THE WORLD OF MUSIC

FOLK

JAZZ

CLASS
DISCOVER...
Journey with us to a new horizon of sound, where all your favorite music—the classics, soundtracks, showtunes, folk songs, jazz, rock and popular releases—suddenly come alive with amazing brilliance and exceptional clarity.

Ampex brings you the most complete library of pre-recorded stereo tapes available—on open reel, 4-track cartridge, 8-track cartridge and cassette. Every major artist, every type of music is on stereo tape...well over 4,000 outstanding selections from more than 65 different recording labels. And, all skillfully reproduced from the original studio master for the listener who knows the difference between the ordinary and the excellent.
Feature by feature, the SL 95 is today's most advanced automatic turntable

An investment of $129.50 in an automatic turntable cannot be taken lightly. When you're ready to buy, compare carefully—feature by feature. You will find that Garrard's SL 95 meets your every requirement since it offers all the innovations that distinguish a superlative instrument plus the assurance of years of flawless performance. Here's why:

Synchronous motor: Look for a synchronous motor, the only type which can really guarantee constant speed regardless of voltage, record load, warm up and other variables. By locking into the fixed 60 cycle current (rather than varying voltage), this type of motor guarantees the unwavering pitch and distortion-free record reproduction you should insist upon in a top-notch record playing unit. Garrard's revolutionary new Synchro-Lab Motor®, which powers the SL 95, is not only synchronous...it also offers the advantages of the induction type motor—instant starting, high driving torque and freedom from rumble.

Light, kinetically matched turntable: The SL 95's synchronous motor has obsoleted the heavy turntable which was developed because of the need to override fluctuation in the speed of induction motors, through flywheel action. The relatively light (3 pounds), but magnificently balanced turntable, precision matched to the kinetic energy of the motor, now relieves weight on the all-important center bearing and reduces wear and rumble in this most critical area. Furthermore, its full-sized 11 1/2" diameter gives your records maximum edge support.

Low-mass tonearm: Look for tracking capabilities which can only be obtained through light weight and low resonance damping, combined with rigidity and advanced pivotry. The SL 95's distinctive, dynamically balanced one-piece arm of Afrozmosia wood and aluminum is mounted within a gyroscopically gimbaled assembly which permits it to float virtually friction-free on jewel-like needle pivots. The need for plug-in shells is eliminated by a new cartridge clip which insures flawless alignment. It is compatible with the latest, most compliant pick ups and the arm will track them perfectly down to the smallest fraction of a gram specified.

Permanently accurate anti-skating control: Look for a control that relies on a counterweight and is not affected by wear or temperature. The SL 95's patented control, which neutralizes side pressure on the stylus, is adjusted by a simple sliding weight rather than springs.

Convenient, gentle, cueing control: The SL 95 features single action cueing—one control is used to start the motor and lift and lower the tonearm. Its location at the front of the unit plate facilitates the safeguarding of your records in manual and automatic play.

Accurate audible/visible stylus force adjustment: The SL 95 combines accurately calibrated visual positions with detents for positive 1/4 gram settings.

Two-point support for automatic play: It has been found vital to have positive support of records at center and edge. The SL 95's center spindle dropping mechanism guarantees perfect operation at all times, regardless of the condition of center hole or size or thickness of records. A unique support platform telescopes into the unit plate when the SL 95 is used as a manual player. Patented automatic spindle handles up to six records safely; manual spindle rotates with record, has durable, friction-free Delrin® tip.

The Garrard Line. There are seven Garrard models this year, priced from $37.50 to $129.50, less base and cartridge. We urge you to send for a complimentary Comparator Guide with full, feature by feature descriptions. Write Garrard, Dept. AY849, Westbury, N.Y. 11590.

World's Finest
Stereo Review's

TAPE RECORDER ANNUAL 1969

TAPE-RECORDER TERMINOLOGY .................................................. 17
THE REELING MIND ........................................................................... 22
A BUYERS' GUIDE FOR TAPE-RECORDER SHOPPERS
   1. Reel-to-Reel Recorders ......................................................... 24
   2. Four- and Eight-Track Recorders .......................................... 27
   3. Cassette Recorders ................................................................. 29
RECORDING TAPE: A SHORT PRIMER ............................................ 33
WHITE-BOX TAPE ........................................................................... 37
TAPING OFF THE AIR ..................................................................... 40
TRANSFERRING DISCS TO TAPE ................................................... 41
A BRIEF INTRODUCTION TO TAPE EDITING ................................. 45
HOW TO CHOOSE A MICROPHONE ............................................. 47
KEEPING IT CLEAN ......................................................................... 51
TAPE-RECORDER STANDARDS .................................................... 53
PROGRESS REPORT ON HOME VIDEO TAPE RECORDERS ........ 57
TAPE AND THE LAW ....................................................................... 62
MY TWENTY-FIVE FAVORITE TAPES ............................................. 120

DIRECTORY OF MANUFACTURERS ............................................... 4

TAPE RECORDER DIRECTORY
   Home TV Tape Recorders ......................................................... 60
   Recorders, Players, and Transports .......................................... 65
   Tape-Cartridge Machines ......................................................... 90
   Raw Tape .................................................................................. 105
   Tape Accessories ...................................................................... 108

MICROPHONE DIRECTORY ........................................................... 111
HEADPHONE DIRECTORY ............................................................. 117
PRERECORDED TAPE ROUNDPUP ................................................ 122

ADVERTISERS' INDEX .................................................................... 134

PHILLIP T. HEFFERNAN, Publisher • WILLIAM ANDERSON, Editor
WILLIAM LIVINGSTONE, Managing Editor • LARRY KLEIN, Technical Editor
BORYS PATCHOWSKY, Art Director • ROBERT S. CLARK, Associate Editor
WILLIAM WOLLHEIM, Assistant Technical Editor • LAWRENCE SPORN, Associate Publisher


Circle No. 7 on Reader Service Card.
A copy of this Test Report on the Tandberg Model 64X Stereo Tape Recorder is yours for the asking:

~ EQUIPMENT TEST REPORTS ~

By Hirsch-Hoek Laboratories

The Tandberg Model 64X offers the highest caliber of performance presently obtainable in a home tape recorder. We could not find fault with it in any respect. The Tandberg 64X sells for $549 and is well worth it.

Hear this superb 4-track stereo tape deck for yourself. Any authorized Tandberg dealer will be happy to give you a live demonstration.

NOW AVAILABLE!

...another Tandberg achievement of equivalent quality — the Model 12X, completely self-contained stereo system. $485.00

for better, clearer, more natural sound...

Model 64X features 4 separate tape heads for record, playback, erase, bias, FM stereo multiplies, sound-on-sound, echo effects, add-a-track, direct monitor, remote control. $549.00

Tandberg OF AMERICA, INC.
P.O. BOX 171, 8 THIRD AVENUE
PELHAM, NEW YORK 10803

Directory of Manufacturers

The following is an alphabetical listing of manufacturers whose products are described in this volume. Addresses are furnished for your convenience should you care to write for further information.

ADIRMDAL .......................... 90
3800 W. Cortland St.,
Chicago, III. 60647

AIWA—Selectron International
Co., Inc. .......................... 65, 90
4215 West 45 St.,
Chicago, Ill. 60632

AKG—Microphone-Headphone
Division of North American
Philips Co. ....................... 111, 117
100 East 42nd St.,
New York, N. Y. 10017

ALLIED RADIO CORP. ....... 66, 69, 90
100 N. Western Ave.,
Chicago, Ill. 60680

ALTEC LANSING—Div. of
LTV-Ling Altec, Inc. ........... 111, 112
1515 S. Manchester Ave.,
Anahiem, Cal. 92803

AMERICAN GELOSO
ELECTRONICS INC. ............. 114
261 Park Ave. S.,
New York, N. Y. 10010

AMPEX CORP. ................. 66, 69, 80, 105
401 Broadway,
Redwood City, Cal. 94063

ALRO INDUSTRIES—Div. of
Aristo Tone Electronics, Inc. .... 68
240 Fifth Ave.,
New York, N. Y. 10001

ARVIN INDUSTRIES, INC.—
Consumer Products Div. ........ 90, 93
Columbus, Ind. 47201

AUDIOTAPE—
Audio Devices, Inc. ........... 105, 108
236 East 42nd St.,
New York, N. Y. 10017

AUDIOTEK—Div. of
GC-Hydrometals, Inc. .......... 108, 112
400 S. Wyman St.,
Rockford, III. 61101

AUTOMATIC RADIO MFG. CO., INC. .............. 93
2 Main St.,
Melrose, Mass. 02176

DIRECTORIES OF
MANUFACTURERS

BELL & HOWELL CO. .......... 69, 93, 94
7100 McCormick Rd.,
Chicago, Ill. 60615

BEYER—Elpa Marketing Industries,
Inc. .......................... 112
Theresis Bldg.,
New Hyde Park, N. Y. 11044

(Continued on page 8)
Columbia Stereo Tape Club

now offers you

ANY 5 STEREO TAPES FOR ONLY $2.97

if you join the Club now, and agree to purchase as few as five additional selections during the coming year, from the more than 300 to be offered

REWINDBABY NEED YOUR LOVIN' BY JOHNNY RIVERS
5626. Plus: Apache, Runaway, Hound Dog, etc.

THE DOORS
5644. Plus: The End, Light My Fire, Break On Through

RAY CONNIFF & THE SINGERS HONEY

ROGER WILLIAMS SONGBOOKS Golden Hits
5553. Plus: Maria, River, Yesterday, Day Dream, Somewhere Over The Rainbow

ANDY WILLIAMS
6556. Also: Up, Up And Away, By The Time I Get To Phoenix, Love Is Blue, Spooky, It's All In The Game

FREE — IF YOU JOIN NOW

REVOLUTIONARY SELF-THEADING TAKE-UP REEL

JUST DROP THE END OF THE TAPE OVER THIS REEL, START YOUR RECORDER AND WATCH IT THREAD ITSELF! UNIQUE SCREW-IN PROCESS AUTOMATICALLY ThreadS TAPE TO ANY THICKNESS, RELEASES FREELY ON REWIND.

JUST LOOK AT THE FANTASTIC SELECTION of best sellers the Columbia Stereo Tape Club is now offering new members! The greatest stars... the biggest hits... and all available in the incomparable stereo fidelity of 4-track reel-to-reel tape! And to introduce you to the Club, you may select any five of these tapes... ALL FIVE FOR ONLY $2.97! That's right, 5 STEREO TAPES FOR $2.97, and all you need do is agree to purchase as few as five more tapes during the coming year.

HOW THE CLUB OPERATES: Each month you'll receive your free copy of the Club's magazine which describes and displays tapes for many different listening interests and from many different manufacturers. You may accept the regular selection for the field of music in which you are primarily interested, or take any of the scores of other tapes offered you, or take no tape at all that month.

TAPEs SENT ON CREDIT: Upon enrollment, the Club will open a charge account in your name... and that means that you'll pay for the tapes you want only after you've received them and are enjoying them. The tapes you want will be mailed and billed to you at the regular Club price of $7.95 (occasional Original Cast recordings somewhat higher), plus a small mailing and handling charge.

FREE TAPeS GIVEN REGULARLY! Once you've completed your enrollment agreement, you'll get a stereo tape of your choice FREE for every two tapes you purchase.

SEND NO MONEY NOW! Just fill in and mail the coupon today! Your free take-up reel and your five tapes will soon be in your home for you to enjoy for years to come!

