; frequency response 40-18,000 Hz ±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 ±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..... $299

M-500 Dynamic Ribbon Microphone
Super-cardioid design; frequency response 40-18,000 Hz ±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..... $199

M-260-S Dynamic Ribbon Microphone
Super-cardioid design; frequency response 50-18,000 Hz ±2.5 dB; sensitivity −153 dBm (EIA); high-energy ribbon; 200-ohm impedance; suitable for speech, music, or vocals; has on/off switch and Cannon XLR termination..... $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; 4½" × ⅞"; 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" × 15/16"; Cannon XLR termination; comes with clamp and presentation case. $179

M-69 Moving-Coil Microphone
Dynamic cardioid design; frequency response 50-16,000 Hz ±3 dB; sensitivity −144 dBm (EIA); 200-ohm impedance; for indoor/outdoor applications; unaffected by temperature 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 ±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..... $135

M-400 Moving-Coil Microphone
Super-cardioid dynamic type; frequency response 50-15,000 Hz; 200-ohm impedance; feedback suppression; hum-bucking coil; on/off switch; includes presence boost case and clamp..... $119

M-818 Matched-Pair Microphones
Dynamic cardioid matched-pair stereo microphones; frequency response 50-16,000 Hz; 500-ohm impedance..... $150 pr.

CALECTRO

Q4-152 Cardioid Microphone
Cardioid dynamic microphone; frequency response 50-13,000 Hz; output −58 dB; impedance 30,000 ohms; 10-ft cord with connector and lavalier strap included..... $34

Q4-157 Dynamic Microphone
Lightweight omnidirectional dynamic microphone with satin silver finish; frequency response 55-13,000 Hz; dual impedance 200/50,000 ohms; output −85 dB (low), −62 dB (high); swivel holder and 15-ft cable included..... $30

Q4-158 Cardioid Microphone
Unidirectional cardioid dynamic microphone; frequency response 100-12,000 Hz; sensitivity −73 dB/600 ohms, −54 dB/50,000 ohms; dual impedance 600 ohms and 50,000 ohms; includes stand holder, base, and 10-ft cable with plug... $27

Q4-170 Matched-Pair Microphones
Omnidirectional matched-pair stereo microphones for voice and stereo recording applications; on/off

7 MICROPHONES

AKG

D-12E Cardioid Microphone
Cardioid dynamic microphone designed for low-frequency instruments and general vocal applications; frequency response 40-17,000 Hz; impedance 200 ohms; shock-suspended transducer; fixed wire-mesh windscreen; includes 10-in non-detachable cable with XLR connector, swivel-joint stand adapter with 5/8"-27 thread and case; 21 oz.... $205

D-330BT Super Cardioid Microphone
Super cardioid microphone designed for the professional vocalist; features two equalizer switches (three-position bass rolloff and three-position treble rise) for tailoring response; frequency response 50-20,000 Hz; impedance 200 ohms; shock-mounted plug-in field-replaceable transducer; dual windscreen/pop filter; die-cast housing; includes SA 31 stand adapter and case; 14 oz. $185

D-2000E Super Cardioid Microphone
Super cardioid dynamic microphone for the professional entertainer or recording studio; frequency range 35-17,000 Hz ±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 1/16" dia. × 6 1/2" L; 11 oz..... ..... $150

D-320B Cardioid Microphone
Mobile cardioid dynamic microphone features three-position bass rolloff switch; frequency response 50-18,000 Hz; impedance 200 ohms; shock-mounted plug-in transducer; dual windscreen/pop filter; die cast housing; includes SA 31 stand adapter and case; 13 oz. $145

D-200E Cardioid Microphone
Cardioid dynamic microphone for the semi-professional recordist and musician; frequency range 25-16,000 Hz ±3 dB; sensitivity −56 dBm ASA; 200-ohm impedance; supplied with SA-20 stand adapter, wire mesh grille, cotton-fiber screen and case; 1 9/16" dia. × 7 5/16" L; 8 1/2 oz. $125

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 1/16" dia. × 6 1/2" L; 12 oz..... $125

D-310S Cardioid Microphone
Cardioid dynamic microphone for vocal music coverage in the home or studio; shock mounted transducer; frequency response 80-18,000 Hz; impedance 200 ohms; integral on/off switch; dual windscreen/pop filter; die cast housing; includes SA 31 stand adapter and case; 10 oz..... $115
D-310. Similar to D-310S without integral on/off switch; frequency response 80-18,000 Hz.... $110

D-1000E Cardioid Microphone
Rugged cardioid dynamic microphone doubles as 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 ±3 dB; sensitivity −52 dBm; 200-ohm impedance; supplied with bronze windscreen, SA-12 stand adapter and case; 1 7/16" dia. × 6 1/8" L; 8 1/2 oz. $100

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 9/16" dia. × 6 5/16" L; 6 1/2 oz. $90
D-190ES. Same as D-190E but with on/off switch $95

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 1/2-ft non-detachable lightweight cable, lavalier clip with tie clasp, lavalier cord and case; nickel-plated brass finish; 11/16" dia. × 2 7/8" L; 5 1/2 oz (including cable) $80

D-130E Microphone
Omnidirectional microphone designed for newsfilm and ENG applications; frequency response 50-15,000 Hz; impedance 200 ohms; includes SA-30 stand adapter and case; 9 oz..... $80

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 1/16" dia. × 6 7/16" L; 5 1/4 oz. . $75
D-120ES. Same as D-120E except with on/off switch $80

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-shotgun 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 $77
CE-1 ..... $60
CE-2 ..... $60
CE-5 ..... $70
CE-8 ..... $138
CE-10/1 ..... $105
CE-10/7 ..... $110
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.. $150
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. $150
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 $155
C-510E. For lavalier operation; consists of CE-10/1 lavalier element and SE-5E powering module; two W-6 windscreens; battery and case $180

AUDIO-TECHNICA

AT814 Unidirectional Microphone
Moving-coil dynamic cardioid microphone designed for professional recording and broadcasting studios; frequency response 50-16,000 Hz; sensitivity −56 dB (0 dB-1 mW/10 dynes/cm²); EIA sensitivity −150 dB; 600-ohm nominal impedance; features high-efficiency windscreen and balanced low-impedance output; includes 16.5-ft cable with Cannon XLR-3 professional connector, tapered slip-in stand clamp, and carrying case..... $115

AT813 Unidirectional Microphone
Incorporates electret condenser permanently polarized element; 6-micron polymer diaphragm; frequency response 20-20,000 Hz; sensitivity −55 dB; 600-ohm nominal impedance; max. input SPL 125 dB; S/N 50 dB (1 kHz, 1 μbar); AA penlight battery powered; supplied with 16.5-ft cable with professional 3-pin connector, slip in stand clamp, carrying case, and battery..... $100

AT812 Unidirectional Microphone
Incorporates moving-coil dynamic element; frequency response 50-18,000 Hz; sensitivity −60

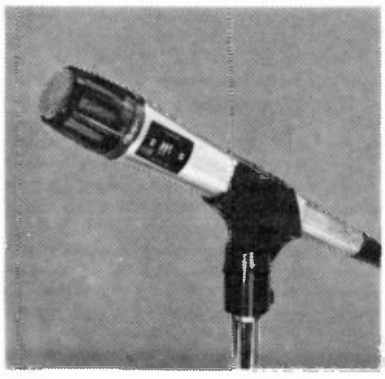
dB; 600-ohm nominal impedance; supplied with 16.5-ft cable with professional 3-pin connector, slip-in stand clamp, and carrying case..... $95

AT803S Sub-Miniature Microphone
Electret condenser permanently charged element; omnidirectional pattern; 5-micron polymer diaphragm; 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 × 0.8" L..... $85

AT811 Unidirectional Microphone
Incorporates electret condenser permanently polarized element; frequency response 50-20,000 Hz; sensitivity −56 dB; 600-ohm nominal impedance; max. input SPL 130 dB; S/N 50 dB (1 kHz, 1

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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frequency response 20-22,000 Hz ±4 dB; sensitivity 2 V for 100 dB; max. power input 0.1 W continuous; dist. 0.5% at 200-dB SPL; 100-ohm impedance at 1 kHz; brushed blue denim finish; supplied with 10-ft flat cord with heavy-duty plug; 5.9 oz $70

Dynaphase 35 Headphones
Dynamic headphones with open-audio construction and 1½-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/channel continuous; extend-adjustable headband with pivot yokes, padded vinyl cover, and vinyl-covered foam cushions; supplied with 10-ft cord and molded connector; 7 oz (less cord) $45

STAX

SR-Sigma Earspeakers
Electrostatic push-pull panoramic sound headphones; frequency response 30-35,000 Hz; max.

sound pressure 103 dB; impedance 122k ohms at 10,000 Hz; 460 g $450

SRX-III Earspeakers
Electrostatic push-pull type; response 30-25,000 Hz; SPL 96 dB at 100 V rms input; maximum level 110 dB; weight 390 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; 4¾" H × 2⅞" W × 8" D .. $300

SR-5 Earspeakers
Electrostatic push-pull type; response 30-25,000 Hz ±1 dB; SPL 96 dB at 100 V rms input; maximum level 110 dB; weight 432 g including cord; comes with SRD-6 energizer, a polarizing supply and signal source; response 10-30,000 Hz ±2 dB; dist. 0.02% at 1 W, 1000 Hz; overall size 2⅝" H × 2¹¹⁄₁₆" W × 6½" D.... $175

SR-44 Earspeakers
Electret condenser system combines SR-40 headphones with SRD-4 adapter; features wide latitude in headband adjustment; requires ac power source. $120

STUDER/REVOX

RH 310 Stereo Headphones
Open-type lightweight headphones designed for amplifiers rated for 4-600 ohm load impedances; frequency range 20-20,000 Hz.... $80

SUPEREX

PEP-81 Electrostatic System
Consists of PEP-81 headphones and CC-81 control console; headphone frequency response 15-18,000 Hz ±2 dB, 10-22,000 Hz ±5 dB; dist. 0.2%; impedance-matched to CC-81 for 4-16 ohms; isolation-type headphones with fully adjustable vinyl-covered headband and foam cushions and 15-ft coiled cord; control console has level controls for both channels (20-dB range), speaker/phone rocker, on/off switch; can accommodate two sets of headphones; requires 5 W per channel min. drive; console size 11" × 3¼" × 6½".... $150

PEP-79E Electrostatic System
Consists of PEP-74 headphones and CC-79E control console; headphone frequency response 15-18,000 Hz ±2 dB, 10-22,000 Hz ±5 dB; negligible dist.; impedance-matched to CC-79E for 4-16 ohms; trans-air lightweight headphones with fully adjustable vinyl-covered headband and foam cushions and 15-ft coiled cord; control console is designed for use with main amp level controls, has self-protecting circuits; console size 2½" H × 7" W × 4" D.... $90

SM-700 Headphones
Dynamic headphones with 2¾-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).... $70

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) $60

TRL-99 Headphones
Dynamic headphones with 2¾-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).... $55

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) $45

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) $35

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

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.... $75

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.... $65

HR-F1 Headphones
Complementary back electret push-pull, full-face drive system; 2.5-micron diaphragm; frequency response 20-20,000 Hz.... $50

UHER by WALTER ODEMER

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. $67
W675. With five-pin plug for Uher cassette recorders $67
W676. With phone plug for amplifiers $67

W 775 Stereo Headphones
Dynamic stereo headphones with one active and six aux. membranes per system; half-open design; frequency response 16-20,000 Hz; SPL 94 dB; nominal impedance 600 ohms/system; nominal loading capacity 200 mW; dist. 1.0%; auto strap adjustment; gimballed earcups; 3-m cable; 330 g.... $14

YAMAHA

YH-1 Stereo Headphones
Lightweight "Orthodynamic" design featuring sintered ferrite disc magnets with combination voice-coil diaphragm between; frequency response 20-20,000 Hz; output 94 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; supra-aural pads; 8-ft straight cord; weight 10.2 oz with cord.... $65
YH-2. Same as YH-1 except output 93 dB/mW SPL; weight 8.1 oz with cord.... $50
YH-3. Similar to YH-2 except 1 W rated input, 3 W max.; 7.4 oz with cord.... $35

6 HEADPHONES

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 1 mW; max. input 0.5 W; 3-in dynamic speakers; 10-ft coiled cord with stereo phone plug..... $32

ST-16 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..... $22

SANSUI

SS-100 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 (2¼-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 (2¼-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 2¼-in wide dynamic drivers; frequency response 20-20,000 Hz; 25-ohm impedance; 13.1 oz..... $42

SS-30 Headphones
Thin polyester 2¼-in wide dynamic cones; frequency response 20-20,000 Hz; max. input 500 mW; 8-ohm impedance; 11.5 oz..... $30

SENNHEISER

HD 224 Headphones
Dynamic stereo headphones; frequency response 16-20,000 Hz; SPL 94 dB at 1 mW; THD 1.0%; 200-ohm nominal impedance; double-walled circumaural foam earpads cover entire ear; includes steel-stranded detachable 3000-mm cable; 252 g. $136

HD 430 Headphones
"Open-aire" design dynamic headphones; frequency response 16-20,000 Hz; sensitivity 94 dB with 1 mW input, nominal SPL at 1000 Hz; HD 0.5%; impedance 600 ohms/ch; padded earpad rims and adjustable suspension strap; includes 10-ft cable; 7 oz $119

HD 424 Headphones
Deluxe "open aire" design dynamic headphones; frequency response 15-20,000 Hz; sensitivity 17.7 μbar/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) $109

HD 420 Headphones
"Open-aire" design dynamic headphones; frequency response 18-20,000 Hz; sensitivity 94 dB with 1 mW input, nominal SPL at 1000 Hz; HD 1.0%; impedance 600 ohms/ch; adjustable suspension strap and cushioned earpads; includes 10-ft cable; 4 oz $85

HD 414 Headphones
"Open aire" design dynamic headphones; frequency response 20-20,000 Hz; sensitivity 17.7 μbar/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; 10-ft cable; 5 oz (without cable) .. $75

HD 400 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)..... $44

HD 44 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) $40

SIGNET DIVISION, A.T.U.S., INC.

TK33 Stereophones
Dipolar electret condenser stereophones with power adapter. Stereophones feature high-compliance film moving diaphragm 45 mm diameter and 2 microns thick; suede-finish inner headband construction and pivotal porous vinyl ear pads. Passive impedance matching transformer adapter features stereophone/speaker operation and hi/lo stereo-

phone sensitivity switches; two dual-color LED arrays in groups of six, first four indicating medium-to-loud normal reproduction and last two indicating high level peaks; no external power required; can accommodate two headsets. Frequency response 20-22,000 Hz ±2 dB; sensitivity 100 dB at 1 V, 1000 Hz; THD 0.1% at 110-dB SPL; matching impedance 4-16 ohms; includes 8.2-ft cord with special plug and 3.9-ft adapter cable with four-conductor plug. Stereophone 9.7 oz with cord; adapter 4 lbs; adapter 5.5" H × 2.4" W × 8.7" D..... $250

TK22 Stereophones
Moving-coil dynamic stereophones feature high-compliance polyester dome diaphragm 20 microns thick and 45 mm diameter with 40-micron self-supporting silver/copper voice coil and FXD magnet; full-swivel foam earpieces and soft suede-finish inner headband; frequency response 20-20,000 Hz; sensitivity 96 dB at 1 mW, 1000 Hz; THD 0.4% at 110-dB SPL; matching impedance 4-16 ohms; includes 11½-ft cord with plug; 9.2 oz with cord. $80

SONY

Z Series Stereo Headphones
Stereo headphones feature lightweight palladium-coated construction, uniform piston action across diaphragm surface, 30-mm diameter voice coils, magnets with copper-coated yoke and thin copper-clad aluminum wire, litz wire, and SBMC grille material; 110-ohm impedance; sensitivity 104 dB/mW; 50-mW rated input; include 2-m cord.

DR-Z7. Frequency response 20-25,000 Hz; THD

0.03% at 1000 Hz, 93 dB SPL; 420 g with cord.... ..... $100

DR-Z6. Similar to DR-Z7 except 400 g.... ..... $85

DR-Z5. Similar to DR-Z6 except frequency response 20-22,000 Hz; THD 0.1%; 360 g..... ..... $70

DR-6M Stereo Headphones
Mini stereo headphones designed for live or off-the-air sound monitoring; 28-ohm impedance; sensitivity 110 dB/mW; 10-mW rated input; frequency response 20-20,000 Hz; 2-m cord; 350 g. $65

S Series Stereo Headphones
Stereo headphones feature 70-mm speaker, vinyl ear enclosures, rugged housing, and long curled cord; impedance 14 ohms; sensitivity 102 dB/mW; 100-mW rated input; frequency response 20-20,000 Hz; 3-m curled cord.

DR-S5. Volume and tone controls; 385 g $50

DR-S4. Volume control, 375 g $40

DR-S3. 350 g; no volume or tone control $30

DR-2 Stereo Headphones
Impedance 10 ohms; sensitivity 104 dB/mW; rated input 100 mW; frequency response 20-20,000 Hz; 2-m cord; 300 g..... $22

SPEEDEX

31-609 Headphones
Stereo headphones with adjustable padded headband and ear pieces; connect to amp outputs from 4-16 ohms; frequency response 20-25,000 Hz; 10-ft coiled cord with stereo plug $34

31-607 Headphones
Open-air stereo headphones with adjustable padded headband and foam cushion ear pieces; connect to amp outputs from 4-16 ohms; frequency response 20-20,000 Hz; 10-ft coiled cord with stereo plug $23

31-605 Headphones
Stereo headphones with volume control on each earphone; stereo/mono switch; adjustable headband and removable foam rubber ear cushions; connect to amp outputs from 4-16 ohms; frequency response 20-18,000 Hz; 10-ft coiled cord with stereo plug..... ..... $13

31-603 Headphones
Stereo headphones with adjustable headband and foam rubber ear cushions; connect to amp outputs from 4-16 ohms; frequency response 50-15,000 Hz; 10-ft coiled cord with stereo plug..... $8

STANTON

Stereo/Wafers XXI Headphones
Ultra-lightweight professional-standard headphone;

earpiece; padded headband and earcups; independent volume/balance control on each earpiece; 15-ft coiled cord; frequency response 18-24,000 Hz $30

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 straight cord with standard stereophone plug; 14.3 oz $55

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 continuous; 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/channel continuous; sensitivity 100 dB SPL at 0.10 V input at 1 kHz for each channel; frequency response 20-20,000 Hz; dist. less than 0.5% 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 $100

Monitor 10 Stereo Headphones
Dynamic type covering a frequency range of 20-20,000 Hz, with 2¼-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 $80

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 $75

SE-6 Stereo Headphones
Dynamic open-air stereo headphones feature samarium cobalt magnets in 25-micron polyester film dome diaphragms; 150-ohm impedance; sensitivity 102 dB/mW at 1000 Hz; max. input 200 mW/ch; frequency response 20-20,000 Hz; includes 9 ft, 5 in cord and Y-type cord with ¼-in short plug; 8.8 oz $70

SE-500 Stereo Headphones
Incorporates high-polymer film diaphragm; frequency range 20-20,000 Hz; sensitivity 100 dB/3 V; max. input power 30 V/channel; resistant to temperature/humidity changes; plugs directly into headphone jack of any amplifier or receiver..... $70

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; 16½-ft coiled cord $55

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 7⅗ oz without cord, 9⅕ oz with..... $50

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..... $45

SE-2 Stereo Headphones
Dynamic stereo headphones feature ferrite magnetic circuits in 25-micron polyester film dome diaphragms; 150-ohm impedance; sensitivity 99 dB/mW at 1000 Hz; max. input 200 mW/ch; frequency response 20-20,000 Hz; includes 8 ft, 2 in cord and Y-type cord with ¼-in plug; 9 oz $30

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..... $30

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 ¼-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; 4-16 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 ¼-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 $37

PRO-20 Stereo Headphones
Dynamic-type; frequency response 20-20,000 Hz; 4-16 ohm impedance; base port $30

Nova-30 Headphones
3½-in speakers for wide response; frequency response 30-18,000 Hz; soft cushion earcups; padded adjustable headband; 4- to 16-ohm impedance; supplied with 10-ft coiled cord and ¼-in plug $25

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 ¼-in plug; 4-16 ohm impedance $20

Nova-10 Stereo Headphones
Has cushioned earpads with 2-in speakers; adjustable vinyl headband; frequency response 50-15,000 Hz; has cord and ¼-in plug; 4-16 ohm impedance $15

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..... $38

6 HEADPHONES

PMB 40 Dynamic Headphones
On-the-ear style with reticulated foam ear cushions; max. SPL 128 dB (1 kHz); 400-ohm impedance; max. input 0.1 W; sensitivity 0.2 mW for 100-dB SPL (1 kHz); 0.3% THD at 100-dB SPL (1 kHz); frequency response 20-20,000 Hz; has 10-ft cord; 7.5 oz $70

PMB 20 Dynamic Headphones
On-the-ear style with reticulated foam ear cushions; max. SPL 118 dB (1 kHz); 400-ohm impedance; max. input 0.1 W; sensitivity 2 mW for 100-dB SPL (1 kHz); 0.3% THD at 100-dB SPL (1 kHz); frequency response 20-20,000 Hz; has 10-ft cord; 3.9 oz $50

CALECTRO

Q4-135 Stereo Headphones
Open-air stereo headphones with adjustable padded headband and foam cushion earpieces; frequency response 20-20,000 Hz; matches 4-8 ohms amp output; 10-ft coiled cord with stereo plug $23

Q4-134 Stereo Headphones
Stereo headphones with built-in volume control knob, stereo/mono switch, adjustable headband, and removable foam rubber ear cushions; frequency response 20-18,000 Hz; matches 4-8 ohms amp output; 10-ft coiled cord with stereo plug $14

Q4-133 Stereo Headphones
Stereo headphone with adjustable headband and foam rubber ear cushions; frequency response 50-15,000 Hz; matches 4-8 ohms amp output; 10-ft coiled cord with stereo plug $8

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 ±20% (1 kHz); output level 100 dB (1 kHz); max. input 100 mW; 12 oz $30

HANDY

96-1014 Stereo Headphones
Open-air stereo headphones feature lightweight construction, cushioned earpieces, and fully adjustable padded headband; frequency response 20-20,000 Hz; 8-ohm impedance; matches amplifiers with 4-16 ohm output; 6-ft straight cord with stereo plug $38

96-1017 Stereo Headphones
Open-air stereo headphones have adjustable padded headband and foam-cushion earpieces; frequency response 20-20,000 Hz; matches amplifiers with 4-16 ohm output; 10-ft coiled cord $32

96-1016 Stereo Headphones
Stereo headphones with adjustable headband and removable foam rubber ear cushions; frequency response 20-18,000 Hz; matches amplifiers with 4-16 ohm output; 10-ft coiled cord with plug $19

96-1015 Stereo Headphones
Stereo headphones with adjustable headband and soft foam rubber ear cushions; frequency response 50-15,000 Hz; matches amps with 4-16 ohm outputs; 10-ft coiled cord with plug $12

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 (5/16", 3/8", 5/8", PF 1/2", 1/4"); 1.32 lb. $100

BN-5. Biphonic processor for HM-200E; processes binaural sources through stereo speaker systems. $280

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; semi-vented 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

Technician/VFR Stereophones
Stereo headphones with variable-frequency-response controls; slide-type controls at base of each earcup permit fine tuning of shape of response curve; frequency response 10-22,000 Hz; THD 0.3% at 1 kHz (100-dB SPL); 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 ... $80

HV/1A Stereophones
Features low-mass "Decilite" driver elements for 15-30,000 Hz coverage; 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; extendable headband with self-adjusting, pivoting yokes and soft padded vinyl cover; 3-conductor coiled cord (10-ft extended); 10 oz $55

HV1LC. Same as HV/1A 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 $55

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 rms sine wave, 0.13 V rms pink noise; weight (less cord) 12.8 oz $33

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 $50

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 as K/6ALC 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 Quadraphones
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 $45

F-700 Stereo Headphones
Lightweight headphones feature ultra-thin diaphragm with rare-earth-magnet transducer; adjustable vinyl leatherette headband and 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

SP-78 Stereo Headphones
Deluxe closed-acoustic stereo headphones; two-way design with separate woofer and tweeter in each

6 HEADPHONES

AKG

K-340 Stereo Headphones
Two-way stereo headphones incorporate electret-condenser, high-frequency transducers, dynamic mid/low-frequency transducers, crossovers, and ten passive diaphragms in circumaural earcups; frequency response 15-20,000 Hz; matches 4-400 ohm output impedance; includes 9.8-ft coiled cable and standard stereo phone plug; weight 14 oz... $189

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 ±20% impedance over 16-20,000 Hz; sensitivity 13 μbar/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 ¼-in phone plug; 10 oz $85

K-141 Monitor Headphones
Supra-aural, dynamic professional monitoring headphones; frequency response 20-20,000 Hz; matches 4-600 ohm output impedance; includes 9.8-ft four-conductor cable and standard three-conductor stereo phone plug; weight 9 oz..... $69

K-140S Stereo Headphones
Stereo headphones with dynamic sound transducers; frequency response 20-20,000 Hz; 600 ohms ±20% impedance over 20-20,000 Hz; sensitivity 15 μbar/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 ¼-in phone plug; 6 oz $55

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; 4½ oz... $27.

AUDIO-TECHNICA

ATH-7 Stereophones
Electret condenser stereophones; frequency response 20-22,000 Hz ±2 dB; sensitivity 98 dB SPL at 1 kHz (0 dB=0.002 μbar/V); impedance 4-16 ohms; includes impedance-matching adapter with headphone/speaker switching and normal/high-level LED indicators; 8¼-ft cord; adapter size 3½" H × 2⅜" W × 7" D; headset weight (less cord) 7.4 oz $150

ATH-6 Stereophones
Electret condenser stereophones; frequency response 40-22,000 Hz ±3 dB; sensitivity 98 dB SPL at 1 kHz; impedance 4-16 ohms; includes impedance-matching adapter with headphone/speaker switching; 8¼-ft cord; adapter size 1⅜" H × 3" W × 3⅜" 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; 11½-ft cord; 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; 11½-ft cord; 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; 8¼-ft cord; 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

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-S Electrostatic Headphones
Electrostatic headphones; frequency response 10-25,000 Hz; comes with sintered bronze cover plates and power supply $279
ET-1000. Same as ET-1000-S without power suppy $160

DT-444S Wireless Headphones
Wireless infra-red headphones; frequency response 20-20,000 Hz; uses ISS 76 infra-red transmitter; individual volume controls; stereo/mono switch; rechargeable NiCd batteries $230

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 as DT-48 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^{-4} 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^{-4} μbar); 5-100-400-2000 ohms impedance; max. input 1 W per phone..... $90

DT-96 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^{-4} μbar); 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) $65
DT-440. Similar to DT-220 but open high-velocity type; polyvinyl chloride diaphragm with Novodur housing; chrome-plated finish $65
DT-441. Same as DT-440 but with different casing style; polyvinyl chloride diaphragm with Novodur housing; chrome-plated finish $75

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) $30

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 $115

PMB 6 Orthodynamic Headphones
On-the-ear style with leatherette foam ear cushions; max. SPL 121 dB (1 kHz); 140-ohm impedance; max. input 2 W; sensitivity 7 mW for 100-dB SPL (1 kHz); 0.3% THD at 100-dB SPL (1 kHz); frequency response 16-23,000 Hz; has 10-ft cord; 9 oz... $95

PMB 4 Dynamic Headphones
Around-the-ear style with leatherette foam ear cushions; max. SPL 114 dB (1 kHz); 400-ohm impedance; max. input 0.1 W; sensitivity 4 mW for 100-dB SPL (1 kHz); 0.3% THD at 100-dB SPL (1 kHz); frequency response 20-20,000 Hz; has 10-ft cord; 7.5 oz $85

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5 CAR STEREO ACCESSORIES

MITSUBISHI CAR AUDIO

CV-23 Equalizer/Booster
Six-band graphic equalizer/amplifier. Equalizer center frequencies set at 50, 150, 400, 1000, 3500, and 10,000 Hz, ±12 dB boost or cut; booster output 30 W/ch continuous; features volume/fader controls with five LEDs/side; balance slide control $160

MOTOROLA

EQB4001 Graphic Equalizer/Booster
Features ten color-coded power output LED indicators; fader control; 40 W continuous total power, 20 W/ch; slide controls for each of five bands centered at 60, 250, 1000, 3500, and 10,000 Hz; control range ±12 dB; frequency response 35-20,000 Hz −3 dB; power on/off switch with indicator light; 6-ohm output load impedance per speaker in four-speaker operation, 3 ohms in two-speaker system... ..... $140
EQB4000. Same as EQB4001 minus power output LED indicators $130

EQB-3000 Graphic Equalizer/Booster
Graphic equalizer/booster; 30 W continuous total power output; HD 1% at 10 W; slide controls for each of five bands; front-rear fader; LED power indicators; for use with two or four speakers $140

PA5000 Stereo Power Amplifier
Features switchable equalization comprising bass boost/flat response and treble boost/flat response; audio by-pass switch; output 50 W continuous, 25 W/ch; handles 4, 6, or 8-ohm speakers with power inputs of 25 W min.; compatible with units operating on 12 V negative ground; can be installed under dash, under seat, or in trunk $90

MUNTZ HI Z

Z50 Amplifier
Dc-dc inverted amplifier; output 50 W continuous into 4 ohms; frequency response 25-22,000 Hz; dist. 1.0%; high-impedance input; heavy-duty heat sink; 16-gauge wire and 6-pin DIN plug; 1⅝" H × 7½" W × 6" D $149

Z169 Amplifier/Equalizer
Seven-band graphic equalizer/30-W power amplifier. Equalizer center frequencies set at 60, 250, 500, 1000, 4000, 8000, and 15,000 Hz, ±12 dB boost or cut. Amplifier: transformerless direct-coupled circuitry; output 15 W/ch continuous; frequency response 10-30,000 Hz −3 dB; output impedance 10,000-20,000 ohms; load impedance 4-8 ohms; 13.8 V dc; 1¾" H × 5¾" W × 6¼" D $100

Z77 Amplifier
Balanced transformerless amplifier; output 24 W continuous into 4 ohms; frequency response 30-20,000 Hz; dist. 1.0%; 18-gauge wire and 6-pin DIN plug; high-impedance input; 2⅜" H × 6½" W × 5¼" D $50

T-112 Amplifier
30-W amplifier with bass and treble slide controls, ±12 dB boost or cut; frequency response 30-18,000 Hz; S/N 70 dB; 1⅝" H × 4¾" W × 6" D $50

PIONEER

AD-50 Graphic Equalizer/Amplifier
Five-band stereo graphic equalizer/amplifier; five frequency band tone controls; fader control; LED "power on" indicator; 10-LED power level display (five LEDs per channel); max. output 25 W/channel continuous, 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, 250, 1000, 3500, 10,000 Hz; 2⅝" H × 5⅞" W × 7" D $250

AD-360 Booster Amplifier
Booster amplifier with built-in protection circuits and auto on/off power switch; max. output 70 W/channel continuous, 50 W/channel into 4 ohms at 1000 Hz with 0.8% dist.; frequency response 20-30,000 Hz, 2 V input for max. output; 2½" H × 9" W × 8" D $230

GM-120 Amplifier
Component stereo amplifier with short circuit protection; max. power output 60 W/channel, 30 W/channel min. (both channels driven) into 4 ohms over 30-20,000 Hz at 0.3% THD; frequency response 20-30,000 Hz at −3 dB; THD 0.04% at 25 W, 1000 Hz; S/N 75 dB; 2⅜" H × 7" W × 8¼" D $200

CD-7 Graphic Equalizer
Seven-band graphic equalizer features IC echo with time delay control and built-in dual amp balancer; equalization frequencies set at 60, 125, 250, 500, 1000, 3500, and 10,000 Hz ±12 dB; frequency response 20-30,000 Hz at ±3 dB; S/N 70 dB; output level 200 mV; delay time 0-7000 msec; 2" H × 5⅞" W × 6½" D $200

AD-30 Graphic Equalizer/Amplifier
Five-band stereo graphic equalizer/amplifier; five frequency band tone controls; fader control; two LED peak power indicators; LED power indicators; max. output 15 W/channel continuous, 10 W with 1% dist. at 1000 Hz into 4 ohms; frequency response 30-30,000 Hz −3 dB; S/N 65 dB; ±12 dB equalization range; equalization frequencies 60, 250, 1000, 3500, 10,000 Hz; 2" H × 5⅞" W × 6½" D $150

GM-40 Component Power Amplifier
Component power amplifier; max. output 20 W/channel continuous, 10 W/channel min. at 50-20,000 Hz into 4 ohms with 0.8% THD; 15-40,000 Hz −3 dB frequency response; less than 0.06% THD at 1.5 W, 1000 Hz; S/N 80 dB $85
GM-12. Similar to GM-40 except 12 W amplifier; 6 W/ch continuous $55

AD-320 Power Amplifier
Power amplifier has max. output 20 W/channel continuous, 16 W/channel into 4 ohms at 1000 Hz with 0.8% dist.; frequency response 40-20,000 Hz; 2⅛" H × 4⅝" W × 5½" D $80

AD-312 Power Amplifier
Power amplifier with integrated circuitry has max. output 12 W/channel continuous, 9 W/channel into 4 ohms at 1000 Hz with 0.8% dist.; frequency response 40-20,000 Hz; 2⅛" H × 4⅝" W × 4½" D.. ..... $60

CD-606 Dual-Amplifier Balancer
Dual-amp balancer with active electronic fader allows front-to-back or multiple amplifier balancing; 2" H × 1" W × 6⅛" D $45

AD-307 IC Noise Suppression System
FM noise suppression system designed to reduce static and multipath interference picked up by antenna; mounts remotely or on car stereo; plug-in installation; 1⅝" H × 3⅛" W × 1" D $35

REALISTIC

12-1879 Power Booster/Equalizer
Unit combines power booster and five-band equalizer. Features front/rear fader control, radio/tape selector switch, illuminated audio power meters, and power indicator light; equalizer center frequencies set at 60, 250, 1000, 3500, and 10,000 Hz, ±9 dB boost or cut; output 40 W $100
12-1878. Similar to 12-1879 except has 30 W output $80

12-1877 Power Booster
Compact power booster with two-way selector switches from radio to tape deck and power indicator lamp; output 40 W $50

12-1876 Stereo Power Booster
Car stereo power booster for 10-W speakers or higher $30

12-1348 FM Converter
Compact FM car converter with built-in afc, auto switching for negative and positive ground, lighted dial, and IC and ceramic filter circuitry; sensitivity 2 μV; 12 V dc $30

RECOTON

SE50 Graphic Equalizer/Power Amplifier
Power amplifier/frequency equalizer features multiple speaker and defeat switches and power on/off with LED; amplifier output 15 W/ch continuous with 1.0% THD; frequency response 10-30,000 Hz −3 dB at 1000 Hz; five slide equalizer switches with center frequencies set at 50, 250, 1000, 3500, and 10,000 Hz, 12 dB boost or cut; 13.8 V dc $130

SANYO

PB5050 Car Power Booster
Underdash or trunk mount car power booster with automatic electronic monitoring system and built-in reversing power plug for 4-8 ohm speakers; output 25 W/ch continuous at 1.0% THD; frequency response 40-20,000 Hz; aluminum finned cabinet... ..... $60

SCHMEGG

120 Linear Power Amplifier
Direct-coupled complementary stereo amplifier; driven push-pull inverter power supply; remote turn-on for direct transferral of high current connection to battery; output 60 W/ch continuous into 4 ohms; dist. 0.05% typically; frequency response 20-20,000 Hz ±0.25 dB; min. load impedance 3 ohms; S/N −90 dB; 13.8 V dc, 22 A max. current drain $200
60A. Similar to 120 except output 30 W/ch continuous, both channels driven into 4 ohms, from 20-20,000 Hz with 0.25% max. THD $130
40A. Similar to 60A except output 20 W/ch continuous $82

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 × 7" W × 7" D $300
1060RC. Remote control for AD1060; allows Concert Machine to be installed in hidden location in vehicle; includes 12-ft cable $40

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/ch continuous; 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 × 6³⁄₁₆" W × 6½" D $90

LC-101 Power Amplifier
Full-spectrum car power amplifier; output 36 W continuous at 10.0% THD, 30 W continuous at 1.0% THD; frequency response 20-20,000 Hz; input impedance 27 ohms; output impedance 3 ohms; separate treble and bass boost slide levers; power level meter; for use with all tape decks and car radios; 1¾" H × 6⅜" W × 5½" D $50

8000, 15,000, and 20,000 Hz, ±20 dB boost or cut; four-speaker fader; spring-loaded wire contacts; power and defeat controls; output 60 W into 4 ohms with 0.1% THD; 6⅛" H × 7¼" W × 2¼" D... ..... $180

JS-70. Similar to JS-120 except has seven bands with 60-15,000 Hz frequency range; dual VU meters..... $120

JS-50. Similar to JS-70 except with five bands; output 40 W into 4 ohms; 2⅛" H × 5¾" W × 6⅛" D... ..... $80

JS-40. Similar to JS-50 except with three bands comprising bass, mid, and treble controls with ±15 dB boost or cut; output 36 W into 4 ohms; 6⅛" H × 5¼" W × 2⅛" D..... $60

JS-31 Amplifier

Car amplifier has 30-W output into 4 ohms with 0.1% THD; 2⅝" H × 4" W × 6⅛" D..... $40

CLARION

300-EQB Power Booster/Equalizer

Power booster/graphic equalizer; 30 W/ch continuous; 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

COBRA

GEA40-5 Graphic Equalizer/Amplifier

Five-band graphic equalizer/amplifier; center frequencies set at 60, 250, 1000, 4000, and 12,000 Hz with ±12 dB boost or cut; amplifier has "Bridge Transformerless Circuitry"; output 20 W/ch continuous; frequency response 30-20,000 Hz; front-to-rear fader control; power on/bypass control with LED; can drive four 6-ohm speakers..... $90

GEA60-7. Similar to GEA40-5 except seven-band equalizer with center frequencies set at 60, 150, 400, 1000, 2500, 6000, and 12,000 Hz; output 30 W/ch continuous; LED power level indicators/ch; frequency response 20-20,000 Hz..... $130

GEA120-7. Similar to GEA60-7 except amp output 60 W/ch continuous..... $180

CRAIG

V503 Amplifier/Equalizer

Car stereo amplifier/four-band graphic equalizer. Amplifier: output 36 W/ch min. continuous into 4 ohms with 0.5% THD from 50-15,000 Hz; S/N 60 dB; OCL/LOT dc-coupled circuitry; automatic power switching. Equalizer frequency ranges from 20-150, 150-1000, 1000-7000, and 7000-20,000 Hz; electronic time delay; tone defeat and power range pushbuttons; reversible slide-out bracket $200

V505. Similar to V503 except 24 W/ch amp .. $145

V504. Similar to V503 except 12 W/ch amp .. $120

V501 Amplifier

Stereo amplifier; output 12 W/ch; 2.0% THD; auto power switching; compatible with four-speaker matrix system; plug-in installation..... $60

V502. Similar to V501 except 24 W/ch with 1.0% THD..... $85

V590 Line Amplifier

Low-level stereo line amplifier; matches low-level tuner and deck outputs to power amps; THD 0.08% from 20-20,000 Hz at 2.83 V out; can be set for high or low sensitivity $30

FOSGATE ELECTRONICS

Tetra I Tetrasound

In- or underdash Tate sound decoder/preamp/equalizer converts standard car stereo radio or tape player into four separate channels producing 360-degree spatial sound field; available with trunk-mount 200-Series 200-W Fosgate amplifier or 400-Series 200-W power biamp. Features LED peak-reading indicators with display on/off switch; front-to-back fader and left/right front and rear slide balance controls; left/right input indicators; stereo panorama/SQ decode mode switch; tape/radio input selector; input level trimmer pots; left/right equalization slide controls set at 45, 175, amd 20,000 Hz. Decoder: incorporates automatic dimension

control, phase corrector, and base combination circuitry; separation 35 dB between channels; THD 0.08% typically, 0.15% max. from 20-20,000 Hz; max. output 2.25 V rms; noise −80 dB at full level. Power amp: 200 W continuous total output into 4 ohms, 100 W continuous into 8 ohms; frequency response 20-20,000 Hz ±0.25 dB; slew rate 60 V/μsec; damping factor 1000; sensitivity 0.5 V rms in; input impedance 20,000 ohms; noise −80 dB; THD 0.05% at 50-W out, 4 ohms. Preamp: frequency response 20-20,000 Hz ±0.25 dB; THD 0.02% from 20-20,000 Hz; max. output 10 V rms; noise −90 dB; input impedance 20,000 ohms.

200-Series. 200-W amplifier $895

400-Series. 200-W power biamp $1095

PR-2100 The Punch

Bi-amplified power amplifier with built-in variable electronic crossover and separate active equalizer with center frequencies set at 45, 175, and 20,000 Hz. Features automatic power switching with time-delay; LED array for source material level; auto system shut-off; radio and tape unit inputs; power supplies for each channel and fully regulated power supply with overload protection; pulse-width-modulated power supply. Power output 200 W continuous into 4 ohms and 100 W continuous into 8 ohms; frequency response 20-20,000 Hz ±0.25 dB; slew rate 60 V/μsec; damping factor 1000; sensitivity 0.5 V rms in; input impedance 20,000 ohms; noise −80 dB; 1¾" H × 8⅝" W × 3¼" D.... ..... $460

PR-250 The Punch

Car amplifier with separate active equalizer with 45 and 20,000 Hz center frequencies. Features auto system shut-off; auto power switching with time delay; fully regulated power supply and separate power supplies for each channel; oversized heatsinks; pulse-width-modulated power supply. Output 100 W continuous into 4 ohms, 50 W continuous into 8 ohms; frequency response 20-20,000 Hz ±0.25 dB; slew rate 60 V/μsec; damping factor 1000; sensitivity 0.5 V rms; input impedance 20,000 ohms; noise 80 dB; 1⅝" H × 4" W × 2½" D. . $250

PR-252. Similar to PR-250 except equalizer has center frequencies set at 45, 175, amd 20,000 Hz, separate radio and tape unit inputs, and LED array for source material level with on/off switch; 1¾" H × 8⅝" W × 3¼" D $316

PR-220 The Punch

Underdash or hidden-mount amplifier with auto stop, auto power switching with time delay, built-in six-position active equalizer, and oversized heatsinks. Output 40 W total continuous into 4 ohms; frequency response 20-20,000 Hz ±0.25 dB; slew rate 60 V/μsec; damping factor 1000; equalizer center frequencies set at 45 (+18 dB) and 20,000 (+12 dB) Hz; sensitivity 3.5 V rms in; input impedance 39 ohms; noise −80 dB; 2½" H × 6¾" W × 4¾" D $120

HANDIC

EQ-20-7 Graphic Equalizer/Amp

Seven-band graphic equalizer/amplifier with fader control; RCA jacks for direct hookup; output 60 W; designed for two or four speaker systems..... $120

SP-15 Power Amplifier

Compact power amplifier with bass and treble controls and LED power indicator; output 15 W/ch continuous; frequency response 50-15,000 Hz; S/N 70 dB; control range for bass 12 dB at 100 Hz, for treble 12 dB at 10,000 Hz $60

Noise Killer

Noise killer with ic circuit designed to cut out ignition noise from FM radio reception; fits all Handic car stereos by plug-in jack $15

KRACO

KE-7 Graphic Equalizer

Seven-band graphic equalizer with slide controls covering 60, 150, 400, 1000, 2400, 6000, and 15,000 Hz, ±12 dB boost or cut; features variable fader control with built-in heatsink; right/left channel output power meters; earphone/headphone jack. Output 50 W/ch continuous, 40 W/ch at 10.0% THD; frequency response 25-40,000 Hz; includes power supply and speaker wires; 65 mm H × 180 mm W × 200 mm D $139

KE-5 Graphic Equalizer

Graphic equalizer with fader control; max. output 30 W/ch continuous; five equalizer controls (60, 250, 1000, 3500, and 10,000 Hz); LED power-on indicator; variable fader control with specially engineered heatsink; power on/off switch $124

KE-3 Graphic Equalizer

Max. output 25 W/ch continuous; power-on indicator; power on/off switch; illuminated output power meter; low/mid/hi equalizer controls; brushed aluminum front panel with black vinyl coated cabinet.. ..... $83

LAKE COMMUNICATIONS

701 Graphic Equalizer/Booster Amp

Seven-band graphic equalizer/booster with slide equalizer controls at 60, 150, 400, 1000, 2400, 6000, and 15,000 Hz; power output 25 W/ch; fader control; pushbutton on/off with LED indicator; 1¹³⁄₁₆" H × 5½" W × 6½" D $60

MATRECS

MA-1050 Graphic Equalizer/Booster

Five-band graphic equalizer with balanced transformerless power amplifier; center frequencies set at 60, 250, 1000, 3500, and 10,000 Hz, ±12 dB boost or cut; max. output 25 W/ch; frequency response 30-30,000 Hz; dist. 0.4% at 1 W, 1000 Hz; S/N 70 dB; input impedance 57 ohms; min. load impedance 4 ohms/ch; has booster bypass with power switch and complete protection against short circuit, overheating, excess voltage, and reverse polarity; 13.2 V dc..... $125

MA-1040. Similar to MA-1050 except input impedance switchable 10/40,000 ohms; has fader control $117

MA-1000 Stereo Booster

Balanced transformerless power amplifier; output 25 W/ch; frequency response 30-30,000 Hz; dist. 0.4% at 1 W, 1000 Hz; S/N 70 dB; input impedance 10/40,000 ohms; min. load impedance 4 ohms/ch; has tone/variable output control; booster bypass with power switch; complete protection against short circuit, overheating, excess voltage, and reverse polarity; 13.2 V dc $78

MIDLAND INTERNATIONAL

60-150 Graphic Equalizer/Amplifier

Combination five-band graphic equalizer and amplifier; equalizer center frequencies set at 60, 250, 1000, 2500, and 10,000 Hz, ±12 dB boost or cut; amplifier output 12 W/ch continuous at 1.0% THD; frequency response 50-20,000 Hz; features fader control, pushbutton power switch with LED, and power on/off bypass; includes slide-on mounting bracket for top or bottom mounting; 2⁷⁄₁₆" H × 6" W × 6" D..... $100

60-100. 60-150 amplifier only $70

5 CAR STEREO EQUIPMENT

with one-touch automatic loading. Cassette: Philips-type compact playback with locking fast-forward and eject; wow and flutter 0.35% wrms; S/N 40 dB; channel separation 40 dB; dist. less than 3.0%. Radio features pushbutton tuning of five preselected AM-FM stations; volume, tone, and balance controls; LED FM stereo indicator; FM sensitivity 3 μV; S/N 40 dB; dist. less that 3.0%; AM S/N 40 dB; dist. 4.0%; system frequency response 40-12,000 Hz; output power 5 W at 1000 Hz; speaker impedance 4-8 ohms; adjustable shafts; 2½" H × 7" W × 5⅜" D $180

SCS-333. Similar to SCS-444 except playback cassette player features auto-reverse and locking fast-forward, rewind, and stop; S/N 45 dB; dist. less than 2.0%; channel separation 55 dB. Radio FM sensitivity less than 1 μV and S/N 45 dB; AM S/N 40 dB; 1 15/16" H × 7" W × 6⅜" D $180

SCS-222. Similar to SCS-444 without pushbutton tuning of five preselected AM-FM stations; 1¾" H × 7" W × 5⅜" D $120

SCS-202 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player; designed to fit most American and foreign cars; features four-way front-to-back and side-to-side fader; volume/tone control; pushbutton locking fast forward; LED stereo FM and tape indicators; local/distant switch; adjustable shafts; output 10 W; 1¾" H × 7 1/16" W × 4¾" D $140

SANYO

FT2200 AM-Stereo FM/Cassette Deck

In-dash unit combines AM-stereo FM radio and metal-compatible cassette deck with Dolby noise-reduction system and built-in digital quartz clock; designed for small foreign and American sub-compact cars. Cassette features Sendust Alloy record/playback head, bias head switch for normal, CrO_2, FeCr and metal tapes, and automatic/manual reverse, locking fast forward and rewind; wow and flutter 0.07% wrms; frequency response 40-19,000 Hz; S/N 62 dB. Electronic-varactor tuner features ten-station touchbutton memory tuning, LED frequency and time display, and manual FM stereo/mono and local/distant switches; frequency response 30-15,000 Hz at +3 dB; stereo separation 32 dB at 1000 Hz. Preamplifier features output jacks, bass and treble controls, loudness switch, rotary on/off/master volume control and balance control; frequency response 30-25,000 Hz at ±3 dB..... $330

FT645 AM-Stereo FM/Cassette Player

In-dash unit combines AM-stereo FM radio and stereo cassette player with built-in digital quartz clock. Cassette features automatic reverse and program repeat, self-draw tape compartment and locking fast forward and rewind; wow and flutter 0.08% wrms; frequency response 50-12,000 Hz; S/N 50 dB; output 9 W continuous. Radio features LED FM stereo indicator, automatic IC FM stereo/mono switching, automatic up/down control for electric antennas, and pushbutton AM/FM selector; FM stereo separation 28 dB $180

FT412 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio and stereo cassette player designed for foreign and American sub-compact cars. Features automatic eject and tape replay; locking fast forward and rewind; memory tuning for up to five AM and five FM stations; local/distant and FM muting switch; separate balance and tone controls; lighted stereo and tape indicators; pigtail for automatic electric antennas..... $180

FT482 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio and auto reverse stereo cassette player features automatic music select system which locates gap between musical selection on cassette; local/distant and FM muting switch; locking fast forward and rewind; separate volume, balance, bass, and treble controls. Wow and flutter 0.08% wrms; frequency response 50-12,000 Hz; S/N 55 dB; max. output 7.5 W/ch continuous. $160

FT603 Cassette Player

Miniature underdash cassette player with slide in-slide out bracket features automatic and manual reverse, locking fast forward, pilot light in play mode, and separate volume, tone and balance controls $70

SHARP

RG-5252 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player designed for foreign-made cars. Features 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-3550. Similar to RG-5252 except designed for domestic cars..... $170

RG-5702 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player designed for foreign-made cars. Features automatic reverse 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-3400. Similar to RG-5702 except designed for domestic cars..... $150

RG-5202 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player designed for foreign-made cars. Features 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

RG-3200. Similar to RG-5202 except designed for domestic cars..... $130

SPARKOMATIC

SR-3400 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player with digital clock. Features auto stop; pushbutton

eject; electronic loudness, muting, high filter, and AM/FM controls; local/distant control; elapsed timer and reset controls; locking fast forward and rewind; bass, treble, balance, and fader controls; LED stereo indicator. Wow and flutter 0.3% rms; S/N 40 dB; channel separation 45 dB; audio output 40 W continuous at 1.0% THD; frequency response 20-20,000 Hz; 1¾" H × 7" W × 5½" D $300

SR-2400. Same as SR-3400 except has 8-track player with program selector and LEDs instead of cassette; no fast forward and rewind; wow and flutter 0.25% rms; 5⅛" D..... $270

SR-3300. Similar to SR-3400 except auto-reverse cassette player with tape direction control and LED indicator; no digital clock with elapsed time and reset controls $260

SR-3100. Similar to SR-3300 minus auto reverse with tape direction control and LED $230

SR-2100. Same as SR-3100 except has 8-track player with program selector and indicator lights instead of cassette; wow and flutter 0.25% rms; 5⅛" D..... $220

SR-340 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player with digital clock. Features elapsed timer and reset controls; electronic loudness, muting, high filter, and AM/FM controls; local/distant control; automatic end-of-tape and pushbutton eject; locking fast forward and rewind; bass, treble, balance, and fader controls; LED stereo indicator. Wow and flutter 0.3% rms; S/N 40 dB; channel separation 45 dB; audio output 10 W at 1.0% THD; frequency response 40-15,000 Hz; 1¾" H × 7" W × 5½" D $260

SR-240. Same as SR-340 except has 8-track player with program selector and LED indicators instead of cassette; wow and flutter 0.25% rms; 5⅛" D . $240

SR-330. Similar to SR-340 except auto reverse player with tape direction control and indicator; no digital clock..... $230

SR-310. Similar to SR-330 without auto reverse $190

SR-210. Same as SR-310 except has 8-track player with program selector and indicator lights instead of cassette; wow and flutter 0.25% rms; 5⅛" D. $180

SR-301 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player with AM/FM, muting, local/distant, and mono/stereo switches; auto shutoff; pushbutton eject and fast forward and rewind; separate balance and fader controls; tone control. Wow and flutter 0.3% rms; S/N 38 dB; channel separation 42 dB; audio output 8 W at 1.0% THD; frequency response 60-12,000 Hz; 1¾" H × 6 11/16" W × 4 13/16" D $120

SR-201. Same as SR-301 except has 8-track player with program selector and LEDs instead of cassette $120

5 CAR STEREO ACCESSORIES

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

HI-COMP Line

HCB-860 Amplifier

Stereo amplifier; output 60 W/ch with 1.0% THD $180

HCE-750 Equalizer/Preamp

Five-band parametric equalizer and preamplifier; equalizer center frequencies set at 35-70, 125-280, 500-1000, 1750-3500, and 6000-12,000 Hz ±10 dB boost or cut; designed to plug into RCA preamp outputs of HI-COMP units and works with all amplifiers $135

BLAUPUNKT

BEA-200 Equalizer/Power Amp

Five-band graphic equalizer with power amplifier and reverb effect synthesizer. Equalizer: five slide controls with center frequencies set at 60, 250, 1000, 3500, and 12,000 Hz ±12 dB boost or cut. Power amp: front-to-rear four-speaker fader control, tone defeat switch, and power on/off; max. output 16 W/four channels. Reverb: on/off switch, time delay control, and gain control; delay time 30 msec; reverb time 180 msec; noise output 3 mV. Frequency response 30-40,000 Hz −4 dB; THD 1.0%; includes mounting bracket; 1.6" H × 7.5" W × 5.5" D $233

BEA-100. Similar to BEA-200 without reverb unit; 1.6" H × 5.5" W × 5.6" D $144

CAR TAPES

JS-120 Graphic Equalizer

Ten-band graphic equalizer with center frequencies set at 30, 60, 150, 400, 1000, 2400, 4000,

controls with center detent. Wow and flutter 0.13% wrms; tape frequency response 30-15,000 Hz at ±3 dB; S/N 60 dB (Dolby on), 52 dB (Dolby off); 2" H × 6" W × 6⅝" D $250

KP-8005 AM-Stereo FM/Cassette
In-dash AM-stereo FM Supertuner and cassette player. Features auto eject and replay, and locking fast forward and rewind; five-station preset tuning; volume/tone/balance controls; muting switch; stereo/mono switch; 8 W max. continuous output power; FM usable sensitivity 1.1 μV at 75 ohms (12 dBf); 50-dB quieting sensitivity 1.4 μV at 75 ohms (14.3 dBf); alternate channel selectivity 74 dB; capture ratio 1.7 dB; FET r-f amplifier; PLL for stereo separation; tape frequency range 30-12,000 Hz; wow and flutter 0.28% wrms; 2" H × 7⅛" W × 5¾" D; nose dimensions 1¾" H × 4⅛" W × 1⅛" D $250
KP-8000. Same as KP-8005 except designed to DIN standard for European cars; nose 1⅝" H × 4⅛" W × ¾" D; shaft spacing 5⅛-in..... $250
KP-5005. Same as KP-8005 but with manual tuning..... $230

KP-3500 AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio and cassette player designed to fit European cars. Unit features built-in PNS noise suppression system, auto eject and replay, locking fast forward and rewind, stereo/mono and local/distant switches, and volume, tone and balance controls. Wow and flutter 0.28% wrms; tape frequency response 30-12,000 Hz; max. output 8 W continuous; FM usable sensitivity 1.1 μV; FM 50-dB quieting sensitivity 1.4 μV; selectivity 74 dB; capture ratio 1.7 dB; 2" H × 7⅛" W × 5¾" D; nose dimensions 1⅝" H × 4⅛" W × ¾" D..... $230

KP-500 Stereo FM/Cassette
Underdash FM stereo Supertuner and cassette player. Features automatic eject; fast forward and rewind; PLL multiplex demodulator; automatic stereo/mono switching; local/distant switch; loudness and muting switches; separate bass and treble controls; 8 W max. continuous output power; FM usable sensitivity 1.1 μV; 50-dB quieting sensitivity 1.4 μV; alternate channel selectivity 74 dB; capture ratio 1.7 dB; wow and flutter 0.3%; frequency response 40-10,000 Hz; brushed aluminum panel; 3" H × 7⅝" W × 7½" D..... $220
KP-250. Similar to KP-500 except separate balance/tone/volume control; 2" H × 6⅛" W × 6¾" D. $165

KPX-600 Stereo FM/Cassette
Underdash FM stereo Supertuner and stereo cassette player. Features automatic replay and eject; locking fast forward and rewind; tape-play indicator; electronic governor motor; volume, bass, treble, and balance controls; FM muting; loudness contour switch; FM stereo indicator; FM stereo/mono switch. FM tuner: 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 −3 dB; S/N 52 dB; 2⅜" H × 7⅞" W × 6⅞" D..... $220

KP-4000 AM-Stereo FM/Cassette
In-dash AM-stereo FM receiver with cassette player. Features automatic stop and eject; rotary mode selector; local/distant switch; LED tape and FM stereo indicators; 8 W max. continuous output power; tape frequency response 40-10,000 Hz; wow and flutter 0.3%; 2" H × 7⅛" W × 6¼" D; nose dimension 1¾" H × 4⅛" W × 1⅜" D $200

KP-88G Cassette Player
Underdash stereo cassette player with Dolby noise-reduction system and electronic governor motor. Features automatic replay and eject; 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 ±3 dB; S/N 60 dB (Dolby on), 52 dB (Dolby off); 2" H × 6" W × 6⁹⁄₁₆" D $180
KP-66G. Similar to KP-88G except without Dolby; 2" H × 4⅞" W × 6⅛" D..... $150

KP-575 Cassette Player
Underdash cassette player has auto reverse with auto tape slack eliminator, locking fast forward and rewind, tape direction indicators, loudness control, and volume, tone and balance controls. Wow and flutter 0.25% wrms; tape frequency response 30-14,000 Hz; S/N ratio 50 dB; max. output 10 W continuous; 2" H × 6⅛" W × 4¹³⁄₁₆" D..... $160
KP-373. Similar to KP-575 except without auto reverse; has auto replay and slide volume control; 2" H × 4¾" W × 6⅛" D..... $135

KP-272 Cassette Player
Underdash cassette player with auto eject, fast-forward and rewind, and separate volume, tone, and balance controls. Wow and flutter 0.3% wrms; frequency response 40-10,000 Hz; max. output 8 W continuous; 2" H × 5⅞" W × 6⅛" D..... $110

TP-9006 AM-Stereo FM/8-Track
In-dash AM-stereo FM Supertuner and 8-track player. Features dial-in-door, FM muting, separate bass and treble, LED stereo indicator, local/distant switch, and five AM and five FM preset pushbutton tuning; 8 W max. continuous output power; FM usable sensitivity 1.1 μV at 75 ohms; 50-dB quieting sensitivity 1.4 μV at 75 ohms; alternate channel selectivity 74 dB; capture ratio 1.7 dB; wow and flutter 0.25% wrms; 3¼" H × 7⅛" W × 6⅜" D; nose size 3" H × 4⅝" W; designed primarily for GM cars $240
TP-9005. Similar to TP-9006 except designed primarily for Ford cars..... $240
TP-9004. Similar to TP-9006 except designed primarily for Chrysler cars $240

TP-7007 AM-Stereo FM/8-Track Player
In-dash AM-stereo FM radio and 8-track player with auto and manual program change, five-station preset pushbutton tuning, stereo/mono switch, LED FM and stereo indicators, and volume, balance and tone controls. Wow and flutter 0.3% wrms; tape frequency response 40-10,000 Hz; max. output 8 W continuous; 2" H × 7⅛" W × 6¼" D..... $180
TP-6006. Similar to TP-7007 without five-station preset tuning; has local/distant switch and LED stereo indicator; 2" H × 7⅛" W × 6¼" D $150

TP-900 Stereo FM/8-Track
Underdash FM stereo Supertuner and 8-track player. Features PLL multiplex demodulator; FET front end; auto/manual program selection; fast forward; program repeat; local/distant switch; loudness switch; muting; separate bass, treble, balance controls; auto stereo/mono switching; FM usable sensitivity 1.1 μV; 50-dB quieting sensitivity 1.4 μV; alternate channel selectivity 74 dB; capture ratio 1.7 dB; tape response 30-15,000 Hz; wow and flutter 0.25%; 3" H × 7⅜" W × 7½" D..... $120
TP-200. Similar to TP-900 except has LED stereo indicator and illuminated track indicator; frequency range 40-10,000 Hz; wow and flutter 0.3%; 2⅛" H × 7½" W × 7⅜" D $120

RCA

20C505 AM-Stereo FM/Cassette Player
In-dash unit combines AM-stereo FM radio and stereo cassette player. Features five × five AM/FM slidebar switching; five quick-set pushbutton tuning; local/distant switch; automatic frequency control; stereo balance control; fader control; dial light dimmer control lead; automatic power antenna activator lead. 10 W/ch continuous; frequency response 30-20,000 Hz; 4-8 ohm impedance; adjustable shafts; 2³⁄₁₆" H × 7" W × 6" D $225

12R210 AM-Stereo FM/Cassette Player
In-dash unit combines AM-stereo FM radio and stereo cassette player; compact installation for use in small domestic and foreign cars. Features 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/ch continuous; frequency response 30-15,000 Hz; 3-8 ohm impedance; adjustable shafts; 1⅝" H × 6¹¹⁄₁₆" W × 4⅜" D..... $165

12R206 Cassette Player
Underdash compact cassette player features 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 × 5¼" W × 6½" D..... $73

12R704 AM-Stereo FM/8-Track Player
In-dash unit combines AM-stereo FM radio and stereo 8-track player. Features radio dial in cartridge door; five quick-set tuning pushbuttons; cartridge eject; local/distant 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; 2¹³⁄₁₆" H × 7" W × 6" D $210

12R710 AM-Stereo FM/8-Track Player
In-dash unit combines AM-stereo FM radio and stereo 8-track player. Features radio dial in cartridge door; short chassis only 4¾-in deep; AM/FM slidebar switching; local/distant switch; stereo fader and balance controls; afc pushbutton; tape program indicator lights. 10 W/channel; frequency response 30-10,000 Hz; 3-8 ohm impedance; adjustable shafts; 2" H × 7¹⁄₁₆" W × 4¾" D..... $157

12R904 Stereo FM/8-Track Player.
Underdash unit combines stereo FM radio and front-loading 8-track tape player. Features nonglare numbered program indicator lights; pushbutton tape program selection; sliding volume, balance, and tone controls; FM stereo indicator light; tape dust cover; compact size for installation in small cars, boats or RV's. 14 W output; frequency range 80-8000 Hz; wow and flutter 0.3% rms; 3-8 ohm impedance; 2" H × 6¾" W × 6¾" D..... $98

REALISTIC

12-1886 AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio/cassette player features adjustable shafts, locking fast-forward/rewind, stereo/mono switch, and separate controls for bass, treble, and loudness; 12 W/channel; 12 V dc negative ground $180
12-1887. Same as 12-1886 except has 8-track player..... $180

12-1884 AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio and cassette player features adjustable shafts, locking fast forward/rewind, and separate controls for bass, treble, and loudness; 12 V dc negative ground $100
12-1885. Same as 12-1884 except has 8-track player..... $100

12-1809 Cassette Player
Cassette player with auto eject and fast forward/rewind controls; output 24 W $100
12-1810. Similar to 12-1809 except radio/8-track player with headphone jack..... $100

RHAPSODY

RY-702/A AM-FM/Cassette Player
In-dash stereo cassette player with AM-stereo FM 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" × 6¼" × 2⅛" $90

RY-862 AM-FM/8-Track Player
In-dash stereo 8-track player with AM-stereo FM radio; lighted slide-rule dial on tape opening cover; automatic and pushbutton track changer with LED number indicators; 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" × 6¼" × 2⅛"..... $80

SANKYO SEIKI

SCS-444 AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio and cassette player

5 CAR STEREO EQUIPMENT

FM switches; LED stereo indicator; built-in FM noise suppressor. FM sensitivity 4 μV; FM stereo separation 30 dB $320

Z171 AM-Stereo FM/Cassette Deck

In-dash AM-stereo FM radio/auto reverse cassette deck. Cassette: features locking fast forward and rewind; electronic pushbutton program changer; hi-fi equalization circuit; LED tape direction indicators; pushbutton tape function controls; high-impedance output; fast forward/rewind time 100 sec (C-60); wow and flutter 0.3% wrms; frequency response 30-13,000 Hz; S/N 40 dB. Radio features built-in automatic noise suppression circuit; tone control; FM muting; loudness; pre-amp circuitry; separate bass and treble controls; balance control; LED stereo indicator; FM sensitivity 5 μV; FM image rejection 40 dB at 98 MHz. 1¾" H × 6⅞" W × 6" D $250

Z940 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player features fast forward and fast rewind, stereo/mono and local/distant, and FM stereo indicator light. Tape wow and flutter 0.3%, frequency response 50-10,000 Hz, S/N 42 dB, 5-W output; FM radio sensitivity 6 μV, stereo separation 25 dB; 1¾" H × 6¾" W × 4¾" D..... $129

NAKAMICHI

250 Cassette Player

Designed for use with ADS subminiature biamplified speaker systems; Dolby noise reduction circuitry; selectable playback equalization; full auto shut-off; dc servomotor drive; volume, tone, and balance controls; supplied with bracket for underdash mounting and connecting cables; playback frequency response 40-17,000 Hz ±3 dB; wow and flutter 0.08% wrms; S/N 62 dB (with Dolby); output 580 mV; 9⅛" × 7⅓" × 3½"..... $310

250S. Same as 250 but with ac power supply. $335

PANASONIC

Cockpit RM-610 Tuner/Cassette Deck

Ceiling-mounted modular control unit incorporates stereo cassette deck, FM stereo tuner, and preamplifier with plug-in power amplifier. Tape deck: has switchable Dolby noise-reduction system; auto reverse; locking fast forward and rewind; auto eject; tape selector for normal and CrO_2 tapes; LED tape direction indicator; volume control; wow and flutter 0.2% wrms; frequency response 30-14,000 Hz; S/N 60 dB with Dolby; crosstalk −57 dB; stereo separation 40 dB at 1000 Hz. FM tuner: automatic multipath noise suppressor, r-f amplifier, and double-balanced mixer circuitry; three preset pushbutton preset or manual electronic FM tuning; auto FM stereo/mono switch; FM stereo indicator; LED dial frequency indicators; muting switch; local/distant switch; noise blanker; usable sensitivity 16 dBf; S/N 65 dB; image rejection 70 dB; i-f rejection 80 dB; frequency response 30-15,000 Hz. Preamp: separate center-detent bass and treble controls; balance and fader controls; 21 click-stop volume control; loudness switch; ten-LED output power indicators. Plug-in power amplifier: hidden mount (behind dash, under seat, or in trunk); 60 W total output into 4 ohms with 0.5% THD from 20-20,000 Hz; frequency response 20-40,000 Hz −3 dB; S/N 82 dB. Optional speakers available with Cockpit system; 1¹₂" × 27³₄ × 9⁷/₁₆"... $1000

Speaker. Rear-deck surface-mount two-way air-suspension speaker system with urethane-edged 4³₄-in woofer and 2-in tweeter; max. input 50 W; frequency response 60-20,000 Hz; 4-ohm input impedance; 5⁷/₁₆" × 9¹³/₁₆" × 7⁷/₁₆"..... $210

CQ-8700 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM electronic tuner digital radio, clock, and cassette player with Dolby noise-reduction system and auto reverse. Cassette features

locking fast forward/rewind, manual eject, and LED tape direction indicator. Radio features five-memory buttons for five AM and five FM station selections, seek control that stops on strong frequencies, manual frequency scan, quartz-controlled PLL frequency synthesizer, built-in impulse noise quieting circuit, LED frequency and time display on cassette door, LED stereo and flashing signal/strength indicators, and local/distant, Dolby, and bi-amp switches; electric antenna and dimmer leads. Wow and flutter 0.2%; tape frequency response 30-12,500 Hz; S/N 53 dB (Dolby off), 62 dB (Dolby on); FM frequency response 30-15,000 Hz; FM S/N 60 dB; THD 0.2%; adjustable shafts and trimplates $700

CQ-7600 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio and Repeatrack cassette player with Dolby noise-reduction system and built-in five-band graphic equalizer. Features locking fast forward/rewind; eject button; bi-amp, Dolby, and local/distant switches; FM muting; quartz-controlled PLL frequency synthesizer; stereo indicators; built-in INQ circuit; electric antenna and dimmer leads; equalizer center frequencies set at 60, 250, 1000, 3500, 10,000 Hz at ±12 dB. Wow and flutter 0.02% wrms; tape frequency response 30-12,500 Hz at −3 dB; S/N 63 dB (Dolby on); adjustable shafts and trimplates $400

CQ-7400. Similar to CQ-7600 except without Dolby noise-reduction, quartz-controlled PLL frequency synthesizer, and bi-amp switch; has equalizer center frequencies set at 80, 250, 1000, 3500, 10,000 Hz at ±12 dB..... $300

CQ-6600 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio and cassette player with Repeatrack cassette has adjustable shafts and trimplates to fit American and imported cars. Features locking fast forward/rewind; auto or manual eject; LED stereo/tape mode indicators; switchable INQ circuit designed to suppress impulse noise on FM band; local/distant/super sensitivity control; tuner, balance, fader and tone controls; pushbutton tuning; max. output 7 W/channel $260

CQ-4600. Similar to CQ-6600 except 8-track; has manual and auto program change and LED program indicators..... $260

CQ-6800 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio and stereo cassette player with Repeatrack; adjustable shafts and trimplates. Features locking fast forward/rewind, auto or manual eject, LED stereo indicator, tone and balance controls, afc on FM, and local/distant switch. Max. output 5 W/channel $160

CQ-2800 AM-Stereo FM/8-Track

In-dash AM-stereo FM radio and 8-track player with two-stage preamp and dual channel amplifiers; adjustable shafts and trimplates. Features dial-indoor, digital program indicator, program change button, FM stereo light, local/distant switch, and volume, tone, and left/right balance controls. Max. output 7 W/channel $150

CX-7200 Component Cassette Player

Underdash cassette player with auto reverse. Features two stage preamp and dual channel amp; separate volume, left/right tone, and balance controls; one-lever operation for locking fast forward/rewind/eject; manual program selector; LED program indicators; wow and flutter 0.3% wrms; frequency response 40-12,000 Hz at −3 dB; S/N 50 dB; output 2 W/channel at 400 Hz; THD 5%; impedance 4 ohms..... $140

CX-5200. Similar to CX-7200 without auto reverse; has Repeatrack that switches rewind mode to playback at the beginning of tape; frequency response 40-10,000 Hz −3 dB $100

CX-1200. Similar to CX-7200 except 8-track with Panasonic Vertical Head Movement System; wow and flutter 0.13% wrms; S/N 40 dB $90

CA-9600. AM-stereo FM tuner..... $100

CJ-3600. Five-band graphic equalizer and amplifier $150

CJ-2600. Dashboard-mount; 10 W/ch power booster $60

The 15-W/ch CJ-3000, 20-W/ch CJ-4000, and 50-W/ch CJ-5000 in-dash amplifiers can be used with all Panasonic car cassette players.

PIONEER

KE-5000 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM Supertuner and stereo cassette player with dual-Dolby circuitry; electronic PLL frequency synthesizer tuning; digital readout for station frequency and time with clock button; random access memory allows pre-setting up to five

AM and five FM stations through electronic feather-touch buttons; scan/stop and seek buttons for station selection; built-in PNS noise suppression. Cassette features auto replay, locking fast forward and rewind, and CrO_2 tape selector. Radio features double diffusion MOS FET front end, muting and stereo/mono switches, AM/FM local distant switch, and built-in fader control. Wow and flutter 0.28%; tape frequency response 30-12,000 Hz; S/N 53 dB (Dolby on), 45 dB (Dolby off); output 8 W continuous; FM usable sensitivity 1.1 μV into 75 ohms (12 dBf); FM 50-dB quieting sensitivity 1.4 μV into 75 ohms (14.3 dBf); selectivity 74 dB; capture ratio 1.7 dB; 3" H × 7⅛" W × 5⅞" D $420

KE-3000. Similar to KE-5000 without Dolby noise-reduction system 2" H × 7⅛" W × 5⅞" D $360

KE-2000. Similar to KE-3000 without PNS noise suppression, electronic PLL synthesizer, digital readout, and scan tuning; LED electronic pointer display; AM local/distant switch..... $320

KPX-9500 AM-Stereo FM/Cassette

In-dash AM-stereo FM Supertuner and electronically governed stereo cassette player with dual-Dolby noise-reduction circuitry; LED stereo and Dolby indicators. Cassette features auto replay and eject, and locking fast-forward and rewind. Radio features five-station preset pushbutton tuning, stereo/mono switch, loudness control, separate bass and treble controls with center detent, and volume and balance controls. Wow and flutter 0.13% wrms; tape frequency response 30-15,000 Hz −3 dB; S/N 60 dB (Dolby on); FM usable sensitivity 1.1 μV into 75 ohms (12 dBf) mono; FM 50-dB quieting sensitivity 1.4 μV into 75 ohms (14.3 dBf); selectivity 74 dB; capture ratio 1.7 dB; 3" H × 4⅛" W × 1⅛" D $330

KPX-9000 AM-Stereo FM/Cassette

In-dash AM-stereo FM Supertuner and electronically governed stereo cassette player; volume and balance control; auto eject; LED tuning scale; rewind/fast-forward lever; separate bass and treble controls; loudness contour switch; five-station preset pushbutton tuning; LED stereo and tape play indicators; FM muting; FM stereo/mono switch; tuner capture ratio 1.7 dB; FM usable sensitivity 1.1 μV into 75 ohms (12 dBf) mono. Tape player: fast-winding time 120 sec (C-60); wow and flutter 0.13% wrms; frequency response 30-15,000 Hz −3 dB; S/N 52 dB; 2" H × 7⅛" W × 5⅞" D; nose 1¾" H × 4⅛" W × 1⅛" D $300

KP-707G Cassette Deck

Underdash cassette deck with Dolby noise-reduction system, electronic governor motor, and ferrite head. Features auto reverse with auto tape slack eliminator; CrO_2 tape selector; audio muting switch; feather-touch direction, fast forward, and rewind tape controls; loudness control; tape direction indicators; separate bass, treble, balance, and volume

tion with 5-sec hold; hold button locks in with afc; PLL tuning; digital frequency readout; can pushbutton preset up to five AM and five FM stations; FM noise blanker; FM muting; LED FM and stereo FM indicators; front antenna trimmer; local/distant; separate bass, treble, fader, and balance controls; FM IHF usable sensitivity 1 μV at 12 dBf; S/N 60 dB; FM i-f rejection 70 dB; FM capture ratio 1.7 dB; frequency response 40-15,000 Hz; output 15 W/ch continuous with 1.0% THD; load impedance 4 ohms; 2⅜" H × 7¾" W × 6½" D $450

67-550. Same as 67-440 except has 8-track player with auto/manual programming and tape program indicator lights $450

63-445 CB/AM-FM/Cassette Player

In-dash unit incorporates 40-channel CB transceiver, AM-stereo FM radio, and stereo cassette player. Cassette: electronically-controlled capstan drive motor; auto stop; locking fast forward button; pushbutton eject; LED tape mode indicator; wow and flutter 0.35% rms. CB transceiver: dual conversion superheterodyne receiver with switchable ANL; PLL 40-channel tuning; lighted signal power meter (also reads as tuning meter for radio); separate underdash-mounted 500-ohm dynamic microphone with LED channel readout and "on air" indicator with dimmer switch, channel change, and squelch controls; monitor switch; output 4 W; receiver sensitivity 0.5 μV for 10-dB S/N; adjacent channel selectivity 70 dB; squelch range 0.5-1000 μV. Radio features pushbutton AM/FM selectors; FM stereo light; local/distant switch; tone control; fader and balance controls; FM 30-dB quieting sensitivity 5 μV; FM i-f rejection 75 dB; FM image rejection 40 dB; FM stereo separation 28 dB at 1000 Hz; output 6 W/ch continuous; load impedance 4 ohms; 2⅜" H × 7¾" W × 6¾" D $400

63-545. Same as 63-445 except has 8-track player with auto/manual program change and LED program lights $400

67-457 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/auto reverse cassette player. Cassette: twin capstan drive; four-pickup playback head; pause detector; auto/manual program change with locking fast forward/rewind; pushbutton eject; LED tape direction lights; wow and flutter 0.25%; crosstalk −35 dB; S/N 48 dB. Radio: pushbutton local/distant and AM/FM; LED stereo FM indicator; antenna trimmer; balance and fader controls; FM sensitivity 5 μV; FM S/N 60 dB; output 4.5 W/ch continuous with 10.0% THD; 2⅜" H × 7¾" W × 6½" D $190

67-557. Similar to 67-457 except has 8-track player with auto/manual program change and LED program indicators; no antenna trimmer; tape wow and flutter 0.3%; crosstalk −40 dB; S/N 45 dB; FM S/N 63 dB $180

67-455 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player. Cassette: adjustable pickup playback head; auto stop; twin capstan drive; locking fast forward; pushbutton eject; wow and flutter 0.3%; crosstalk −30 dB; S/N 45 dB. Radio: backlit tuning dial in tape door; local/distant control; LED stereo FM indicator; balance and fader controls; FM usable sensitivity 5 μV; FM S/N 63 dB; output 4.5 W/ch at 10.0% THD; 2³/₁₆" H × 7½" W × 6½" D $130

67-555. Same as 67-455 except has 8-track player with auto/manual programming and program indicator lights; 8-track crosstalk −40 dB $130

MITSUBISHI CAR AUDIO

RX-79EM AM-FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player with auto reverse; features locking fast forward and

rewind; four-speaker capability; tuning, balance, and fader controls with five-station pushbutton preset; stereo/mono switch; pushbutton program selector; AM/FM LEDs; 18 W/ch $280

RX-73 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player features pushbutton AM/FM; tuning/fader control with five-station pushbutton preset; locking fast forward and eject; left and right balance controls; local/distant switch $180

RX-7 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player designed for imported cars. Cassette features auto reverse, auto eject, locking fast forward and rewind, and LED tape flow indicator; wow and flutter 0.15% wrms; S/N 50 dB; 40-dB separation. Radio features FM noise killer circuit; one-touch six-station pushbutton preset tuning; program selector switch; frequency response 40-13,000 Hz; dist. 1.0%; capture ratio 4 dB; selectivity 48 dB $230

RX-69. Similar to RX-7 except designed for domestic cars; without six-station preset; has five-station pushbutton preset, stereo/mono switch, dual-color-mode dial illumination, bass booster switch, and fader and balance controls for four-speaker 8-ohm system; dist. 0.5%; selectivity 35 dB $210

RS-67. Similar to RX-69 except has 8-track player with one-touch program selector; radio has five AM/FM station preset; wow and flutter 0.2% wrms; S/N 50 dB $210

Car Stereo Components

CV-21EM. 20 W/ch power amplifier with balanced transformerless circuit; loudness control; separate bass and treble controls; fader and balance controls; attenuation switch; dimmer control connection $130

CJ-20EM. AM-stereo FM tuner with noise-killer circuitry, local/distant switch, muting circuit, and illuminated tuning meter $125

CX-20EM. Cassette deck with auto eject, hard permalloy heads, level controls, and dimmer control connections; wow and flutter 0.15%; S/N 55 dB; frequency response 30-14,000 Hz $90

CX-21EM. Same as CX-20EM except has noise-reduction switch, locking fast forward/rewind, program selector switch, and auto reverse $130

MOTOROLA

CC975AX AM-FM/Cassette Player/CB

In-dash unit combines AM-stereo FM radio and stereo cassette player with AutoCue; also features CB standby and CB/radio pushbuttons; LED channel display; pushbutton operations; removable microphone $430

TC894AX AM-FM/Cassette Player

In-dash unit combines AM-stereo FM radio and stereo cassette player; features Dolby noise-reduction system for tape and FM radio modes; hard permalloy head; tape equalization control for FeCr and CrO_2 tapes; loudness control; pushbutton local/distant, eject, filter, mono/stereo, and FM controls; pushbutton tuning; locking fast forward and rewind; AutoReverse; fader control; separate bass and treble controls; stereo indicator light; 24 W continuous total system power $390

TC890AX. Same as TC894AX minus loudness control; 8 W continuous total system power $400

TC887AX AM-FM/Cassette Player

In-dash unit features AM-stereo FM radio and front-loading stereo cassette player; 8 W continuous total system power; AutoReverse sensor automatically plays second side of tape; locking fast forward and rewind switch with direction indicator light; FM local/distant switch; stereo indicator lights; left/right balance controls; front-rear fader; mono/stereo switch; hard permalloy head; 2.6" H × 7.1" W × 5.3" D $250

TC888AX AM-FM/Cassette Player

In-dash unit combines AM-stereo FM radio and front-loading stereo cassette player; 8 W continuous total system power; AutoCue control electronically positions tape in either forward or reverse mode; pushbutton tuning; separate fader control; locking fast forward and rewind buttons; tape eject; tone, balance, and volume controls; local/distant and mono/stereo switches; stereo indicator light; hard permalloy heads $240

TC885AX AM-FM/Cassette Player

In-dash unit designed for compact cars combines AM-stereo FM radio and front-loading stereo cassette player; 8 W continuous total system power; AutoReverse; hard permalloy tape head; manual tuning; controls for tone, balance, and volume; locking fast forward and rewind; tape eject; pushbutton local/distant, mono/stereo, and FM controls; stereo indicator light $200

TC883AX AM-FM/Cassette Player

In-dash unit combines AM-stereo FM radio and front-loading stereo cassette player; 8 W continuous total system power; pushbutton tuning; front-to-rear fader; controls for tone, balance and volume; locking fast forward and rewind; tape eject; local/distant switch; hard permalloy head $185

TC881AX AM-FM/Cassette Player

In-dash unit combines AM-stereo FM radio and front-loading stereo cassette player; 8 W continuous total system power; AutoEject; front-to-rear fader; controls for tone, balance, and volume; locking fast forward and rewind; local/distant switch; stereo indicator light; hard permalloy head $140

TC879AX AM-FM/Cassette Player

In-dash unit combines AM-stereo FM radio and front-loading stereo cassette player; 8 W continuous total system power; short chassis depth; locking fast forward and rewind; volume, tone and balance controls; tape eject; tape run light; manual tuning; local/distant switch; stereo indicator light; hard permalloy head $110

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-brackets for easy mounting.

TC344S. Total output 24 W continuous; rotary bass and treble controls; loudness contour control; hi-filter, power meter $150

TC334S. Total output 8 W continuous; AutoReverse; tape direction switch and light $110

CT950AX AM-FM/8-Track/CB

In-dash unit combines AM-stereo FM radio and 8-track tape player; also features CB standby and CB/radio pushbuttons; LED display; pushbutton operation; removable microphone $400

TF882AX AM-FM/8-Track Player

In-dash unit combines AM-stereo FM radio and 8-track player; 24 W continuous total system power; balance and volume controls; pushbutton or manual tuning; local/distant, mono/stereo, and program select pushbutton controls; stereo and program indicator lights; separate controls for bass, treble, and front-to-rear fader; loudness button $210

TF880AX AM-FM/8-Track Player

In-dash unit combines AM-stereo FM radio and 8-track player; 8 W continuous total system power; pushbutton or manual tuning; volume, tone and balance controls; front-to-rear fader; local/distant, mono/stereo, and program select pushbutton controls; stereo and program indicator lights $165

TM428S 8-Track Player

Underdash 8-track tape player; 24 W continuous total system power; separate controls for volume, bass, treble, and balance; loudness, fast forward, channel select, and program repeat pushbutton controls; lighted channel indicator $110

MUNTZ HI Z

350 AM-Stereo FM/Cassette Deck

In-dash AM-stereo FM radio/auto reverse cassette deck with LED clock/station frequency readout and built-in 50-W amp; designed to operate with Model 77 amplifier. Features locking fast forward and rewind; cassette eject button; mono/stereo and AM/

5 CAR STEREO EQUIPMENT

KID-588. Similar to KID-589 without mute on/off; has fast forward/rewind switch and local/distant control; in-dash or underdash installation..... $208

KID-587 AM-Stereo FM/Cassette Player
In-dash/underdash AM-stereo FM radio/stereo cassette player. Cassette features fast forward and eject and LED tape run indicator. Radio features five AM and FM pushbuttons; variable tone control; LED FM stereo indicator; local/distant and AM/FM switches; sliding balance and variable fader control $176

LAFAYETTE

CP-2300 AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio/stereo cassette player features locking fast forward/rewind/eject switch; mono/stereo switch; FM local/distant switch; stereo indicator light; tone, volume, and balance controls. $100

RK-300 Cassette Player
Underdash stereo cassette player features automatic reverse; has fast forward, rewind, and eject controls and slide controls for volume, balance, and tone $80

CP-1200 AM-Stereo FM/8-Track Player
In-dash AM-stereo FM radio/8-track player features illuminated flip-away tape door/tuning dial; FM local/distant switch; LED tape program and stereo indicators; tone, volume, and balance controls.... $90

LAKE COMMUNICATIONS

990 AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio/cassette player features digital LED clock/radio frequency readout display. Radio includes multipurpose concentric control for volume/balance (pull and turn) and bass/treble (push and turn); stereo balance/tuning control; toggle switches for time/frequency, AM/FM, and stereo/mono modes; LED FM stereo indicator. Cassette features auto eject and fast forward and rewind. Output 6 W/ch; stereo separation 30 dB; 13.8 V dc negative ground; 44 mm H × 178 mm W × 150 mm D..... $200

280 AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio and dual capstan stereo cassette player. Cassette features auto reverse at end of tape or manual pushbutton control, lighted tape direction indicators, and eject pushbutton. Radio features channel select, AM/FM, and local/distant pushbuttons, LED stereo FM indicator, and concentric volume/tone and balance/tuning controls. Output 6 W/ch; FM and tape stereo separation 30 dB; 13.8 V dc negative ground; 50 mm H × 143 mm W × 182 mm D..... $120
2160. Similar to 280 except has chrome and woodgrain front panel design $120

880 AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio/cassette player in wood-grain and chrome finish. Cassette features automatic shutoff at end of tape and pushbutton eject/fast forward. Radio features pushbutton stereo/mono, bass boost, muting, local/distant, afc, and AM/FM controls; volume/tone and tuning/fader controls; stereo balance control; LED channel and FM stereo indicators. Output 7 W/ch; stereo separation 20 dB min.; 13.8 V dc negative ground; 50 mm H × 180 mm W × 125 mm D $100

8900 AM-Stereo FM/8-Track Player
In-dash AM-stereo FM radio/8-track tape player features digital LED clock/radio frequency readout display. Radio features concentric volume/tone control with program frequency readout function (push); balance/tuning control; lighted mode indicators; front-to-back speaker fader control; AM/FM and local/distant pushbuttons. 8-track features LED tape channel indicators. Output 6 W/ch; stereo separation 30 dB; 13.8 V dc negative ground; 56 mm H × 176 mm W × 120 mm D..... $180

8500 AM-Stereo FM/8-Track Player
In-dash AM-stereo FM radio/four-track, two-channel 8-track player. 8-track features dial-in-the-cartridge door and LED channel indicators. Radio features LED stereo/FM indicator; locking pushbutton controls for stereo FM/mono, AM/FM, and local/distant; volume/tone with push program and tuning/fader with push balance controls. Output 6 W/ch; stereo separation 25 dB; 13.8 V dc negative ground; 56 mm H × 176 mm W × 120 mm D..... $100

MARANTZ

CAR-427 CompuTuner/Cassette Deck
Unit incorporates stereo CompuTuner/preamplifier/auto reverse cassette deck with digital quartz clock/radio frequency display. Cassette features Dolby noise-reduction system with tape and FM Dolby buttons, Sendust-alloy tape head, tape equalization for special tape (includes metal-particle), memory preset tape eject and power off auto eject, and locking fast forward and rewind. Tuner/preamplifier features front-to-rear preamp fader control; atmospheric interference rejection; quartz-locked synthesized tuning with ten electronic memory preset buttons and electronic station search; center-detented bass, midrange and treble controls; loudness compensation; FM muting; FM impulse-noise blanker $625

CAR-400 CompuTuner/Cassette Deck
Unit combines stereo CompuTuner, built-in stereo amplifier, and cassette deck with digital quartz clock/radio frequency display. Cassette features Dolby noise-reduction system, auto eject, and locking fast forward and rewind. Radio features quartz-locked synthesized tuning with 12-station electronic memory preset buttons and electronic station search; atmospheric interference rejection; center detented bass and treble controls; fader control; FM muting $500

CAR-302 Tuner/Cassette Deck
Unit combines AM-FM stereo tuner and stereo cassette deck. Cassette features Dolby noise-reduction system, super hard permalloy tape head, auto eject, and fast forward and rewind. Radio features five-station preset; atmospheric interference rejection; separate bass and treble controls; volume control; LED FM stereo indicator; front-to-rear speaker fader $300

CAR-301 Tuner/Preamp/Cassette Deck
Unit combines AM-FM stereo tuner/preamplifier/cassette deck. Cassette deck features Dolby noise-reduction system, super hard permalloy tape head, auto eject, and fast forward and rewind. Radio features five-station pushbutton preset; atmospheric interference rejection; separate bass and treble controls; loudness compensation volume control; LED FM stereo indicator; preamp front-to-rear speaker fader $270

MARUMÉ by DYUSA

M-560A AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio and stereo cassette player features LED tape playing and stereo receiving indicators and local/distant switch. Controls include automatic reverse, fast forward, rewind with lock and manual, and program change and eject pushbuttons. Wow and flutter 0.3% wrms; output 7 W/ch; 12 V dc negative ground; 1⅝" H × 6¾" W × 5¹⁵⁄₁₆" D $150

M-5300 AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio and stereo cassette player features eject, fast forward, local/distant, mono/stereo, and on/off pushbuttons; other controls include volume/tone and tuning/balance; LED AM-stereo FM indicator. Tape: wow and flutter 0.35%, S/N 40 dB, crosstalk 40 dB. Radio: S/N 30 dB (FM) and 20 dB (AM), max. sensitivity 3.2 μV (FM), 20 μV (AM). Output 5 W/ch into 4 ohm; frequency response 50-10,000 Hz; 50 mm H × 180 mm W × 145 mm D..... $110

M-5000 AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio and stereo cassette player features fast forward/eject pushbutton. Radio features pushbutton AM/FM, local/distant, and muting controls; other controls include volume/tone and tuning/balance. Tape: wow and flutter 0 35%; S/N 40 dB. Radio: output 7 W/ch into 4-8 ohms; frequency response 5-10,000 Hz; S/N 30 dB (AM), 45 dB (FM); 11-16 V dc negative ground; 44 mm H × 178 mm W × 125 mm D $100

M-8400 AM-Stereo FM/8-Track Player
In-dash AM-stereo FM radio and two-channel stereo 8-track player features dial-in-door, slide-bar switch, and adjustable antenna trimmer. Radio features pushbutton on/off and local distant; other controls include volume/tone and tuning/balance. Wow and flutter 0.3%; max. output 7 W/ch; 12 V dc negative ground; 1²⁵⁄₃₂" H × 6¾" W × 4¹³⁄₁₆" D..... $110

M-8000 AM-Stereo FM/8-Track Player
In-dash AM-stereo FM radio and four-channel stereo 8-track player with pushbutton program change. Radio features AM/FM and local/distant switches, pushbutton FM/stereo, and concentric volume/tone and tuning/balance controls. Tape: wow and flutter 0.35%; S/N 40 dB. Radio: output 7 W/ch into 4-8 ohms; frequency response 5-10,000 Hz; S/N 30 dB (AM), 45 dB (FM); 11-16 V dc negative ground; 44 mm H × 178 mm W × 125 mm D..... $100

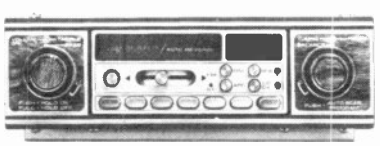
METROSOUND

MS-9655 Ultra-Fi Radio/Cassette Deck
In-dash digitally microprocessor-controlled AM-stereo FM radio/auto reverse stereo cassette player.

Cassette features Sendust head; locking fast forward and rewind; pushbutton eject and tape direction; LED tape direction indicator; wow and flutter 0.15% wrms; frequency response 50-12,000 Hz. Radio features touch sensor volume, balance, bass, treble, up/down scan, station enter, and four-way fader electronic controls; full memory scan (can program up to ten stations); LED digital frequency readout; pushbutton AM/FM, local/distant, and dimmer/lock; LED AM, FM, and station enter mode indicators; can be used as preamplifier with addition of external amp; output 12 W/ch continuous with 1.0% THD, both channels driven, into 4 ohms; frequency response 25-20,000 Hz ±1 dB; breakaway trimplate; supplied with adjustable dummy shafts (to 160-mm pitch); 2¾" H × 7" W × 5⅞" D. $595

MIDLAND INTERNATIONAL

67-440 AM-Stereo FM/Cassette Player
In-dash unit incorporates "MicroPrecision" electronic memory-controlled AM-stereo FM radio, modular stereo amplifier, auto reverse cassette player with twin capstan drive, and quartz crystal digital clock. Cassette: four-pickup playback head with



pause detector; locking fast forward/rewind; eject; LED tape direction indicators; wow and flutter 0.2% (JIS weighted); frequency response 30-15,000 Hz; S/N 48 dB; crosstalk −46 dB. Receiver: scan func-

tuner and quartz clock and cassette player with auto reverse. Features auto search; ten-station pushbutton tuning; local/distant and AM/FM switches; bass and treble controls..... $500

GP-7881 AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio and cassette player with Dolby noise-reduction system and auto reverse; four-way bass; five-station pushbutton tuning; slide-bar left/right balance control; local/distant switch; adjustable shaft..... $300
DP-7872. Similar to GP-7881 without Dolby system $200
DP-7871. Similar to DP-7872 except with noise blanker and fixed shafts..... $200

GL-7851 AM-Stereo FM/8-Track Player
In-dash AM-stereo FM radio and 8-track player with dial-in-door; four-way fader mute and treble/bass control; local/distant switch; LED stereo and tape indicators; five pushbutton tuning; adjustable shafts..... $250
DL-7841. Similar to GL-7851 without four-way fader mute and treble/bass control $130

Component System
AT-7831. AM/FM tuner with auto-search tuning; bass and treble tone controls; local/distant and stereo/mono pushbutton switches..... $280
AT-372/EX-1. Stereo FM tuner with auto-search tuning..... $230
SP-711S1. Cassette deck with auto reverse and Dolby noise-reduction system; slide-bar bass and treble tone controls..... $200
PA-150F. Four-channel power amp with 80-W output $120
CA-100. Control amplifier $90
RV-130-EX-1. Electronic stereo graphic timer delay with LED 500, 1500, 3000 msec; fader/volume and reverb controls; pushbutton power control.$180

HANDIC

Las Vegas AM-FM/Cassette Player
In-dash AM-stereo FM radio and cassette player with auto reverse, auto eject and locking fast forward/rewind. Radio features LED digital display for AM/FM frequency and clock with elapsed timer; local/distant switch; five-pushbutton AM/FM tuning; Noise Killer adaptor; power antenna cord; adjustable shafts. Wow and flutter 0.3%; frequency response 50-10,000 Hz; output 7 W/ch continuous; FM sensitivity 2 μV; FM selectivity 35 dB; impedance 4-8 ohms; 12 V dc negative ground; 2.75" H × 7.25" W × 5.50" D..... $420

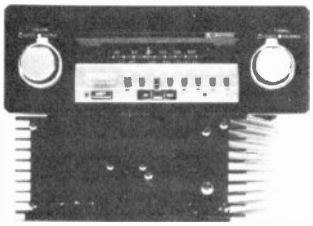
Napoli AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio with electronic tuning and cassette player with auto eject and locking fast forward/rewind; adjustable shafts and DIN standard nosepiece for foreign and domestic cars. Radio features two memory functions for auto or manual tuned stations; 13-LED dial indicator; local/distant/manual tuning switch; built-in Handic Noise Killer designed to cut out ignition noise and FM radio static distortion; power antenna cord. Wow and flutter 0.3%; frequency response 50-10,000 Hz; output 6 W/ch continuous; FM sensitivity 2 μV; FM selectivity 35 dB; impedance 4-8 ohms; 1.65" H × 6.85" W × 5.51" D..... $380

Paris Mark II AM-FM/Cassette Player
In-dash AM-stereo FM radio and cassette player with auto reverse; adjustable shafts and DIN standard nosepiece fit any type of car; locking fast forward and rewind; plug-in jack for Handic Noise Killer. Wow and flutter 0.3%; frequency response 40-12,500 Hz; output 7 W/ch continuous; FM sensitivity 1 μV; FM selectivity 35 dB; impedance 4-8 ohms; 12 V dc negative ground; 1.61" H × 6.89" W × 5.79" D $240
Miami. Similar to Paris without auto reverse; has LED stereo indicator; dial-in-door; pushbutton eject and fast forward; mono/stereo switch; response 50-10,000 Hz; FM sensitivity 2 μV; output 6 W/ch continuous; 1.85" H × 6.89" W × 5.79" D.... $150

La Scala Cassette Player
Underdash stereo cassette player with locking fast forward/rewind; ic circuitry; slide balance, rotary volume and tone controls; wow and flutter 0.4%; frequency response 40-12,000 Hz; output 5 W/ch continuous; 1.97" H × 6.38" W × 6.89" D..... $70

JENSEN

R430 AM-Stereo FM/Cassette Player
In-dash bi-amplified AM-stereo FM receiver/cassette player with Dolby noise-reduction system and



separate power amplifiers. Features cassette door/tuner dial; pushbutton eject; fast forward/rewind switch; automatic flashing tape alarm reminds you when ignition is turned off to remove cassette; LED cassette and stereo indicators; individual bass/treble and balance/fader; other controls include pushbutton remote power amplifier, bi-amplification, loudness compensation, muting, AM/FM, local/distant, and tuner. Wow and flutter 0.2%; S/N 73 dB (FM Dolby); frequency response 30-18,000 Hz; THD 0.4% at 52 W; output 30 W continuous; FM sensitivity 1.0 μV; FM alternate channel rejection 75 dB; FM stereo separation 35 dB; capture ratio 1.5 dB; bi-amplifier output 25 W (bass), 5 W (treble); bi-amp crossover 1000 Hz $530
R420. Similar to R430 without power amplifier and remote power amplification control; THD 1.0% at 16 W; bi-amplifier output 5 W (bass), 5 W (treble); output 10 W continuous..... $400
R410. Similar to R420 without bi-amplification; output 5 W continuous; THD 1.0% at 8 W..... $400

R330 AM-Stereo FM/8-Track Player
In-dash bi-amplified AM-stereo FM receiver/8-track player with Dolby noise-reduction system and separate power amplifiers. Features LED program and stereo indicators; individual bass/treble and fader/balance; volume/push-program and tuning/push-fast forward controls; other controls include pushbutton remote power amplifier, bi-amplification, loudness compensation, muting, AM/FM, local/distant, and tuner. Wow and flutter 0.2%; S/N 73 dB (FM Dolby); frequency response 30-18,000 Hz; THD 0.4% at 52 W; output 30 W continuous; FM sensitivity 1.0 μV; FM alternate channel rejection 75 dB; FM stereo separation 35 dB; capture ratio 1.5 dB; bi-amplifier output 25 W (bass), 5 W (treble); bi-amp crossover 1000 Hz $530
R320. Similar to R330 without power amplifier and remote power amplification control; THD 1.0% at 16 W; bi-amplifier output 5 W (bass), 5 W (treble); output 10 W continuous..... $400
R310. Similar to R320 without bi-amplification; output 5 W continuous; THD 1.0% at 8 W..... $400

J.I.L.

634E AM-Stereo FM/Cassette Player
In-dash computer-programmed AM-stereo FM radio and cassette player with auto reverse. Cassette features auto eject, locking fast forward/rewind, and LED tape direction indicators. Radio features fluorescent digital time and frequency readout; pushbutton tuning for four AM and four FM channels with scan/pause and seek/lock-in functions; auto FM muting; local/distant button; hour/min adjust; treble/bass tone control; power boost "Power Pumper" switch; FET front end and adjustable shafts; max. output 20 W/ch continuous; 2" H × 7" W × 7" D..... $490
633. Similar to 634E without computer programming and digital clock/frequency display; has LED stereo indicator; 2" H × 7¼" W × 6¾" D $325
632. Similar to 633 without "power pumper" power booster; has max. output 10 W/ch continuous; 2" H × 7¼" W × 6" D $275
631. Similar to 632 without auto reverse and eject; has auto stop; max. output 6 W/ch continuous; 2⅛" H × 7¼" W × 5" D $190

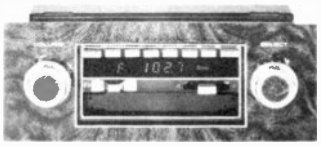
607 Cassette Player
Underdash stereo cassette player with pushbutton fast forward, rewind, and eject controls; left-to-right balance control; play indicator light; 1¾" H × 5½" W × 6½" D..... $100

874E AM-Stereo FM/8-Track Player
In-dash computer-programmed AM-stereo FM radio and 8-track player with dial-in-door. Unit features LED frequency readout and time display; hour/minute adjust; auto FM muting; LED stereo indicator; pushbutton tuning for four AM and four FM channels with scan/pause and seek/lock-in functions; AM/FM selector button; treble/bass tone controls; power boost "Power Pumper" switch; FET front end and adjustable shafts; max. output 20 W/ch continuous; 2" H × 7" W × 7" D..... ....$415
873. Similar to 874E without computer programming; has program indicator lights; 1¹³⁄₁₆" H × 7¼" W × 6" D..... $270
872. Similar to 873 without "Power Pumper" power booster; has AM/FM slide bar selector; max. output 6 W/ch continuous $175

517 Stereo FM/8-Track Player
Underdash stereo FM radio and 8-track player with channel selector; numerical program indicator; balance, tone, and volume controls; repeat play; radio/tape switch; local switch; 2" H × 6¾" W × 6¾" D..
..... $145
515. Similar to 517 without FM radio; has LED program indicator..... $90

KRACO

LED-509 AM-Stereo FM/Cassette Player
In-dash/underdash computer-controlled AM-stereo FM radio/stereo cassette player with green LED digi-



tal clock (adjustable in hr and min) and radio frequency display. Cassette features auto eject; locking fast forward and rewind; LED tape play indicator. Radio features six memory preset AM and FM buttons; signal-seeking auto-tuning; auto scan of radio frequencies; separate bass and treble controls; variable balance and fader controls; LED AM/FM/stereo FM indicators; output 20 W/ch max., 15 W/ch at 10.0% THD; three-position adjustable shafts; also available with 8-track player..... $400

LED-503 AM-Stereo FM/Cassette Player
In-dash/underdash AM-stereo FM radio/stereo cassette player with LED digital clock (adjustable in hr and min)/radio frequency display. Cassette features auto stop, locking fast forward, manual tape eject, and LED tape indicator. Radio features three AM and three FM preset pushbuttons; stereo balance, tone, and fader controls; clock/radio selector switch; LED FM stereo indicator; mute on/off; local/distant switch; elapsed timer control..... $300

LED-501 AM-Stereo FM/Cassette Player
In-dash/underdash AM-stereo FM radio/stereo cassette player with LED digital clock/radio frequency display with selector switch and clock hr/min adjustment. Cassette features fast forward/eject and LED tape play indicator. Radio features variable fader and tone controls; sliding stereo balance control; weather band, bass boost, and mute on/off; stereo/mono switch; LED AM, FM, and stereo FM indicators; manual tuning $250

KID-589 AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio/automatic reverse cassette player. Cassette features locking fast forward and rewind, manual tape eject, tape program selector switch, LED tape play and tape direction indicators. Radio features stereo balance, tone, and fader controls, FM stereo/mono switch, mute on/off, and LED stereo FM, AM, and FM indicators..... $208

5 CAR STEREO EQUIPMENT

× 6¼" D $180
JS-3500. Similar to JS-8001 except underdash with 5 W/ch output at 1.0% dist $140

JS-8250 AM-Stereo FM/8-Track
In-dash AM-stereo FM radio/8-track tape player with local/distant switch; output 8 W/ch at 1.0% dist.; FM sensitivity 4.0 μV for 30-dB quieting; 1⅞" H × 7" W × 4¾" D $110

JS-600 Cassette Player
Underdash stereo cassette player with auto reverse, fast forward, and rewind controls; output 5 W/ch at 1.0% dist.; 2" H × 7" W × 6½" D $100

CLARION

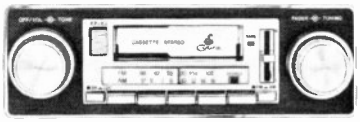
PE-751B AM-Stereo FM/Cassette Player
In-dash unit combines AM-stereo FM radio with stereo cassette player. Features five pushbutton tuning; Dolby noise-reduction on both cassette and FM; locking fast forward and rewind; separate bass and treble controls; 15 W/ch continuous; front-to-rear fader; left-to-right balance control; FET front end; cassette eject button; stereo indicator light; cassette program change button; Dolby indicator lights; Dolby switch; smaller chassis to fit over 90% of all U.S. and foreign cars $340

PE-684A Stereo FM/Cassette Player
Underdash unit combines stereo FM radio with stereo cassette player. Features power amplifier with 12 W/ch continuous; 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 to PE-684A without FM tuner $220

PE-453A 8-Track Player
Underdash stereo 8-track player features power amplifier with 12 W/ch continuous; separate bass and treble controls; left-to-right balance control; program change switch; program repeat switch; punch sound; muting; loudness button $150

COBRA

99GTL AM-FM/Cassette Player
In-dash AM-stereo FM radio and stereo cassette player. Cassette features fast forward/eject button



and LED tape running indicator; wow and flutter 0.2% rms; frequency response 60-10,000 Hz ±3 dB. Radio features five preset AM/FM pushbutton tuning; manual tuning; FM local/distant control; LED FM stereo indicator; front-to-rear fader control; slide balance control with center detent; power antenna lead; FM usable sensitivity 1.8 μV; FM stereo separation 30 dB; FM S/N 56 dB; max. output 12 W/ch continuous into 4 ohms; adjustable shafts; 2³⁵/₆₄" H × 7³/₆₄" W × 6¹⁹/₆₄" D $200
97GTL. Similar to 99GTL without five memory AM/FM pushbutton tuning; 2³/₆₄" H × 7³/₆₄" W × 6¹⁹/₆₄" D $150

98GTL AM-Stereo FM/8-Track Player
In-dash AM-stereo FM radio and stereo 8-track player. 8-track player features LED program indicators and tape repeat control; wow and flutter 0.2% rms; frequency response 60-10,000 Hz ±3 dB. Radio features five preset AM/FM pushbutton tuning; manual tuning; FM local/distant; LED FM stereo indicator; front-to-rear fader control; slide balance control with center detent; power antenna lead; FM usable sensitivity 1.8 μV; FM stereo separation 30 dB; FM S/N 56 dB; max. output 12 W/ch continuous into 4 ohms; adjustable shafts; 2³⁵/₆₄" H × 7³/₆₄" W × 6¹⁹/₆₄" D $190
95GTL. Similar to 98GTL without pushbutton memory tuning; 2³/₆₄" H × 7³/₆₄" W × 6¹⁹/₆₄" D $140

CRAIG

T686 AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio, stereo cassette player, and digital radio frequency/clock display. Cassette features Dolby noise-reduction system; automatic end-of-tape and power-off eject; locking fast forward and rewind; equalization for normal or CrO_2 tapes. Radio features five-station pushbutton preset; automatic select signal stabilizer; separate boost/cut bass and treble controls; balance and fader controls; pushbutton loudness contour control; local/distant pushbutton; preamp output jacks; 12 W/ch; 2¾" H × 7⅛" W × 5¼" D $420
T684. Similar to T686 without digital clock/radio frequency display, end-of-tape eject, and signal stabilizer; cassette has auto-reverse with equalization selector for 120- or 70-μsec tape; power antenna; 2" H × 7⅛" W × 6" D $337
T688. Similar to T684 without five-station pushbutton preset, power antenna, and preamp jack; has end-of-tape and power-off eject $280
T681. Similar to T688 without Dolby noise-reduction, tape equalization, separate bass and treble controls, loudness control, and tape auto reverse function; 2" H × 7⅛" W × 5¼" D $220

T636 AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio/stereo cassette player with digital clock/radio frequency display with hr/min time adjust. Cassette features auto end-of-tape and power-off eject; locking fast-forward and rewind. Radio features five-station pushbutton preset; signal stabilizer; separate boost/cut bass and treble controls; separate balance and fader controls; loudness contour pushbutton; local/distant button; preamp output jacks; 2¾" H × 7⅛" W × 5¼" D $360
T634. Similar to T636 without digital clock/radio frequency display, signal stabilizer, and end-of-tape eject; cassette has auto reverse function; 2" H × 7⅛" W × 6" D $280
T638. Similar to T634 without separate bass and treble controls and tape auto reverse; has end-of-tape and power-off auto eject; 2" H × 7⅛" W × 5¼" D $220

T635 AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio/stereo cassette player with LED digital clock/radio frequency display. Cassette features power-off and end-of-tape auto eject; locking fast forward and rewind slide bar. Radio features ten-station pushbutton preset with auto scan; PLL circuitry; separate balance and fader controls; power antenna; local/distant and muting controls; 2½" H × 7⅛" W × 4¼" D $360
T639. Similar to T635 without digital clock/radio frequency display, fader control, power-off and end-of-tape auto eject, and locking rewind; designed for foreign cars; 2" H × 6⅜" W × 5½" D $190
T608. Similar to T639 without pushbutton station preset; 1¾" H × 6¼" W × 4½" D $133
T610. Similar to T608 except has auto return to play at end-of-tape and end-of-tape eject; 2" H × 7⅛" W × 5¼" D $120

T615 AM-Stereo FM/Cassette Player
In-dash AM-stereo FM radio/stereo cassette player with digital clock/radio frequency readout display with hr/min adjust. Cassette features auto reverse, locking fast forward and rewind, and pushbutton eject; LED tape direction indicator. Radio features pushbutton stereo/mono, local/distant, AM/FM controls; bass/treble control with push program/frequency and pull balance knob; tuning control; fader control; 2" H × 7⅛" W × 6" D $290
T606. Similar to T615 without tape auto reverse; has power-off and end-of-tape auto eject; 2¾" H × 7⅛" W × 5¼" D $240
T607. Similar to T606 without LED digital radio frequency/clock display and power-off and end-of-tape eject; auto reverse cassette; 2" H × 7⅛" W × 5¼" D $200
T614. Similar to T607 without auto reverse; has power-off and end-of-tape auto eject; 2" H × 7⅛" W × 6" D $170

Underdash Cassette Players
T180. Auto reverse cassette player with separate boost/cut bass and treble controls, locking fast forward/rewind, loudness pushbutton, and tape eject; output 12 W/ch; includes reversible quick-release slide-out bracket; 2⅜" H × 6½" W × 6⅛" D .. $190
T200. Same as T180 except radio has auto frequency control, local/distant, and stereo-matrix circuitry $155
T100. Stereo cassette player with matrix circuitry, locking fast forward and rewind, and end-of-tape indicator; includes quick-release bracket $110

S686 AM-Stereo FM/8-Track Player
In-dash AM-stereo FM radio/8-track player with digital clock/frequency display. 8-track features LED program indicators. Radio features five-station pushbutton preset; signal stabilizer pushbutton with LED indicator; separate boost/cut bass and treble controls; loudness contour and local/distant pushbuttons; separate balance and fader controls; preamp jacks; power antenna; 2¾" H × 7¼" W × 5¼" D $360
S683. Similar to S686 without digital clock/radio frequency display, preamp jacks, power-off eject, power antenna, five-station pushbutton preset, and signal stabilizer; has fast forward and auto repeat $290
S682. Similar to S683 but 2" H × 7¼" W × 5½" D $240

S636 AM-Stereo FM/8-Track Player
In-dash AM-stereo FM radio/8-track tape player with digital clock/radio frequency display. 8-track has LED program indicators. Radio features signal stabilizer with indicator; five station pushbutton preset; local/distant and loudness contour pushbuttons; separate boost/cut bass and treble and balance and fader controls; 2¾" H × 7¼" W × 5¼" D. $325
S606. Similar to S636 without separate bass and treble controls, loudness, five-station preset, and signal stabilizer; has power-off eject $240
S608. Similar to S606 without digital clock/radio frequency display and power antenna; has separate bass and treble controls, fast forward, and muting; 2" H × 7¼" W × 5¼" D $180

S632 AM-Stereo FM/8-Track Player
In-dash AM-stereo FM radio/8-track player with five station pushbutton preset, separate boost/cut bass and treble controls, local/distant pushbutton, separate balance and fader controls, illuminated program indicators, and tape auto or manual program change; 2½" H × 7¼" W × 5½" D $180
S609. Similar to S632 without fader and five station pushbutton preset; 2" H × 7⅛" W × 4¾" D $120

8-Track Underdash Players
S200. 8-track player with stereo FM radio; has repeat/fast forward; stereo matrix; afc; local/distant pushbutton; includes quick-release slide-out bracket $120
S281. Same as S200 except with Powerplay Amplifier $170
S180. 8-track player with loudness, fast forward with low-level sound, repeat, and reversible quick-release bracket; 12 W/ch $145
S280. Same as S180 except with FM stereo radio $180
S101. 8-track player with stereo-matrix, locking fast forward, power-off eject, repeat, and automatic and manual program change; 2⅜" H × 6½" W × 6⅛" D $100

FUJITSU TEN

EP 750-S1 AM-FM/Cassette Player
In-dash AM-stereo FM radio with electronic digital

tures auto reverse, loudness contour, tape switch for CrO_2, locking fast-forward and rewind, tape eject, and LED tape direction indicator. Radio features LED AM/FM stereo indicators, local/distant switch, FM muting, and AM/FM stereo band selector. Wow and flutter 0.15% wrms; S/N 60 dB with Dolby; FM sensitivity 2 μV for 30-dB quieting; stereo separation 30 dB at 1000 Hz; 1.74" H × 7.10" W × 5.87" D..... $332

CS-101. Preamp/40-W amplifier and five-band graphic equalizer for CS-052 ..... $135

CS-032 AM-Stereo FM/8-Track Player

In-dash AM-stereo FM tuner and stereo 8-track player features loudness contour, channel selector, LED program indicators, and program repeat switch. Radio features FM muting, LED stereo indicator, local/distant switch and AM/FM mode selector. Wow and flutter ("A" weighted) 1.5%; S/N 50 dB; FM sensitivity 2 μV for 30 dB S/N; stereo separation 30 dB at 1000 Hz; 1.74" H × 7.10" W × 5.31" D $265

CS-101. Preamp/40-W amplifier and five-band graphic equalizer for CS-032 ..... $135

CS-152 Cassette Deck

Underdash cassette deck with Dolby noise-reduction system. Features auto reverse, locking fast forward and rewind, loudness contour, tape eject, tape switch for CrO_2, and separate bass, treble and balance controls. Wow and flutter 0.15% wrms; S/N 60 dB with Dolby $212

CS-112. Underdash AM-stereo FM tuner for CS-152; features LED stereo indicator, and FM muting, AM/FM, stereo/mono, and local/distant switches; FM sensitivity 4 μV at 1 W; stereo separation 30 dB at 1000 Hz..... $153

CS-101. Pre-amp/40-W amplifier and five-band graphic equalizer for CS-152 ..... $135

AUDIOVOX

DGC-20 AM-Stereo FM/Cassette Player

In-dash digitally-synthesized AM-stereo FM pushbutton radio with memory, stereo cassette player, and built-in quartz clock. Features include electronically-controlled tuning with green LED digital display; as many as six AM and six FM stations can be preset; auto scan searches and stops at next available station; "display priority" switch for constant frequency or time readout; pushbutton stereo/mono and local/distant switches. Wow and flutter 0.35% wrms; frequency response 50-10,000 Hz; max. output 6.5 W/ch with 10% THD; FM stereo separation 25 dB; 2" H × 7⅛" W × 6" D..... $480

CAS-600A AM-Stereo FM/Cassette

In-dash unit combines AM-stereo FM 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 $350

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 $340

DGT-500 AM-Stereo FM/8-Track Player

In-dash digital readout AM-stereo FM radio/8-track player/quartz clock features LED program indicators, manually tuned AM-stereo FM with green LED digital readout of station frequency and time, and pushbutton FM local/distant and stereo/mono switches. Wow and flutter 0.25% wrms; frequency response 50-10,000 Hz; max. output 6 W/ch with 10% THD; FM stereo separation 25 dB; 2" H × 7⅛" W × 5½" D..... $300

CAS-450 AM-Stereo FM/Cassette

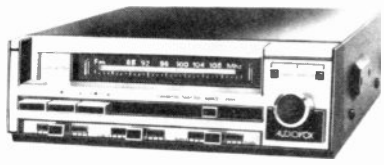
In-dash unit combines AM-stereo FM radio and auto reverse stereo cassette player; four-way stereo balance; power output 4 W continuous; mono/stereo, program select, local/distant, eject, and locking fast-forward controls $212

CAS-310 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; 2⁹/₁₆" H × 7" W × 5½" D..... $200

UC-20 FM Stereo/Cassette Player

Underdash FM stereo radio and cassette player features LED stereo and tape indicators, dial-in-door,



pushbutton local/distant and stereo/mono switches, slide control for fast forward, rewind, and automatic eject; other slide controls include volume, balance and tone. Wow and flutter 0.25% wrms; S/N 45 dB (tape), 55 dB (radio); frequency response 50-10,000 Hz; max. output 6 W/ch with 10% THD; 2⅛" H × 6¾" W × 6½" D $150

UT-30. Similar to UC-20 except 8-track player with LED program indicators $136

C-981A 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; 1¾" H × 5½" W × 6¾" D..... $136

HI-COMP Line

HCM-0010 AM-FM/Cassette Deck

In-dash AM-stereo FM radio and stereo cassette deck. Deck features auto reverse, Dolby FM circuitry, and preamp and RCA output jacks. Radio features 12-station memory preset pushbutton tuning, separate bass and treble controls, four-way balance, and muting..... $595

HCM-005 AM-Stereo FM/Cassette Deck

In-dash AM-stereo FM radio/stereo cassette deck. Cassette deck features Dolby noise-reduction system, CrO_2 and FeO_2 tape selector, and auto reverse. Radio features electronic tuning, regular/biamp capability, separate bass and treble controls, and loudness control $495

HCC-1030 AM-Stereo FM/Cassette Deck

In-dash AM-stereo FM radio/stereo cassette deck. Deck features Dolby noise-reduction system, auto reverse, tape selector for FeO_2 and CrO_2 tapes, and locking fast forward and rewind. Radio features pushbutton tuning, FM Dolby, separate bass and treble controls, four-way balance; local/distant, and mono-stereo switches; output 13 W/ch continuous with 1.0% THD..... $330

HCC-1025. Similar to HCC-1030 without muting... ..... $300

HCC-550 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player; designed for imported cars with 105-mm-wide nosepiece; has locking fast forward and rewind and stereo/mono switch; output 3 W/ch continuous with 1.0% THD..... $175

HCC-500 AM-Stereo FM/Cassette Player

AM-stereo FM radio/stereo cassette player; designed for imported cars with "500" nosepiece; short 4½-in chassis depth; has locking fast forward and local/distant switch; output 3 W/ch continuous with 1.0% THD..... $150

BLAUPUNKT

CR-2000D AM-FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player. Cassette: features Dolby noise-reduction system with Dolby FM circuitry, auto reverse, power eject, locking fast forward and rewind, and program select switch; fast forward/rewind time 65 sec (C-60); wow and flutter 0.15% wrms (JIS); frequency response 35-14,000 Hz −10 dB; THD 1.0% at 1000 Hz, 10 dB; S/N 53 dB at 1000 Hz, 0 dB; crosstalk −53 dB at 1000 Hz, 0 dB; channel separation 38 dB at 1000 Hz, 10 dB. Radio features variable tone control, stereo balance control, FM muting, mono/stereo switch, manual tuning control, waveband select and local/distant switch; max. sensitivity 0.8 μV; S/N 68 dB at 1 mV in; i-f rejection 80 dB; image rejection 46 dB; THD 1.5%; frequency response 40-15,000 Hz ±6 dB. Designed to fit most imported cars and has adjustable shafts for domestic cars; 1¾" H × 7¹/₁₆" W × 5⅛" D $303

CR-2000. Same as CR-2000D without Dolby noise reduction circuitry; has company's ASU noise suppression circuitry for FM broadcast reception . $275

Essen AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player. Cassette features power eject, locking fast forward and rewind, and cassette eject; fast forward/rewind time 90 sec (C-60); wow and flutter 0.25%; THD 2.0% at 1 W; crosstalk −33 dB. Radio features variable tone control, balance control, stereo/mono switch, manual tuning controls, station frequency indicators, and ASU noise suppression circuit for FM reception; sensitivity 1 μV for 1 W out; image ratio 50 dB; stereo separation 32 dB; 1¾" H × 7" W × 5¼" D $277

CR-8000 AM-Stereo FM/8-Track

In-dash AM-stereo FM radio/8-track tape player. 8-track features tape program selector and tape eject; wow and flutter 0.25% wrms (JIS); frequency response 35-14,000 Hz −10 dB; THD 1.0% at 1000 Hz, 10 dB; S/N 50 dB at 1000 Hz, 0 dB; crosstalk −55 dB at 1000 Hz, 0 dB; channel separation 40 dB. Radio features variable tone control, balance control, waveband select and local/distant switch, and ASU noise suppression circuitry. Unit designed for imported cars and has adjustable shafts for domestic car installation; 1¾" H × 7" W × 5⁹/₁₆" D $192

CAR TAPES

JS-6200 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player features preset pushbutton tuning for up to five FM and five AM stations; LED station frequency/clock readout; local/distant switch; separate bass and treble controls; auto reverse, fast forward, and rewind; output 15 W/ch at 1.0% dist.; FM sensitivity 1.5 μV for 30-dB quieting; 2¼" H × 7" W × 4⅞" D..... ..... $500

JS-6100. Similar to JS-6200 without preset pushbutton tuning; output 8 W/ch at 1.0% dist.; com-

bined bass/treble control; 1¾" H × 7" W × 5" D.... ..... $400

JS-9600 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player features preset pushbutton tuning for up to five FM and five AM stations; auto reverse, fast forward and rewind; local/distant switch; output 8 W/ch at 1.0% dist.; FM sensitivity 3.0 μV for 30-dB quieting; 2½" H × 6¾" W × 6¼" D..... $220

JS-9200. Similar to JS-9600 without preset pushbutton tuning; FM sensitivity 4.5 μV for 30-dB quieting; 2" H × 7" W × 6" D $190

JS-9350. Similar to JS-9200 without auto reverse and tape rewind; FM sensitivity 4.0 μV for 30-dB quieting; 1¾" H × 6¾" W × 4¾" D..... $110

JS-9380 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player with preset pushbutton tuning for up to five AM and five FM stations; fast forward control; local/distant; output 5 W/ch at 1.0% dist.; FM sensitivity 4.0 μV for 30-dB quieting; 2" H × 5⅜" W × 4⅞" D... $200

JS-8580. Same as JS-9380 except has 8-track instead of cassette player..... $200

JS-8001 AM-Stereo FM/Cassette Player

In-dash AM-stereo FM radio/stereo cassette player with local/distant, auto reverse, fast forward, and rewind controls; output 8 W/ch at 1.0% dist.; FM sensitivity 2.5 μV for 30-dB quieting; 2" H × 7" W

5 CAR STEREO EQUIPMENT

AFCO

IDC-750A AM-FM/Cassette Player
In-dash AM-stereo FM radio and cassette player with auto reverse. Features locking fast forward/rewind; eject; local/distant and AM/FM switches; dial light dimmer and antenna switch; fader/balance control. Wow and flutter 0.35% wrms; frequency response range 100 Hz (tone) −1±3 dB to 4000 Hz (high) −1±5 dB, 100 Hz (tone) +9±3 dB to 2000 Hz (low) −16±5 dB; output 6 W; FM separation 35 dB; 1 13/16" H × 7" W × 5 1/8" D..... $169

ALPINE

7307 Preamp/Tuner/Cassette Deck
In-dash AM-stereo FM tuner/preamplifier/stereo cassette deck. Cassette deck features Dolby noise-reduction system, CrO_2/FeCr selector button, ignition-key off and cassette glide eject, auto replay at end of rewind, auto eject at end of play/fast forward, and music sensor in fast forward and rewind; wow and flutter 0.09%; frequency response 40-16,000 Hz; S/N 65 dB. Radio features five-station pushbutton preset, noise eliminator switch, separate bass and treble controls, mute switch, DIN connector, and tone-by-pass switch; FM usable sensitivity 1.4 μV; FM S/N 72 dB; FM capture ratio 1.5 dB .. $380

7203 AM-Stereo FM/Cassette Deck
In-dash AM-stereo FM radio/stereo cassette deck. Cassette features Dolby noise-reduction system; hard permalloy tape head; cassette and electronic glide eject; CrO_2/FeCr tape selector; auto replay at end of rewind; auto eject at end of play/fast forward; wow and flutter 0.13%; frequency response 40-12,000 Hz; S/N 65 dB. Radio features four-way fader/balance control; noise eliminator switch; separate bass and treble controls; mute switch; loudness contour; output 20 W/ch continuous; FM usable sensitivity 1.4 μV; FM S/N 72 dB; FM capture ratio 1.5 dB; dist. 0.8% at 8 W continuous.... $380
7212. Similar to 7203 without hard permalloy tape head; CrO_2/FeCr tape selector, and noise eliminator switch; cassette has auto reverse; wow and flutter 0.14%; tape frequency response 40-11,000 Hz.... ..... $360

ALTUS

CLA-3740 AM-FM/Cassette Player
In-dash AM-stereo FM pushbutton radio with digital readout and clock and stereo cassette player with auto reverse. Features tape eject, locking fast-forward and rewind, and tape direction indicator. Radio features five pre-set pushbutton tuning, auto FM muting, hr/min adjustment, local/distant switch, stereo indicator light, and front/rear fader and left/right balance controls. Wow and flutter 0.2%; frequency response 30-12,000 Hz; S/N 45 dB; amp output 15 W/ch continuous; FM THD 1.0% at 1 W; FM sensitivity 4.8 μV −3 dB; FM S/N 60 dB; FM stereo separation 35 dB at 1000 Hz; 12 V negative ground; 2.77" H × 7.1" W × 6" D..... $411

CTH-2392 AM-FM/Cassette Player
Combines stereo cassette player with AM-stereo FM radio; locking fast forward and rewind; fader control; treble control; bass control; tape indicator light; quick-set pushbutton 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 continuous; 14.4 V dc; 2 3/4" H × 7" W × 5" D..... $313

RCD-3349 AM-FM/Cassette Player
Combines stereo cassette player with AM-stereo FM radio and LED digital clock; locking fast forward and rewind; automatic tape eject; fader control; balance control; AM/FM mode selector; stereo FM indicator; FM local/distant 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 by car instrument panel dimmer; 4-8 ohm impedance; audio output 10 W continuous; 14.4 V dc; 2 3/4" H × 7" W × 5" D..... $298

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/distant switch; adjustable shafts; 4-8 ohm impedance; output power 8 W continuous; 12 V dc negative ground; 2 3/4" H × 7" W × 5" D..... $253

CXR-2376 AM-FM/Cassette Player
In-dash AM-stereo FM radio and side-loading stereo cassette player with auto reverse and electronic motor speed control; adjustable shafts and trimplates and DIN standard nosepiece to fit foreign cars. Features locking fast-forward and rewind, LED tape, stereo and AM/FM indicators, and local/distant, eject and AM/FM band selector switches. Wow and flutter 0.25%; frequency response 30-10,000 Hz; S/N 55 dB; amp output 5 W/ch continuous; FM THD 1.5% at 1 W; FM sensitivity 1.5 μV at −3 dB; FM S/N 60 dB; FM stereo separation 30 dB at 1000 Hz; 12 V negative ground; 1.75" H × 7.01" W × 5.15" D $250

CXT-9520 AM-FM/Cassette Player
In-dash AM-stereo FM radio and stereo cassette player. Features locking fast forward and rewind, power-off tape eject, four-way balance control, dial-in-door, muting, stereo indicator light, five-push-button tuning, mono/stereo switch, and power antenna lead; output 5 W/ch; 2.62" H × 7.13" W × 5.45" D $220

CXA-2374 AM-FM/Cassette Player
In-dash AM-stereo FM radio and side-loading stereo cassette player with electronic motor speed control and adjustable shafts and trimplates. Cassette features locking fast-forward and rewind, tape eject, and tape indicator light. Radio features stereo and AM/FM indicator lights, AM/FM band selector, and volume, tone and tuning controls. Wow and flutter 0.25%; frequency response 30-10,000 Hz; S/N 55 dB; amp output 5 W/ch continuous; FM THD 0.9% at 1 W; FM sensitivity 2.4 μV −3 dB; FM S/N 60 dB; FM stereo separation 35 dB at 1000 Hz; 1.75" H × 7.01" W × 5.15" D..... $170

IDC-3226 AM-FM/Cassette Player
In-dash AM-stereo FM radio and stereo cassette player; adjustable shafts. Features fast-forward control; pushbutton eject; tape and stereo indicator lights; local/distant, AM/FM, radio/tape selector switches; muting, and variable tone, volume, and balance control. Wow and flutter 0.2%; frequency response 30-10,000 Hz; S/N 55 dB; amp output 5 W/ch continuous; FM THD 0.7% at 1 W; FM sensitivity 1.3 μV −3 dB; FM S/N 60 dB; FM stereo separation 32 dB at 1000 Hz; 12 V negative ground; 1.72" H × 7.07" W × 4.41" D..... $105

ELR-3742 AM-Stereo FM/8-Track Player
In-dash AM-stereo FM pushbutton radio with digital readout/clock display and stereo 8-track player with LED program indicators. Features five preset pushbutton tuning, auto FM muting, hr/min adjustment, local/distant switch, AM/FM mode control, stereo indicator light, fader and bass/treble balance controls. Wow and flutter 0.25%; frequency response 30-18,000 Hz; S/N 50 dB; amp output 15 W/ch continuous; FM THD 2.0% at 1 W; FM sensitivity 1.9 μV −3 dB; FM S/N 60 dB; FM stereo separation 35 dB at 1000 Hz; 12 V negative ground; 2.88" H × 7.11" W × 7.91" D..... .. $384

RED-3335 AM-FM/8-Track Player
In-dash stereo 8-track player with AM-stereo FM radio and LED digital clock. Features fader control; balance control; volume, tone and tuning control; AM/FM mode control; stereo FM indicator light; FM local/distant 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 continuous; 14.4 V dc..... $274

PBH-2385 AM-FM/8-Track Player
Combines stereo 8-track player with AM-stereo FM radio. Features 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 pushbutton tuning; local/distant switch; adjustable shafts; 4-8 ohm impedance; audio output 25 W continuous; 14.4 V dc $259

NPB-2408 AM-FM/8-Track Player
In-dash unit combines stereo 8-track player with AM-stereo FM radio. Features five quick-set pushbutton tuning; four-way balance control; AM/stereo FM indicator lights; stereo channel indicator lights; FM local/distant switch; automatic tape switching; adjustable shafts; 4-8 ohm impedance; audio output 10 W continuous; 12 V dc negative ground; 2 3/4" H × 7 1/16" W × 6 1/4" D..... $188

Super Separates Line

CS-052 AM-Stereo FM/Cassette Player
In-dash AM-stereo FM tuner and cassette player

with Dolby noise-reduction system. Cassette fea-

ble recording capability with access to 14 VHF/UHF

channels, three-hr recording capacity, express tuning, and auto shut-off and fine tuning; 16 lbs, 9 oz. $500

SL-5400 Video Cassette Recorder

Betamax 4½-hr color video cassette recorder with direct-drive dc head and servo capstan motors in rotary two-head helical scan system and NTSC-color video signal. Features BetaScan system for instant forward/reverse search and scan; built-in three-day timer/one-event programmer; fourteen-position pushbutton tuning; auto program selector; still-frame capability; BetaScan Commander remote control with freeze-frame capability up to 15 ft away; audio dubbing; five recording length settings; air-damped cassette lid; remote camera connector; four-digit tape counter. Video: horizontal resolution 280 lines (monochrome), 240 lines (color); S/N 45 dB (monochrome). Audio: S/N 40 dB; frequency response 50-8000 Hz (Beta II), 100-7000 Hz (Beta III). Includes cassette tape, channel indicators, antenna connectors, 75-ohm coaxial cable, and 300-ohm twin-lead cable; 33 lbs; 6½" H × 19¾" W × 15" D..... $1250

Betamax SL-8600 VCR

Color video cassette recorder with Beta cassette format for three-hour recording. Features 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; 7¹¹/₁₆" H × 18⅜" W × 16⅛" D..... $1150

VP-2011 Video Cassette Player

U-Matic ¾-in one-hour video cassette player with microprocessor-controlled Auto Search Control random access unit with automatic program/segment locate and play function, pause control, and LED digital position/selected position readout display. Features auto stop, rewind, and restart; still adjust control; 8-pin VTR connector; BNC video out and playback on conventional TV receiver with optional r-f adaptor $2000

V0-2610. U-Matic video cassette player/recorder with input review, skew control, and still adjust $2150

VP-2010. U-Matic player with still control... $1775

Trident VP-2030. U-Matic player/recorder can record on three major world TV systems, NTSC, PAL, and SECAM, when used with PVM-1850PS Trinitron monitors $2350

PVM-1850PS. Trinitron monitor..... $1430

TOSHIBA

V-5425 Portable VCR

Betamax two-speed five-hour programmable portable video cassette recorder. Features comput-r-tune micro-computer 12-station programmable electronic tuning system that presets up to three programs per week; freeze frame, fast forward, and reverse with scanning and monitoring facilities; four-digit tape counter with fast forward/rewind auto find and counter memory rewind; LED digital clock/program frequency display with adjust switch; audio dubbing; remote pause; LED power, record, long play, pause/still, and tape function indicators $1400

V-5420 Video Cassette Recorder

Programmable three-hour Beta-format video cassette recorder records up to three different programs within seven-day period. Features built-in electronic digital clock/timer; memory circuits fed with day of program, program channel, program time, and program length; programmable electronic forward/reverse channel selectors (2-13) with LED channel indicators; tape sentinel; piano-key tape function controls with LED indicators; search tape counter with memory reset; LED power, record, standby, and pause indicators; audio dubbing; remote pause control..... $1295

IK-1610. Portable color video camera with 25-mm F/1.8 lens, built-in condenser mike, hand grip and shoulder rest, univicon sensitivity, remote trigger pause, and ac/dc operation..... $895

IK-1650. Same as IK-1610 but also has 18-105 mm F/1.8 zoom lens and electronic viewfinder with built-in record/playback monitor and sound . $1345

V-5530 Video Cassette Recorder

Portable three-hour Beta-format video cassette recorder. Features audio dubbing; remote pause; cue and review; touch reference controls; optional built-in battery supply; allows one hour fully remote recording..... $1245

TU-530. Timer/tuner for V-5530; LED timer for hands-off recording; includes battery charging function..... $245

V-5310 Video Cassette Recorder

Color video cassette 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 $1095

LVR Video Tape Recorder

Endless-loop-tape fixed-head fixed-reel one-hour color video tape recorder. System features simpli-

fied internal mechanics, 17-sec fast-access time to any track for visual review/preview, 220-track digital tape indexing, distortion- and vibration-free tape handling, smaller size and weight, and high-speed tape duplication; uses ½-in 100-m-long graphic-lubricated tape. Additional features include random access and function flexibility; red LED track counter display; enter three-digit track number selector; play and record buttons with LED; up/down for preview, scan, or rewind; repeat with LED indicator (repeats selected 17-sec track, locks, cancelled by play or stop); stop; and eject. Video: EIA NTSC-compatible color in and out signals; S/N 42 dB min.; resolution 240 lines (color); track access time 20 msec/track; single track loop time 16.7 sec; audio S/N 40 dB; 5⅜" H × 12⅜" W × 13½" D ..... approx. $600

ZENITH

VR9000W Video Director VCR

Betamax-format five-hour color video cassette recorder. Features Video Action remote control with

speed search and stop; automatic digital timer display with auto shut-off permits user to program over three-day period; electronic 14-pushbutton tuning; audio dubbing; tape counter with reset button; camera jack for use with any Zenith black-and-white or color TV camera $1195

4 VIDEO CASSETTE RECORDERS

heads, one stationary audio control head, and full track and audio dubbing erase heads, azimuth helical scan system, and EIA-standard NTSC color signal. Features three-way power supply (built-in

sealed rechargeable battery, 12 V dc, or ac home current); audio dub; pause; logic-controlled tape function controls; three-digit tape counter with memory; standard/long play speed switch; battery check meter. Video: horizontal resolution 280 lines (b&w), 240 lines (color); input 1.0 V p-p, 75 ohms unbalanced; S/N 42 dB (b&w). Audio: input −20 dB, 100k ohms unbalanced (line), −70 dB, 600 ohms unbalanced (mic); frequency response 100-8000 Hz −10 dB (standard play), 100-6000 Hz −10 dB (long play); S/N 40 dB. Includes 1-2 hr video cassette, battery pack, car battery cord, shoulder strap, earphone, 5-ft 75-ohm VHF output cable, and 300/75 ohms VHF antenna adaptor; 19 lbs with battery; 5½" H × 12½" W × 12½" D $1150

515. Electronic varactor tuner for VH5200; 14-position electronic tuning system for 14 UHF/VHF channels; remote TV channel changing; permits ac home operation and off-the-air recording; also recharges built-in battery on ac power..... $425

VA505. Power supply for VH5200; recharges batteries and enables standard ac house current operation..... $130

VK705 Color Camera. Has built-in white balance filter system $660

VK715. Color video camera with 6:1 zoom lens and thru-the-lens optical viewfinder $850

VK720. Color video camera with electronic viewfinder; 6:1 zoom lens, and boom electret microphone..... $960

VH5020 Video Cassette Recorder

VHS ½-in six-hour color video cassette recorder with two rotary hot press ferrite video heads, one audio control stationary head, and full-track and audio dubbing erase heads and EIA NTSC color signal system. Features built-in electronic digital clock/timer; 14 UHF/VHF station selection buttons; audio dub; pause control; three-digit tape counter with memory; cue/review; tuner/camera input select switch. Video: horizontal resolution 270 lines (b&w), 230 lines (color); input 1.0 V p-p, 75 ohms unbalanced; S/N 42 dB (b&w, Rhode & Schwarz); output 1.0 V p-p 75 ohms unbalanced. Audio: input −20 dB, 100k ohms unbalanced (line), −70 dB, 600 ohms unbalanced (mic); output −6 dB, 600 ohms unbalanced (line); frequency response 100-8000 Hz (standard play), 100-6000 Hz (long play), 100-5000 Hz (SLP), all −10 dB; S/N 40 dB. Includes 1-2-3 hr video cassette, remote pause control with 20-ft cable, 5-ft 75-ohm VHF output cable, 5-ft 300-ohm UHF connector cable, 75/300 ohms VHF matching transformer, and 300/75 ohms VHF antenna adaptor; 6⅞" H × 19⅛" W × 15½" D $1100

VH5150. Same as VH5020 except has built-in electronic digital clock/timer display that can program up to six hours of recording over seven-day period; 7" H × 19" W × 14¾" D $1325

RCA

VCT400 SelectaVision VCR

VHS programmable two-speed direct-drive video cassette recorder with standard play (two hours) or long play (four hours) recording option; rotary two-head helical scan system; NTSC color video signal (EIA). Features built-in electronic seven-day programmer with microprocessor and timer display; user feeds memory circuits day of program, program time, program length, and program channel, and up to four programs on different channels can be preset; 14 programmable electronic touch-button selectors receive 82 VHF/UHF channels with LED channel indicators; electronic program indexing searches beginning of particular program and automatically stops at that point. Additional features include three-digit tape counter with memory; remote pause control with 20-ft cord; tracking control; automatic dew moisture control with LEDs; audio dub; fast forward/rewind time 4 min (VK250 cassette). Input levels 1.0 V p-p, 75 ohms unbalanced (video), −20 dB, 50k ohms unbalanced (audio, line), −70 dB, 600 ohms unbalanced (audio, mic); output levels 1.0 V p-p, 75 ohms unbalanced (video), −6 dB, 600 ohms unbalanced (audio); VHF output signal Ch 3 or 4, 75 ohms unbalanced; 75-ohm external VHF antenna terminals, 300-ohm external UHF antenna terminals; 110-130 V ac, 60 Hz; 7" H × 19" W × 14½" D $1300

CC001. Color camera with 25-mm lens, built-in microphone, detachable optical viewfinder, and recording/pause control..... $875

CC002. Color camera with Canon 6:1 zoom lens, built-in microphone, electronic viewfinder, and recording/pause control..... $1300

BW003. Black-and-white camera with 16-mm lens, built-in microphone, flip-up viewfinder, and trigger pause control $330

BW004. Black-and-white camera with Canon 3:1 zoom lens, built-in microphone, and trigger pause control..... $430

MC001. Microphone $13

VK250. 2-4 hour video cassette $27

VK125. 1-2 hr video cassette $19

VCT201 SelectaVision VCR

VHS two-speed direct-drive video cassette recorder

with standard (two hours) and long (four hours) play recording option; rotary two-head helical scan system; NTSC color video signal (EIA). Features built-in 24-hr digital clock/timer with auto stop (allows user to preset beginning and end of unattended recording); three-digit tape counter with memory that also serves as program indexer; remote pause control with 20-ft cord; tracking control; automatic dew moisture control with LED; audio dub; fast forward/rewind time 4 min (VK250 cassette). Input levels 1.0 V p-p, 75 ohms, unbalanced (video), −20 dB, 50k ohms, unbalanced (audio, line), −70 dB, 600 ohms, unbalanced (audio, mic); output levels 1.0 V p-p, 75 ohms, unbalanced (video), −6 dB, 600 ohms, unbalanced (audio); VHF output signal Ch 3 or 4, 75 ohms unbalanced; 75-ohm external VHF antenna terminals and 200-ohm external UHF antenna terminals; optional cameras, video cassettes, and microphone same as VCT400; 110-130 V ac, 60 Hz; 7" H × 19⅛" W × 15½" D..... $1000

SANYO

Betacord Video Cassette Recorder

Color video cassette recorder with Beta cassette format for one hour, two hour, or three hour recording/playback; one-touch pushbutton 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 × 19 5" W × 14.6" D..... $995

SONY

SL-3000 Portable VCR

Betamax 1-hr portable color video cassette recorder with rotary two-head helical scanning system and EIA-standard NTSC color video signal system. Fea-

tures one-button recording; audio dubbing; cue function; pause control; logic-controlled tape functions; dew sensor; battery indicator; three-way power supply (ac, dc, or battery operation); four-digit tape counter; tape speed control system. Video: S/N 45 dB; input 1.0 V p-p, 75 ohms unbalanced; output 1.0 V p-p, 75 ohms; resolution 240 lines. Audio: S/N 40 dB; frequency response 50-7000 Hz. Includes −26-dB earphone, antenna switch and 2-m cable, and shoulder strap; 8.5 kg with tape and battery; 127 mm H × 296 mm W × 345 mm D..... $1300

HVC-1000. MF Trinicon color video camera for SL-3000; has ⅔-in Trinicon pick-up tube; built-in F1.8 14-42 mm zoom lens, built-in microphone, single reflex optical viewfinder, remote start/stop recorder control functions, and remote control pause; 300-line resolution; S/N 45 dB; video output 1.0 V p-p; 22 kg $1400

TT-3000. Tuner-timer for SL-3000; features built-in electronic digital timer for seven-day programma-

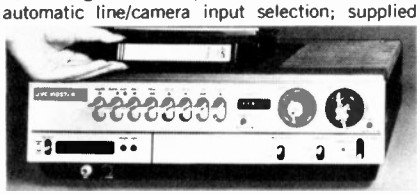
NOTICE TO READERS

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

NEED MORE INFORMATION?

Write direct to the manufacturer or distributor. A list of names and addresses starts on page 4.

4; tracking control; drop-out compensator; built-in automatic line/camera input selection; supplied



with PBP-1 battery pack, earphone, r-f converter, F connector, two antenna cables, and antenna selector. Video: input 0.5-2.0 V p-p, 75 ohms unbalanced; output 1.0 V p-p, 75 ohms unbalanced; horizontal resolution 240 lines (color); S/N 45 dB (Rhode & Schwarz noise meter). Audio: input −67 dBs, 10k ohms unbalanced (mic), −20 dBs, 50k ohms unbalanced (line); output −6 dBs, 1k ohm unbalanced (line), 0 dBs, 1k ohms unbalanced (earphone); frequency response 70-10,000 Hz; S/N 40 dB; 20.5 lbs with cassette, battery pack, and r-f converter; 5 7/16" H × 13 3/8" W × 13" D.... $1250

HP-4000AU Vidstar Portable VC Player

Portable VHS two-hour color video cassette player with rotary slant azimuth two-head helical scanning system and NTSC color signal system. Playback-only machine features lightweight construction; still playback key that freezes scene for up to four min; built-in r-f converter for channel 3 or 4; piano-key tape function controls; three-digit tape counter with search button and reset; LED power and dew indicators; tracking control; remote control jack; ac power pack compartment; includes ac power pack, earphone, r-f converter, two antenna cables, F connector, and antenna selector. Video: output 1.0 V p-p, 75 ohms unbalanced; horizontal resolution 240 lines (color); S/N 45 dB (Rhode & Schwarz). Audio: output −6 dBs, 1k ohms unbalanced (line), 0 dBs, 1k ohm unbalanced (earphone); frequency response 70-10,000 Hz; S/N 40 dB; 17.8 lbs with ac power pack; 5 7/16" H × 13 3/8" W × 14 3/16" D..... $925

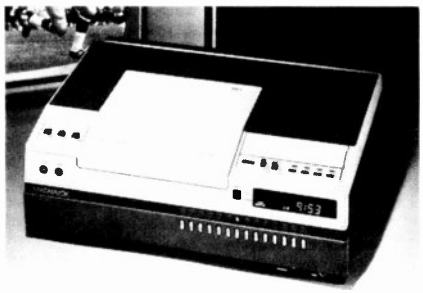
GC-3300U Color Video Camera

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 × 3 9/16" W × 10 3/4" D $1500

MAGNAVOX

8225 Video Cassette Recorder

VHS programmable 2/4-hr "Touch-Tune" video cassette recorder can be preset for up to seven days



to record four programs on different channels or same program regularly for as long as tape lasts. Features built-in electronic digital clock/timer that turns unit on and off, changes channels automatically, and displays time of day and pre-selected program schedule; timer light; 14-channel pushbutton electronic channel selection (2-83) with LED channel indicators; automatic fine tuning switch; tracking control; three-digit tape counter with memory; automatic dew moisture control; remote pause jack; remote control unit for tape start/stop at distance; audio dubbing button; microphone jack; includes dustcover $1295

8220. Similar to 8225 except non-programmable video cassette recorder with built-in 24-hr electronic digital clock/timer (allows user to preset beginning and end of unattended recording) and remote-control editing $1025

Deluxe color video camera with zoom lens and electronic viewfinder $1295
Color video camera with fixed-focus lens and electronic viewfinder $895
Black-and-white video camera with fixed-focus lens and optical viewfinder $325

MITSUBISHI

HS 200 U Video Cassette Recorder

VHS 2-4-6 hr 1/2-in three-speed color video cassette recorder with five dc servo-controlled motors in di-

rect-drive transport system and two rotary hot press ferrite helical-scan, dual-purpose audio sync-control, dual-purpose full-track audio dubbing/erase, and dual-purpose cue heads. Features seven-day programmable memory that stores up to six programs; electronic digital seven-day timer; program search; electronic 12-channel touch tuning; automatic repeat; three-digit index counter; auto TV/VCR switch; audio dubbing; mic input; video and audio in/out; switchable channel 3 or 4 r-f; microprocessor-controlled tape function controls; includes full-function remote control with provision for optional wireless full-function remote unit. S/N 42 dB; fast forward/rewind time 3 min with T-120 tape; 6.5" H × 19.5" W × 13.5" D $1400

PANASONIC

Omnivision IV Series

PV-2200 Portable VCR

Portable VHS programmable four-hour color video cassette recorder and detachable electronic pushbutton VHF and UHF tuners with automatic fine tuning; can program up to four selections on any channel over seven-day period or can program same selection for seven days a week with timer; operates 30 min outdoors with optional PK-300 color camera. Features electronic digital clock/timer with on/off for preset recording; solenoid tape function pushbutton controls; three-way power supply through house current, car/vehicle battery, or rechargeable battery; built-in r-f modulator for channels 3 or 4; includes shoulder belt and rechargeable Panalloid battery; 5 1/2" H × 12 1/8" W × 14 1/4" D (deck), 5 1/2" H × 7 1/2" W × 14" D (tuner)..... $1525

PV-2100. Similar to PV-2200 except has detachable manual VHF and UHF tuners $1450

PV-1500 Video Cassette Recorder

VHS programmable four-hour color video cassette recorder records up to four programs on any channel over seven-day period. Features digital clock/timer with on-off; built-in VHF and UHF tuners with electronic pushbutton tuning; built-in r-f modulator for channels 3 or 4; piano-key tape function controls; simulated wood-grain cabinet; includes plastic dustcover, cables, connectors, and NV-T60 VHS video cassette; 7" H × 19 1/4" W × 15 1/2" D..... $1295

PV-1100 Video Cassette Recorder

VHS four-hour color video cassette 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; 6 7/8" H × 19 1/8" W × 15 1/2" D.....
..... $1095
Optional black and white hand-held camera with built-in microphone $300

PK-300 Color Video Camera

Color video camera with 17-102 mm 12.0 C-mount 6:1 zoom lens, electronic viewfinder, and built-in omnidirectional electret condenser microphone; light intensity indicator; has pistol grip with remote trigger switch and shoulder support/tripod mounting hole; includes ac adaptor; 11 lbs $1275

PK-200. Color video camera with 25-mm f1.8 C-mount lens, optical viewfinder, and condenser microphone; 8 lbs..... $850

QUASAR

VH5100 Video Cassette Recorder

VHS four-hour programmable color video cassette recorder with remote TV channel change. Features seven-day advanced programming with automatic channel change and built-in digital clock/timer display; forward/reverse program cueing; one-button selection of 14 UHF/VHF stations; audio overdub; switchable channel 3 or 4 r-f modulator; auto switching to TV selection when VTR off. Video: horizontal resolution 270 lines (b&w), 230 lines (color); input 1.0 V p-p, 75 ohms unbalanced; output 1.0 V p-p, 75 ohms unbalanced; S/N 42 dB (b&w, Rhode & Schwarz). Audio: input −20 dB, 100k ohms unbalanced (line), −70 dB, 600 ohms unbalanced (mic); output −6 dB, 600 ohms unbalanced; frequency response 100-8000 Hz −10 dB (short play), 100-6000 Hz −10 dB (long play); S/N 40 dB. Includes 1-2 hr video cassette, remote channel/pause control with 20-ft cable, 5-ft 75-ohm VHF output cable, 5-ft 300-ohm UHF connector cable, 75/300 ohms VHF matching transformer, and 300/75 ohms VHF antenna adaptor; 7" H × 19" W × 14 3/4" D $1350

VH5010. Same as VH5100 without remote channel change and electronic program cue and review; 6 7/8" H × 19 1/8" W × 15 1/2" D..... $1150

VH5200 Portable VCR

VHS 1/2-in four-hour portable color video cassette recorder with two rotary hot press ferrite video

4 VIDEO CASSETTE RECORDERS

AKAI

VT-300N Nighthawk Portable VCR

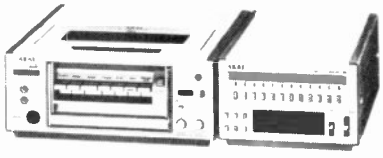
Portable ½-in, 30-min black-and-white video cassette recorder designed for low-light applications; modular design with optional detachable three-in black-and-white monitor; includes Nighthawk video camera with C-mount 8:1 zoom lens, detachable 1.5-in VF-300E electronic viewfinder, and built-in omnidirectional electret microphone. Recorder has twin rotating glass and crystal ferrite heads in frequency modulation system; uses USA Standard TV signal; features quick start, piano key function controls, battery meter, and three-digit tape counter with reset; resolution 270 lines; S/N 40 dB (video), 45 dB (audio); input 1 V p-p into 75 ohms (video), −65 dB into 600 ohms (audio); audio frequency response 80-10,000 Hz; accepts Akai VK30 cassette; ac or two 6-V battery operation; 5" H × 9.75" W × 11.5" D. Video camera features 500-line horizontal resolution at 15,750 Hz; vertical frequency 60 Hz; video output 1 V p-p composite; 8" H × 2.6" W × 6.5" D..... $2395

VT-350 Portable VCR

Portable black-and-white video cassette recorder with vertical-interval editing, variable speed frame control, and still frame; ½-in cassette format; 30-min recording time; twin rotating head, frequency modulation recording system; audio dubbing; includes black and white video camera with "C" lens mount, VF-300E electronic viewfinder, and 8:1 (11.5 to 90 mm) zoom lens; battery or ac power; recorder dimensions 5" H × 9.75" W × 11.5" D; camera dimensions 3.6" H × 4.3" W × 7.8" D..... $2195

ActiVideo VCR/Tuner-Timer

Portable VHS two-hour color video cassette recorder with detachable color TV tuner adaptor/timer. Video



recorder: has rotary slant azimuth two-head scan system and NTSC color video signal system; features double-speed playback; still and single-frame advance/variable speed playback (still through four times normal speed control); front-panel remote pause control jack; three-digit tape counter with memory; sound dubbing; LED flashing dew warning, battery warning, and tape motion indicators; video horizontal resolution 240 lines; input 0.5-2 V, 75 ohms unbalanced (video), −65 dB, 600 ohms (mic); output 1 V, 75 ohms unbalanced (video), −20 dB, 1000 ohms (audio); S/N 45 dB (video), 40 dB (audio); audio frequency response 50-10,000 Hz. Tuner/timer: features built-in programmable 24-hr LED digital clock/timer display that can be preset for up to seven days with auto on-off function; 12-channel (UHF/VHF) electronic tuning; auto battery recharging; auto shut-off; auto external/internal battery switch; three-hour battery charge time. System operates on ac house current or rechargeable nickel-cadmium batteries; includes antenna switch box, r-f convertor, earphone, wire remote pause control, T-30 video cassette, channel display card for tuner, antenna cable, UHF antenna, 75/300 ohm antenna convertors and 300/75 ohm antenna convertors; 13.3 lbs (VCR), 10.4 lbs (tuner); 4.8" H × 11.5" W × 11.9" D..... $1495

GENERAL ELECTRIC

IVCR0010W Video Cassette Recorder

VHS four-hour computer-programmable color video cassette recorder. Features electronic memory bank

with five program select buttons with LED indicators, auto start, stop, and channel change, repeat program button, and four sequence indicator lights; built-in digital clock/timer display with memory recall (displays pre-programmed schedule of shows); 12-channel pushbutton electronic tuning for any combination of VHF/UHF channels; three-digit tape counter with memory and program search; remote pause control for use within 16 ft; audio dubbing; pause control; long/standard play tape speed selector; tracking control; includes 75-ohm coaxial cable, two 300-ohm UHF twin leads, 300/75 ohm transformer, 75/300 ohm transformer, and terminal block; high impact plastic construction with woodgrain finish; 6¼" H × 18 13/16" W × 14 1/16" D. $1300

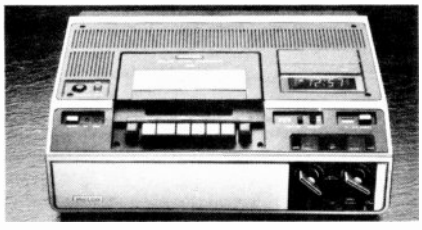
IVCR0002W Video Cassette Recorder

VHS four-hour color video cassette recorder. Features built-in 24-hr digital clock/timer display with preselected auto start/stop; long/standard play recording selector; built-in VHF/UHF tuner; tape counter with memory switch and program search; remote pause control for use within 20 ft; tracking control; audio dubbing; dew indicator lamp; 6⅞" H × 19⅛" W × 15½" D..... $995

GTE PHILCO

V1100 Video Cassette Recorder

VHS 2/4-hour color video cassette recorder with separate remote pause control unit. Features built-in 24-hr electronic digital clock/timer with auto



shut off at end of program; built-in VHF/UHF tuners and auto fine tuning (enables user to tape program when TV is off or while watching another program); audio dubbing button; LED on and dew indicators; digital tape counter with memory; mic jack; includes power cord, tape, and antenna cables. S/N 43 dB/sec (video), 40 dB/sec (audio); video horizontal resolution 240 lines; audio frequency response 50-10,000 Hz; 120 V ac, 60 Hz, 28 W; 6⅞" H × 19⅛" W × 15½" D..... $1075

SC2106. NTSC color video camera with built-in electret condenser mjcrophone; F 1.9 lens with Standard C mount; detachable optical viewfinder... ..... $850

GTE SYLVANIA

VC4000 Portable VCR

Portable VHS four-hour video cassette recorder with separate remote control unit. Features separate record and playback sections; built-in 24-hr programmable digital timer; pause button (manual or with remote control); audio dubbing button; built-in electronic VHF/UHF tuner with pushbutton channel selection; battery pack and carrying strap included in record section $1500

VC2500 VHS Video Cassette Recorder

VHS 2/4-hr color video cassette recorder with separate remote pause control unit. Features built-in 24-hr electronic digital clock/timer; built-in VHF/UHF tuners with auto fine tuning (allows user to tape program when TV is off or while watching another program); auto threading; audio dubbing button; LED on and dew indicators; digital tape counter

with memory reset; mic jack; includes power cord, tape, and antenna cables. S/N 43 dB/sec (video), 40 dB/sec (audio); video horizontal resolution 240 lines; audio frequency response 50-10,000 Hz; 120 V ac, 60 Hz, 28 W; 6⅞" H × 19¼" W × 15⅜" D..... $1075

JVC

HR-4100 Vidstar Portable VCR

Portable VHS two-hour color video cassette recorder with rotary slant azimuth two-head helical scan recording system and NTSC color signal system. Features piano-key recording/playback controls including audio dub; three-digit tape counter with search button and reset; LED battery and moisture warning indicators; three-way power supply; battery pack compartment; built-in r-f converter for channel 3 or

3 8-TRACK TAPE MACHINES

AKAI

CR-83D 8-Track Deck
Recorder/player features illuminated elapsed-time record indicator, locking pause, fast-forward, independent 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 ±3 dB (low-noise tape); dist. 2% at 3¾ ips; 4¼" H × 16½" W × 9½" D $225

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/tape counter; three-position function switch; two VU record level meters; fast-forward and pause controls; LED track and end indicators; automatic or manual track change; dual mike jacks; 4½" H × 14¾" W × 10⅞" D $290
RH-60. Similar to RH-65 except frequency response 30-12,000 Hz; no Dolby circuitry; 4½" H × 14¾" W × 10½" D $250

TH-30 8-Track Deck
Playback deck; frequency response 30-12,000 Hz; wow and flutter 0.25%; S/N 40 dB; output 240 mV; automatic/manual track change; LED track indicators; vertical headshift mechanism for positive tape/head contact; 4⅝" H × 7⅞" W × 10⅞" D $70

CHANNEL MASTER

HD-6005 8-Track Deck
Stereo 8-track record/play deck with pushbutton auto stop; pushbutton 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 × 15¼" W × 10" D... ..... $110

CHELCO

TP-520 Portable 8-Track Player
Portable 8-track player with AM-FM slide-rule radio. Features four LED channel indicators; built-in afc on FM; automatic/manual program selectors; ac line cord/battery/optional car adapter operation; earphone and car adapter jacks; automatic ac/dc switching; includes carrying strap $45

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

ER8150 8-Track/Cassette Deck
8-track and cassette deck with Dolby noise-reduction system. Wow and flutter 0.15% wrms (8-track), 0.09% wrms (cassette); frequency response 40-12,000 Hz at ±3 dB; S/N 52 dB (8-track, Dolby on), 56 dB (cassette, Dolby on) $330
ER8155. Similar to ER8150 except has cassette with wireless remote control editing $370

ER8125 8-Track Deck
8-track deck has Dolby noise-reduction system and dc servomotor. Wow and flutter 0.15% wrms; frequency response 35-12,000 Hz at ±3 dB; S/N 44 dB (Dolby off), 52 dB (Dolby on) $200

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 separation 40 dB (1 kHz); 5" H × 14⅜" W × 10" D.. $180

LAFAYETTE

RK-899 8-Track Deck
Stereo 8-track deck features selectable auto stop for play/record modes; dual record level meters; left/right mic input jacks; record level controls; pause control; walnut vinyl covered wood cabinet. Frequency response 50-10,000 Hz; wow and flutter 0.3%; 4⅛" H × 16½" W × 18¼" D..... $160

PANASONIC

RS-808 8-Track Deck
Front-loading 8-track record/play deck with slide-in cartridge mechanism; features auto-stop in record/playback modes with LED indicators; auto/manual program selector with LED indicators; locking pause and fast forward switches; left and right channel level controls; two level meters; tape time counter; jacks for mic and headphones; two built-in connection cords; simulated wood cabinet $140

REALISTIC

TR-803 8-Track Deck
Record/play deck features digital timer; pushbutton control of continuous play, program repeat, auto-stop, 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; 4¾" × 16½" × 10" $200

TRC-883 8-Track Deck
Record/play deck features dual VU meters; level controls; pushbutton 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 case; 4⅝" × 14" × 8¾" $140

TRC-884 8-Track Deck
Record/play deck features dual VU meters; level controls; pushbutton 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%; 13⅓" × 8½" × 5" $100

REFERENCE by QUADRAFLEX

708D 8-Track Deck
Wow and flutter 0.17% wrms; frequency response 40-12,000 Hz ±2.5 dB; S/N 50 dB $220

SANYO

RD8020A 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 × 12½" W × 10" D..... $100

TELEX

TMS-100 Music Machine
Automatic stereo 8-track cartridge changer switches and selects 12 tape cartridges for uninterrupted music; two pushbutton sequences permit playing of each cartridge completely or intermixing programs from different cartridges; automatic gain control; load and reject pushbuttons; 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; 9⅝" H × 18¼" W × 16¼" D $695
TMS-101. With pre-amplifier only $595

TRANSAUDIO

3850 8-Track Deck
Stereo 8-track record/playback deck features pushbutton fast forward, auto stop, restart, record, pause, and repeat; separate left/right record level controls; LED channel indicators; dual VU meters with LED stop and record indicators; two mic jacks; phone jack. Wow and flutter 0.2% wrms; frequency response 40-10,000 Hz ±3 dB; S/N 48 dB... $160

ALWAYS....
check the *TAPE RECORDING & BUYING GUIDE* first before you shop for your new equipment.