Note: All tapes offered by the Club must be played back on 4-track stereo equipment.

APO, FPO Addresses: write for special offer

COLUMBIA STEREO TAPE CLUB · Terre Haute, Indiana

SEND NO MONEY—JUST MAIL COUPON

COLUMBIA STEREO TAPE CLUB
Terre Haute, Indiana 47808

Please enroll me as a member of the Club. I've indicated at the right the five tapes I wish to receive for $2.97 plus postage and handling. Include the self-thrading take-up reel FREE.

My main musical interest is (check one):

□ CLASSICAL □ POPULAR

I agree to purchase five selections at the regular Club price from the more than 300 to be offered in the coming year... and I may cancel membership at any time thereafter. If I continue, I am to receive a stereo tape of my choice FREE for every two additional selections I accept.

Name: ____________________________ (Please Print) First Name Initial Last Name
Address: ____________________________
City: __________ State: __________ Zip: __________ Code: __________

434-7/08
12 new 3 3/4 ips tapes from RCA

<table>
<thead>
<tr>
<th>Label</th>
<th>Title</th>
<th>Performer</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCA</td>
<td>It's a Man's World</td>
<td>ED AMES</td>
<td>2 albums</td>
</tr>
<tr>
<td>RCA</td>
<td>The Romantic World</td>
<td>EDDY ARNOLD</td>
<td>2 albums</td>
</tr>
<tr>
<td>RCA</td>
<td>Schumann: Concerto in A Minor</td>
<td>VAN CLIBURN</td>
<td>2 albums</td>
</tr>
<tr>
<td>RCA</td>
<td>Brahms: Concerto No. 1</td>
<td>VAN CLIBURN</td>
<td>2 albums</td>
</tr>
<tr>
<td>RCA</td>
<td>The Fascinating Moods of Their Brazil</td>
<td>LOS INDIOS TABAJARAS</td>
<td>2 albums</td>
</tr>
<tr>
<td>RCA</td>
<td>The Spirit of Christmas with the Living Strings</td>
<td>FELICIANO!</td>
<td>2 albums</td>
</tr>
<tr>
<td>RCA</td>
<td>The Little Drummer Boy</td>
<td>MISHA DICHTER</td>
<td>2 albums</td>
</tr>
<tr>
<td>RCA</td>
<td>The Voice and Guitar of Jose Feliciano</td>
<td>FELICIANO!</td>
<td>2 albums</td>
</tr>
<tr>
<td>RCA</td>
<td>A unique and peral performance of Handel's Messiah</td>
<td>JUSSI BJOERLING</td>
<td>1 album</td>
</tr>
<tr>
<td>RCA</td>
<td>The Bitter and the Sweet</td>
<td>Jose Feliciano</td>
<td>2 albums</td>
</tr>
<tr>
<td>RCA</td>
<td>Let the World Go By</td>
<td>CHICAGO SYMPHONY</td>
<td>2 albums</td>
</tr>
</tbody>
</table>

Another Reel Turn-on.
Now nearly 800 cartridge tapes in RCA's ever-growing catalog.
HINGEPOWER, CRAZY!


The Toshiba
THE INTERNATIONAL ONE

Circle No. 38 on Reader Service Card.

When Bob Dylan wrote "Times they are a changin'" he probably meant it for everyone in the world except record lovers. You see, record lovers are record savers. A stubborn group who just won't face progress...the new Uher 7000 tape deck.

The first four track tape deck designed to outperform any other in its price range as well as those two and three times the price. (This was determined by an independent consumer laboratory survey, not us.)

Uher 7000 offers more than great music. No more scratched records, or worn out grooves. And you save money with tapes.

In addition, there are two speeds to give you hours and hours of enjoyment on one tape; sound on sound and full fingertip control for complete ease of operation.

These are just a few of the reasons why more and more music lovers are going with Uher. As for those record lovers, "Times they are a changin'." Hear the 7000 at a franchised dealer or write for literature.

Uher 7000 by Martel
The easy-to-love tape deck


Circle No. 22 on Reader Service Card.
and your FREE choice of any record available today at discounts of up to
The honest sincere CITADEL CLUB way is quite simple. There are no
THERE IS A BETTER WAY: The Longines Symphonette's New Citadel
You've seen the 'tricky' ads in this and other publications: Get 10 records FREE they
02 IRON CLAD GUARANTEE: FACTORY -FRESH RECORDS, MOST
and hard-to-find specialties.
name it, Arnold, Sergio Mendes & Brasil '66, any original Broadway Cast... you
Conniff, Beatles, Diana Ross and The Supremes, Aretha Franklin, Eddy
Herb Alpert and The Tijuana Brass, Doctor Zhivago, Bobbie Gentry, Ray
and Roll? Movie or TV themes? Order Elvis Presley, Arthur Fiedler,
I ANY RECORD, ANY ARTIST, ANY LABEL, ANY KIND OF MUSIC!
You are not required to buy any records at all! Buy as many or as few records as you need—records of your choice!
3 IRON CLAD GUARANTEE: FACTORY-FRESH RECORDS, MOST
sealed in plastic. Any record that passes our inspection team
is imperfect, is replaced without additional cost to you.

**TYPICAL CITADEL RECORD CLUB SUPER-BARGAINS**

<table>
<thead>
<tr>
<th>Performer</th>
<th>Normal List Price</th>
<th>Citadell Special Price</th>
<th>Performer</th>
<th>Normal List Price</th>
<th>Citadell Special Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRANK SINATRA</td>
<td>2.59</td>
<td>1.99</td>
<td>HERB ALPERT</td>
<td>2.59</td>
<td>1.99</td>
</tr>
<tr>
<td>MANTOVANI</td>
<td>2.59</td>
<td>1.99</td>
<td>THE Tijuana BRASS</td>
<td>2.59</td>
<td>1.99</td>
</tr>
<tr>
<td>CONNIE FRANCIS</td>
<td>2.59</td>
<td>1.99</td>
<td>BARBRA STREISAND</td>
<td>2.59</td>
<td>1.99</td>
</tr>
<tr>
<td>LAWRENCE WEK</td>
<td>2.59</td>
<td>1.99</td>
<td>HARRY BELAFONTE</td>
<td>2.59</td>
<td>1.99</td>
</tr>
<tr>
<td>AL HIRT</td>
<td>2.59</td>
<td>1.99</td>
<td>LEONARD BERNESTEIN</td>
<td>2.59</td>
<td>1.99</td>
</tr>
<tr>
<td>ARTHUR FIEDLER</td>
<td>2.59</td>
<td>1.99</td>
<td>NATHAN COLE</td>
<td>2.59</td>
<td>1.99</td>
</tr>
<tr>
<td>REAVER LEWIS</td>
<td>2.59</td>
<td>1.99</td>
<td>EDY ARNOLD</td>
<td>2.79</td>
<td>2.79</td>
</tr>
<tr>
<td>BOBBY DARIN</td>
<td>2.59</td>
<td>1.99</td>
<td>HENRY MANCINI</td>
<td>2.59</td>
<td>2.59</td>
</tr>
<tr>
<td>TONY BENNETT</td>
<td>2.59</td>
<td>1.99</td>
<td>GUY LOMBARDO</td>
<td>2.59</td>
<td>2.59</td>
</tr>
<tr>
<td>GOUNT BASIE</td>
<td>2.59</td>
<td>1.99</td>
<td>ROLLING STONES</td>
<td>2.59</td>
<td>2.59</td>
</tr>
<tr>
<td>STAN GETZ</td>
<td>2.59</td>
<td>1.99</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

HOW THE SWEEPSTAKES WORKS. The symbol on the claim certificate attached tells you what prize you have won. To claim your prize, simply return the certificate. Your prize will be sent along with your membership kit.

4 24 HOUR SERVICE IN MOST CASES! Your orders filled promptly... mostly within 24 hours. The fastest service in the industry.

5 FREE MEMBERSHIP KIT INCLUDES 300-PAGE SCHWANN CATALOG PLUS TWO OTHER BIG BARGAINS! As a member you get the famous SCHWANN catalog which lists more than 30,000 long-play records now available. Same book used by the biggest stores... tells you the manufacturers' suggested prices and other information. And you get two BONUS BIG BOOK CATALOGS listing special bargains and current top sellers. All FREE with your membership.

6 "MONEY-BACK" MEMBERSHIP-JUST LIKE A FREE TRIAL! In order to introduce you to the tremendous advantages of membership in The Citadel Record Club, we invite you to accept a three-month trial for just $1. And—we will even give you a Record Bonus Certificate worth $1 when you become a lifetime member, just like a FREE trial. AND—we'll even bill you later for the small $1 fee. Remember—every Citadel Club membership is for the entire family. Your children can order and save. Any member of your family can order records... and save. But—try us out. Mail the card or coupon for the special three-month trial for just $1.

**SEND NO MONEY—MAIL CARD OR COUPON TODAY!**

CITADEL RECORD CLUB

Symphonette Square, Larchmont, N.Y. 10538

Enroll me in the club for all the privileges described in the advertisement. I get FREE kit including SCHWANN catalog plus two bonus big books. I AM NOT OBLIGATED TO BUY ANY RECORDS... but save up to 55% on those I really want, any artist, any label. Bill me for the $1 trial membership and send the $1 Record Bonus Certificate which I can use toward my first purchase.

MR. MRS. MISS

ADDRESS

CITY STATE ZIP

☐ I have enclosed my $1.00 now—Do not bill me later. Refund guaranteed if not delighted.

C. S. Inc.
031-002
Here's your chance to SAVE big money on tapes...every 4-track, 8-track and cassette available...a complete library of over 6,000 to choose from...all at savings of at least 1/3 off list price. These savings are yours only as a member of the Cartridge Tape Club of America. And, there's still more. You get reduced prices on home and auto tape players. A bi-monthly magazine with complete tape listings, feature stories, news, photos, tape reviews, top selling tapes, etc. Monthly top tape magazine with complete tape listings, feature stories, news, photos, tape reviews, top selling tapes, etc. Monthly top tape and new release newsletters. Bonus offers. Special gifts. Nothing is ever sent unless you want it. No minimum purchase required. There's no other club of its kind. No other club offers you the complete choice of tapes. Write for complete details. Or join today. Send just $5 for a lifetime membership fee. Plus the tapes I have ordered...

(Continued on page 14)
For technical sound recording everything points to Revox

New from the Willi Studer Factory comes the revolutionary Model 77 incorporating design developments based on experience gained in the broadcast field with the 37 and 62 Series Studer machines. The 77 is a studio quality machine compactly presented and offering features unique in this price class including total indifference to fluctuations in mains supply periodicity. With a wow and flutter level below broadcast standard requirements plus linear response from 20-20,000 Hz at 7½ ips (42 db) and an ultra low noise level, this new Revox now sets the standard by which the rest will be judged.

Write or call for further information...

REVOX CORPORATION, 212 Mineola Avenue, Roslyn Heights, N.Y. 11577. New York.
Telephone: (516) 484-4650.

Circle No. 30 on Reader Service Card.
Here are 10 facts about uniCLUB. Try them—10 reasons to clip the coupon and join now!