2 OPEN-REEL TAPE MACHINES

A-6100 Mark II Stereo Tape Deck
Two speed (15 and 7½ ips), ½-track, two-channel deck; will handle reels up to 10½-in; four heads (erase, record, play, ¼-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..... $1400

A-3300SX-2T Tape Deck
Two-speed (15, 7½ ips), ½-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 10½-in reels. Wow and flutter 0.04% (15 ips), 0.06% (7½ 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 7½ ips; THD 1% at 1 kHz. Features independent left/right channel source/tape selectors; VU-type level meters; manual cue lever; separate bias and equalization selectors; 17⁵/₁₆" H × 17⁵/₁₆" W × 8⁵/₁₆" D..... $1050

Audio Specialist Series

X-10 Stereo Tape Deck
Two-speed (7½ and 3¾ ips) ¼-track two-channel tape recorder with three dc motors in closed-loop dual-capstan drive system and erase, record, and playback heads; 10½-in reel capacity. Features pitch control; cue lever; pushbutton tape function controls with rec mute; separate mic and line input

level controls; output level control; source/tape monitor switch; separate two-position recording bias and equalization buttons; four-digit tape counter with memory and timer; two VU meters. Wow and flutter (NAB weighted) 0.03% (7½ ips), 0.04% (3¾ ips); frequency response 30-28,000 Hz (7½ ips), to 20,000 Hz (3¾ ips); S/N 63 dB; 17¹³/₁₆" H × 17" W × 10⁵/₁₆" D..... $1000
X-10R. Same as X-10 except bi-directional record/playback with six heads (two each erase, record, and playback)..... $1150

X-7 Stereo Tape Deck
Two-speed (7½ and 3¾ ips) ¼-track two-channel tape deck with three dc motors in closed-loop dual-capstan drive and erase, record, and playback heads; 7-in reel capacity. Features pitch control; separate mic and line input level controls; tape/source monitor switch; output level control; two-position bias and equalization; two VU meters; pushbutton tape function controls including rec mute; timer standby; four-digit tape counter; provision for optional remote control unit. Wow and flutter (NAB weighted) 0.03% (7½ ips), 0.04% (3¾ ips); frequency response 30-28,000 Hz (7½ ips), to 20,000 Hz (3¾ ips); S/N 63 dB; 14⁵/₁₆" H × 17" W × 10⁵/₁₆" D..... $700
X-7R. Same as X-7 except has bi-directional record/playback and auto repeat..... $800

4-Channel

A-3440 4-Channel Tape Deck
Two-speed (15 and 7½ ips) ¼-track four-channel Simul-Sync tape deck with erase, record/sync and playback heads and three motors; 10½-in reel capacity. Features four function select buttons with LEDs and source/sync/play output select buttons with tape/source monitoring and standby functions; headphone monitor switch with four-track pushbuttons; independent level control; four separate input and output level controls per channel with mic attenuation/mic/line input selectors; four VU meters; pitch control; four-digit tape counter; micro-switch tape function controls with LED pause and record; manual cueing; four unbalanced high- or low-impedance microphone input jacks; provision for optional dbx interface noise-reduction unit and optional RC-70 remote control. Wow and flutter (NAB weighted) 0.04% (15 ips), 0.06% (7½ ips); frequency response ±3 dB 40-22,000 Hz at 0 VU (15 ips), to 20,000 Hz at −10 VU (7½ ips); S/N 65 dB with 3.0% THD, weighted; **input sensitivity/impedance 60 mV/50,000 ohms (line), 0.25 mV/600 ohms (mic);** 117 V ac, 60 Hz; 20½" H × 17½" W × 9¼" D..... $1600

A-2340SX Tape Deck
Two-speed (7½ and 3¾ ips) ¼-track four-channel Simul-Sync tape recorder with erase, record, and playback heads and three motors; 7-in reel capacity. Features four Sync function select buttons with tape/source output select switches; four mic/line input level controls and output level controls for each channel; four VU meters; micro-controlled tape function controls; four-digit tape counter; four mic jacks and two phone jacks; provision for optional RC-120 remote control unit. Wow and flutter (NAB weighted) 0.08% (7½ ips), 0.10% (3¾ ips); frequency response ±3 dB 40-18,000 Hz (7½ ips), to 10,000 Hz (3¾ ips); S/N 62 dB with 3.0% THD, weighted; **input sensitivity/impedance 0.1 V/100k ohms (line), 0.25 mV/600 ohms (mic);** 17⁵/₁₆" H × 13¾" W × 8¾" D..... $1175

TECHNICS by PANASONIC

RS-1520US Open-Reel Deck
Compact professional tape deck; ½-track, two-channel recording/playback and ¼-track, two channel playback; four head system; three speeds (15, 7½, 3¾ ips); quartz control phase-locked dc brushless servo direct-drive capstan motor; reel tables; two-tape tension controlled dc brushless direct drive motors; isolated loop direct-drive transport system. Features full IC logic tape transport functions; direct switching from mode-to-mode without tape strain; separate left and right bias and equalization controls; left and right VU meters; built-in stroboscope. Wow and flutter 0.018% wrms (15 ips), 0.3% wrms (7½ 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 (7½ 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; 17½" H × 18" W × 10⁷/₈" D..... $2000
RS-1506US. Similar to RS-1520US except ¼-track, two-channel recording/playback and ½-track, two-channel playback..... $1500
RS-1700US. Similar to RS-1506US except auto-reverse in both recording and playback modes; ¼-track, two-channel; six-head system..... $2000

TELEX

Telex/Magnecord 1400 Series
Three-speed (either 15, 7½, 3¾ ips or 7½, 3¾, 1⅞ ips) open-reel tape recorder; reel sizes 5, 7, or 8¼ 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 3¾ ips, 0.24% at 7½ ips, 0.17% at 15 ips (all DIN weighted), 0.25% at 3¾ ips, 0.17% at 7½ ips, 0.12% at 15 ips (all rms unweighted); S/N 60 dB (NAB weighted); frequency response 30-10,000 Hz ±3 dB (3¾ ips), 30-18,000 Hz ±3 dB (7½ ips), 35-22,000 Hz ±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.** Features VU meters for each channel; separate mike and line input gain controls plus master gain control; catenary head block design and hyperbolic contour heads ensure intimate tape/head contact; 110/130-V ac, 50/60 Hz, 180 W ....from $2195

UHER by WALTER ODEMER

SG-631 Logic Open-Reel Deck
Three-speed (7½, 3¾, 1⅞ 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 servomotor to form the Omega loop. Wow and flutter 0.05%; frequency response 20-25,000 Hz (7½ ips), to 16,000 Hz (3¾ ips), to 12,500 Hz (1⅞ ips); S/N 65 dB (two-track at 7½ ips). Features built-in strobe disc; speed control; peak-reading meter; built-in "Dia-Pilot" for recording signal impulses and automatic slide-projector control; switchable peak-level limiter; separate stereo headphone power with volume, bass, and treble controls; A/B monitoring; remote-control facilities; 10½-in reel, max..... $1876

SG 561 Royal Open-Reel Deck
Four speed (7½, 3¾, 1⅞, ¹⁵/₁₆ ips) two- or four-track mono/stereo record/play deck with interchangeable two- or four-track tape head mount with Recovac longlife heads and built-in stereo amplifier with mixing facility; 7-in reel capacity. Features "Synchro-Play" sound-with-sound, "Multi-Play" sound-on-sound, reverb effect, and echo; "Dia-Pilot" for record/playback of cueing signals for auto slide projectors, will also synchronize sound and picture in 8- and 16-mm film-making; separate mic/radio and phono input controls; mic in/out switch; dual peak-reading meters; tape/source monitor switch; separate and continuous tandem tone control; four-digit tape counter with zero reset; tape tension comparator; electronic end-of-tape shut-off. Wow and flutter (DIN 45507) 0.05% (7½ ips), 0.1% (3¾ ips), 0.2% (1⅞ ips); frequency response 20-20,000 Hz (7½ ips), to 15,000 Hz (3¾ ips), to 9000 Hz (1⅞ ips); S/N (weighted, DIN 45500) on two-track 67 dB (7½ ips), 66 dB (3¾ ips), 65 dB (1⅞ ips), on four-track 65 dB (7½ ips), 64 dB (3¾ ips), 61 dB (1⅞ ips); crosstalk −60 dB (mono), −45 dB (stereo); 13.9" H × 18" W × 7.5" D..... .... $1419

4200 Report IC Recorder
Four-speed (7½, 3¾, 1⅞, ¹⁵/₁₆ ips) two-track stereo record/play recorder with Recovac tape head. Features 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; ac, single-cell, car, or rechargeable battery operation. Wow and flutter 0.2% (DIN), 0.15% (rms); S/N 62 dB (rms A curve); frequency response 35-20,000 Hz (all at 7½ ips); input 0.12-40 mV at 200 ohms (mic), 2.4-700 mV (radio), 0.045-20 V at 2 megohms (phono)..... $1062

SG-521 Four-Speed Recorder
Four-speed (7½, 3¾, 1⅞, and ¹⁵/₁₆ 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 7½ ips); 6 W/ch continuous into 8 ohms (30-20,000 Hz) at 1% THD; S/N 65 dB (two-track at 7½ ips); can be operated vertically or horizontally $928

BOLDFACE indicates that the machine has professional qualities.

trolled digital logic function controls; quartz-crystal speed control; logic-controlled tape tension; electronic tape-motion sensor; digital tape counter readout in min and sec; auto stop logic; electronic pause control; instant repeat play control; continuous record or play function; solid-state switching of audio circuits; 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 stereo outputs; zero-level line outputs and level and tone-controlled outputs; VU meter with overmodulation indicators; input or off-tape metering; variable speed (±7 halftones) with optional remote control available, variable speed (2.5 to 21.5 ips with ex-

ternal oscillator. Wow and flutter (DIN 45507/IEEE 193-1971) 0.06% (15 ips), 0.08% (7½ ips), 0.10% (3¾ ips); frequency response +2/−3 dB 30-22,000 Hz (15 ips), to 20,000 Hz (7½ ips), to 16,000 Hz (3¾ ips); S/N on ¼-track 63 dB (15 and 7½ ips), 60 dB (3¾ ips); on ½-track machines 67 dB (15 and 7½ ips), 64 dB (3¾ ips); 18.2" H × 19" W × 6.9" D..... $2999

B77 Stereo Tape Recorder

Two-speed (choice of 3¾ and 7½ ips, 7½ and 15 ips, 15/16 and 1⅞ ips, or 1⅞ and 3¾ ips) stereo tape recorder with three motors; reel capacity 10½ in. Features integrated drive logic computer-type push-point function keys; built-in tape cutter close to headblock; dual VU meters with peak level indicators; separate left/right record and input level controls; tape monitor switch; provision for remote control of all functions and electric timer operation; connectors for remote control of tape transport functions, remote control of variable tape speed, and slide projector or crossfade unit. Wow and flutter (DIN 45507/IEEE 193-1971) 0.6% (15 ips), 0.08% (7½ ips), 0.1% (3¾ ips); frequency response +2/−3 dB 30-22,000 Hz (15 ips), to 20,000 Hz (7½ ips), to 16,000 Hz (3¾ ips); S/N on ¼-track 63 dB (15 ips and 7½ ips), 60 dB (3¾ ips), on ½-track 67 dB (15 and 7½ ips), 64 dB (3¾ ips); mic input level/impedance 0.15 mV/2.2k ohms (lo position, 50- to 600-ohm mics), 2.8 mV/110k ohms (hi, 20k-ohm mics); 16.3" H × 17.8" W × 8.14" D..... $1499

B77 Self Sync. Same as B77; available in 3¾ and 7½ ips or 7½ and 15 ips speeds with playback possibility from record head..... $1599

B77 Dolby B. Same as B77 except 3¾ and 7½ ips speed only with Dolby B noise-reduction system; separate compressors and expanders for each channel; S/N on ½-track 67 dB (3¾ ips), 71 dB (7½ ips)..... $1799

B77 Autostart. Same as B77 except with VOX control $1749

B77 Slide Sync. Same as B77 except with additional head for slide projector control $1599

A77 Mk IV Tape Deck

Two-speed (3¾ and 7½ ips or 7½ and 15 ips), ½- or ¼-track stereo tape recorder with servo-controlled capstan and two reel motors and three heads; reel capacity 10½ in. Features dual VU meters with LED peak level indicators; auto shut off; relay/solenoid operations controls; off-tape or input monitoring; two record level controls; provision for remote control; optional plug-in 8-W power amp boards; metal cage for rack or custom mounting, and suitcase version with built-in speakers available. Wow and flutter (DIN 45507/IEEE 193-1971) 0.06% (15 ips), 0.08% (7½ ips), 0.1% (3¾ ips); frequency response +2/−3 dB 30-22,000 Hz (15 ips), to 20,000 Hz (7½ ips), to 16,000 Hz (3¾ ips); S/N on ¼-track 62 dB (7½), 59 dB (3¾), on ½-track 66 dB (15 and 7½ ips), 63 dB (3¾ ips); 16⅜" H × 14 3/16" W × 7⅛" D . $1499

A77 Mk IV Professional. Same as A77 Mk IV but only in 7½ and 15 ips speed; **balanced and floating inputs and outputs;** no input selector and level controls accessible from outside of machine; **inputs and outputs via Cannon connectors**..... $1950

TANDBERG

TD 20A "Baron" Open-Reel Deck

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

7½ and 3¾ ips; ¼-track..... $1500
15 and 7½ ips; ¼-track..... $1550
15 and 7½ ips; ½-track..... $1600
Carrying case with/without wheels ..... $300/$245

Series 15 Open-Reel Recorder

Three-speed (7½, 3¾, 1⅞ ips), mono record/play open-reel recorder; wow and flutter 0.1% at 7½ ips; frequency response 40-18,000 Hz ±2 dB at 7½ 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; 6¾" H × 13⅜" W × 11⅞" D.

1541F or 1521F. ¼-track or ½-track $750

TAPE-ATHON

800 TRAK-4 Tape Player

Four-track solid-state monaural playback machine with 8-pole, 3-wire, reversible motor, capstan, two playback heads, and 12-W power amplifier. Two stacked 7-in snap-in Music-Pak reels hold up to 400 musical selections on each reel. Features fast-changing reel-to-reel cassettes (3 sec); automatic tape reversing; separate treble and bass controls; tape control start/release knob; mic and music volume controls; automatic shutoff if tape slackens; head cover for capstan, heads, and tape guides; walnut case. Wow and flutter 0.25% at 1⅞ ips; frequency response 50-5000 Hz ±2 dB; S/N 50 dB; high-impedance mic input (rear panel); 600 ohms nominal impedance; 117 V, 60 Hz, 75 W max.; 13¼" H × 13¼" W × 15¾" D..... $700

Music-Pak. 16-hr play $125

TASCAM by TEAC

90-16 Recorder/Reproducer

16-track, 16-channel open-reel recorder/reproducer; transport, heads, and electronics are completely integrated; full IC logic circuits for transport plus motion sensing; ac servo-controlled direct drive capstan is capable of ±30% variable speed operation; output and function select; remote operation capability; 16 VU-type averaging meters plus 32 adjustable level LED indicators; 1-in tape width. Wow and flutter 0.03% rms (NAB) weighted, ±0.04% peak (ANSI) weighted; 15-ips tape speed; fast-winding time 120 sec (2400 ft); overall frequency response 40-18,000 Hz ±3 dB; S/N 65 dB weighted, 60 dB unweighted referenced to 3% THD level (10 dB over 0 VU) at 1 kHz; dist. 1% at 1 kHz (0 VU); 3% overall THD at 10 dB over 0 VU; crosstalk −45 dB at 400 Hz; erasure −65 dB at 1 kHz, +10 VU reference; record level calibration 0 VU referenced to 3 dB over 185 nWb/m of tape flux, adjustable; **line input −10 dB (0.3 V) or −20 dB (0.1 V) switchable, 20,000-ohm impedance, unbalanced; line output −10 dB (0.3 V), 10,000-ohm impedance, unbalanced;** 117-V ac, 60 Hz; 47¼" H × 24 7/8" W × 28 5/16" D..... $16,500

80-8 Recorder/Reproducer

½-in, 8-tracks; will take up to 10½-in reels NAB hub only; 15 ips and 7½ 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 ±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 × 17¼" W × 12" D..... $3990

35-2 Recorder/Reproducer

Two-track stereo/four-track stereo playback (switchable) two-speed (15 and 7½ ips ±0.5%) open-reel recorder/reproducer with dc servo-controlled capstan and two eddy current induction reel motors and high-density Permaflux erase, record, playback, and 4-track playback heads; 10½-in reel capacity; separate transport and electronics design. Transport features touch-button logic tape function controls with motion-sensing direct mode changes; pitch control; punch-in recording facility; cueing and edit; four-digit tape counter. Electronics features optional dbx encode/decode; six-step bias selector and variable record EQ control; source/calibration/output monitor switch; separate left and right input and output level controls; two VU meters with LED peak indicators. Wow and flutter (NAB weighted) 0.03% at 15 ips, 0.06% at 7½ ips; frequency response 40-22,000 Hz ±3 dB (15 ips), to 18,000 Hz (7½ ips); HD 0.6%; S/N 100 dB with dbx, 65 dB without dbx at 3.0% THD; stereo channel separation 50 dB at 1000 Hz; **line input sensitivity/impedance 60 mV/50,000 ohms; line output level/load impedance 0.45 V/10,000 ohms;** headphone output/impedance −21 dB/8 ohms; fast forward/rewind time 160 sec for 1800 ft; 16½" H × 18 13/16" W × 10½" D (transport); 6 15/16" H × 18 13/16" W × 9 5/16" D (electronics) $1900

DX-2. Plug-in dbx noise-reduction cards for 35-2 ..... $225

40-4 Recorder/Reproducer

Four-track, ¼-in recorder/reproducer; will take up to 10½-in reels NAB hub only; 15 and 7½ 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% wrms NAB at 15 ips; fast-winding time 120 sec for 2500-ft tape; frequency response 40-20,000 Hz ±3 dB (15 ips), 40-15,000 Hz ±3 dB (7½ ips); S/N 63 dB weighted, 58 dB unweighted at 15 ips, 65 dB weighted, 60 dB unweighted at 7½ ips; overall dist. 1% at 400 Hz, 0 VU at 9 dB; crosstalk greater than 50 dB at 400 Hz; 21" H × 17¼" W × 12" D. $1700

TEAC

A-6600 Stereo Tape Deck

Two speed (7½ and 3¾ ips), ¼-track, two-channel deck; will handle reels up to 10½-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 inputs; hi and low bias and equalization settings; three-position monitor switch; peak LEDs flash at 10 VU (7½ ips) and 8 VU (3¾ ips); remote control with optional RC-80..... $1575

2 OPEN-REEL TAPE MACHINES

speed (internally switchable pairs of 15 and 7½ ips or 7½ and 3¾ ips) compact professional tape recorder with variable three-speed (±7%) dc servo capstan and two induction torque reel motors and four plug-in rugged Permalloy head stacks (½ track

erase, record and reproduce and ¼-track reproduce); handles 10½-in EIA or NAB reels and 5- or 7-in plastic reels; ¼-in tape. Features dual VU meters with +9-dB peak-reading LEDs; adjustable bias; record equalization for high and low speeds for each channel; two-speed operation button in speed pairs; four-digit tape counter with reset and selection locator memory that recues machine to zero setting; cue control; edit control; selective reproduce; TTL-IC logic noise-free punch-in/punch-out record; motion-sensing play mode directly from fast forward or rewind; fixed output level control; two line/mic input level controls; LED flashing record; built-in 1000-Hz test oscillator; rewind time 90 sec for 2500-ft reel. Wow and flutter (NAB weighted) 0.05% (15 ips), 0.06% (7½ ips), 0.10% (3¾ ips); frequency response ±2 dB 30-22,000 Hz (15 ips at 0 VU), 25-20,000 Hz (7½ ips at −10 VU), 30-12,000 Hz (3¾ ips at −10 VU); dist. 1.0% at 1000 Hz, 250 nWb/m; S/N (weighted) 65 dB (15 and 7½ ips), 64 dB (3¾ ips); crosstalk 55 dB at 1000 Hz on adjacent tracks; **line inputs 15 dBm, 50k ohms unbalanced and 600 ohms balanced;** mic input −70 dBm, 50k ohms unbalanced; line output 4 dBm/−10 dBm (fixed level, switch selectable), max. output +28 dBm, headroom +24 dBm before clipping, **load impedance 600 ohms balanced, output impedance 50 ohms balanced;** headphone jack −24 dBm, 8-ohm impedance; **standard 3-pin XLR connector.** Includes 10½-in NAB reel, precision hold down knob, and NAB reel shims; vinyl wooden cabinet; vertical or horizontal operating position; 21⅞" H × 21½" W × 8⅛" D..... ..... $1945

4/8-Channel

Mark II Four-Channel Recorder
Incorporates features of MX-5050 plus separately packaged transport and electronics, dc capstan servo with pitch control, plug-in electronics, complete accessibility to electronics adjustments, and interface jack for adding dbx or Dolby noise-reduction system; tape speeds 15 and 7½ ips; three four-track heads in line stacks for erase, record, reproduce; wow and flutter 0.05% at 15 ips, 0.06% at 7½ ips; frequency response 50-20,000 Hz ±2 dB, 35-25,000 Hz ±3 dB (15 ips at 0 VU), 50-18,000 Hz ±2 dB, 40-20,000 Hz ±3 dB (7½ ips at −10 dB); **600-ohm balanced output;** 10½ in NAB reels; ½-in tape, 0.075-in track width; 25¼" × 19" standard rack mount..... .... $3595
Two-Channel. Same as Mark II but uses ¼-in tape; will handle 5- and 7-in plastic reels or 10½-in EIA or NAB; 21¼" × 19" standard rack mount... $2445

MX-5050-QXHD Four-Channel Recorder
Four-channel, two-speed (15 and 7½ ips), ¼-track, ¼-in tape recorder/reproducer with dc capstan servo system and two induction torque reel motors; reel size 5, 7, and 10½ inch EIA or NAB; four head stacks, erase (tracks 1 and 3), erase (tracks 2 and 4), record (four track), and reproduce (four track); rewind time less than 90 sec (2500-ft reel). Wow and flutter 0.05% at 15 ips, 0.06% at 7½ ips; connectors: **line in/out standard three-pin XLR, mike standard ¼-in phone jack; inputs: 15 dBm unbalanced 50k ohms, 600 ohms balanced with optional transformer, mike 70 dBm unbalanced nominal 50k ohms;** outputs: variable or fixed level, headroom 19 dBm before clipping; headphone jack −24 dBm nominal 8 ohms unbalanced; NAB standard equalization; S/N 63 dB weighted, 60 dB unweighted (at 15 ips), 62 dB weighted, 59 dB unweighted (at 7½ ips); frequency response 50-20,000 Hz ±2 dB, 35-25,000 Hz ±3 dB (both at 15 ips), 50-18,000 Hz ±2 dB, 40-20,000 Hz ±3 dB (both at 7½ ips); distortion less than 1% at 1000 Hz at 185 nWb/m; vertical or horizontal operation; vinyl-covered wood case; rack mounting kit and floor console optional; transport 16¹¹⁄₁₆" H × 18⅛" W × 9½" D; electronics 11³⁄₁₆" H × 18⅛" W × 9½" D..... $2845
MX-5050-8D. Similar to MX-5050-QXHD except eight-channel ½-in tape recorder/reproducer..... ..... $4895

PHILIPS

N4506 Tape Recorder
Three-motor, three-head, preamplified tape recorder features 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, 1⅞ ips); max. reel diameter 7-in. Frequency response 35-11,500 Hz (1⅞ ips), to 20,000 Hz (3¾ ips), to 26,000 Hz (7½ ips); S/N (without DNL) 60 dB (7½ and 3¾ ips), 58 dB (1⅞ ips); wow and flutter 0.05% (7½ ips), 0.07% (3¾ ips), 0.2% (1⅞ ips); fast-winding time 180 sec (1800 ft); channel separation 30 dB; track separation 60 dB; full complement of inputs/outputs; 17" H × 21¾" W × 8¼" D..... $650

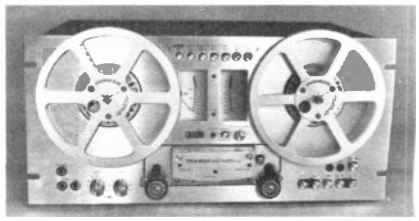
N4504 Tape Recorder
Three-motor, three-head tape recorder features two peak-reading meters; direct switchable tape direction; A-B monitor switch; dynamic noise limiter; three speeds (7½, 3¾, 1⅞ ips); max. reel diameter 7-in. Frequency response 35-11,500 Hz (1⅞ ips), to 20,000 Hz (3¾ ips), to 26,000 Hz (7½ ips); S/N (without DNL) 60 dB (7½ and 3¾ ips), 58 dB (1⅞ ips); wow and flutter (wrms) 0.05% (7½ ips), 0.07% (3¾ ips), 0.2% (1⅞ ips); fast-winding time 180 sec (1800 ft); channel separation 25 dB; track separation 60 dB; full complement of inputs/outputs; 16¾" H × 16⅜" W × 7¼" D $490

PIONEER

RT-2022 Stereo Tape Deck
Two-speed (7½ and 15 ips), ½-track, three-motor, three-head stereo deck; will handle up to 10½-in reels; ⁴⁄₈ pole hysteresis synchronous motor and two six-pole inner-rotor induction motors for reel drive. Features 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 and sound-with-sound. Wow and flutter 0.04% wrms at 15 ips, 0.08% wrms at 7½ ips; S/N 55 dB; THD 0.8% max. at 15 ips, 1.0% max. at 7½ ips; response 30-28,000 Hz ±3 dB at 15 ips, 40-20,000 Hz ±3 dB at 7½ ips; full complement of inputs and outputs; 21³⁄₄" H × 18⅛" W × 10¹³⁄₁₆" D $1590

RT-909 Stereo Tape Deck
Two-speed (3¾ and 7½ ips), ¼-track, three-motor, four-head stereo tape deck; direct-drive motor with pitch control and dual capstan transport system; accepts both 10- and 7-in reels. Features two-step bias and equalization selector with variable bias; Fluroscan level indicators with peak and average functions; four-digit electronic counter; auto reverse; separate mic/line and left/right input level controls. Wow and flutter 0.04% at 7½ ips, 0.08% at 3¾ ips; frequency response 20-28,000 Hz ±3 dB (7½ ips), 20-20,000 Hz ±3 dB (3¾ ips); S/N 60 dB..... $895

RT-707 Stereo Tape Deck
Auto-reverse playback stereo reel to reel tape deck; two speed (3¾ and 7½ ips); speed accuracy



±0.5%; three-motor, four-head, ¼-track, two-channel design; handles 7-in reels; FG servo ac direct drive motor for capstan drive and two six-pole inner-rotor induction motors for reel drive. Features solenoid operated, direct switchable function buttons and preset function buttons for timer record and play, auto and manual reverse play; auto repeat play; incependent L/R recording mode selectors; two bias and two equalization tape selection; full complement of inputs/outputs. Wow and flutter 0.05% wrms (7½ ips), 0.08% wrms (3¾ ips); S/N 58 dB; dist. 1% max. (7½ ips); fast rewind 100 sec (7-in reel); frequency response 30-24,000 Hz ±3 dB (7½ ips), 30-16,000 Hz ±3 dB (3¾ ips); crosstalk −50 dB; channel separation 50 dB; pitch control ±6% (playback only); 9¹⁄₁₆" H × 18²⁹⁄₃₂" W × 14¹³⁄₃₂" D $695

RT-701 Stereo Tape Deck
Two speed (3¾ and 7½ ips) design; speed accuracy ±0.5%; three-motor, three-head design; FG servo ac direct drive motor for capstan drive and two six-pole inner-rotor induction motors for reel drive; handles 7-in reels. Features solenoid-operated direct switchable function buttons and preset function buttons for timer record and play; permalloy heads; line/mike mixing; two bias and two equalization tape selectors; full complement of inputs/outputs; fast rewind 100 sec. Wow and flutter 0.05% wrms (7½ ips), 0.08% wrms (3¾ ips); S/N 58 dB; dist. 1% (7½ ips); frequency response 30-24,000 Hz ±3 dB (7½ ips), 30-16,000 Hz ±3 dB (3¾ ips); crosstalk −50 dB; channel separation 50 dB; pitch control ±6% (playback only); 9¹⁄₁₆" H × 18²⁹⁄₃₂" W × 14¹³⁄₃₂" D $595

4-Channel

RT-2044 4-Channel Tape Deck
Same as RT-2022 stereo deck except with two TAU-11 amplifier units; 37¹⁵⁄₁₆" H × 18⅛" W × 10³⁄₁₆" D $2010

REALISTIC

TR-3000 Stereo Tape Deck
Two-speed (7½ and 3¾ ips), ¼ track two-channel stereo system with three heads; will accept up to 7-in reels. Frequency response 40-22,000 Hz ±3 dB at 7½ ips, 40-14,000 Hz ±3 dB at 3¾ ips; S/N at 19 cm/sec 58 dB ("A" weighted), 47 dB (unweighted); THD 0.6% $500

STUDER/REVOX

A700 Stereo Tape Recorder
Three-speed (choice of 15, 7½, and 3¾ ips, ¹⁵⁄₁₆, 1⅞, and 3¾ ips, or 1⅞, 3¾, 7½ ips) stereo tape recorder with plug-in head assembly (¼- or ½-track available), three heads (fourth head optional), and frequency and phase servo capstan motor and two servo reel motors. Features microprocessor-con-

2 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; will handle up to 10½-in reels; double-capstan closed-loop drive system; one ac servomotor for capstan drive and two six-pole eddy current motors for reel drive; three GX heads and one full-track erase head. Features 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, 0 VU; S/N 60 dB; fast-forward and rewind time within 120 sec (1800-ft tape); 16¼" H × 18" W × 8" D $1995

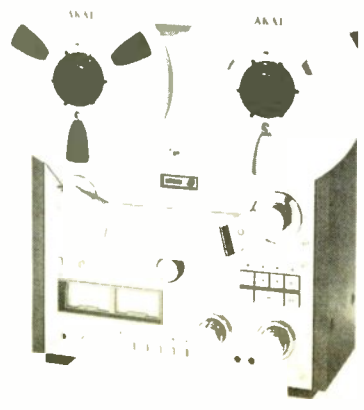
GX-650D Stereo Tape Deck

Three-speed (15, 7½, and 3¾ ips), ¼-track two-channel stereo/mono system; will handle up to 10½-in reels; 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). Features 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 meters; 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 $1295

GX-635DB Stereo Tape Deck

Two-speed (7½ and 3¾ ips), ¼-track, two-channel record/playback stereo deck with dual-process Dolby noise-reduction system, ac servo direct-drive capstan and two reel motors, and two GX record, two GX playback, and two erase heads; handles up to 10½-in reels. Features automatic reverse in record/playback; ±6% pitch control; full logic solenoid function controls; mic/line mixing; output level control; record mute; real time counter; remote control jack. Wow and flutter 0.03% wrms at 7½ ips; frequency response 30-27,000 Hz ±3 dB with WR tape; dist. 0.5% at 7½ ips (1000 Hz, 0 VU); S/N 62 dB DIN without Dolby; 19" H × 17.4" W × 10.1" D $1095

GX-635D. Similar to GX-635DB without Dolby noise-reduction system $995



GX-267D Stereo Tape Deck

Two-speed (7½ and 3¾ ips), ¼-track, two-channel stereo deck with two GX playback, two GX record, amd two erase heads and center pole generator ac servo capstan and two eddy current reel motors; handles up to 7-in reels; direct capstan drive system. Features two brake drums each fitted with Mylar brake belt for supply and take-up reels; three-position record/playback auto reverse for one-way record/playback, one-cycle record/playback, or one-cycle record and continuous playback; feather-touch solenoid operations controls with direct function control; record mute with 1-sec timing indicator; timer start switch with wake-up music function; line/mic input mixing controls; instant pause control; dual VU meters; low noise/wide range tape selector switch; dual monitoring; left/right record mode selector switches; output level control; one-way damped tension arm. Wow and flutter 0.04% wrms (7½ ips), 0.06% wrms (3¾ ips); frequency response ±3 dB 30-25,000 Hz (7½ ips), to 19,-000 Hz (3¾ ips), both with Akai LN-150-7 tape; dist. 0.5% at 1000 Hz, 0 VU; S/N 60 dB (JIS); input sensitivity/impedance 0.25 mV/2.4k ohms (mic), 70 mV/100k ohms (line), output level 0.775 V (line), 100 mV into 8 ohms (headphone); 18.5" H × 17.3" W × 9.8" D $850

GX-270D. Similar to GX-267D except with three heads (four-head function); peak-level indicator lamp; add-on recording; 15.9" H × 17.4" W × 8.3" D $775

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 $675

GX-4000DB Stereo Tape Deck

Two-speed (7½ and 3¾ ips), ¼-track, two-channel stereo system with Dolby noise-reduction system, GX recording and playback heads and erase head, and four-pole induction motor; handles up to 7-in reels. Features tape/source monitor and low noise/wide range selector switches; auto stop; mic/DIN/line mixing; output control; pause control; four-digit index counter with reset; LED record indicator. Wow and flutter 0.08% wrms; frequency response ±3 dB 30-24,000 Hz (7½ ips), to 16,000 Hz (3¾ ips); dist. 1.0% at 1000 Hz, 0 VU; S/N 60 dB without Dolby; input sensitivity 0.25 mV (mic), 70 mV (line), 2 mV into 10k ohms (DIN); output level 580 mV (line), 100 mV into 8 ohms (headphone), 0.3 V (DIN); 12.4" H × 17.3" W × 9.1" D $500

GX-4000D. Same as GX-4000DB without Dolby noise-reduction system $400

1722II Stereo Tape Deck

Two-speed (7½ and 3¾ ips), ¼-track, two-channel stereo tape system with record/playback and erase heads and two-speed induction motor; handles up to 7-in reels. Features low noise/wide range tape selector switch; three-way speaker switch for mute/recording monitor, normal, and PA; auto shut-off; rear-panel speaker switch convertible to PA system; pause control; built-in phono equalizer amp directly records from magnetic phono cartridge; built-in 5 × 7-in speakers with speaker jacks; line and DIN in and out connections; two VU meters. Wow and flutter 0.14% rms (7½ ips), 0.18% rms (3¾ ips); frequency response ±3 dB at 7½ ips 30-21,000 Hz (wide-range tape), to 18,000 Hz (low-noise), at 3¾ ips 40-15,000 Hz (wide range), to 13,000 Hz (low-noise); dist. 2.0% at 1000 Hz, 0 VU; S/N 50 dB; output 10 W total music power, 6 W continuous; crosstalk 60 dB (mono), 45 dB (stereo); input sensitivity/impedance 0.5 mV/100k ohms (mic), 150 mV/330k ohms (line); output level 1.23 V (line), 100 mV into 8 ohms (headphone), 5 W into 8 ohms (speaker); 14.1" H × 14" W × 9.8" D $475

4-Channel

GX-630DSS 4-Channel Tape Deck

Two-speed (7½ and 3¾ ips) four-channel or stereo record/playback tape system with ac servo direct-drive capstan and two reel motors and four GX glass-and-crystal ferrite heads; 10½-in reel capacity. Features A-B monitoring in either mode; full logic solenoid function controls; "Quadra-Sync" dubbing circuit; mic/line mixing; left/right track selector; pitch control (±5%); tape select switch; line output control; auto stop; pause control with lock; four VU meters. Wow and flutter 0.06% rms at 7½ ips; frequency response 30-21,000 Hz ±3 dB (7½ ips); dist.0.5% at 7½ ips, 1000 Hz, 0 VU; S/N 58 dB weighted (wide-range position); 20.7" H × 17.3" W × 9.4" D $1250

GX-270DSS 4-Channel Tape Deck

Two-speed (7½ and 3¾ ips) ¼-track, four and two channel record/play deck with ac servo direct-drive capstan motor plus two eddy current motors for fast-forward and rewind and four GX heads in three-head function; 7-in reel capacity. Features 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. 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 $1075

OTARI

MX-5050-B Tape Recorder

Two-channel ½-track (¼-track reproduce) three-

"a professional studio recorder with a handle"

"ReVox new B77 is long on performance and short on Mickey Mouse features."

That's what Herb Friedman said about the ReVox B77 in Hi-Fi/Stereo Buyers' Guide.* If you're a serious audiophile or location recordist, you'll be interested in what Herb has to say.

In addition to evaluating products for Hi-Fi/Stereo Buyers' Guide, Herb Friedman is Chief Engineer for Tridac Electronic Laboratories and a major New York radio station. As such, he produces taped programming and he knows the real differences between truly professional recorders and others that claim to have "professional features".

Differences like 18dB record headroom, flat response with no low-frequency "head bumps", the highest usable dynamic range and the lowest noise of any audiophile recorder. Add to these such features as all-digital-logic-control of tape motion, large meters with LED peak level indication, self-contained tape splicer, and a rugged 37-pound package with a handle and you've got the best recorder in the world.

If you'd like to know what else Herb Friedman thinks about the B77, please circle reader service number or write to us for complete information including a reprint of his article and a list of dealers where you may see and hear the ReVox B77 demonstrated.

REVOX

Studer ReVox America, Inc., 1819 Broadway, Nashville, Tennessee 37203 (615) 329-957

In Canada: Studer ReVox Canada, Ltd.

CIRCLE NO. 23 ON READER SERVICE CARD

WE COULDN'T SAY SCOTCH® NOW HAS THE WORLD'S TRUEST SOUND IF IT WEREN'T THE ABSOLUTE TRUTH.

Here's the proof...new Scotch® Metafine®. It's the world's first tape to offer the advantage of pure metal particles, not just metal oxide. That's why Metafine delivers higher highs, lower lows—*double* the output of chromium dioxide tapes. Truly, a breakthrough!

The same dedication to technological perfection that made Metafine possible is a part of every Scotch recording tape we make. That's why the very best sound your system is capable of delivering comes with Scotch. That's also why Scotch is used in most professional recording studios.

When you see the name Scotch on a recording tape you can expect to hear every bit of the true, pure sound you're after.

SCOTCH® RECORDING TAPE. THE TRUTH COMES OUT.

3M

CIRCLE NO. 3 ON READER SERVICE CARD

1 CASSETTE TAPE MACHINES

trols; electronic auto stop; rec mute; timer standby; input level control with mic/line input selector; output level control; low-noise high-linearity amplifier circuitry; three-digit tape counter; memory rewind. Wow and flutter 0.035% wrms; tape speed deviation 0.3%..... $550

TOSHIBA

PC-X40 Cassette Deck

Front-loading programmable metal-compatible stereo cassette deck with Dolby noise-reduction sys-

tem and All-Sendust record/playback and ferrite erase heads. Features digital ic-controlled programmable multi-music quick sensor system (programs up to six musical selections) with play/skip button; dual LED bar graph peak-level meters with switchable dot/bar level indicator; auto repeat and auto program; tape editor switch; separate bias and equalization for normal, CrO_2, and metal tapes; separate left/right record level controls; output level control; three-digit tape counter with reset and memory rewind; cue and review; soft eject; provision for optional external timer. Wow and flutter 0.05% wrms; frequency response 20-18,000 Hz ±3 dB at 20-dB input; S/N with Dolby 72 dB (metal), 68 dB (CrO_2) $380

PC-X20. Similar to PC-X40 without programmable multi-music quick sensor system, memory rewind, auto program, and tape editor control.. ..... $300

PC-5460 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, servo dc motor, and all Sendust record/playback and ferrite erase heads. Features three-level/six-way independent bias/equalization; two triple-function meters (VU, peak-level, and peak-hold); editor volume control; mic and line mixing with separate 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 × 16½" W × 11" D $370

PC-4460 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, dc servomotor, and hard permalloy record/playback and ferrite erase heads. Features 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; frequency response 30-16,000 Hz ±3 dB (chrome tape); S/N 69 dB (Dolby on, chrome tape); 6" H × 16½" W × 11" D $300

PC-3460 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, dc servomotor, and hard permalloy record/playback and ferrite erase heads. Features 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; frequency response 30-16,000 Hz ±3 dB (chrome tape); S/N 67 dB (Dolby on, chrome); 5¾" H × 16½" W × 11" D $230

PC-2460 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, dc servomotor, and permalloy record/playback and ferrite erase heads. Features two wide-range peak-reading level meters; two-level four-way separate 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); 6½" H × 16½" W × 11" D $170

TRANSAUDIO

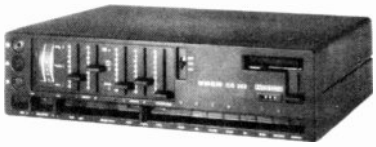
5500 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system. Features dual VU meters with peak and record LEDs; separate bias and equalization for normal, FeCr, and special tapes; record level control; output level control; piano-key tape function controls; auto stop; three-digit tape counter with reset. Wow and flutter 0.12% wrms; frequency response 40-14,000 Hz ±3 dB (FeCr); S/N 59 dB with Dolby..... $175

UHER by WALTER ODEMER

CG-362 Cassette Deck

Stereo record/play cassette deck with Dolby noise-reduction system and three-motor drive system. Features DNL; switchable MPX filter; automatic bias and equalization switch; three-position tape selector; RCA and DIN input-output connectors; 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. Wow and flutter 0.15% wrms; S/N 68 dB (Dolby on, chrome tape); frequency response 20-18,000 Hz (MPX filter off)..... $1186

CR-240 Portable Cassette Deck

Compact front-loading portable cassette deck with Dolby noise-reduction system, collectorless, low-wear motor with electronic control, two contrarotating flywheels, and built-in loudspeaker for mono monitoring. Features automatic start after fast-forward or rewind; automatic end-of-tape shut-off; switchable alc; remote control accessory; clock timer operation; separate or tandem (mechanical coupling) record level controls; twin peak-reading level meters for record and playback with meter illumination and 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, CrO_2 and FeCr), 65 dB (Dolby on, Fe_2O_3); 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; 9¼" × 2⅛" × 7¼" $1186

CR-240AV. Audio-visual version of CR-240.. $1257

CR-210 Portable Cassette Recorder

Four-track mono/stereo record/play cassette recorder; wow and flutter 0.12% wrms; S/N 58 dB (chrome tape); frequency response 20-16,000 Hz (chrome tape); auto reverse; built-in condenser microphone; self-contained power stage; internal monitor speakers; photoelectric tape-drive control; on/off alc switch; automatic bias switching for CrO_2 tape; operates from 115-V ac or 12-V battery supply $1115

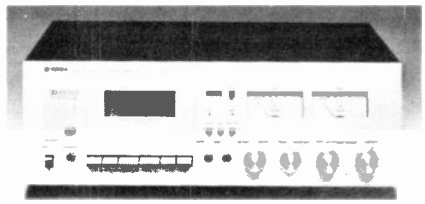
CG-332 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system and hard permalloy tape head. Features separate left and right channel level controls, plus combined master control; adjustable headphone power stage; three-position tape type selector switch (Fe, CrO_2, 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 (CrO_2 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 × 15" W × 10.1" D $533

YAMAHA

TC-1000 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, PLL servomotor and mechanical



governor reel motor, "Pure Plasma Processed" Sendust-Alloy record/playback head and ferrite erase head, and dual FET differential ICL low-noise amplifier. Features mic attenuator switch; auto stop; memory rewind; tape select/bias fine adjust switch for CrO_2, LH, and FeCr tapes; timer recording; headphone amp; mic/line mixing; dual line output (fixed and variable); FM multiplex filter; twin peak-reading meters; LED Dolby and record indicators; electronically-controlled operating switches; three-digit tape counter with reset; headphone and two mic jacks; fast forward/rewind time 70 sec (C-60). Wow and flutter 0.05% wrms (JIS); frequency response 30-16,000 Hz (LH), 30-18,000 Hz (CrO_2), both ±3 dB; THD at 1000 Hz 1.0% (LH), 1.6% (CrO_2); S/N 60 dB without Dolby (JIS weighted), 69 dB at 5000 Hz with Dolby; channel separation 30 dB at 1000 Hz; input sensitivity/impedance 0.25 mV/600 ohms (mic), 50 mV/50k ohms (line); output level 340 mV max. (line), 1 mW into 8 ohms (headphone); 6¹¹⁄₁₆" H × 18⅛" W × 12⅞" D.. $650

TC-520 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, double-belt drive transport, high torque dc motor, and super hard permalloy record/playback and ferrite erase heads. Features three-position bias/equalization for CrO_2, LH, and FeCr tapes with fine bias adjust; two VU meters with two-colored LED peak level indicators; rec mute switch; electronic muting circuit; timer recording; headphone amp circuitry; auto shutoff; line/mic inputs; independent left/right rec level controls; three-digit tape counter with reset; fast forward/rewind time 90 sec (C-60). Wow and flutter 0.07% wrms (JIS); frequency response ±3 dB 30-13,000 Hz (LH), to 15,000 Hz (FeCr and CrO_2); THD at 1000 Hz 1.5% (LH), 2.0% (CrO_2); S/N 57 dB (JIS weighted); channel separation 30 dB at 1000 Hz; input sensitivity/impedance 0.3 mV/5000 ohms (mic), 50 mV/100k ohms (line); output level 370 mV (line), 1.6 mW/8 ohms or 5 mW/150 ohms (headphones); 6¼" H × 17⅛" W × 12⅞" D..... $320

TC-320 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, high torque dc motor, and super hard permalloy record/play and ferrite erase heads. Features separate bias and equalization switches for LH and CrO_2 tapes; independent level controls; headphone and two mic jacks; dual VU meters with LED record indicator; tape counter with reset; auto stop; fast forward/rewind time 90 sec (C-60). Wow and flutter 0.07% wrms; frequency response ±3 dB 40-14,000 Hz (LH) and to 15,000 Hz (CrO_2); dist. at 1000 Hz 1.5% (LH), 2.0% (CrO_2); S/N without Dolby 57 dB (LH); channel separation 30 dB at 1000 Hz; input sensitivity/impedance 0.3 mV/2k ohms (mic), 50 mV/90k ohms (line); output level 400 mV (line), 3 mW (headphones); 5½" H × 17⅛" W × 11¼" D..... $240

reduction system, FG servo-controlled dc motor, and two heads for erase and record/playback. Features 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 (CrO_2), 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 11/16" H × 17 9/16" W × 13 3/16" D..... $650

A-550RX Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system and dbx circuitry, dc servomotor, and high-density ferrite erase and record/playback heads. Features feather-touch microprocessor-controlled tape function controls; rec/mute control; programmable record/play timer; three-position bias and equalization; separate left and right record level controls; output level control; mic/line switching; three-digit tape counter with memory rewind. Wow and flutter 0.06% wrms; frequency response 30-16,000 Hz (chrome); S/N 56 dB, 66 dB with Dolby over 10,000 Hz, 90 dB with dbx; 147 mm H × 440 mm W × 345 m D..... $550

A-430 Cassette Deck

Front-loading metal-compatible stereo cassette deck with dual Dolby noise-reduction system, three-head reproduction system and dc servomotor. Features automatic bias scanning system with calibrated bias selector and fine bias adjust for normal, CrO_2, and metal tapes; two peak-reading meters; tape/source monitor switch; separate mic and line record level controls; three-digit tape counter with memory rewind; rec mute; piano-key tape function controls. Wow and flutter 0.07% wrms; frequency response 30-17,000 Hz (metal); S/N 55 dB, improved 5 dB at 1000 Hz and 10 dB over 5000 Hz with Dolby; 160 mm H × 410 mm W × 300 mm D. $500

A-510 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, high-density ferrite record/playback and erase heads, and FG dc servomotor. Features fluorescent liquid peak-reading bar graph display; feather-touch micro-switched logic tape function controls; differential gear-coupled record level controls; output level control; separate three-position bias and equalization; programmable timer function; three-digit tape counter with memory rewind; rec mute; provision for remote control unit.... ..... $475

A-500. Same as A-510 except has peak program VU meters instead of bar graph..... $425

A-300 Cassette Deck

Front-loading stereo cassette deck with dual-Dolby circuitry, tension servo system with FG dc servomotor, and three-head system. Features mic/line mixing; output level control; separate two-position bias and equalization selectors; tape counter with memory rewind $425

CX-270 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system and servo-controlled transport motors. Features fluorescent bar graph VU meters with selectable peak-hold manual/automatic reset modes; separate bias and equalization for normal and CrO_2 tapes; mic/DIN and line input selector; separate right/left record level controls; LED record and Dolby; piano-key tape function controls. Wow and flutter 0.07% wrms; frequency response 30-16,000 Hz; S/N 65 dB with Dolby; 142 mm H × 410 mm W × 300 mm D $250

CX-210. Same as CX-270 except has standard VU meters instead of bar graph..... $200

M-124 Syncaset Stereo Cassette Deck

Front-loading Simul-Sync stereo cassette deck with Dolby noise-reduction system, FG dc servomotor, and record/playback and erase heads. Features Simul-Sync (for monitoring on one track while simultaneously recording on another through the same head) with cross-feed switch for slight blending of left and right channels; mic blend level control with left/blend and right mic jacks; independent bias and equalization selectors for normal and CrO_2 tapes; separate left and right record level controls; mic/DIN and line input selector; three-digit tape counter with memory rewind; two VU meters; fast forward/rewind time 90 sec (C-60). Wow and flutter 0.07% (NAB weighted); frequency response 30-16,000 Hz (CrO_2); S/N 55 dB, improved 5 dB at 1000 Hz and 10 dB at 5000 Hz with Dolby; input sensitivity/impedance 60 mV/50k ohms (line), 0.25 mV/600 ohms (mic); 6 1/4" H × 16 1/8" W × 11 1/2" D $450

TECHNICS by PANASONIC

RS-M68 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, FG dc servomotor, and four-track Sendust Extra (SX) record/playback head. Features full auto reverse record/playback with three-position mode switch (continuous play/auto stop at end of reverse record or play cycle/auto reverse that disengages after end of side); two-color fluorescent bar graph peak meters with adjustable meter light switch; forward and reverse cue/review; three-digit tape counter; memory auto play, rewind auto play, and memory stop; separate three-position bias and equalization for CrO_2, FeCr, and normal tapes; input level control with line and mic/DIN input selector; output level control; timer standby switch. Wow and flutter 0.06% wrms; frequency response 20-17,000 Hz (CrO_2 and FeCr); S/N 67 dB with Dolby $550

RS-M56 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, FG dc servomotor, and HPF record/playback head. Features Micro-Computer Music Selector that quickly searches and stops at user-specified song (20-selection capacity) with music select and present status tape direction arrows; two-color fluorescent bar graph peak meters; separate three-position bias and equalization for normal, FeCr, and CrO_2 tapes with bias fine adjust; rec mute; cue and review with quick review; separate line and mic input level controls; output level control; three-digit tape counter with memory auto play; timer standby. Wow and flutter 0.045% wrms; frequency response 30-17,000 Hz (CrO_2 and FeCr); S/N 67 dB with Dolby..... $500

RS-M63 Cassette Deck

Front-loading metal-compatible stereo cassette deck with dual Dolby circuitry, combination wide-gap record/narrow-gap playback heads in single housing and double-gap sendust/ferrite erase head, and high-torque dc motor. Features three-head five-LED function display; two-color fluorescent bar graph peak meters with adjustable meter light control; three-position bias and equalization selector for normal, FeCr, and CrO_2 tapes with bias adjust control and separate metal tape switch; separate line and mic input level controls; tape/source monitor switch; output level control; three-digit tape counter with memory auto play; cue and review with quick review; timer standby. Wow and flutter 0.05% wrms; frequency response 20-20,000 Hz (metal), to 18,000 Hz (CrO_2 and FeCr); S/N 67 dB with Dolby $450

RS-M44 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, FG dc servomotor, and HPF record/playback head. Features two-color fluorescent bar graph peak meters; separate three-position bias and equalization for normal, FeCr, and CrO_2 tapes with bias fine adjust; cue and review with quick review and music selector; three-digit tape counter; memory auto play/memory rewind/rewind auto play; timer standby. Wow and flutter 0.05% wrms; frequency response 30-17,000 Hz (CrO_2 and FeCr); S/N 67 dB with Dolby..... $400

RS-M33. Similar to RS-M44 except without bias fine adjust and switchable multiplex filter in Dolby system; has auto stop..... $350

RS-M22 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc motor, and LH record/playback head. Features fluorescent bar graph peak meters; separate three-position bias and equalization for normal, FeCr, and CrO_2 tapes; cue and review with quick review; rewind auto play; auto stop. Wow and flutter 0.05% wrms; frequency response 30-16,000 Hz (CrO_2 and FeCr); S/N 67 dB with Dolby..... $300

RS-M18 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, high-torque dc motor, and LH record/playback head. Features fluorescent bar graph peak meters; separate three-position bias and equalization for normal, FeCr, and CrO_2 tapes; input level control with line/mic input selector; three-digit tape counter with reset; full auto stop; cue/review; rewind auto play. Wow and flutter 0.06% wrms; frequency response 30-16,000 Hz (FeCr and CrO_2); S/N 66 dB with Dolby..... $250

RS-M11. Similar to RS-M18 without rewind auto play and cue and review; has three-position tape selector; wow and flutter 0.07% wrms; frequency response 30-15,000 Hz (CrO_2 and FeCr)..... $200

RS-M7. Similar to RS-M11 except has two calibrated VU meters; wow and flutter 0.08% wrms..... ..... $175

Professional Series

RS-9900US Cassette Deck

Incorporates closed-loop, double-capstan, three-motor drive, separate amplifier unit, and Dolby noise-reduction system. Features memory play/rewind; pitch control; remaining tape time meter; calibration controls for Dolby play and record, bias, equalization; tape/source monitoring; mike attenuator; tape selection switch; 400- and 8000 Hz test oscillators; MPX filter. Amp unit: S/N 67 dB with Dolby; 55-dB dynamic 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 CrO_2 tape; fast-winding time 70 sec (C-60); two HPF record/play heads and ferrite erase head; tape transport: 7 3/8" H × 19" W × 14 3/4" D; amp: 6 7/8" H × 19" W × 14 3/4" D..... $2000

RS-M85 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 motor; full IC logic control; laminated Sendust head; low noise equalizer and high linearity amplifier; MPX filter. Features fluorescent electronic bar graph peak meters; three-position tape selector; fine bias adjustment; 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 ±3 dB (CrO_2 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 7/8" H × 19" W × 15 7/8" D $700

RS-M65 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, direct-drive planar-opposed cap-

stan motor with integrated FG servo mechanism and coreless reel motors, and laminated sendust head. Features two-color fluorescent bar graph peak meters with adjustable meter brightness switch; three-position tape selector for normal, FeCr, and CrO_2 tapes with bias adjust; IC logic tape function con-

1 CASSETTE TAPE MACHINES

RT-1157 Mk II Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system, Automatic Program Search System (The Sharp Eye), servo-controlled dc motor, and narrow gap permalloy head. Features 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 $220

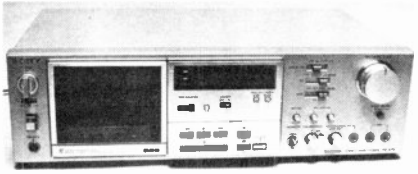
RT-1144 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system. Features three-position bias and equalization for normal, CrO_2, and FeCr tapes; input level control; electronic auto stop; auto program search system (APSS). Wow and flutter 0.08% wrms; frequency response 30-14,000 Hz (normal), to 15,000 Hz (CrO_2 and FeCr tapes); S/N 62 dB with Dolby $190

RT-1125 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction, Automatic Program Search System (The Sharp Eye), servo-controlled dc motor, and narrow gap permalloy head. Features 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 $170

SONY

TC-D5 Portable Cassette Deck
Portable stereo cassette deck with Dolby noise-reduction system, coreless dc servomotor in capstan drive transport, electronic feedback load stabilizer and dc-dc converter, and hard ferrite-and-ferrite head. Features three-way power supply through ac, battery, or car/boat 12-V adapter operation; two VU meters with peak-level LEDs; LED battery life span; three-position tape switch for normal, ferrichrome, and CrO_2 tapes; high-level limiter; 20-dB microphone attenuator; dual input controls; built-in monitor, speaker, and headphone jack; auto shutoff; auto stop; piano-key tape function controls; frequency response 30-16,000 Hz ±3 dB; weight 3 lb, 4 oz $680

TC-K75 Cassette Deck
Front-loading microprocessor-controlled metal-compatible stereo cassette deck with Dolby noise-



reduction system, BSL dc servo capstan and servo spooling reel motors, and ferrite-and-ferrite record/playback and erase heads in three-head configuration. Features 16-segment LED peak-reading meter display with auto/manual peak hold reset; separate four-position bias and equalization switches for normal, FeCr, CrO_2, and metal tapes with variable bias adjust; 19-kHz switchable filter; logic-controlled solenoid tape function controls; auto-space record mute; timer-activated record/play; record level control with line/mic input selector; tape/source monitor switch; separate bias/rec level calibration control; headphone/line output level control; auto play with memory; auto stop; three-digit tape counter with reset; provision for optional remote control. Wow and flutter 0.04% wrms; frequency response 30-18,000 Hz ±3 dB $600

TC-K65. Similar to TC-K75 without variable bias adjust, tape/source monitor switch, separate bias/record level calibration control, and headphone/line output level control; has sendust-ferrite record/playback head and Random Music Sensor (RMS) that preprograms up to 16 selections $500

TC-K55 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system, BSL dc servo capstan and servo spooling reel motors, and sendust-ferrite record/playback head. Features separate three-position bias and equalization switches for FeCr, CrO_2, and normal tapes; switchable 19-kHz filter; record level control with mic/line input selector; dual VU meters with five-LED peak-reading indicators; logic-controlled solenoid tape function controls; auto-space rec mute; auto stop; three-digit tape counter with reset. Wow and flutter 0.04%; frequency response 30-17,000 Hz ±3 dB $400

TC-K45 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system, tri-duty dc servomotor, and ferrite-and-ferrite record/playback head. Features three-position bias and equalization switches for normal, FeCr, and CrO_2 tapes; record level control; mic/line input selector; 16-segment LED VU/peak-reading level display; switchable 19-kHz filter; piano-key tape function controls; auto play; rec mute; auto stop; three-digit tape counter with reset and memory. Wow and flutter 0.05% wrms; frequency response 30-15,000 Hz ±3 dB $320

TC-K35. Similar to TC-K45 without 16-segment LED peak-reading display and memory on/off; has dual VU meters with peak-reading LED $250

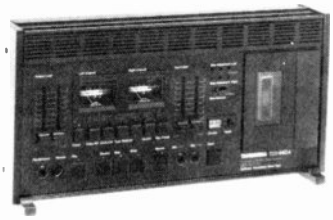
SUPERSCOPE by MARANTZ

C-202LP Portable Cassette Recorder
Two-speed ($1^7/_8$ and $^{15}/_{16}$ ips) portable cassette recorder with permalloy record/playback and erase heads and dc servomotor. Features one-touch record and punch-in record (goes directly from play into record); cue and review; locking pause control; total system shut-off; four-way powering through "C" cell power, ac, external 12 V dc, or optional NiCd battery pack operation; record/battery strength VU meter; automatic/manual/limiter record level slide control; vari-speed control (±15%); tone control; three-digit tape counter; built-in condenser microphone; aux. and remote mic jacks and headphone jack; built-in $3^1/_2$-in speaker system; provision for remote control stop-start unit; fast forward-rewind time 110 sec (C-60). Wow and flutter 0.17% wrms ($1^7/_8$ ips), 0.2% wrms ($^{15}/_{16}$ ips); frequency response 80-8000 Hz ($1^7/_8$ ips), to 4000 Hz ($^{15}/_{16}$ ips); S/N 45 dB with low-noise tape; $3^1/_8$" H × $7^1/_4$" W × $9^3/_4$" D $110

C-200LP. Similar to C-202LP without automatic/manual/limiter record level slide control, vari-speed control, and tone control $90

TANDBERG

TCD 440A Cassette Deck
Metal-compatible stereo cassette deck with dual Dolby noise-reduction system, separate record, playback, and Tandberg erase heads (80 dB erasure at 1000 Hz and 60 dB erasure at 100 Hz), and three motors in dual capstan transport system. Fea-



tures "DYNEQ™" record equalization circuitry designed to automatically adjust record pre-emphasis of deck to maximize potential treble response while simultaneously minimizing treble distortion; "Actilinear" recording system; dual peak-reading meters with second scale reflecting metal-particle signal levels; 10-kHz test oscillator; bias adjust controls for ferric, CrO_2, and metal tapes with set of left/right LEDs; separate slider input and output level controls; source/tape monitor button; record preset; three-digit tape counter with reset; PROM logic-controlled tape function controls with LEDs; LED Dolbys, tape I and II/metal, source/tape, rec preset on/off, and power on/off indicators; optional PCM infrared wireless remote control available. Frequency response 30-20,000 Hz ±3 dB; S/N 70 dB ("A" weighted); anodized matte black finish. $1600

TCD 320 Cassette Deck
Horizontal- or vertical-operating stereo cassette deck with Dolby B noise-reduction system and synchronous record/replay, fast forward, and back wind motors in dual capstan closed-loop transport system. Features self-adjusting input amplifier; equalized peak-reading VU meters; defeatable multiplex filter; headphone output and playback volume controls. Wow and flutter 0.13% wrms (record/playback), 0.09% (JIS); frequency response 30-18,000 Hz; S/N 65 dB min. $700

TCR-222 Cassette Deck
Top-loading cassette deck for mono recording and playback; has three-motor system, one synchronous hysteresis motor for recording and playback and two servo dc motors for fast winding, and dual-capstan closed-loop drive system. Features 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 continuous. 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 $650

TEAC

C-1 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system and three-motor and three-head dual-capstan transport system with PLL dc servo capstan and two dc coreless reel motors. Features LSI logic tape function operation controls; pitch control to vary tape speed up to ±4%; double-action input controls; two peak program VU meters; three-position bias and equalization switch; optional interchangeable bias/equalization card, CX-8; three-position monitor switch; switchable Dolby/dbx noise reduction system with optional dbx II Interface; input selector switch for mic/mic-with-attenuation/line; memory function for auto-stop/repeat; timer control switch; provision for optional remote control unit. Wow and flutter 0.04% (NAB weighted); frequency response 31.5-18,000 Hz ±3 dB (CrO_2), 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 × 19" W × $13^7/_8$" D $1350

C-2. Similar to C-1 except has two motors and accepts metal-particle tape; wow and flutter 0.05%; frequency response 20-20,000 Hz (metal or chrome); S/N 68 dB with Dolby, 90 dB with dbx (optional) $1000

C-3. Similar to C-2 without provision for optional dbx II Interface and plug-in bias/equalization modules; S/N 58 dB, improved 5 dB at 1000 Hz, 10 dB over 5000 Hz with Dolby $600

CX-650R Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system. Features solenoid-operated bi-directional record/play; feather-touch micro-switched logic tape function controls; separate three-position bias and equalization; programmable auto reverse/continuous play; programmable timer function; record mute; tape counter with memory rewind; provision for optional remote control unit $700

A-601R Cassette Deck
Front-loading stereo cassette deck with Dolby noise-

RD5035 Cassette Deck
Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, Sendust Alloy record/playback head and ferrite erase head, and dc high torque motor. Features equalization and bias switches for metal, CrO_2, FeCr, and normal tapes with LEDs; two separate input level controls for both channels; multiplex filter; dual VU meters; digital tape counter with reset; auto stop; air damped cassette door; headphone jack; two mic jacks with left doubling as mono mic. Wow and flutter 0.08%; frequency response 30-19,000 Hz..... $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 $190

RD5030 Cassette Deck
Front-loading stereo record/playback deck with Dolby noise-reduction system; tape select switch for normal, CrO_2, 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) $160

Portables

M9998 AM-Stereo FM/Cassette
Portable AM-stereo FM radio and cassette recorder with Dolby noise-reduction system and LED. Cassette features automatic music select system that locates gaps between musical selections on cassette; instant editing; mic mixing; tape selector for standard, CrO_2, or FeCr tapes; automatic stop; three-digit tape counter; timer standby; two VU/battery condition/tuning meters; choice of two detachable, professional-design microphones or two built-in condenser mics. Radio features LED FM stereo indicator, stereo "wide" switch, loudness contour control, separate center-detented bass, treble and balance controls, stereo line in and line out jacks, headphone jack, twin telescopic rod antennas, and external FM antenna terminals. Built-in two-way speaker system with 6-in woofer and separate 2-in tweeter; two external speaker jacks; operates on ac household current, batteries or auto dc with optional adaptor..... $430

M9996 AM-Stereo FM/Cassette
Portable AM-stereo FM radio and cassette recorder with programmable automatic music select system that locates gaps between musical selection on cassette; up to eight songs can be pre-selected; system has constant LED indicator. Cassette features instant editing, automatic record level control, LED battery/rec playback meters, three-digit tape counter, timer standby, tape selector for normal or CrO_2 tape, and continuously variable monitor level control. Radio features LED tuning eye, LED stereo indicator, stereo "wide" switch, loudness contour control, and separate center-detented bass, treble and balance controls. Two-way speaker system with 6-in woofer and separate 2-in tweeter; line-in and line-out jacks; two external speaker jacks; headphone jack; phone input for external turntable or changer; twin telescopic rod antennas; external antenna terminals; operates on ac household current, batteries, or auto dc with optional adapter $330

M7700 AM-Stereo FM/Cassette
Miniature AM-stereo FM radio and cassette recorder features built-in loudness circuit, mic mixing input and control, choice of built-in condenser mics or external mics, automatic stop, variable monitor system, three-digit tape counter, VU record/battery meter, and soft eject system. Radio has separate balance and tone controls, LED indicators for sound level, external speaker outputs, and line output jacks..... $220

M7500 AM-Stereo FM/Cassette
Miniature AM-stereo FM radio and cassette recorder. Cassette features automatic stop, three-digit tape counter, sleep timer, LED indicator for record/battery power, and two built-in condenser mics. Radio has LED stereo indicator and LED tuning eye, selector switches for AM/FM, tape/radio/timer and mono/stereo/widener, stereo line inputs, and external speaker outputs; operates on batteries or with built-in ac adaptor..... $200

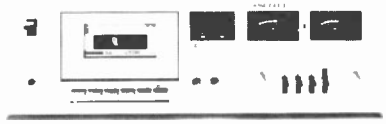
M6000 Compact AM/FM/Cassette
Desk-top AM-FM radio and cassette recorder with raised function symbols for touch operation; features automatic stop, beat cancel switch, pause control, cue and review, variable monitor system, digital tape counter, built-in condenser mic, and jack for remote mic. Radio includes LED tuning eye, battery condition, and record indicators, Hi/Lo tone controls and tape/AM/FM switch; operates on ac (adapter included), batteries or car power, with optional dc adaptor..... $150

M5800 Microcassette Recorder
Compact two-speed microcassette recorder with capstan drive features automatic stop, LED record/battery indicator, pause control, cue and review, digital tape counter, built-in condenser mic, input jack, and earphone jack; includes ac adapter and operates on ac household current, batteries or optional dc car adapter, or optional rechargeable NiCd battery pack..... $150

M5000 Compact Cassette Recorder
Desk top cassette recorder with raised function symbols features automatic stop, built-in condenser mic, cue and review, record level/battery check meter, electrical pause, digital tape counter, input jack for remote mic, and earphone jack; leather carrying case; 1 3/8" H × 6 3/4" W × 4 1/2" D..... $100

H.H. SCOTT

670D Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc motor, and super hard permalloy heads. Features three-position bias and equalization for normal, CrO_2, and FeCr tapes; soft eject mechanism; illuminated cassette compartment; split channel record level control; variable output control; automatic stop; tape memory rewind; LED record, Dolby, and peak level indicators; dual VU meters; three-digit tape counter; line/mic input selector; headphone and two mic jacks. Wow and flutter 0.07% wrms; frequency response 25-14,000 Hz (normal), 25-16,000 Hz (CrO_2 and FeCr tapes); S/N ("A" weighted) 64 dB with Dolby, 56 dB normal; channel separation 40 dB; fast forward and rewind time 90 sec; erasure 70 dB; 5 1/4" H × 17" W × 11 3/4" D..... $200



SHARP

RT-4488 Cassette Deck
Microprocessor-controlled metal-compatible front-loading stereo cassette deck with Dolby noise-reduction system, frequency-generated servomotor, and superhard permalloy head. Features auto program locate device (APLD) with five separate memory functions (locates beginning of selection, automatically plays any segment of tape in forward or reverse modes, automatic on/off, repeatedly plays certain segment of tape, and has rewind and tape counter memory); quartz digital clock and LCD display; LCD electronic tape and elapsed time displays; Opto peak level display with peak hold function; LED record and Dolby indicators; separate mic and line input level controls; four-position bias and equalization for normal, CrO_2, FeCr, and metal particle tapes; auto stop; illuminated tape compartment. Wow and flutter 0.048% wrms; frequency response 20-16,000 Hz (normal), to 17,000 Hz (CrO_2), to 20,000 Hz (metal); S/N 68 dB with Dolby $500

RT-2266 Cassette Deck
Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system and solenoid-controlled transport operations. Features nine-position auto program locate device (APLD) (locates any selection in forward or reverse); Opto peak level display with peak hold; mic/line mixing; output volume control; four-position bias and equalization for normal, CrO_2, FeCr, and metal particle tapes; timer/start mechanism. Wow and flutter 0.045% wrms; frequency response 25-15,000 Hz (normal), to 16,000 Hz (CrO_2), to 18,000 Hz (metal); S/N 67dB with Dolby..... $450

RT-3388A Cassette Deck
Microprocessor-controlled front-loading stereo cassette deck with Automatic Program Locate Device (APLD), Dolby noise-reduction system, servo-controlled dc motor, and hard permalloy record/playback head and ferrite erase head. Features 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; Hall 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) $410

GF-8585 AM-Stereo FM/Cassette Deck
Portable AM-stereo FM radio/stereo cassette deck features auto program locate device (APLD) that instantly locates up to seven tape selections in forward or reverse modes; two shortwave bands with fine tuning; FM muting; FM stereo indicator; separate bass and treble controls; one-touch recording mechanism; full auto stop; CrO_2/normal tape selector; loudness switch; three-way power using ac, dc, or car 120/240 V; built-in two-way speaker system with 16-cm woofers and two multi-cellular horns. Wow and flutter 0.15%; frequency response 40-15,000 Hz (CrO_2); S/N 50 dB; radio output 2.5 W/ch..... $340

RT-1199 Cassette Deck
Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system. Features nine-position auto program locate device (scans tape and stops at desired selection); four-position bias and equalization for normal, CrO_2, FeCr, and metal particle tapes; Opto peak level display with peak hold function; electronic auto stop; output volume control; mic/line mixing. Wow and flutter 0.058% wrms; frequency response 30-15,000 Hz (normal), to 16,000 Hz (CrO_2), to 18,000 Hz (metal); S/N 67 dB with Dolby..... $330

RT-1177 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system. Features three-position bias and equalization for normal, CrO_2, and FeCr tapes; electronic auto stop; output volume control; Opto peak level display; auto program search system. Wow and flutter 0.065% wrms; frequency response 30-15,000 Hz (normal), to 16,000 Hz (CrO_2); S/N 67 dB with Dolby $270

RT-1165 Mk II Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system, Automatic Program Search System (The Sharp Eye), servo-controlled dc motor, and narrow gap permalloy head. Features 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..... $240

1 CASSETTE TAPE MACHINES

two-position tape selector switch (Normal/CrO_2); 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 (CrO_2 tape); THD 2.0% with normal tape; S/N 55 dB (CrO_2 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 15/16" H × 14 1/4" W × 9 7/8" D... $180

STR-700 Portable Radio/Cassette Deck
Front-loading vertical stereo cassette recorder with AM-stereo FM radio. Cassette features auto shutoff; mic input mixing; piano-key tape function controls; built-in condenser microphone; super hard permalloy head. Radio features 6-W music power; dynamic stereo speakers; dual volume controls; three-way power supply; LED FM stereo indicator; LED indicators for battery strength/recording level/signal strength; 9 3/4" H × 17 3/4" W × 4 11/16" D..... $180

STD-1650 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system, mechanical governor dc motor, and super hard permalloy record/playback and ferrite core erase heads. Features 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 (CrO_2 tape); THD 2.2% with normal tape; S/N 53 dB (CrO_2 with filter, Dolby off) improved 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) 0.5 mV at 400 Hz, (line-in) 50 mV at 400 Hz; input impedance (mic) 5k ohms, (line-in) 50k ohms; 5 3/8" H × 14 1/4" W × 7 7/8" D..... $140

SANSUI

SC-5330 Cassette Deck
"Direct-O-Matic" front-loading metal-compatible stereo cassette deck with dual-Dolby circuitry, FG servo capstan and reel motors with holdback tension mechanism, and special record/playback and ferrite erase heads. Features three-position bias and equalization selectors for metal, CrO_2, and normal tapes; two VU meters with five-LED peak-reading indicators; memory rewind, replay, and repeat buttons; rec mute; mic/line mixing with switchable limiter; output level control; logic-controlled feather-touch tape function controls include tape lead-in; LED record, play, and pause indicators; three-digit tape counter with reset; provision for optional external play/record timer. Wow and flutter 0.035%; frequency response ±3 dB 20-20,000 Hz (metal), to 17,000 Hz (CrO_2); S/N 69 dB with Dolby; black matte finish with detachable rack-mounting handles; 7 7/16" H × 19" W (handles on) × 12" D... $520

SC-3300 Cassette Deck
"Direct-O-Matic" front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, FG servo capstan and reel motors with holdback tension mechanism, and special record/playback and ferrite erase heads. Features separate bias and equalization for metal, CrO_2, and normal tapes; 16-segment LED peak-reading indicators; memory rewind; auto replay and repeat functions; record mute; logic-controlled feather-touch tape function controls include tape lead-in; LED record, pause, and play indicators; mic/line mixing; provision for external record/play timer. Wow and flutter 0.04%; frequency response 20-16,000 Hz ±3 dB (metal and CrO_2); S/N 69 dB with Dolby; simulated rosewood-grain finish; 6 5/16" H × 16 15/16" W × 12" D..... $420

SC-3330. Same as SC-3300 except has black matte finish with detachable rack-mounting handles; 6 5/16" H × 19" W (handles on) " 12" D.... $420

SC-1300 Cassette Deck
"Direct-O-Matic" front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, dc drive motor and constant-tension holdback mechanism, and special record/playback and ferrite erase heads. Features 16-segment LED peak-reading indicators; three-position bias and equalization for metal, CrO_2, and normal tapes; record mute; tape lead-in; separate input/output level controls; provision for external timer activation. Wow and flutter 0.05%; frequency response 20-16,000 Hz ±3 dB (metal and CrO_2); S/N 69 dB with Dolby; simulated rosewood finish; 6 5/16" H × 16 15/16" W × 12 5/8" D $320

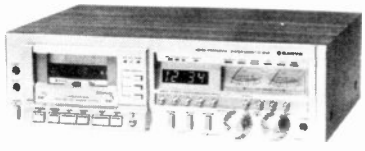
SC-1330. Same as SC-1300 except has black matte finish with detachable rack-mounting handles; 6 5/16" H × 19" W (with handles) × 12 5/8" D $320

D-90 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system, dc servomotor, and super hard permalloy record/playback and ferrite erase heads. Features separate bias and equalization for normal, FeCr, and CrO_2 tapes; dual VU meters; record level control; piano-key tape function controls; provision for external timer with auto shut-off. Wow and flutter 0.055%; frequency response ±3 dB 35-15,000 Hz (CrO_2), to 14,000 Hz (normal); S/N 69 dB with Dolby; metal cabinet; 5 3/4" H × 16 15/16" W × 9 1/2" D $200

SANYO

PLUS Series

RD5372 Cassette Deck
Front-loading microprocessor-controlled metal-compatible stereo cassette deck with dual-Dolby noise-reduction system, dc servo capstan and dc governor reel motors, and separate but integrated Sendust Alloy record and play heads and ferrite erase head; solenoid transport control. Features digital tape counter readout display with reset and memory rewind; auto rewind and repeat; PLL speed control; timer standby for record/playback with provision for external timer/programmer; tape/source monitor switch; defeatable FM multiplex filter; defeatable peak limiter; normal, FeCr, CrO_2, and metal tape selection; lighted front-panel function and tape selection indicators; LED record, pause, and play indicators; two VU meters with peak LEDs; removable damped door. Wow and flutter 0.04% wrms; frequency response ±3 dB 30-19,000 Hz (metal), to 18,000 Hz (CrO_2 and FeCr), to 15,000 Hz (normal); S/N with Dolby 70 dB (metal), 69 dB (FeCr), 67 dB (CrO_2), and 66 dB (normal); THD 0.8% (metal), 1.5% (CrO_2); input sensitivity/impedance 0.26 mV/600 ohms (mic), 100 mV/100 ohms (line); line output level/load impedance 1 V/7k ohms; channel separation 42 dB; crosstalk −70 dB; 6 1/4" H × 17 3/8" W × 12 5/8" D $500



RD5370. Similar to RD5372 without digital tape counter readout display, LED record, play, and pause indicators, auto rewind and repeat, and PLL-synthesized speed control; CrO_2 and FeCr frequency response 30-17,000 Hz, normal 30-13,000 Hz; THD 1.7% (metal), 2.0% (CrO_2) $400

D65 Cassette Deck
Front-loading metal-compatible auto-reverse cassette deck with Dolby noise-reduction system, Sendust Alloy record/playback and ferrite erase heads, and dc servo capstan and dc governor reel motors. Features separate bias and equalization for metal, CrO_2, FeCr, and normal tapes; defeatable FM multiplex filter; auto stop; edit record mute control; digital tape counter with reset; timer standby function with provision for optional external timer/programmer; output level control; two lighted VU meters; feather-touch solenoid transport controls and mode selectors; lighted tape direction arrows; damped door; headphone jack; two mic jacks with left jack doubling as mono mic jack. Wow and flutter 0.04% wrms; frequency response ±3 dB 20-18,000 Hz (metal), to 16,000 Hz (CrO_2 and FeCr), to 13,000 Hz (normal); S/N with Dolby 70 dB (metal), 69 dB (FeCr), 67 (CrO_2), and 66 dB (normal); THD 0.8% (metal), 1.5% (CrO_2); input sensitivity/impedance 0.3 mV/400-10,000 ohms (mic), 50 mV/50 ohms (line); line output level/load 0.53 V/7k ohms; channel separation 42 dB; crosstalk −70 dB; 5 1/4" H × 16 1/2" W × 10 5/8" D..... $400

D62 Cassette Deck
Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, Sendust Alloy record/playback and ferrite erase heads, and dc servomotor. Features automatic music select system (automatically locates gap between musical selections on cassette) with flashing tape direction arrows; two-color fluorescent peak-hold level bar graph bias and equalization for metal, CrO_2, FeCr, and normal tapes; displays with high-speed peak/standard VU selection switch; mic/line mixing; output level control; defeatable FM multiplex filter; auto stop; piano-key transport controls include record mute; digital tape counter with memory rewind; timer standby with provision for external tuner and programmable timer; removable damped door; black metal finish. Wow and flutter 0.04%; frequency response ±3 dB 20-20,000 Hz (metal), to 17,000 Hz (CrO_2 and FeCr), to 13,000 Hz (normal); S/N with Dolby 70 dB (metal), 67 dB (CrO_2), 69 dB (FeCr), and 66 dB (normal); THD 0.8% (metal), 1.5% (CrO_2); input sensitivity/impedance 0.3 mV/400-10,000 ohms (mic), 50 mV/50k ohms (line); output level/load 530 mV/7k ohms (line), 50 mV/8 ohms (phone); channel separation 42 dB; crosstalk −70 dB; 5 1/4" H × 17 5/8" W × 11 3/8" D $330

D60. D62 with silver-faceplate $330

D55. Similar to D60 without automatic music select system..... $290

D45. Similar to D55 without dual-mode bar graph display and memory rewind; has one-color peak-hold bar graph display; wow and flutter 0.05% wrms; frequency response ±3 dB 30-19,000 Hz (metal), to 17,000 Hz (CrO_2 and FeCr), to 13,000 Hz (normal); S/N with Dolby 67 dB (metal), 66 dB (FeCr), 64 dB (CrO_2), 63 dB (normal); headphone output/load 32 mV/8 ohms; channel separation 38 dB; 5 3/11" H × 16 1/2" W × 11 1/2" D $260

RD5350 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system, PLL dc servomotor with 34 stator and 34 rotor poles, and permalloy recording head. Features LED peak indicators; separate calibrated input and output level controls; two lighted VU meters; record mute; standby timer; full automatic stop; locking pause; separate bias and equalization switching (CrO_2 and normal); separate left and right microphone jacks; headphone jack; digital tape counter; Dolby on/off switch; line-in, mic/DIN input button. Frequency response up to 17,000 Hz with CrO_2 and FeCr tape; S/N 64 dB (Dolby on); simulated walnut covered metal cabinet..... $250

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 +2.5%; CrO_2/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..... $200

eration, 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; 9¼" × 3½" × 7½" $60

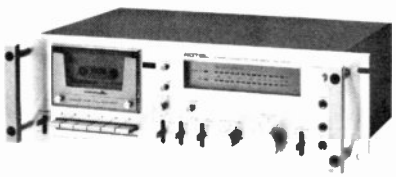
RY-292 Portable Cassette Recorder

Portable battery or ac operated cassette recorder; pushbutton 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; 2¾" H × 5½" W × 11" D $30
Microphone $4

ROTEL

RD-2200 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, electronic governor dc motor, and



Sendust recording/playback and ferrite erase heads. Features three-position bias and equalization controls for normal, CrO_2, and FeCr tapes with adjustable bias control; input selector for line, mic, and record mute; multiplex filter; 13-element LED bar chart peak level indicator; three-digit tape counter; pushbutton controls for reset and memory rewind; operation controls for eject, record, rewind/review, play, fast forward/cue, and pause; headphone amplifier with control; headphone and two mic jacks. Wow and flutter 0.05%; frequency response 30-17,000 Hz ±3 dB (normal) and 30-19,000 Hz ±3 dB (CrO_2 and FeCr tapes); S/N 64 dB with CrO_2, Dolby in; rack mountable $430

RD-2000 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, electronic governor dc motor, and Sendust recording/playback head. Features three-position bias and equalization with adjustable bias control; five LED peak indicators; two VU meters; input selector for line and mic/DIN; multiplex filter; headphone and two mic jacks; damped ejection; tape counter. Wow and flutter 0.05%; frequency response 30-17,000 Hz ±3 dB (normal), 30-19,000 Hz ±3 dB (CrO_2 and FeCr); S/N 64 dB with Dolby; rack mountable $370

RD-25F Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, electronic governor dc motor, and super hard permalloy recording/playback head. Features three-position bias and equalization with bias adjust; two VU meters; LED peak indicator; input selector for line and mic/DIN; multiplex filter; headphone jack and two mic jacks; automatic stop; output and record level controls; tape counter; wood cabinet. Wow and flutter 0.06%; frequency response 30-14,000 Hz ±3 dB (normal and LH tapes), 30-16,000 Hz ±3 dB (FeCr and CrO_2 tapes); S/N 63 dB with CrO_2, Dolby in $340

RD-15F Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, electronic governor dc motor, and super hard permalloy record/playback head. Features LED peak level indicator; three-position tape bias/equalization selectors; input level controls; two VU meters; cue and review; automatic shutoff at end of tape; tape counter; wood cabinet. Wow and flutter 0.08%; frequency response 20-13,000 Hz ±3 dB (normal and LH tapes), 20-15,000 Hz ±3 dB (FeCr and CrO_2); S/N 60 dB with CrO_2, Dolby in $250

SAE

SAE Two Line

C3D Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, FG servomotor, and two heads.

Features solenoid logic-controlled tape function controls; auto stop; memory rewind; separate bias and equalization for low noise, FeCr, and CrO_2 tapes; two lighted VU meters; mic/line input selector; rec mute; record level and record balance controls; timer switch for optional external ac timer; provision for optional remote control. Wow and flutter 0.06%; frequency response 30-18,000 Hz ±3 dB; S/N 64 dB with Dolby; 5.3" H × 17.4" W × 14" D $400

SANKYO

STD-3000 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, frequency generator servo capstan and mechanical governor dc reel motors, and ferrite core combination record/playback and erase heads. Features dual-color fluorescent bar-graph peak level meter; provision for optional auto record/playback memory timer; auto rewind/playback; separate three-position bias and equalization for normal, FeCr, and CrO_2 tapes; recording sensitivity calibration control; 19-kHz multiplex filter; separate mic and line record level controls; output level control; logic-controlled tape function controls; three-digit tape counter with reset; fast-forward/rewind time 80 sec (C-60). Wow and flutter 0.04% wrms; frequency response 20-16,000 Hz (normal), to 18,000 Hz (CrO_2); dist. 1.2%; S/N 58 dB (CrO_2, Dolby off), improved 5 dB at 1000 Hz and 10 dB at 5000 Hz with Dolby; input sensitivity/impedance 100 mV/50k ohms (line), 0.35 mV/5k ohms (mic), 0.1 mV/1k ohm (DIN); output level 580 mV (line and DIN), 2 mW into 8 ohms (headphone); 4⅝" H × 17⅛" W × 11⅞" D $550

STD-2500 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, frequency generator servomotor,

and super hard Sankyo Dynalloy head. Features built-in digital clock/timer display with pushbutton reset, memory, tape, and time controls and slow/fast setting, seconds, and sleep function buttons; dual-color fluorescent bar-graph peak meters; auto shutoff; three-position bias and equalization for normal, FeCr, and CrO_2 tapes; mic/DIN, line, and rec mute input selector switch; record level control; output level control; piano-key tape function controls; auto tape loading; fast forward/rewind time 80 sec (C-60). Wow and flutter 0.065% wrms; frequency response 30-15,000 Hz (normal), to 17,000 Hz (CrO_2); dist. 1.5%; S/N 56 dB (CrO_2, Dolby off), improved 5 dB at 1000 Hz and 10 dB at 5000 Hz with Dolby; input sensitivity/impedance 50 mV/50k ohms (line), 0.5 mV/6.8k ohms (mic); output level 580 mV (line), 2 mW (headphone); 5²⁹/₃₂" H × 17⅛" W × 11⁷/₁₆" D $450

STD-2000 Cassette Deck

Automatic front-loading stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc motor, and super hard permalloy record/play and erase heads. Features total automatic shut-off; separate three-position bias and equalization switches; three-digit memory counter; LED peak indicator; twin illuminated VU meters; LED record, Dolby, and tape running indicators; line/mic/DIN input switch; piano-key tape function controls; mechanical pause; fast-winding time 90 sec (C-60). Wow and flutter 0.058% wrms; frequency response 30-14,000 Hz (normal tape), 30-18,000 Hz (CrO_2 and FeCr tapes); THD less than 1.0%; S/N 56 dB (CrO_2 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; available in chrome-finished panel and wood cabinet or black finish; 5½" H × 17" W × 11¾" D $310

STD-2200 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, dc servomotor, and super hard permalloy record/playback head. Features fluorescent bar-graph peak level meter; three pushbutton tape selectors for normal, FeCr, and CrO_2 tapes; pushbutton input select; record level control; output level control; LED record indicator; piano-key function controls; three-digit tape counter with reset; fast-forward/rewind time 80 sec (C-60). Wow and flutter 0.07% wrms; frequency response 30-14,000 Hz (normal), to 16,000 Hz (CrO_2); dist. 1.8%; S/N 55 dB (CrO_2, Dolby off), improved 5 dB at 1000 Hz and 10 dB at 5000 Hz with Dolby; input sensitivity/impedance 50 mV/50k ohms (line), 0.7 mV/10k ohms (mic), 0.1 mV/1k ohms (DIN); output level 580 mV (line and DIN), 2 mW into 8 ohms (headphone); 5²⁹/₃₂" H × 17⅛" W × 11⁷/₁₆" D. $280

STD-1870 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc motor, and super hard permalloy record/playback and ferrite core erase heads. Features automatic shut-off; record level controls; three-position tape selector switch (CrO_2, FeCr, normal); three-digit tape counter; memory switch; record/mute switch; input select switch; output level control; piano-key tape function controls; twin illuminated VU meters with LED peak indicator; fast-winding time 90 sec (C-60). Wow and flutter 0.06% wrms; frequency response 30-14,000 Hz (normal tape), 30-17,000 Hz (CrO_2 and FeCr tapes); THD 1.1% with normal tape; S/N 55 dB (CrO_2 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, (line) 50 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; 5¹⁵/₁₆" H × 17⅛" W × 9⅞" D $250

STD-1850 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc motor, and super hard permalloy record/play and ferrite core erase heads. Features three-position tape selector switch (CrO_2, 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 (CrO_2 and FeCr tapes); THD 2.0% with normal tape; S/N 55 dB (CrO_2 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, (line) 50 mV at 400 Hz; input impedance (DIN/mic) 10k ohms, (line-in) 50k ohms; available in chrome-finished panel and wood cabinet or black finish; 5¹⁵/₁₆" H × 15¾" W × 9⅞" D $230

STD-1750 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, mechanical governor dc motor, and super hard permalloy record/playback and ferrite core erase heads. Features record level controls; three-digit tape counter; total automatic shut-off;

1 CASSETTE TAPE MACHINES

as tape counter, quartz clock, quartz timer and quartz stop watch; side-mounted deactivator switch for quartz system. Includes built-in electret condenser microphone; 45 mm dynamic speaker; auto shut-off; LED record/battery check indicator; front-panel function selector, reset and start/stop buttons, and tape speed switch; side-mounted cassette eject button, record, play and stop pushbutton controls; top-mounted four-way switch features review, rewind, cue and fast forward functions; earplug/monitor, mic, remote control, and power jacks. Tape speeds: 2.4 cm/sec and 1.2 cm/sec; ac bias; max. output 150 mW at 2.4 cm/sec and 75 mW at 1.2 cm/sec; frequency response 300-7000 Hz (2.4 cm/sec) and 300-7000 Hz (1.2 cm/sec); 3 V dc; complete set includes three MC-60 microcassettes, cassette head cleaner, earphone, ac adaptor, carrying case, wrist strap, two 1.5-V AA Penlight batteries, two silver oxide batteries; optional detachable AM and FM radio and other accessories available; 5½" H × 2⅜" W × 15/16" D.... $350

D120. Similar to D130 without multi-function quartz digital display; complete set with voice actuator $300

D110. Similar to D120 except one-speed recorder; complete set without voice actuator and cassette head cleaner $240

PHILIPS

N2535 Cassette Deck

Stereo cassette deck with Dolby noise-reduction system. Features 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/overload indicator; fool-proof selector switching that enables speed and direction change without going through stop. Wow and flutter 0.01%; frequency range 30-16,000 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/1k ohm; 18" × 5⅞" × 10¼" $280

PIONEER

CT-F1250 Cassette Deck

Microprocessor-controlled front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, closed-loop dual-capstan transport with quartz-locked direct-drive capstan motor and dc fast-winding motor, and "Single-Crystal Ferrite Solid" record/playback and Alfex erase heads. Features four memory functions; monitoring-while-recording capability; two 24-segment Fluroscan average/peak/peak-hold meters; automatic bias and equalization controls; multiplex filter; mic/line mixing and recording; auto stop; quartz-locked pitch control; fast forward/rewind time 65 sec (C-60). Wow and flutter 0.03% wrms; frequency response 20-18,000 Hz ±3 dB (standard), to 19,000 Hz with CrO_2, metal, and FeCr tapes; S/N 69 dB with Dolby (chrome); two mic, two line, and DIN inputs; two line, DIN, and headphone outputs; 7⅜" H × 16⁹/16" W × 14⁹/16" D $695

CT-F950 Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, electronically controlled dc servomotor with built-in generator for capstan drive in closed-loop dual-capstan transport, and crystalline ferrite record/playback and Alfex erase heads in three-head configuration. Features 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 0.04% wrms; frequency response 20-17,000 Hz ±3 dB (standard LH tape), 20-19,000 Hz ±3 dB (chromium dioxide and metal tapes); S/N 59 dB (Dolby off), 69 dB (Dolby on); HD 1.3% at 0 dB; mike input sensitivity 0.3 mV-100 mV/30k ohms; 7⅜" H × 16⁹/16" W × 14½" D. $595

CT-F850 Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc servomotor with built-in generator for capstan drive and dc high-torque fast-winding motor in closed-loop dual-capstan transport, and Sendust record and playback and Alfex erase heads. Features Fluroscan level indicators with average and peak functions. Wow and flutter 0.04% wrms; frequency response 20-17,000 Hz (standard LH tape), to 18,000 Hz (CrO_2 and FeCr tapes), to 19,000 Hz (metal tape); S/N with Dolby 69 dB; HD 1.2%; mic input sensitivity/impedance 0.3 mV-100 mV/10k ohms; 5⅞" H × 16⁹/16" W × 14¹³/16" D $495

CT-F750 Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, high-torque dc servomotor, and stationary four-track record/playback and two ferrite erase heads. Features auto reverse; line/mic-DIN input selector; soft-touch buttons; vertical-hold tape mounting; LED Dolby; bias and equalization for standard, FeCr, CrO_2, and metal tapes; illuminated cassette compartment; fast forward/rewind time 85 sec (C-60). Wow and flutter 0.05% wrms; frequency response 20-15,000 Hz (standard), to 17,000 Hz (FeCr and CrO_2), to 18,000 Hz (metal), all ±3 dB; S/N 69 dB with Dolby; HD 1.2% at 0 dB; mic input sensitivity/impedance 0.3 mV-100 mV/10k ohms; 5⅞" H × 16⁹/16" W × 13¼" D $395

CT-F650 Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc servomotor, and hard permalloy record/playback and ferrite erase heads. Features automatic music selection that locates gaps between musical selections; vertical cassette holding mechanism; LED Dolby; tape selector switch; tape compartment illumination; complete complement of inputs and outputs; fast forward/rewind time 85 sec (C-60). Wow and flutter 0.05% wrms; frequency response 20-15,000 Hz (standard), to 17,000 Hz (chrome and ferrichrome), to 18,000 Hz (metal); S/N 69 dB with Dolby; HD 1.2%; 5⅞" H × 16⁹/16" W × 13¼" D $295

CT-F500 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, dc servomotor, and hard permalloy recording/playback and ferrite erase heads. Features 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 (CrO_2 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; 5½" H × 14¹³/16" W × 10¼" D $195

QUADRAFLEX

Reference 412D Cassette Deck

Metal-compatible stereo cassette deck with Dolby noise-reduction system; features peak-reading LEDs; wow and flutter 0.06% wrms; frequency response 30-16,000 Hz ±3 dB (CrO_2); S/N 60 dB with Dolby $270

PCD 488 Cassette Deck

Wow and flutter 0.065% wrms; frequency response 30-17,000 Hz ±3 dB (FeCr); S/N 62 dB with Dolby $299

For more product information, write directly to the manufacturer. See address list on page 4.

REALISTIC

SCT-3000 Cassette Deck

Stereo cassette deck with dual-Dolby noise-reduction system, three heads, and dual capstan drive. Features fine bias adjust with tone; seven solenoid control logic function keys; auto rewind; and LED peak indicators. Wow and flutter 0.05% wrms; frequency response ±3 dB 30-10,000 Hz (R/P Supertape Gold), 30-20,000 Hz (Supertape Gold); THD 0.9%; S/N 61 dB weighted with Supertape Gold Dolby CCIR $560

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, and dual capstan drive servomotor. Features 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 (CrO_2 tape); wow and flutter 0.06% wrms; S/N 61 dB; 5⅝" × 17⅞" × 10" $400

SCT-16 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system and permalloy record/play head. Features 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; 5½" × 15½" × 11" $300

SCT-19 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system. Features 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 (CrO_2 tape); wow and flutter 0.12% wrms; S/N 59 dB; 5½" × 15" × 11" $200

SCT-20 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system. Features dual VU meters; auto-stop; bias and equalization switch; tape counter; headphone and left/right microphone jacks; push-lever rewind, fast forward, stop/eject, and pause. Frequency response 40-13,000 Hz (CrO_2 tape); wow and flutter 0.19% wrms; S/N 53 dB; THD 2% at 1 kHz (0 VU); 3¾" × 11¾" × 9" $140

RHAPSODY

RY400 AM-FM/Cassette Deck

Portable front-loading cassette recorder/player, AM-FM radio, and built-in rhythmer. Features VU record level meter; LED peak indicator; digital tape counter; pushbutton pause, stop-eject, play, fast forward, rewind and record controls; removable condenser microphone can be used as remote. Radio features vertical slide dial; large tuning knob; LED tuning and battery level indicator; telescopic antenna. Built-in rhythmer mixes rhythm with radio, guitar, microphone and line-in for recording on tape or into amplifier and plays rhythm independently. Two speakers, each with 6-in woofer and 1¾-in tweeter; 110-220 V ac, 50-60 Hz or six D-cell batteries. Demonstration tape, extension cable for remote microphone, and plug-in ac cord are included; 11" H × 16" W × 4½" D $200

RY-1227 Portable Cassette Recorder

Portable ac/dc cassette recorder with AM-FM radio and built-in condenser microphone; double face op-

drive and dc reel motors in two-capstan drive system, and Sendust alloy record and playback and

laminated core erase heads. Features automatic "Accu-Bias" control with built-in 400- and 10,000-Hz oscillators (compatible with all tape formulations); separate bias and equalization for metal, high, and normal tapes; electronic logic-controlled feathertouch tape function controls; VU meters with left/right 10-step LED peak indicators; fade out control; mic mixing; three-digit tape counter with reset and memory rewind; built-in timer function operable with optional audio timer; multiplex filter; auto stop; record mute; lighted auto Accu, Dolby, record, play, and pause indicators; line and mic input level controls; left/right channel mic jacks with auto stereo/mono switchover; phone jack (8-200 ohm headphones); soft eject; fast forward/rewind time 90 sec (C-60). Wow and flutter 0.045% wrms; frequency response 20-16,000 Hz (normal), to 18,000 Hz (high), to 20,000 Hz (metal); S/N 62 dB with metal tape, Dolby out; input level/impedance 0.3 mV/5k ohms (mic), 50 mV/100k ohms (line); output level 775 mV at 0 VU (line out); 6⁵/₁₆" H × 17¹/₄" W × 14³/₈" D..... $800

TA-630DS Cassette Deck

Front-loading stereo cassette deck with dual-Dolby circuitry, PLL dc servomotor in two-belt drive transport, and hyperbolic S&S Sendust head. Features "Accubias" with built-in 400- and 10,000-Hz oscillators with Accu bias adjust; three-position bias and equalization for CrO_2, FeCr, and normal tapes; three-digit tape counter with reset and memory rewind; piano-key tape function controls; dual VU meters with two peak indicators; auto stop; timer start/pause provision; rec mute; Dolby FM/line/mic-DIN input selector; input and output level controls; high/low impedance headphone jack. Wow and flutter 0.055% wrms; frequency response 20-15,000 Hz (normal), to 18,000 Hz (FeCr and CrO_2); S/N 68 dB with Dolby (FeCr above 5000 Hz); input level/impedance 0.3 mV/50k ohms (mic), 50 mV/50k ohms (line), 0.1 mV/5k ohms (DIN); output level/load impedance 0.775 V/50k ohms (line and DIN); headphone impedance 8-200 ohms; 6¹/₄" H × 16¹/₂" W × 12" D..... $350

TA-2010 Cassette Deck

Front-loading stereo cassette deck with dual-Dolby circuitry, dc servomotor, and hard permalloy Widex record/playback and ferrite erase heads. Features "Accu-Bias" adjust; three-position bias and equalization for high, FeCr, and normal tapes; piano-key tape function controls; three-digit tape counter with reset; input level control; two VU meters with ±3 dB Dolby level indication; auto stop; pause control; two mic jacks; high-impedance phone jack; fast forward/rewind 90 sec (C-60). Wow and flutter 0.08% wrms; frequency response 20-14,000 Hz (normal), to 16,000 Hz (FeCr and CrO_2); S/N 54 dB with FeCr tape, Dolby out; input level/impedance 0.3 mV/5k ohms (mic), 50 mV/50k ohms (line); output level/load impedance 480 mV/50k ohms (line); headphone load impedance 8-200 ohms; 5¹⁵/₁₆" H × 16⁷/₁₆" W × 10¹/₂" D..... $260

OPTONICA

RT-6502 Cassette Deck

Front-loading microprocessor-controlled metal-compatible stereo cassette deck with Dolby noise-reduction system, frequency-generated servomotor, and superhard permalloy head. Features Auto Program Locate Device (APLD) with five memory functions (locates beginning of selection, automatically plays any segment of tape in forward or reverse, auto on/off, repeatedly plays certain segment of tape, and has rewind and tape counter memory); quartz digital clock and LCD display; LCD electronic tape and elapsed time displays; Opto peak level display with peak hold function; record and Dolby LED indicators; separate mic and line input level controls; four-position bias and equalization for normal, CrO_2, FeCr, and metal particle tapes; full auto stop; illuminated tape compartment. Wow and flutter 0.045% wrms; frequency response 20-17,000 Hz (normal), to 18,000 Hz (CrO_2), to 20,000 Hz (metal); S/N 68 dB with Dolby..... $540

RT-6506. RT-6502 with ebony finish..... $540

RT-6202 Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system. Features nine-position Auto Program Locate Device (APLD) that locates any selection in forward or reverse; logic solenoid-controlled transport; Opto peak level display with peak hold; mic/line mixing; output volume control; four-position bias and equalization for normal, CrO_2, FeCr, and metal particle tapes; timer/start mechanism. Wow and flutter 0.04% wrms; frequency response 25-15,000 Hz (normal), to 17,000 Hz (CrO_2), to 18,000 Hz (metal); S/N 67 dB with Dolby..... $470

RT-6206. RT-6202 with ebony finish..... $470

RT-6501 Cassette Deck

Front-loading microprocessor-controlled cassette deck with Dolby noise-reduction system, frequency generator servomotor, and permalloy head. Features Automatic Program Locate Device (APLD) with 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); 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..... $450

RT-6505. RT-6501 with ebony finish..... $450

RT-6201 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, two electronic governor dc motors for capstan and reel drives, and Sendust alloy record/playback head. Features Auto Program Search System (APSS); solenoid-controlled transport; multiplex filter; two VU meters with three peak LEDs; output volume control. Wow and flutter 0.05% wrms; frequency response 30-14,000 Hz (normal), to 16,000 Hz (CrO_2), to 17,000 Hz (FeCr), all ±3 dB; S/N 67 dB with Dolby..... $370

RT-6205. RT-6201 with ebony finish..... $370

RT-6101 Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system. Features nine-position Auto Program Locate Device (APLD) that scans and stops at desired selection; four-position bias and equalization for normal, CrO_2, FeCr, and metal particle tapes; Opto peak level display with peak hold; electronic auto stop; output volume control; mic/line mixing. Wow and flutter 0.055% wrms; frequency response 25-15,000 Hz (normal), to 16,000 Hz (CrO_2), to 18,000 Hz (metal); S/N 67 dB with Dolby..... $350

RT-6105. RT-6101 with ebony finish..... $350

RT-6001 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system. Features Auto Program Search System (APSS); three-position bias and equalization for normal, CrO_2, and FeCr tapes; electronic auto stop; output volume control; Opto peak level display. Wow and flutter 0.06% wrms; frequency response 25-15,000 Hz (normal), to 16,000 Hz (CrO_2); S/N 67 dB with Dolby..... $270

RT-6005. RT-6001 with ebony finish..... $270

RT-1515 Cassette Deck

Front-loading stereo cassette deck incorporates Dolby noise-reduction system, dc electronic governor motor, and single Micro Crystal Ferrite head. Features dual adjustable bias and equalization controls; input level controls; electronic auto stop. Frequency response 30-12,500 Hz ±3 dB (normal tape), 30-14,000 Hz ±3 dB (CrO_2 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); wow and flutter 0.085% wrms; fast-winding time 100 sec (C-60); 6.3" H × 16.3" W × 9.6" D..... $250

RT-1515B. RT-1515 with ebony finish..... $250

PANASONIC

RN-006 Microcassette Recorder

Two-hr two-speed microcassette recorder with electronic governor motor and capstan drive. Features built-in condenser mic; full auto-stop; LED record/battery indicators; edit function; tape speed selector; one-touch record/cue/review controls; locking pause control; five-hr rechargeable system; comes with ac adaptor, five-hr recharging pack, telephone pick up, two blank cassettes, earphones, carrying case and strap; champagne gold finish; 5¹/₂" H × 2⁷/₈" W × ⁵/₈" D..... $300

RP-8180 Microcassette Recorder

Microcassette recorder features playback "Speed Set" control; full auto-stop; easy-matic circuitry; pushbutton operation; cue/review; one touch record; LED record/battery indicator; 3-in PM speaker; headset, foot pedal control, and ac cord included; optional rechargeable battery pack and car adaptor; silver finish; 2³/₅" H × 9¹/₅" W × 6⁴/₅" D..... $215

RQ-195. Similar to RP-8180 without headset and foot pedal control..... $180

RQ-2720 Portable Cassette Recorder

Slimline monaural cassette recorder features easy-matic circuitry; auto-stop (semi-full); tape speed control; mic sensitivity selector; built-in condenser mic; one-touch record/cue/review controls; locking pause control; edit function; LED record and battery indicators; operates on two "AA" batteries; comes with ac adaptor; champagne with gray finish; ²⁵/₃₂" H × 6⁷/₈" W × 4⁹/₃₂" D..... $200

RQ-2727. Similar to RQ-2720 without tape speed control and mic sensitivity selector; operates on four "AA" batteries; silver with black finish; 1¹/₁₆" H × 4⁹/₁₆" W × 7⁷/₁₆" D..... $130

RS-612US Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, dc servo motor, and LH head. Features separate bias and equalization selectors; timer stand-by switch for auto recording or playback; auto-stop for record/playback; separate level meters; left/right channel level controls; locking pause/fast forward/rewind controls; line-in/line-out jacks for mic and headphones; LED recording indicator; includes two stereo connection cords; simulated wood cabinet..... $180

RN-177 Microcassette Recorder

Two-speed microcassette recorder with up to two hours record or playback; capstan drive. Features built-in condenser mic; easy-matic circuitry; LED record/battery indicator; cue/review; one-touch recording; locking pause control; mic and monitor jack; battery recharge system with optional rechargeable battery pack; ac adaptor/recharger, two blank tapes, carrying case and strap and earphones included; operates on two "AA" batteries; black with silver finish; 1¹/₄" H × 2⁵/₈" W × 5¹/₂" D... $160

RQ-165A. Similar to RN-177 with up to one hour recording time; 2-in PM dynamic speaker; 1¹/₄" H × 2⁵/₈" W × 5³/₈" D..... $90

PEARLCORDER by OLYMPUS

D130 Microcassette Recorder/Player

Two-hour two-speed modular pocket microcassette recorder/player with capstan drive, coreless motor (can drive 8-ohm 10-in woofer), and ferrite recording head. LED display functions

1 CASSETTE TAPE MACHINES

in rewind or fast forward, dual-Dolby circuitry, tape/source monitor switch, cue and review, piano-key tape function controls, and LED record indicator.... ..... $435

SD 3000. Similar to SD 4000 without tape/source monitor switch and metal compatibility; has separate bias and equalization for normal and special tapes, separate left/right record level controls, single Dolby circuitry, and super hard permalloy heads $295

SD 1000. Similar to SD 3000 without multiplex filter in Dolby system, rec mute, cue and review, CompuSkip, and LED bar graph peak-reading meters; has two VU meters $235

SD 800 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system and super hard record/playback permalloy head. Features separate bias and equalization for normal, special/CrO_2, and FeCr tapes; separate left and right record level controls; two VU meters; three-digit tape counter with reset; total system shut-off..... $199

MITSUBISHI

DT-30 Cassette Deck

Direct front-loading stereo cassette deck with Dolby noise-reduction system, closed-loop dual capstan

drive dc servomotor, separate ferrite recording and erase heads and sendust playback head, and twin power lines for recording equalizer amp. Features solenoid-operated microswitch controls; automatic spacing-pause button; dual peak-reading meters with three-sec peak-hold for readings above 0 dB; separate mic and line input recording level controls plus master recording volume control with presetter; three-position bias and equalization for normal, special, and FeCr tapes and 440- and 8000-Hz internal oscillators for bias adjustment; FM multiplex filter; memory play and rewind; auto repeat and auto rewind; mic and tape output mixing in playback mode; output level control; two mic jacks with left-channel doubling as mono mic jack; headphone jack; three-digit tape counter; fast forward/rewind time 80 sec (C-60). Wow and flutter 0.05% wrms (playback); S/N weighted at 400 Hz 58 dB (without Dolby), 66 dB (with Dolby); frequency response 40-15,000 Hz (normal), to 18,000 Hz (special), and to 20,000 Hz (FeCr), all ±3 dB; dist. 1.0%; erasure ratio 70 dB at 1000 Hz; crosstalk 35 dB between channels (500-6300 Hz), 65 dB between tracks (1000 Hz); input sensitivity 0.3 mV (mic), 100 mV (line); bias frequency 85 kHz; 6¾" H × 16¾" W × 14⅞" D..... $650

M-T01 Cassette Deck

Compact direct front-loading stereo cassette deck with Dolby noise-reduction system, closed-loop dual-capstan drive dc servomotor, and sendust recording/playback head. Features solenoid-operated microswitch controls; automatic spacing-pause button; twin peak-reading VU meters; three-position bias and equalization for normal, special, and FeCr tapes; multiplex filter; timer control with external timer unit; memory-stop and memory-play; microphone and line input level controls; output level control; headphone jack; two mic jacks with left channel doubling as mono mic jack; three-digit tape counter; fast forward/rewind time 80 sec (C-60). Wow and flutter 0.05% wrms; S/N (weighted at +3 dB) 56 dB without Dolby, 64 dB with Dolby; frequency response 40-13,000 Hz (normal), to 15,000 Hz (special and FeCr), all ±3 dB; erasure ratio 70 dB at 1000 Hz; crosstalk 35 dB between channels, 65 dB between tracks; harmonic dist. 1.0% at 400 Hz; input sensitivity 0.3 mV (mic), 100 mV (line); bias frequency 85 kHz; 5½" H × 10⅝" W × 9⅜" D..... $560

DT-10 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system and capstan drive dc servomotor. Features residual tape meter; separate mic and line input level controls plus master recording level control; two VU meters with LED peak-level indicator; memory rewind; output level control; two-position bias and equalization for normal and special tapes; oil-damped eject; headphone jack; two mic jacks with left channel doubling as mono mic jack; fast forward/rewind time 80 sec (C-60). Wow and flutter 0.06% wrms; frequency response 40-12,000 Hz (normal) and to 15,000 Hz (special), at ±3 dB; dist. 1.0% at 400 Hz; S/N 56 dB without Dolby, 64 dB with Dolby; erasure ratio 70 dB at 1000 Hz; crosstalk 35 dB between channels, 65 dB between tracks; input sensitivity 0.24 mV (mic), 80 mV (line); bias frequency 85 kHz; 6¾" H × 16¾" W × 14⅞" D $370

NAKAMICHI

1000 II Cassette Deck

Three-head stereo record/play deck with Dolby noise-reduction system and DNL, Crystal Permalloy playback head and record head azimuth alignment beacon, and dual capstan, closed-loop transport with dc servomotor drive. Features 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. 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); 11"/16" H × 20"/16" W × 8"/16" D..... $1650

700 II. Similar to 1000 II but without auto rewind or DNL; 10"/16" H × 20½" W × 5⅛" D..... $1140

RM-10. Remote control duplicates control systems of 1000 II and 700 II; controls all tape motion including record; can also be used with 580 Series; 15-ft cable $60

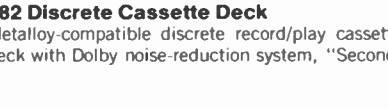
HC-1000. Extra heavy duty carrying cabinet covered in leatherette; double-protected edges and corners; side-mounted folding metal carrying handles; front and rear covers for complete protection; accommodates one 1000 II..... $365

HC-700. Similar to HC-1000 but for 700 II; rear cover attached; metal hinged door for connection access..... $325

DS-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 500 cassette decks; self-repeating 24-hr basis; 2" H × 12¼" W × 4½" D..... $180

582 Discrete Cassette Deck

Metalloy-compatible discrete record/play cassette deck with Dolby noise-reduction system, "Second-



Generation" Direct-Flux erase head, Crystalloy record SuperHead, and Crystalloy playback SuperHead with discrete configuration for independently-adjustable record and play azimuths, and PLL dc servomotor and two dc motors in closed-loop, double-capstan system. Features three-position tape selector for EX, SX, and ZX tapes; equalization selector; defeatable multiplex filter; tape-start memory and timer self-start in record/play; built-in 400-Hz (0 dB) and 15-kHz (−20 dB) test oscillators; three-position record calibration and bias adjust controls; source/tape monitoring; 47-dB peak-reading meters; double-negative-feedback record and play amplifiers; MOS logic-controlled anti-spill and tape-end shutoff; high-output 8-ohm headphone amplifier. Frequency response 20-20,000 Hz ±3 dB; wow and flutter 0.05% wrms max., 0.1% weighted peak; S/N 66 dB at 400 Hz, 3.0% THD, A-weighted (with ZX metalloy tape and Dolby); THD 0.8% at 400 Hz, 0 dB (with ZX tape); erasure 60 dB with ZX tape; input 50k ohms at 50 mV; output 2.2k ohms at 1 V; headphone output 45 mW; 5⅛" H × 19"/16" W × 13²⁵/₃₂" D..... $890

581. Same as 582 without source/tape monitoring. $770

580 Cassette Deck

Metal-compatible stereo record/play cassette deck with Dolby noise-reduction system, Crystalloy record/playback SuperHead and Direct-Flux erase head, and PLL dc servomotor and two dc motors in closed-loop double-capstan system. Features two-speed cueing during fast-wind; double-negative-feedback record and play amplifiers; timer self-start in record/play; separate bias and equalization for EX and SX tapes; defeatable multiplex filter; tape-start memory; built-in 400-Hz test oscillator; record calibration and bias adjust controls; 47-dB peak-reading meters; MOS logic-controlled anti-spill and tape-end shutoff; high-output 8-ohm headphone amplifier. Frequency response 20-20,000 Hz ±3 dB; wow and flutter 0.05% wrms max., 0.1% weighted peak; S/N 63 dB at 400 Hz, 3.0% THD, A weighted (with SX tape and Dolby); THD under 1.5% at 400 Hz, 0 dB; input 50k ohms at 50 mV; output 3.3k ohms at 1 V; headphone output 45 mW; 5⅛" H × 19"/16" W × 13²⁵/₃₂" D..... $650

RM-580. Wireless remote control for 580 Series decks; receptor unit connects to deck via one-meter cable; hand-held transmitter battery-operated; seven-bit pulse code modulation on infrared carrier; all transport functions duplicated; ten-meter range; direct line-of-sight required..... $155

500 Cassette Deck

Two-head stereo record/play cassette deck with Crystal Permalloy record/play head, Dolby noise reduction system, and dc servomotor drive. Features full-range 45-dB peak-reading meters; 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; 4½" H × 15" W × 10" D.. $480

550. Similar to 500 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; 3½" H × 12¼" W × 13¾" D; 11.15 lb (without battery) $630

HC-550. Hard carrying case for 550..... $60

350 Cassette Deck

Stereo record/play deck with Dolby noise reduction system and dc servomotor. Features tape selector; full automatic shut-off; three low-impedance microphone inputs with mixing. 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; 3½" H × 7⅓" W × 9½" D..... $440

HC-350. Carrying case with built-in 12-V lead-acid battery and recharging circuit; 12-hr charge for 2-hr continuous recording with 350; 10½" H × 9½" W × 3¾" D; 4.5 lb..... $125

ONKYO

TA-2080 Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system and two-channel Dolby recording calibrations, PLL dc servo

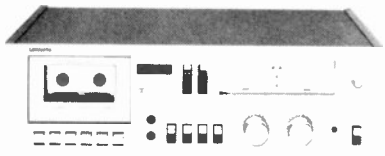
and 2 and DIN) and 50 mV/8-16 ohms (headphone); fast-winding time 85 sec (C-60)..... $350

KX-830 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc motor, ac bias system (bias frequency 85 kHz), and hard permalloy recording/playback head and ferrite erase head. Features 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 recording indicator; two-way tape loading system; three-digit tape counter; two large illuminated VU meters with LED peak indicator. Wow and flutter 0.06% wrms, ±0.18% DIN; S/N 62 dB (Dolby on, normal tape), 64 dB (Dolby on, CrO_2 tape); frequency response 35-13,000 Hz ±3 dB (normal tape), 35-16,000 Hz ±3 dB (CrO_2 tape), 35-15,000 Hz ±3 dB (Ferri-CrO_2 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; 6⁹/₁₆" H × 16¹⁵/₁₆" W × 13¹/₁₆" D..... $325

KX-650 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc motor, ac bias system (85 kHz frequency), and hard permalloy record/play and ferrite erase heads. Features full auto stop; three-position equalization selector for normal, chrome, and reserve tapes; two-position bias for normal and chrome; LED Dolby and recording indicators; mic/DIN-line-att mic/DIN input selector; illuminated VU meters; three-digit tape counter; two mic jacks and headphone jack. Wow and flutter 0.05% wrms; frequency response 40-13,000 Hz (normal), to 15,000 Hz (CrO_2 and ferri-chrome), all ±3 dB; S/N 62 dB (normal with Dolby), 64 dB (CrO_2 and ferri-chrome with Dolby); HD less than 1.5% at 1000 Hz, 0 VU with normal tape; input sensitivity/impedance 77.5 mV/80k ohms (line 1 and 2), 16.0 mV/3.3k ohms (DIN), −12 dB (att mic/DIN), 0.19 mV/10k ohms (mic 1 and 2); output level/load impedance 775 mV at 0 VU/100k ohms (lines 1 and 2 and DIN), 48.9 mV/8-16 ohms (headphone); fast-winding time 85 sec (C-60); 6³/₈" H × 17⁹/₁₆W × 13¹⁵/₁₆" D..... $299
KX-550. Similar to KX-650 minus LED Dolby indicator and mic/DIN-line-att mic/DIN input selector; has two-position equalization selector for normal and chrome tapes; input sensitivity/impedance 77.5 mV/100k ohms (lines 1 and 2), 16.0 mV/2k ohms (DIN), 0.15 mV/10k ohms (mic 1 and 2); output level/load impedance 489 mV at 0 VU/100k ohms (lines 1 and 2 and DIN), 48.9 mV/8-16 ohms (headphone); 6¹/₄" H × 15³/₄" W × 11¹/₁₆" D... $235

LAFAYETTE

RKD-600 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc motor, and three-head design with separate recording and playback heads in single housing and true monitoring off playback head. Features air-damped cassette eject system; "feather-touch" control keys; full auto stop; two VU meters with dual peak LEDs; mic/line mixing; memory rewind; independent bias and equalization; monitor switch; MPX filter; output control. Frequency response 40-16,000 Hz (CrO tape); wow and flutter 0.06%; S/N −63 dB (Dolby on); less than 2% dist.; 5¹/₄" H × 16¹/₄" W × 11³/₄" D..... $300



RKD-225 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system, dc servomotor, and permalloy head. Features 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; dual VU meters with peak LED; auto shut-off; independent bias and equalization; memory rewind. Frequency response 30-13,000 Hz (FeO_3 tape); wow and flutter 0.09%; S/N greater than 60 dB (Dolby on); 6⁷/₈" H × 17⁹/₁₆" W × 12" D..... $200

RKD-150 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system and electronically-controlled dc motor. Features auto shut-off; independent bias and equalization; independent record level controls; dual mic inputs; dual VU meters with peak LED; 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%; 5¹/₂" H × 16¹/₂" W × 11³/₄" D..... $150

LENCO

C-2003 Cassette Deck
Stereo cassette deck with Dolby noise-reduction system. Features automatic tape selection switching for CrO_2 tape, manual for three others; switchable multiplex filter; mono switch; two peak level indicators; ±2.5% speed regulation during playback; ferrite erase and record heads and hard permalloy play head; three-digit tape counter with "zero stop." 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 μV 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). 85 mm H × 285 mm W × 460 mm D..... $795

RAC 10 Auto Cassette Changer
Automatic cassette changer plays 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 × 252 mm × 210 mm..... $695

LUX

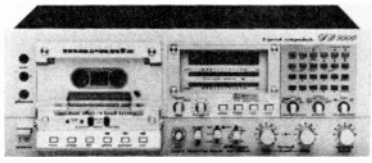
Luxman Laboratory Reference Series

5K50 Cassette Deck
Front-loading metal-compatible stereo cassette deck with processed dc record/playback amp circuitry, quartz-locked direct-drive dual capstan motor and two coreless reel motors, ferrite record and erase and Sendust playback heads, and Dolby noise-reduction system. Features four-digit, seven-segment LED electronic tape counter display (also reads record/playback time in min and sec) with memory and reset; fluorescent green 24-dot/ch plasma level meter with upper 12 dots for peak hold; variable bias with "Bridge Recording by Bias Current and Signal Current"; azimuth adjustment with two lamps; search cue/review; IC logic-controlled operations; equalization for normal, CrO_2, and EX (metal) tapes; tape/source monitor switch; separate mic/line record level controls; rec mute; headphone jack; two mic jacks; 400 and 6000 Hz oscillator; provision for optional remote control. Wow and flutter 0.03% wrms; S/N with Dolby 66 dB (CrO_2), 65 dB (LH); frequency response 30-18,000 Hz (CrO_2), to 16,000 Hz (LH), both ±3 dB; dist. 1.2% with LH tape at 1000 Hz, 0 dB; separation 35 dB at 1000 Hz, 0 dB; crosstalk −60 dB at 1000 Hz, 0 dB; input sensitivity 100 mV (line), 0.25 mV (mic), 2 mV/1k ohms (DIN); output level 580 mV; headphone output 1 mW into 8 ohms; 5³/₁₆" H × 17¹³/₃₂" W × 14¹/₄" D..... $1995

K-12 Cassette Deck
Front-loading metal-compatible stereo cassette deck with processed dc recording/playback amps, FG servo capstan and electronic governor reel motors, Sendust record/playback and ferrite erase heads, and Dolby noise-reduction system. Features four-digit, seven-segment LED digital tape counter/timer; fluorescent green plasma level meter with peak hold function; IC logic-controlled operations controls; record mute; mic mixing; memory rewind; separate line/mic recording level controls; bias/equalization selector for normal, CrO_2, and EX (metal) tapes; provision for optional remote control; headphone jack. Wow and flutter 0.04% wrms; S/N with Dolby 69 dB (metal), 65 dB (CrO_2), 63 dB (LH); frequency response ±3 dB from 30-20,000 Hz (metal), to 18,000 Hz (CrO_2), and to 16,000 Hz (LH); dist. 1.2% with LH tape at 1000 Hz, 0 dB; input sensitivity/impedance 100 mV/50k ohms (line), 0.25 mV/50k ohms (mic), 30 mV/1k ohms (DIN); output level/impedance 580 mV/220 ohms (line in), 1 mW into 8 ohms (headphone); 4³¹/₃₂" H × 17¹/₄" W × 14⁹/₁₆" D..... $995
K-10. Similar to K-12 except has digital tape counter, electronic LED peak level meter, and auto rewind/playback; input sensitivity 0.45 mV (mic), 2 mV/1k ohms (DIN); output level 430 mV; headphone output 1.5 mW into 8 ohms; 5" H $695
K-5. Similar to K-10 except with bridge reel/capstan motor and two VU meters with LED peak indicator; no auto rewind/play, timer switch, rec mute, or mic recording level control; S/N with Dolby 65 dB (metal), 63 dB (CrO_2), 60 dB (LH); dist. 1.5% with LH tape at 1000 Hz, 0 dB; output level 580 mV; 5²⁹/₃₂" H × 17¹/₄" W × 10³/₈" D..... $495

MARANTZ

SD 9000 Cassette Compudeck
Two-speed (1⅞ and 3¾ ips) microprocessor-controlled metal-compatible front-loading stereo cassette deck with dual Dolby circuitry, Sendust alloy three-head system, and two servo-controlled motors. Compudeck microprocessor programming and selection circuitry features random access memory and sequential access memory playback programming keyboard of up to 19 music selections; keyboard tape counter start/stop and memory call with counter memory mode selector; timer on/off with clock functions; timer/counter/clock selector switch; program start/skip/pause with program mode selector. Additional features include four-digit LED counter/timer/program indicator display; LED peak level bar graph display; pushbutton normal, special/CrO_2, FeCr, and metal tape selectors with bias fine adjust (±15%); speed selector; separate mic and line record level controls; tape/source monitor switch; output level control; rec mute; electronic feather-touch tape function controls with LED play, pause, and record indicators; built-in record/playback timer; sensor total system shutoff; front-panel access for head adjustment..... $775



SD 8000. Similar to SD 9000 without tape/source monitor switch; has single-Dolby circuitry $650

SD 6000 Cassette Deck
Two-speed (1⅞ and 3¾ ips) metal-compatible front-loading cassette deck with Dolby noise-reduction system, Sendust alloy record/playback and erase heads, and two servo-controlled motors. Features LED bar graph peak-level meters; three-digit tape counter with reset and memory rewind/replay; pushbutton tape selector for normal, special/CrO_2, FeCr, and metal tapes with bias fine adjust (±15%); speed selector switch; record/playback timer; rec mute; separate mic and line record level controls; output level control; auto slack tape take-up; electronic feather-touch tape function controls with LED play, pause, and record indicators; total system sensor shut-off..... $500
SD 4000. Similar to SD 6000 without memory rewind/replay, bias fine adjust, auto slack take-up, output level control, and record/playback timer; has CompuSkip automatic sequential program selection

1 CASSETTE TAPE MACHINES

super ANRS/ANRS, non record, S&L (search and lock), or record mute modes, bias adjustment, high frequency equalization (flat response at 10,000 Hz ±1.0 dB accuracy), ±0.5 dB tape sensitivity adjustment, and error detection and correction with LED peak indicators at −10, −5, 0, +3, and +6 dB; solenoid controlled tape function controls; timer standby with music wake-up; three-digit tape counter with memory stop and play; real-time pause; provision for optional remote control; two-stepped gear/oil-damped cassette lid; fast forward/rewind time 85 sec (C-60). Wow and flutter 0.035% wrms; frequency response at 20 VU ±1 dB with computer 40-12,500 Hz (metal, SA/chrome, and normal), at ±3 dB 25-17,000 Hz (metal and SA/chrome), to 16,000 Hz (normal), at 0 VU 25-12,000 Hz ±3 dB (metal), to 8000 Hz (SA/chrome); THD 1.0% at 0 VU, 1000 Hz (metal); S/N 60 dB without ANRS, improved 5 dB at 1000 Hz and 10 dB above 5000 Hz with ANRS; crosstalk −65 dB at 1000 Hz; channel separation 35 dB at 1000 Hz; input sensitivity/impedance 0.2 mV/600-10,000 ohms (mic), 80 mV/70k ohms (line); output level/impedance 0-300 mV/3-8k ohms (line), 0-0.5 mW/8-1k ohms (headphone); 4⅞" H × 17 11/16" W × 15⅜" D $750

KD-A77. Similar to KD-A8 without computerized B.E.S.T. tuning system; has recording equalizer switch and combination three-head record/playback and two-gap SA erase heads; wow and flutter 0.04% wrms; frequency response at 20 VU ±3 dB 25-18,000 Hz (metal and SA/chrome); 4¾" H × 17¾" W × 15" D $550

KD-A7. Similar to KD-A77 without multi-LED peak level indicators and three-head monitor switch; has fluorescent 12-level spectro peak indicators set at 60, 150, 400, 1000, 2400, 6000, and 15,000 Hz, X-cut SA record/playback and two-gap SA erase heads, and recording equalizer circuit; frequency response at 20 VU with metal and SA/chrome tapes 25-17,000 Hz ±3 dB; 12⅞" D $500

KD-A6. Similar to KD-A7 without fluorescent spectro peak indicator; has ±10% pitch control; 12 7/16" D $480

KD-85 Cassette Deck

Front-loading stereo cassette deck with super ANRS noise-reduction system and recording equalizer circuit; has FG servo capstan and dc reel motors, and Sen-Alloy record/playback and double-gap ferrite erase heads. Features pushbutton 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 ±3 dB (normal) and to 17,000 Hz (SA/chrome); S/N 57 dB; wow and flutter 0.04% wrms; THD 0.4%; 6¼" H × 17¾" W × 12⅞" D $530

KD-65 Cassette Deck

Front-loading stereo cassette deck with super ANRS noise-reduction system and recording equalization, FG dc servomotor, and Sen-Alloy record/playback and double-gap erase heads. Features 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 30-17,000 Hz ±3 dB (chrome tape); S/N 57 dB, 66 dB (above 5 kHz with ANRS); wow and flutter 0.05% wrms; THD 0.5%; 6¼" H × 17¾" W × 12⅞" D $430

KD-1636II Portable Cassette Deck

Top-loading portable stereo cassette deck with super ANRS noise-reduction system, electronic governor coreless dc motor, and Sen-Alloy record/playback and double-gap ferrite erase heads. Features 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 ±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 × 14⅝" W × 9 11/16" D $400

KD-S201 Cassette Deck

Front-loading stereo cassette deck with super ANRS noise-reduction system, FG dc servomotor, and Sen-Alloy record/playback and double-gap ferrite erase heads. Features pushbutton 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 ±3 dB (chrome tape); S/N 56 dB, 66 dB (above 5 kHz with ANRS); wow and flutter 0.06% wrms; THD 0.5%; 6 9/16" H × 19 11/16" W × 14⅛" D $390

KD-1770II Cassette Deck

Top-loading stereo cassette deck with super ANRS noise-reduction system, FG dc servomotor, and Sen-Alloy record/playback and double-gap ferrite erase heads. Features independent drive system for both capstan and reels; twin five-LED peak indicators for left and right channels; three-position (six pushbuttons) bias and equalization selection; mic/line mixing; memory rewind; mirrored VU meters; photocell automatic tape-end stop. Frequency response 30-16,000 Hz ±3 dB (chrome tape); S/N 56 dB, 66 dB (above 5 kHz with ANRS); wow and flutter 0.05% wrms; THD 0.5%; 4 15/16" H × 16¾" W × 10⅞" D $380

KD-A5 Cassette Deck

Front-loading metal-compatible stereo cassette deck with super ANRS, electronic governor dc motor in two-motor transport system, and SA record/playback and two-gap SA erase heads. Features solenoid-controlled tape function controls; record mute; two VU meters with five-LED peak level indicators; record/play timer standby; tape select switch for high bias, FeCr, SF/normal, SA/CrO_2, and metal tapes; three-digit tape counter with reset; remote control provision; two-stepped gear/oil-damped cassette lid; fast-forward/rewind time 85 sec (C-60). Wow and flutter 0.04% wrms; frequency response at 20 VU, ±3 dB 30-16,000 Hz (metal and SA/chrome), to 15,000 Hz (normal), at 0 VU ±3 dB 30-12,500 Hz (metal), to 8000 Hz (SA/chrome); THD 1.0% at 0 VU, 1000 Hz (metal); S/N 60 dB with metal, improved 5 dB at 1000 Hz and 10 dB above 5000 Hz with ANRS; crosstalk −65 dB at 1000 Hz; channel separation 35 dB at 1000 Hz; input sensitivity/impedance 0.2 mV/600-10,000 ohms (mic), 78 mV/100k ohms (line); output level/impedance 0-300 mV/3-6k ohms (line), 0-0.3 mW/8-1k ohms (headphones); 4¾" H × 16 9/16" W × 11⅞" D $360

KD-A3. Similar to KD-A5 except has piano-key tape function controls; no provision for remote control; fast forward/rewind 80 sec (C-60); wow and flutter 0.055% wrms; DIN input sensitivity/impedance 0.1 mV/1k or 10k ohms switchable; DIN output level/impedance 0-300 mV/5k ohms; 5⅞" H × 16 9/16" W × 10 5/16" D $300

KD-2 Portable Cassette Deck

Top-loading portable stereo cassette deck with super ANRS, electronic governor coreless dc motor, and SA record/playback and two-gap ferrite erase heads. Features three-way power source (ac, 6 V dc, or four "D" batteries); left/right master recording/volume control; three-position input switch; two round VU meters; separate headphone amp with level control; piano-key tape function controls; dual-ball cassette hold system; fast-forward/rewind time 90 sec (C-60). Wow and flutter 0.09% wrms; frequency response ±3 dB 30-16,000 Hz (SA/chrome), to 15,000 Hz (normal); THD 1.2% at 0 VU, 1000 Hz; S/N 57 dB, improved 5 dB at 1000 Hz and 10 dB above 5000 Hz with ANRS; weighs 8.8 lbs with batteries; 3¾" H × 10⅞" W × 11⅜" D $350

KD-25 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, FG dc servomotor, and Sen-Alloy record/playback and double-gap ferrite erase heads. Features three-position bias and equalization selection; five LEDs for multi-point (−10, −5, 0, +3, +6 dB) peak level indication; automatic input selector for 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 ±3 dB (chrome tape); S/N 56 dB, 66 dB (above 5 kHz with Dolby); wow and flutter 0.06%; THD 0.5%; 5⅞" H × 16 9/16" W × 10 7/16" D $270

KD-10. Similar to KD-25 except has Cronios record/playback and two-gap ferrite erase heads and tape amount scale; channel separation 30 dB at 1000 Hz $210

KD-A1. Similar to KD-10 without five-LED peak level indicators; has direct-access cassette well and single record level control; wow and flutter 0.08% wrms; THD 1.4% at 0 VU, 1000 Hz; S/N 57 dB, 67 dB with Dolby; 5⅞" H × 15⅜" W × 10⅝" D .. $180

KENWOOD

KX-1030 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc motor, ac bias system (bias frequency 85 kHz), and three ferrite heads for record, rewind, and erase. Features 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 recording indicator; tape monitor; three-digit tape counter; two large illuminated VU meters with LED peak indicator. Wow and flutter 0.06% wrms; S/N 65 dB (Dolby on, normal tape), 67 dB (Dolby on, CrO_2 tape); frequency response 35-15,000 Hz ±3 dB (normal tape), 35-18,000 Hz ±3 dB (CrO_2 tape), 35-17,000 Hz ±3 dB (Ferri-CrO_2 tape); HD 1.3% at 1 kHz, 0 VU with normal tape; fast-winding time 80 sec (C-60); line 1 input 77.5 mV at 56k ohms, line 2 input 0.1 mV at 1k ohm; line output 775 mV; headphone impedance 8-16 ohms; 6 9/16" H × 16 15/16" W × 13 1/16" D $450

KX-760 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc motor, ac bias (85-kHz frequency), and hard permalloy record/playback and ferrite erase heads. Features three-position bias and equalization selectors for normal, chrome, and reserve tapes; multiplex filter; separate line and mic input volume controls; audio timer; memory index; LED record/Dolby/memory index indicators; full auto shutoff; independent record/playback level controls; illuminated cassette compartment; three-digit tape counter; headphone jack; two mic jacks with left-channel doubling as mono mic jack; two illuminated VU meters. Wow and flutter 0.05% wrms, ±0.18% (DIN); frequency response 40-13,000 Hz (normal) and to 15,000 Hz (CrO_2 and ferri-chrome), all ±3 dB; S/N (DIN weighted) 62 dB (normal with Dolby), 64 dB (CrO_2 with Dolby); HD 1.0% at 1000 Hz, 0 VU with normal tape; input sensitivity/impedance 77.5 mV/50k ohms (line 1 and 2), 10.9 mV/1.5k ohms (DIN), 0.2 mV/10k ohms (mic 1 and 2); output level/load impedance 775 mV at 0 VU/100k ohms (lines 1

CD4015 Cassette Deck

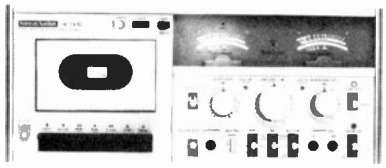
Front-loading stereo cassette deck with Dolby noise-reduction system, dc-governor motor in capstan drive, and ferrite and Mu-Metal heads; has tape selector switch for normal and CrO_2 tape; two record level/VU meters; one dual input level control; wow and flutter 0.09% wrms; S/N 50 dB (Dolby off), 56 dB (Dolby on); frequency response 40-11,000 Hz ±3 dB (normal tape), 40-13,000 Hz ±3 dB (CrO_2 tape); THD 1.8% at 0 VU; 5¾" H × 15" W × 8⅛" D $150

CR4013. Similar to CD4015 except has two LED VU meters $170

HARMAN/KARDON

hk 3500 Cassette Deck

Three-head, dual-motor, front-loading stereo cassette deck with Dolby noise-reduction system; dual permalloy record/play head for tape monitoring;



capstan drive and fast forward/reverse motors; phase compensation in record mode. Features twin lighted peak-reading record/play VU meters calibrated from −40 to +6 dB with two LED tape overload indicators and flashing LED record indicator; separate Dolby record and playback electronics; three-position bias and equalization controls for low-noise, FeCr, and CrO_2 tapes; colinear variable bias trim control; test signal generator for Dolby (400 Hz) and bias (8000 Hz) calibration; separate level controls for microphone input, line input, and playback; tape counter with memory control; tape motion indicator; headphone monitor amplifier; spring-loaded record mute switch; headphone and two mic jacks; variable speed control for playback; fast-winding time 60 sec (C-60). Wow and flutter 0.05% wrms; frequency response 20-17,500 Hz (low-noise, FeCr, CrO_2); THD 1.2% at 3 dB below Dolby level; S/N 65 dB; microphone sensitivity 0.5 mV; low-level line sensitivity 50 mV; high-level line sensitivity 200 mV; channel separation 37 dB; channel crosstalk 65 dB; input impedance 600 ohms (microphone), 30k ohms (aux., low level), 50k ohms (aux., high level); headphone impedance 8 ohms $549

hk 2500 Cassette Deck

Stereo cassette deck with Dolby noise-reduction system, dc servo-controlled motor, and permalloy record/play head. Features 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 and flashing record "pause" indicator; tape counter with memory control; tape motion indicator; headphone monitor amplifier; spring-loaded record mute switch; subsonic filter; Dolby FM filter "off" position for mic/phono recording; fast-winding time 75 sec (C-60). Wow and flutter 0.06% wrms; frequency response 20-16,000 Hz ±3.0 dB (low noise, FeCr, CrO_2); THD 1.5% (3 dB below Dolby level); S/N 63 dB; sensitivity (microphone) 0.5 mV, (line) 50 mV; channel separation 35 dB; channel crosstalk 62 dB; microphone input impedance 1000 ohms; headphone impedance 8 ohms .. $359

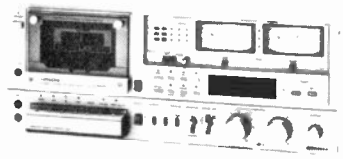
hk 1500 Cassette Deck

Stereo cassette deck with Dolby noise-reduction system, dc servo-controlled motor, and permalloy record/play head. Features 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 for low-noise and CrO_2 tapes; three-digit tape counter; tape motion indicator; headphone monitor amplifier; Dolby-on LED; record-on LED; two microphone inputs; fast-winding time 75 sec (C-60). Wow and flutter 0.06% wrms; THD 1.5%; frequency response 30-15,000 Hz ±3.0 dB (low noise, CrO_2); S/N 63 dB; sensitivity (microphone) 0.5 mV, (line) 50 mV; channel separation 35 dB; channel crosstalk 60 dB; microphone input impedance 1000 ohms; headphone impedance 8 ohms $279

HITACHI

D-5500 Cassette Deck

Front-loading microcomputer-controlled stereo cassette deck with Dolby noise-reduction system, Uni-



torque direct-drive capstan and dc servo reel motors, dual-capstan transport, and closed-gap ferrite record/playback and erase heads. Features microcomputerized automatic bias and equalization calibration with pushbutton test, three memory, tape formulation (CrO_2, normal, and FeCr), and manual controls with bias and equalization level meters; infra-red wireless remote control with tape function controls and LEDs (operates within 32-ft radius or can be inserted in front panel when not in use); two VU meters with three LED peak indicators at +7, +5, and +3 dB; auto rewind play/stop; rec mute; separate line and mic/DIN record level controls; output level control; tape/source monitor switch; three-digit tape counter with reset; air-damped cassette eject; fast forward/rewind time 90 sec (C-60). Wow and flutter 0.028% wrms; frequency response ±3 dB in manual position using Hitachi tape 30-18,000 Hz (normal and FeCr), to 19,000 Hz (CrO_2), in test position of Automatic Tape Response System using other tapes 30-18,000 Hz (normal and FeCr), to 20,000 Hz (CrO_2); dist. 1.2% at 0 VU, 1000 Hz; S/N (A weighted, 3.0% THD) 68 dB with Dolby, 60 dB without Dolby; input sensitivity/impedance 60 mV/100k ohms (line), 0.35 mV/300-5000 ohms (mic); output level 550 mV; 7⅜" H × 17⅛" W × 12⅝" D $1200

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; includes handles $700

D-980 Cassette Deck

Front-loading stereo cassette deck with dual-Dolby noise-reduction system and built-in Dolby Calibration Control System for specific tape fine tuning, Unitorque direct-drive capstan and dc servo reel motors, closed-gap ferrite record/playback and erase heads, and dual capstan, closed-loop transport. Features separate bias and equalization switches for normal, CrO_2, and FeCr tapes with bias adjust; graphic operations mode indicator; TTL ic logic tape function controls; edit button; auto rewind play/stop; tape/source monitor; separate line and mic/DIN record level controls; output level control; dual VU meters with 0, +3, and +7 LED peak indicators; fast forward/rewind time 90 sec (C-60). Wow and flutter 0.03% wrms; frequency response ±3 dB 30-17,000 Hz (normal and FeCr), to 18,000 Hz (CrO_2); dist. 1.3% at 0 VU, 1000 Hz; S/N (A weighted, 3.0% THD) 67 dB with Dolby; input sensitivity/impedance 60 mV/100k ohms (line), 0.35 mV/300-5000 ohms (mic); output level 550 mV; 6½" H × 17⅛" W × 10" D $550

D-75S Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc capstan and dc reel motors, and Sendust record/playback and double-gap ferrite erase heads. Features fluorescent bar graph VU/peak-reading meter display; four-position tape selector for normal, FeCr, CrO_2, and metal tapes; record level control with line/mic input selector; output level control; feather-touch logic tape function controls; auto rewind and auto play switch; rec mute; three-digit tape counter with reset; fast forward and rewind time 90 sec (C-60). Wow and flutter 0.04% wrms; frequency response ±3 dB 30-15,000 Hz (normal and FeCr), to 16,000 Hz (CrO_2), to 17,000 Hz (metal); dist. 1.2% at 0 VU, 1000 Hz; S/N (A weighted, 3.0% THD) 66 dB with Dolby; input sensitivity/impedance 60 mV/47,000 ohms (line), 0.38 mV/300-5000 ohms (mic); output level 500 mV; 4⅜" H × 17⅛" W × 10½" D $400

D-40S. Similar to D-75S but has SL permalloy record/playback and erase heads, "Power-Assisted" piano-key tape function controls, two VU meters with five-LED peak-reading indicators, and three-position tape select buttons for normal, CrO_2, and FeCr tapes; no output level control or metal compatibility $240

D-850 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, three-head system for tape monitoring encompassing ferrite tape heads, and dual-capstan servo motors. Features power-assisted controls; three-position bias and equalization; 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 ±3 dB (normal tape), 30-16,000 Hz (CrO_2), 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; 5¾" H × 17⅛" W × 10" D $399

D-580 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, dc servo capstan and dc reel motors, and SL permalloy record/playback and erase heads. Features ic logic tape function controls; auto play and auto rewind switch; rec mute and pause; three-position bias and equalization selectors for normal, FeCr, and CrO_2 tapes; dual VU meters with +3 and +7 LED peak indicators; separate line and mic record level controls with built-in mic amplifier; output level control; three-digit tape counter with reset; fast forward/rewind time 90 sec (C-60). Wow and flutter 0.04% wrms; frequency response ±3 dB 20-15,000 Hz (normal), to 16,000 Hz (FeCr), and to 18,000 Hz (CrO_2); dist. 1.5% at 0 VU, 1000 Hz; S/N (A weighted, 3.0% THD) 66 dB with Dolby; input sensitivity/impedance 80 mV/47,000 ohms (line), 0.38 mV/3300 ohms (DIN and mic); output level 500 mV; 5⅝" H × 17⅛" W × 10" D $380

D230 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, dc servomotor drive, and two hard permalloy SL heads. Frequency response 30-12,500 Hz ±3 dB (normal tape), 30-14,000 Hz ±3 dB (CrO_2 and FeCr); S/N 58 dB (Dolby on), 53 dB (Dolby off); wow and flutter 0.09% wrms; 10" H × 15⅜" W × 5⅝" D $180

JVC

KD-A8 Cassette Deck

Front-loading computerized metal-compatible stereo cassette deck with Super ANRS (automatic

noise reduction system), X-cut SA (Sen-Alloy) record/playback and two-gap SA erase heads, and FG dc servo capstan and dc reel motors in ID (independent drive) tape transport. Features computer-controlled B.E.S.T. (bias, equalization, and sensitivity of tape) Tuning System which automatically detects SF/normal, FeCr, SA/CrO_2, or metal tape,

1 CASSETTE TAPE MACHINES

dual-capstan twin-belt closed-loop drive system, and Sendust record/playback head and erase head in direct load and lock system with automatic head

protection. Features computerized logic solenoid tape function controls; electronic fade/edit; auto reverse; 8% variable pitch control; equalized LED peak-level bar-graph indicators; switchable limiter; switchable multiplex filter; timer provision for optional external timer; memory stop and play; separate line/DIN and mic input selectors; line/mic mixing; headphone level control; six-position bias and equalization selector for Fe, Fe I, Cr, Cr II, FeCr, and metal tapes; auto tape-slack prewind; provision for optional remote control; fast forward/rewind time 65 sec (C-60). Wow and flutter 0.03% wrms; frequency response ±3 dB 20-18,000 Hz (Fe), to 19,000 Hz (CrO_2 and FeCr), to 20,000 Hz (metal); HD 0.4%; S/N with Dolby 67 dB (Fe and CrO_2), 69 dB (FeCr), 70 dB (metal); 5¾" H × 17⁹⁄₁₆" W × 13⅜" D $850

C830. Similar to C839 without computerized logic solenoid tape function controls, auto reverse, playback, and record, auto tape-slack prewind, and timer and remote control provision with optional timer and remote control unit; has PLL dc servomotor with i-f generator, true monitor capability, twin-belt drive system, and logic-controlled intermode switching; wow and flutter 0.035% wrms; frequency response ±3 dB 20-17,000 Hz with Fe tape and to 18,000 Hz with CrO_2 ..... $500

C820 Cassette Deck

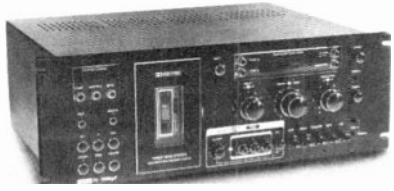
Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, high-torque dc servomotor with i-f generator, twin-belt drive system, direct load and lock system, and Sendust record/playback head. Features equalized LED peak-level indicators; two-way memory stop; switchable multiplex filter; switchable limiter; logic-controlled intermode switching; six-position bias and equalization; separate line and mic input level controls; auto shutoff; fast forward/rewind time 65 sec (C-60). Wow and flutter 0.04% wrms; frequency response 20-16,000 Hz (Fe), to 17,000 Hz (CrO_2), to 18,000 Hz (FeCr), to 19,000 Hz (metal); HD 0.5%; S/N with Dolby 64 dB (Fe and CrO_2), 67 dB (FeCr and metal); 5¾" H × 17⁹⁄₁₆" W × 13⅜" D $420

C810. Similar to C820 without two-way memory stop and switchable limiter; not metal compatible; has three-way bias/equalization and hard permalloy record/playback head; frequency response ±3 dB 20-16,500 Hz (CrO_2) and to 17,000 Hz (FeCr); S/N with Dolby 63 dB (Fe and CrO_2), 66 dB (FeCr). $330

EUMIG USA, INC.