2. You save a minimum of 35% on LP's; 33% on tapes and 25% on books.
3. You can save even more by taking advantage of the regular extra discount "Specials." You receive a free Harrison tape catalog listing every available record and its price. You receive a free Harrison tape catalog listing every available record and its price.
4. Never a requirement to buy. No monthly "stop-order" forms to return. You receive just the club catalog and its price.
5. LIFETIME MEMBERSHIP
   The club membership fee is $5. This is for lifetime privileges which are increasing all the time.
6. FREE CLUB MAGAZINE
   Members regularly receive "uniGUIDE" advising them of the latest releases, recommended best-buys and extra discount "Specials." When you join you receive a free 300-page Schwann record catalog listing every available record and its price. You receive a free Harrison tape catalog if you specify.
7. FASTEST SERVICE ANYWHERE
   Your orders are not only processed but shipped the same day we receive them. This unique service is possible because your orders are picked from an inventory of over 250,000 LP's & tapes. You get factory-new sealed albums and tapes only. Defects are fully returnable at no charge.
8. SAVE UP TO 50% ON STEREO GEAR
   Individual components or complete systems—uniCLUB supplies hi-fidelity equipment of virtually every manufacturer at tremendous savings. This month's "Hi-Fi Special" is a Garrard SL95 turntable; List $129.50, to members only $53.00.
9. BOOKS OF ALL PUBLISHERS
   The Book Division—only uniCLUB has it—offers members at least 25% off on any book in print.* You get only original publishers' editions, uniGUIDE lists best-sellers, just-published books and work books "Specials." *Texts are reduced 10%.
10. FOUR CLUBS IN ONE
    uniCLUB is really a time-saver. It makes joining many clubs unnecessary. Now you can buy all your records, tapes, auto-cartridges, books and stereo-gear from one convenient source. We hope you'll join today!

Sends free Schwann catalog, order blanks & uniGUIDE by return mail.
$5 enclosed guarantees me:

1. LIFETIME MEMBERSHIP in uniCLUB
2. 35%-80% savings on LP albums, 1/2 off on tapes, 25% on books.
3. No requirements ever to buy anything. Nothing will ever be sent until I order it. I must be delighted with uniCLUB or within 30 days I will let you know and receive a full refund.

 uniCLUB Inc.
239 S. Cotner Ave., Los Angeles, Cal. 90064

TAPE RECORDER ANNUAL

Circle No. 39 on Reader Service Card.
Ask anyone who really knows about hi-fi to recommend an automatic turntable.

Pick out an audio engineer, hi-fi editor, record reviewer or hi-fi salesman at random, and ask him which turntable is the best.

Chances are he'll say Dual. Because he probably owns one.

In fact, 19 out of 20 people whose living depends on hi-fi own Duals. Nineteen out of twenty.

As you might expect, there are good reasons why the experts agree Dual is so good.

It performs quietly and smoothly. With less rumble, wow and flutter than whatever equipment they previously owned. With one record or ten.

The platter (not just the motor) maintains accurate speed, even when the voltage varies from 80 to 135 volts. And the Dual continuous-pole motor is quieter and more powerful than any comparable synchronous type.

The Dual tonearm is friction-free. That means it can track flawlessly at a stylus force as low as half a gram (about one-fifth the weight of a U.S. dime). No other automatic has an arm that achieves this. And the Dual arm is accident and jam-proof. (A slip-clutch guards it against damage.)

Tonearm settings for tracking force and anti-skating are simple and precise. You just dial them.

And there are, of course, many other facts about Dual that the experts appreciate.

(Like the ultra-gentle cueing control and variable pitch control, for example.)

As for the people who own other brands of turntables, let's just say that they're not the audio engineers, hi-fi editors, record reviewers and hi-fi salesman.

Most likely, they are all nice people. But would you trust any of them to recommend a turntable?

(For the complete Dual story, ask an expert to show you his Dual, or write for our booklet containing over a dozen complete reviews.)

United Audio Products, Inc., 535 Madison Avenue, New York, N.Y. 10022.)
Hear it like it is!
Now from RCA...tape recorder/players from the people who know sound the best


RCA Mark 8 stereo tape cartridge player. Automatic 8-track table model plays auto tapes at home. You get up to 80 minutes of continuous music. Turns on as cartridge is inserted, turns off when cartridge is removed. Track selection is automatic. Two 5" oval speakers. (YLD 42)

Circle No. 28 or Reader Service Card.
A Beginner's Introduction to TAPE-RECORDER TERMINOLOGY

The tape recorder, possibly because it has both mechanical and electrical aspects, is for the novice one of the most difficult audio components to understand. Describing the combination of mechanical and electronic features that go into a recorder is a task requiring a large, sometimes obscure vocabulary. If you don’t learn just what the special jargon is all about, it is difficult, at this point in tape-recorder history, at least, to choose intelligently the one recorder that will best meet your specific needs. The task is further complicated by the tremendous versatility of the modern tape recorder. Almost any tape recorder can do a lot, but different machines can do different things. Without understanding the special language, you cannot be sure of just what a machine can do, or whether it has the features you need. It may be reassuring to know that a particular recorder has “sound-on-sound” facilities, but if you’re not quite sure what sound-on-sound means, knowing it exists is not much help. If you think that a “dropout” or a “head” is some kind of hippie, and that “squeal” is something that informers do, then it would be a good idea to study the short glossary of tape terms that follows. Adapted by Stereo Review’s technical editors from 101 Terms: A Glossary of Tape Recording Terms, published by the Magnetic Products Division of the 3M Company, it may not only save you some money when you go recorder shopping, but will also give you a better idea of what it is you’re buying and how to get the most out of it.

—William Wollheim
Acetate Base—The transparent cellulose-acetate plastic film that forms the backing for many magnetic recording tapes.

Acoustic Feedback—The echo, howling, or reverberation caused by a system's microphone(s) picking up the sound output from its own speaker(s).

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

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

Azimuth Adjustment—The mechanical adjustment of a magnetic head whereby the head gap is displaced to achieve optimum tape-playback performance and recorder-to-recorder playback compatibility. (See also Head Alignment)

Azimuth Loss—The signal loss caused by lack of alignment between the playback-head gap and the signal recorded on the tape.

Backing or Base—The flexible material, usually cellulose acetate or polyester, on which is deposited the magnetic-oxide coating that "records" the taped signal.

Bias—A constant signal or tone added to the audio signal during recording to circumvent the inherent non-linearity of magnetic systems. The best (and most commonly used) bias is a high-frequency (usually 30,000 to 100,000 Hz) alternating current fed to the recording head along with the audio signal to be recorded.

Bulk Eraser or Degausser—A hand-held (or larger) device used to erase an entire reel of magnetic tape without removing it from the reel. It generally produces a strong alternating magnetic field that neutralizes all previously recorded magnetic patterns on the tape.

Cartridge—A sealed plastic container that holds tape of 1/4-inch or narrower width. Designed to eliminate manual tape threading, cartridges operate on either the continuous-loop (single hub) principle or the reel-to-reel (double hub) system. Cartridge machines are usually smaller and simpler to use than ordinary open-reel units. (See also Cassette)

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

Cassette—A type of tape cartridge operating on the hub-to-hub principle and now coming into wide use in portable and some home machines.

Cps—Abbreviation for "cycles per second," the units for expressing frequency. The term "cps" is now obsolete and has been replaced by "hertz." (See also Frequency and Hz)

Crosstalk—The undesired mixing of signals between the adjacent tracks recorded on a tape.

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

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

Distortion—Any difference between the original audio signal and that reproduced by a recording machine. Distortion takes many forms, and although it can never be completely eliminated, it can be reduced to a very low level in a good recording and reproducing system.

Dropout—During playback, the instantaneous loss of a recorded signal resulting from imperfections in the tape. These may take the form of non-magnetic foreign particles inscribed in and flush with the tape's surface. However, these imperfections are most commonly high spots on the tape surface that push the tape away from the magnetic head, thereby increasing the area affected (the "umbrella" effect). Small dropouts have less effect on low-frequency than on high-frequency signals. Also, full-track recordings are less sensitive to dropouts than are the narrower track widths. High-quality sound recording tapes are practically free of dropouts.

Dual-Track Recorder—Usually a monophonic recorder with a recording-head gap that covers somewhat less than half the width of a standard quarter-inch tape, making it possible to record one track on the tape in one direction and (by turning the reels over) a second track in the opposite direction. Also known as "two-track" or "half-track."

Dub—A copy of another recording. Tape recordings are easy to duplicate with a minimal loss of quality by recording from one machine to another.

Dynamic Microphone—An electromagnetic pressure microphone that employs a moving coil in a magnetic field to convert sound pressure to electrical energy in a manner similar to that of an electric generator. Impedance and output are generally lower than those of the ceramic or crystal microphone types. Low impedance permits the use of longer connecting cables without high-frequency loss or hum pickup.

Dynamic Range—The voltage ratio (expressed in decibels) between the softest and loudest sounds a tape recorder or other device can reproduce without undesirable distortion in loud passages and excessive noise in soft ones.

Editing—The alteration of a tape recording by physical means to eliminate or replace undesirable portions, add portions not present in the original, or otherwise rearrange the original. Magnetic tape is unsurpassed for editing purposes, since it can be easily cut and spliced.

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

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

Extra Play—Also called "long play" or "extended play." Refers to tape that gives 50 per cent more recording playing time on a standard reel because it employs a thinner base together with a thinner but usually more responsive oxide coating.

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

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

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

Foot Switch—An electrical or mechanical foot-pedal device for stopping and starting a tape recorder without use of the hands. Useful for dictating and for transmitting. (Continued overleaf)
Four-Track or Quarter-Track Recording

The arrangement by which four different channels of sound may be recorded on quarter-inch-wide audio tape. These may be recorded as four separate and distinct tracks (monophonic) or two related (stereo) pairs of tracks. By convention, tracks 1 and 3 are recorded in the "forward" direction of a given reel, and tracks 2 and 4 are recorded in the "reverse" direction.

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

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

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

Full-Track Recording—Applies to quarter-inch-wide (or less) tape only. It defines track width as essentially equal to tape width.

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

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

Harmonic Distortion—Distortion characterized by the appearance in the output signal of spurious harmonics of the fundamental frequency. Usually expressed as a percentage of the output signal.

Harmonics—Overtones that are integral multiples of the fundamental frequency. In properly balanced a.c.-biased tape recorders, only the odd-order harmonics (primarily the third) are generated by the recording process and these are very low in amplitude.

Head—In a magnetic-tape recorder, the generally ring-shaped electromagnet across which the tape is drawn. Depending on its function, it either erases a previous recording, converts an electrical signal to a corresponding magnetic pattern and impresses it on the tape (record function), or picks up a magnetic pattern already on the tape and converts it to an electrical signal (playback function). Most home tape recorders have a separate erase head, but combine the record and play functions in a single unit. Professional machines and those intended for the serious amateur have separate heads for erase, record, and playback.

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

1. Azimuth or skew, in which the width dimension (corresponds to track width) of the head gap is at a precise 90-degree angle to the tape edge.

2. Height, in which the gap-width dimension is centered on the standard track location.

3. Tilt, in which the face of the head must be simultaneously tangent to the same degree with both edges of the tape and without distortion of either of the latter.

4. The adjustment to assure that the tape is tangent with, and contacting the specific portion of, the head face containing the head gap, and remains so during the playing of the tape.

5. The adjustment toward or away from the tape to assure proper contact pressure ("wrap") between head and tape.

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

Head, Hyperbolic—A tape-recorder head with faces so shaped that a minimum of tape tension is required to ensure good tape-to-head-gap contact.