FL-1000 Cassette Deck

Front-loading microprocessor-controlled metal-



compatible stereo cassette deck with Dolby noise-reduction system, three separate heads, and opto-electronic capstan control. Features logic-controlled solenoid tape function controls; 24-segment/channel fluorescent level display with switchable VU, peak-reading, and peak-hold functions; separate 400- and 16,000-Hz oscillators; bias controls for metal, high bias, and normal bias tapes; master fader for mic/line and line/line mixing; variable output control; LED digital counter display with reset, memory, and go to controls; speed accuracy 15,000 times/sec; rack-mountable $1500

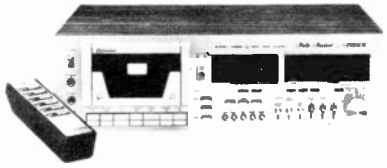
CCD Cassette Deck

Top-loading stereo cassette deck with Dolby noise-reduction system, opto-electronic servo-controlled capstan motor, dc-controlled mixing circuits, and three heads. Features logic solenoid tape function controls with LEDs; LED display record-level indicators; built-in tone generator; three-digit tape counter with reset and memory rewind; full-function remote control; automatic or manual record level setting; separate headphone volume control. Wow and flutter 0.05% wrms; frequency response 20-20,000 Hz ±3 dB (FeCr and CrO_2), 30-16,000 Hz (ferric); S/N with Dolby 72 dB (FeCr), 68 dB (CrO_2), and 66 dB (ferric); 5.4" H × 17.1" W × 11.8" D $1300

FISHER

CR5150 Cassette Deck

Front-loading solenoid-operated cassette deck with dual Dolby noise-reduction system, dc servo and dc



governor motors with capstan drive, and three ferrite heads. Features full-function wireless remote control, electronic digital tape counter display with built-in timer, two illuminated VU meters, tape selector switch for normal, CrO_2, and FeCr tapes, and defeatable FM subcarrier filter. Wow and flutter 0.04% wrms; frequency response ±3 dB 30-15,000 Hz (normal), 30-18,000 Hz (CrO_2); THD 1.4%; S/N 55 dB (Dolby off), 64 dB (Dolby on); channel separation 40 dB; signal crosstalk −70 dB; input sensitivity/impedance 0.2 mV/600-10,000 ohms (mike), 100 mV/100,000 ohms (aux., FM Dolby); output 1 V/5000 ohms at 0 VU (line); walnut-grain vinyl veneer finish; 5⅓" H × 17⅓" W × 11⅞" D $700

CR5125. Similar to CR5150 without electronic digital tape counter/timer display; has dual capstan drive and wireless remote control editing; black finish; 4¾" H × 17⅓" W × 12¼" D $500

CR4029 Cassette Deck

Front-loading two-speed (1⅞ and 3¾ ips) metal-compatible cassette deck with dual Dolby noise-reduction system, dc servo motor, capstan drive, and three VHT/Sendust heads. Features four position bias and equalization selectors for metal particle, normal, FeCr, and CrO_2 tapes with bias fine adjust; tape source monitor switch; two illuminated VU meters; LED tape, source, Dolby, and record indicators; piano-key function buttons; and mic/line input selector. Wow and flutter 0.06% wrms (1⅞ ips), 0.05% wrms (3¾ ips); frequency response ±3 dB at 1⅞: 30-14,000 Hz (normal), to 16,000 Hz (CrO_2 and FeCr), to 18,000 Hz (metal), ±3 dB at 3¾: 30-20,000 Hz (normal), 30-22,000 Hz (CrO_2 and FeCr), 30-25,000 Hz (metal); THD 1.5% at 0 VU (1⅞), 1.2% at 0 VU (3¾); S/N 52 dB (Dolby off), 62 dB (Dolby on); channel separation 45 dB; signal crosstalk −70 dB; input sensitivity/impedance 0.2 mV/600-10,000 ohms (mike), 100 mV/100,000 ohms (line); output 1 V/5000 ohms (line); walnut-grain vinyl veneer finish; 4¾" H × 17⅓" W × 12¼" D..... $500

CR4031 Cassette Deck

Front-loading two-speed metal-compatible cassette deck with Dolby noise-reduction system, dc governor motor, capstan drive, and two Sendust/ferrite heads. Features Auto Search Function (automatically locates the next gap in tape selection) with search cue button, two illuminated VU meters, metal and standard tape bias and equalization, tape selector switch for normal, CrO_2, FeCr, and metal tapes, and piano-key function buttons. Wow and flutter 0.07% wrms (1⅞), 0.06% wrms (3¾); frequency response ±3 dB at 1⅞: 30-14,000 Hz (normal), to 15,000 Hz (CrO_2 and FeCr), to 16,000 Hz (metal), at 3¾: 30-20,000 Hz (normal), to 22,000 Hz (CrO_2 and FeCr), to 23,000 Hz (metal); THD 1.8% (1⅞), 1.6% (3¾); S/N 52 dB (Dolby off), 62 dB (Dolby on); channel separation 42 dB; signal crosstalk −70 dB; input sensitivity/impedance 0.2 mV/600-10,000 ohms (mike), 100 mV/100,000 ohms (line); output 1 V/5000 ohms (line); walnut-grain vinyl veneer finish; mounting hardware included; 4¾" H × 17⅓" W × 12¼" D..... $350

CR4028. Same as CR4031 without mounting hardware..... $350

CR4027. Similar to CR4031 without metal tape capability; has two super permalloy/ferrite heads; wow and flutter 0.08% wrms (1⅞), 0.07% wrms (3¾); THD 2% at 0 VU (1⅞), 1.8% at 0 VU (3¾); channel separation 40 dB $300

CR5120 Cassette Deck

Front-loading stereo cassette deck with dual Dolby circuitry, dc Hall Element servomotor and dc governor motor, and 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 (CrO_2 tape); THD at 0 VU 1.4%; tape speed variation ±0.8%; fast-winding time 84 sec. Features two VU meters and LED peak-indicators; 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, CrO_2 and FeCr tape; memory rewind; walnut-grain vinyl veneer finish; 6⅝" H × 17⅛" W × 12½" D $350

CR5115 Cassette Deck

Front-loading stereo cassette deck with dual Dolby circuitry, dc servomotor, and 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 ±3 dB (normal tape), 30-17,000 Hz ±3 dB (CrO_2 tape); THD at 0 VU 1.5%; tape speed variation ±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, CrO_2, and FeCr tape; walnut-grain vinyl veneer finish; 6⅝" H × 16⅜" W × 11¾" D..... $280

CR4016 Cassette Deck

Front-loading two-speed cassette deck with Dolby noise-reduction system, dc servo motor, capstan drive, and two super permalloy/ferrite heads. Features electronic tape speed change, CrO_2/normal bias and high/low equalization switches, two illuminated VU meters, tape selector switch. Wow and flutter 0.1% wrms (1⅞), 0.09% wrms (3¾); frequency response ±3 dB at 1⅞: 40-13,000 Hz (normal), to 14,000 Hz (CrO_2), ±3 dB at 3¾: 40-18,000 Hz (normal), to 19,000 Hz (CrO_2); S/N 50 dB (Dolby off), 60 dB (Dolby on); THD 2.2% (1⅞), 1.9% (3¾); channel separation 40 dB; signal crosstalk −70 dB; input sensitivity/impedance 0.2 mV/600-10,000 ohms (mike), 100 mV/100,000 ohms (line); walnut-grain vinyl veneer finish; 5¼" H × 17⅓" W × 9½" D..... $250

CR4025 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, dc-governor motor in capstan drive system, and ferrite and Mu-Metal heads. Features tape selector switch for normal and CrO_2 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 ±3 dB (normal tape), 40-14,000 Hz ±3 dB (CrO_2 tape); THD 1.8% at 0 VU; fast-forward and rewind time 100 sec; 6" H × 15⅛" W × 11⅞" D $200

automatically locates song on cassette in fast forward or reverse; other features include auto replay; auto shut-off in all modes; combined battery indicator, tuning meter, and record level indicators; CrO_2 tape switch; auxiliary input for recording from second tape deck; FM muting; loudness control; hi-filter switch; separate balance, bass, treble, and volume controls; built-in stereo mics; two 4¾-in woofers and two 1⅝-in tweeters; jacks for headphones, external mics, speakers and remote control; retractable telescopic swivel antenna and carry handle. Wow and flutter 0.15% wrms; output 2 W/channel continuous; tape frequency response 50-10,000 Hz, 50-12,000 Hz with CrO_2; runs on 6 "D" batteries (not included), house current, or car's power supply with optional adapter; 9.7" H × 17.6" W × 5.0" D..... $340

SK-1 Portable Cassette Recorder
Portable cassette recorder with AM-stereo FM radio has auto stop, fast forward, rewind, pause, review/preview, built-in stereo mics, loudness control, two 4¾-in speakers, and balance, tone and volume controls; jacks for external microphones, speakers, remote control, and turntable. Wow and flutter 0.15% wrms; frequency response 60-10,000 Hz; S/N 46 dB; output 2.0 W/channel continuous; 8.6" H × 15.4" W × 3.9" D..... $210

RK-356 AM-FM/TV-Cassette Recorder
Portable AM/FM radio and TV/audio cassette recorder with automatic sleep switch for timed shut-off and full band TV audio reception for channels 2 through 13. Features fast forward, rewind, pause and auto-stop, volume and tone controls, 4¾-in speakers, and external jacks for speakers and mics; powered by batteries, house current, or car's power supply with adaptor. Wow and flutter 0.15% wrms; frequency response 60-10,000 Hz; S/N 50 dB; output 2.0 W continuous; 7.3" H × 12.1" W × 3.6" D. $125

RK-306 AM/FM/Cassette Recorder
Portable AM/FM radio and cassette recorder with LED record level/battery condition meter, built-in mic, auto shut-off, fast forward, rewind and pause, volume and tone controls, 4¾-in speaker, and external mic and speaker inputs; powered by batteries, house current or car's power supply with adaptor. Wow and flutter 0.15% wrms; frequency response 50-10,000 Hz; S/N 50 dB; output 2 W continuous; 7.3" H × 12.1" W × 3.6" D $105

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 × 6⅛" W × 11⅛" D $100

KD-11. Similar to KD-12 but has LED indicator for recording level and battery condition; ac bias and erase; remote mike jack with on/off external speaker jack $75

CHANNEL MASTER

HD-6007 Cassette Deck
Stereo play/record cassette deck features 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; 5⅜" H × 15" W × 10½" D..... $130

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. Features automatic stop; automatic level control; sleep switch; pushbutton tape controls; slide-lever tone and volume controls; slide-rule radio dial; telescopic antenna; will record direct from radio $60

TR-505 Mini Cassette Recorder
Mini cassette recorder with AM/FM radio and built-in condenser microphone; ac/dc operation with optional adapter. Features instant rewind and replay in recording mode; 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, adjustable shoulder strap, and carrying case..... $60

TR-404C Portable Cassette Recorder
Deluxe front-loading cassette recorder with AM-FM radio and built-in condenser microphone. Features LED tuning and battery check indicator; pushbutton controls; automatic shut off; automatic level control; sleep timer control; earphone and external microphone jacks; rod antenna; records live or direct from radio; ac/battery operation; 110/220 V switchable $55

TR-404A Portable Cassette Recorder
Combines front-loading ac/dc cassette recorder with AM/FM radio and built-in condenser microphone. Features automatic stop; automatic level control; switchable sound monitor; pushbutton 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. Features automatic stop; automatic level control; sound switch monitor; pause button; pushbutton and toggle control switches; slide-lever volume and tone controls; slide-rule type radio dial; 110/220 V switchable $50

TR-400A Portable Cassette Recorder
Portable cassette recorder with built-in condenser microphone; operates ac/dc with ac cord included. Features automatic stop; automatic level control; earphone, aux., and two mic jacks; 117 V ac.... $30

TR-500 Mini Cassette Recorder
Mini cassette recorder with built-in microphone; ac/dc operation with optional adapter; pause button; tape counter; automatic level control; earphone jack and earphone included $30

CONCEPT

ELC Cassette Deck
Front-loading stereo cassette deck with dual Dolby circuitry, dc electronic servo capstan and dc hi-torque hub motors, and sintered Alloy Linear Phase record/playback and ferrite erase heads. Features electronic logic solenoid-assisted tape function controls with LEDs; memory stop, auto play, auto repeat, and timer record and play with optional external timer controls; bias and equalization for Fe, FeCr, and special tapes; separate mic and line input level controls; output level control; two dB-calibrated recording level meters with LED peak-reading indicator; three-digit tape counter with reset; fast-forward/rewind time 75 sec (C-60). Wow and flutter 0.04% wrms; frequency response ±3 dB 30-16,000 Hz (CrO_2, FeCr, and special), to 14,500 Hz (Fe and normal); THD 1.0% at +3 dB, 0.3% typically; S/N 62 dB with Dolby; input sensitivity/impedance 60 mV/47k ohms (line), 0.27 mV/600 ohms (mic); output level/impedance 1.0 V at +3 dB/47 ohms (line), 100 mV/8 ohms (headphone); 5½" H × 19⅛" W × 11⅜" D..... $525

CRAIG

5201 Cassette Deck
Front-loading stereo cassette deck with dual Dolby circuitry. Features pushbutton bias/equalization for normal and CrO_2 tapes; full auto shutoff; mic/line input button; separate left/right record level controls; dual VU meters with Dolby level calibration; three-digit tape counter with memory rewind; viscous-damped cassette eject; pause control; fast forward/rewind time 120 sec (C-60). Wow and flutter 0.1% rms; frequency response 35-14,000 Hz ±3 dB (standard), 30-16,000 Hz ±2 dB (CrO_2); S/N 60 dB with Dolby; stereo separation 30 dB; crosstalk −50 dB; 6¼" H × 17" W × 11¾" D..... $300

H221 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system. Features separate bias and equalization pushbuttons for normal and high-performance tapes; auto shutoff; dual VU meters; separate left/right record level controls; three-digit tape counter with instant reset; pause control; pushbutton tape function controls; fast forward/rewind time 110 sec (C-60). Wow and flutter 0.15%; frequency response 40-12,500 Hz (standard), to 15,000 Hz (high-performance); S/N 50 dB with Dolby; stereo separation 30 dB; crosstalk −55 dB; 5¹³/₁₆" H × 15⅜" W × 10½" D..... $220

DENON

DR-750 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system, direct-detection servo-controlled

dual capstan system with dc coreless and dc governor motors, and Sendust tip, ferrite-core record/playback and ferrite erase heads. Features casted aluminum base construction; continuously variable bias adjust; tape selector for low-noise ferrichrome, chrome, cobalt, and normal tapes; pause/mute button; quick record button; separate mic and line level controls; three-digit tape counter with reset, memory rewind, and timer start controls; logic-controlled pushbutton tape function controls with LEDs; multiplex filter; dual peak/VU meters; LED residual tape status indicator; fast forward-rewind time 70 sec (C-60). Wow and flutter 0.04% wrms; frequency response ±3 dB 30-18,000 Hz (cobalt), to 16,000 Hz (LH tape with −20 dB MPX filter switch and Dolby out); HD 0.9% at 1000 Hz (LH); S/N 65 dB at 1000 Hz, 3.0% THD, Dolby on (cobalt); channel separation 35 dB at 1000 Hz; crosstalk −65 dB at 1000 Hz; input level/impedance −70 dB/10k ohms (mic), −20 dB/50k ohms (line); headphone load impedance 8 ohms at 1 mW; 303 mm H × 415 mm W × 226 mm D..... $1200

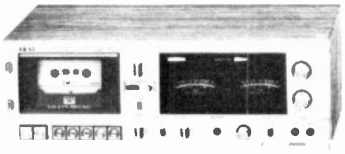
DR-250 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system, dc servo capstan and dc reel motors, and Sendust record/playback and double-gap ferrite erase heads. Features continuously variable bias adjust; three-position tape selector for LH, Fe-Cr, and cobalt tapes; muted recording/pause button; timer recording/playback provision; automatic repeat; auto rewind and memory stop; logic-controlled tape function buttons with LEDs; three-digit tape counter with reset; two VU meters with vertical three-color five-LED peak level indication array; fast-forward/rewind time 70 sec (C-60). Wow and flutter 0.05% wrms; frequency response ±3 dB 35-15,000 Hz (cobalt), to 14,000 Hz (LH); S/N 62 dB at 3.0% THD, Dolby on (cobalt); channel separation 35 dB at 1000 Hz; crosstalk −65 dB at 1000 Hz; input level/impedance −68 dB/10k ohms (mic), −21 dB/50k ohms (line); 8-ohm headphone load impedance at 0.7 mW; 147 mm H × 434 mm W × 267 mm D..... $430

DUAL

C839 RC Cassette Deck
Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, two-motor

1 CASSETTE TAPE MACHINES

reduction system, crystal ferrite and glass GX recording/playback and two erase heads, and elec-



tronically-controlled dc capstan and dc reel motors. Features illuminated feather-touch logic function controls; three-position auto reverse (allows one-way record/playback, two-way record/playback, or continuous playback/two-way recording); three-digit tape counter with memory search and LED; dual VU meters with LED +3/+7 dB peak level indicators; line/mic mixing; output level control; four-position bias and equalization for low noise, low noise/high output, CrO_2, and FeCr tapes; rec mute; timer start; LED Dolby; damped tape eject; two mic jacks; headphone jack; fast forward/rewind time 60 sec (C-60). Wow and flutter 0.045% wrms; frequency response ±3 dB 35-14,000 Hz (LH and LN), to 15,000 Hz (CrO_2), to 16,000 Hz (FeCr); dist. 1.0% (LN and LH), 1.5% (CrO_2 and FeCr); S/N without Dolby 55 dB (LN and LH), 56 dB (CrO_2 and FeCr); input sensitivity/impedance 0.25 mV/5k ohms (mic), 70 mV/100k ohms (line), 0.25 mV/2.2k ohms (DIN); output 410 mV (line and DIN), 100 mV into 8 ohms (headphone); 5.9" H × 17.3" W × 11.4" D $550

CS-732D Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, permalloy record/playback and two erase heads, and electronically-controlled dc motor. Features three-position auto reverse (allows continuous repeat or two-way recording); tape direction switch; four-position bias and equalization for low noise, low noise/high output, CrO_2, and FeCr tapes; recording level control; one-touch mic/line input selector; output level control; three-digit tape counter with reset; damped tape eject; two VU meters; LED record, +7 dB peak level, and Dolby indicators; piano-key function controls; fast forward/rewind time 90 sec (C-60). Wow and flutter 0.06% wrms; frequency response ±3 dB 35-13,000 Hz (LN and LH), to 14,000 Hz (CrO_2), to 15,000 Hz (FeCr); dist. 1.3% (LN and LH), 1.5% (CrO_2 and FeCr); S/N without Dolby 54 dB (LN and LH), 56 dB (CrO_2 and FeCr); input sensitivity/impedance 0.25 mV/5k ohms (mic), 70 mV/100k ohms (line), 2.0 mV/10k ohms (DIN); output level 410 mV (line and DIN), 100 mV into 8 ohms (headphone); 6.3" H × 17.3" W × 11.4" D $400

GXC-725D Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, electronically controlled dc motor, and GX record/play head and one erase head. Wow and flutter 0.06% wrms; frequency response 35-16,000 Hz ±3 dB (CrO_2 tape); dist. 1.2% (0 VU, 1 kHz); S/N 51 dB (Dolby off, +5 VU). Additional features include 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 × 17.3" W × 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, and electronically controlled dc motor. Wow and flutter 0.06% wrms; frequency response 35-15,000 Hz ±3 dB (CrO_2 tape); dist. 1.5% (0 VU, 1 kHz); S/N 51 dB (Dolby off, +3 VU). Other features include two line out and one headphone jack; two mike and two line in jacks; automatic stop; multiplex filter; mike/line mixing; memory rewind; two peak-level indicators; two VU meters; 6.5" H × 17.3" W × 11.2" D..... $375

GXC-706D Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, crystal ferrite and glass GX recording/playback and erase heads, and electronically-controlled dc motor. Features four-position bias and equalization for low noise, low noise/high output, CrO_2, and FeCr tapes; dual VU meters with +7 dB LED peak level indicator; mic/line mixing; output level control; LED recording and Dolby indicators; three-digit tape counter with reset; auto stop; headphone jack; two mic jacks; removable receptacle lid; piano-key function controls; fast forward/rewind time 120 sec (C-60). Wow and flutter 0.055% wrms; frequency response ±3 dB 35-13,000 Hz (LN), to 14,000 Hz (LH), to 15,000 Hz (CrO_2 and FeCr); dist. 1.3% (LN and LH), 1.5% (CrO_2 and FeCr); S/N without Dolby 54 dB (LN and LH), 56 dB (CrO_2 and FeCr); input sensitivity/impedance 0.25 mV/5k ohms (mic and DIN), 70 mV/100k ohms (line); output level 410 mV (line and DIN), 100 mV into 8 ohms (headphone); 5.9" H × 17.3" W × 11.4" D..... $250

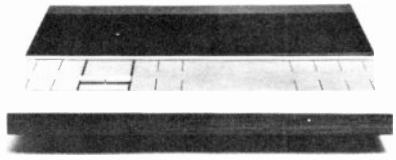
CS-703D Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, vertical headblock assembly, and electronically-controlled dc motor. Features bias and equalization for CrO_2 and LN tapes; left/right recording level controls; auto stop; two VU meters; LED record and Dolby indicators; two mic jacks; headphone jack; piano-key function controls; three-digit tape counter with reset. Wow and flutter 0.06% wrms; frequency response 40-15,000 Hz ±3 dB (CrO_2); dist. 1.3% with LN tape; S/N 56 dB with CrO_2, Dolby off; 5.9" H × 15" W × 10.5" D..... ..... $200

BANG & OLUFSEN

Beocord 5000 Cassette Deck

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



servomotors, and Sendust record/playback tape head. Features automatic bias selection; automatic tape head demagnetization; 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) ±0.1%; S/N (DIN) 57 dB (CrO_2 tape, Dolby off), 65 dB (CrO_2 tape, Dolby on); frequency range (DIN) 30-15,000 Hz; fast forward/rewind time 60 sec; speed deviation ±0.5%; sleek wood grain and stainless-steel cabinet design; 3⅛" H × 18½" W × 11" D $650

B·I·C

T-4M Cassette Deck

Front-loading microprocessor-controlled metal-

compatible two-speed (1⅞ and 3¾ ips) stereo cassette deck with four Dolby circuits for encode/decode and FM copy, tachometer feedback dc servo capstan and dc spooling motors in dual-capstan transport, and wide-gap record, narrow-gap playback, and erase heads. Features LED peak-reading (−36 to +9 dB) bar graph display with peak hold; three-digit electronic tape counter readout with microprocessor-controlled counter reset, memory inhibit, memory 1, memory 2, auto rewind, and auto play buttons; solenoid tape function controls with pause, record, and play LEDs; separate mic and line record and headphone and output level controls; tape/source monitor; record calibration; separate three-position bias and equalization for hi, normal, and lo tapes; adjustable Dolby calibration; multiplex filter; pitch control (±5%); record safety/mute switch; fast forward/rewind time 48 sec (C-60). Wow and flutter 0.05% wrms (1⅞ ips) and 0.035% wrms (3¾ ips); frequency response 20-20,000 Hz (1⅞ ips), to 22,000 Hz (3¾ ips); THD 1.7% at 1⅞ ips, 1.4% at 3¾ ips; S/N with Dolby at 1⅞ ips 64 dB (70 μsec tape), 68 dB (metal), at 3¾ ips with Dolby 68 dB (70-μsec tape), 72 dB (metal), all "A" weighted, ref. 3.0% THD; erasure 75 dB (70-μsec), 80 dB (metal); input impedance 50k ohms (line), 600 ohms (mic); output level/impedance 2 V rms/3k ohms (line), 0.7 V rms/150 ohms (headphones); 6⁷⁄₁₆" H × 17⁵⁄₁₆" W × 10¹⁄₈" D..... $850

T-3 Cassette Deck

Front-loading two-speed (1⅞ and 3¾ ips) stereo cassette deck with four Dolby circuits for encode/decode and Dolby FM, tachometer feedback dc servomotor in dual-capstan transport, and wide-gap record, narrow-gap playback, and erase heads. Features dual 45-dB peak-reading meters with chameleon LED record/THD overload indicators; three-digit tape counter with memory and reset; 70- and 120-μsec equalization; hi/normal/lo bias; multiplex filter; record ready with LED; tape/source, record calibration, and mic/line buttons; separate output and headphone level controls; piano-key tape function controls; fast forward/rewind time 48 sec (C-60). Wow and flutter 0.05% wrms (1⅞ ips), 0.035% wrms (3¾ ips); frequency response ±3 dB with 70-μsec tape 25-19,000 Hz (1⅞ ips), to 22,000 Hz (3¾ ips); THD at 0 VU with 70-μsec tape 1.8% (1⅞ ips) and 1.5% (3¾ ips); S/N ("A" weighted, 3.0% THD, 70-μsec tape) with Dolby 63 dB (1⅞ ips), 67 dB (3¾ ips); line input 200 mV; mic input impedance 8-600 ohms; output level/impedance 2.0 V rms/10k ohms (line), 0.7 V rms/100 ohms (headphones); 6⁷⁄₁₆" H × 17⁵⁄₁₆" W × 10¹⁄₈" D $530

T-2. Similar to T-3 except has single Dolby noise-reduction circuitry, single-capstan transport, and two heads; no tape/source monitor and record calibration buttons; wow and flutter 0.06% wrms (1⅞ ips) and 0.04% wrms (3¾ ips); frequency response 30-18,000 Hz (1⅞ ips), to 21,000 Hz (3¾ ips); THD 1.9% (1⅞ ips), 1.6% (3¾ ips); S/N with Dolby 62 dB (1⅞ ips), 66 dB (3¾ ips); 6" H × 16¾" W × 9¼" D..... $350

T-1. Similar to T-2 without record ready switch, multiplex filter, output and headphone level controls, chameleon LEDs, and memory; has 25-dB peak-reading meters; frequency response 35-17,000 Hz (1⅞ ips), to 20,000 Hz (3¾ ips); THD 2.0% (1⅞ ips), 1.7% (3¾ ips); S/N 61 dB (1⅞ ips) and 63 dB (3¾ ips) with Dolby; output level/impedance 1.0 V rms/10k ohms (line), 0.5 V rms/150 ohms (headphones); 6" H × 15½" W × 9¼" D $300

CALIBRE

440 Cassette Deck

Front-loading stereo cassette deck with dual-Dolby circuitry. Features left/right digital LED bar-graph VU display from −20 to +8 dB; separate bias and equalization switches for FeCr, normal, and special tapes; three-digit tape counter with reset and memory; left/right balance control; record master level control; mic/line source input selectors; piano-key tape function controls; LED azimuth adjust. Wow and flutter 0.06% wrms; frequency response 30-15,500 Hz ±3 dB (FeCr); S/N 61.5 dB with Dolby $335

CENTREX by PIONEER

SK-7 Portable Cassette Recorder

Portable cassette recorder with AM-stereo FM radio has programmable auto replay and Songfinder that

1 CASSETTE TAPE MACHINES

AIWA

AD-6900 Mk II U Cassette Deck

Front-loading wireless-remote-controlled metal-compatible stereo cassette deck with Dolby noise-

reduction system, 38-pulse FG servomotor in dual-capstan drive system, and three-head combination V-cut Ferrite Guard record/playback and erase heads. Features separate three-position bias and equalization for LH, FeCr, and metal tapes with automatic CrO_2 tape switching; ±20% bias fine adjust controls for LH, FeCr, and CrO_2 tapes and "Flat Response Tuning System;" two dual-scale peak/VU meters with peak hold, peak, and VU LED controls; separate mic and line recording level controls; output level slide control; tape/source monitor switch; feather-touch logic-controlled tape function controls on deck with LEDs and on hand-held remote control unit; three-digit tape counter with reset and memory stop/replay; external record/play/repeat timer provision; includes wireless infrared remote control unit. Wow and flutter 0.04% wrms; frequency response +2/−3 dB at 0 VU 25-9000 Hz (CrO_2), to 12,500 Hz (metal), at −20 VU, +2/−3 dB 25-14,000 Hz (LH), to 17,000 Hz (CrO_2), to 18,000 Hz (metal); S/N 68 dB with FeCr tape, Dolby on; input sensitivity/impedance 0.25 mV/200-10,000 ohms (mic), 75 mV/50,000 ohms (line); output level/impedance 0.41 V/50,000 ohms (line), 2 mW/8 ohms (headphone); 4¾" H × 17¾" W × 12¹⁵/₁₆" D..... $1000

AD-6800 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, two heads plus special bias-test head, and servo capstan motor plus dc reel motor. Features dual-needle meters showing VU (average) and peak level for each channel; selectable peak hold; front-panel bias adjust for three tape types, plus bias-calibration oscillator; 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. 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); 6⅜" H × 17¾" W × 13³/₁₆" D..... $550

AD-L40U Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, dc servomotor, and Sendust Guard head. Features three-position bias and equalization for LH, FeCr, and metal tapes with auto CrO_2 switching; LH bias fine adjust; 20-point LED optical peak/VU meter display with −20 to +10 dB range; record level control with line and mic/DIN input selector; headphone output level control; rec mute; pause with timer start provision; piano-key tape function controls. Wow and flutter 0.04% wrms; frequency response at −20 VU, +2/−3 dB 30-13,000 Hz (LH), to 15,000 Hz (CrO_2), to 16,000 Hz (FeCr), to 17,000 Hz (metal); S/N 65 dB with FeCr tape, Dolby on; input sensitivity/impedance 0.3 mV/3000 ohms (mic), 50 mV/50,000 ohms (line); output level/impedance 0.41 V/50,000 ohms (line), 2 mW/8 ohms (headphone); 5⅞" H × 17¾" W × 11⁷/₁₆" D..... $490

AD-6550 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system and remaining tape time meter, 38-pulse FG servomotor, and Ferrite Guard head. Features bias fine adjustor and separate bias and equalization selectors; oil-damped cassette ejection; memory rewind; two VU meters and two-step peak indicator lamps. Wow and flutter 0.05% wrms; S/N 65 dB (Dolby on, FeCr tape); frequency response 30-15,000 Hz ±3 dB (FeCr and CrO_2 tape), 30-13,000 Hz ± 3 dB (LH tape); fast-winding time 90 sec (C-60); 5¹⁵/₁₆" H × 16⁹/₁₆" W × 13" D..... $450

AD-6400 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, 38-pulse FG servomotor, and Ferrite Guard tape head. Features three-step tape selector switches; bias and equalizer selectors; LH bias fine tuning; 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. 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 (CrO_2 tape), 20-15,000 Hz (LH tape); fast-winding time 90 sec (C-60); 5¹⁵/₁₆" H × 16⁹/₁₆" W × 13" D.. $380

AD-6350U Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, dc servomotor, and permalloy head. Features three-position tape selector; bias fine adjust; rec mute; LED VU and peak-level indicators; built-in timer standby; full auto stop; cue and review; mechanical pause; line/mic input selector; record indicator lamp; oil-damped eject. Wow and flutter 0.08% wrms; S/N 65 dB (FeCr tape with Dolby); fast-winding time 85 sec (C-60); 5¹⁵/₁₆" H × 16⁹/₁₆" W × 13" D..... $320

AD-M200U Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, dc servomotor, and ultra-hard permalloy head. Features separate bias and equalization for LH, FeCr, and CrO_2 tapes; LH fine bias adjust; dual VU meters with +3 and +7 dB peak-reading LEDs; record level control with line/mic input selector; output level control; full auto stop; cue and review; piano-key tape function controls. Wow and flutter 0.06% wrms; frequency response ±3 dB at −20 VU 30-12,500 Hz (LH), to 14,000 Hz (CrO_2 and FeCr); S/N 62 dB with FeCr tape, Dolby on; input sensitivity/impedance 0.3 mV/3000 ohms (mic), 75 mV/50,000 ohms (line); output level/impedance 0.41 V/50,000 ohms (line), 0.8 mW/8 ohms (phones); 5⅞" H × 16½" W × 10⅜" D. $260

AD-M100U. Similar to AD-M200U without peak-reading LEDs, LH bias fine adjust, and output level control; has auto CrO_2 tape selector and separate left/right record level controls with line/mic input selector; wow and flutter 0.07% wrms; S/N 60 dB with CrO_2 tape, Dolby on $210

SD-L22U Mini Cassette Deck

Front-loading mini stereo cassette deck with Dolby noise-reduction system. Features five-point LED peak level meter display; LH/CrO_2 tape selector; record level control with mic/line input selector; LED tape running indicator; three-digit tape counter with reset; piano-key tape function controls with lighted arrows. Wow and flutter 0.09% wrms; frequency response 25-14,000 Hz (LH), to 16,000 Hz (CrO_2); S/N 60 dB with Dolby; 2⅞" H × 8⁵/₁₆" W × 7⅞" D.. ..... $260

AKAI

GXC-570DII Cassette Deck

Vertical-style front-loading stereo cassette deck with dual-process Dolby noise-reduction system, separate crystal-ferrite and glass GX recording, playback, and erase heads, FG dc servo capstan motor and two dc reel motors, and closed-loop double-capstan drive system. Features Sensi-Touch logic circuit function controls with individually colored function indication lamps; detented left/right mic and line recording level controls; tape/source monitor switch; output level control; three-digit tape counter with continuous playback and memory rewind; pitch control for playback (±6%); four-position bias and equalization for low noise, low noise/high output, CrO_2, and FeCr tapes; phone level adjustment during playback/monitor; 400-Hz calibration tone switch; left/right recording calibration adjustment; multiplex filter; limiter switch; switchable VU/peak-reading meters with LEDs; Dolby LED; auto door opener; left/right mic and headphone jacks; remote control provision for optional RC-17 or RC-18 remote control unit; fast forward/rewind time 50 sec (C-60). Wow and flutter 0.06% wrms, 0.17% (DIN 45500); frequency response ±3 dB 35-15,000 Hz (LN), to 16,000 Hz (LH), to 17,000 Hz (CrO_2), to 19,000 Hz (FeCr); dist. at 1000 Hz, 0 VU 1.0% (LN and LH tapes), 1.5% (CrO_2 and FeCr); S/N without Dolby 51 dB (LN and LH), 52 dB (CrO_2 and FeCr); input sensitivity/impedance 0.25 mV/2.4k ohms (mic), 70 mV/100k ohms (line); output level 410 mV (line), 300 mV into 8 ohms (headphone); 10" H × 17.3" W × 8.9" D..... $900

RC-18. Remote control for GXC-570DII $58

RC-70. Full-function wireless remote control for GXC-570DII; operates with all Akai solenoid machines $150

GXC-750D Cassette Deck

Front-loading stereo cassette deck with dual-Dolby noise reduction system, GX record and playback heads plus erase head, and closed-loop double-capstan drive with three motors. Features ADR system; memory rewind; mic/line mixing; switchable peak level/VU meters; multiplex filter; bias and equalization for LN, LH, CrO_2, and FeCr tapes; remote control jack for optional RC-17, RC-18, or RC-70 remote control units; pause with lock; full-logic solenoid function controls. Wow and flutter 0.06% wrms; frequency response 35-18,000 Hz ±3 dB with FeCr tape; dist. 1.0% at LH position; S/N 56 dB weighted (CrO_2) without Dolby; 6.2" H × 17.3" W × 12.5" D..... $725

GXC-735D Cassette Deck

Front-loading stereo cassette deck with Dolby noise-

At 1⅞, it outperforms other cassette decks. At 3¾, it's in the open-reel class. B·I·C introduces the T-4M. With full metal tape capability, and performance so unprecedented it puts cassette technology on a new plane. Thanks to B·I·C's exclusive Broadband Electronics, at 1⅞ ips the T-4M ranks with the world's finest cassette decks. At 3¾, it challenges even expensive open reel machines. The numbers speak for themselves: guaranteed frequency response of 20 Hz to 23 kHz ±3dB at 3¾ on 70 μSec tape (20 Hz to 21 kHz at 1⅞!). For complete literature write B·I·C/Avnet, Dept. T, Westbury, N.Y. 11590. **The new T-4M Two-Speed Cassette Deck.**

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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.

Impedance—The opposition to the flow of alternating current in a circuit, generally categorized as either "high" or "low," but measured in ohms.

Input—The terminals, jack, or receptacle provided for the introduction of an electrical signal or electric power into a device or system.

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

ips—Abbreviation for 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.

Lavalier—A microphone designed to hang from 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.

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, allowing 30 minutes of recording 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.

Mixer—An audio control unit whose basic function is to combine two or more audio signals into a single, composite signal.

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.

Mono, Monophonic—Single-channel sound.

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.*

MPX Filter, Multiplex Filter—Circuits to remove 19kHz FM pilot tones from a signal.

NAB Curves, NAB Equalization—Standard 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 components, other than distortion, added to a signal or sound.

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

Omnidirectional—A microphone type that picks up sound relatively evenly from all directions.

Output—A port or set of terminals at which a system or component delivers useful energy or a useful signal, also the energy or signal delivered. 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.

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 that responds to short transient signals, often used to supplement *Recording-Level Meters* which usually indicate average signal levels.

Peak-Reading Meter—A type of *Recording-Level Meter* that responds to short transient signals.

Piezoelectric Microphone—A microphone whose generating element is a crystal or ceramic element, which generates a voltage when bent or stressed.

Pinch Roller—A rubber or neoprene wheel which presses the tape against the capstan during recording or play.

Pitch Control—A circuit which permits the speed of a tape transport's motor to be varied slightly to raise and lower the musical pitch of the recording or to slightly lengthen or shorten playing time.

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

Playback Head—Magnetic head used to pick up a signal from a tape.

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.*

Prerecorded Tape—A commercially available recorded tape.

Pressure Pad—A device that forces tape into intimate contact with the head gap, usually by direct pressure at the head assembly.

Print-Through—Undesired transfer of magnetic pattern from layer to layer of tape on a reel.

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

Q8—A quadraphonic 8-track tape cartridge.

Quarter-Track—See *Four-Track.*

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.

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.

Sensitivity—A measure of relative output for a given input of a tape, microphone, etc.

Separation—The degree to which two stereo signals are kept apart.

Signal-to-Noise Ratio—The ratio, usually expressed in decibels, between the loudest undistorted tone a system can handle and the noise remaining when the 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 rerecorded 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 between pieces of tape.

Splicing Tape—A special pressure-sensitive, nonmagnetic tape used for joining two lengths of magnetic tape.

Stereophonic, Stereo—Using two or more channels to create a spatial effect.

Supercardioid—See *Cardioid.*

Synch, Sync—The maintenance of correct time relationships between events, synchronization.

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. It makes possible the repetitive playback of a recording without rewinding the tape.

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

THD—Total *Harmonic Distortion.*

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.

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 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.

Wavelength—In tape recording, the shortest distance between two peaks of the same magnetic polarity; also, the ratio of tape speed to recorded frequency.

Wow—Slow, periodic variations in the speed of the tape, characterized by its effect on pitch.

Wrap—The length of the path along which tape and head are in intimate physical contact.

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 holds recording levels within permissible limits. Also known as Automatic Volume Control (AVC).

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 steady-state signal 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. Every tape formulation has slightly different bias requirements.

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.

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.

Cardioid—The quasi-heart-shaped sensitivity pattern of most uni-directional microphones. Hypercardioid 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, especially the *Eight-track Cartridge.*

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

Ceramic Microphone—See *Piezoelectric Microphone.*

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

Chromium Dioxide (CrO_2)—A magnetic material used on some 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 2 1/2 x 1/2 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.

CrO_2—See *Chromium Dioxide.*

Crosstalk—Undesired signal-leakage from one sound channel or track to another.

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 that 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—A proprietary electronic device or circuit that reduces the amount of noise (principally tape hiss) introduced during the recording process by boosting—in carefully controlled amounts—the strength of weak high frequency signals before they are recorded. During playback the signals (and the noise) are cut back by an exactly equivalent amount. The original dynamics are restored, but the noise is reduced by 10 dB.

Dropout—The momentary loss of a recorded signal resulting from imperfections in the tape.

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.

Eight-Track—Most commonly, a cartridge tape system having eight narrow tracks on 1/4-inch tape wound in a continuous loop around a single hub.

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).

Erasure—The neutralization of the magnetic pattern stored on tape.

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

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

Figure-8 Microphone—A microphone (usually a *Ribbon* type) whose sensitivity is greatest to front and rear, and weakest to both sides.

Flutter—Very short, rapid variations in tape speed.

Four-Track or Quarter-Track Recording—The arrangement by which four different channels of sound may be recordec on quarter-inch-wide audio tape. These may be recorded as four separate and distinct tracks (monophonic) or two stereo pairs of tracks. 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.

Frequency—The repetition rate of cyclic energy, such as sound or alternating electrical current, expressed in cycles per second.

Frequency Response—A graph or chart showing how a system or component affects the strength of a signal as its frequency varies.

Front-to-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.

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

Gap—The effective distance between opposite poles of a magnetic head.

Harmonic Distortion—Distortion characterized by the appearance in the output signal of spurious harmonics of the fundamental frequency.

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.

Head Alignment—Mechanical adjustment of the spatial relationships between the head gaps and the tape.

Head Demagnetizer or Degausser—A device used to neutralize possible residual or induced magnetism in heads or tape guides.

Hertz—One cycle per second, the unit of frequency. Abbreviated Hz.

So, we also checked the CrO_2 frequency response with BASF Professional II, a genuine chromium-dioxide formulation that experience has taught us generally requires a somewhat higher bias level than most tapes designed for the CrO_2 switch position. Sure enough, frequency response improved to ±2 dB from 32 to 17,000 Hz, and the curve was slightly flatter in the upper mid-range than with the ferrichrome tape, whose numerical rating was the same.

Dolby tracking of the PC-5460 was excellent at input levels of −30 and −40 dB, never deviating by more than 0.5 dB. At a −20-dB input the tracking was very good, following the non-Dolbyized response curve within ±1.5 dB up to 12,500 Hz, above which it dropped more sharply. This close match confirms the Dolby claim to be relatively tolerant of slight errors in absolute level, since when we checked the Dolby calibration with our 200-nWb/m Dolby-level test tape, we found the meter to be low by 1.5 dB.

Playback response was checked with our TDK AC-337 test tape, which can be used directly to check the ferric (120-microsecond) equalization and can also be used to check performance in the 40- to 12,500-Hz range in the CrO_2 position by applying standard correction factors. In both cases the response sloped slightly downward at the highest frequencies. Since the overall record-playback response (which uses the same head for both functions) was flatter over a much greater range with all tapes tested, we suspect that the head in our sample of the PC-5460 may have had a very small azimuth error.

From the line-level inputs, a signal level of 75 mV was required to obtain a 0-dB indication on the recording-level meters. A microphone input of 0.25 mV produced the same indication, and the overload point was 27 mV, making the inputs suitable for all but very high-output microphones.

Distortion at a 0-dB record level was only 0.46 per cent with the Maxell UD-XL I tape, a figure matched by the somewhat overbiased TDK SA. The BASF ferrichrome and chromium-dioxide tapes produced 1.15 and 1.3 per cent third-harmonic distortion, respectively, at this recording level. To reach the usual 3 per cent third-harmonic distortion level on playback, the four tapes required inputs of +7.5, +6, +4.2, and +3.1 dB. Referred to the playback outputs at the 3 per cent reference point, A-weighted signal-to-noise ratios without Dolby noise reduction were 59.4, 60.5, 61, and 58.5 dB, respectively. With the Dolby circuitry switched in and using the CCIR/ARM weighting curve, the signal-to-noise figures improved to 66.4, 68.5, 69.2, and 66.6 dB, respectively.

In their "average-responding" mode, the meters of the PC-5460—like those of most audiophile tape decks—do not conform to the ballistic characteristics of genuine VU meters. Tested with standard 0.3-second bursts, they under-read by 1.5 dB, and with 0.5-second tone bursts they overshot by nearly as much. What is likely to be of more interest to the home recordist, however, is the fact that in their peak-reading mode the meters not only hit the signal peaks exactly, but displayed a very slow return action that made them easier to read. And the peak-hold function held as long as our patience in waiting for it to recede.

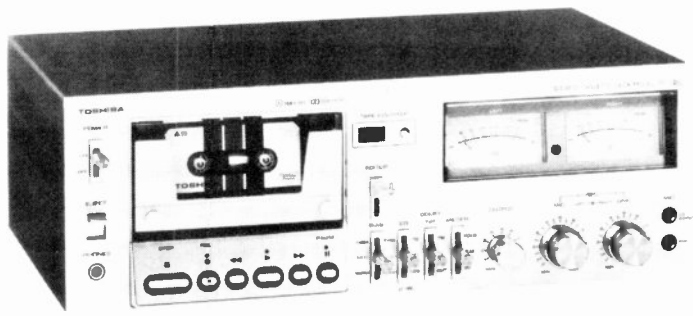
Wow and flutter of the PC-5460 registered 0.062 per cent on the weighted rms basis and 0.12 per cent on a DIN-B weighted measurement when using the TDK AC-341 test tape. These figures increased, respectively, to only 0.075 and 0.14 per cent when recording and playing back from a blank cassette. Fast-forward and rewind times were a bit on the slow side, however; it took 105 seconds to go from one end of a C-60 cassette to the other.

● ***Comment.*** Once you become accustomed to the slight whirring noise produced by the motor-driven cams when you press the transport-mode buttons, the Toshiba PC-5460 is a delight to use. Its three-digit counter, though lacking a "memory rewind" feature, proved exceptionally accurate throughout the course of our measurements. The record and output controls have the silken feel of those found in the finest amplifiers and receivers, and, while obviously designed for rough rather than highly precise editing, the EDITOR function proved surprisingly easy to use and become accustomed to.

Our ears confirmed the measurements of frequency response, Dolby accuracy, and fine signal-to-noise ratios. For FM and disc dubbing using "normal" tapes, the PC-5460 is virtually flawless. For copying a direct-to-disc LP or master tapes you might (or might not) detect the improved high-frequency response provided by a CrO_2 or ferrichrome cassette. It is clear that the Toshiba PC-5460 is a fine machine that represents an excellent value within its price range.

corders, the B77 produced a very listenable volume through 200-ohm headphones.

As we see it, the B77 should appeal to the serious tape-recording hobbyist who would like to have many of the qualities of a true "pro" machine without paying the price in dollars, size, weight, and convenience that a real professional recorder would entail. Assuming that the traditional quality standards and ruggedness of Revox recorders have been carried forward into the B77, it should be a very good long-term value.



Toshiba PC-5460 Stereo Cassette Deck

The Toshiba PC-5460 is a front-loading cassette deck that features a laminated Sendust record/playback head and uses a single dc servomotor for its capstan and reel drives. A second motor, connected through a gear and multiple-cam arrangement, provides a power assist for the transport-mode control buttons so that only a light touch is required to activate their functions, which can be executed in any sequence. Even the record mode can be entered directly at any time, including from high-speed rewind or play.

The cassette well is located on the left side of the panel, and the lid opens with oil-damped smoothness when the EJECT lever is pressed. Cassettes are inserted, tape downward, into slides on the back of the clear-plastic compartment door, which affords a complete view of the cassette label. Two thumbscrews permit removal of the front portion of the lid to give access to the heads for routine cleaning and demagnetizing. The transport-mode control buttons are immediately below the cassette-well doors.

Separate three-position lever switches select the proper bias and equalization for ferric-oxide (NORM), ferrichrome (FeCr), and chromium-dioxide (CrO_2) tape formulations. A similar switch turns the Dolby noise-reduction system on and off and provides an FM position that additionally changes the equalization from 75 to 25 microseconds to ensure proper reception and taping of broadcasts in which the Dolby system has been used. By placing the PC-5460 in its recording mode but leaving the PAUSE button depressed you can "de-Dolbyize" such programs and hear them through your receiver or amplifier (assuming it has no Dolby system of its own) even when the unit is not actually recording.

Another METER lever switch provides three different types of reading from the record-level meters. In one position of the switch the meters read average VU levels on a scale from −20 to +4 VU (Dolby level is indicated by a small dot at the +3-VU position). In the center position, the meters read peak signal levels from −40 to +10 dB. With the switch in its uppermost position, the meter needles hold the highest signal peak encountered so that you can, for example, audition a disc you intend to dub and determine its maximum level.

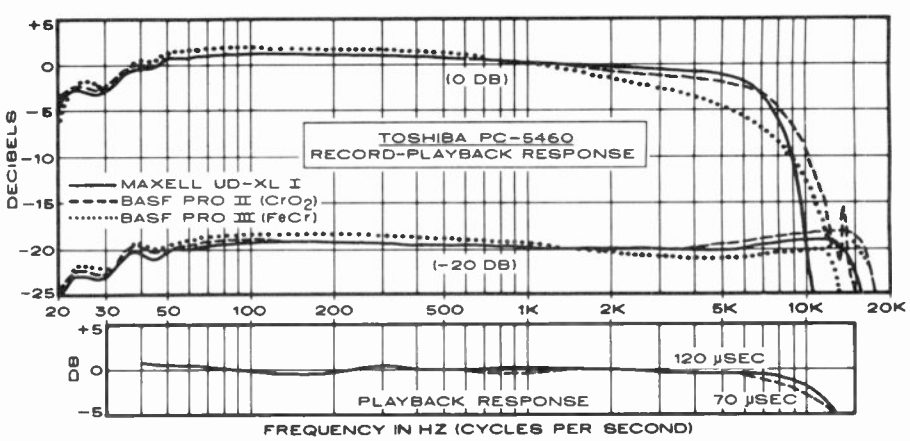
An OUTPUT control adjusts the listening volume for both channels simultaneously at the front-panel headphone jack and at the rear-panel phono-jack outputs. We found the listening levels satisfactory with headphones in the 8- to 600-ohm range. Separate concentric left- and right-channel controls are provided for microphone and line-level inputs, which can be mixed. Recommended microphone impedances range from 600 to 10,000 ohms.

One rather unusual feature on the front panel is a spring-loaded EDITOR lever which functions, in effect, as a master record-level control. As this lever is slowly pulled down (or released) during recording it fades the overall recording level down (or up), permitting gradual program transitions or the insertion of quiet passages between taped selections. The operation of the EDITOR feature does not affect either the indications on the record-level meters or the volume at the headphone or output jacks, so you must judge the proper rate of fade-out and fade-in without visible or audible clues.

The rear panel of the PC-5460 contains the usual input and output jacks of the phono-jack type, together with left- and right-channel calibration controls used to match the sensitivity of the deck to the level of a broadcast Dolby-level FM tone. (In its Dolby-FM mode, the regular front-panel recording-level controls are inoperative, but, once calibrated, the Dolby FM level should be the same for all stations broadcasting such programs unless you change your tuner or receiver.) Also on the rear panel is an FM-multiplex switch that will eliminate any residual 19-kHz stereo subcarrier products that might interfere with the proper operation of the Dolby circuits (whether the program is Dolby-encoded or not) of the deck when you tape off the air. The Toshiba PC-5460 cassette deck measures 16½ x 5⅞ x 11 inches and weighs just under 14 pounds. Price: $369.96.

● ***Laboratory Measurements.*** According to the manufacturer, our sample of the PC-5460 was adjusted for Maxell UD-XL I (Fe), TDK SA (CrO_2), and Denon DX5 (FeCr). Lacking a sample of the recommended ferrichrome tape, we tried the more readily available Sony FeCr, BASF Professional III, and 3M Master III, obtaining the best results with the BASF tape. For the ferric and chromium-dioxide formulations we followed the manufacturer's recommendations initially, though, as explained below, we found that we could obtain a somewhat flatter and wider frequency response in the CrO_2 position when using BASF Professional II.

The recommended ferric-oxide tape, Maxell UD-XL I, gave an extremely flat response —within ±1 dB—from 34 to 14,500 Hz, and the low-frequency undulations ("head bumps" caused by the physical contour of the playback head) were unusually well controlled. BASF Professional III (a ferrichrome formulation) produced an overall record-playback frequency response (at the usual −20-dB level) of ±2 dB from 32 to 17,000 Hz. Overall response from the suggested TDK SA was within +0, −3 dB from 32 to 15,000 Hz, but the gradually increasing droop in response from about 3,500 Hz upward suggested to us that our sample of the PC-5460 might be *slightly* overbiased for this particular tape.



and rewind modes. When the cueing switch is operated, the fast-forward and rewind controls do not latch, so they can be used to shuttle the tape back and forth with considerable precision.

The operating controls of the B77 occupy the lower third of the panel area and are arranged in functional groups. At the left are the MONITOR controls plus the speed selectors and the power switch. The concentric volume control affects only the level at the two nearby headphone jacks (intended for 600-ohm or other medium-impedance phones). The line-output levels can be set by small control shafts in the rear of the machine next to the line output jacks. The monitor switch channels either incoming signals or the playback-amplifier outputs to the line and phones output jacks. A small playback-mode switch selects normal or reversed-channel stereo, mono, or left- or right-channel playback through both outputs (this control affects the line outputs as well as the headphone jacks).

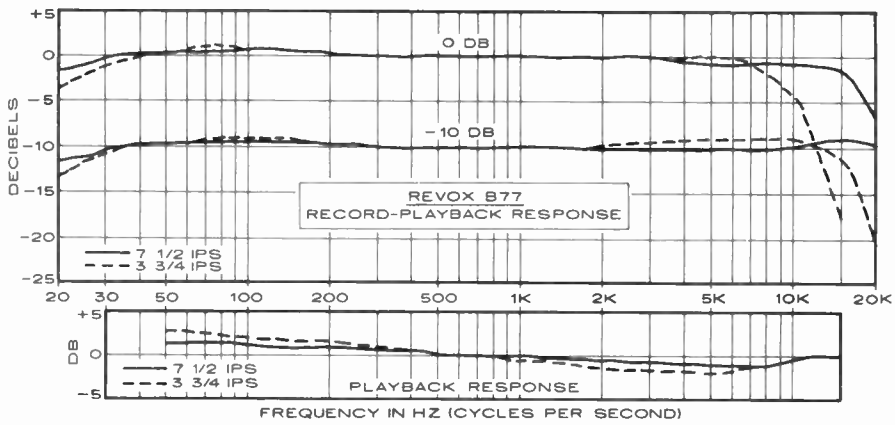
The recording controls occupy the central portion of the panel. Each channel has its own level control plus an input-selector switch with positions for low- or high-level microphones, AUX, and RADIO (for a DIN-level signal source), plus interchannel transfer positions (L to R and R to L) for making sound-with-sound recordings. Each channel also has its own recording safety-interlock switch and a red light that shows when it is in a recording condition. The two phone-jack microphone inputs are located near the switches. On each meter face is a peak-indicating LED that glows red for excessive recording levels.

Finally, the lower-right portion of the panel contains the transport operating controls. They are light-touch momentary-contact pushbuttons which operate the machine through electrical solenoids and a logic system that makes it possible to go from any mode to any other without first stopping the tape. Normally, the red RECORD button must be pressed simultaneously with the PLAY button to make a recording (and, of course, the corresponding recording safety switches must be on). In addition, the B77 can make "flying-start" or "punch-in" recordings while playing a tape, if one holds the PLAY button in and touches the RECORD button at the desired point during playback.

The fast-forward and rewind buttons can be operated sequentially to shuttle the tape back and forth smoothly, and with a little practice the STOP button can be used to halt it at exactly the desired point. The PAUSE button does not latch and must be held in for as long as the recording is to be halted. Thus, it offers little advantage (other than one-finger operation) over using STOP and restarting the tape with both the RECORD and PLAY buttons. However, an optional remote-control accessory is available on which PAUSE *is* a locking control.

The input and output connectors are set into the rear of the machine. They include a line-voltage selector (from 100 to 240 volts) and jacks for the tape-transport and capstan-speed remote-control accessories (the latter makes it possible to vary the tape speed continuously from 2.5 to 11 ips) as well as a slide-projector synchronizer (which requires an electronic module installed in the recorder). The aux input and line-output jacks, line-level controls, and DIN socket for the RADIO input and output circuits complete the facilities available at the rear of the machine.

The B77 has a folding carrying handle, and it can be operated in a horizontal or a vertical position. However, if tape editing is planned, horizontal operation is preferable so that the playback-head gap can be seen.



Record-playback response curves for the Revox B77 are shown at levels of 0 and −10 dB, rather than the usual 0 and −20 dB. Note the wide response of the B77 (with Scotch 206 tape) at −10 dB and the absence of low-frequency "bumps" in the curves at either level.

The Studer/Revox B77 is 17¾ inches wide, 16¼ inches high, and 8⅛ inches deep (slightly greater top and side clearance is required when 10½-inch reels are used). It weighs 37½ pounds. Price: $1,195.

● ***Laboratory Measurements.*** The Studer/Revox B77 is factory-adjusted for Scotch 207 tape (we used the very similar Scotch 206 for our tests). Studer believes that the bias controls found on some consumer recorders do not assure best results with different tapes, since the recording equalization is also likely to require adjustment. Thus, the company recommends that the machine be set up for one specific tape by a competent technician using appropriate laboratory instruments.

In our measurements of playback equalization, we used Ampex test tapes: 31321-04 for 7½ ips and 31331-01 for 3¾ ips. The latter is a 120-microsecond tape, and the B77 has 90-microsecond playback equalization at its lower speed, so we would not expect to get a truly flat response from the Ampex tape. However, the 3¾-ips playback response was a smooth, downward-sloping line, varying only ±2.5 dB from 50 to 7,500 Hz (the frequency limits of the test tape). At 7½ ips, the response was within +1, −1.5 dB from 50 to 15,000 Hz.

The record-playback frequency response with Scotch 206 tape was well within Studer's very fine specifications. At 7½ ips, it was within +1, −1.5 dB from 20 to 20,000 Hz at a −10-dB recording level. At 0 dB, there was little evidence of tape saturation under 15,000 Hz, and the response was within +1, −1.5 dB from 20 to 15,000 Hz and down 7 dB at 20,000 Hz. One feature of the Revox frequency-response curve was distinctive—it had none of the low-frequency "bumps" typical of most tape recorders. This is a function of head design, and Studer has evidently done a very effective job in that department.

The 3¾-ips response at −10 dB was within ±1 dB from 28 to 15,000 Hz, down 3 dB at 20 Hz and 10 dB at 20,000 Hz. As expected, the 0-dB response at the slower speed showed the effects of tape saturation beginning at about 6,000 Hz. The response was ±1 dB from 30 to 7,000 Hz, down 3.5 dB at 20 Hz and 4.5 dB at 10,000 Hz.

For a 0-dB meter reading, the AUX recording input at maximum gain was only 17.5 millivolts (exceptionally high sensitivity for a high-level input). The microphone sensitivities were 0.053 and 1.35 millivolts, respectively, for LO and HI inputs, with respective overload points of 20.5 and 350 millivolts. The playback output from a 0-dB recording level was 0.7 volt at 1,000 Hz. The meter calibration corresponded to the rated 257 nW/m flux level for a 0-dB reading. The peak overload lights flashed at a +5.5-dB level. The meters themselves were overdamped by VU standards, giving a reading that was about 55 per cent of steady-state signal level on 0.3-second tone bursts.

The third-harmonic distortion during playback (from a 1,000-Hz, 0-dB signal) was 0.8 per cent at 3¾ ips and 0.5 per cent at 7½ ips. The reference distortion level of 3 per cent was read at recording inputs of +6 and +8 dB, respectively. The signal-to-noise ratio (S/N) referred to these levels was 57 and 61 dB in unweighted measurements for the 3¾- and 7½-ips speeds. With "A" weighting the S/N improved to 63.5 and 68 dB, and with CC IR/ARM weighting it was 60 and 64.2 dB. At maximum gain through the microphone LO input the noise level was 10 dB higher; with the HI input the increase was a negligible 1.5 dB.

The peak flutter reading in a DIN-weighted measurement was 0.05 per cent at 3¾ ips and 0.045 per cent at 7½ ips. These were measured with the Ampex 31336-01 and 31326-01 test tapes. The principal flutter frequencies were 60 and 120 Hz. In fast forward, 1,800 feet of tape was wound in 76 seconds; something like 100 seconds was required for the same amount of tape in rewind.

● ***Comment.*** The Studer/Revox B77 is obviously one of the better home tape recorders, which is no less than we would expect from Studer. Many of its individual performance ratings can be matched by somewhat less expensive machines, but we know of none at a significantly lower price that is the full equal of the B77. It excelled particularly in its very low flutter (it is rated with almost ridiculous conservatism at 0.1 and 0.08 per cent for the two speeds) and the flatness of its frequency response, especially at low frequencies. We noted the same conservative approach to ratings throughout the extremely detailed specifications for the B77. It met and comfortably surpassed every spec but one—the previously mentioned VU-meter characteristic.

The B77 is a very easy machine to use, and as one becomes familiar with it the considerable flexibility of its operating controls becomes more apparent. Unlike most tape re-

acceptable at a −20-dB level, where they changed the overall response by about 2 dB over much of the high-frequency range. It was virtually perfect at −40 dB, where there was no detectable change in response until the frequency exceeded 10,000 Hz. The 120-μs (STD) playback equalization was measured with a TDK AC-337 test tape. The response was an excellent ±0.5 dB from 60 to 12,500 Hz and was up only 1 dB at 40 Hz. At first, it seemed that we would not be able to measure the 70-μs (CrO_2) equalization, since our test tapes do not have the notch that switches the recorder. However, we found that the FeCr switch setting changed the playback equalization to 70-μs. With our Teac 116SP tape we found it to be flat within ±1 dB over the 40-to-10,000-Hz range of the tape.

A line input of 50 mV or a microphone input of 0.22 mV was needed to produce a 0-dB recording level. The microphone inputs overloaded at 150 mV, the highest figure we have measured on a cassette recorder. The playback output from a 0-dB recording varied somewhat with the tape used, from 0.59 volt with Master II to 0.78 volt with MRX3. The third-harmonic playback distortion with a 1000-Hz input signal was measured with each tape as a function of recording level. The reference 3% distortion level was measured at 0 dB with the Master II tape and at −0.5 dB with Sony FeCr. With Memorex MRX3, we measured only 0.5% up to a +3-dB level and had to record at +7.5 dB to measure 3% distortion in the playback mode.

The playback S/N ratio, referred to the signal level that produced 3% distortion, was about 50 dB in an unweighted measurement with Master II and FeCr tapes. It was a very good 57 dB with MRX3. With A weighting, the S/N was 55 to 56 dB with the first two tapes and 63 dB with MRX3. Finally, with CCIR/ARM weighting and using the Dolby system, the S/N was 62 dB with the first two tapes and 68 dB with MRX3. The noise level increased by 18.5 dB through the microphone inputs at maximum gain and by 5 dB when the gain was set to its center position.

Tape speed in our sample machine was about 0.5% fast. In the fast-speed modes a C60 cassette was moved from end to end in about 80 seconds. The flutter, with a weighted rms (JIS) measurement, was a low 0.06%. Even the weighted peak flutter (DIN) was a very good ±0.08%. The playback flutter readings were made with a TDK AC-342 test tape. In a combined record/playback measurement, the flutter was 0.07% wrms and ±0.14% weighted peak. The flutter was principally in the 15-to-20-Hz range, with another peak at 55 Hz.

● ***Comment.*** When we recorded interstation FM tuner hiss at a −20-dB level and listened to the playback, we discovered that all three tapes we had chosen were capable of almost perfect response. In each case, there was only a very slight difference in the playback signal that we were unable to eliminate with the BIAS control. Even though the BIAS adjustment appears to lack the convenience of use that we have seen on some other recorders that have built-in test oscillators for making this adjustment, we believe that by using tuner hiss one can actually come closer to an optimally flat response in most cases.

The fluorescent level "meters" worked very well, being accurate and extremely easy to read. In the AVERAGE mode, they indicated about 1 dB low on 0.3-second tone bursts, which is slightly slower than a standard VU meter but still better than most mechanical meters used on consumer cassette recorders. As PEAK indicators, this indicator is one of the best, with virtually instantaneous response and a slow decay that takes a couple of seconds to descend through its full range.

It is worth noting that shutting off the recorder returns the TAPE COUNTER to 000. If one is recording or playing a tape and interrupts it by shutting off the power the electronically controlled index counter reading is lost, unlike the case with mechanical index counters.

Although the manual does not recommend using high-impedance phones with the Model CT-F900, we found that it produced very comfortable listening levels with 200-ohm phones (most recorders cannot). The various special functions of the machine, such as the MEMORY and REPEAT features and TIMER operation, worked perfectly. The automatic tape sensing system excluded older chromium-dioxide tapes from use. Although the manual does not mention this, these tapes can be played (but not recorded) by pushing the selector button to its FeCr setting.

We can say unequivocally that the Pioneer Model CT-F900 is a first-rate cassette deck. The sound quality of prerecorded tapes and of tapes we made on this machine was uniformly excellent. There is no longer much excuse for distorted recordings due to excessive signal levels. The PEAK HOLD feature lets one know, after one brief practice run, what maximum level to expect from any program. A convenient feature of this deck is its ability to make "flying-start" recordings. This can also be valuable in editing tapes. While listening to a tape, at any point where one wishes to record another program, holding down both the PLAY and REC buttons places the machine in its recording mode.

As we have often found with cassette decks, the greatest dynamic range is usually obtained with a good ferric tape. The chrome and ferrichrome tapes saturate at a lower level, and cannot be recorded as heavily without excessive distortion. However, they have better high-frequency saturation characteristics. So if the program has strong high-frequency content, these tapes will often give the best results, in spite of their slightly reduced midrange.

The Model CT-F900 offers a rare combination of listening quality and operating versatility. Combined with a price that is, by today's standards, moderate, it ranks extremely high among other high-quality decks.

Studer/Revox B77 Tape Recorder

In two decades on the American hi-fi scene, Revox tape recorders have earned an enviable reputation for quality. Having recently established a new U.S. distributorship, the Swiss-based manufacturer (Willi Studer) has chosen to add his own name to the brand name—hence, the latest Revox recorder is the Studer/Revox B77.

The B77 might seem to be a logical successor to the long established A77, which it resembles in many respects. However, at least for the time being, both models will be carried in the product line. The B77 is a high-quality open-reel tape deck specifically designed for the discriminating home user. It operates at either 3¾ or 7½ ips, selected by pushbutton switches, and the capstan has its own direct-drive, servo-controlled a.c. motor. Separate torque motors drive the take-up and supply reels, which can be up to 10½ inches in diameter. The B77 is available in half-track and quarter-track versions. We tested a quarter-track model.

The upper portion of the dark-gray recorder (with contrasting accents in its aluminum knobs and trim) is devoted to the tape reels. The hub shafts are ¼ inch in diameter, so adapters are needed if 10½-inch NAB reels are to be used. Between the reels is the push-button-reset index counter, and below that is the head assembly with its snap-off cover. To the right of the heads is a built-in tape-splicing block, complete with pivoted cutting knife. As an aid to editing, a "cueing" slide switch under the heads brings the tape into light contact with the playback head so one can locate a specific point either by turning the reels by hand or with the machine in the fast-forward

The tape transport employs a servo-controlled dc motor for the capstan drive and a mechanical governor-controlled dc motor for the hub drive. The transport is controlled by solenoids that are actuated through a logic system by light-touch buttons located on a black panel below the cassette well. Rectangular transport control buttons are grouped functionally. Small, colored indicators near the buttons light when the buttons are actuated.

The logic system makes it possible to operate the controls in any sequence without damage to the tape or the deck. Pressing any control while the tape is in motion momentarily stops the deck before executing the change of mode. The transport shuts off and mechanically disengages when the tape stalls at the end of a cassette, or in the event a tape should break.

At the upper right of the panel is a large recording INPUT level control that consists of two concentric knobs coupled by a slip clutch. Below it are two microphone jacks (for dynamic or electret microphones), a stereo headphone jack for low-impedance phones, and a small concentric knob control for adjusting the playback OUTPUT level. In the lower center of the panel are a number of pushbutton switches. Two are for selecting the program that appears at the LINE outputs (SOURCE or TAPE playback) in the rear. The recording input can be transferred from the rear LINE jacks to the microphone inputs by one of the buttons (the two sources cannot be mixed, however). One button turns the Dolby system on and off, and another selects the recording bias and record/playback equalization. In the AUTO (out) position of this latter button, the recorder automatically selects the bias and equalization for any ferric (STD) or chromium dioxide (CrO_2 or a "chrome equivalent" tape such as TDK SA, Maxell UD-XL II, etc.) tape. This is done by a sensor that detects the special notch in the back of a chrome cassette.

When the TAPE button is pushed in, the bias and equalization are set for ferrichrome (FeCr) tape. A small BIAS knob near the TAPE button can be used to trim the bias over a limited range to optimize the recorder for any specific brand of tape within the three basic categories.

Some of the most novel features of the Model CT-F900 are contained in a square indicator and control subpanel in the center of the front. Across its top are two horizontal rows of level indicators from a fluorescent Digitron vacuum tube display that creates a row of blue-lighted squares that moves to the right with increasing signal level. There are separate rows of level indicators for the two channels. Between the rows is a calibrated scale that covers a −20-to-+7-dB range. Below the level-indicator display is a large three-digit TAPE COUNTER display made up of 8-mm high Digitron numerals that can be seen easily from a considerable distance.

Twelve small pushbuttons on the subpanel control the unique operating features of the CT-F900. The deck has a "memory rewind" like that offered on a number of other tape decks, except that it operates entirely electronically through a special purpose LSI microprocessor that can perform four different memory functions. In the MEMORY STOP mode, pressing the rewind button causes the tape to rewind to the point where the indicator reads 000, and stop. MEMORY PLAY is similar, except that it goes into a normal play mode after stopping. REPEAT END operates automatically when the end of the tape is reached, rewinding the tape to its beginning and replaying it. COUNTER REPEAT operates in a similar fashion, except that the tape rewinds to 000 and starts playing from there.

The deck can be operated from an external clock timer for unattended playback or recording of programs. After the machine has been set up for correct recording conditions, it and the program source are plugged into the clock timer and the TIMER START-REC button is pressed. When power is restored by the timer, the recorder automatically goes into the record mode. For playback only, TIMER START-PLAY is pressed.

The level meter is more than merely a nonmechanical voltage indicator. It can be set to read AVERAGE levels, roughly corresponding to a VU meter, or to be a PEAK meter that can accurately follow the shortest musical transients. There is also a PEAK HOLD mode, in which the highest peak level attained is held on the display. A button resets the TAPE COUNTER to 000, and colored indicator lights show the status of the MEMORY, DOLBY, and TAPE BIAS systems.

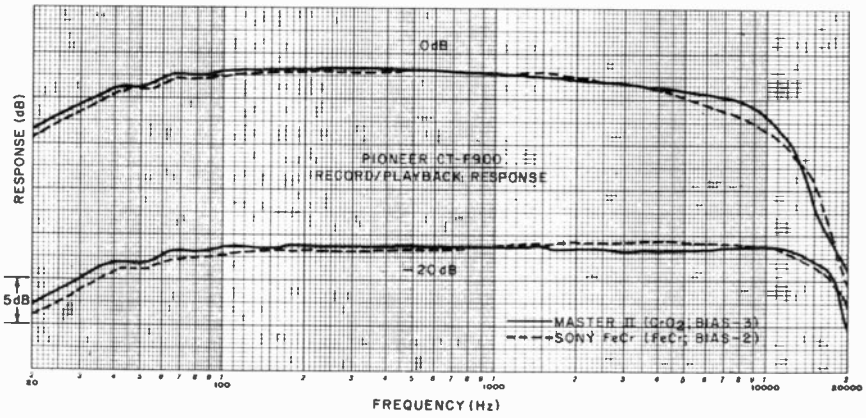
This is a relatively large cassette deck. It measures 16.5"W × 14.5"D × 7.38"H (42 × 36.8 × 18.7 cm) and weighs 24.25 lb (11 kg). An optional rack mounting adapter permits the deck to be installed in a standard 19" (48.3-cm) EIA rack. The suggested retail price of the Pioneer CT-F900 is $575.

● ***Laboratory Measurements.*** No information was supplied on specific tapes for which the bias had been set on the tape deck we tested, so we ran frequency-response curves on a dozen or more tapes, adjusting the BIAS control for flattest response for each tape. Although our BIAS settings usually did not match the recommendations in the manual, the differences were not large, and perfectly satisfactory results should be obtained with almost any good-quality tape. In the absence of built-in oscillators, the best way to make this adjustment is to record interstation FM tuner hiss at a −20-dB level and switch between the SOURCE and the TAPE monitor signals while adjusting the BIAS control for the closest audible match between the two.

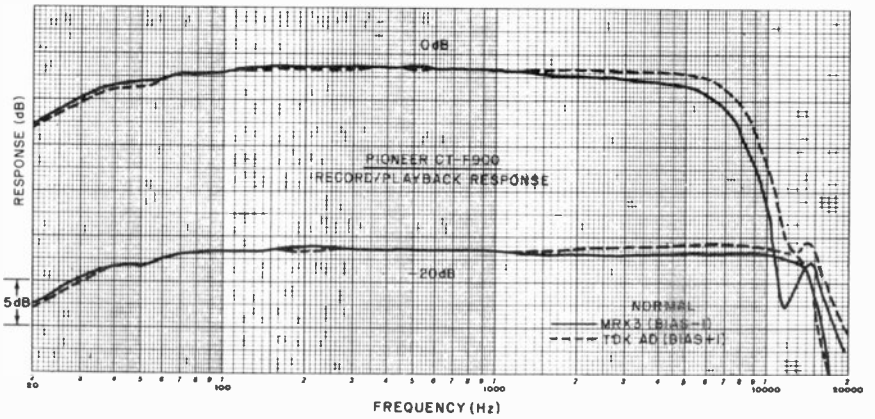
We selected one of each basic tape type for the balance of our tests. (The selection was partly arbitrary, and partly because these tapes seemed to give the flattest overall frequency response.) Scotch Master II was used for the "chrome" tape. This is a cobalt-treated ferric tape, designed for chrome bias and 70-μs equalization. Sony Ferrichrome was used for the FeCr tape and Memorex MRX3 for the STD tape.

At a −20-dB recording level, the frequency response was within the manufacturer's limits of ±3 dB over a range of 30 to 15,000 Hz for STD tape and 30 to 17,000 Hz for the other two tapes. The low-end response dropped off smoothly below about 60 Hz, with almost no sign of the response "ripples" that are typical of most cassette recorders. The response was, in fact, much flatter than the Pioneer specifications would suggest. With Master II tape, it varied less than ±0.5 dB from 55 to 14,000 Hz, and the other tapes yielded very nearly as good results.

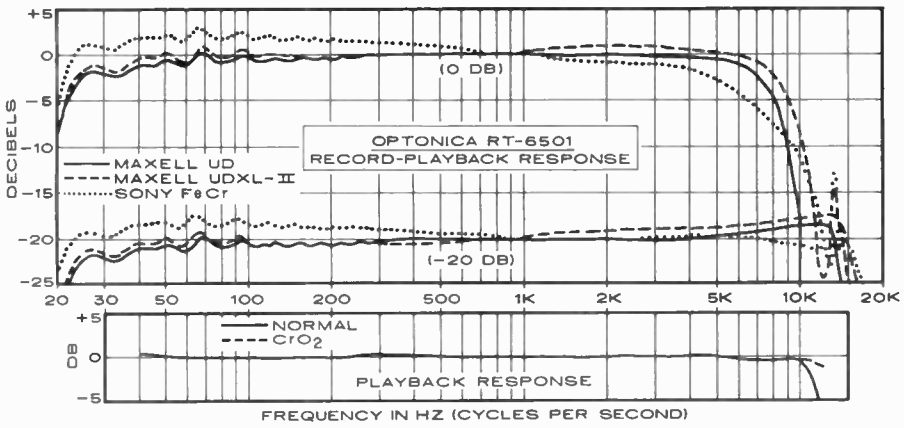
The "tracking" of the Dolby circuits was



Frequency response at two recording levels for "chrome" and FeCr tapes.



Frequency response at two recording levels for two standard tapes.



the output-level control fully turned up, the output for a 0-dB meter indication was 700 mV at the line-output jacks and 80 mV into a pair of 8-ohm headphones. The headphone listening levels were adequate with both low- and medium-impedance phones of ordinary efficiency. Microphone overload occurred at an input level of 30 mV. The record-level meters tracked very accurately from input levels of +5 down to −6 dB, with a very slight error setting in below that point, so that a true −10 dB input registered as −9 dB. The meter ballistics were somewhat slow compared with genuine VU-meter characteristics, rising to only about 70 percent of full-scale indication with 0.3-second tone bursts.

We checked the playback frequency response with our new TDK AC-337 test tape, since we have found good agreement between it and those we have used in the past and since it permits us to extend the measurement range to 12,500 Hz. This tape can be used to check the playback equalization for ferric tapes directly, and by applying the proper correction factors it can also be used to evaluate CrO_2 equalization. With this tape we found that the playback response of the RT-6501 was extremely flat, within ±0.5 dB from 40 to 10,000 Hz and down only 1.5 dB at 12,500 Hz in the ferric switch position. Playback response in the CrO_2 position was almost identical, with a very slight dropoff of 1 dB at 10,000 Hz and 1.9 dB at 12,500 Hz.

The overall record-playback frequency response was very smooth—well within the manufacturer's specifications and certainly as wide as we could reasonably expect from a deck in this price class. The low-frequency "head bumps" that typically cause undulations of several decibels in the region below 100 Hz were quite well controlled. The flattest overall response was obtained with the Maxell UD (ferric) tape, which varied by only ±1 dB all the way from 40 to about 7,000 Hz, rising smoothly to +1.5 dB at 13,000 Hz, above which it dropped off rapidly. The response with Maxell UDXL II, using CrO_2 bias and equalization, was very nearly as flat over the same range, reaching a gradual peak of about +2 dB around 14,000 Hz and dropping to −2.5 dB at 16,000 Hz. Sony ferrichrome had a somewhat elevated low-end response and a very slightly more irregular curve, but it, too, was within ±3 dB all the way from 20 to about 17,000 Hz.

The Dolby-level meter calibration (which occurs at +3 dB on the scale) proved to be within 0.2 dB of the playback level from a standard 200-nW/m Dolby test tape. Tracking error between Dolby-in and Dolby-out sweeps across the frequency range of the machine was typically less than ±0.5 dB—and never worse than ±1 dB—at levels of −20, −30 and −40 dB. This is fine performance.

The RT-6501 provided a higher-than-usual margin (about 7 or 8 dB) between an indicated playback level of 0 dB and the 3 per cent third-harmonic distortion point traditionally used for signal-to-noise (S/N) measurements. In practice, this means that recording levels that cause the peak-indicating LED to flicker occasionally are still acceptable for low-distortion recordings. The unweighted S/N ratios measured 53 dB with the Maxell UD and Sony ferrichrome tapes and 54.5 dB with Maxell UDXL II. Using CCIR/ARM weighting brought the S/N ratios up to 54.5 dB for the UD and 58 dB for the UDXL II and ferrichrome. Finally, adding Dolby noise reduction to the weighted measurements resulted in a 64.5-dB S/N for the Maxell UD ferric and 68 dB for the CrO_2-equivalent Maxell UDXL II and the Sony ferrichrome. These are truly superb signal-to-noise measurements, especially remarkable in view of the moderate price.

The flutter of the RT-6501 measured a low 0.054 per cent with a TDK test tape and 0.072 per cent on a combined record-playback measurement using the wrms standard. The DIN peak-weighted figures (which are always much higher) tested out at 0.07 and 0.09 per cent, respectively—both excellent. Fast-forward and rewind times were moderately slow —135 seconds for a C-60 cassette—but were exactly as specified.

● ***Comment.*** The performance of the Optonica RT-6501 leaves very little to be desired in terms of low distortion, high signal-to-noise ratio, and low wow and flutter. Its frequency response is good (especially with ferrichrome and chrome-type formulations), though in direct comparisons with extremely demanding program material some very slight dulling of the very highest frequencies was detectable, particularly in the ferric position. We doubt, however, whether even this essentially minor limitation would be noticeable in the vast majority of applications for which audiophiles would normally use a cassette deck.

No machine could offer as many different kinds of computer control as this and at the same time permit an instant understanding of its features and functions. However, the owner's manual methodically takes one step-by-step through each of the control features (all of which we have not had space to describe fully), despite occasional lapses into somewhat unconventional English. We could wish that the seven piano-key levers had been more clearly differentiated (only the RECORD lever is color coded), but one quickly becomes accustomed to their locations. And once we had mastered them, we found the computer features a sheer delight.

In our view, the Optonica RT-6501 is a truly fine performer that would be well worth its price even without its unique microprocessor. With the latter included, it is easily one of the best cassette-deck values we've come across.

Pioneer CT-F900 Stereo Cassette Deck

Some interesting new features highlight Pioneer's Model CT-F900 three-head, two-motor cassette deck. For instance, it has replaced VU meters with fluorescent level indicators; and it has electronic memory controls, a dual-capstan drive system operated through a microprocessor-controlled logic system, and a "double Dolby" system that allows programs to be monitored just as they will sound with noise reduction.

Since the cassette well extends beyond the front panel, the status of the tape on a cassette being played is clearly visible at all times. When it is first inserted, the machine goes into REWIND for an instant, taking up any slack in the tape so that the portion between the two capstans will be under the proper tension. A hinged cover can be swung up to protect the heads and capstans when no cassette is in place.

solenoid sound. This is not far from the actual case, since one of the very few details supplied about the inner workings of the deck in the Eumig literature is the fact that the head assembly is pivoted and moves through an arc to contact the tape. However this is accomplished, the heads appear to contact the tape firmly but slowly, with a minimum of impact. The record azimuth adjustment was easy to make and not very critical, unless one is concerned with the response at the highest audio frequencies (beyond 15,000 Hz).

Eumig also claims a start-up time of less than 40 ms for the low-mass capstan motor so that the PAUSE start and stop action (which actually shuts off the motor, instead of leaving it running with the pressure roller released, as is usually done) occurs instantly and with no audible wow. We confirmed this in use. In general, we are most impressed with the mechanical performance of the recorder.

We are less enthusiastic about the relatively low saturation level of the recording head. With most tapes, the 0-dB record/playback frequency response was not as wide as we have found on many other cassette decks in the upper-price range. Even the very measurable difference in response between the −20- and −40-dB recording levels with TDK SA tape suggests that the deck should be operated with a very low average recording level, which needlessly restricts its dynamic range. This is why we obtained S/N figures that, though very acceptable, are not quite as good as expected from a $1300 cassette recorder. True, the noise levels are low, but so is the maximum recording level.

When recording from FM broadcasts, the deck did a "perfect" job in the sense that operating the monitor button to listen to the incoming program or the tape playback resulted in absolutely no audible difference in the sound. When we tried recording FM tuner interstation hiss at various levels and making this comparison, we could always hear some difference in the extreme highs. The playback was usually slightly dulled, even at levels as low as −20 dB. With high-energy tapes such as TDK AD, which had a rising high-end response, the effect was the reverse, with the playback sounding slightly bright. In both cases the difference was slight, probably too small to detect when recording FM broadcasts or dubbing from most records.

Our conclusions are, of course, based on tests with just one sample of the Model CCD. Hence, we have no way of knowing how representative our test deck was of the company's entire production. If the Model CCD could be given just a few decibels of added headroom in recording, it would be unarguably one of the finest decks on the market at any price. This deck is ingeniously designed, ruggedly made, and highly versatile, with basically excellent performance—when using a limited number of suitable tapes and only when the maximum recording level is kept to −3 dB or less as read on the LED indicators.

Optonica RT-6501 Stereo Cassette Deck

The Optonica RT-6501 cassette deck incorporates a computer-like microprocessor that gives it a number of unusual and interesting operating features. One is an "Auto Program Locate Device" (APLD) that enables the user to skip ahead (or go back past) up to nineteen program selections on a tape side in order to begin playback with the particular one desired. The device works by scanning the tape as it runs in the high-speed modes and counting the blank spaces between selections. (The blank spaces must be about 3 seconds in duration; an "editor" button can be used during recording to insert spaces of the right length automatically.) Since some program material may have "natural" pauses, an alternative method of cueing is provided, this one using the built-in electronic digital counter. If the counter reading at which a desired selection begins is known, this number can be punched in on the front-panel, calculator-type keyboard, and the RT-6501 will advance or rewind to precisely that point (provided the counter has been "zeroed" in at the start of the side). A liquid-crystal display (LCD) panel is used to show the counter reading, transport status, and commands being executed or stored in the memory.

The same LCD panel is used for the readout of a crystal-controlled digital clock timer, which can be set to show the time of day in either 12- or 24-hour modes (whether or not the deck is running). The timer can be used to switch the deck on or off at a preset time for completely unattended operation, and it also controls a switched 400-watt convenience outlet on the back of the machine for associated equipment (the 400-watt rating should be adequate for all but the most powerful amplifiers). At the touch of yet another button, the time display can (without losing track of clock time) be used to show the elapsed running time of the cassette in use, permitting calculation of the amount of recording or playing time still available. A pair of 1.5-volt AA cells inserted into a compartment on the rear apron of the RT-6501 keeps the clock and memory going even when the deck is turned off (the off position is marked STAND-BY on the front-panel power switch). The batteries are said to last for one year.

The RT-6501 is a front-loading design with a Permalloy record/playback head and a ferrite erase head. The transport is driven by a single dc servomotor. Cassettes are inserted into clips on the inside of the tilt-down loading door, whose large, clear window provides ample visibility. The front portion of the door can be easily removed by two knurled screws, giving access to the heads for routine cleaning and demagnetizing. An illuminated panel behind the cassette helps show how much tape remains on a side. Beneath the cassette well is a row of piano-key levers for the usual transport functions.

The microprocessor buttons and display, reminiscent of a hand-held calculator, occupy the center section of the front panel. Further to the right is a pair of illuminated record-level meters marked −20 to +5 dB. Their rather subdued lighting matches that of the adjacent liquid-crystal display. Just below the meters are two red LED indicators. One of these is used to show when the machine is in the record mode. The second is a peak indicator that shows momentary high signal levels too brief to register accurately on the meters. (In our tests the peak-reading LED began to flash with an input level of approximately +7 dB.)

The other operating controls are located below the meters. Pushbuttons control the lighting of the LCD panel, engage the memory-rewind feature (which is conventional in operation), turn the Dolby system on and off, and separately select either high or low bias and either 70- or 120-microsecond playback equalization. The former bias and equalization settings are for CrO_2 (or equivalent) tapes, the latter for regular ferric oxides. For ferrichrome tapes, the low bias and 70-microsecond switch positions are used. Separate record-level controls are provided for microphone and line-level inputs (they are arranged in concentric pairs). A single output-level control simultaneously varies the signal at the line-output jacks and the front-panel headphone jack.

In addition to the battery compartment and switched ac outlet, the rear panel carries the input and output jacks. The RT-6501 measures about 17 3/8 inches wide, 14 1/8 inches deep, and 5 3/4 inches high; it weighs just under 20 pounds. Price: $400.

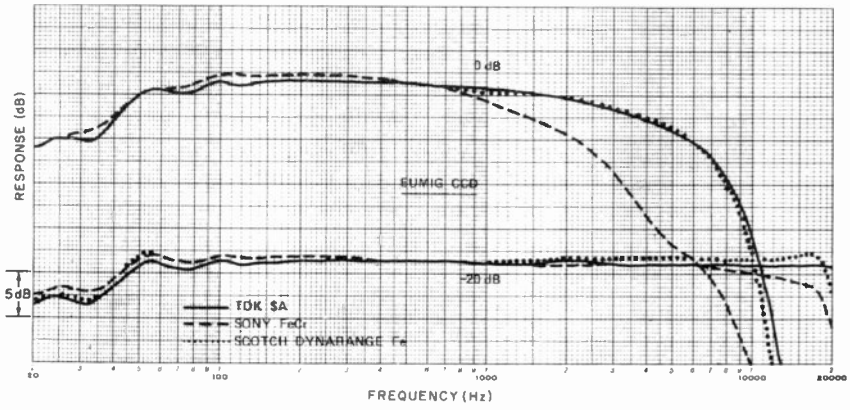
● ***Laboratory Measurements.*** The Optonica RT-6501 comes factory-adjusted for Maxell UD (ferric), Maxell UDXL II (CrO_2-type), and Sony ferrichrome (FeCr) tapes, all of which we used for our basic tests.

A 0-dB indication on the record-level meters required a line input of 51 millivolts (mV) or a microphone-input level of 0.2 mV. With

filter into the recording circuits to eliminate any possible interaction between the pilot carrier leakage in a tuner output and the Dolby system of the recorder.

The Eumig Model CCD measures 17.1" W x 11.8" D x 5.4" H (43.4 x 30 x 13.8 cm) and weighs 16 lb (7.3 kg). A remote-control accessory supplied with the recorder duplicates all transport-control functions, including recording and fast forward and reverse. It measures about 3.5" x 2" x 1" thick (7.6 x 5.1 x 2.5 cm) and plugs into the recorder through an approximately 90" long (2.3 m) cable. Suggested price is $1300.

● ***Laboratory Measurements.*** The operating manual that accompanies the Model CCD makes no recommendations or suggestions about specific types of tape to be used with the deck. (It is, however, sufficiently complete in its description of the deck's operation and features.) An individually run frequency-response curve is supplied, also without reference to the tape or even the recording levels, making it of little value. We took advantage of the deck's monitoring capability to test some 16 tapes in an effort to find the one (or ones) that best matched the bias and equalization settings.



Frequency response at 0 and −20 dB for three different tape types.

Among the ferric-oxide tapes, we tested BASF Professional I, Fuji FX-I, Maxell UD-XL I, Maxell LN, Memorex MRX3, Scotch Dynarange, Scotch Master I, and TDK AD. It was obvious that the machine's bias was too low for the high-performance tapes in this group, all of which had a more or less rising high-end response at a −20-dB recording level. However, Scotch Dynarange and Maxell LN yielded virtually flat response curves, with the slightly better high-frequency saturation of the Scotch tape making it our choice for the balance of the tests with Fe tape.

Among ferrichrome tapes there is much less choice. We tested BASF Professional III, Scotch Master III, and Sony FeCr. The deck was clearly not suitable for use with the first two, which had severe high-frequency losses. The Sony tape provided an acceptable, though not particularly good, response compared to the other tape types. This is the tape we used for our FeCr tests.

As expected, the cobalt-treated ferric "chrome-equivalent" tapes gave the best results with the Model CCD. We tested BASF Professional II, Fuji FX-II, Maxell UD-XL II, Scotch Master II, and TDK SA. Although all gave acceptable results, the TDK SA had an impressively flat response that left no doubt that it was the best tape for this deck as it was biased and equalized.

The frequency response at −20 dB with TDK SA was flat within ±0.5 dB from 47 to beyond 20,000 Hz. The head "ripples" at low frequencies had little effect down to about 45 Hz, but the output dropped about 5 dB at 35 Hz and below, which applies to any of the tapes we used. At the high end, the response was down 3 dB at just beyond 21,000 Hz. The 0-dB record/playback response displayed the expected saturation effect. It dropped off beyond 2000 Hz and intersected the −20-dB curve at 10,500 Hz.

The Sony FeCr tape gave a response within +0.5/−3 dB from 38 to 17,000 Hz at −20 dB. However, its saturation at high levels was more pronounced than we are accustomed to seeing, even on cassette machines. The 0-dB response dropped steeply beyond 1000 Hz and intersected the −20-dB curve at 6300 Hz.

The response with Scotch Dynarange was nearly as flat, though not quite as extended, as the TDK SA response. At −20 dB, it was within ±0.5 dB from 46 to 18,000 Hz, and the 0-dB response intersected the −20-dB curve at 10,000 Hz.

The playback equalization could be measured only for the 120-μs (Fe) response since our standard test tapes do not have the notches required for switching the deck to 70 μs and there is no override feature. The low-frequency portion of the response from the TDK AC-337 test tape was very flat. However, beyond 1000 Hz, the output dropped off slightly to about −3 dB at 12,500 Hz. Overall, it was within ±1.5 dB from 40 to 12,500 Hz, which is a respectable response for any cassette recorder.

The 19-kHz multiplex filter began to affect the frequency response as low as 10,000 Hz and less, but it decreased it by only about 8 dB at 19,000 Hz. Although the attenuation appeared to increase at higher frequencies, it was relatively low at the critical 19,000 Hz pilot carrier frequency.

The Dolby tracking of the recording and playback circuits was excellent. At −20 dB, the frequency response with and without Dolby changed by no more than 1 dB at any frequency up to 15,000 Hz. At −40 dB, the two curves were within 1 dB of each other up to our measurement limit of 20,000 Hz. Noticing that the response at −40 dB was rising slightly at 20,000 Hz, instead of falling as it did at −20 dB, we extended our −40-dB measurement to 40 kHz. The result was an impressive response of ±2 dB from 40 to 23,500 Hz!

To produce a 0-dB recording level indication on the LEDs, a line input of 50 mV was needed. The microphone sensitivities were 0.068 and 0.77 mV for the two positions of the microphone attenuator. The corresponding overload levels were 7.7 and 52 mV. The playback output voltage, which is fixed, was 0.46 volt for FeCr tape, 0.57 volt for Scotch Dynarange, and 0.66 volt for TDK SA, all from a 0-dB recording input at 1000 Hz. A comparison with the playback output from a TDK Dolby-level cassette revealed that the playback "Dolby level" of 200 nW/m corresponded to a recording made at −3 dB on the deck's own amplitude display, but there was no Dolby mark on the display scale, nor was any reference made to this matter in the manual.

The playback waveform from a 0-dB recording with any of the tapes was severely distorted. It contained from 5.6% to 7.1% of third-harmonic distortion. To obtain the usual reference level of 3% third-harmonic distortion, we had to record the Dynarange and SA tapes at −2 dB and the FeCr tape at −4 dB. The S/N, relative to these levels, was respectively 48.5, 51.5 and 51 dB for the three we used in our tests in an unweighted measurement. Using the Dolby system and CCIR/ARM weighting, we measured S/N figures of 63.5, 65.5, and 62 dB for Fe, Cr, and FeCr tapes. The noise level through the microphone inputs increased by 2.6 or 15 dB (depending on the attenuator setting) at maximum gain, compared to the noise through the line inputs. The recording ave circuit attacked almost instantly to hold the gain effectively at −3 dB. There was negligible distortion from overloads of 30 dB or more. (The "pumping" of the background noise level as the gain fluctuates makes this feature unsuitable for music recording.)

The deck's measured flutter actually surpassed the remarkable claims made for it! With a TDK AC-342 test tape, the peak weighted flutter (DIN) was 0.05%, and the weighted rms flutter (JIS) was 0.035%. The same readings were obtained in a combined record/playback measurement. The speed was 0.15% fast and did not change as a cassette was being played. The crosstalk from left to right channel at 1000 Hz, measured with a TDK AC-352 tape, was a relatively high −33 dB, which is still adequate for a full stereo effect.

The Model CCD is claimed to have a very fast rewind speed, and it did. It rewound a C-60 cassette in only 47 seconds, which is appreciably faster than the 80 or more seconds of a typical cassette transport. However, its fast forward was slower, taking 84 seconds to move the same amount of tape. Headphone volume through 200-ohm phones was excellent. The headphone amplifier built into this recorder makes it one of the very few cassette decks that can actually produce a loud listening level with just about any kind of dynamic phones.

● ***Comment.*** Functionally and operationally, this appears to be a well-conceived and executed deck. Its rather unusual features are easy to get used to; afterward, it is difficult to imagine a recorder smoother or easier to use. The transport is astonishingly silent. The advantage of its stepped-motor design compared to solenoid control was the absence of thumps or clunks. The tape heads move up to contact the tape with a "motor" rather than a linear-

mounted on it and an absolute minimum of visible point-to-point wiring. Even the transport mechanism appears to be simpler and more compact than most we have seen. One would expect that this special attention to design details will pay dividends in long-term reliability. It is clear that in all aspects of its design and performance, the Dual 819 is a first-rate unit.

Eumig CCD Stereo Cassette Deck

The Austrian-made Model CCD from Eumig is a three-head, top-loading cassette deck with many unusual design and operating features. In particular, it has a low-mass servo-controlled capstan motor with optical feedback, solenoid control of all transport functions, full remote control as a standard feature, flexible dual inputs with mixing capability, and fast peak-responding LED recording level indicators.

The recorder is finished in black and has an upward-sloping rear section that contains the level indicators and ON/OFF power switch. The transport controls are light-touch pushbuttons, each of which has a status indicating LED near it. Input and output jacks are in the rear, microphone jacks are in the front, and various controls and switches are located on the front and underneath the recorder.

A light touch on a button opens the door of the cassette compartment, while an additional, firmer pressure causes the cassette tray to tilt upward with a slow, damped motion for loading and unloading a cassette. Selection of bias and recording and playback equalization is automatic, using the special keying hole on the rear of a cassette to select operating conditions for chrome (Cr) tape; otherwise, the machine is set up for either ferric-oxide (Fe) or ferrichrome (FeCr) tape. A slide switch under the cassette cover permits the user to choose between these two tapes, since there is no special cassette keying to distinguish between them. The appropriate LED in front of the cassette compartment comes on to indicate the type of tape being played or recorded.

The deck has a memory-stop feature associated with its index counter. The stop works in either direction of tape motion in the fast-speed modes when the counter reaches 000. Two pairs of slide-type potentiometers are provided for recording level adjustments on each channel for each of the two inputs. An input is selected by touching a button in front of its level controls. Simultaneously, the scale markings for the selected controls light up and the appropriate INPUT LED lights up. Normally, touching the other input button will shut off the first input. However, both inputs can be used simultaneously by holding down one button while touching the other.

Between the INPUT select buttons is another button labelled AUTO/MAN. Touching this button causes the manual level controls to be replaced with an automatic volume control (avc) circuit. This function would principally be used for speech recording. It can be used with either recording input but not with both simultaneously. When the avc is on, the lights for the level controls and the LED indicators extinguish. Normal manual control is restored with a second touch of the AUTO/MAN button. Plugging a microphone into one of the input jacks replaces the corresponding LINE input of INPUT 2 with the microphone signal.

The recording-level indicators are calibrated from −20 to +6 dB with LEDs that form a line whose length is proportional to the peak incoming signal level. Up to −3 dB, the LEDs are green; the 0-dB LED is yellow; and the +3- and +6-dB LEDs are red. Since the signal level is monitored after the recording equalization, the LEDs give a true picture of the peak levels applied to the recording head.

The transport controls are fully logic operated through solenoids. Any transport control button can be touched while the machine is running in any mode without risking damage to tape or deck. Even the button for the cassette compartment door can be operated while the tape is running. Pressing the OPEN button while the deck is operating causes the tape to stop. Then the compartment door opens and allows the tape to be lifted out of the deck by the tray. Only the record function cannot be engaged once the tape is in motion. The deck is placed in the record mode in a rather unorthodox manner. The PAUSE button must be touched first, then the REC button. After the levels have been set, another touch of the PAUSE button starts the recording process. Alternatively, the REC button can be pressed first, followed by *two* touches on the PAUSE button. While recording, touching PLAY will instantly place the deck in the play mode.

As befits a true three-head recorder, the Eumig CCD has full off-the-tape monitoring capability. This includes a double Dolby system so that the playback is heard with the correct frequency response and noise level while a recording is being made. Certain operating sequences of the transport controls will also switch the monitor outputs from tape to source (but not from source to tape). One must keep an eye on the red MONITOR LED to determine which program is being heard. The Dolby NR button inserts and removes the Dolby noise-reduction circuits. There is also a headphone jack with its own independent PHONES level control.

Barely visible on the front surface of the deck are the two microphone jacks and two pushbutton switches. One button is for selecting the microphone sensitivity to accommodate high- and low-output microphones (the microphones can have balanced or unbalanced outputs and any impedance from 100 to 5000 ohms). The other button is a TEST switch that controls an internal 400-Hz oscillator used both for record head azimuth adjustment and Dolby-level adjustment.

Like the few other true three-head cassette decks with physically separate recording and playback heads, the Model CCD provides for an azimuth adjustment on its recording head. This permits one to compensate for any skew effects in the cassette that could alter the azimuth relationship between the tape and two heads. (The playback head is fixed and is factory aligned against a standard test tape.) This record-head alignment is required to obtain the full high-frequency response of which the deck is capable, although Eumig states that "for most recordings this adjustment will probably not need to be made." The other manufacturers of three-head cassette decks are emphatic about the importance of making this adjustment for *every* cassette before recording and even when recording on the second side of a cassette after the deck has been adjusted for the first side.

To make the alignment, the deck is put into the record mode and the TEST button is engaged. In general, the green LEDs on the level display will come on for only one channel. With the cassette cover open, a small nonmagnetic screwdriver (supplied with the recorder) is inserted into a slot in the well and turned until the LEDs for both channels come on for about the same percentage of the time, flashing on and off alternately. The TEST button can then be released and the tape returned to its beginning for making the recording.

To perform the Dolby alignment for matching the input and output levels within 2 dB, the TEST tone and the Dolby system are switched on. This gives a steady indication for both channels on the display. Small individual thumbwheel controls on the front of the deck are then adjusted until the yellow LEDs in the display just begin to flicker. As before, the TEST button is released and the tape is returned to its beginning before making a recording.

Beneath the recorder are two pushbutton switches. One transfers INPUT 1 from phono jacks to a DIN connector and performs appropriate level and impedance changes. The other button permits one to insert a 19-kHz

ing amplifier *following* equalization, and they therefore read the instantaneous peak level of the signal as it is being recorded on the tape. Because of their fast response time and the point in the circuit at which they monitor the program, Dual's meters eliminate any need for the LED's or other peak indicators that are often used to supplement conventional slow-responding meters.

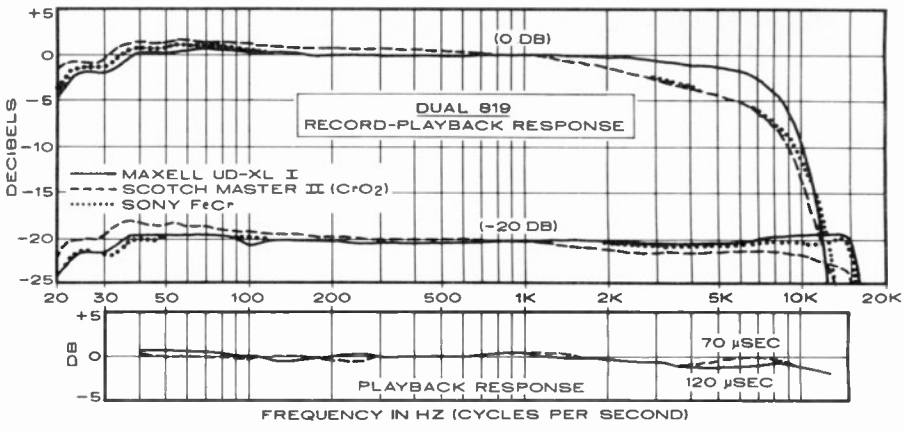
Below the meters are the two pairs of recording-level knobs. The line and microphone inputs are separately controlled and can be mixed. Separate controls for the two channels are concentrically mounted. There are two microphone jacks. Plugging one microphone into either of the jacks connects it to *both* recording channels in proportion to the settings of the level controls. When two microphones are plugged in, each feeds its indicated channel only.

Between the recording-level controls is one of the 819's special features, which was first introduced on Dual's top model, the 939. Called the "fade/edit" system, it permits a smooth transition from one already recorded segment to the next without the abrupt changes and switching transients that often occur when a recorder is stopped and then restarted in the recording mode. It can also be used to edit out unwanted portions of a recorded tape smoothly with minimal risk of losing any desired material. This feature is used while the machine is in the playback mode. When a button is pressed in and held, current is slowly applied to the erase head, increasing over a period of 3 to 5 seconds to the point where it fully erases the tape. When the button is released, the erase current is gradually removed over a similar period, smoothly restoring the program to the original level. Since this is done while listening to the tape, there is no uncertainty about when the erasure should begin (although one must first time the segment to be erased, so as to know when the button should be released). Since the fade/edit system will operate on any cassette, even when its recording safety tab has been removed, the button is located behind a plastic door that must be held open while the button is pressed. This prevents accidental erasure of a tape.

The Dual 819 has the "memory wind" feature that is becoming almost standard on high-quality cassette recorders. However, Dual goes beyond most others, since the automatic stop when the index counter reaches 000 is effective in fast-forward as well as in the usual rewind mode. Red and green LED indicators on the panel show when the Dolby system is on and when the machine is in the recording mode. The end-of-tape stop and disengagement of the transport is controlled by a photocell sensor that stops the machine within a quarter second of the time *either* tape hub stops turning. The input and output jacks are recessed into the rear of the cabinet, together with a DIN socket and two screwdriver-adjustable output-level controls. The Dual 819's case is finished in dark brown, contrasting with the bright metal knobs and the large, well-lit silver meter faces. It measures 17⅛ × 6 × 13¼ inches and weighs 17¾ pounds. Price: $430.

● ***Laboratory Measurements.*** Although the instruction manual for the 819 lists the recommended bias/equalization settings for a number of tapes, we were informed by the importer (United Audio) that the machine had been adjusted for Maxell UD-XL I (Fe), Scotch Master II (CrO_2), and BASF Professional III (FeCr). Lacking a suitable sample of the BASF tape, we used Sony Ferrichrome.

The Maxell UD-XL I tape provided a very flat record-playback frequency response (at −20 dB), within ±0.75 dB from 30 to 15,500 Hz. We noted that the low-frequency "ripples" caused by the head contours were less prominent than those of many other decks. The Scotch Master II response sloped downward slightly from 35 to 15,000 Hz, although it varied only ±2.5 dB from the 1,000-Hz level between 20 and 14,500 Hz. The response with Sony Ferrichrome was flat within ±1 dB from 33 to 15,000 Hz.



The Dolby tracking of the 819 was among the best we have measured. Up to 12,000 Hz, there was less than 0.5 dB difference between response curves made with and without the Dolby circuits at levels from −20 to −40 dB. The playback frequency response was within +0.8, −1.7 dB from 40 to 12,500 Hz using the TDK AC-337 (120-microsecond) test tape. The 70-microsecond playback response, measured with the Teac 116SP tape, was within +0.5, −1 dB from 40 to 10,000 Hz.

A 0-dB recording-level reading on the meters of the 819 required an input of 44 millivolts (mV) at the line jacks or 0.29 mV at the microphone jacks. The playback level from a 0-dB recording was in the 0.6- to 0.8-volt range, depending on the tape used. The microphone preamplifier overloaded at a 57-mV input. The overload was taken as the level that produced 3 per cent second-harmonic distortion, since the waveform rounded softly rather than clipping abruptly. The limiter came into action rapidly at 0 dB (it did not affect lower levels), reducing the recording gain and effectively preventing any distortion, even from severe overloads of 20 dB or more. However, following a severe overload, the gain returned to normal very slowly over periods as long as 30 seconds. This feature can be useful when recording voices, but it might produce some strange effects when recording music at too high a level.

At a 0-dB recording level, the playback distortion was lowest (0.63 per cent) with the Maxell UD-XL I tape and considerably higher (2 and 1.6 per cent, respectively) with the Scotch and Sony tapes. For a reference 3 per cent playback distortion, the recording inputs for the three tapes were +5, +2, and +3 dB, respectively. The A-weighted signal-to-noise ratios without Dolby, referred to the 3 per cent distortion level, were 59, 60.3, and 58 dB. With Dolby circuits in use and CCIR/ARM weighting, these ratios improved to 65.6, 70, and 67 dB. The noise increased by 10.5 dB through the microphone inputs at maximum gain. The headphone volume was gratifyingly high, even with 200-ohm phones.

The meters of the Dual 819 responded perfectly to the 0.3-second tone bursts used to check for conformity with VU-meter standards (although they are not equivalent to VU meters, being faster in their attack and slower in their decay). The reading on 0.3-second bursts, repeated once per second, was the same as on a steady-state signal of the same level. The meters were also calibrated very accurately, so that any given input-level change produced exactly the same amount of change on the meters. This is a rare occurrence with cassette-deck meters. The Dolby marks, set at 0 on the meters, were within 1 dB of the standard Dolby-level calibrating tones on our test tapes. The crosstalk from the right to the left channel at 1,000 Hz, measured with a TDK AC-352 test tape, was −54.5 dB.

Dual's tape transport, which has a rather impressive flutter rating of 0.05 per cent, lived up to its claimed performance. The weighted peak (DIN) flutter was a very low ±0.06 per cent. With a weighted rms reading the flutter was an amazing 0.035 per cent! These measurements were made with a TDK AC-342 test tape, but the readings increased only 0.005 per cent in a combined record-playback measurement made using a conventional high-quality blank cassette. In its fast-forward and rewind speeds, the Model 819 moved a standard C-60 cassette from end to end in 60 to 65 seconds.

● ***Comment.*** In its price class, the Dual 819 has some formidable competitors, and one has the right to expect first-class performance from any cassette deck selling for more than $400. Nevertheless, even in such distinguished company, the 819 stands out. To us, the extremely low flutter, flat frequency response, and low noise level of the 819, combined with its superbly accurate and useful meters (ordinarily one must pay a considerably higher price for a cassette deck with accurate, equalized, peak-reading meters), make this one of the more attractive values in a high-quality cassette deck. Such features as the fade/edit system and the bidirectional memory stop can be considered simply as bonuses.

Finally, although most recorder owners will never have the occasion to open up their machines and examine the internal construction, we can testify that the interior of the Dual 819 is as neat as the proverbial pin. There is a large circuit board with several smaller boards

formance down to 20 Hz. High frequencies rolled off fairly gently above 15,000 Hz, to −7.5 dB at 20,000 Hz. At a 0-dB recording level, the effects of tape saturation were hardly detectable below about 7000 Hz, and the 0-dB response curve intersected the −20-dB curve at 15,000 Hz. (This intersection usually occurs around 11,000 to 12,000 Hz.)

Performance with TDK SA tape was generally similar, although there was a slight response rise at 10,000 Hz and slightly better output at the highest frequencies. The overall response was ±3 dB from 20 to 19,000 Hz. The 0-dB curve intersected the −20-dB curve at 15,500 Hz.

When we measured the record/playback response at 3¾ ips with AD tape, we found a substantial improvement. (Although it was predictable and expected, it was nonetheless highly impressive.) The response was within ±3.5 dB from 20 to 24,400 Hz at −20 dB, and the 0-dB curve was virtually flat up to 13,000 or 14,000 Hz, intersecting the −20-dB curve at 20,000 Hz. With SA tape, the response was fairly similar, and was within ±3.5 dB from 20 to 25,000 Hz at −20 dB. The 0-dB response saturated earlier than that of the AD tape. The curve began to drop at 10,000 Hz, but it intersected the −20-dB curve somewhere above 20,000 Hz.

Dolby tracking was unusually close. The change in frequency response, when the Dolby system was switched in and out, was less than 1 dB up to about 12,000 Hz and less than 2 dB at 15,000 Hz, at recording levels of −20 and −40 dB. The meters indicated exactly 0 dB (the Dolby level) when we played a standard Dolby level calibration cassette. Unlike many low-priced recorders, the meter calibrations here were exceptionally accurate (an input change of "X" dB produced a closely corresponding change in the meter indications). With 0.3-second tone bursts used to check VU-meter ballistics, the Model T-2's meters indicated the same as with a steady-state signal. On program input, we could see that the meters had a fast rise time, followed by a much slower decay, so that they tended to follow the peak program level.

The 1⅞-ips speed drifted slightly, from 0.5% fast at one end of a cassette to 0.15% fast at the other end. (We made no speed measurements at 3¾ ips.) Using a TDK AC-342 flutter test tape, we measured the CCIR (weighted peak) flutter at a very good ±0.1%. The JIS (wighted rms) flutter varied from 0.05% to 0.07% at the two ends of the cassette. In a combined record/playback flutter measurement, the CCIR and JIS flutter readings were respectively ±0.12% and 0.09% at 1⅞ ips. At 3¾ ips, they measured ±0.06% and 0.04%. These figures would do justice to a good open-reel recorder! In fast forward and rewind modes, the transport moved a C-60 cassette from end to end in 51 seconds, which is considerably above average for a cassette deck.

● ***Comment.*** The B.I.C Model T-2 demonstrated superb performance at 3¾ ips. But we were equally impressed by what it did at 1⅞ ips! After all, the limitations of the cassette medium begin to decrease rapidly when the speed is doubled. Hence, we were not so surprised by what we measured at 3¾ ips (although the prospect of frequency response, S/N, and flutter levels approaching or matching those of a costly three-head cassette deck is certainly attractive).

Considering the T-2 solely as a conventional 1⅞-ips cassette deck, it is one of the better values we have seen in some time. In many ways, it is a "no frills" machine, with a single motor, combination record/playback head, completely mechanical transport controls, and no imput mixing capability. On the other hand, it has superb meters, whose dynamic range and response characteristics give the user a much clearer idea of what the program is doing than run-of-the-mill recorder meters. The manner in which the green RECORD indicator instantaneously changes to red at a +1-dB level might seem to be a rather minor "gimmick," but we found it to be by far the most visible and informative overload indicator we have seen on a tape deck. It simply cannot be ignored or confused with any other indication. Perhaps its only weakness is that it flashes far below the true overload level of AD tape, but it is nearly ideal for use with SA tape.

When we recorded interstation FM tuner hiss at −20 dB on AD tape, the playback was almost indistinguishable from the input signal. (There were minute differences, but one must listen very closely to detect them.) By increasing the speed to 3¾ ips, we could record at meter readings of −2 dB, with the red overload indicator flashing regularly, and hear only about the same small amount of degradation in the high-frequency response. At −10 dB, the reproduction was perfect. In our experience, this is uniquely fine performance for a two-head cassette deck. In practical terms, this means that the Model T-2 is much less likely to compress the high-level peaks and produce a dull or "mushy" sound, especially when recording from a live source, than almost any other comparably priced cassette recorder.

Unfortunately, one must also consider the limitations of a cassette operating at 3¾ ips. Operating times are halved, so that even a C-90 cassette plays only about 23 minutes on a side. One would think that a C-120 would be an ideal solution to this problem, since it would be the equivalent in recording time of a C-60 operating at 1⅞ ips. However, B.I.C specifically and categorically states that the Model T-2 should *not* be used with C-120 tapes, both because of their magnetic and physical properties and because the high-speed rewind and fast forward of the transport could damage very thin tapes.

Even if one finds C-90 tapes satisfactory, there is the question of compatibility. Tapes made at 3¾ ips can be played only on a machine equipped with that speed, which restricts the range of use significantly for the immediate future. And although metal-particle tapes are expensive, they have the potential of giving much of the performance at 1⅞ ips that B.I.C achieves at 3¾ ips, while retaining playback compatibility with existing cassette decks.

Thus, we prefer to consider the B.I.C Model T-2 as an especially good cassette recorder, with performance well above the normal for its price range. It also has a higher speed operating mode that gives it outstanding performance capability at the expense of reduced playing time.

Dual 819 Stereo Cassette Deck

The Dual 819 is a front-loading, single-motor, two-head cassette deck featuring a Sen-Dust alloy record/playback head. The tape transport is driven by a d.c. servomotor with a heavy, dynamically balanced flywheel. A newly designed, gear-driven, fast-forward and rewind mechanism eliminates many of the intermediate rubber wheels and clutches used on other cassette transports, and it is claimed to be more reliable.

The cassette compartment is at the left of the panel, with a row of conventionally operated mechanical "piano-key" levers below it. The transport controls can be operated in any sequence without going through stop (except when going into record, which can only be done with the tape stopped). When the EJECT lever is pressed, the cassette compartment door opens slowly, carrying with it the cassette tray. During operation the entire cassette can be seen.

Pushbuttons select bias andequalization for ferric-oxide (FE) or chromium-dioxide (CR) tapes. Engaging *both* buttons, logically enough, sets up the machine for ferrichrome tape. Similar buttons turn on the Dolby system and the recording limiter, which goes into operation at levels above 0 dB to prevent distortion from unexpected high-level program peaks. Above these buttons are a headphone jack and two small knobs that adjust the headphone volume separately for each channel.

The two large, illuminated level meters are calibrated from −20 to +3 dB. The meters monitor the level at the output of the record-

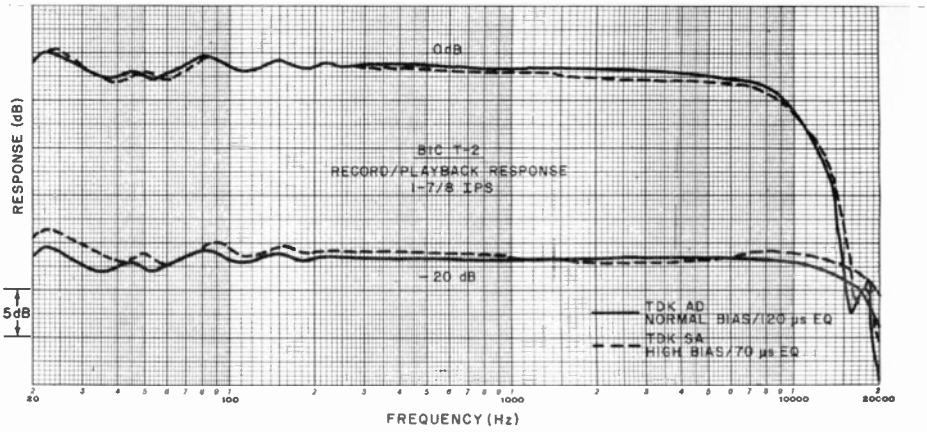
features tachometer feedback for speed regulation. A RECORD SAFETY switch has three positions, labelled SAFE, READY, and MUTE. This switch operates in addition to the mechanical RECORD switch associated with the transport keys and the recording safety tabs on the cassette, which prevent the RECORD key from being engaged when they are removed. In the SAFE position, the deck will not record or erase, no matter how the other controls are set. In READY, the recorder operates in a conventional manner, under the control of its RECORD and PLAY keys. MUTE is spring-loaded and can be used to blank out unwanted material (such as commercial announcements) while making a recording. Holding it down allows the deck to continuously erase the tape, with no signal being recorded. Releasing it restores normal recording. A DOLBY/MPX switch is also provided. In its bottom position, the Dolby system is off. Setting it to the center position, turns on the Dolby system and a green LED above the switch. In the top position, a multiplex (MPX) filter is inserted in the signal path to prevent an FM tuner's pilot carrier leakage from influencing the operation of the Dolby system.

Separate switches control bias and equalization. The three BIAS positions are labelled HI, NORM, and LO, while the EQ settings are marked in terms of their time constants (70 and 120 μs). In general, HI bias is for chromium-dioxide or equivalent tapes, while good ferric-oxide tapes will require NORM bias. LO bias is presumably for relatively inexpensive, low-performance tapes.

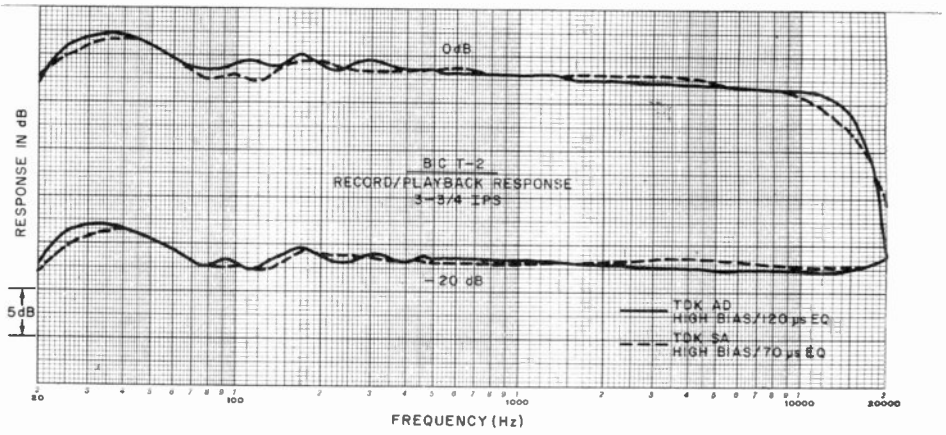
To the right of the recording level knobs is a pushbutton switch that permits selection of either the LINE or the MIC inputs for recording. (The two cannot be mixed.) Next in line to the right is the PHONES jack.

The B.I.C Model T-2 examined here is a single-motor, two-head, two-speed cassette deck with distinctive styling and unique operating features. Its black panel, with clearly legible white markings, contrasts with a rosewood-finished wooden cabinet. The overall dimensions are 16$^3/_4$"W × 6"H × 9$^1/_4$"D (42.6 × 15.2 × 23.5 cm), while its weight is 12.8 lb (5.8 kg). Suggested retail price is $329.95

● ***Laboratory Measurements.*** The recorder had been factory adjusted for TDK AD and SA tapes (NORM BIAS and 120-μs EQ; HI BIAS and 70μs EQ). Hence, we used these tapes for all our tests. Insofar as possible, all measurements were made at both tape speeds. Following the information supplied with the recorder, we used HI bias for both tapes at 3$^3/_4$ ips, although the EQ time constants were the same at both speeds.



Record/playback response for TDK AD and SA tapes at 1$^7/_8$ ips.



Record/playback response for TDK AD and SA tapes at 3$^3/_4$ ips.

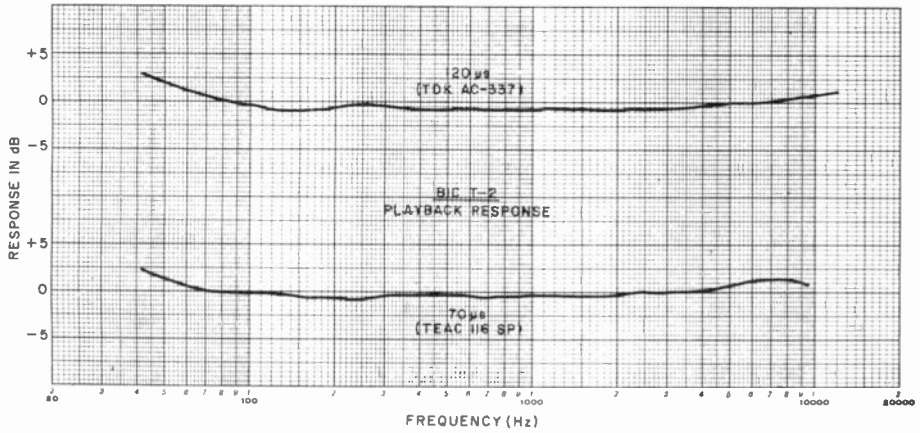
The line inputs at the rear apron required only 31 mV at 1000 Hz for a 0-dB meter indication. The corresponding maximum playback level was about 1.8 volts. MIC sensitivity was 0.165 mV, and the microphone preamplifier overloaded with a 21-mV input. This indicates the need for caution when recording from microphones, any of which can deliver over 21 mV at reasonably high sound levels. The maximum headphone output was 1.5 volts into 200 ohms, which gave a very comfortable listening level with medium-impedance phones.

The 1000-Hz playback distortion with a 0-dB recording signal level was well below the specified limits with SA tape and extremely low (0.25% to 0.5%) with AD tape. The reference recording level for AD tape, corresponding to 3% playback distortion, was +5 dB at 1$^7/_8$ ips and +7 dB (well above the meter scales) at 3$^3/_4$ ips. As expected, the SA 70-μs tape saturated at a lower level, +3 dB at 1$^7/_8$ ips and +4 dB at 3$^3/_4$ ips. The red OVERLOAD indicator came on at + 1 dB, well before the onset of significant distortion with either tape.

The unweighted S/N, referred to the 3% distortion signal level, was about 48 dB at the lower speed and 51 dB at the higher speed with both tapes. With A weighting, it was 57 to 57.5 dB at 1$^7/_8$ ips. At 3$^3/_4$ ips, the difference between the two tapes was revealed, with AD measuring 61.2 dB and SA 62.4 dB. When we used the Dolby system with CCIR/ARM noise weighting, the S/N performance was very good. It was 64.2 dB with AD tape and 63.6 dB with SA tape, both at 1$^7/_8$ ips. At 3$^3/_4$ ips, S/N was 66.8 dB for AD and 69 dB for SA tape.

The 120-μs playback equalization was measured with a TDK AC-337 test tape. It was flat within ±0.5 dB from 90 to 4000 Hz, and rose to +3.4 dB at 40 Hz and +2.2 dB at 12,500 Hz. The 70-μs response from a Teac 116 SP tape was within ±0.5 dB from 63 to 4000 Hz and rose to +2.4 dB at 40 Hz and +1.7 dB at 10,000 Hz.

Record/playback frequency response with TDK AD tape at 1$^7/_8$ ips (measured at a −20-dB level) was ±1.5 dB from 20 to 15,000 Hz. The response "ripples" at low frequencies, though present, were much less noticeable than on most cassette recorders. B.I.C's T-2 was unusual in maintaining its full per-



Playback response on test tapes with 120 and 70 microsecond equalization.

rated −8-dB reading on the PEAK scale.

Third-harmonic distortion in the playback mode was low at all three speeds. At a 0-VU level, it measured 0.32% on the two lower speeds and 0.22% on the highest speed. The reference 3% playback distortion was reached at a recording input of +6.5 to +7 dB, depending on the speed. At low levels (−10 dB), the distortion was the lowest we have measured from any tape recorder. It was 0.032% to 0.056%, depending on the speed.

The A-weighted S/N ratio, relative to the 3% distortion reference level, was about 66 dB at the highest speed and 67 dB at the lowest speed. By a small margin, the S/N was best (68 dB) at 7½ ips, but it should be noted that the S/N differences among all three speeds were negligible. Noise level through the microphone input at maximum recording gain was 10 dB greater than through the line inputs. At the maximum recommended setting of the microphone gain (7 on a scale of 10) the increase was only 3 dB.

We measured the playback flutter at the two lower speeds with Ampex test tapes. The weighted rms (JIS) flutter was 0.065% at 3¾ ips and 0.05% at 7½ ips. The weighted peak (DIN) readings were ±0.09% at both speeds. We also measured the combined record/playback flutter at all three speeds. The DIN and JIS measurements were ±0.11% and 0.085% at 3¾ ips and ±0.1% and 0.06% at 7½ ips. At 15 ips, the recorder again delivered its most outstanding performance, with a DIN flutter of ±0.04% and a JIS of 0.023%.

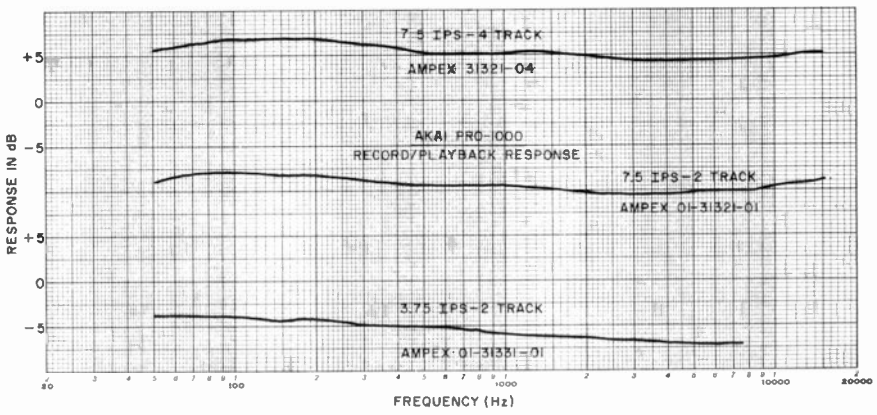
In its fast-wind modes, the recorder wound a 1200-ft (366-m) reel in 62 seconds.

● ***Comment.*** Anyone who thinks that open-reel tape recording is "dead" for home users should get acquainted with the Akai Model PRO-1000. True, it is not "everyman's" tape recorder. It is very heavy and expensive, and it does much more than most home recordists will ever need. But it is well-suited to the needs of the serious amateur recordist, for whom it was obviously designed. Standard phone plugs are employed rather than "Cannon-type" connectors used universally for microphone inputs in professional recording (where balanced microphone circuits are the norm). The input and output jacks are also standard phono types, for easy interfacing with other home audio components.

The tape transport operated perfectly. Its logic system made it practical to operate the controls in any sequence with no risk of damaging the tape. Touching the PLAY button during fast-wind operation brought the tape to a swift stop for an instant before it resumed at normal speed. "Flying-start" recordings can be made at any time while playing a tape by holding in the PLAY button and touching the REC button at the desired point. The reverse is also possible: while recording, a touch of the PLAY button instantly returns the machine to playback.

As for actual performance, at 7½ ips, this is a very fine home recorder, with many of its qualities optimized at that speed. This is an important consideration for the nonprofessional user, most of whose tapes will probably be in the quarter-track format at 7½ ips. At 15 ips, on the other hand, the recorder is nothing less than superb in its frequency-response, headroom, and flutter performance. Even at 3¾ ips, it is creditable.

As we see it, the special virtue of the PRO-1000, compared to some other fine open-reel recorders, is its highly versatile input mixing arrangement. It will not do the synchronized multitrack recording of a four-channel recorder, but it will enable the imaginative amateur to create professional-quality tapes from live program sources. That is what it was made for, we think, and it is admirably equipped for the task.



Playback responses at 7½ ips on 4 and 2 tracks and at 3¾ ips on 2 tracks.

B.I.C T-2 Stereo Cassette Deck

In the more than ten years since Philips introduced the "Compact Cassette," it has been exclusively a 1⅞-ips tape format for audio recording and playback. Philips licensing agreements have, until now, prevented any manufacturer from entering the consumer market with cassette machines operating at other than 1⅞ ips. Philips' purpose has been to maintain full compatibility between all cassette recorders and tapes. Now, however, the situation has changed with the introduction of three new cassette decks from B.I.C. In addition to the usual 1⅞-ips speed, the "T" series decks can be operated at 3¾ ips. Just as with open-reel tape, doubling the tape speed makes possible a substantial improvement in frequency as well as dynamic ranges as well as flutter.

At first glance, the Model T-2 appears to be quite conventional, though unusually handsome. The front-loading tape transport, with its bottom-hinged door, is at the left of the front panel. Piano-key controls are below it and include a combined STOP/EJECT key. (Initial operation of this key stops the tape motion, and the second opens the cassette compartment.) The tape must be at a stop before the PLAY, FAST FORWARD, or REWIND controls can be operated. The cassette compartment's window is retained by two thumbscrews and can be removed easily for cleaning, demagnetizing, and adjusting the heads.

Just to the right of the cassette compartment is an index counter with a MEMORY button that can be set to stop the tape in REWIND when the counter registers 000. Two large, well-lit meters have black faces with back-lit white scale markings and white pointers that are exceptionally easy to read. Above 0 dB, the markings are in red. The meter scales are logarithmic and cover a range from −40 to + 5 dB, with the Dolby level calibration (corresponds to a 200 nW/m flux level) at 0 dB.

Below the meters are two large concentric knobs for setting recording levels for the two channels. A single indicator between the meters glows green when the deck is recording and instantly changes to red if the peak level exceeds 0 dB. A small OUTPUT LEVEL knob is located to the right of the meters, while below it is a separate PHONES LEVEL control that affects only headphone outputs.

The remaining controls from a single row across the bottom of the panel, including a switch for selecting either 1⅞- or 3¾-ips tape speed. The dc motor that drives the transport

trol panel to adjust reel tension for either 10½" or 7" reels. Other pushbuttons are provided for selecting tape speed, controlling ac power to the entire recorder, and activating the AUTO PLAY system. The last switches the machine from fast forward or rewind to play at a point where a piece of conducting foil is attached to the back of the tape. Removable hub adapters for large-hub 10½" reels are supplied, as is a 10½" metal reel that is stored in the transport's cover. The cover over the tape heads is hinged for easy access to adjust and clean the heads.

Other pushbuttons control the transport solenoids. They include the usual basic tape-speed and direction selectors, a REC (recording) button with a red indicator light, and a PAUSE button with a yellow light. A CUE button allows partial contact between the tape and the heads during fast winding so that recorded portions can be located easily. In this mode, the output level is automatically reduced by 15 dB to prevent tweeter burnout, since signal levels in the ultrasonic range can be generated. On the back of the transport unit are two unswitched ac outlets, the line cord, a socket for a remote-control accessory, and three integral cables whose plugs mate with connectors on the amplifier unit.

The amplifier unit has four separate inputs, each with its own recording-level control, and a master recording-level control. Each level knob has a concentric metal ring that functions as a preset stop mechanism. The ring can be set to any point of a knob's rotation; and when that point is reached, a definite resistance to the knob's movement is felt. The knobs normally have a very light, effortless "feel." This makes it very easy to drop the recording gain on any input to zero and fade it in smoothly to the desired preset level without having to look at panel markings.

Each of the four recording inputs has a three-position switch that connects it to either a LINE or a MIC input. The third position introduces a 20-dB attenuation into the microphone circuit to prevent amplifier overload on very loud program material. INPUT 1 and INPUT 4 go to the left and right channels, respectively. However, the INPUT 2 and INPUT 3 signals can be positioned anywhere on the stereo stage, from full left to full right, by means of their individual PAN POT controls. The latter have center detents for a mono (center-channel) placement. Dots on either side of center correspond to a placement 45° off-center.

The PLAYBACK knob is similar in size and appearance to the recording level controls. The ring around it, however, is the playback level control for the right channel—not a preset stop. This permits the playback levels in the two channels to be adjusted independently. A detent at the center of rotation gives the reference playback level of zero VU (0.775 V) from a signal recorded at zero VU. The two large illuminated meters serve a triple function. They have separate scales for VU and PEAK levels, as selected by a knob to the right of the meters. In the VU mode, the meters have the ballistic characteristics specified for VU meters. The VU scale covers the prescribed range from −20 to +3 dB, while the PEAK scale is logarithmic over a range of −40 to +5 dB. A sine wave that indicates 0 VU will read −8 dB on the PEAK scale. The PEAK readings can be used as an accurate indication of recording level, with the assurance that program peaks that do not exceed a 0-dB reading will not overload the recording.

The third position of the METER switch is labelled BIAS. In this mode, the meters indicate relative bias current, which is adjustable separately for the two channels. The nominally correct bias is at zero (center) on the meter scale. There is a range of ±40% about the zero point. The bias controls are center-detented at the point corresponding to a zero percent meter reading, which is the factory-set level for optimum performance with Scotch 206 tape. Two knobs labelled EQ are for adjusting the recording equalization. They are calibrated from 0 to 10 and are detented at the center setting of 5, which is also the optimum equalization for Scotch 206 tape. The instruction manual lists the recommended BIAS and EQ settings for some 20 popular tapes. (Of course, with an external oscillator, one can adjust the deck for any tape, using these controls.)

A stereo headphone jack is provided. It is driven from its own amplifier stage, which is rated to deliver up to 50 mV into 8-ohm loads. The headphone level control operates on the playback signals after their level has been set with the PLAYBACK control. (It does not affect the LINE outputs.)

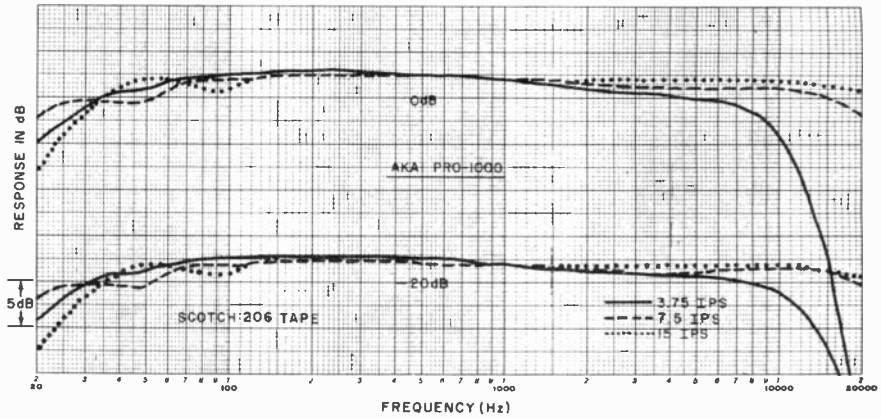
The remaining controls include a MONITOR switch for channeling either the incoming (SOURCE) or playback (TAPE) signals to the LINE outputs and the headphones, and a switch that selects either the half- or quarter-track playback head. A small knob permits the recording and playback equalization to be simultaneously changed to match the tape speed.

On the rear of the amplifier unit are four phono jacks for the LINE inputs and four ¼" (6.35-mm) phone jacks for the microphones (which should be medium-impedance types in the range of 600 to 10,000 ohms). There are also two parallel sets of LINE output phono jacks and two MIXER output jacks that carry the SOURCE program, the latter, regardless of the setting of the MONITOR switch. Three sockets accept the cables from the transport unit to the power supply, the record and erase heads and the playback heads.

A novel and convenient feature of the PRO-1000 is its provision for inserting a noise-reducing processor into its recording and playback circuits. This is done through two groups of phono jacks on the rear of the amplifier section, which are normally connected through by a slide switch.

The PRO-1000 is packaged in a "portable" form consisting of two units, each with handles and a cover to protect it in transit. The exterior of the recorder is covered in black leather-grain vinyl. The tape-transport section measures about 19" W × 16¼" H × 11" D (486 × 412 × 284 mm) and weighs 62¼ lb (28.3 kg). The amplifier section is 19" W × 12" D × 9" H (486 × 231 × 309 mm) and weighs 22½ lb (10.2 kg). The two units are joined by three cables that allow them to be placed side-by-side or with the transport atop the amplifier. Suggested retail price is $1995.

● ***Laboratory Measurements.*** Basic specifications of the Model PRO-1000 were derived with Scotch 206 tape, which we used for all our record/playback measurements. Playback equalization was checked with Ampex standard alignment tapes at 7½ and 3¾ ips (19 and 9.5 cm/s). At 7½ ips, the response was within ±1.25 dB from 50 to 15,000 Hz. The 3¾-ips tape was recorded with a 120-microsecond time constant, while the recorder uses 90 microseconds. In spite of the discrepancy, the measured response was flat within ±1.6 dB from 50 to 7500 Hz.



Frequency responses at 0 and −20 dB for Scotch 206 tape at three speeds.

At 3¾ ips, the record-playback frequency response was within +1/−5 dB from 23 to 12,000 Hz at a −20-dB recording level. At 0 dB, it covered a 25-9000-Hz range with the same variation. At 7½ ips, the recorder's true capabilities became more obvious. The −20-dB response was +0.5/−5 dB from 20 to 26,000 Hz. Not surprisingly, the recorder was at its most impressive at 15 ips. There were no signs of tape saturation, so the 0-dB and −20-dB response curves were identical. Including the small low-frequency "head contour" ripples, the response was within +0.5/−5 dB from 28 to 29,500 Hz.

A LINE input of 75 mV or a MIC input of 0.26 mV was required for a zero-VU recording level. The MIC preamplifier overloaded at a very safe 183 mV, which increased to 1.45 volts when we used the 20-dB microphone attenuator. The playback output from a zero-VU recording read zero VU on the meter when the PLAYBACK control was set to its center detent. The corresponding output voltage was the rated 0.78 volt. (At the lowest speed, the playback level registered −1 dB). The headphone volume was fairly good with 200-ohm phones, although the design is for 8-ohm phones.

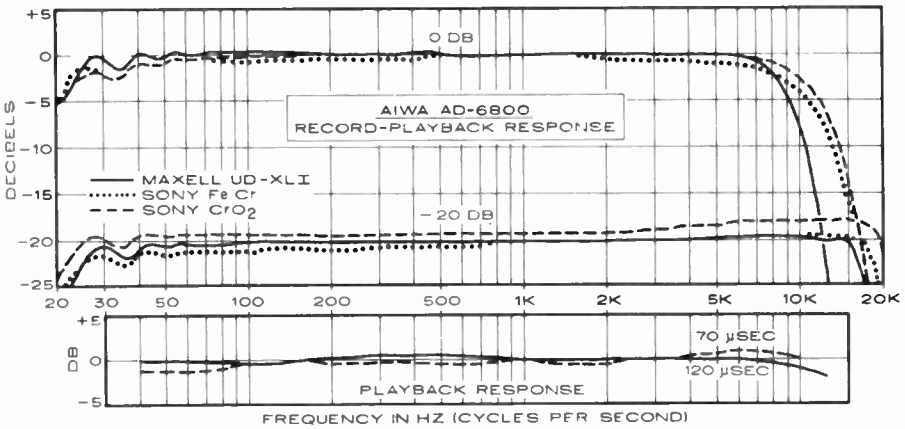
The meter ballistics were close to those specified, though not exactly correct. In the VU mode, the meters registered −1 dB on the 0.3-second tone bursts that should read the same as a steady-state signal of the same level. The PEAK mode gave a +3-dB reading on the same signal and read −1.5 dB on 10-ms bursts. A sine wave of exactly 0 VU gave the

19 inches wide, 13¾ inches deep, and 6½ inches high and weighs about 22 pounds. Price: $550.

● ***Laboratory Measurements.*** Test data supplied with the machine indicated that it had been set up for and checked out with Aiwa tapes not generally available in this country. Therefore, we put its special tape-compatibility features to good use and checked the frequency response with a large number of different tapes. All gave very good results, which was in itself a novel experience for us. We selected three of those that gave the flattest overall record-playback frequency response for full testing. Maxell UD-XL I was used as the "normal" tape and Sony CrO_2 and FeCr for the other two. Our choice of the Sony tapes was based on Aiwa's indication that their own brand of cassette tapes is manufactured for them by Sony.

The 120-microsecond playback equalization was measured with a TDK AC-337 test tape, and it was within ±1 dB over the tape's range of 40 to 12,500 Hz. The 70-microsecond response was measured with a Teac 116SP test tape, and it was within ±1 dB over the tape's range of 40 to 10,000 Hz. The record-playback curves were remarkably flat. For example, the Maxell UD-XL I response was within ±0.5 dB from 40 to 15,500 Hz and down 2 dB at 26 and 16,000 Hz. Sony CrO_2 was within ±1.5 dB from 23 to 19,500 Hz, and Sony FeCr was within ±1.5 dB from 24 to 18,500 Hz. The widest overall response (although not necessarily the flattest) was measured with BASF Chromdioxid Super (now Professional II) and TDK SA, both of which were within ±1.5 dB from 23 to 20,000 Hz.

These frequency-response measurements were made at a −20-dB recording level. The response curve at 0 dB intersected the −20-dB curve between 12,500 and 16,000 Hz, depending on the tape. This indicates substantially lower tape saturation at high frequencies than occurs with most two-head cassette decks (and thus more efficient head design). At a 0-dB recording level, using UD-XL I tape, the third-harmonic distortion in the playback was a very low −50 dB (0.3 per cent) for frequencies up to 400 Hz, increasing to a maximum of −33 dB (2.2 per cent) at 3,000 Hz. With FeCr tape, the curve shape was similar, but the distortion levels were higher: −40 dB (1 per cent) at 400 Hz and −27 dB (4.5 per cent) at 3,000 Hz. The highest distortion was measured with CrO_2 tape, but it was nearly constant with frequency from −28 to −25 dB (4 to 5.6 per cent). Of course, these distortion readings would be lower at lower recording levels. The Dolby-reference mark on the meters was at +3 dB.



The reference-distortion level of 3 per cent at 1,000 Hz was reached at a recording input of +7 dB with UD-XL I, −3 dB with CrO_2, and +2 dB with FeCr. The unweighted signal-to-noise ratios (S/N) referred to those levels were, respectively, 47, 35.5, and 39.5 dB. With IEC A weighting, these became 58.5, 49.5, and 54.5 dB. Finally, with CCIR/ARM weighting and using the Dolby system, they were 64, 55.5, and 60.8 dB. The noise increased by 9 dB through the microphone inputs at maximum gain. The Dolby circuits tracked very closely, so that the overall frequency response changed by no more than 1 dB at frequencies up to 14,000 Hz when Dolby was used (at levels of −20 and −40 dB). A standard Dolby-level tape (200 nW/m) gave meter readings within 1 dB of the AD-6800's Dolby-calibration marks.

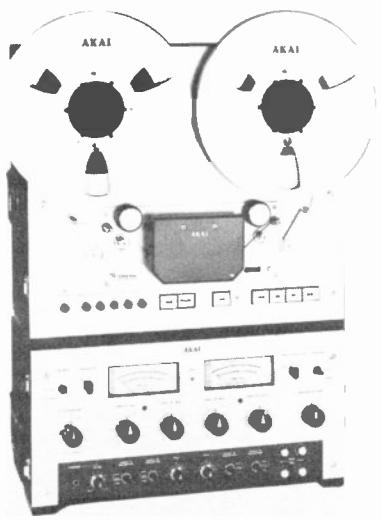
For a 0-dB recording level at maximum gain, the LINE input was 44 millivolts and the MIC input was 0.23 millivolt. The MIC circuit overloaded at 40 millivolts input. The unweighted rms flutter was 0.12 per cent, and wow was less than the 0.01 per cent residual of the test equipment. The VU meters overshot by 1 dB on 0.3-second tone bursts, but the PEAK meters read the steady-state value of the signal exactly. A C-60 cassette was moved from end to end in about 90 seconds in the fast speeds. The limiter worked very well, holding a +10-dB overload down to only +2 dB and a +20-dB input to +3 dB. It had absolutely no effect at input levels of 0 dB or less.

● ***Comment.*** The Aiwa AD-6800 ranks as one of the very best two-head cassette machines we have seen. Whether it is actually the "best" depends on one's personal assessment of the relative importance of various characteristics of a recorder. There can be no doubt, however, that the AD-6800's frequency response cannot be surpassed by anything less than one of the far more expensive three-head machines.

The bias "fine-tune" feature is one of the most useful additions to a cassette recorder that we can imagine. It works with impressive simplicity and effectiveness. With a few tapes we were unable to set a bias that gave exactly equal outputs at both frequencies, but the audible effect was negligible.

The dual meter system worked beautifully. It is superior to the LED peak lights used on many recorders, since the PEAK HOLD can be used to determine the maximum input levels of a tape or disc and the final recording levels can be set accordingly. Like most cassette-recorder manufacturers, Aiwa does not recommend using C-120 tapes (drive slippage produces a severe "wow").

Although the AD-6800 is an expensive machine, its performance is consistent with its price, and its special features are not only genuinely useful, they are generally unobtainable in other machines at any price. It is refreshing, in the midst of so much "sameness" in competitive hi-fi products (albeit at a usually high level of performance), to find a cassette recorder that is distinctively different, and superior as well.



Akai PRO-1000 Tape Recorder

The Akai Model PRO-1000 is a deluxe open-reel stereo tape recorder whose features and performance bridge the gap between good home recorders and true professional equipment. As such, it is an excellent example of a genuine "semiprofessional" tape recorder.

The PRO-1000 is a three-speed recorder that accommodates 10½" (26.6 cm) reels and operates at 15, 7½, and 3¾ ips (38, 19, and 9.5 cm/s). It is designed for two-track recording and playback, although it also has a separate quarter-track playback head to give it compatibility with tapes recorded in that format. The recorder also has extensive input mixing facilities and front-panel controls for adjusting the bias and recording equalization to match any specific tape.

Front panels of the Model PRO-1000 are finished in satin aluminum with contrasting black knobs whose large index arrows make their settings visible at a glance. The tape is driven by a dual capstan system, with a servo-controlled ac motor, that maintains a constant tape tension across the heads for minimum flutter. Tension arms on both sides of the heads control tape movement during start-up and shut-off. The arms also stop the transport when the tape runs out or if it should break. Each reel is driven by its own six-pole eddy-current motor.

The tape transport has a button on the con-

HIRSCH-HOUCK LABS TESTS TAPE MACHINES

Aiwa AD-6800 Stereo Cassette Deck

Aiwa's Model AD-6800 front-loading cassette deck takes a giant step toward eliminating the problem of tape/machine incompatibility. It has built-in oscillators that record equal-amplitude signals at 400 and 8,000 Hz, respectively, on the left and right channels of the tape. A special third head plays back these test signals as they are being recorded, and their relative levels are shown on the left- and right-channel VU meters. In addition to the three levels of bias set by a lever switch on the panel (for ferric, CrO_2, and FeCr tapes), there are three small, separate vernier bias-adjustment knobs, one for each switch position. In the special TEST mode of operation, the appropriate fine adjustment for bias is varied until the two meter readings are identical. This optimizes the deck's frequency response and distortion for that particular tape. The entire process takes only a few seconds, and this feature should make the AD-6800 compatible with almost any "oxide" tape made in the past, present, or (possibly) immediate future.

In its TEST mode, the AD-6800 employs a third "play" head, and it is necessary to adjust the azimuth of that head to match that of the record head. This is done by means of a sliding lever inside the cassette compartment, which is moved so as to give a maximum reading on the right-channel (8,000-Hz) meter. Then the bias adjustment can be set for the particular tape to provide equal-level meter readings for both channels. This azimuth setting has nothing to do with the normal recording or playback functions of the machine, which is a conventional two-head recorder except in the TEST mode.

The metering system of the Aiwa AD-6800 is also unique. Each meter has two separate movements and pointers reading against a single mirrored scale. The black pointer gives conventional VU meter readings on a −20- to +5-dB scale. When a PEAK button on the panel is engaged, the red pointer also comes into action, reading the instantaneous peak signal level on a scale from −40 to +10 dB simultaneously with the action of the VU meter. The peak meters can respond in as little as 10 milliseconds, and their long decay time of 1.5 seconds in effect causes them to "hang" on the peak program level as a recording is being made. The relative positions of the two pointers give a constant display of the peak-to-average ratio of the program level. Finally, when the PEAK HOLD button is pressed, the red pointers remain at their highest attained levels, moving upward only if a still higher level signal comes along. The "hold" circuit maintains these maximum readings, within 1 dB, for as long as 30 minutes.

The tape transport of the AD-6800 features the "auto-loading" system that Aiwa introduced a year or two ago. The cassette is placed on a tray in the cassette compartment, and a slight push, closing the compartment door, will cause the cassette to be drawn automatically into the machine and placed on the tape-hub drive shafts. The compartment is well lit, and the 30-degree upward tilt of the cassette makes it easy to see the amount of tape left on each hub. When the STOP/EJECT key is pressed, the front-panel cover rises slowly and the cassette is moved forward to where it can be easily removed. The tape is driven by a dc servomotor whose speed is controlled by frequency-generator feedback.

The piano-key controls are interlocked so that (except for wind and rewind cueing) STOP must be pressed before making any change of tape speed or direction. The PAUSE key disengages the drive capstan, and it can be used to set the machine up for unattended recording or playback with the aid of an external clock timer. Like other Aiwa recorders, the AD-6800 has a tape-motion indicator whose sections glow in sequence when the tape is in motion. The index counter has a memory-rewind system that stops the tape in rewind when the counter reaches 000.

The three-position BIAS lever switch is used in conjunction with a similar EQ switch, which is marked to show either a 70- or 120-microsecond equalization time constant. Normally, the two switches are set to the appropriate corresponding positions for one of the three basic tapes. A third lever switch turns on the Dolby system, and in its third position it adds a low-pass MPX filter to prevent any FM-tuner pilot-carrier leakage from interfering with the system's operation. The fourth lever switch selects either LINE or MIC/DIN inputs (they cannot be mixed) or the TEST mode. A DIN connector (covered) is on the front panel next to this switch.

The left- and right-channel recording-level controls are concentrically mounted, as are the playback-level controls. A pushbutton turns on the LIMITER, which, to prevent distortion, goes into operation at levels exceeding 0 dB. At the left of the panel are the pushbutton power switch, two microphone jacks, and a stereo-headphone jack. The phono-jack line inputs and outputs are in the rear, together with a connector that can tie the recorder to an Aiwa record player so as to synchronize the recording operation with the tone-arm indexing of the record player.

The Aiwa AD-6800 has a satin-finish aluminum front panel, walnut-finish wooden side plates, and a black metal top that has on it a complete, functional block diagram showing the deck's signal-flow paths and control operations. The machine measures approximately

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
Advent (all)		X	
Ampex			
Grand Master	X		
364 Series 20/20+	X		
363 Series Chromium Dioxide		X	
371 Plus Series	X		
370 Series low-noise/high-output	X		
350 Series "Super"	X		
360 High-Frequency Series	X		
362 Extended-Frequency Series	X		
BASF			
Professional I	X*		
Professional II		X	
Professional III			X
Studio Series	X		
Performance Series	X		
Chromdioxid		X	
LHSM Series	X		
SKLH Series	X		
SKSM Series	X		
Capitol			
"the music tape"	X		
Capitol 1	X		
Capitol Chromium-dioxide		X	
The Mod Series	X		
Columbia			
2CB800 Series	X		
2CL Series	X		
Fuji			
FX-I	X*		
FX-II ("Beridox")		X*	
FL low-noise	X		
FX	X		
FC		X	
Hitachi			
"Ultra-Dynamic" UDC Series	X		
Low-Noise Series	X		
Irish			
261 Professional Series	X		
262 Low-Noise Series	X		
263 Chromium Dioxide Series		X	
Lafayette			
XHE Criterion Series	X		
Criterion Series	X		
Low-Noise Series	X		
Chromium-Dioxide		X	
Criterion Ultra-Dynamic Series	X		
Voice-grade	X		
Maxell			
UD-XL I	X*		
UD-XL II		X*	
UD Series	X*		
LN Series	X		
Memorex			
MRX_3	X*		
Chromium Dioxide		X	
MRX_2	X		
Meriton			
Ferri-Chrome Cassette			X
Chromium-Dioxide Cassette		X	
Low-Noise/High-Output Series	X		
Low-Noise Series	X		
Nakamichi			
SX		X*	
EX II	X*		
EX	X*		
Chromium Dioxide		X	
Norelco (Discontinued)			
300 Series	X		
200 Series	X		
100 Series	X		
RCA (Discontinued)			
Red Seal Cobalt Energized	X		
Vibrant Cassettes, Series CV	X		
Recoton			
Low-Noise, Series CD	X		
Royal Sound			
Chromium Dioxide		X	
Ultra-Linear, Series ULC	X		
Low-Noise, Series APC	X		
Scotch			
Master I	X*		
Master II		X*	
Master III			X
Dynarange Low-Noise/High-Density	X		
Highlander Low-Noise	X		
Master	X		
Classic			X
Chrome Cassettes		X	
High-Energy	X		
Extended-Range	X		
Sony (Sony/Superscope)			
Ultra-High-Fidelity Cassettes	X*		
Chromium-Dioxide CRO Series		X	
FeCr Cassettes			X
Duad			X
Soundcraft (Discontinued)			
2SR-801 Series	X		
2SC Series	X		
TDK			
SA, Super Avilyn		X*	
AD	X*		
Dynamic Series, D	X		
Audua	X*		
SD series	X		
Krom series (KR)		X	
Maverick series	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 CrO_2-type tapes, those identified with an asterisk are not CrO_2 tapes, but so-called "70-microsecond ferrics," usually modified by cobalt.

tape decks, corresponds to a reading of approximately +3 dB on the meters).