Hz—The standard abbreviation (of hertz) which has replaced cps (cycles per second) as the term for the unit of frequency.

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

Index Counter—An odometer type of counter that indicates revolutions (not feet of tape), usually of the supply reel, thereby making it possible to index selections within a reel of tape and readily locate them later on a given machine.

Input Signal—An electrical voltage embodying the audio information that is presented to the input of an amplifier, tape recorder, or other electronic component.

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

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

Inverter—Device to change one type of electrical current to another type. Frequently used to change 6- or 12-volt direct current to 120-volt alternating current for operation of an a.c. tape recorder in an automobile or boat.

Ips—Abbreviation for tape speed in inches per second.

Jack—Receptacle for a plug connector leading to the input or output circuit of
Tape thickness is usually measured in mils.

20 signal sources to be blended, balanced, and fed simultaneously into a tape recorder or amplifier.

Monophonic (Monaural) Recorder—Refers to single-channel recorders, as distinguished from stereophonic types. Current home recorders are almost all four-track stereo.

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 the recording is made and while the recording is still in progress.

NAB Curves—Standard tape-recorder playback equalization curves established by the National Association of Broadcasters. (See also Equalization)

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

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

Octave—The interval between two frequencies of sound or electrical energy having a ratio of 2:1.

Output (also Maximum Undistorted Output)—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 (such as Scotch No. 111).

Oxide—The ferro-magnetic particles which, when properly dispersed in a plastic binder and coated on a backing or base, form the magnetic portion of magnetic tape. Conventional oxide particles are chemically known as gamma ferric oxide, are brown in color, acicular (needle-like) in shape, and of micron length. Less conventional oxides have been developed that exhibit significantly different magnetic properties (and size). All oxides used in magnetic tape maintain magnetism induced in them until demagnetized by an external magnetic field.

Patch Cord—Sometimes called "signal lead." A short shielded wire or cable with a plug on either end (or with a pair of clips on one end) for conveniently connecting together two pieces of sound equipment such as a phonograph and tape recorder, an amplifier and speaker, etc. Not to be used for 120-volt current.

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" positions. Essential for a tape recorder used for dictation and generally helpful for editing purposes.

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

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

Plug—A circuit connector that is inserted into a jack.

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.)

Portable Recorder—Originally, any tape recorder designed for easy mobility and requiring connection to a 120-volt a.c. supply for operation. Recently the term has been applied specifically to battery-powered units that do not require external power for operation.

Power Amplifier—An amplifier designed to produce sufficient power to operate a loudspeaker. (See also Preamplifier)

Power Cord—Cord for connecting the tape recorder to an external power source, such as a 120-volt a.c. line.

Preamplifier (also Preamp)—An amplifier that raises extremely weak signal levels (such as those from a microphone, magnetic playback head, or a phonograph pickup) to a level sufficient to drive a power amplifier. Some tape recorders combine the preamp and the power amplifier. Others—especially special tape recorders designed for use as a built-in part of a high-fidelity music system—may include a preamplifier, but no power amplifier. The tape recorder's preamplifier usually includes the record and playback circuits.

Prerecorded Tape—Tape recordings that are commercially available and generally embody the same material that is available on phonograph records.

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

Pressure Roller—Also called "pinch roller" or "capstan idle." A hard-rubber roller that holds the magnetic tape tightly against the capstan, permitting the latter to draw the tape off the supply reel and past the heads at a constant speed. (See also Capstan)

Print-Through—Undesired transfer of
Rewind Control—A button or lever for rapidly rewinding tape from the takeup reel to the supply reel.

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

Sensitivity—As used to describe the capabilities of raw tape, it indicates the relative output for a given input in the linear (low-distortion) portion of a tape's magnetic transfer characteristic. Sensitivity data plotted as a function of frequency (or wavelength) gives frequency response, usually relative to a standard reference tape.

Separation—The degree to which two stereo signals are kept apart. Stereo realism depends on the successful prevention of their mixture in all parts of a hi-fi or tape system. Tape systems have separation capability superior to that of disc systems.

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

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

Splicing Block—A metal or plastic device incorporating a groove within which ends of the tape to be spliced are held. An additional diagonal groove provides a path for a razor blade to follow in cutting the tape. It makes splices very accurately using narrow-width (7/32") splicing tape. (See also Tape Splicer)

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

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

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 tape-head 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 rewinding modes of operation, thus preventing head wear.

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

Tape Monitoring—See Monitor Head

Tape-Transport Mechanism—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.

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

Tape Speed—The speed at which tape moves past the head in recording or playback modes. Standard tape speed for home use is 7½ ips or half that speed (3¾ ips). Speeds of 1⅝ and 1⅞ ips are found on some machines, but on reel-to-reel recorders are usually suitable only for non-critical voice recording. Some cartridge machines using special tape and circuits achieve very good results at the slow speeds. Professional recording speeds (for making original master tapes of music, for example) is usually 15 ips and sometimes higher.

Tape Splicer—A device, similar to a film splicer, for splicing magnetic tape automatically or semi-automatically. Different models vary in operation, most using splicing tape; some professional units employ heat. (See also Splicing Block)

Telephone Pickup—Any of several devices used to feed telephone conversations into a tape recorder, usually without direct connection to the telephone line and operating by magnetic coupling.

Tensilized Polyester—A polyester tape backing that has been prestretched principally in the lengthwise direction for increased longitudinal strength.

Tone Controls—Control knobs on a tape-recorder amplifier used to vary bass and treble response to achieve the most desirable balance of tone during playback.

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

Triple-Length (or Triple-Play) Tape—An extra-long-play magnetic tape for maximum recording time on reels of a given size. It uses an ultrathin but very strong 0.5-mil tensilized polyester base.

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).

Uniformity—in terms of magnetic tape properties, a figure of merit relating to the tape's ability to deliver a steady and consistent output level when being recorded with a constant input. Usually expressed in decibel variation from average at a mid-range frequency.

VU Meter—A "volume unit" meter that indicates audio-frequency levels in decibels relative to a fixed 0-decibel reference level. The meter movement differs from those of ordinary voltmeters in that it has a specified ballistic response adapted to monitoring speech and music. Used in many home and most professional recorders to monitor recording levels and maintain them within the distortion limits of the tape.

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

Weighting Characteristic—the shaped frequency-response characteristic of a measuring device used to produce more realistic indications of the subjective response of the ear than are obtained with unweighted (flat) measurements.

Wow—A form of distortion in sound-reproducing systems caused by periodic variation in the speed of the medium (such as tape) and characterized by its effect on pitch.

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

By

Charles Rodrigues
SHOPPING for a tape recorder can be a harrowing experience. If you approach the task lacking previous experience and elementary technical know-how, anything an audio salesman tries to tell you may simply result in confusion. With a little preparation, however, you can enter an audio store prepared not only to cope with a salesman's jargon, but also to make a wise selection from the almost limitless variety and brands of tape gear now available in all price ranges.

A good first step toward making an informed choice is a short survey of the basic types of tape machinery currently on the market. Beyond their use of the same basic medium—magnetic tape—today's tape machines tend to have sharply divergent purposes, so let's start with a rundown of recorder types:

- **The All-Purpose Stereo Recorder**: The "standard" tape recorder is a completely self-contained machine that records and plays back stereo tapes, requiring no outside help beyond material to record and the microphones or shielded leads to do it with. It has a dual-channel (stereo) amplifier and two speakers (or sets of speakers); the speakers may be built in (usually facing outward from the left
The Tape "System": Although some models look very much like the standard stereo recorder at first glance, the tape-system unit is meant to be something more. The tape system may be a three-piece affair consisting of a walnut center cabinet containing tape-transport mechanism, stereo amplifier, and controls, plus two separate speaker systems. The three pieces are intended to sit on a shelf or buffet—or to be mounted on a wall. What differentiates these systems from the all-purpose recorder described above is their intended role as the heart of a basic music system centered around tape. Instead of groups of outputs and inputs intended for connection to an external hi-fi set up, the modular tape system simply has provision for an auxiliary source such as an FM tuner (if it is not already built in) that can be played through the unit's centralized control facilities. Some modular systems have output jacks for feeding an external audio amplifier. This represents the manufacturer's way of hedging his bet. The tape compact system may include, in effect, a full stereo receiver. This makes it into a "stereo compact music system" that includes a tape mechanism rather than a record player.

The Tape Deck: The polar opposite of the modular system is the tape deck, designed solely for connection to a component hi-fi system (or to a modular music system designed around a record player). The deck has no power amplifiers or speakers of its own. In its simplest version it is a playback-only unit, almost always with its own playback preamplifiers. It is used in connection with the tape input jacks on an amplifier or receiver. In its most complex form, the deck offers elaborate "professional" recording and playback features, and lacks only speakers and a power amplifier. At least one deck is now available with a small, high-quality stereo amplifier built in, but no speakers.

The Battery-Operated Recorder: Made feasible by the transistor, the battery-operated portable recorder is decidedly a special-purpose machine that usually puts less emphasis on music (and fidelity) than on using a recorder camera-style for taping wherever you go. Not to be confused with the $29.95 toys sold in the local drug store, the new generation of battery-operated machines ($50 and up) offers respectable sound quality for recordings made away from the comfort of your living room. Some of them have outputs for an external amplifier, and, when they use a standard tape speed (such as 3¾ or 1⅞ ips) and provide a capstan drive, they often produce tapes that can be played back with good results on conventional living-room recorders. Unlike all the other types of machine discussed here, battery-operated portables are mostly two-track monophonic machines. However, there are a few reel-to-reel and cartridge stereo versions available.

The Cartridge and Cassette Machine: Overlapping all the previous categories, the cartridge tape machines offer tape enclosed within a plastic cartridge rather than wound on a conventional open reel. You simply drop or push the cartridge in place, slide a lever or depress a button, and the machine takes over. The overall objective, of course, is to compete with the convenience of discs as a medium for sound reproduction. Aside from the battery-operated machines and the machines designed for use in cars, there are three major cartridge systems for home use at the moment. These are the eight-track, the four-track, and the cassette; all of which are discussed later in this article. Of the three types, you should be aware that the cassette units almost all have recording capability, while the four- and eight-track units seldom do.

If you find it impossible at this point to decide which of the foregoing basic types of recorder is the one for you, things are only as they should be. With the possible exception of the battery-operated machine, whose special purpose may well not be yours, all the kinds of machines mentioned are well worth seeing and hearing in operation before you choose one type over another. Each has decided strengths and weaknesses.

The modular or compact tape system approach implies that in the long run tape is more important to you than discs. If you are starting out with no record collection, this possibility may be worth considering. But in any case, a record player can be plugged into any of the systems. Based on the further assumption that you now own no audio equipment, the tape-system approach may save you both money and the extra space occupied by separate components. But it is in direct competition with equally appealing stereo-compact systems for playing discs, and it involves a good bit of possible extra expense if you decide later to upgrade your equipment.

The question of the deck vs. the all-purpose recorder is also worth careful consideration. The greatest appeal of the deck is in the lowest ($100-$200) and the highest ($400 upward) price categories. In both price ranges, the deck allows you to make sure that every penny goes into features that won't
duplicate those you already have in your present hi-fi system. In the broad medium-price range, however, the complete machine is very often the better buy, since the fact that you can hear any tape you've made right on the spot encourages you to use the recorder outside the home as well as in conjunction with your regular audio system.