At the −20-dB level, at which normal cassette-deck frequency-response measurements are made, both tapes are essentially identical, with a frequency response (on the Nakamichi deck) that obviously extends beyond the 20,000-Hz limit of the graph. At a −20-dB level, however, the metal tape (in this case, a sample of 3M's Metafine, though samples from TDK and Fuji performed essentially similarly, if with very slightly less overall output) is down only 3 dB at 20,000 Hz, a point reached by the regular tape at 15,000 Hz. At a 0-dB level the metal-alloy tape is down only 1 dB at 10,000 Hz, at which frequency the regular tape is −6.5 dB and fading fast. And, confronted with a level (+10 dB) bound to produce overload, the metal tape shows a slightly greater resistance to saturation at the low-to-middle frequencies and an *enormously* higher signal capacity at all frequencies above a couple of thousand hertz.

Final pricing on all these new tapes has not been announced, but it is widely expected that—at least initially—fine-metal cassettes are likely to cost about twice as much as currently available premium cassettes. Also, since the vastly increased record-bias and erase-current requirements of metal-particle tape exceed the capacity of existing cassette decks, you'll need a new machine (or extensive modifications on an existing one, including new heads and electronics) to record with the tape. Two companies—Tandberg and Eumig—have announced that they will have "retrofit" modifications available for specific models. (Any deck that will handle chromium dioxide will *play back* a metal tape, however.)

I have tested samples of three different manufacturers' tapes and found them, happily, to be astonishingly close in their bias and equalization requirements (a couple of samples from different batches showed *slight* bias-requirement differences, but certainly of no greater magnitude than one finds between premium conventional tapes). Oxide shed has seemed a bit greater than usual, calling for more frequent head cleaning, but this problem may be solved by the time production-line runs are undertaken. The machines, too, may have their little quirks when first introduced, but this is normal with any new technology.

From a purely theoretical basis, looking at the retentivity numbers, one would expect that low-frequency maximum-output levels from pure-metal tape should be considerably higher than for conventional tapes. As Figure 2 shows, they are somewhat higher, but not quite as much as might have been predicted. The reason for this is that the tape manufacturers are using a somewhat thinner magnetic coating (expected to be standardized at about 4 microns) than is customary on more conventional tapes. At least one reason for this has to do with the *erase* capabilities of the first-generation decks, which, though perhaps adequate for the thinner-coated tape, would probably not suffice for a somewhat thicker coating—or for a theoretically possible higher-retentivity metal-particle tape. At present there is still room for improvement in this area.

Do you *need* the advantages, especially at high frequencies, that metal-alloy cassettes will afford? Certainly not, if your only interest lies in dubbing from FM or if (unlike myself) you find no objectionable treble compression and distortion when recording more demanding source material. But if you find even the best cassettes currently available "running out of gas" at the very high frequencies, then you owe it to your ears to consider metal tape very seriously.

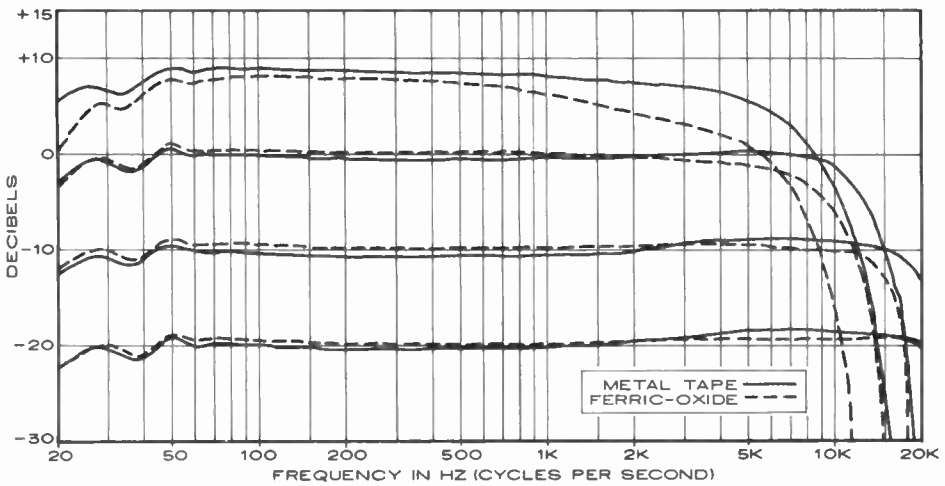


Figure 2 At higher recording levels, the enormous potential of metal-particle tape (solid curves) becomes evident. At 10,000 Hz and a +10-dB record level, its output is about 15 dB greater than that of conventional tape (dashed curve).

Digital Recorders

Waiting just a little farther down the road (but not quite as far as many think) is the home digital or PCM ("pulse-code modulation") recorder, which in consumer versions will undoubtedly use the kind of transport presently found in home videocassette recorders. By converting the continuously varying ("analog") signals of music and speech into strings of numbers expressing their instantaneous values, digital recording offers unquestionable potential advantages: a 90-dB (!) signal-to-noise ratio with 0.03 per cent distortion, flat response to 20,000 Hz at all signal levels, total elimination of wow and flutter, and reduction of modulation noise below measurability. For the professional who works constantly with "live" sources—and needs, moreover, to be able to produce copies, and copies of copies, and *copies* of copies of copies with absolutely *no* loss or degradation from one generation to the next—digital recording is undoubtedly *the* way to go.

On the consumer front, however, the situation is a little less clear. The specifications cited above are for a professional system using "sixteen-bit" digital numbers and a digital sampling rate of about 50 kHz, which, with today's technology at any rate, is expensive beyond belief ($50,000 is a good "ballpark" figure for such a recorder). And there are at least preliminary indications that the standards for home digital recorders (which, as you might expect, are being set by the Japanese) will be considerably less demanding: for example, twelve- to thirteen-bit numbers with a 32-kHz sampling rate. This will still yield *very* impressive performance—well beyond that of current analog recorders, metal or no metal—but by the time costs come down from their approximately $3,000 level of today, other developments in analog recording (such as the introduction, expected shortly, of new noise-reduction devices) may raise its performance to a point a bit closer to that of home digital.

Ultimately, digital recorders will probably take over, just as the PCM disc will ultimately render the conventional LP obsolete. Though a *full* takeover is many years away, I would expect to see a *significant* penetration of digital into the top-end recorder market in the next three to five years. Does this mean that all the enormous effort that has gone into the development of metal-alloy tape will be lost? By no means, for the high coercivity of metal gives it an enormous advantage (for example, far greater "packing density" for the digital "bits") over older, oxide-base tapes. Where the demand for top-quality tape performance is greatest, metal-alloy tape is where we are and—one way or another—where we're going.

Two-speed Cassettes

In the meantime, another approach to surpassing the audio cassette's present limitations has recently been introduced by B.I.C., and there is reason to believe that others will follow suit. This is the two-speed (1⅞ and 3¾ ips) cassette deck which, in return for halving the available playing time per side, offers a far wider frequency bandwidth (to 30,000 Hz and beyond on the sample I've encountered) *plus* a significant improvement (about 4.5 dB) in signal-to-noise ratio. In designing its two-speed series of tape decks, B.I.C. did the job properly by reducing the playback-equalization time constants by a factor of two when increasing the speed by a factor of two, and one can only hope that when others bring out 3¾-ips decks they, too, will follow the B.I.C. procedure, establishing a *de facto* if not "official" standard. (Otherwise, interchangeability of recorded cassettes would be impossible.) We'll have to see whether the marketplace will accept the shorter playing time for the higher quality obtainable at the higher speed. But ultimately, of course, there's no reason why a two-speed, metal-compatible deck should not come on the scene. *There's* something to ponder! □

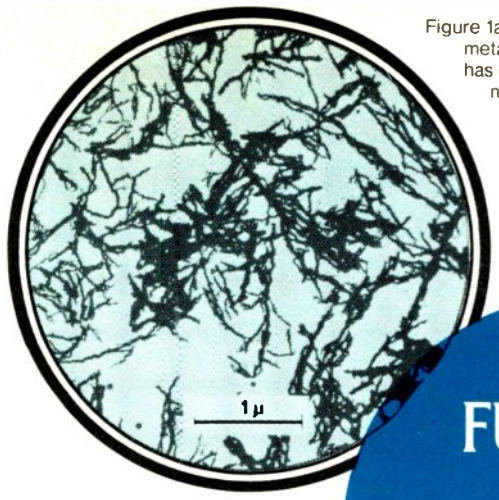


Figure 1a. This sample of metal-alloy particles has delicate threads made up of small crystals.

THE FUTURE OF MAGNETIC TAPE

By Craig Stark

Figure 1b. Conventional ferric and chromium tapes have more or less monolithic magnetic particles.

"MAGNETIC tape is the writing paper of the electronics age," remarked the president of a major Japanese tape company as he guided a group of visiting American journalists through his plant's impressive production, research and development, and quality-control facilities. It is the kind of comment that sends the mind on a quick scan of communications history, from Stone Age cave paintings through Babylonian clay tablets, to movable type and modern newsprint, and on to Edison's cylinders, the LP disc, open-reel tape, and today's audio and video cassettes.

This fascinating tale of a continuing evolution in storage media is paralleled by an equally dramatic evolution in the types of "message" we are able to store and communicate. And the saga is far from over. Looking ahead just a short distance into the future of magnetic recording, we see a familiar pattern shaping up again, one that spells REVOLUTION. It may not overwhelm all of us at once, and it may progress in a somewhat disorderly fashion, but make no mistake, it's coming.

Metal Tapes

At just about the time these words reach print, it is expected that metal-particle tape (variously called "metal-alloy" and "fine-metal" tape), together with the first generation of tape decks capable of recording and erasing it, will be available at consumer retail outlets. Both "hardware" (the decks) and "software" (the tapes) have been publicly shown on a number of occasions, and I recently had the chance to put several samples of both machines and tapes to the laboratory test. The machines I have personally tested have been preproduction samples, as have the tapes. But the latest batches of tapes are intended for machine calibration, so they cannot be far removed from what the final product will be. And, on the whole, that final product seems to be shaping up rather well.

Stated briefly, the overall potential of fine-metal tape could lead to a low-frequency maximum-output level approximately *twice* that of conventional cassettes—plus a comparable increase at high frequencies. (In engineering terms, both "retentivity," for low-frequency performance, and "coercivity," for high-frequency performance, have been boosted, the former to perhaps 3,000 or 3,300 gauss and the latter to about 1,000 oersteds.) The very first products off the line will probably not be able to exploit the *full* potential benefits theoretically available, but they are likely to have significantly improved performance over ordinary cassettes, particularly in the area of high-frequency capacity, the traditional weak point in cassette performance.

Unlike other magnetic materials used in making tape, the pure-metal particles used in the new tapes do not contain the oxygen atoms that, in a sense, use up space within molecules of the "standard" ferric oxide (Fe_2O_3) and chromium dioxide (CrO_2). Rather, the new metal-alloy tape particles consist—in at least one formulation, anyway—of approximately 70 per cent iron (Fe) and 30 per cent cobalt (Co) by atomic weight. Such particles must be protected from rusting (oxidizing) both during manufacture and in actual tape coating and slitting, for if they were permitted to combine with oxygen it would adversely modify their superior magnetic performance. The deepest tape-industry secrets today lie in the methods used to form a protective shell around each metal particle. The *theoretical* advantages of this kind of tape have been known to magnetics experts for many years; getting a chemically stable tape manufactured before the pure-metal material changes into something else has been the problem.

At TDK I saw an actual demonstration of how (by one of several methods) the metal particles themselves are created. A lab technician took two partially filled beakers of colorless, transparent liquid (one containing a solution of iron and cobalt salts, the other an aqueous solution of sodium borohydride), poured the one into the other, and instantly produced an inky-black fluid which cleared in a few moments as the black metal particles settled to the bottom. In industrial production of tape "powder," this mixing would be carried out in the presence of a strong magnetic field so that the precipitate would form thinly linked chains like beads on a necklace, each "jewel" of which would have the approximate diameter of one magnetic "domain" (about 260 angstroms). The differences, seen through an electron microscope, between the metal-alloy particles and those of a more conventional cobalt-treated ferric oxide are vividly obvious in the photos of Figure 1 on the facing page.

THEORY aside, how well does the tape actually work? Trying to pin that down put me through a good deal of personal travail, not just because of the tapes themselves but also because of the scarcity of suitable machines to use them on. Two tape-machine companies offered to provide production-line samples of their metal-ready tape decks, but they could not make my deadline. A third delivered a prototype that was still beset with a few unsolved problems. Finally, a prototype Nakamichi machine was acquired that seemed to represent the current state-of-the-art in handling metal tape (Nakamichi says that performance of its final production version will be even better).

The two "families" of curves shown in Figure 2 pretty much tell the story of just how superior the new metal-alloy tape is to even a topnotch "conventional" tape (TDK SA). Four sets of output-*vs.*-frequency curves were made at input levels of +10, 0, −10, and −20 dB, "0 dB" being defined in each case as the input level which, at 1,000 Hz, produced a 200-nanoweber-per-meter flux level on the tape (this level is commonly referred to as "Dolby level" and, on most

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B side. Mismatched halves can also leave gaps where the tape might catch and jam. Poor molding can result in the tape touching the shell in more places than necessary, or at other than the proper angle, impeding its progress and causing wow and flutter, interchannel phase shift, and, possibly, out-of-pitch recording. If a hub is not precisely circular or if its circularity is not completed within proper tolerances by the clamp used to attach the tape to it, lumps in winding may ultimately cause similar results.

Guide rollers too must be perfectly circular, and they should rotate with a minimum of friction. For this reason they are often mounted on polished stainless steel pins. In the front of the cassette, the pressure pad should be mounted on strong, yet pliable metal spring material anchored in turn by pins molded into the shell. The pressure pad plays a critical role in final performance, by maintaining constant, precise, tape-to-head contact. Behind the pressure pad and spring a metal magnetic shield is often used to shield the tape inside from stray magnetic fields. Finally, the tape pack should always be sandwiched between slip sheets which are not only almost friction free, but also confine any contact with the tape pack to a minimal surface area. Hairline folded and bubble surfaced slip sheets both effectively accomplish this.

The road to a high-quality cassette begins with the precision tooling of the dies that are used for the injection molding process. These are sometimes tooled in parallel, for mirror-image matching. Each pair of shell halves produced by a mold should be kept together until final assembly, to assure a perfect match. All parts should be handled gently, by robots if possible, to avoid deformation or other damage.

● ***Final Assembly.*** There are two distinct schools of thought in regard to assembly. Many manufacturers assemble the various mechanical parts into the shell, along with a length of leader stretched in the tape path between the two hubs. When the cassette reaches the end of the assembly process, robot pincers withdraw the leader through the front of the cassette, cut, splice the pancake at one end, and back wind rapidly, cut again, attach the other end of the leader, and send the cassette on its way to packaging.

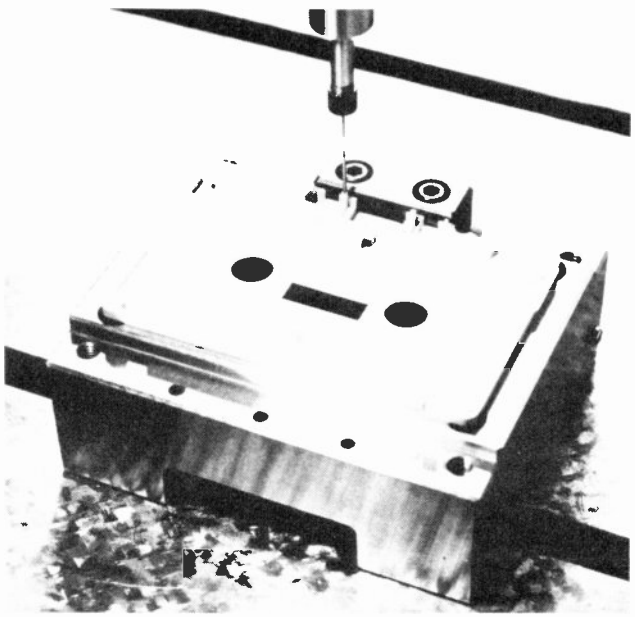
In the other approach, leader material is spliced into the tape before slitting. This, according to its adherents, assures a stronger splice and guarantees that the width of tape and leader will be uniform, since both are slit together. Now the tape is in pre-measured lengths (say, C-60s) with leader in place on the pancakes when they are put into final assembly. The pancakes are mounted on automatic winding machines, and each length of tape is attached to the left of two hubs, individually wound, attached to the right hub, and sent down the line.

In the final assembly process used by TDK, the cassette is then assembled piece by piece. The B shell halves proceed down an automatic conveyer, and each part is placed in its proper position, which is verified by optical or mechanical monitoring devices. The tape roll is then set into place, the top slip sheet put in place, and the B half's A mate set on top. The five assembly screws are then simultaneously torqued into position under computer control. The finished cassettes are then trundled off in large trays by a robot and placed in an atmospherically controlled "wine cellar," a block long and several stories deep, with tens-of-thousands of other finished cassettes. Here, they remain on line awaiting final labeling, packaging, and/or out-processing, as required, to warehouse or shipping.

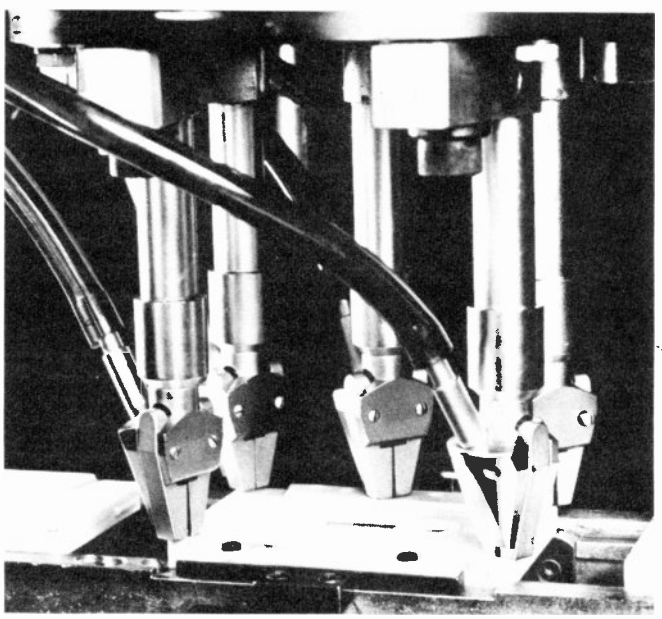
In addition to all this, a percentage of each batch of finished products is tested to assure compatibility with the many decks on today's market and to make sure that they meet mechanical and electromagnetic performance specifications. Forced running extreme environmental conditions and other tests are performed to ensure reliability. If a manufacturer can warrant performance under the worst conditions, it can certainly offer its product with full confidence for everyday use.

As indicated earlier, the details of manufacture vary considerably from one company to another. While it is understandable that each manufacturer favors its own methods, the important ingredients in the final product are likely to be the same: quality of raw materials, precision of manufacture, rigorous inspection, and, most of all, integrity. Broadly speaking, all cassettes are intended to do more or less the same job, although with performance standards that vary according to type and price. Manufacturers, as we have seen, go to considerable trouble to make cassettes equal to their task. An aware consumer will take care in choosing the product to which he will entrust cherished recordings. □

Author Michael Takizawa is Technical Specialist at TDK Electronics Corporation in Garden City, New York.



Sophisticated sensing equipment ensures that elements of the injection-molded cassette half are of the proper height and precisely at the correct angle.



The final step of assembly: simultaneous computer torqueing of the five screws which hold the two shell halves together.

As the tape is slit, it is wound onto hubs. These rolls of tape are known as pancakes.

equalization settings, which afford lower noise levels than normal settings. Chromium dioxide (CrO_2), introduced in 1970, was the first such compound. Ferricobalt, an alternative formulation for the high bias position, was originally perfected in 1975. Tape "pigments" (a bit of terminology held over from the "barn paint" days), including cobalt, have such a high potential magnetic energy that they must be somewhat modified for audio applications. They can also be used for demanding home video applications. Until the "cobalt adsorption" process was perfected, they also were somewhat unstable and subject to high frequency evaporation over a period of time. In cobalt adsorption, ferric oxide particles are treated with cobalt in solution to produce ferric particles with a very thin layer of cobalt ions just under their outer surface, as if it had been soaked up or injected.

The latest of the special formulations is a tape pigment made of metallic particles rather than oxide. Today's metal tapes possess roughly four times the magnetic energy of high bias—CrO_2 and ferricobalt—tapes. This translates to improvements in maximum output levels, particularly at the high end of the frequency range, and associated improvements in dynamic range. Under ideal conditions, the performance of metal is said to equal that of open reel tape recorded quarter track at seven and one-half inches-per-second. Metal tape has been the subject of research ever since the end of World War II, but some formidable manufacturing problems (not to mention the lack of compatible decks) have kept it away from market. Almost any sizable quantity of pure metal particles exposes a vast surface area to the oxygen in the atmosphere, which can lead to rapid or explosive oxidation. Therefore the particles must be stabilized during manufacture and in the final product. Actual metal particle tapes pose no pyrotechnical dangers, but a tape that has rusted can deliver high noise levels and poor overall frequency response.

One method of obtaining metal particles is to mix a metal salt solution with sodium borohydride in a magnetic field. This causes elongated particles to precipitate in the liquid, safe from atmospheric oxygen. These are separated, washed, and dried, still in an oxygen-free environment. In final form on the tape, each particle is individually encapsulated to protect it from air.

Binder is the next ingredient that goes into recording tape. The magnetic particles are suspended in the binder prior to coating. The binder has the function of holding the particles on the tape backing or base film, and must be formulated in such a way as to assure that the tape surface will coat smoothly and evenly. It can also help assure particle alignment and good packing density, and in the finished product, must function, in addition, as a lubricant, helping the tape to slip past the record and playback heads. Binder also keeps the tape surface from shedding magnetic material that can clog the tiny gaps in your deck's heads.

The final component of recording tape is, of course, the backing, or base material. Polyester film forms the base of modern recording tape. Other things have been tried—paper, polyvinyl chloride, cellophane, to name a few. But unlike these, polyester is not particularly likely to absorb moisture or dry out, or to be sensitive to changes in temperature, even at thicknesses of as little as 0.0025 inch. Thickness of the film is critical in that it influences strength and susceptibility to stretching. In addition, space inside a cassette shell is strictly limited—the thicker the tape, the less playing time. On the other hand, ultra-thin tape places an extra burden on the mechanism (to avoid jams) and can be more susceptible to print-through if other properties are not carefully balanced.

To combine the particles, binder, and base material into recording tape, a machine called a web coater is used. The base material is fed into the machine in broad rolls, while the particles and binder, carefully mixed together, are raised to a stringently controlled temperature and coated onto the base material as it passes through. Excess oxide is removed, as the machine also calenders, or polishes, the tape to a high degree of smoothness.

Coating takes place under atmospheric conditions more rigorously regulated than those of a hospital operating room. Workers in the coating area wear laboratory gowns, masks, hair nets and slippers. They enter through airlocks which vacuum-clean them as they pass through. No airborne impurities are permitted to become mingled with the raw materials used in the coating process. A stray bit of dirt might not seem significant amidst miles of broad rolls of coated tape—unless it found its way into your cassette as a dropout.

After the tape is coated, dried, calendered, and inspected, and leader material is spliced in at proper intervals, the broad rolls are ready for the slitting process. (Some manufacturers splice in leader at a later stage.) Each is mounted in a slitter, a machine that features an array of precisely aligned, perfectly parallel, surgically sharp blades. These cut the tape into cassette widths of $^3/_{20}$-of-an-inch and wind it into flat rolls known as "pancakes." All this must occur without feathering the edges of the tape, which would impede its movement inside the shell or cause uneven tape-to-head contact as the scalloped edge moves across the head surface. The pancakes are then demagnetized.

● ***Manufacturing the Shell.*** Cassette mechanics are coming in for increasing scrutiny by all manufacturers these days, as the realization sinks in that mechanics not only define the cassette's reliability (resistance to jamming), but also influence overall sound performance. It's important to hold the manufacture of all mechanical parts—shell halves, pins and guide rollers, slip sheets, even screws—within space-age tolerances. If shell halves do not match properly, for example, performance of the cassette may vary from the A to the

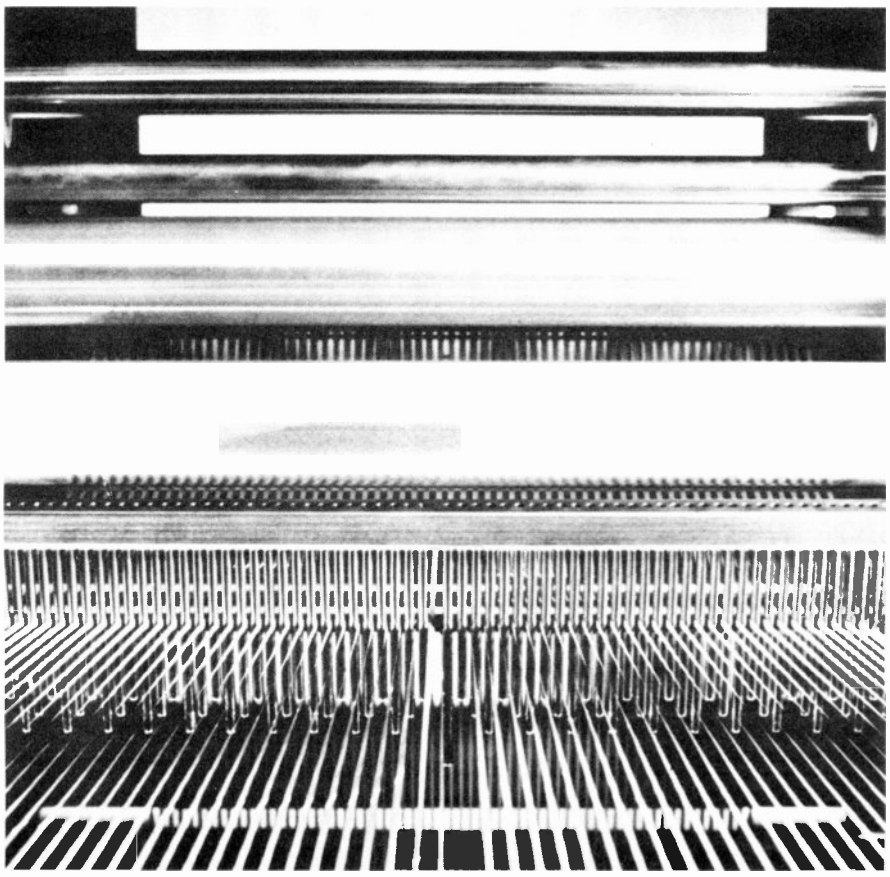
HOW CASSETTES ARE MADE

By Michael Takizawa

You might imagine that since all cassettes look the same, they are made in the same way. But every manufacturer has its own methods, many of which are proprietary. Like restaurant chains, manufacturers have secret formulas that they consider central to their products' superiority. Small and simple as they may seem, audio cassettes and their cousins, home video cassettes, have had as much research and development attention lavished on them as any piece of electronics. And they are also just as difficult to manufacture, if not more so. This is true for a couple of reasons. First, the challenges that the narrow width and slow speed of cassettes pose to sound reproduction are substantial enough to warrant the attention of a battalion of physicists. Second, the most significant advances in magnetic recording in recent years have really been co-developments between tape and deck manufacturers. Recording tape and decks provide the intrinsic potential of or limitation on each others' performance; one is only as good as the other.

This is particularly true of cassettes, which are more than just recording tape. The shell and mechanism that house the tape function as a complete transport system when the cassette is snapped into a tape deck. Therefore, a host of physical properties, as well as the electromagnetic characteristics of the tape, affect the final musical performance of the product, necessitating precision engineering every step of the way. Even the design of an apparently simple part such as a guide roller may take up a score of blueprints detailing thousands of checkpoints.

A manufacturing process as complex as that of a cassette depends on a high level of pre-, post- and in-process quality control. This begins with the raw materials for the tape—magnetic particles (powder), binder, in which the particles are suspended, and base film, on which the binder and particles are coated—even before they are processed. Then there are the styrene, clear plastic, stainless steel wires, felt, and other materials that go into the mechanism and shell to be inspected, too. Interestingly the various companies that make cassettes tend to have historic involvement in one or more of the various components of the product—magnetic materials, adhesives, film, chemicals, and the like.



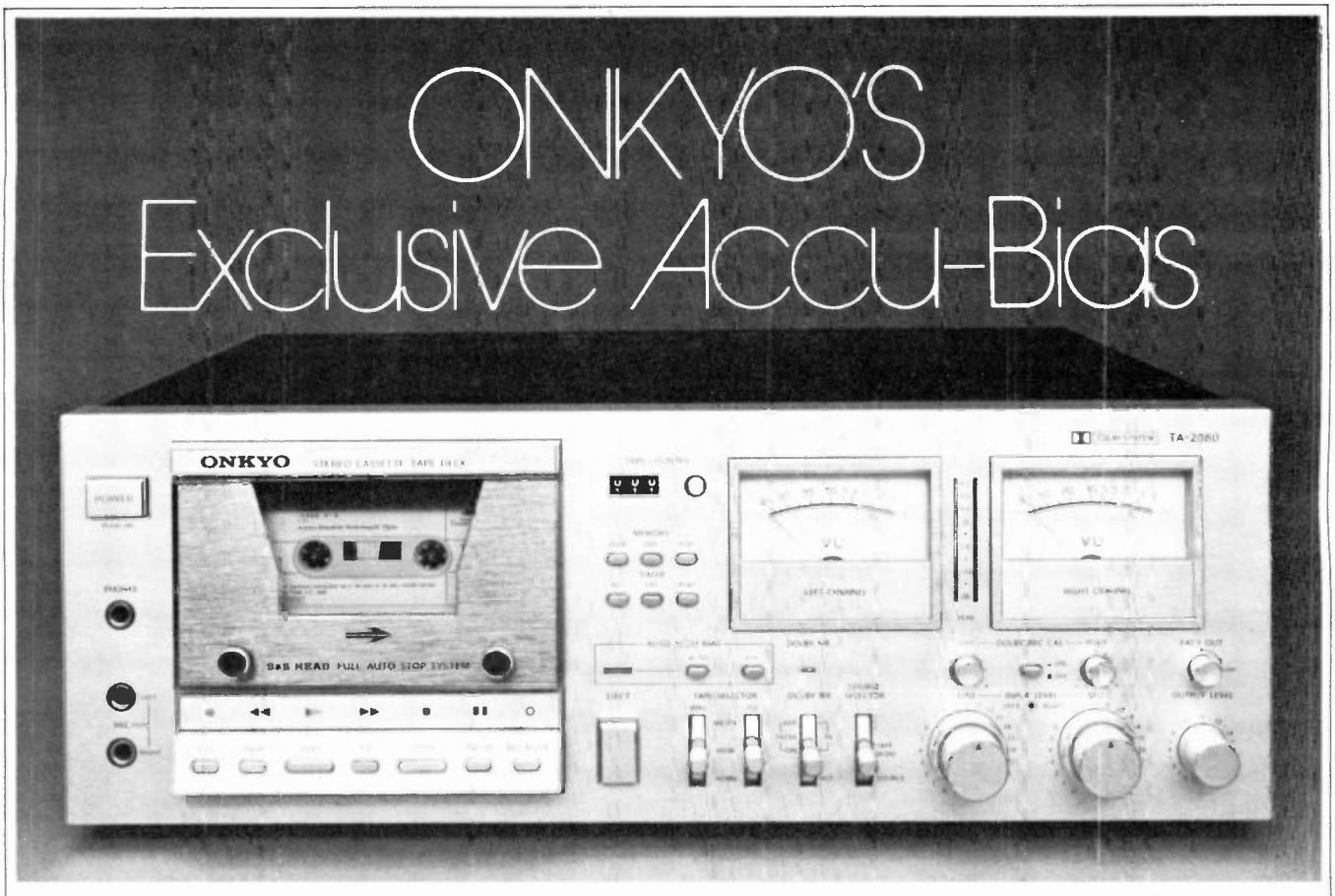
Recording tape is coated in broad rolls, then slit into appropriate widths on machines like this one.

● ***Manufacturing the Tape Itself.*** Primary to the performance of any cassette is the magnetic formulation—the millions of microscopic needle-shaped particles that make up the coating. Ideal particles are long and narrow: the greater the ratio of length-to-width, the better. They should have a high degree of uniformity, so they can be tightly packed together in the tape coating leaving no gaps to result in dropouts. The surface of the particle itself—visible only with the aid of an electron microscope—must be totally responsive to magnetization (no "pores").

In the early days of tape recording, particles were all oxides and were made much the same way. Manufacturers began by producing ferric oxide (rust) or buying it from chemical suppliers who sold it for use in barn paint, an application in which size and shape of the particles don't matter. To tailor the particles for magnetic recording, the oxides were tumbled about in mills, mixed with precisely-shaped steel balls for varying lengths of time. Later refinements in the milling process brought continuing improvements in the length-to-width ratios, virtually eliminated splits, pores and other irregularities, and brought the gamma-ferric-oxide, standard-bias cassette tape to the high level of performance it enjoys today.

Seeking even better performance, companies began to develop new compounds with higher magnetic energy than gamma ferric oxide. These could be played back on cassette decks set up with special high bias and playback

ONKYO'S Exclusive Accu-Bias



BECAUSE ALL TAPES AREN'T CREATED EQUAL

You see, all tapes aren't created equal. All manufacturers' tapes require slightly different bias than the average 3-position setting for optimum performance, i.e., widest and flattest frequency response and lowest harmonic distortion. Even the same type of tape from the same manufacturer varies in its bias requirements. Batches differ. Processing has its ups and downs.

The newest, hottest audio tape is metal particle. It can give performance level equal to or better than open reel tapes. But, it's so new that bias standards aren't set. When they are, who's to say that the same manufacturer to manufacturer variability will not apply to the metal particle tape?

That's why Onkyo invented automatic ACCU-BIAS.

Onkyo's automatic ACCU-BIAS uses logic circuitry centered around built-in reference generators to determine the optimal settings for bias *for any tape you use*...every time you use it.

And it's all automatic. With Onkyo's automatic ACCU-BIAS you just tell the logic circuits the kind of tape you're using... Metal, High or Normal. Push the automatic ACCU-BIAS button, engage play and record. Within seconds the automatic ACCU-BIAS computer determines and sets the *exact* bias, stops, rewinds and is ready for you to make a perfect recording.

That's not an average setting. Nor a compromise setting. But the precise setting for *any* cassette you use every time you record. So, unless you want a factory technician to make your decisions for you, there's only one way to go.

Onkyo's TA-2080 with automatic ACCU-BIAS.

What kind of performance can you expect with ACCU-BIAS and metal particle tape? Frequency response of 20-20,000Hz. And a S/N ratio of 62dB with Dolby* out.

Other features that add to the flexibility are 2 sendust alloy heads, plus a special laminated erase head for new metal tapes, feather touch solenoid transport, PLL DC servo motor drive, dual capstans, line mic mixer and 10 segmented peak level LED in columnar array between VU meters.

Another feature is the "Fadeout" which gradually erases portion of the tape during playback while you listen for those times when the tape runs out before the music...easing and simplifying editing chores.

Overall specifications and features make Onkyo's TA-2080 something special. Automatic ACCU-BIAS makes it even more. Check it out at your Onkyo dealer and see what it means by Onkyo's motto of being a step ahead of state-of-the-art.

*Dolby is a trademark of Dolby Laboratories, Inc.

Artistry in Sound

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Canada: Sole Distributor, Tri-Tel Associates, Ltd., Ontario, Canada

trace of "chestiness" or nasality in your friend's voice. (This check will also give you a good idea of the mikes' relative outputs.)

Second, take a group of house keys on a key-ring or chain and walk around each microphone at a fixed distance of about 4 feet, shaking them vigorously. This will check the high-frequency response of the two contenders (again, you know what the keys sounded like "live") as well as give you an idea of their polar responses in comparison to each other. (Even omnidirectional mikes are not fully omnidirectional at high frequencies, and with cardioids you can determine approximately how wide an "acceptance angle" they have before the jangling keys change their tonal characteristics.) Again, the test is not which sounds "better" but which matches the live sound more closely. (I'm assuming all the other equipment is good enough and set up so as not to invalidate your judgments.)

There are other important considerations that go into selecting microphones, having to do with balanced *vs.* unbalanced cables, microphone impedance, and output levels, all of which concern the "interface" between the mike and the recorder you intend to use it with.

All microphone cables have some electrical capacitance, and the longer the cable, the greater the capacitance. Cable capacitance tends to cause treble losses; the higher the frequency, the greater the loss. The frequency at which a given cable capacitance will begin to introduce significant loss is determined by the *impedance* of the microphone it's connected to. The lower the microphone impedance, the longer the cable you can use between the mike and mixer or recorder input before appreciable treble losses occur. Thus, while with low-impedance (Lo-Z) mikes rated in the 50- to 250-ohm range you can use cable runs of up to about 200 feet safely, with a high-impedance (Hi-Z) mike rated at 10,000 to 20,000 ohms a cable run over 15 feet long will produce some high-end response loss. Typical medium-impedance mikes, in the 500- to 1,000-ohm range, should be okay with cable runs of up to about 35 feet.

Just as professionals invariably choose low-impedance microphones, they also invariably select "balanced-line" instead of "unbalanced" operation. The difference is that in a balanced cable there are two signal conductors *plus* the outer braided shield, whereas an unbalanced cable (like the ordinary shielded cables used with home hi-fi components) has a single inner conductor for one of the two signal leads and uses the outer braided shield itself for shielding against hum *and* as the other signal conductor. Balanced lines are essentially immune to pickup of ac hum from power lines, motors, lighting arrangements, etc., but, with long runs of unbalanced line, hum and buzz can be a problem. Balanced microphone cables are generally terminated either in a three-pin "Cannon-type" plug (pin number 1 is shield, 2 is "signal hot," and 3 is "signal cold") or in a 1/4-inch "stereo" phone plug (the tip is "signal hot," the ring is "signal cold," and the sleeve is for the shield). Unbalanced microphone cables usually use a regular 1/4-inch phone plug, with the center conductor connected to the tip and the shield to the sleeve. Professional microphones are usually supplied without plugs, but they do come with instructions for proper wiring.

Fortunately, many of the higher-price recorders and mixers whose inputs are designed for unbalanced cables with 1/4-inch phone plugs will *accept* a 1/4-inch stereo-plug (balanced-line) mike feed and will automatically ground the "ring" part of the plug along with the sleeve. You then lose the true balanced-line configuration and its noise-reducing advantages, but this does permit you to choose a microphone designed for balanced-line operation (high-quality mikes usually are) and plug it in—if your recorder's input impedance is correct for it. If, on the other hand, you want to use Lo-Z balanced-line microphones with a recorder or mixer having a Hi-Z unbalanced input, you must buy an accessory microphone "matching" transformer (generally about $20), which is connected at the *deck* end of the cable, *not* at the microphone end. (One reason professional-quality mixers cost so much more than typical audiophile models is that the former invariably include these costly microphone input transformers.)

Finally, we come to the question of picking a microphone whose output level is compatible with the input sensitivity of your recorder. Even a brief look at parts-house catalogs or manufacturers' specification sheets will disclose a bewildering array of negative numbers—all the way from about −35 dB to about −145 dB—for microphone sensitivity (signal output for a given acoustic input, that is), which is sometimes expressed with reference to microbars, sometimes in terms of dynes per square centimeter, and other times in terms of pascals. (While few of us who *use* microphones have degrees in math or physics, most of those who write microphone specs seem to delight in showing that *they* do!)

Since your aim is to use your microphones with your recorder rather than demonstrate your prowess with a scientific calculator, *do* insist, before buying, that you be allowed to return a mike whose output proves incompatible with your recorder's input. Here's a kind of rough and ready check, which can be performed either at home or in a dealer's showroom, that will give you a fair idea of output-level suitability.

1. Set up the microphone in front of a loudspeaker, just as if the latter were an instrument you intended to record. Plug the microphone into your tape deck, making sure that your amplifier's tape switch is in *source* position so you won't create an unholy howling.

2. Play a piece of music from FM or disc through the speaker at a very loud level—a level that you judge is as loud as the microphone would pick up at a live performance.

3. Slowly increase the recording level to the point where your meter is running into the red area and note the setting of the recording-level control. (If your deck has both a master recording-level control *and* a mike-level control, set the master control at the level you would normally use for dubbing from FM or discs, then use the mike-level control.)

4. If you find that you've barely turned up the mike-level control (for example, less than one quarter of its available rotation, or a ten o'clock position), the microphone you're testing probably has too much output for your recorder and may overload its input stage even before the signal gets to the level control.

5. On the other hand, if you've had to advance the record control very much over its half-way rotation (beyond two o'clock, for example), the mike probably has too little output for your deck. You can double-check this by turning the music off and, wearing headphones, gradually turning up the mike-level control in a quiet room until you find the point where the hiss level suddenly begins to rise rapidly. (This is in addition to the normal room noise the mike is picking up.) From that point upward on the control you're going to have trouble making live recordings with your deck. The output of a microphone when picking up *live* music levels should drive your meters into the red *before* you reach this point. As this test suggests, the position of the mike-level control that indicates good mike-to-tape-recorder compatibility should optimally fall somewhere between eleven o'clock and two o'clock.

That should about do it. If you are satisfied with the way the microphone behaves in all the checks to this point, you can be reasonably confident about buying it. But remember that quality alone is not enough—be sure that the microphone's characteristics fit the job you want it to do. □

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 (140 dB 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 shotguns. 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.

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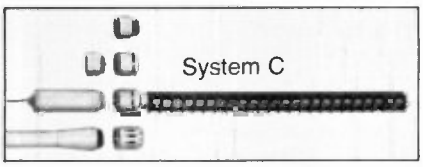
Electro-Voice backs up these two microphones with the only unconditional warranty in the business: for two years we will replace or repair your CS15P or CO15P microphone, when returned to Electro-Voice for service, at no charge – no matter what caused the damage!

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.



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CIRCLE NO. 11 ON READER SERVICE CARD

HOW TO BUY MICROPHONES

By Craig Stark

Unless your recording interests extend no farther than dubbing from discs or FM, sooner or later you're likely to be shopping for a pair of microphones. Unless you stick to the specific recommendations, if any, of your tape-deck manufacturer, you may find yourself confronted with a bewildering array of terms and specifications.

The first decision you'll probably want to make is whether you want a pair of *omnidirectional* ("omni") microphones (see illustration below), which, as the name implies, are equally sensitive to sounds coming from all directions, or whether your recording needs would be better served by *cardioid* ("unidirectional") mikes, which reject sounds coming from the rear. (There is a third classic microphone pickup pattern, the "figure eight," which is also illustrated below, but its use tends to be highly specialized and more suited to professional applications.)

Of the two major types, I personally prefer omnidirectional microphones (at least when noise from an audience isn't likely to be excessive), for on a per-dollar basis they tend to give the smoothest frequency response. On the other hand, cardioids are by far the most popular choice (also the most easily available), and you can frequently get a very good stereo image by physically taping the cases of two cardioids together with plastic electrical tape to form an "X" in which the two mikes point about 90 degrees apart. (This also permits you to use a single microphone stand to support the pair of them.) However, if you intend to use cardioids with a vocalist who never holds a mike more than an inch away from his or her mouth, select a model with a built-in "bass-rolloff" switch. When operating very close to the sound source, unidirectional microphones produce an artificial bass boost, known as the "proximity effect," for which the rolloff switch will compensate.

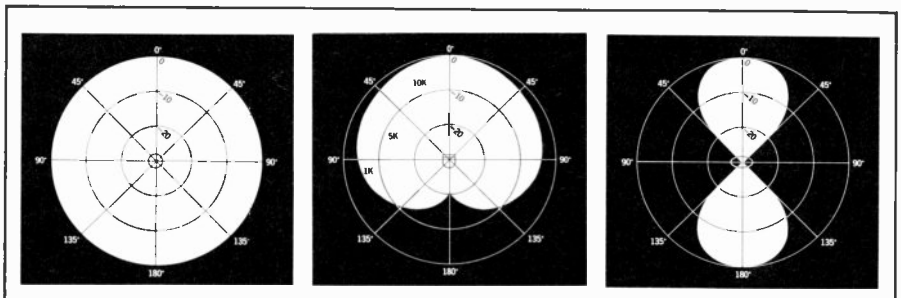
Even the briefest reading of audiophile catalogs or manufacturers' literature will disclose the fact that, regardless of which pickup pattern you choose, you must next decide between *dynamic*, *electret* (or "electret condenser"), *ribbon*, *crystal* (or "ceramic"), or, if price is no object, *condenser* microphones.

Genuine condenser microphones are the professional's first choice for the widest, flattest frequency response. They frequently offer switchable pickup patterns (or interchangeable screw-on capsules to achieve this), but they generally cost $300 and *up*, and they require an external power supply.

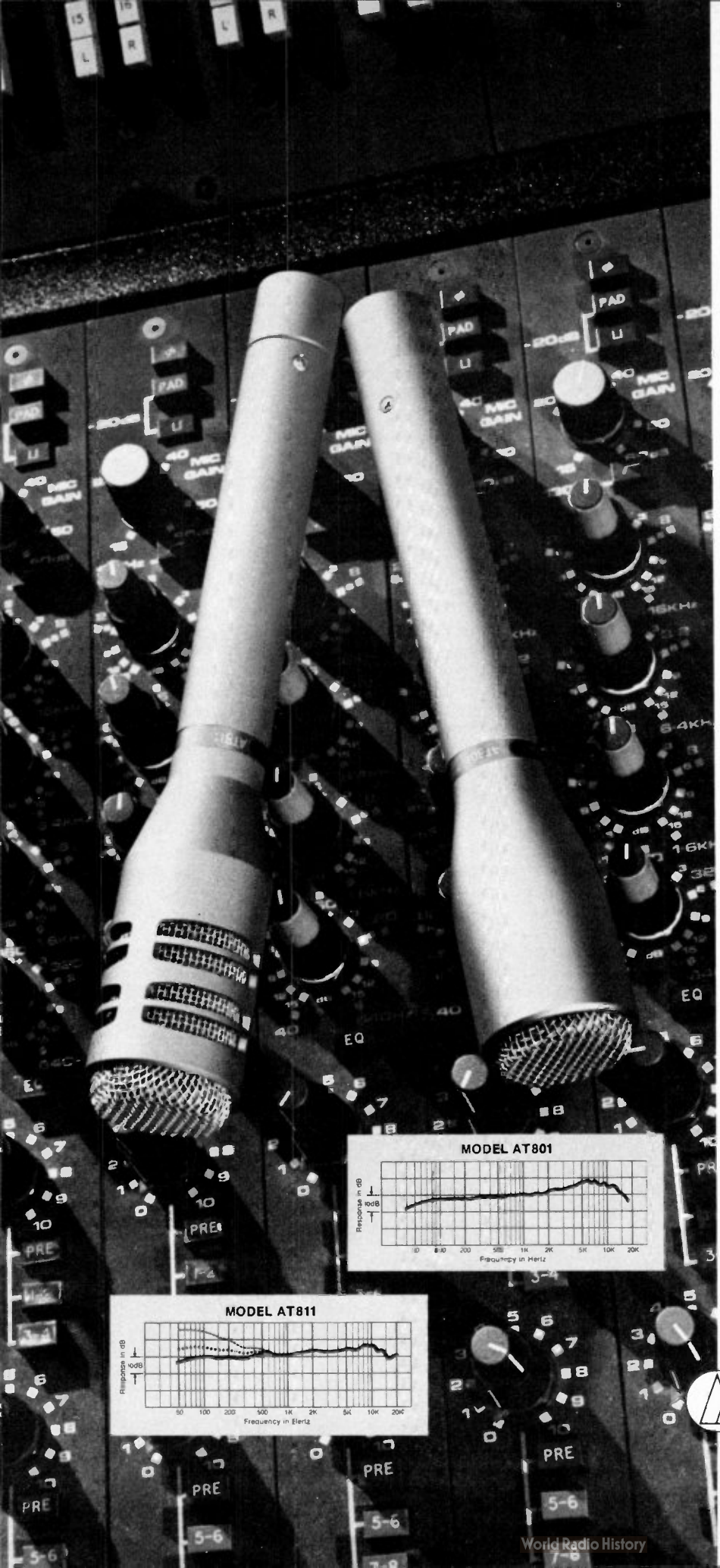
At the opposite end of the economic scale are the crystal or ceramic types, which are often available for under $5. These are definitely not designed for high-fidelity music recording. In the $50 to $200 range, however, are to be found many excellent examples of the three other basic types: dynamic, electret, and ribbon. Ribbon microphones are relatively rare: they tend to be rather costly, have generally excellent transient response, and are often said by professionals to have a certain "warmth" in vocal recording that makes them an even better choice than the condenser type. Dynamics are the most abundantly available. They come on all quality levels, are rugged, capable of wide and smooth frequency response, and have long been the "workhorses" of the broadcast industry. They operate like a regular loudspeaker, only in reverse. Electrets are relative newcomers to the scene. They are, as a matter of fact, a type of condenser microphone, akin in operation to an electrostatic type of loudspeaker (again, in reverse). While, unlike dynamics, they do require a power supply, it normally consists of only a couple of "AA" cells installed inside the microphone case. Having had excellent results with dynamics, electrets, and ribbons, I don't recommend you make your choice simply on the basis of *type*, but, if possible, on comparisons between specific models.

The ideal "test," of course, involves actual use of different microphones under different conditions, but unless you have an extraordinarily obliging dealer, this is not likely to be a feasible option. Most microphones come with bare wires at the end of the cables supplied (so you can attach the particular type of connector your recorder or mixer input requires), but if you narrow your choice to a couple of models, you may find a dealer willing to rig a connection from one of each into his best recorder and demo system to permit a limited comparison. If so, here are two "quick and dirty" checks I found particularly useful.

First, take a *male* friend with a normal speaking voice with you to the showroom. (*Never* use your own voice, however good, because nobody sounds the same to himself as he does to others.) Set up microphone "A" on a stand, adjust the level of the recorder to obtain normal readings, and let your friend read a paragraph or two from the morning newspaper at a normal speaking distance of 1 to 2 feet. Then check microphone "B" at the same recorder setting. On playback, listen for any



Left to right: polar response patterns of omnidirectional, cardioid, and "figure-eight" microphones. Note that these diagrams actually represent solid, three-dimensional shapes and not flat surfaces.



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EQ should be used to improve the sound... not to fix the mike!

Introducing affordable smooth sound. The remarkable AT801 and AT811 Electret Condensers. With curves so smooth you would have to pay a bundle to match them anywhere else.

Response like this has a number of benefits. First, your EQ is used only to touch up the sound, not to correct built-in errors of the microphone. Which leaves more leeway to control the overall sound.

And without unwanted peaks you have more usable headroom. That's vital when you're working near the dynamic limit of a preamp or line amp. Sound stays clean and sharp. Compressors or limiters sound less forced, because they are controlling peaks in the *sound,* not peaks in the *mike!*

But perhaps the biggest advantage is the versatility of these A-T condensers. Because they have just the right amount of presence for today's recordings, they're not limited to just one kind of instrument...just one type of voice. Put them *anywhere* in the mix: brass, reeds, percussion, chorus, or strings. Then listen. What you hear in the studio you'll hear at the console. Which is a great place to start in miking any session.

At well under $100 these are two of the best bargains you'll find these days. Reliable, clean-sounding, and the most predictable microphones you can use. Make them a mainstay in your studio today. Write for spec sheets and dealer list.

Model AT801 Omnidirectional Electret Condenser

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erase previous information, the bulk eraser does a better job and, in fact, can return the tape to better than new condition.

● ***Cleaning and Demagnetizing Equipment.*** Maintenance of your recorder is absolutely vital if you expect to get anywhere close to peak performance. Cleaning the machine requires some Q-Tips and the head cleaner recommended by the manufacturer (isopropyl alcohol—*not* rubbing alcohol—will usually do in a pinch). Use these together to clean the heads, metal guide posts, capstan, etc. There is some controversy over what type of cleaner to use on the pinch roller, as some types may cause cracking. If you have any question about maintenance, a call to the manufacturer should get you an answer.

Demagnetization must be performed periodically to prevent build-up of unwanted magnetism along the tape path; for this you will need a demagnetizer. Stay away from the cheap types designed for cassette heads—it's worth getting a professional model if you want to do the job as quickly and efficiently as possible. I've also found that a magnetometer (for measuring residual magnetism) is very helpful for letting you know when your heads, or other parts in the tape path, need demagnetization.

● ***Microphones.*** Microphones are obviously essential to any studio. These days, electret condenser microphones have become very inexpensive while offering high quality for the price; as little as $30 will buy a decent one. Dynamic microphones are long-time favorites, though the good ones are more expensive than an electret type. Ribbon microphones are quite expensive and are therefore seldom used in home recording studios. If your mixer has unbalanced inputs, a compatible microphone is the best choice, but remember that a relatively inexpensive transformer can match a balanced mic output to an unbalanced mixer input.

Here's a tip on increasing your mic collection: electronic parts companies, many of which advertise in electronic hobbyist magazines, will occasionally offer microphone elements at a very attractive price . . . say, $5 to $15. I've picked up several of these, and while their quality won't make professional-quality mic makers envious, they are good enough for certain uses. One of my favorite vocal mics, for example, only cost me $7, and for voice outperforms a $100 dynamic I use for other instruments. If you plan on recording a variety of acoustic instruments at the same time, you may also find it handy to have a contact mic or two sitting around. Through equalization, they can be made to sound acceptable. Moreover, they bypass some of the leakage problems that may occur with regular microphones.

● ***Patch Cords, Adapters, Etc.*** No studio is complete without a little box of cords and adapters that allow you to plug anything else. You might have a guitar with a phone jack that needs to plug into a device with a phono jack, and an adapter cord is the only way you'll do it. A few matching transformers, patch cords for use with your patch bay (if you have one), ac adapters for when batteries give out—all of these can bring rescue when you're in a tight spot. Whenever you need an adapter, either make or buy one. You're bound to run into the same problem again and again. If you accumulate a selection of adapters over the years, however, you'll be prepared for any emergency.

● ***Outboard Units.*** Compressors and limiters are very useful devices. They automatically restrict dynamic range of a signal so that it's compatible with the limited dynamic range of tape recording equipment. Peaks can be smoothed out to avoid overloading and soft passages brought up in level to keep a signal out of the noise. Outboard expanders also have their uses, although they are less necessary than compressors.

One of the most popular and versatile devices you can add to your studio is digital or analog delay line. These devices produce echo and reverberation effects, simulated vibrato, "flanging" effects, tone modification, doubling and strengthening of parts, and more.

Noise gates are helpful for keeping the overall sound as clean as possible. When the input signal to a noise gate drops below a preset, adjustable threshold, the signal is turned off. This prevents any noise in the channel from getting through to the next stage.

● ***Tuning Standard/Test Oscillator.*** A tuning standard can put some A-440 tone at the start of a piece so you'll have a reference to tune to in future sessions. A test oscillator can insert 0 VU test tones on the tape at a variety of frequencies; these are useful for calibration and adjustments.

Putting It All Together

We've discussed a lot of equipment here, but don't be intimidated or feel you need all of the items mentioned in order to get started. An organ can make a good tuning standard; we've already mentioned budget mics; you don't have to have a second machine when you first start out; and there are other ways you can cut corners without cutting out too much good sound.

A ballpark figure that's often quoted for getting a small studio together is $20,000—but don't you believe it! I recorded a master quality tape some years ago in a $1500 studio that included a mixer, a four-track master recorder, and a good-quality cassette recorder as a second machine.

You'll also find it helpful to have some books on recording so you can benefit from the knowledge others have accumulated over the years. A sampling of these references accompany the article.

One final comment: Equipment alone does not account for good recordings. Recording, like music, is an *art form.* So even if you can't afford multitrack equipment, start with whatever is within your financial reach—a cassette player, an old three-head machine, whatever. The "hands on" education will be valuable, and you'll be laying the foundation for greater creative recording adventures in the future. □

RECORDING BOOK SAMPLER

Home Recording for Musicians (Craig Anderton; Music Sales Corp., 33 West 60th St., New York, NY 10023)

Modern Recording Techniques (Robert Runstein; Howard W. Sams & Co., Inc., 4300 W. 62 St., Indianapolis, Ind 46206)

Audio Cyclopedia (Howard Tremaine; Howard W. Sams & Co., Inc, 4300 W. 62 St., Indianapolis, Ind 46206)

The Recording Studio Handbook (John Woram; Sagamore Publishing Co., 1120 Old Country Road, Plainview, NY 11803)

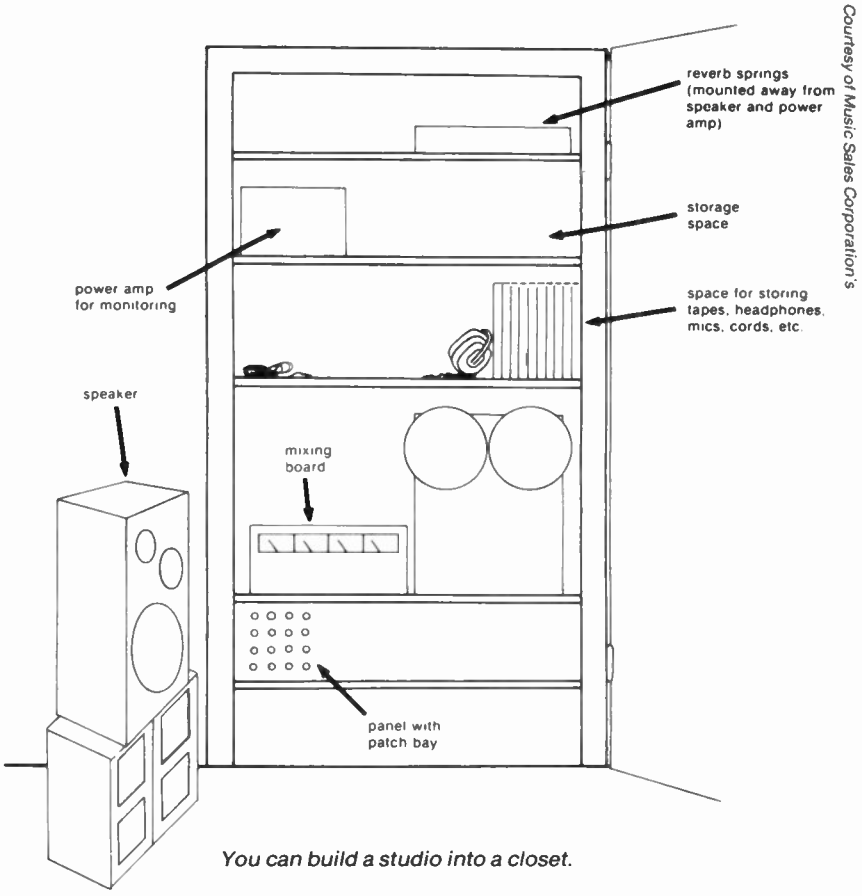
Microphones: Design and Application (Lou Burroughs; Sagamore Publishing Co., 1120 Old Country Road, Plainview, NY 11803)

Handbook of Multichannel Recording (F. Alton Everest; TAB Books, Blue Ridge Summit, PA 17214)

Sound Recording (John Eargle; Van Nostrand Reinhold Co., 450 W. 33rd St., New York, NY 10001)

thing from a simple treble boost/cut, bass boost/cut tone control similar to those found on hi-fi amps to a multistage parametric or graphic equalizer. This is a very important module, as it allows you to alter tonal quality of a recorded track during the mixdown process. Let's suppose you recorded a bass part that during the time of recording sounded terrific, and during mixdown you discover that more "punch" is required to make the bass stand out a bit. With an equalizer, you can add that "punch" electronically by boosting the response in the area of 100 to 300 Hz.

A simple bass/treble, boost/cut equalizer can handle a variety of common recording needs, but can't do anything too sophisticated. The next step up in complexity is to add switchable high-frequency and low-frequency break points to the same type of control. Another possibility is an extra control for mid-range boost or cut. Each increase in flexibility has its cost. If you have a 16 channel mixer with 16 equalizers to contend with, the extra complexity can send the price through the roof. Though it's very nice to have sophisticated equalizer design, fortunately it isn't always necessary. External units can be patched in to supplement simpler equalizers when necessary.



Courtesy of Music Sales Corporation's

You can build a studio into a closet.

● ***How To Choose a Mixer.*** With so many options available it would appear that choosing a mixer would be a formidable task. In some ways this is true, but the hard fact is that your budget will tend to do the selecting for you. If you can afford perhaps $1000 for a mixer, your choice is thereby limited to certain models. Then your problem becomes choosing between those specific ones that are within your means. Here are some guidelines for making your choice:

* Choose a mixer that has more inputs than you think you need. Also, look for flexibility. A generous allotment of points and jacks, easy patching capabilities, and multiple output busses are preferable to a limited number of access points and a lot of "bells and whistles."

* To keep costs down, I'd advise selecting a mixer with unbalanced, high-impedance inputs and having some accessory matching transformers around to patch in when required. It is rare, at least in my experience, that you will want to have eight or more low-impedance balanced mics plugged into the mixer all at once (especially since many instruments can plug directly into the console). But your intended use could change this requirement. For example, if you want to do a live recording requiring multiple mics whose cables must stretch over several rows of an auditorium, low-impedance balanced line inputs will be well worth their cost.

* Listen carefully for residual noise. With the equipment in a quiet environment, check to see how much noise (hiss) is added when you switch in the preamp, equalizer, reverb, and so on. All these noise contributions add up rapidly in a multitrack context, and you need to squeeze every last dB of noise performance that you can out of your system.

* Consider building your own modular mixer. Building a mixer is tedious, but certainly possible—even for some beginners.

Accessories

Putting together a studio can be a never-ending process, since the setup can always get bigger and better. But no matter what type of studio you have, there are certain accessories that are absolutely essential and others that aren't *that* necessary but make life easier. We'll cover the most important ones here.

● ***Tape.*** Now that you have your recorder(s), you'll need tape. I advise getting the very best you can afford, on professional 10½-inch metal reels. The difference in sound quality between top-of-the-line tape and budget tape is dramatic—even more so in a budget studio context.

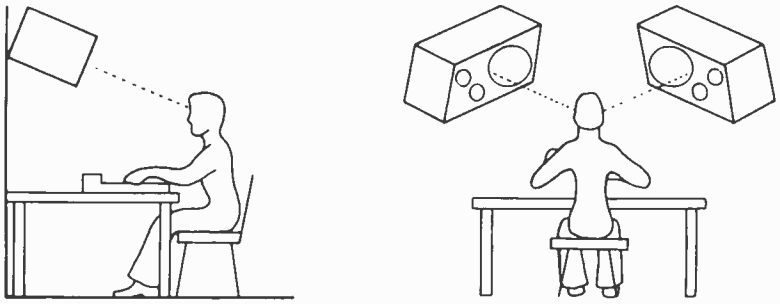
Good quality tape is not cheap, but there are some ways around this problem. If there is a good studio supply shop in your area, you can often buy "pancakes" (tape wound on a hub, but without reels) and the reels separately. You can then assemble the pancakes onto the reels yourself, saving a few dollars in the process. Another tip: buy tape that's physically thick, such as 1.0- or 1.5-mil types. Thicker tapes reduce printthrough and are less likely to tear or stretch.

● ***Tape Accessories.*** There are many occasions where you will want to edit your own tapes, either within a particular piece or within a given reel (for example, removing an unwanted take). To do this, you will need a splicing block for the width of tape you are using, splicing tape (I prefer very thin splicing tape, although it's more expensive than the standard kind), and some sharp, nonmagnetized razor blades. You might also want some paper or plastic *leader tape* to insert between selections or to put at the beginning and end of a reel. (If you choose paper tape, you can write an identification at the head of the reel.)

Chances are you'll also need some spare reels for holding portions of a tape while you work on other sections. Another handy accessory is the *bulk eraser* for erasing an entire reel of tape. Although recording over a track will

chine. Mixers come in many shapes, sizes, and prices; it will probably take you a bit of research to determine what's best for you.

Mixers are classified by the number of inputs and the number of output busses. A mixer with 4 inputs and 2 output busses, for example, would be termed a "4 in, 2 out" mixer. The number of inputs you will need depends on the number of channels in your multi-channel machine. In other words, if you have an 8-track machine you must have *at least* 8 inputs to accommodate the 8 individual outputs of the recorder for mixing. In practice, it's a good idea to have several more inputs, since you may want to add additional parts when you mix. For a four-track studio, I recommend a minimum of 6 inputs, and for an eight-track studio, at least 12 inputs.



Courtesy of Music Sales Corporation

The left illustration shows a speaker mounted against a wall at an angle so that it aims towards ears while mixing. On the right, when stereo is involved, speakers are placed horizontally at ear level with tweeters at the extreme right and left corners.

The number of outputs is somewhat less critical. In many professional studios, the number of mixer outputs equals the number of inputs on the multichannel machine. This allows any combination of signals to be mixed into any tape recorder channel with only two of the busses required for stereo mixdown. In small studios, however, it often isn't necessary to have one output buss per tape recorder input. Instead, you may have 2 or 4 output busses whose signals can then be routed into the desired tape-recorder input via the patch bay. The advantage of more output busses is that you can assign a given input to any given output buss merely by flicking a switch. With fewer busses, patching, which is more time-consuming than switching, becomes necessary. But since time in a home studio is so much less expensive than at a commercial studio, patching often yields a net saving.

Not all output busses feed tape recorders. Many mixers, for example, include a *monitor* or *cue* buss. This is usually mono with its own set of faders; the output of this buss leads to a power amplifier connected to multiple headsets located in the studio. A musician doing an overdub will often not want to hear the same mix of the song that everyone else in the control room is hearing. It's harder to sing a vocal, for example, when lots of other instruments are playing. Consequently, the vocalist may ask for a mix that emphasizes, say, the rhythm section. In the meantime, the engineer in the control room will want to check how the vocal sounds with all the tracks in place. To do this, the engineer sets up a stereo mix on the two output busses leading to the second machine, while the musician's headphones are fed a custom mono mix with levels set by the monitor buss controls.

A *reverb* buss is also a handy feature found in many mixers. This, like the monitor buss, has its own set of channel level controls. These controls take a mix of the various tracks and send it to the input of a reverb unit whose output feeds back into a dedicated input on the mixer. Setting up an independent reverb mix allows you to insert varying amounts of reverb on different instruments.

Some mixers also include auxiliary busses that can fulfill specific functions. An auxiliary buss would be pressed into service in addition to a single reverb buss to give stereo reverberation effects. Or, it could be used to feed various tracks into an additional special effect such as tape echo.

● ***Submixing Capabilities.*** Boards with many inputs often allow you to submix tracks. Let's say you have four harmony vocal parts, and you need to fade them all in and out together. Normally this requires manipulation of four separate faders. But with a submixer, you can pre-blend these four channels into one controlled by a single fader. This feature, generally found on more expensive mixing consoles, can prove particularly useful for live recording.

● ***Solo/Mute Pushbuttons.*** Each channel of a full-function console will also have solo and mute pushbuttons. Depressing the solo button for any channel puts that channel alone into the monitor. Depressing the mute button cancels that channel, but leaves all other channels as is. The solo function is useful when you're listening to several mixed tracks, but need to momentarily isolate one (perhaps you want to change its tonal quality). The mute switch is used to cut a channel off when there is no signal to mask its noise.

● ***The Mixer Input Module.*** Typically, an input signal does not go directly to the mixing buss, but instead passes through an input module capable of processing the sound in various ways. Although input modules vary widely in terms of capabilities, they all have preamp and equalization (tone control) submodules.

The preamp has the job of bringing low-level signals (such as microphone outputs) up to the higher levels required by the mixing buss. In a simple mixer, the preamp will have a bare gain control; more complex preamp designs may include a stepped master level control, in addition to a supplemental gain control trim; a phase reverse function, to change the phase of the input signal 180 degrees; an input attenuator, to prevent strong signals from overloading the preamp; a low frequency roll off option that cuts out signals below a given frequency or choice of frequencies (say, 100 or 50 Hz); and an overload indicator. There are other features, but these are the most common.

One of the most important attributes of the preamp, and thus of the mixer, is the type of input signals it will accept. There are two major types of microphone and electrified musical instrument outputs: low-impedance balanced and high-impedance unbalanced. Low-impedance balanced line are used in most professional studios. With this system you can have very long microphone cable runs without pickup of noise and hum. Home studios, on the other hand, tend to use unbalanced, high-impedance lines. These are much less expensive, since balanced low-impedance inputs require either a transformer or additional active circuitry *at each input*. However, if you want to plug, say, a microphone with a low-impedance balanced output into a high-impedance, unbalanced input, you need only connect an appropriate matching transformer between them.

● ***Equalization Module.*** The equalization section of a console can be any-

machine with more than a small group of performers. An 8-track machine offers much greater flexibility; premixing becomes less of a problem, and a better stereo image can be created. The cost of an 8-track recorder is about twice that of a 4-track type, but if you're really serious about quality recording, the money will be well spent.

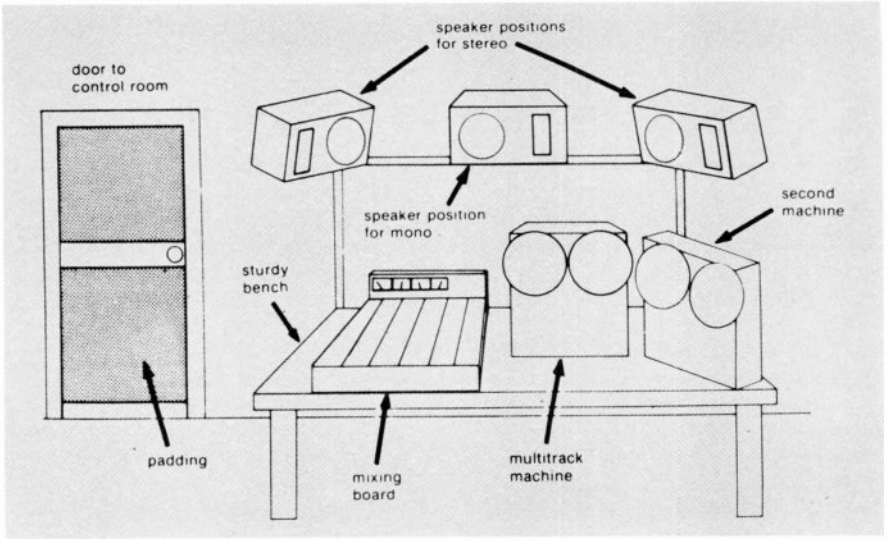
● ***What About Noise Reduction?*** One price paid for packing lots of tracks onto relatively narrow tape is that noise is increased. Each track is not only a place to store a recorded signal, but a source of noise as well. Therefore, if you intend to do a lot of track bouncing, or if you want very clean recordings, some kind of noise-reduction system is called for. Some recorders offer built-in noise reduction, which can result in a lower overall cost than buying the recorder and noise reduction separately. If your recorders do not include noise reduction, you must patch outboard units into the system. It's possible to make good-quality tapes without noise reduction if you're extremely careful, but a little electronic help can take you a long way toward professional quality. Some popular noise-reduction systems for home recording enthusiasts are made by dbx, although Dolby B also has adherents.

● ***Reel Size and Speeds.*** Because higher tape speeds generally give superior performance, most professional studios roll their tape along at 15 or even 30 inches per second. Therefore, make sure the machine you select has a 15 ips capability. While this doubles the tape cost, the improvement in sound is usually worth it. For experimentation and other noncritical uses where it pays to economize on tape, it's handy to also have a 7.5-ips option. Given a choice between dual-speed options of 3.75/7.5 ips and 7.5/15 ips, take the latter.

Some of the newer machines have a feature (sometimes an outboard option) that allows you to vary speed of the capstan motor (typically ±5% to ±20%, depending on the model). This can be well worthwhile in the studio. For example, if you have an instrument that's slightly out of tune compared to other instruments already recorded on the tape, you can alter speed of the recorder to match the instrument's pitch. Variable speed is also helpful for special effects such as recording a snare drum at a higher-than-normal speed and slowing it down to normal on playback for a deeper, fuller sound.

Running at 15 ips, you'll use up tape fairly rapidly, which makes the capability of handling 10½-inch reels very desirable. If your budget holds you to a 7.5-ips machine, you may also have to settle for 7-inch reels.

● ***A Second Tape Machine?*** A tape with a bunch of tracks on it does not necessarily make an artful recording; the tracks must be blended together, balanced with each other, and spiced with effects such as reverb or equalization to make the final product. The results of *mixing*, as this process is called, are recorded in stereo on a second open-reel machine, which produces a quarter-track or half-track master on ¼-inch tape. The final tape will only be as good as the recorders used to make it. In particular, you should strive to obtain a mixdown machine comparable in quality to your multitrack. Luckily, we only need a two-track machine for this application, so cost won't be absurdly high.



Courtesy of Music Sales Corporation

Examples of various possible layouts for home studio recording are shown above. In each case, we've assumed a medium-size console, some bookshelf-size monitor speakers, and a single person operating the machine and mixer.

Most professional masters are mixed onto half-track machines. If you expect to sell your tapes to a record company or otherwise interface with the professional audio world, your second machine should be of this type. Half-track recorders are sonically superior to quarter-track models, but they are usually professionally-oriented and carry a corresponding price tag. Another alternative is to use a high quality cassette recorder for your masters. If at some point you want to mix your tapes on the finest equipment, you can always obtain a high quality machine from a rental service for a month or so.

One good source for a second machine is through upgrading your studio. If you start off with, say, a four-track, when you upgrade to an eight-track, you can either use the 4-track as an extra machine (it will make quarter-track copies, as well as provide special effects or echo), or trade it for a half-track model.

Ideally the second recorder should be able to handle 10½-inch reels and have 7.5- and 15-ips speeds. It should also be as quiet as possible, for you often will want to omit noise reduction on the master tape to maintain compatibility with other studios.

● ***Optimizing the Machine.*** Many tape machines are shipped over long distances and suffer a few bumps along the way. Therefore, the head azimuth, recording bias, and other parameters may be out of adjustment. Upon obtaining your deck, I strongly suggest that you take it to a reputable pro audio shop and have it tweaked for optimum performance. This will involve checking the head alignment, setting of bias and equalization, and possibly, a thorough mechanical inspection. You may elect to have the machine set up for a specific brand and type of tape so you can buy that tape in bulk and therefore save some money.

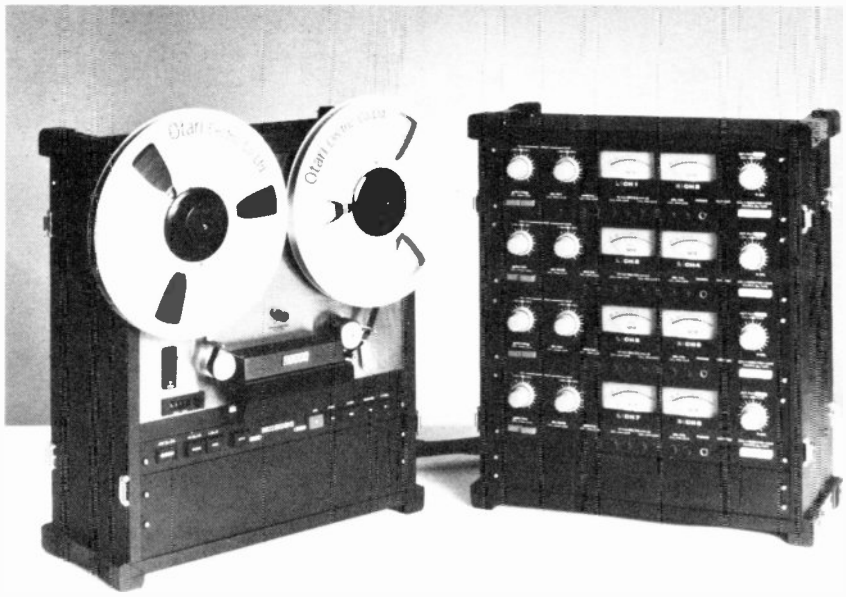
If you're not familiar with the basic maintenance that tape decks require, try to get a sympathetic technician to explain to you the proper procedures for cleaning, demagnetization, and, possibly, bias adjustment. Every year or so, have the machine re-calibrated and checked for problems like head wear. Good tape-to-head contact is vital, and as head wear occurs, the need for realignment increases. Even small deviations from the ideal can create substantial losses in high-frequency response and overall sound quality.

The Mixer

A mixer can be considered to be the traffic director for all your signals. It routes signals that are to be recorded into the multichannel tape deck, and mixes the signals from the multichannel deck to feed to your second ma-

Studio Recording at Home

By Craig Anderton



Otari's MX-5050-B ½-track recording machine.

More and more music lovers and musicians are building recording studios in their own homes. Though not usually as sophisticated as the studios regularly used by top recording groups, home studios can indeed be used to produce tapes of high musical and technical quality. The proof? Some "Top 10" albums have used material originally recorded in the artist's home studio.

Assembling a *good* home studio is not an especially simple task. But neither is it a forbidding challenge. Some equipment is generally more expensive than standard audiophile equipment, of course. Second, there is a lot of different equipment to choose from; and third, the equipment must be chosen to work together as a *system*.

The rewards of having your own studio can be great, though. For musicians, a home studio is not only highly educational to use, it's also a lot of fun (working out songs, practicing instruments, and so on). If you want to pursue a career in audio engineering or production, a home studio can help you learn proper procedure in a low-pressure environment (without paying $100 an hour to practice in a commercial studio). Moreover, there is always a possibility that the home studio will grow into a full-blown, professional installation that can be operated as a profit-making business.

There are three basic ways to acquire your studio. These are:

(1) *Buying equipment from hi-fi, audiophile, and professional sound shops.* This is the most expensive route, but can offer advantages in terms of availability of service, counsel, etc. Much of this equipment, especially raw tape and accessories, can also be bought at a discount from mail-order companies.

(2) *Buying (or trading) second-hand equipment.* Studios are constantly upgrading, which may offer you a chance to pick up some equipment at relatively low prices. Obtaining a used multitrack recorder, for example, might save enough money so that you can afford more and better accessories. Of course, the normal cautions about second-hand equipment apply.

(3) *Building your own equipment.* Magazines (such as *Popular Electronics*) include many practical circuits you can build yourself to enhance your studio. Granted, you probably won't want to build a tape recorder from scratch, but simple mixers, outboard devices, and the like may be assembled either from kits or from individual parts—giving substantial monetary savings.

The Tape Recorder

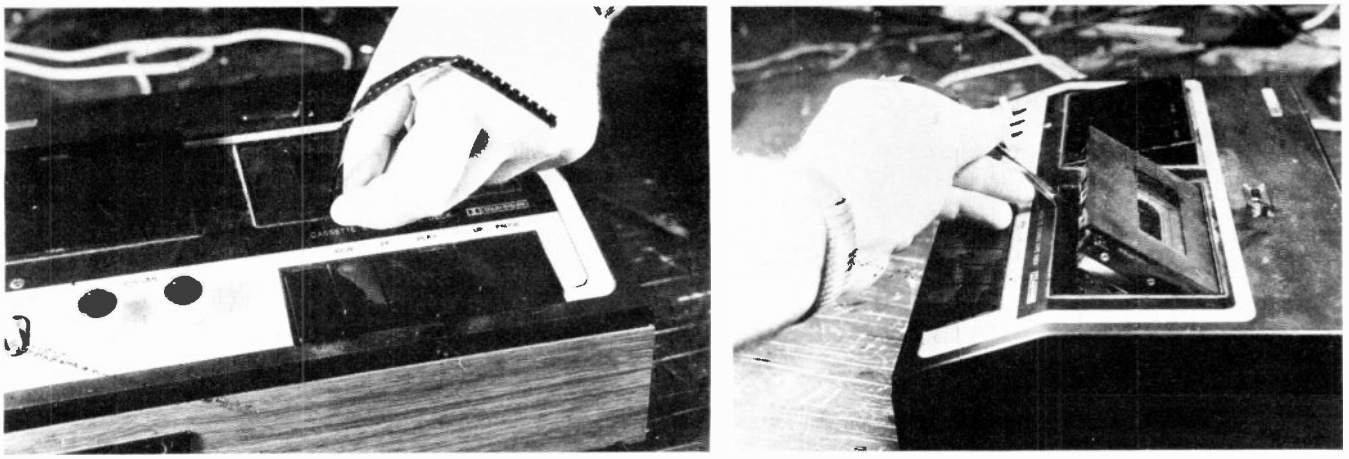
If your budget is stringently limited, a typical three-head, open-reel stereo recorder will allow you to enjoy some of the pleasures of a home studio. It will make it possible for you to "Ping Pong" material from one track to another using a selective recording process (called sound on sound, or sometimes sound with sound). Using this facility, you start by recording an instrument in, say, the left channel. The signal from the left channel is then picked up at the playback head, mixed with a new part, and recorded onto the right channel. The right channel now consists of two parts. This composite material can be played back and re-recorded with another part onto the left channel again.

Accumulated noise and distortion put practical limits on how many overdubs (or generations) you can create in this manner, but you can typically generate four or five parts. (A noise-reduction system makes it possible to add even more.) One very big drawback, though, is that the relative levels of each part are permanently set at each step of the process. So, if after listening to a complete piece you decide that a part on the first track was not properly recorded or balanced, there's nothing you can do about it.

Ping-Ponging with a tape recorder also restricts recording to monophonic. To obtain stereo, you could bounce signals back and forth between two stereo tape decks, mixing in additional parts on each bounce. Although these methods are useful, they are at best primitive. To really get into making your own music, you will need a multi-channel tape recorder. This type of recorder can record a number of independent tracks of music on a single piece of tape. Machines with 4, 8, 16, and 32 tracks are the most common.

● ***What Kind of Multitrack?*** Professional 4-track machines generally use ½-inch-wide tape, but a 4-track machine for home application will generally use ¼-inch tape. Similarly, professional 8-tracks use 1-inch tape, while home 8-tracks use ½-inch tape. Unless compatibility with professional studios is absolutely necessary, stick to the narrower tapes; professional equipment leads to professional prices and tape costs.

By bouncing signals on a 4-track recorder, you can get many more than 4 tracks in the final product; sometimes you can stack and Ping-Pong tracks until you have 16 or more in your final version. The main disadvantages of bouncing are a loss of quality and the requirement of extensive amounts of premixing. Also, it is difficult to secure truly good stereo effects on a 4-track



Strip of movie-film leader wrapped around edge of cassette where tape and erase head meet provides sound-on-sound recording, recording over original material without completely erasing it.

To create reverberation, patch the line outputs of a three-head recorder to its own line inputs. Then begin making a microphone recording. The feedback effect's intensity is regulated by the deck's mike-line mixing controls or, lacking these, its record-level and output-volume controls. If the deck has neither of these, an external mixer must be used between the line output and inputs. Note that care has to be taken in setting the feedback level. If it is too high, the oscillation or ringing that creates a reverberant effect can get out of hand and perhaps damage your equipment.

Sound Effects

In any dramatic production, sound effects play a major role in telling the story. This is almost as true of movie and stage plays as it is of pure sound productions. There are three sources for sound effects. The first is simply to record the real sound. Another is to use sound-effects records. Many of these records are listed in the supplement to the *Schwann Catalog*, and you will find a substantial listing in this writer's own book, *Tape Recording for the Hobbyist*. The third source is your own creative effort, often the only way to acquire certain effects and always the most fun. You will find some suggestions for creating several key effects elsewhere in these pages.

With a complex production, you can make things more manageable by assembling, in sequence, the music you will use on one cassette and the sound effects on another. Use the tape index counter to cue each effect or musical passage. Pay special attention to transient sounds like a gunshot or a sharp explosion since cueing accuracy is especially important owing to briefness of the sound.

The easiest way to put together an audio production without a mixer—provided that stereo isn't essential—is to set one track aside for mike recording and use the other for music and sound effects. This is the same arrangement used for cross fades—two cassette decks, one feeding music and the other sound effects, patched to the master recorder via a "Y" connector. Careful use of the output-level controls on the donor decks will permit you to mix effects and music together on one track and fade them to a background level when adding dialogue on the other.

A script should be used for any kind of production, whether pure audio, film or theatrical. You can prepare one in TV style, with dialogue on the right side in a half-page column, and technical directions on the left side, opposite the dialogue. Or you can run audio cues between dialogue that is typed across the full page, setting off the technical direction by typing it all in capitals. Another alternative is to follow what many theatrical directors do—prepare an audio cue sheet as an adjunct to a separate, full script. In this approach, technical instructions, including identification of sounds to be used, are shown opposite dialogue cues and notations referring to location of action in the script. This gives an audio operator all the necessary information in a convenient, manageable form.

As you get into production work, you will undoubtedly develop a few special wrinkles of your own, depending on what cassette equipment you use and what you use it for. And you will discover something that open-reel hobbyists learned long ago: Copy cats don't have nearly as much fun as cats that create. □

Some Useful Sound Effects

The best sound effects are the original sounds recorded on tape. But if you want to suggest somebody being hit with a blackjack, you will hardly want to seek out the authentic sound. Neither are you likely to oblige a script by actually blowing up a building or crashing a car. Here are a few sound effects that can prove useful when you have these and similar needs.

Screening Brakes: You can achieve a spine-tingling screech by using a block of wood with three heavy nails hammered through at an angle to form a triangular pattern. Run this across glass while pressing down hard to give your listeners goose pimples.

Auto Crash: Slam a couple of aluminum plates together for a reasonably good suggestion of a collision.

Explosion: You'll get a bang out of smashing a large, inflated paper bag. If you have access to a dual-speed cassette unit, record the exploding bag at the higher speed and play it back at the lower speed.

Fire Engine: A fair simulation can be made using a battery-powered siren made for a bicycle.

Gunshot: Hold a shoe box fairly close to the mike and hit it hard with a ruler.

Fist Fight: Hit your palm with your fist while close to the mike.

Clubbing: Slug a cantaloupe with a rolling pin or a hammer to suggest a blackjack hitting somebody's head.

If you read the prices, you won't believe the specs:

DP-EC7 Turntable:

Drive	20-pole direct-drive DC Servomotor
Speeds	33⅓ and 45rpm
Speed selection	Automatic/manual
Wow and flutter	Less than 0.03% (WRMS)
Speed adjustment	±3.0%
Signal-to-noise ratio	Better than 73dB (DIN 45-539-B)
Tone arm, S-type	universal, static balance
Effective length	227mm (9″)
Overhang	14mm (9/16″)
Tracking error	+2.9° – 1.5°
Offset angle	22°
Headshell	fiber reinforced plastic (FRP)
Anti-skating mechanism	Dial setting
Possible cartridge wt.	5.0-10.5 gr.
Tracking force adjustment	0-3.0 gr. (0.1 gr. step)

Special functions: Auto lead-in, Auto return from lead-in, Auto lead-out, Free lift/cue, Free L-R traverse, Cue prevention in absence of record, Auto speed change.

MS-10 Loudspeakers:

System/cabinet finish	2-way/walnut
Impedance	6Ω (min. 5Ω at 2kHz)
Power handling capacity	100W (IEC rated power)
Frequency response	35-20,000Hz ±4dB
Speakers	
Woofer	25cm (10″) cone, GFRP honeycomb
Tweeter	5cm (2″) cone
Output acoustic (pressure level)	87dB/W @ 1 meter

DA-A7DC Power Amplifier:

Note: All measurements are for 8 ohms output unless otherwise stated.

Minimum continuous output power 75W per channel, both channels driven, from 15Hz – 20kHz, with no more than 0.01% total harmonic distortion.

Total harmonic distortion 20Hz – 20kHz	
At 40W per channel	0.004%
Intermodulation distortion (70Hz: 7kHz, 4:1)	
At rated power	0.008%
At 1W per channel	0.01%
Power bandwidth (IHF)	(10Hz – 60kHz) (0.05% THD)
Frequency response	
At rated power	+0, –0.1dB 20Hz – 20kHz
At 0.5W per channel	+0, –1dB DC – 150kHz
Input sensitivity	1V
Damping factor	100, 20Hz – 20kHz
Channel separation	
At 1kHz	80dB
At 20kHz	60dB
Signal-to-noise ratio at rated power	
IHF-A closed circuit	122dB

DA-C7 Tuner-Preamplifier:

FM Tuner Section

Usable sensitivity	
Mono	11.2 dBf (2.0μV)
Stereo	23.1 dBf (7.8μV)
50 dB quieting sensitivity	
Mono	20dBf (5.5μV)
Stereo	40dBf (55 μV)
Signal-to-noise ratio	
Mono: 76dB	Stereo: 73dB
Frequency response	+0.5, –1dB 30Hz – 16kHz
Total harmonic distortion at 1kHz, 65dBf (figures in brackets for 'narrow' setting)	
Mono	0.08% (0.25%)
Stereo	0.1% (0.5%)
Capture ratio	1dB (2dB)
Alt. chan. selectivity	50dB (75dB)
Stereo separation (1kHz)	45dB (35dB)

AM Tuner Section

Usable sensitivity	200μ V/m (bar ant.)
Selectivity	25dB
Total harmonic distortion	1%
IF response ratio	40dB

Preamplifier Section

Input sensitivity/impedance	
Phono 1/2	2.5mV/50kΩ
Aux, Play 1/2	150mV/50kΩ
Output level/impedance	
Rated	1V/600Ω

Preamplifier Section (cont.)

Maximum	10V
Rec 1/2	150mV/600Ω
Signal-to-noise ratio, IHF-A network	
Phono 1/2	87dB (10mV)
Aux, Play 1/2	99dB (closed circuit)
Total harmonic distortion at rated output, attenuator at –20dB, 1kHz	
All inputs	0.003%
RIAA deviation	±0.2dB, 20Hz – 20kHz
Tone controls boost/cut	
Bass	±10dB at 100 Hz
Treble	±10dB at 10kHz
Subsonic filter	18Hz (–6dB/oct)
Power consumption	25W

DT-10 Cassette Tape Deck:

Tape speed	4.75cm/sec (1⅞ips) ±1%
Wow and flutter (playback)	0.06% wrms
Fast forward/rewind	80sec (C-60 tape)
S/N ratio +3VU, weighted, 400Hz (200pwb/mm)	
Dolby out: 56dB	Dolby in: 64dB*
Erasure ratio (1kHz)	70dB
Crosstalk	
Between channels (500 – 6,300Hz)	35dB
Between tracks (1kHz)	65dB
Harmonic distortion, 400 Hz (160pwb/mm)	1%
Frequency response	
Normal tape	40 – 12,000Hz ±3dB
Special tape	40 – 15,000Hz ±3dB

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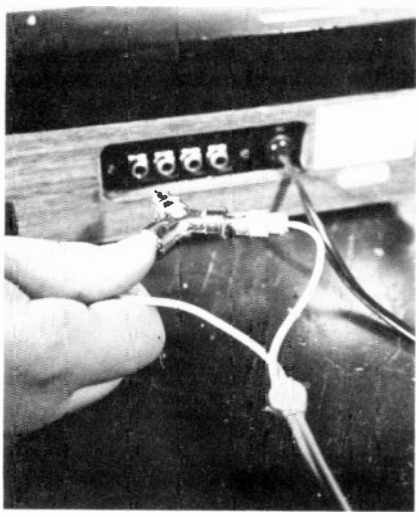
*DP-EC7 Turntable: $300.00**

*DT-10 Cassette Tape Deck: $370.00**

*DA-A7DC Power Amplifier: $330.00**

**Manufacturer's suggested retail price.*

begins where the index counter shows some multiple of 10. If you are going to string together excerpts from a number of different tapes, use the same technique to index each excerpt.



Two-into-one "Y" adaptor feeds stereo recording into input of single channel or blends outputs of two recorders into single set of inputs to master recorder.

Special Effects and Overdubs

As you build your master recording, you should decide on how to make transitions. If you want a series of independent musical selections, leave a bit of space between the end of one and the beginning of the next. If you prefer to fade from one to another, you will want to index each selection at the end as well as the beginning. Then slowly lower the recording level as the end of one approaches and bring it up as you start the next selection.

Cross fades are more interesting, but they require the use of two donor decks and a mixer. You can do without the mixer, though, if the donor decks have output-level controls. In that case, outputs of the two decks should be fed together into the mastering recorder through two-into-one "Y" adaptors. The proper output level of each donor machine should be established beforehand and marked on the output control scale with a bit of colored adhesive tape. The first recording should be dubbed at this output level. When the index counter shows that the end of the first selection has almost been reached, start the second recorder. Gradually turn up its output level and simultaneously drop the output level of the first deck, and you will have created the audio equivalent of a pictorial dissolve in films.

These days, recordings in which a singer's voice is multiplied, or in which three or more harmonies are added at different times, are commonplace. They are usually done with multi-track recorders that permit you to lay down one track while listening to another. The effect was pioneered about a quarter of a century ago, long before multitrack machines were developed, when a husband-and-wife, singer-guitarist team (Les Paul and Mary Ford) made it their trademark. First, they would make a basic recording on one studio recorder. Then they would play it back through the mixing console into a second recorder, listening through headphones as they added a second part and blended them together. The process was then repeated, going this time from the second recorder to the first while adding a third part, and so on. This add-on process was repeated as many times as they wanted for a given effect —but stopped short of the point where noise buildup became unacceptably audible.

You can do the same thing with a couple of cassette decks plus a mixer. In fact, you don't need an external mixer for this effect if your decks both have built-in facilities for mixing mike and line. Moreover, you can do it without internal or external mixing if your recorder can accept mike and line inputs at the same time. First make the basic recording on the donor machine. Then plug a mike into the left channel of the machine doing the mastering, and patch its right-channel line input to the donor machine's output. A stereo output from the donor machine can be blended together with a "Y" connector of the two-into-one type.

As the first add-on part on one track is layed down, you can hear yourself through stereo headphones blending in with the earlier recording as it is being dubbed onto the other track. You can make recording-level corrections for proper balance whenever you wish. If you want to stop at this point, you can play the two tracks back as a stereo recording, or you can switch to mono and blend them. Otherwise, you can interchange the cassettes and build additional parts by repeating the process.

When you work with cassette instead of open reel, the limit on how many parts you can add successfully is more stringent. Narrower tracks and slower speed cause the cassette format to build up noise much more rapidly than open reel. A Dolby or other noise-reduction system will help to offset this buildup. A couple of the new two-speed cassette decks at 3 3/4 ips could let you do still better. But even with conventional, high-quality cassette decks it should be possible to build at least a four-part recording.

Another method of combining old and new recordings is the sound-on-sound technique, which involves defeating the erase head either by disengaging it electrically or isolating it physically. Means for doing this were built into some recorders, notably certain Norelco and Uher models, many years ago.

By permitting you to record over a previous recording without wiping it out, sound-on-sound lets you come up with a blend of old and new. Unfortunately, it also degrades the original recording. Partial erasure of higher frequencies, caused by the recording bias current, pushes the original recording into the background.

Actually, sound-on-sound was originally developed to superimpose brief snatches of narrative over background music in movies and slide shows. As a matter of fact, sound-on-sound is a built-in feature of most super 8 sound projectors today. And it does work because loss of clarity during brief voice-over insertions is normally tolerable.

To make a sound-on-sound recording on a cassette, you have to isolate the erase head from the tape. A strip of 8-mm. movie film leader, placed where the erase head contacts the tape, will do the job nicely. As you insert the cassette in its well, wrap the film leader around the open edge at the point where contact between the tape and erase head occurs. Then set controls for "record," and add whatever you want. If you then wish to go to full erase and record, simply leave the deck in record mode and pull out the film leader while the tape is still moving.

Reverberation

An old warhorse among open-reel special effects is echo or reverberation. This requires feeding the monitor output of a playback head into a record head. Lower tape speeds give long delays and provide an echo effect, while higher speeds reduce the delay, causing reverberation more than a distinct echo. The higher the playback volume level, the more intense the effect.

Not too long ago, this technique was beyond the reach of cassette users. But with three-headed decks available in the cassette format, it can be used to give a reverberant sheen to mike recordings—provided that the deck can accept mike and line inputs together. A distinct echo can't be produced even though cassettes operate at a low speed because the play and record heads are much closer together than in open-reel machines. In at least one design they share a common housing. But it's no real problem because reverberation is the more musically useful effect.

Use Your Cassette Recorder as a Creative Tool

By Arthur J. Zuckerman

If you own a cassette tape deck, chances are you use it almost exclusively to copy and play back music from records and broadcasts. That's fine as far as it goes, but tape has a lot more to offer than simple copying. Not too many years ago, when open reel was still king, tape hobbyists were doing all kinds of wonderful, creative things—making sound productions that ranged in complexity from custom music albums to full-blown, radio-style extravaganzas.

Creative recording is not a lost art. Serious amateurs are still happily "creating" refreshing recordings. But these are mostly people who have retained the open-reel format, which makes it easy to edit by cutting and splicing, build multiple tracks, and superimpose sound. Some open-reel enthusiasts create albums nearly as polished as commercial studio products. Others apply their skills to making sound tracks for home movie and slide shows. Still others use the same techniques to create mood music and other off-stage sound for community theatre.

Although open-reel equipment is obviously better suited to creative recording, there is no reason why you can't get in on the fun and rewards with a cassette, especially if you pool resources with one or two friends who also have cassette equipment. A surprisingly wide variety of production tricks—including editing—are possible with cassette machines.

Editing Electronically

Editing (the rearranging, adding and deleting of material) is the key to any production work with sound. Traditionally, most audio editing has been done by cutting tape and splicing segments together in a desired sequence. An accomplished open-reel editor can even take a single bad note out of a recording and replace it with a better one from another "take."

Such cut-and-splice editing is possible with cassettes, too (splicing equipment is available for the format), but it is extremely difficult, and high precision is virtually impossible to achieve. Because cassettes operate at a low, 1⅞ ips tape speed, the recorded material is crowded together instead of being spread out along the tape, as it is with the four- to eight-times higher speeds of open reel. Therefore, it is very difficult to find dead spaces at which to cut a cassette tape. In addition, open-reel tape editors "rock" their reels (move them back and forth) to find dead spots, a practice that is impossible with cassettes.

Another type of editing, however, lends itself beautifully to the cassette format. This is electronic editing, which is a sophisticated form of tape dubbing or copying. It is used on videotapes and, increasingly, on digital tapes. Being a selective copying process, electronic editing of cassettes requires the use of at least two recorders, one on which to build the program and the other to provide source material. The line output of a donor recorder is connected to the line input of the mastering deck. If the donor machine doesn't have a line output, the speaker or headphone output can be used. It's preferable, though, to use a machine with a proper line output when possible. A mono signal can be fed to a stereo mastering deck with a "Y"-type, one-into-two, adapter.

Good electronic editing requires precise cueing. Thus, a very accurate pause control on the mastering deck is needed. If the donor machine has a tape index counter, it should be set to "0" when the leader-to-tape splice is positioned just past the record head. Then all the material recorded on the cassette should be indexed with the counter and the numbers written down. It helps if an unrecorded section of tape is left between selections. Ideally, segments should be spaced so that each

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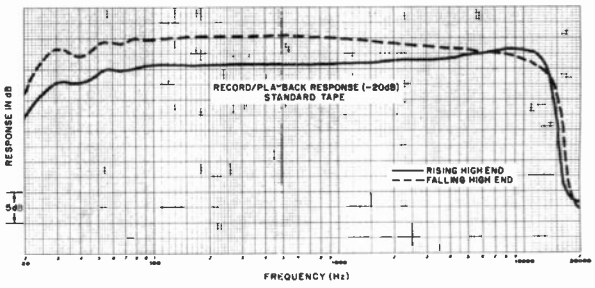
must the bias be set for the type of tape, but for the specific brand. A few recorder manufacturers specify the tapes for which their machines are set up at the factory, but most do not. Except for the two- or three-position switches used to set the bias for a general category of tape, external bias adjustments are rare in open-reel recorders and almost non-existent in cassette recorders. For the consumer, this means that he must restrict himself to the specific tape used by the manufacturer in his final adjustment of the machine, unless he is competent to readjust the bias himself. Most recorder manufacturers will be glad to suggest suitable tapes, if they are not listed in the instruction manual. Alternatively, the consumer can try several brands and standardize on the one that sounds best. When using chromium-dioxide (CrO_2) or equivalent tape, it is only necessary to have a machine with a switch that selects the appropriate bias (and generally, equalization) for this tape.

A frequency-response rating of "40 to 20,000 Hz, ±3 dB" means that the output can vary a total of 6 dB from its maximum to its minimum, within that frequency range. Without an actual response curve (rarely supplied by the manufacturer, but included in most equipment test reports), one cannot assume that two recorders with identical ratings will sound alike. One may have a rising response at the high end and will sound bright. Another, still within the ±3 dB rating, could have a falling high-frequency response and sound subdued or even dull. Between these extremes there are an infinite number of response variations.

Another aspect of recorder frequency response, not always specified separately, is its *playback response*. This indicates its suitability for playing commercially recorded tapes or tapes made on another recorder.

● ***Crosstalk and Stereo Channel Separation.*** These are different manifestations of the same effect—leakage of a signal from one track of the tape to another. This leakage is largely a function of head design but can also occur in the wiring to the heads and in the recorder's electronics.

Both effects are usually specified at a middle frequency, such as 1000 Hz, although they vary with frequency. Crosstalk is the more serious, from a listening standpoint. It is a transfer of signal from one pair of tracks to the other. When playing the tape in the forward direction, the second pair of tracks are being played backwards, and the crosstalk will be in the form of noise or garbled sounds, with no relationship to the desired program. When the leakage occurs between the two stereo channels in the same direction of tape travel, its only effect is to slightly dilute the audible separation of the program. Since any tape recorder is likely to have much better channel separation than the program being recorded actually requires, this "problem" is trivial. Typical specifications for a high-quality recorder might be: Crosstalk more than 60 dB at 1 kHz; separation more than 50 dB at 1 kHz.



Here is a case of two recorders with almost identical specs within the audible range: Recorder (A) response ±3 dB, 25-14,500 Hz with rising high end (solid curve); Recorder (B) response ±3 dB 25-13,000 Hz with falling high end (dashed curve). Compared to (A) recorder (B) would sound somewhat dull.

● ***Meter Characteristics.*** The level meters of many recorders are marked as "VU" meters, usually incorrectly. The characteristics of a VU meter are detailed in an IEEE/ANSI specification. These include a frequency response within ±0.5 dB from 25 to 16,000 Hz, and a 0 VU reading corresponding to 1 milliwatt at a specified impedance (usually 600 ohms). When a signal which will result in a 0 VU reading is applied, the meter pointer should read 99% of that reading in 0.3 second, with an overshoot of 1 to 1.5%, and should return to its rest in approximately the same time when the signal is removed.

Typical home-recorder meters rarely have the ballistic characteristics of a VU meter and are more correctly described as "dB meters" (assuming that their dB calibrations are correct, which is not always the case). It is important to know the general response characteristics of a recorder's meters to be able to allow sufficient reserve range for brief program peaks. Most meters, including true VU meters, are average-responding devices. Some recorders have peak-reading meters, able to respond in a few milliseconds. In some units, the meters read the outputs of the recording amplifiers, thereby including the effect of the equalization and reducing the likelihood of over-recording a signal having strong high-frequency content.

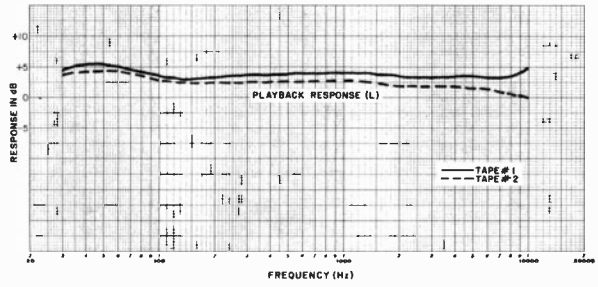
● ***Noise Reduction.*** Better-grade cassette recorders almost universally incorporate the Dolby "B" or some other noise reducing system, such as dbx or the ANRS used in JVC recorders. A few expensive open-reel recorders are also "Dolby-ized"; the price differential for this feature is considerable in this case since the tape monitoring capability requires four Dolby circuits instead of the two used in cassette recorders. The Dolby and JVC systems offer about 10 dB of noise suppression; dbx is rated for a 30 dB improvement in apparent S/N ratio. □

and flutter measurements are frequently combined into a single flutter rating, expressed as a percentage. For example, 0.2% flutter will cause a 1000-Hz tone to vary between 998 Hz and 1002 Hz.

Unweighted measurements respond equally to flutter rates over a wide range (such as 0.5 Hz to 10 Hz for flutter, 10 Hz to 200 Hz for flutter, or 0.5 Hz to 200 Hz for a combined measurement). Since the most audibly objectionable flutter rates occur between 1 and 10 Hz, current IEEE standards call for a *weighted peak* flutter measurement, emphasizing that frequency range and reducing the contribution of higher and lower frequencies to the final measurement. Some recorder manufacturers use a similar weighting curve applied to rms rather than peak measurements. Cassette recorders are tested in the same manner.

Weighted readings are always less than unweighted readings, usually by about 20 to 30%. A peak measurement will always be greater than an rms measurement. A comparison among published flutter ratings for different recorders is only valid if the same technique was used in all cases.

In most cases, a flutter level of 0.1% or less will not be audible. Most of the better open-reel recorders (and a few cassette decks) can meet this requirement. Good cassette recorders typically have 0.15% to 0.25% flutter, while low-priced open-reel machines fall in the same range. With some types of music this can be audible but, in general, only to a critical listener. Flutter levels exceeding 0.3% are not consistent with high-fidelity reproduction.



The playback response of a cassette recorder using two different samples of the same test tape.

● ***Signal-to-Noise (S/N) Ratio.*** The dynamic range of a tape recorder is limited by the maximum level that can be recorded and played back with acceptably low distortion and by the residual noise level in the playback output. The ratio of these two levels, expressed in decibels, is the signal-to-noise ratio (S/N).

Usually, a single figure (e.g., 55 dB) is given as the S/N rating. Implicit in such a rating is a specific (but often unstated) distortion level at maximum signal input. A total harmonic distortion (THD) of 3% is generally used as a reference for S/N rating of home tape machines. As a rule, the reference distortion will be reached with an input of +3 dB to +6 dB, allowing some reserve recording "headroom" for brief peaks that might not register on the meters. In the case of cassette recorders, the headroom is usually not more than 2 or 3 dB at middle frequencies (and sometimes considerably less) and reduces greatly at higher frequencies.

The audible noise in the playback output consists mostly of hiss or wideband random noise. Usually there will be some low-frequency noise as well (such as power-line hum), but this is much less audible. Ignoring this, an unweighted noise measurement responds equally to hum and hiss and may give an unduly pessimistic result. Therefore, it is customary to "weight" the noise measurement to discriminate against the less audible frequencies. Sometimes the weighting curve is specified (e.g., ANSI "A" weighting, etc.), but often it is not. As with flutter, S/N ratings can only be compared when they are based on the same reference distortion and weighting characteristics.

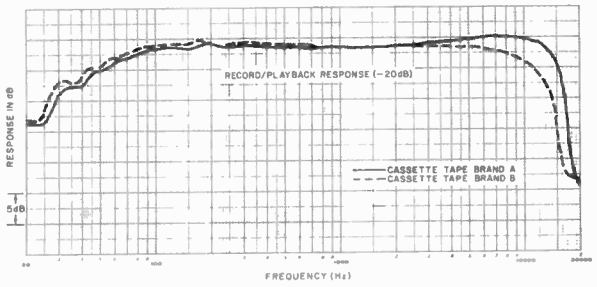
● ***Distortion.*** The total harmonic distortion (THD) ratings published for tape recorders (e.g., "less than 1%") can be assumed in the absence of other information to be measured with a 1000-Hz signal recorded at an indicated level of 0 dB on the recorder's meters. Since distortion is also affected by tape speed, it should be specified at each operating speed. Distortion can also depend on the type of tape used. Fortunately, in the case of open-reel recorders, the differences are minor, within any one classification of tape ("standard," "low noise," etc.). In the case of the cassette recorder, the tape is a critical factor and *must* be known for any meaningful interpretation of the ratings.

● ***Frequency Response.*** A frequency-response specification, as a minimum, should include the limits (e.g., 40-20,000 Hz), the variation over that range (±3 dB), and the tape speed ($7^1/_2$ ips, 19 cm/sec). The frequency response also depends on the tape used, but with most open-reel recorders this is not very critical.

Most tape recorders, especially at the lower tape speeds, cannot achieve their rated frequency response at maximum recording level. It is customary to measure frequency response at a lower level, not more than −10 to −15 dB, to avoid the high-frequency saturation problems that cause this. The easiest way to judge a recorder's high-frequency headroom is to measure its frequency response at 0 dB and at a lower level such as −20 dB. The smaller the difference in high-frequency response between the two measurements, the better.

Cassette recorders present special problems. The high-frequency recording equalization is greater than that used in open-reel machines and the test level should not exceed −20 dB. For best results, the recording bias should be matched to the tape. This is important even with open-reel recorders but is absolutely vital with cassette decks. Not only

tem provides complete electrical control of tape speed, including such possibilities as vernier adjustment or even continuous adjustment over a wide range. It is also entirely unaffected by line voltage or frequency variations.



Difference in over-all frequency response with change of tape formulation (at fixed "Std" bias setting).

● ***Tape Heads.*** Most recorders can be classified as two-head or three-head machines. As a minimum, an erase head and a combined record/playback head are required. The electronic portions of two-head recorders are switched between the record and playback functions.

For best performance, different gap widths are required on the recording and playback heads. The ideal solution is to have separate heads for the two functions and this is now the rule in all but the least expensive open-reel recorders.

The separate playback head makes it possible to monitor the program from the tape. Separate recording and playback amplifiers are also required for this feature, which is now found on most of the better open-reel decks. Off-the-tape monitoring simplifies setting optimum program levels. Distortion or hiss from excessive or insufficient level shows up immediately, as well as hum and unexpected background noises.

Almost all cassette recorders have two heads. A few have been built with separate record and playback heads, with a third head for non-critical monitoring or with a single head structure containing separate record and playback gaps. A very few that are quite expensive solve the formidable problems of using three separate heads in the cassette format.

Most home tape recorders, either open reel or cassette, are *four-track* (quarter-track) machines. A stereo program is recorded on two tracks in one direction, and when the reels are interchanged the second pair of tracks is recorded in the opposite direction.

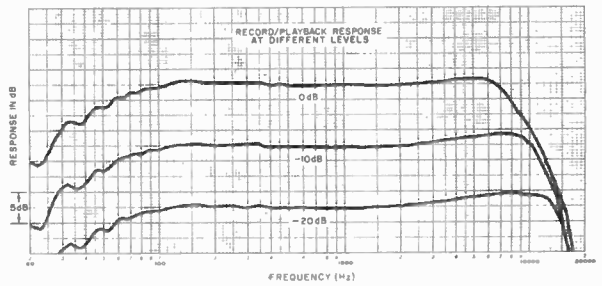
● ***Tape Speeds.*** Most home open-reel tape recorders operate at 7½ ips (19 cm/sec) and 3¾ ips (9.5 cm/sec). The higher speed provides slightly extended high-frequency response, but many of today's models cover the audible frequency range with nearly equal effectiveness at either speed. Nevertheless, a 7½-ips recording is easier to edit and will almost always have a better S/N ratio, lower distortion, and lower flutter than one made at 3¾ ips on the same machine. Balancing this is the economy of the slower speed, which requires half as much tape for the same recording time. Some recorders also have a 1⅞ ips (4.75 cm/sec) speed, principally for recording voice or non-critical musical material.

A few high-priced machines offer 15 ips (38 cm/sec), either in addition to the two normal speeds or replacing the slower one. This feature is usually found in recorders designed to handle 10½-inch reels, which provide the same playing time as a 7-inch reel operating at 7½ ips. Compatibility with professional machines is the principal reason for using the 15-ips tape speed.

The cassette recorder operates only at 1⅞ ips. However, by virtue of special head designs and tape formulations, many cassette machines compare favorably with open-reel recorders in listening quality.

● ***Fast Winding Time.*** Many manufacturers specify the time required to move a given length of tape in fast-forward or rewind. Some single-motor transports require as much as 3 minutes or more to handle a 1200-foot (370 m), 7-inch reel of standard 1.5-mil tape. Three-motor machines typically operate about twice as fast. With thinner tape (1 mil or 0.5 mil), either 1800 feet or 2400 feet can be wound on a 7-inch reel and proportionally longer times are required.

For a given playing time, most cassette recorders are comparable to three-motor open-reel machines in their fast speed operation. Times of 75 to 90 seconds are typical for a C-60 cassette (equivalent to 1200 feet of tape at 7½ ips). A few cassette transports can move a C-60 tape in as little as 40 to 45 seconds.



Effect of recording level on frequency response of a cassette recorder.

● ***Wow and Flutter.*** Wow and flutter are the audible effects of uneven motion of the tape across the heads. When the speed fluctuation occurs at a low rate (under 10 Hz), the characteristic "wow" sound can be heard, especially on extended organ and piano notes. Faster rates, up to 200 Hz or more, are heard as "flutter"—a slight muddying of the sound and in extreme cases, a "gargling" quality. Wow

Features and Specifications

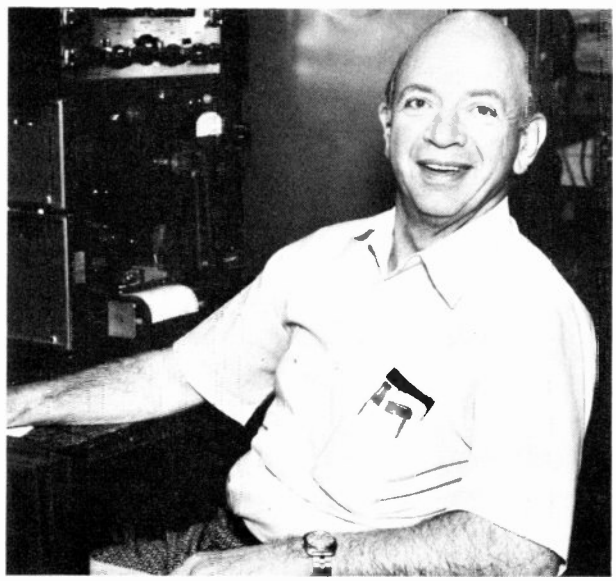
The use of published specifications as a basis for judging product performance is probably more practical for a tape recorder than for any other hi-fi component. This fortunate situation occurs because a tape recorder (at least, a good one) has relatively little effect on the quality of programs recorded or played back through it. The noise level may be increased somewhat and, in most cases, there will be a small (hopefully inaudible) amount of flutter added to the sound. The frequency response and distortion existing in the incoming signal will usually determine the final quality; a properly operated recorder causes remarkably little degradation of sound.

Not all recorders are specified with equal thoroughness. The best machines, however, carry an impressive array of figures and technical terms, probably more confusing than edifying to a nontechnical reader. Using the features and specifications of a typical high-quality open-reel recorder as an outline, here are definitions and explanations of some of the specifications, with observations on those with greatest significance as well as those of little or no importance. Most of the items for an open-reel recorder also apply to a cassette recorder.

● ***Drive System.*** A tape transport may use one, two, or three motors. A three-motor machine has a constant-speed motor to drive the capstan, which in turn drives the tape. Each tape reel is driven by its own torque motor which maintains a constant tape tension, within the tensile limits of the tape base material. During high-speed operation (fast-forward or rewind), the capstan does not contact the tape and one reel motor operates at high speed while the other supplies a controlled amount of "drag" to prevent tape spills.

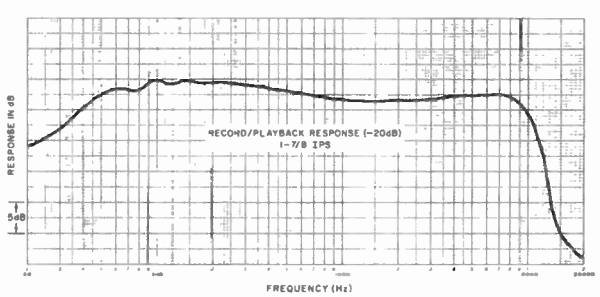
Many open-reel machines and cassette recorders use a single motor that drives the capstan at constant speed and operates the reels through a system of belts and slip clutches. Other things (construction, workmanship, etc.) being equal, single-motor transports usually have somewhat more flutter than three-motor types.

Three-motor tape transports are inherently more reliable, due to the elimination of belts and clutches which require periodic adjustment or replacement, and they lend themselves to remote control. A very practical advantage of a three-motor transport is its higher speed in fast-forward or rewind. Some decks



use two motors—one for the capstan and one driving the tape hubs through belts.

● ***Types of Motors.*** The capstan of a tape recorder should be driven by a constant-speed motor. Synchronous motors (whose speeds are fixed by the power line frequency) are often used for capstan drive in high-quality recorders, with induction motors used to drive the reels. Many single-motor machines also use induction motors for capstan drive. The speed constancy of an induction motor is adequate for most home recording purposes, but not for professional applications, where precise timing is important.



Response of high-quality open-reel recorder at 1⅞ ips. It is not as good as typical cassette recorder response at the same speed.

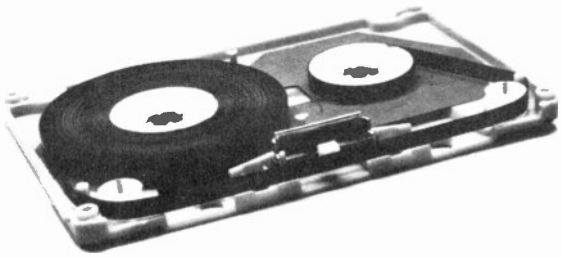
Some transports use an electronically servo-controlled d.c. motor for their capstan drive. This sys-

begin, the two formats do not really compete on the basis of cost.

The eight-track cartridge is basically intended for *playback*. Cartridge recording is a clumsy business, and for this reason there have been few cartridge recorders on the market until recently. The longest-playing cartridges I know of run 94 minutes in four segments; every 23½ minutes the endless loop of tape in the cartridge completes one full circuit, and the tape head shifts automatically, with a "chunk," to engage another set of tracks on the tape. The cycling process is the same for recording as for playback, and since there is a break in the program every time the tape head has to reorient itself, the recordist has to keep careful track of the running tape—which he can't see—if he doesn't want his music interrupted.

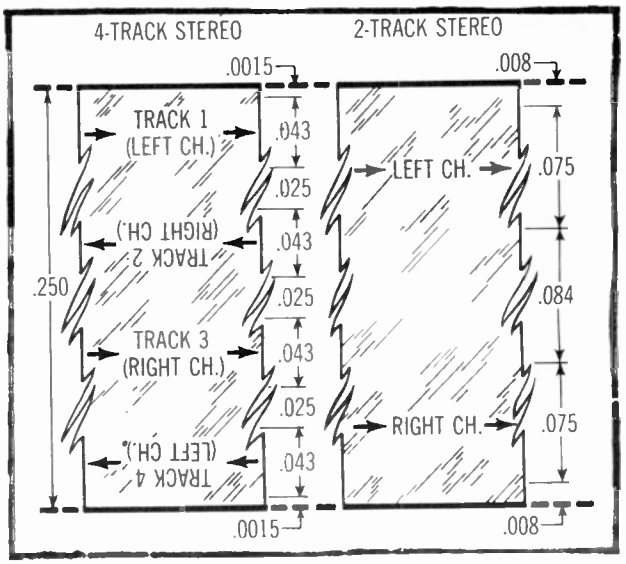
Although most eight-track decks provide a fast-forward speed, you can't reverse the tape. To return to a specific point on the tape you must fast-forward along through the entire loop until the spot comes up again.

● ***Reliability.*** According to reports, cassette and eight-track troubles are most frequently caused by the tape and its container, and open-reel difficulties generally result from failures of the transport mechanism. Such malfunctions manifest themselves as perturbations—or cessation—of tape motion. Electrical failures may make one or more channels weak, distorted, or altogether silent. Open-reel has tape-pack problems of its own—warped reels and, sometimes, rippled tape edges. But transferring open-reel tape to a new reel is easier than prying open a cassette or cartridge to rescue the jammed tape inside. Tape jamming within the plastic container has plagued cassettes since their beginning. Eight-track cartridges have a special problem. Since layers of tape wound on the reel must be free to slide past each other, the tape has to be treated with some kind of dry lubricant, and it appears that in time the lubricant can wear out (or off). If there is a way to avoid this, it is simply to buy only cartridges of the very highest quality—good advice, incidentally, for any of the tape formats.



Cassettes are more like open-reel systems except two reels are housed within a plastic shell.

Failures can also be caused by improper maintenance. Chores, such as head cleaning, degaussing, and, in some cases, lubrication, must be done on schedule.



Most home tape recorders use the four-track (quarter-track) configuration. In the open-reel format, tracks alternate in direction. The two-track layout (half-track) with wide tracks, which yield superior results (and double tape cost), is shown above.

● ***Portability.*** This is a consideration that will interest only certain readers. Some are looking for carry-along entertainment, and for them cassettes and cartridges should be equally suitable. The size of a portable tape player is mostly determined by the size of its speaker. There are some ultra-small cassette portables hardly larger than the cassette itself. Also, you can fit more cassettes than cartridges into your coat pocket.

Other readers may want to make high-quality recordings on location. The best—and in some cases the smallest—machines for this purpose are the special-application, battery-powered open-reel units (Nagra, Stellavox, Uher, and so forth) designed for recording film soundtracks and other professional uses. Ironically, the smaller they are, the more expensive they are. There are a few pocket-size battery-operated cassette portables that do a surprisingly good job of recording music with their built-in microphones. And Sony makes a *stereo* portable cassette recorder with built-in Dolby circuits and provisions for chromium-dioxide tape.

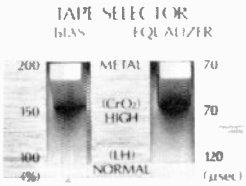
The foregoing discussion of the present state of tape recording and its formats should provide you with the basic information you need in choosing the *format* for a first tape recorder. It seems clear that all three formats are going to be with us for quite a while, and your choice of format and particular model will probably best be made on the basis of your current recording requirements rather than on an attempt to guess what the future holds.

There are many reasons for owning the new Sansui SC-3300.

Metal is just one.

Metal particle tape could be the most exciting thing that's happened to tape recording in years. But to get the full benefits of metal, you need a special cassette deck — like the new Sansui metal-compatible SC-3300.

The great thing about the SC-3300, though, is that even if you're not sure about metal or are wary of the software expense, this deck still makes a great deal of sense. Here's why:



SOUND QUALITY IS SUPERB. The SC-3300 is designed to get the most out of any tape, including the newest pure metal formulations. We're using a special alloy record/play head that's particularly immune to saturation from the high bias currents needed for metal recording; and it's much more wear-resistant than even the strongest conventional heads.

The erase head, too, is special — a double-gap ferrite design that produces a 70dB erasure factor for beautiful low-noise recordings. Our new Roller Back holdback tension mechanism further improves sound quality by suppressing frequency-modulated distortion and reducing wow and flutter to a mere 0.04%.

OPERATION IS EFFORTLESS. The feather-touch controls of the SC-3300 are monitored by an LSIC logic chip tied to high precision solenoids. So you get the freedom you need to concentrate on the music you're making or taping. It's so foolproof that no matter how fast you push the buttons, the tape will never jam or stretch.

The unusually versatile tape selector system provides separate switches for bias and equalization, with numerical indications of the optimum levels for normal, chrome and metal tapes.

And our 16-segment/channel LED peak-level indicators make it easy to set just the right levels for maximum signal and minimum noise. They're calibrated in dB and indicate red if a signal is too strong.

ALL THE EXTRAS, TOO. For added convenience, you can connect the SC-3300 to a timer, and the logic circuits will start recording or playing any time you want. Sansui's exclusive Tape Lead-In feature automatically skips over the unusable leader and beginning portion of each tape. And of course there's Dolby™ noise reduction, memory rewind, variable output and a computer-assisted pause control.

The brushed aluminum face and simulated rosewood cabinet of the SC-3300 perfectly complement our new Double-Digital receivers. We also have a complete line of matte-black finish metal-compatible models that come equipped with rack-mounting handles.

So, whether you're a strong believer in metal or just looking for a new cassette deck, visit your authorized Sansui dealer to see the best.

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Sansui

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two reels (simple hubs, actually) are *within* the plastic shell, and the tape is accessible only through openings along an edge of the housing. Cassettes are also recorded and played in two directions and must usually be flipped over for side two, although some automatic-reversing machines for home and automobile use are available.

Open-reel tape is wound in a pancake shape on a plastic reel similar to home movie-film reel.

● ***Fidelity.*** If you plan to do most of your listening to commercially prerecorded tapes, *their* fidelity will determine the limits of the fidelity you get in playback. Prerecorded tapes, at their infrequent best, sound almost as good as discs. Of the three formats, open-reel prerecorded tapes are probably still the best in overall frequency response, noise level, dynamic range, and so forth. Cassettes rank second, and eight-track cartridges are a somewhat distant third. This is no necessary reflection on the *potentials* of the formats—or how they might sound if you make your own tapes.

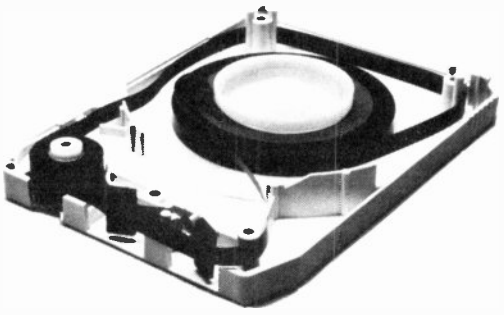
Dolby B processing, the hiss-reducing treatment for tape introduced to consumers some years ago, is available on a number of cassette releases and (so far) on a few open-reel prerecorded tapes. This process is the most effective way of dealing with hiss on your tapes, but you will have to pay more for a tape machine with Dolby circuits or buy a separate, add-on Dolby unit. Equipment with built-in Dolby circuits is much more expensive in the open-reel format than with cassettes, probably because the open-reel machines generally use *four* Dolby modules (to encode for recording and simultaneously to decode the monitor-head output). Cassette machines, on the other hand, almost always use *two* Dolby modules that are switched to encode during recording and to decode during play. The exceptions are very expensive cassette decks with full-response monitor heads.

Open-reel and even cassette recordings that are home-made on the best equipment are often audibly perfect. There are, however, certain unavoidable inconveniences in recording on eight-track cartridges, and these will be discussed later on.

● ***Suitability.*** None of the three formats is compatible with any other. Therefore, you must think about the suitability of a particular tape format to your present and future needs and way of life. For example, if you bought your present automobile with a tape player already installed, chances are it's an eight-track unit. This is a persuasive argument for owning a home eight-track recorder/player to generate new material for car play and to be able to play at home the tapes you have acquired to listen to while driving. But if you're starting from scratch, an *automatic-reversing* cassette player is fully as convenient to use in a car—and *four* cassettes will fit in the space occupied by *one* eight-track cartridge. Also, with a cassette deck connected to your high-fidelity system, you'll be able to make tapes to play either at home or in your car.

One question you'll have to deal with sooner or later is whether to buy a tape *recorder* or a tape *deck*. A *recorder*, in current parlance, is a machine that comes complete with its own amplifiers and speakers—in other words, a self-contained music system. A *deck* is designed to play back through an existing music system (appropriate plug-in jacks must be provided on the amplifier or receiver). Recorders and decks are available in all three formats. Many recorders can function as decks as well if they are connected to an external music system through special output jacks; the recorder's built-in speakers and amplifiers are then by-passed.

The availability of the kind of music you like in one format or another may also influence your choice. Eight-track offers the largest selection of prerecorded tapes, especially for youth-oriented music. In contrast, reports are that sales of prerecorded cassettes have been decreasing from year to year. Prerecorded open-reel tapes, although constituting the smallest library, have been growing in popularity since Dolby-ized offerings were introduced.



Inside view of the 8-track cartridge with its single reel and continuous loop of recording tape.

● ***Flexibility.*** The goal of the first high-fidelity cassette deck was to approach the same performance and flexibility afforded by open-reel equipment, but in a form that was more compact and easier to use. By and large, this has been reached. Cassettes are available in playing times from 15 to 90 minutes in each direction of tape travel (which nicely corresponds to what can be recorded on the various lengths of open-reel tapes on 7-inch reels at 7½ inches per second). Cassettes are much easier to handle, require no threading, and dozens of them fit in an ordinary shoe box. Editing a cassette tape is much more difficult than editing an open-reel recording. Since the prices of the best cassette decks generally end where those for good open-reel decks

Sony Tape. Full Color Sound.

Music is full of color. Incredibly beautiful color. Color that you can hear... and (if you close your eyes) color you can almost see. From the soft pastel tones of a Mozart to the blinding brilliant flashes of hard rock to the passionately vibrant blues of the Blues.

In fact, one of the most famous tenors in the world described a passage as "brown ...by brown I mean dark...rich and full."

Music does have color. Yet when most people listen to music they don't hear the full rich range of color the instruments are playing. They either hear music in black-and-white, or in a few washed-out colors.

That's a shame. Because they're missing the delicate shading, the elusive tints and tones, the infinite hues and variations of color that make music one of the most expressive, emotional and moving arts of all.

Music has color. All kinds of color. And that is why Sony is introducing audio tape with Full Color Sound.

Sony tape with Full Color Sound can actually record more sound than you can hear.

So that every tint and tone and shade and hue of color that's in the original music will be on the Sony tape. Every single nuance of color, not just the broad strokes.

Sony tape with Full Color Sound is truly different. Full Color Sound means that Sony tape has a greatly expanded dynamic range — probably more expanded than the tape you're using. This gives an extremely high output over the entire frequency range, plus a very high recording sensitivity.

There's even more to Sony tape with Full Color Sound, however. Sony has invented a new, exclusive SP mechanism for smoother running tape, plus a specially developed tape surface treatment that gives a mirror-smooth surface to greatly reduce distortion, hiss and other noise. Each type of tape also has its own exclusive binder formulation, that gives it extra durability.

Any way you look at it — or rather, listen to it, you'll find that Sony tape with Full Color Sound is nothing short of superb.

If you're not hearing the whole rainbow on your audio tape, try recording on Sony tape with Full Color Sound. Then you'll be hearing all the glorious full color that makes every kind of music, music.

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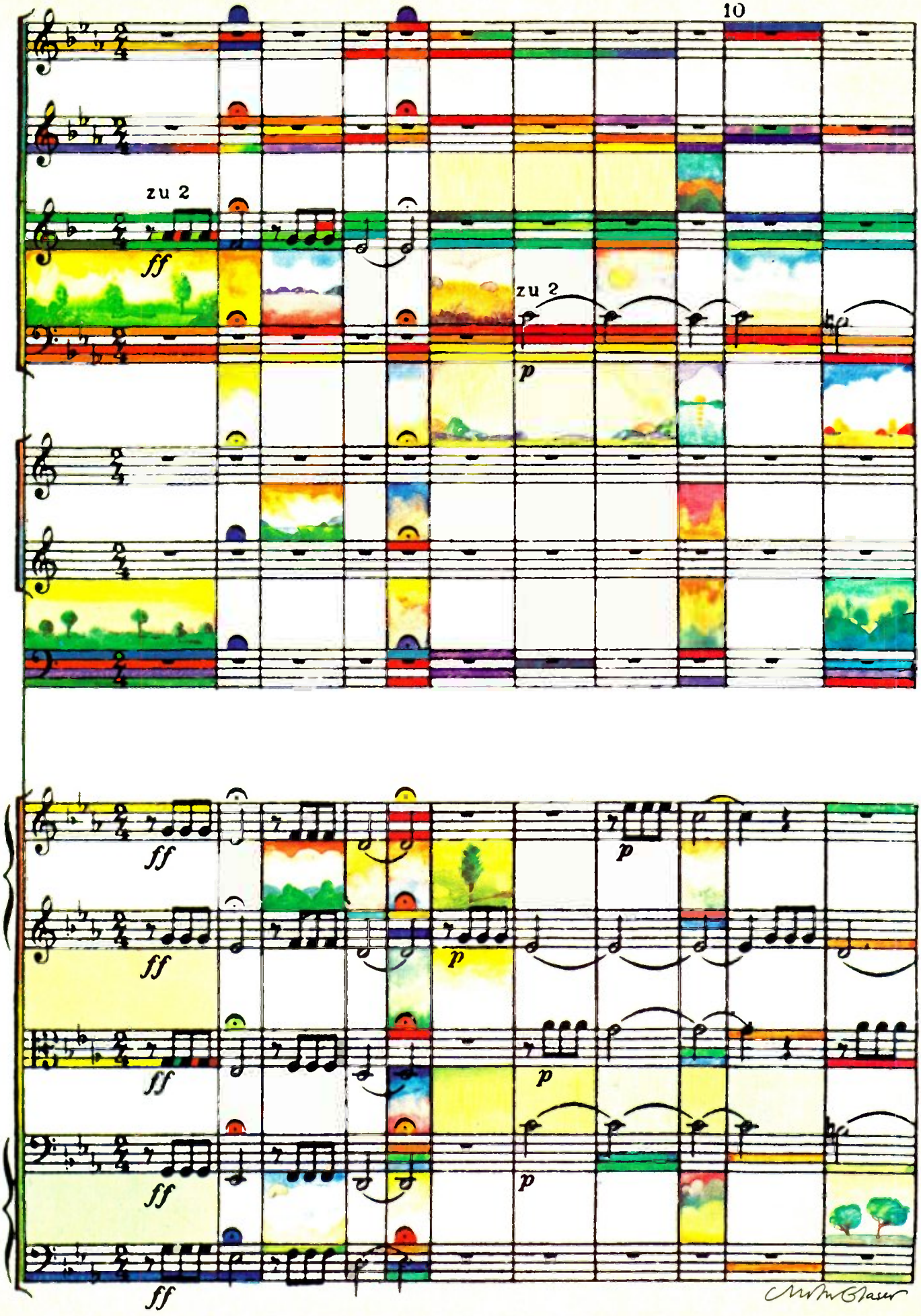

Experts Tell How to Choose a Tape Recorder

* Ralph Hodges explains formats
* Julian Hirsch discusses features and specifications

Tape Machine Formats

Anyone about to buy his first tape machine must first choose from one of three tape formats available: open-reel, cassette, or eight-track cartridge.

The three formats were developed at different times and were intended for different purposes (and I should explain that "format" refers both to the forms in which the tapes come to you *and* to the non-interchangeable machines on which they are played). *Open-reel*, which is the format that usually comes to mind when someone says "tape recorder," was the first of the existing configurations. The open-reel tape is wound in a pancake shape on a plastic reel similar to home movie-film reels. Like such film, the tape in an open-reel machine has to be physically handled. You must unwind a length from the "supply" reel, thread it through the tape machine's guides and across its tape heads, and finally attach it firmly (usually by winding one or two layers over the loose end) to the hub of the "take-up" reel.

Open-reel machines for consumer use are almost always *four-track*, which is to say that they are designed to record and play back two-channel stereo in both directions of the tape—one stereo pair running in one direction and a second pair running in the other. Utilizing the available space in this way saves tape, and the other two formats follow the example set by open-reel, though in different ways. (Discrete *four-channel*, or quadraphonic, open-reel tapes are *not* recorded in both directions; all four tracks are played in one pass by the machines equipped to handle them.)

Some open-reel tape machines require that you switch the reels around in order to play or record in the reverse direction. Others reverse direction automatically at the end of the tape.

The eight-track and cassette formats are both "cartridge" systems, with the tape being enclosed in a plastic shell. Ideally, you should never have to touch it. Eight-track cartridges were initially designed for use in automobiles. They are somewhat larger than cassettes and contain only one reel on which a long continuous loop of tape is, remarkably, wound and *un*wound simultaneously. You simply plug an eight-track cartridge into the player or recorder, and it does the rest. As its name implies, the cartridge has eight parallel tracks—it accommodates four stereo programs or, more recently, two four-channel programs. But the tape never reverses direction; instead, the tape head in the machine is periodically and automatically shifted to intercept the various sets of tracks.

Cassettes and machines on which they are played were first envisioned as low-fidelity devices for recording speaking voices only, but improvements in tape and hardware have made the cassette a serious music medium. Cassettes themselves are small—a bit larger than a pocket address book. They resemble a miniaturized open-reel system, except that the

(cont'd on page 10)

Perfection for the Professional

Drawing upon their unequalled 30 year leadership in magnetic recording technology, Tandberg's TD 20A open reel tape recorder extends their traditionally superior level of performance to even further *limits*—to even beyond the present capabilities of today's magnetic recording tape! This is due to Tandberg's exclusive ACTILINEAR Recording System, which not only provides up to 20 dB headroom margin over existing tape, but is specifically designed to be used with the new high coercivity tapes that will appear in the market in the near future—including the soon-to-be-available metal particle tapes. No other quality open reel tape recorder can make this obsolescent-proof claim today.

The ACTILINEAR Recording System's extremely linear frequency response ("ruler flat" according to some test reviewers) not only makes the TD 20A essentially immune to slew-rate limiting and transient intermodulation distortion (TIM), but also means better transient response and lower distortion overall.

Adding to the TD 20A's superior level of quality & performance is its unique PROM computer-controlled four-motor transport, as well as its many standard operating features that permit a degree of performance and control flexibility that you would expect only from Tandberg—the world leader in tape recorders.

Visit your authorized Tandberg dealer for a demonstration of the TD 20A. Check our *guaranteed minimum specifications* and rate them against any other manufacturer. Combined with the unsurpassed ease of operation & control, the TD 20A is probably more tape deck than you actually need. Isn't it the way things should be?

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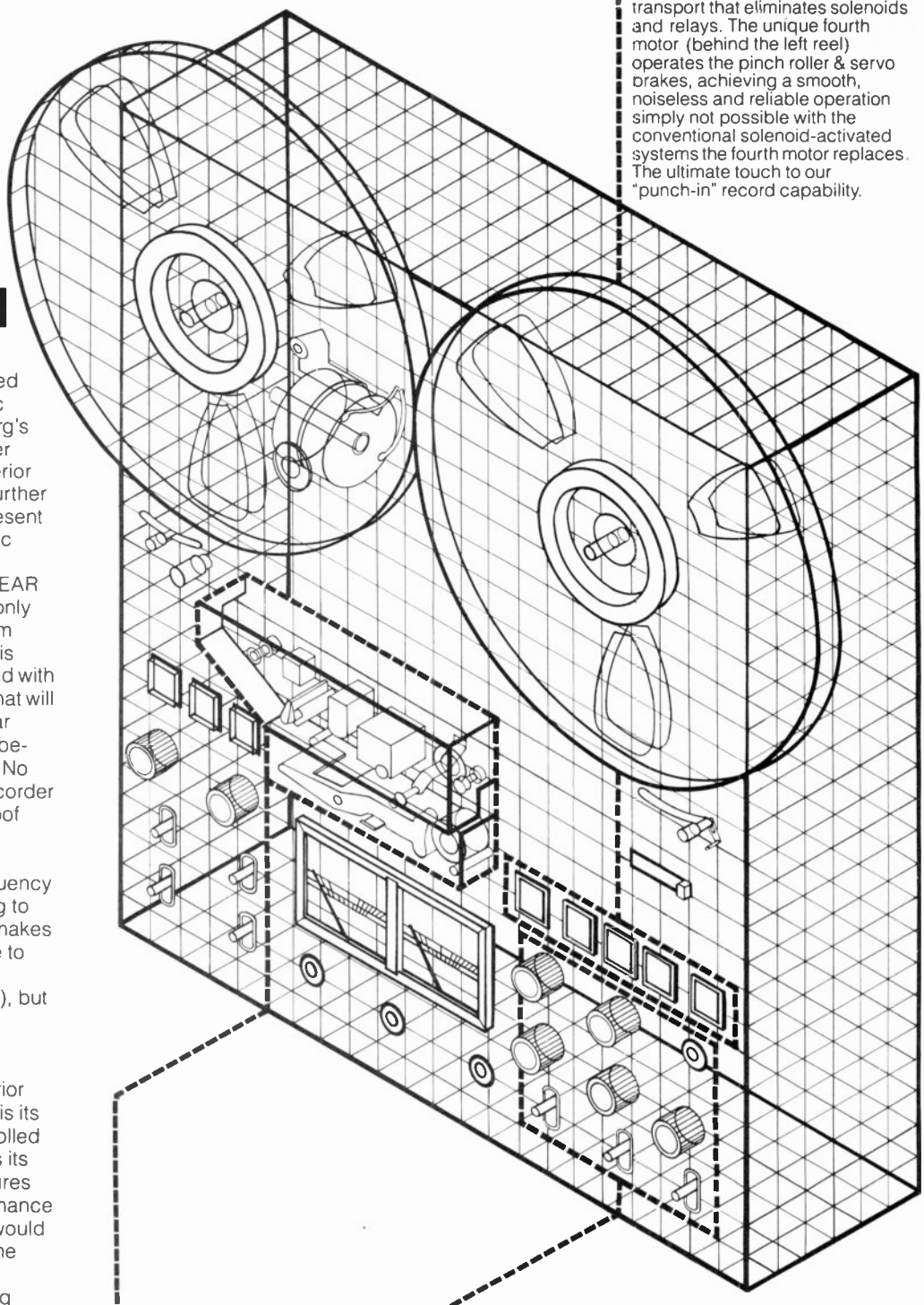
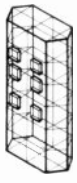


Tandberg's exclusive PROM computer-controlled four-motor transport that eliminates solenoids and relays. The unique fourth motor (behind the left reel) operates the pinch roller & servo brakes, achieving a smooth, noiseless and reliable operation simply not possible with the conventional solenoid-activated systems the fourth motor replaces. The ultimate touch to our "punch-in" record capability.

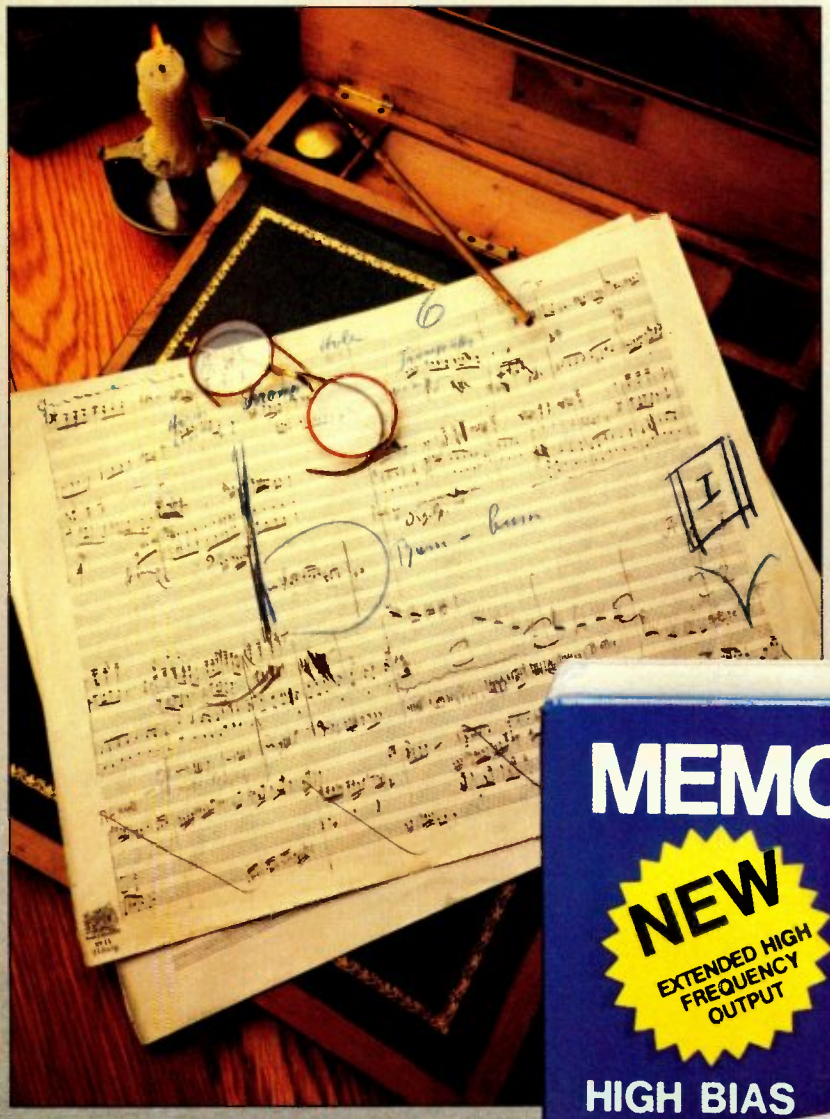
Tandberg's unique ACTILINEAR Recording System, offering up to 20 dB headroom margin over *existing* tape. And easily adjustable for use with the new high coercivity tapes to come, so your TD 20A is obsolescent-proof!

Still more features: Four line input mixer + Master gain control with pre-set, Self adjusting input amplifier, Front-panel bias adjustment, Mic sensitivity switch, Channel Sync & Sound-on-Sound, "Free" mode & Edit/Cue facilities, Infrared-controlled motion sensing device, Professional scrape-flutter filter, Separate power supplies for operational functions & audio functions, and Peak-reading equalized meters that have been graphically redesigned for easier reading.



Optional PCM infrared wireless remote control for an ease of operation that doesn't tie you down to the length of a cable. Plus automatic start & stop via a timer switch (optional).

WHICH NEW HIGH BIAS TAPE WINS WITH MAHLER'S FOURTH SYMPHONY?



Original manuscript sketch for the first movement of Gustav Mahler's Fourth Symphony. Courtesy of The Newberry Library, Chicago.

Choose eight measures of Mahler's Fourth that are really rich in the high frequencies. The type of passage that high bias tapes are designed for.

Record it on your favorite high bias cassette, using the Chrome/CrO_2 setting. Then again on new MEMOREX HIGH BIAS.

Now play back the tapes.

We're convinced you'll have a new favorite.

New MEMOREX HIGH BIAS is made with an exclusive ferrite crystal oxide formulation. No high bias tape delivers greater high frequency fidelity with less noise, plus truer response across the entire frequency range.

In short, you can't find a high bias cassette that gives you truer reproduction.

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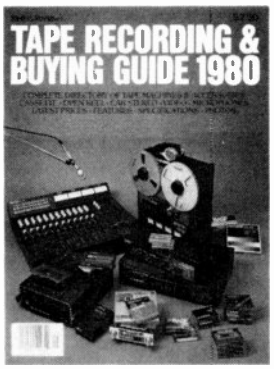
(Continued on p. 130)



Cover Photo: Philip Gottheil

Cover Equipment, counter clockwise from bottom row: Sony SL-3000 Portable Betamax Video Cassette Recorder, Tapco C-12 Mixing Console, Shure SM53 Dynamic Microphone, Stanton Dynaphase 35 Dynamic Headphones, Teac A-3440 Four-Channel Open-Reel Tape Deck, MXR Digital Delay, Nakamichi 582 Metalloy Discrete Cassette Deck, and Pioneer KE-3000 AM-Stereo FM Radio/Cassette Player. Blank Tapes: Ampex, BASF, Fuji, Maxell, Memorex, Sony, TDK, and 3M Scotch

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FEATURES

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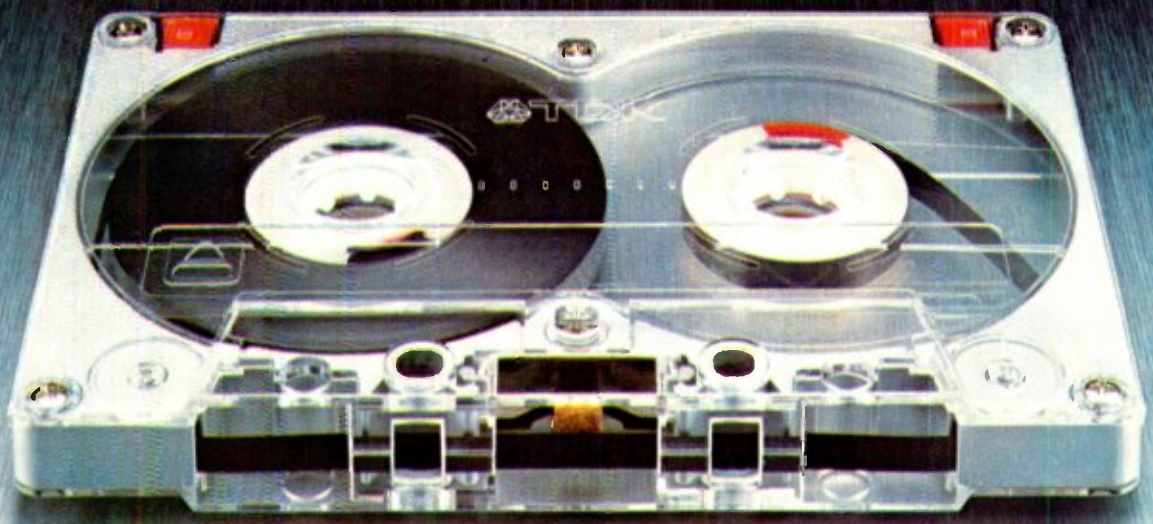
Introducing TDK metal. The Music Mirror.



The era of metal particle tape has arrived. Metal-ready cassette decks are already in the stores, and more are on their way. There are also a number of metal cassettes on the market, and all of them have a high coercivity and remanence—their magnetic energy is roughly four times that of the best oxide tapes. But that does not mean that all metal cassettes are alike. Not by a long shot.

TDK's metal cassette, MA-R, looks, feels and performs like no other cassette. That's why we call it "The Music Mirror." We've used advanced manufacturing technology to solve the problems inherent in metal tape. If left untreated, metal particles oxidize upon contact with water vapor and oxygen in the atmosphere—they actually "rust." TDK has developed a unique way to coat each and every particle with a process that protects them from the atmosphere, even at the critical exposed edge of the tape. The result is a tape that is resistant to oxidation. In fact, the overall stability of MA-R is well within the limits that have been set for conventional cassettes. But superior tape is only part of MA-R's story. TDK's new Reference Standard Mechanism is so revolutionary in design and performance, that its influence will be felt for years to come.

For starters, there's the one-piece, die-cast metal main-frame. Metal is far more resistant to warpage than plastic, and unibody construction eliminates performance differences between the A and B sides. The frame and mechanism are sandwiched between two clear covers held in place by six computer-torqued, double-threaded locking screws that will not slip because of vibration.

MA-R's amazing mechanism is visible for all to see, thanks to a transparent slip sheet. Our unique double hub-clamp is an integral part of a strong and circular tape storage system. (MA-R's two clamps are color-coded red and black, as a visual reference).

Our newly-designed, seamless, water-wheel-type rollers rotate around stainless steel pins, which are micro-polished for circularity. Our new dual-spring pressure pad assembly allows for more flexibility, yet provides more horizontal support for uniform tape to head contact. MA-R even includes removable, replaceable erase-prevention lugs, a new standard in protection and flexibility.

Ask your TDK dealer to show you the new MA-R cassette. Hold it in your hands and feel its weight. Look at the ingenuity and precision of the shell and mechanism. Then listen to it perform in one of the new metal decks. All your senses will tell you that this isn't just another new cassette—it's one of the memorable audio products of our time. TDK Electronics Corp., Garden City, N.Y. 11530.

TDK. MA-R

The machine for your machine.

LUX 5K50

LUX 5K50 STEREO CASSETTE DECK

REDEFINING THE ART OF CASSETTE PERFORMANCE

For over half a century, the name Lux has meant advanced technology and sophisticated designs—qualities sought by dedicated music lovers around the world. And now, Lux's audiophile/engineers have focused their attention on the cassette format.

Some of the special features of the new 5K50: Real-time process DC amplifiers for both record and playback; a unique modular tape-transport system featuring three motors and separate three-head configuration; Lux's dual Plasma record level meter, and most significant, Lux's recently developed BRBS Variable Bias Control System.

Real-time processing DC circuits bring Lux quality amplification to the cassette format for extended bandwidth, low distortion and exceptional signal-to-noise ratios.

The highly sophisticated tape transport extracts the best possible performance from any cassette ... and there's further improvement when Lux cassettes are used. Each of the three heads is precisely designed for its special task, as are the three motors that provide the separate drives for the dual capstans and reel hubs. The capstan drive motor is a quartz-referenced phase-locked loop direct-drive unit, while coreless motors for the reels provide total stability with the precise torque and tension required for an effective dual-capstan transport system.

When a Lux cassette tape is loaded, an electronic digital counter provides the exact minute and second of tape use. The electronic counter functions normally for standard cassettes. A plasma fluorescent display indicates peak levels from -40 to +6 dB per channel with a special +10 dB scale for metal-particle tapes.

To eliminate the distortion inherent in conventional tape-bias circuitry, Lux developed the Bridge Recording Bias System. These special circuits enable the user to adjust the recorder for best possible response with any tape, while eliminating those components and circuits which in conventional decks cause transient distortion and phase shift.

And there is so much more. Electronic IC logic control with feather-touch pushbuttons replaces mechanical operation and its attendant noise and wear problems. Human engineered control clusters; record-head azimuth adjustment with built-in indicators for optimum setting for any tape; signal-to-noise ratios up to 69 dB and frequency response from 30 to 20,000 Hz, depending of course, on the tape used.

The expense of the Lux 5K50 cassette deck is fully justified, not only by what Lux puts into it, but the performance the user can get out of it. Also look into the other Lux cassette decks, Models K-12, K-10 and K-5A, ranging in price from $495 to $2,000 ... each an embodyment of Lux quality.

To experience the Lux lineup of high-performance cassette decks, see your local Lux dealer or write to Mr. Robert Bowman, Vice President of Sales at Lux Audio of America Ltd.


LUX K-10


LUX K-5A


LUX K-12

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