Whatever category of tape machine you ultimately decide to buy, you should be prepared in addition to take some time to look and listen for the best performance you can get for your money. There are many reliable ways to judge the quality of any machine that you should make yourself aware of.

One of the vital considerations in making tape recordings is how low a level of background noise you can achieve. This hinges on two factors: the recorder's inherent electronic and mechanical noise and its provisions for indicating maximum permissible recording level. Both factors can be judged only by making a recording in the store and listening to the playback over a wide-range audio system that will show up significant flaws. Aside from listening for a consistent noise problem of one kind or another, your main concern is to judge the effectiveness and ease-of-use of a machine's recording-level indicators, which should give a clear and reliable indication of how high you can set the gain without encountering distortion.

Although the "magic-eye" indicator is capable of the best reading of momentary peak signals, the level-indicating meter is most popular these days. There are excellent machines using either type of indicator, and you should not let the presence of a "professional" meter influence you toward the purchase of a machine that is otherwise not up to the level of some "magic-eye" machines. Exceptions to this rule are those machines that use a meter whose characteristics are accurately matched to NAB broadcast standards. If you are going to be recording for professional use, then a machine with real VU meters can be quite helpful. (Note, however, that the presence of the letters "VU" on a meter face does not make a VU meter. You may have to check with the manufacturer to determine how closely the meter actually conforms to the standard VU characteristic.)

If noise (usually hiss) seems too obtrusive in a machine that is otherwise appealing, or if you have difficulty in judging just how significant the noise really is, check against a machine that the salesman considers the best in the house. And when you encounter a machine that is mechanically noisy during play or rewind, be wary even if the noise is not audible over loudspeakers; there is a good chance that a variety of other problems will appear (some of them audible through the speakers) in the near future.

Another critical matter is a recorder's freedom from speed variations, particularly the short-term variations called wow and flutter. An "acceptable" amount of wow and flutter is the amount that you yourself cannot hear. To make the most of your critical faculties, you should record and play back on the same machine in order to do your listening, since the speed variations in both modes are added together in playback. And you should make a direct comparison with the music source (preferably a piano record) you are taping. Any amount of variation that is clearly audible is likely to be annoying when you get the recorder home, and you should not gloss over any audible difficulty in the store. Also check a machine's performance near the beginning and end of a reel, where any problems are likely to be aggravated and hence far more audible.

Overall sound quality is a function of frequency response and lack of distortion as well as an absence of the problems already mentioned, and it is often a matter of rather subtle judgments. In general, you can expect overall sound character to improve perceptibly as you move upward from one price class to another. The lowest-price recorders tend to have a slightly "grainy" or veiled quality that reflects somewhat uneven response and a degree of distortion at average recording levels. The medium-price machines are generally slightly restricted in frequency range (the restriction appears mostly in the high frequencies), but smoother in character. The expensive recorder should have an extremely transparent quality, with little or no audible difference between original source and tape in a direct comparison. A number of today's moderately priced machines can achieve this at 7 1/2 ips, and some of the very best ones can do it at 3 3/4 ips.

One good index of quality is the presence of three separate heads, one each for erase, recording, and playback. The presence of separate heads for the recording and playback functions not only permits instantaneous comparison ("monitoring") between what is being put on the tape and the original program source, but insures that each head can be designed for optimum performance of its function. In comparing two machines of apparently similar quality, you may generally assume that the presence of three or more separate heads in one of them is a good indication of superiority.

In judging overall sound quality, an often-effective tactic is to compare the audible quality of a good commercially recorded tape and one recorded on the machine itself. If a machine seems to have good highs on its own recorded material but sounds dull and lifeless on commercial tapes, this is a good indication that the highs are artificially "peaked".
during recording to make up for a poor playback characteristic. Any marked difference between the two kinds of recordings usually indicates a non-standard frequency-equalization circuit in the recorder. As you go up the price ladder and seek out the subtlest sonic improvements, you should rely more heavily on the instantaneous and direct source-vs.-tape comparison.

Once you are beyond the lowest-price category, you should look closely at the way a recorder handles tape. It should start and stop smoothly at normal playing speeds, without spilling or jerking, and it should come to a quick stop from fast-forward or rewinding without breaking, stretching, or snarling tape. The more expensive the machine, the more you should insist on foolproof switching from one mode to another, with no spillage or breakage when it is reversed or thrown into the play mode from its highest speed. And, as mentioned earlier, you should consider significant mechanical noise at playing speed a portent of troubles to come.

One crucial difference between any two machines may be the ability to maintain initial quality. Inexpensive construction and light-weight materials may result in a recorder's top plate flexing or becoming permanently deformed, thus upsetting the critical alignment of tape to heads and guides and making correction of the misalignment extremely difficult.

This is but one of many problems that may develop because of inferior construction. Some compromises are inevitable in the construction of an inexpensive machine, but you can find surprising quality in some economy machines, and you should look for as much as you can find at any price level.

Once you have narrowed your choice to machines of apparently similar quality, you should look for convenience features that may make for greater utility or simply for more fun. Some machines, for example, offer self-threading, automatic playback reversing or automatic rewind at the end of a reel; others can change direction during playback or recording. Most stereo recorders offer sound-on-sound and virtually unlimited add-a-track facilities, while others have echo effects or slide-synchronization signals available. Many machines provide facilities for mixing of inputs and three- or four-speed operation. And at least one has a special noise-reduction circuit that enables the user to make exceptionally high-quality tapes at 33 1/3 ips.

Whether you are after a recorder of respectable but not ostentatious quality or one that makes hardly a concession to the mammoth used in the recording studio, you should be able to find it with a minimum of confusion and wasted shopping effort—provided you have armed yourself with a little knowledge before you walk into the showroom.

2. FOUR-AND EIGHT-TRACK RECORDERS

By Paul Edwards

Four-track? Eight-track? How much will it cost? What about repertoire? Are my favorite performers available in cartridge-tape form? How expensive are the tapes? These are among the various questions a person might ask in weighing the purchase of a stereo tape-cartridge machine.

Initially, the four-track cartridge was king, simply because it was first on the scene. Today the picture is changing, with eight-track seemingly taking over. But for those who already have an investment in four-track cartridges, all is not lost, for there are a number of compatible machines that play both four- and eight-track cartridges.

Four-track equipment and cartridges are cheaper than eight-track. A four-track machine can be bought for as little as $29.95, installed with two speakers for an additional $20, on the West Coast; the same machine and installation will cost perhaps $10 more on the East Coast.

According to Joe Wally, a partner in Wally's Stereo Tape City, a New York City sales and installation firm for tape-cartridge equipment, the lowest price for a "worthwhile" name-brand eight-track tape player is about $100, installed with two speakers. Compatible (both four- and eight-track) name-brand machines start at $130 installed. Wally admitted that there were lower starting points in the eight-track and compatible machines, but claimed that the equipment was not fully reliable. He pointed out that although the compatible machines cost more, the difference could be amortized in time by the purchase of lower-priced four-track cartridges. Four-track cartridges start at $4.95, with some selling for $5.95. Eight-track cartridges start at $6.95 for popular music and $7.95 for show albums. Classical music is $8.95. Twin-packs—double-length tapes—cost $9.95.

Proponents of the four-track system insist that four-track tapes sound better than eight-track because the individual tracks are wider in four-track. Proponents of the eight-track approach insist that their tapes sound better than four-track because of
better quality control. To my ears, any theoretical advantage that the four might have over the eight—or vice versa—are cancelled by road and motor noises when the tapes are played in a car. Theoretically, four-track tapes should give a better signal-to-noise ratio. However, there are many problems in the mass-production duplication of the tapes. One of them is the factor of the quality of the blank tape, which can vary within one manufacturer’s line and from manufacturer to manufacturer. The question of top sound quality in cartridge form is not critical, however, because most people who want this format are aware that the highest-quality sound is obtainable only from open-reel tapes. They buy the cartridge for its greater convenience and ease of handling in the car and in the home.

What about the availability of prerecorded tapes in the two formats? There is an abundance of both types. Perhaps eighty per cent of the music in cartridge form is available in both four and eight track, though you are more likely to find off-beat rock-and-roll groups on small independent labels in the four-track format. On the other hand, RCA does not produce four-track cartridges; people who want RCA artists in cartridge form must buy eight-track.

So much for the merits of the two formats. What about choosing a playback machine? There is a broad selection, covering auto players, double-duty auto/home machines, portable battery-operated eight-tracks, and machines designed for home use exclusively. They range from simple decks (meant to be plugged into a hi-fi system) on up to three-piece ensembles (tape player and two speakers).

The amount of space you have available is the first consideration in buying a cartridge player for your car. Some units are relatively bulky, while others are quite compact. You may find that the former appeal to you for reasons of price or appearance, but that the latter are more appropriate for your particular car. The extra inch of depth required by a bulky machine may mean bruised knees, snagged nylons, and other minor tragedies or discomfort.

A second consideration is price. As noted above, four-track sets start at about $50 installed, eight-tracks begin at $100, and compatibles start at $130. In general, you get what you pay for. Avoid what appear to be super bargains. There are many fly-by-night concerns importing cartridge-tape players, and once they make a “killing” by distributing their products on a blanket basis around the country, they vanish from the scene, leaving dealers and consumers alike with no place to get the units serviced. Deal with a retailer or installer who handles “legitimate,” well-known, major brands that have a good reputation behind them.

Service is a major consideration. Can the retailer you bought the machine from provide the follow-up service? At present, few players are perfect—they all may break down in any one of a variety of ways. Remember, a tape player is both an electronic and mechanical device, which doubles its potential for malfunction. One value of a national brand name is that the manufacturer of the national brand is likely to provide service all over, not in just a small area of the country, as some lesser brands do.

If the retailer cannot install the machine, can he recommend a reliable installer? Some installers are regular auto-service garages that have taken on installations as a sideline. The quality of their work may range from excellent to bad. The nature of the industry is such that an organization specializing in player installations is a better bet than the sideliners.

A full-time installer is in close contact with both industries, knowledgeable about changes taking place in player equipment, and aware of how auto producers are modifying their products. Structural changes in a later-model car can lead to complications for the uninformed installer who operates on a sideline basis.

What should one look for in an auto player? Most have major features in common and operate in a similar manner. With the eight-track machines, you push a tape cartridge into a slot after flipping a switch, and—presto!—out comes music. The music continues until all four pairs of tracks have played, and then the tape begins to repeat itself. With a four-track machine you slip in a cartridge, engage a lever, and the unit plays through the first pair of tracks. Then you flip a lever, and the machine plays the second side. Some units have lighted indicators to show which stereo tracks are playing, as a means of determining what selections are upcoming. All of the machines have a balance control to obtain proper stereo effects, and they all, of course, have a volume control. The better instruments also have a tone control. Some units have a track-selector that enables you to set the next upcoming pair of tracks into operation.

The foregoing are the basics. Some deluxe machines have a track-aligning device, which in some models is called a “fine-tuning” control. This permits the user to line up the playback heads perfectly with the sound tracks, to eliminate the bugaboo of crosstalk, common in eight-track operation. Some machines, both low- and high-priced, have a cartridge-slot cover to keep out dust when the set is not operating. This feature is important where the car is operated under dusty driving conditions.

As a safety measure, it is wise to seek a machine with softened or rounded edges. As for looks, this is a
personal matter. In regard to size, the slim-line models will generally do the trick if space is at a premium. But you might also consider the possibility of "mini" units that can be fitted into a glove compartment (at the expense of this very useful storage space, of course).

Virtually all of the players come with two speakers and the required installation assemblies. Two speakers are adequate for most cars, but many drivers like four for a heightened stereo effect and "soundall-around," front and back. All of the sets have more than enough power to handle the speakers. There are at least a half dozen companies producing compatible auto players that handle both four- and eight-track cartridges. These generally have the same basic characteristics as the individual four- or eight-track units.

The array of products for those seeking a cartridge player for the home is substantial. There is a greater selection available with instruments in deck, ensemble, and portable form, and a few even offer recording capability. The home machines are virtually all eight-track or compatible types and feature the same basic operating characteristics and controls as the auto players. The only real difference is that the home units operate on the 120-volt a.c. house current instead of batteries, and they are usually installed in wooden cabinets.

Eight-track decks start at $59.95, and run to about $189.95 for a compatible unit. There is one four-track model at $99.95. These decks operate through an existing hi-fi system. There are also a few eight-track decks with built-in amplifiers on the market. These require only auxiliary speaker systems to be operational. They range from about $99.95 to $259.95.

3. CASSETTE RECORDERS

By Felix Prinz

Back in the autumn of 1964, Norelco put a cassette recorder, the Carrycorder Model 150, on the American market. At first, the machine was pooh-poohed as just another cartridge machine. Then, suddenly, everyone was talking about the little unit. Overnight the tape-recorder industry moved a giant step forward, and it has been moving swiftly ever since. Although there was only a single cassette recorder model four years ago, there are over a hundred on the market today.

The main appeal of the cassette system is that it is such an easy way of handling magnetic tape. (Incidentally, "cassette" is the word used to differentiate the Philips type of tape cartridge from the others that are currently available.) In operation you put the cassette into place in the recorder (or playback unit), push a button or flip a lever—and presto, you're in business. When the tape has run through, it stops by means of a combination of tension and a frictionless clutch assembly. For play to continue, you remove the cassette and flip it over. After the second side runs through, the machine stops again. Each side of the tape plays for thirty, forty-five, or sixty minutes, depending on the cassette tape length you select. Flipping the cassette to hear the other side is a cinch—it can be done in
hear the other side is a cinch—it can be done in less than five seconds. It is no wonder that lots of people suspect that if the phonograph record is ever to be replaced it will be replaced by the tape cassette.

Also appealing is the small size and light weight of the cassette recorders. Single-channel, monophonic pocket recorders weigh as little as three pounds, and there is one specialized instrument at a mere one pound and three ounces. They can be as small as 3½ x 1½ x 5½ inches, a true coat-pocket size. You can take them virtually everywhere and be ready to do an effective recording job, on the sly or in the open. They are ideal working tools for people in many different occupations, an ideal aid in education, and an amusing instrument for the average person.

A third attractive feature of cassette recorders is their compatibility between the monophonic and the stereo modes. Because of their unique track layout—with stereo tracks running in adjacent pairs—a prerecorded stereo cassette can be played back monophonically on a mono machine, and, conversely, a half-track mono tape can be played back (in mono) on a stereo machine. Thus a person might do his taping on a little portable and play the tapes back on a home stereo machine. Or a person might take along a handful of prerecorded stereo tapes to play on his mono cassette portable at the beach.

Cassette players and recorders come in a variety of small, medium, and large sizes. You can buy a name-brand playback-only unit for as little as $30, a name-brand mono portable recorder for as little as $50, or you can move all the way up the price scale to almost $500 for a component stereo-compact ensemble.

**CARTRIDGES: 4-TRACK, 8-TRACK, AND CASSETTE**

By Larry Klein

A n insight into some of the reasons for the popularity of the cassette-type tape cartridge can be gained by examining the physical and electrical features that distinguish it from the four- and eight-track cartridges. (Incidentally, the term "cassette" was apparently simply to differentiate the Philips-developed cartridge from the other available types.) One of the most significant factors, to my mind, is the relative physical sizes of the cartridges: the cassette measures approximately 3/4 x 3 1/4 x 4 3/8 inches, as contrasted to the size of the four- and eight-track cartridges, which measure approximately 3/4 x 4 x 5 inches. The contrast is pointed up by the fact that four cassettes will fit physically into the space occupied by one of the other types. The radically smaller dimensions of the cassette are significant not only in respect to advantages in storage and handling, but also in that it allows the machine that plays the cassette to be similarly compact.

The hub-to-hub arrangement of the tape in the cassette—as opposed to the continuous-loop setup used in both the four- and eight-track cartridges—has certain mechanical tape-handling advantages. For example, unlike the four- and eight-track machines, cassette units incorporate a fast-forward and rewind function. This makes it possible to find a desired selection on the tape with about the same ease as with a reel-to-reel machine. (In this respect, all cassette machines would benefit enormously from having an index counter, but unfortunately this feature is not yet standard.) By contrast, only a few of the four- and eight-track machines have a fast-forward or "wind" function, mostly because of the mechanical difficulty inherent in pulling the tape rapidly from the center of the reel and wrapping it around the outside of the reel as is required by the continuous-loop format.

Another, and equally significant, factor in the rapid growth of the cassette medium is the cassette's ability to record. Very few of the cassette machines lack a recording function. Even fewer of the four- and eight-track machines have it. This results partly from the difficulty of home recording in the eight-track format where the problems of crosstalk and track-location accuracy are difficult, although not impossible, to solve.

In respect to playing time, there is little to choose from among the three cartridge types. Since, as has been indicated, the four- and eight-track machines rarely have recording capabilities, there is not much point in discussing that aspect. In respect to prerecorded commercial tapes, the manufacturers in general provide the equivalent of one disc album per cartridge.

At this point in time, it is hazardous to state what the relative fidelities of the three systems are—or predict what they could be. On the face of it, the four-track format (which has about the same tape-track width as the standard reel-to-reel four-track stereo prerecorded tapes) should theoretically provide the best signal-to-noise ratio in playback because of its wider track in comparison with the eight parallel tracks on quarter-inch tape used in the eight-track cartridges and the four tracks on ½-inch tape used in the cassette. The situation is further complicated by the fact that both the four- and eight-track cartridges operate at 3½ ips, whereas the cassette runs at 1 ¾ ips.

It is also difficult to make valid comparative listening tests among the various types because of the variability in fidelity of the recorded material. None of the prerecorded cartridges has achieved the sound quality—in respect to noise, frequency response, and dynamic range—that is usual in prerecorded reel-to-reel tapes. In general, it seems fair to state that the average fidelity of all three of the prerecorded cartridges is at
ble featuring a cassette tape mechanism, record player, and AM/stereo FM tuner—all of which creates decision problems for someone who wants to buy a cassette machine.

One of the first questions you'll have to ask yourself is "What do I intend to use it for?" If it is to play prerecorded cassettes only, you can buy a coat-pocket-size playback-only unit for $29.95. These sets are simple, battery-operated affairs with only two controls—combined on-off switch/volume control and a mode control (play, fast forward, and rewind).

If you want to record on the go, free of the power cord, then a battery-operated monophonic portable under $100 might be the right machine for you. Such a machine with a major brand label will cost you around $49.95 at the bottom of the price scale. You may run across one offered as a sale "special" for a few dollars less, especially if you live in or near a big city. For $10 more you can buy a similar set that will also play on house current, or for about the same $10 (and even less) you can pick up an adaptor that will enable your battery portable to play on house current to save drain on the batteries. This type of machine is basic, offering relatively good quality of sound in playback (related, of course, to the power of its internal amplifier and the size of its built-in speaker), and it will do a good job of recording as well. Virtually all machines in this group come with a remote-control microphone, handy if you use the set for dictation or stop-and-go recording. If you are buying one of this group mainly for dictation, check how quickly it starts and stops and if there is any time lag between the start of tape movement and the time recording actually begins. If there is a noticeable time lag, it might call for conscious timing in use, which is distracting about the point that reel-to-reel was as of five years ago. Some of the fidelity problem is undoubtedly a product of the duplication process, and some results from inadequate heads or electronics in the machines, but it is difficult to apportion the blame precisely. In my opinion, none of the systems is presently suitable for high-quality reproduction of classical music. The wow and flutter characteristics of the machines become disturbingly apparent on piano works, and their hiss level is obtrusive during quiet passages. The compression of the dynamic range applied to the four- and eight-track cartridges to make them suitable for automobile-player use (this has been discussed in my STEREO REVIEW column) degrades the sound excessively on classical material. And, of course, there is the loss of the very highest frequencies as mentioned in the accompanying report.

None of the above criticisms is particularly pertinent when applied to cartridge recordings of pops or rock material. Since, in general, the dynamic range of such music is compressed during the original recording process and quiet passages are few, all three of the cartridge systems appear to do equally well in reproducing non-classical material. For a dance party, for example, the eight-track machine with its automatic sequencing of tracks is ideal.

That, in brief, is the status of tape cartridges at the moment; it is too soon to attempt a precise prediction as to where they are going. I expect all three systems to improve significantly—that is, if, in the minds of the manufacturers, public acceptance warrants further investment in research and development. As of now, they have a fascinating potential and many valid uses, but for those concerned with attaining the best in high-fidelity music reproduction, the cartridge machine is not yet the answer.
when you want to concentrate on what you are saying.

In the foregoing group, which runs up to $100, some of the more expensive sets are larger, have bigger speakers, are of better overall quality, and have better frequency response and signal-to-noise ratios. Some have automatic-level control (ALC) which eliminates fiddling with the volume control in a live recording situation. There might also be a tone control or a cassette ejector, which makes cassette removal easier. Most people find that a machine with piano-type keys or pushbuttons provides maximum ease of operation.

If you intend to use your cassette recorder only indoors, you might consider a larger-size self-contained table-top unit. Sets of this type run from about $100 to $140 as monophonic machines. Some of these come in typical portable housings of plastic, but a number of them also come in attractive walnut wood enclosures and fit into almost any decor. Some also include a tuner to permit recording off the air with a mere flick of a switch. Many businessmen use table/desk model recorders in their offices for dictation or for recording conferences.

If you want to be able to play and record in stereo on the go, consider the self-contained battery-operated stereo cassette recorders. These begin at about $140 and range to about $160. They also include an external adaptor or built-in circuitry that permits operation from house current. Most such units have detachable wing speaker systems that can be positioned for optimum stereo effect. There's at least one battery machine for under $200 that includes an AM/stereo FM tuner, which permits recording off the air.

For those who want to record and play stereo at home only, there are many straight non-portable a.c.-operated table-model ensembles to choose from. Most come in wooden housings and have separate speaker systems in matching woods. A few models come in matched plastic housings. Such systems permit recording from auxiliary sources, and have input jacks for such use. The ensembles have speaker systems quite adequate for non-critical use, or these can be connected to a hi-fi system if more volume and higher quality are desired. Sets in this category range from $160 to $270. Two or three higher-price units incorporate a cassette changer, and a few ensembles also contain built-in AM/stereo FM tuners for direct recording of radio programs. These systems are easily mounted on bookshelves or in room dividers.

There are a handful of deluxe ensembles available in the $400 to $500 range for those who want an all-in-one table-model compact music system. Such systems consist of an AM/stereo FM tuner-amplifier with a built-in record changer and cassette recorder plus a pair of matched speaker systems.

If you already own a stereo hi-fi system, you can easily and inexpensively add a stereo cassette playback deck ("deck" means no speakers or amplifier) or stereo record/playback deck to enlarge the system's capabilities. Just hook it in via two or four patchcords in a matter of minutes. Stereo playback-only decks are priced in the $50 to $60 range. At least two companies sell playback-only changers, priced at about $130, which handle up to six cassettes, playing them automatically one after the other.

Cassette decks with record and playback capabilities begin at around $110 and range to about $140. These permit full operation, using the hi-fi system's amplifier and speaker systems as well as tuner if it contains one.

You can have a cassette recorder in your automobile too. Some firms that sell battery portables have a mounting bracket that makes it possible to use their machines in an automobile, playing through either the recorder's speaker or the existing radio speaker in the car. A handful of companies sell cassette recorders made specifically for auto use in both mono and stereo. One mono outfit sells for $69.95. For $119.95 to $149.95 you can get units that offer stereo playback and also permit monophonic recording.

Among recent developments in the field are cassette radio tuners. These devices, the size and shape of a tape cassette, are actually miniature tuners that utilize the amplifier and speaker portions of a cassette recorder to convert it into a radio/cassette recorder. They fit into the player in place of the cassette, operate on a miniature dry cell, and have a claimed frequency response of 80 to 12,000 Hz. Prices start at $11.95.

Another development is automatic reversing at the end of a side. This feature will no doubt be adopted by many manufacturers, and it promises to make the cassette recorder an even more popular electronic home-entertainment product.

One company is offering a $99.50 portable recorder that is designed to be used with a home-movie camera to provide accurately synchronized sound tracks. The unit can also be used as a conventional cassette recorder.

A final note: as with other commodities, you get what you pay for in cassette recorders. A general rule of thumb is that if a given trio of recorders have the same features, the highest-priced of the three will be the best in terms of overall performance. It is also more likely to perform for a longer period before it needs maintenance.
The difference between the track widths of a half-track recording and two tracks of a four-track recording are illustrated by 3M’s tape viewer placed over a spliced length of quarter-inch magnetic tape. Minute iron particles in suspension in the viewer trace out the magnetic modulations on the tape.

RECORDING TAPE: A SHORT PRIMER
EXPLORING THE QUESTION OF WHICH TAPE TO USE FOR VARIOUS RECORDING PURPOSES

By WILLIAM H. MADDEN

For some people, tape recording becomes fraught with mystery and confusion the moment they have to buy a new reel of tape. Should they choose acetate or polyester base? Which reel size? Which length or thickness—300, 600, 900, 1,200, 1,800, 2,400 or 3,600 feet; ¼, ½, 1, or 1½ mil? And should it be low-noise, all-purpose, high-output, low-print, master, standard, extra-strength, double-length, or triple-length? Tensilized, nontensilized, or lubricated?

Despite the profusion of lengths and types, there is no real mystery connected with magnetic tapes. In order to answer the question “What kind of recording tape should I buy?” it is helpful to be aware of some basic tape facts. All tapes have three things in common: (1) the “active” recording medium, or oxide; (2) a flexible backing (or base); and (3) a binder to join the oxide to the backing.

The question of which backing is best has been argued nearly as long as tape recording has existed. A tape’s backing determines its physical characteristics—resistance to tearing or stretching, ability to bend and flex, and reaction to temperature and humidity. The first crude German tapes and those first introduced in the United States in 1947 had paper backings. While easily torn, paper backing was relatively immune to the effects of temperature and humidity. But its surface could not be made smooth enough to permit an even coating of oxide. Nor could it be made thin enough to accommodate more than about 20 minutes of recording time (using a large reel of tape at the very fast 60 or 30 ips speeds required in those days).

About a year later, the first plastic base was developed. Today this is known as cellulose acetate or, more popularly, just acetate, and many inexpensive or all-purpose tapes are now generally backed with acetate. Some recordists prefer it because of its non-stretch, clean-break characteristics, which make it easy to splice. Since all tapes stretch before breaking, it is more correct to say that they have a yield (or stretch) point as well as a breaking point. How much force it takes to reach these points is a function of the tape’s strength. Obviously, the yield point of any tape should be such that the rewind, fast-forward, and stop modes of a normally adjusted recorder will not stress it unduly.

Acetate backings have a yield point at about 5 per cent elongation, which means that tape stretched to this degree (or below) will return to its normal length without any effect on the tape’s performance. Stretched beyond this point, the tape becomes permanently distorted and breakage will occur at about 25 per cent elongation (stretching), depending on the relative humidity.

Acetate backings have a plasticizer that causes
Uneven dispersion of the oxide particles in a tape coating (shown in the photomicrographs to the right) results in high hiss levels that reduce the available dynamic range of the tape. This problem can also lead to high-frequency losses in both recording and playback.

them to absorb more moisture under conditions of high relative humidity. This results in greater flexibility and more stretch before breaking; conversely, acetate tapes become brittle under conditions of low humidity. Excessive brittleness, or "aging," is really the loss of the plasticizing agent brought about by storage under conditions of low humidity or high temperature.

The effect of humidity on acetate can be illustrated with an extreme example: if the relative humidity were to drop from 90 to 30 per cent, a 1,200-foot roll of tape with acetate backing would shrink almost 11 feet. If the reel were tightly wound (and it shouldn't be), this could cause cupping or other physical distortions of the tape surface, rendering it useless.

Enter polyester. Nearly 85 per cent of all types of magnetic tapes (including computer and video tapes) are now manufactured on polyester backings. (The term "Mylar," a proprietary name, refers to only one brand of polyester backing in current use.) Polyester backings have two substantial advantages: stability and strength. Like acetate, polyester becomes permanently distorted (and useless) when stretched beyond the 5 per cent yield point—but it takes twice as much tension to reach this point, compared to acetate. Unfortunately, polyester will elongate anywhere from 90 to 150 per cent before it breaks. To minimize the effect of this characteristic, some tapes are "tensilized," that is, evenly prestretched during manufacture to prevent further stretching during normal use. The strength of polyester backings has made possible the production of extremely thin tapes. Obviously, the thinner the tape, the more tape—and hence recording time—can be accommodated on a reel of a given size. These thinner tapes are known variously as double-length (or double-play), triple-length, and so forth.

Temperature affects both backings in about the same way, although acetate is somewhat more sensitive. In general, the higher the temperature, the more flexible each backing becomes. Humidity, on the other hand, does not affect polyester tape. This kind of backing requires no plasticizing agent and suffers no apparent aging, which makes it ideal for long-term sound storage.

The second constituent all tapes have in common, the binder, is a formulation that holds the oxide particles to the backing and insulates them from each other. A good binder will not become stiff, brittle, or sticky under extremes of temperature and humidity. It should also have the same properties of expansion and contraction as the backing so that the tape will not cup or curl and will pass smoothly over the recorder's heads and tape guides.

Plasticizers and lubricants are added to the binder mixture during manufacture rather than later. Lubricants prolong the life of the tape and of recorder parts that come into contact with it. They also eliminate annoying squeal, caused by the tendency of a tape to alternately stick and slip as it passes over a head. The dry silicone lubricant used in some tapes actually leaves a minute protective coating on re-
corder heads as the tape is played, and lasts for the life of the tape.

Magnetic-tape oxides determine the electrical characteristics of a tape—its performance in the areas of recording, storing, and reproducing signals. The oxide itself is composed of minute iron-oxide particles in a uniform coating held to the backing by the binder. Ideally, an oxide formula should provide uniform output and should be magnetically "soft". A magnetically soft tape is one that can be easily erased or re-recorded but nonetheless retains its magnetic properties during storage.

The first oxides, developed for paper-backed tapes, provided good reproduction but were difficult to erase—the old signal would come through even when the new material was recorded over it. The reddish oxide formulations developed for the first plastic bases resulted in tapes that could be easily erased, but they had to be recorded and played back at high speeds in order to reproduce a full range of frequencies. Better oxides—with smaller particles dispersed more uniformly—have since been developed, enabling a machine to record at speeds of 7 1/2, 3 3/4, 1 7/8, and even 15/16 inches per second and still produce a usable signal.

Two special oxide formulas—dark green and black in color—have been developed to solve certain recording problems. The first, a high-output oxide, has a signal output that is 6 dB greater (for a given record-head signal input) than the now-standard red oxide. Therefore, tape with high-output oxide is particularly useful with recording equipment that has excessive noise or hum, because it is possible to achieve a desired signal strength with less playback-amplifier gain than is needed by standard oxide, and decreasing amplifier gain decreases the noise. The high-output oxides are also able to accommodate sudden loud signals or surges without overloading (distorting). Conversely, they are especially sensitive to weaker sounds.

The latest oxide development (intended originally for use in professional mastering at speeds of 15 ips and higher) resulted in low-noise tape. This special oxide, which is black, has reduced background tape hiss or noise by 6 db. Low-noise tape also has a built-in high-frequency boost that helps maintain a wide frequency response at the slow tape speeds. Although such tape is premium priced (it costs perhaps 80 per cent more than all-purpose tape), its ability to record twice the material per reel at slower speeds—without serious sacrifice of reproduction quality—becomes an economic consideration for the home recordist.

The properties of various types of tape are important in deciding which kind to buy; the other big consideration is obviously the purpose for which you intend to use it. A visit to any well-stocked electronics outlet will prove that there is literally a tape for every purpose, as evidenced by the profusion of types and brand names.

If you intend primarily to make recordings of speeches, interviews, and the like, in which wide
range response is not important, a standard or all-purpose tape is best from the standpoint of economy. If a long conference is in the offing, try one of the thinner double- or triple-length tapes at the slower recording speeds.

For music, an all-purpose tape on the average machine can provide good results at the 7¼-ips speed, and a low-noise tape can offer equivalent fidelity at 3⅜ ips. Tapes are offered in various lengths on reels of different sizes, so it would be wise to consult a recording-time chart to pick the one closest to the length of the selection or selections to be recorded. If the music has a wide dynamic range—that is, contains extremes of loud and soft passages—or if you are copying a second- or third-generation tape, perhaps a high-output tape might be best. Both high-output and low-noise tapes will keep background noise to a minimum.

When long life is a factor, select a polyester backing with a low-print oxide. Through special formulation of the oxide, the various low-print tapes tend to minimize print-through "echo," either before or after, which is actually the recorded signal of one layer impinging on adjacent layers.

For tape correspondence, tiny 3-inch reels are offered in varying tape lengths. Normally these tapes come packed in special mailer boxes that require only an address label and a stamp.

Splicing tape is in a category by itself. The need for the first splice occurred immediately after the first piece of tape broke or required editing. Eventually every recordist experiences a similar need. Although whole articles in this magazine and elsewhere have been devoted to the subject of editing and splicing, a few guidelines can keep the new home recordist, his tapes, and his equipment out of trouble.

- Make splices only with tape that is specified as splicing tape. Other transparent pressure-sensitive tapes may hold the ends of the recording tape together, but some of the adhesive will probably ooze around the splice, damaging the oxide or causing stickiness between layers on the reel. The adhesive may also get onto the heads and make them sticky.

- Cover the entire splice area—and then some—with the splicing tape, making sure that the ends of the recording tape meet, but do not overlap.

- Use some kind of splicing block or jig. Through long practice, professional tape editors can make splices with no mechanical aids other than scissors, but most of us are not so adept. A good splice, produced in a block, will pass smoothly and audibly through tape guides and over heads.

- Use a 30- or 45-degree cut where the tape ends join to eliminate the audible pop that frequently results from 90-degree splices. Mechanical splicers are designed to cut at the proper angle.

You should consider the recording tape you buy as another link in your sound system, and remember that the contribution a given tape can make to high-fidelity sound reproduction depends on other components in your installation. For example, a premium tape may produce no audible improvement when used with a low-quality recorder that cannot take advantage of its low-noise and extended high-frequency characteristics. In such a case, premium tape would be a waste of money, since an all-purpose type would serve just as well. If you are in doubt about whether your machine warrants the use of premium tape, buy a roll and judge for yourself whether improvement is audible.

Many people spend hundreds of dollars on a recorder and then try to economize by buying cheap tape. By using the so-called "white-box" tape, they frequently not only get poor results but sometimes even damage the recorder. They then blame the manufacturer of the recorder for the time and money they have to spend on repairs that otherwise would have been unnecessary. White-box or off-brand tapes are frequently end-of-run, reject products not up to a reputable manufacturer's specifications. They may also be products actually intended for the bargain counter and manufactured without regard for quality control in the areas of slitting, oxide uniformity, splices within the reel, or dropouts. Many of these products have an abrasive effect on tape heads and guides, actually wearing them down measurably after only a few playings. Although some white-box tapes may provide high-quality sound recording, you can never predict quality from reel to reel, or even within the same reel. Branded merchandise from a respected manufacturer carries his guarantee of quality or replacement. And the quality in terms of output level, frequency response, distortion, and noise is maintained within rigid standards from reel to reel.

Assuming you have selected your recording tape, you will naturally want it to continue to give optimum performance. Many of the rules for handling and storing tape have to do with protecting the oxide. Since the oxide "contains" the recorded signal, dust and dirt or physical damage to this surface will result in the kind of signal loss called a "dropout." A signal loss can also occur if the tape is bent or kinked, preventing it from passing smoothly over the recorder's heads. Here are some rules for preserving the quality of your valuable tape recordings:

- Store tape in its original box to protect it from dust or damage.

- Stand the tape boxes on edge like books, rather
than flat in piles. This will prevent warped reels and damage to the edges of the tape.

- Avoid storage in areas of extremes of temperature or humidity. Tape experts recommend room temperature with a relative humidity of 40 to 60 per cent. If the tape is cold, let it warm up to room temperature before playing. For long-term storage, use low-print, polyester-backed tape, and store it in metal cans sealed with pressure-sensitive tape.

- Avoid the build up of excessive tension within a reel of tape by rewinding it occasionally. If your recorder tends to produce tightly packed tape in the rewind or fast forward mode, have it adjusted.

- Avoid exposure to magnetic or electrical fields such as are produced by motors and some speakers.

- Clean the recorder heads and tape guides regularly to eliminate any dust or oxide flakes that could later rub off on a tape and produce dropouts.

Unlike phonograph records, which (under usual playing conditions) wear a little with each playing, tape does not wear significantly if it is properly cared for. Laboratory tests have shown that with good care and storage conditions, tape should last at least one hundred years.

---

**WHITE-BOX TAPE**

**A FEW WORDS TO THE WISE**

By PAUL EDWARDS

Tape hobbyists—generally considered to be human—are subject to all the foibles of the race. One of these is the perpetual search for a bargain. Retailers are aware of bargain hunters and consider them adversaries in a subtle game of "Who is going to get the better of the bargain?"

In the case of the retailer versus the tape-recorder hobbyist, "white-box" tape and money are the factors in the game.

The customer expects to give a minimum amount of money for a maximum amount of performance. But he rarely wins the game. Nine times out of ten, he will lose by buying white-box tape. When tape is sold at a bargain price, substantially below that of premium tape, it stands to reason that tape quality must be inferior in one or more ways. A regular, name-brand premium tape is manufactured to meet standards making for optimum performance when recording and reproducing audio information on a tape machine. This is rarely so in the case of bargain-price white-box tape. The name itself is a giveaway. White-box tape is packaged in a plain white box to indicate anonymity. The white box is actually a disclaimer of origin or, if you will, ownership. All you ever see on such a white box is a footage figure and the words "acetate," "Mylar," or "polyester."

There is, however, a disguised white-box tape which is branded with an individual store name, or that of a member of a chain-store group, or with fancy words like "Concerto," "Allegro," "Symphony," "Classic," "Harmony," "Melody," and so forth. And none of these carries the name of a manufacturer either—anonymity again.

This is all understandable. What manufacturer wants to put his name on something that is generally a rejected, second-rate product that will yield less than top performance? What manufacturer wants to admit that all of his products are not perfect? Corner a big-name tape manufacturer and he will reluctantly admit that he sells a by-product that is packaged more often than not in white boxes. "If we didn't sell the reject stuff, we'd have to charge a lot more for our good stuff," one producer stated. "We just can't afford to junk the rejected tapes," another said. "We'd like to, but it's a matter of getting all the other manufacturers to do the same thing. And they won't. So why should we be altruistic? It would work against us competitively."
Basically, there are several forms of white-box tape, and each presents certain problems. Some so-called "bargain" tapes are rejects of premium tape that failed to meet specifications, and others are rejects of computer or video tape. In the case of computer tape, which is made with an emphasis on high-frequency response, the mid-range and bass performance may suffer. With video tape, the needle-shaped magnetic particles of the coating are oriented cross-wise rather than lengthwise, and there may be loss in output when such tape is used for audio purposes.

The reasons for rejecting audio tape are many. The most frequent are signal drop-outs resulting from improper slitting and uneven oxide dispersion on the tape base. In the latter case, you will hear momentary "dead" spots peppered throughout the tape after it is recorded. Improper slitting affects the contact between the tape and the recording heads, especially on quarter-track recorders. It leads to a higher noise level and generally erratic recording in which one channel may sometimes go dead for varying intervals.

Another kind of rejected tape is that from outside cuts. Oxide is generally applied to 18- or 24-inch widths of base material which is then slit into standard quarter-inch widths for audio use. Since most imperfections in coating are likely to occur along the two outer edges, the better manufacturers eliminate them automatically from their production runs. The less-scrupulous repackage this scrap as white-box tape. There are three common imperfections in outside-cut tape: dropouts, potential edge stretching or irregularity, and uneven coating which leads to erratic recording and reproduction. This kind of tape is likely to produce poor fidelity, especially when used for stereo recording.

Not all white-box tape is rejected tape, however. Some is specifically made for the low-price market by taking short cuts in the manufacturing processes. For example, in making high-quality tape, a slowly revolving cylinder is used for the milling process which finely disperses the oxide particles in the binder. There are machines used to speed this process, to achieve dispersal quickly through a hammering process, but this tends to affect both the magnetic and physical properties of the coating adversely. A tape made in this fashion may have reduced output and increased tendency toward oxide shedding. One producer candidly stated: "I can tell you how it's done: cheap oxides, no primer, no surface treatment, etc. It is made cheap by reducing the integrity of the product."

The low-price tape made for white-box sale has a limited high-frequency response and is somewhat harder on recorder heads and other parts than premium tape is. Some of the low-price 0.5-mil tape is not tensitized and has a tendency to stretch. Also, such tape is not always properly lubricated, and it eventually squeals when played, especially after it has "aged" for a few months.

The foregoing tapes are of doubtful quality, by and large. We now come to a category of white-box tape that has some potential for the bargain hunter. It is spliced, prime-quality tape packaged in white boxes. This is tape supplied to retailers by companies that process prerecorded tapes using first-class raw tape supplied by major manufacturers. The big catch is that most spliced tape is sold on small reels—three-, four-, or five-inchers—although a small amount is sold on seven-inch reels. Another catch is that a single reel may contain tape of two thicknesses—1-mil and 1.5-mil. Further, it may contain tape made by two or more manufacturers! If used in critical applications, such as quarter-track stereo, there may be differences from section to section in frequency response, volume, noise level, and so forth, because the bias requirements will vary with each type of tape.

There is still another form of white-box tape: used tape. This will probably carry the lowest price tag of any of the white-box products. Some of this tape comes from radio stations and commercial studios who used it for some time, then bought newer formulations or more modern, state-of-the-art tapes. Some of it may be quite old, dating from a time when tape was not as good as now, and, if it has an acetate base, it may be devoid of the original lubrication and flexibility. The results may be squeal, excessive abrasion of the recorder heads, oxide shedding, and so forth. Polyesters, on the other hand, remain in good condition. Such tapes might be a good buy since radio stations use prime-quality tape.

A final form of white-box tape is returned merchandise. This is tape returned by dealers to distributors or manufacturers and diverted into white boxes. This tape will most certainly have grab-bag characteristics. And, unfortunately, like other categories of white-box tape, there is no way of detecting what it actually is.

Although I do not recommend white-box tape per se, it can be used for certain purposes. For example, it can be used effectively for tapes of speech where sound quality is not the first consideration. It can be used in noncritical monophonic recording with half-track machines where drop-outs are not as noticeable. It can be used for "knock-around" purposes such as recording pop songs that will soon be erased to accommodate newer tunes, or for "party
fun” where the tapes will be erased afterward. But always avoid using white-box tape where any element of permanency is a consideration.

To some, the foregoing caveats may represent a challenge. "Perhaps I can find a good roll of tape in a white box," a recordist may insist. Well he might find a roll or two . . . . And so we offer the following checkpoints for such optimists:

To check on poor slitting, which shows up as “cupping” or “curling,” unreel a length of the tape and let it dangle almost to the floor in a breezeless area. Any physical distortion of the tape will be readily apparent, in that it will look ruffled or wavy. Another check for poor slitting is to lay a 4- or 5-foot length on a flat surface (the store counter for example). If it is all right, it will lie perfectly flat, touching the surface at all points evenly.

Splices in a roll of acetate-base tape can often be detected by holding the reel of tape up to a strong light. The light should shine evenly through the windings of the tape. Splices will show up as small dark areas, and if there are many of them, they will make the tape appear to be unevenly wound.

Oxide flaking is easy enough to detect. Unreel a length of the tape on a flat surface with a sharp edge, then with the oxide up, pull the tape over the edge. Look for small telltale indications on the surface, and on the tape, that oxide has chipped off. Another test is to scratch the surface of the tape with your fingernail. If the tape flakes badly, forget it. Premium-quality tapes, no matter how well made, shed some oxide, but second-quality tapes may shed so much that the naked tape base will be exposed. Loose oxide can cause all kinds of trouble for the recorder, causing slippage, overall signal loss, high-frequency loss, and squeal. The loose oxide can also act as an abrasive, leading to early head wear and a poor signal-to-noise ratio.

Poor adhesion of the oxide may be a result of economics in production. It shows up as massive flaking or oxide shedding. To test for a good bond between the oxide and the plastic backing, press a strip of pressure-sensitive cellophane tape over the oxide, then pull it away. If the oxide comes off in patches, don’t buy.

Some of the boxes in which secondary tapes are packaged are of thin cardboard—all part of the economics of marketing white-box tape. If these tapes are piled high in storage, the pressure on boxes at the bottom of the pile may cause them to crumple, and then pressure is exerted on the reels, often causing warpage. Put a pencil through the reel hub to check for this condition. If, when the reel is spun, it turns evenly, fine. If it runs akilter, don’t buy.

I’d like to repeat: let the buyer beware. Consider the following paragraph in a letter from an executive of 3M Company, manufacturers of Scotch brand sound tape: “In answer to your question . . . while there may be an apparent advantage in purchasing so-called ‘white-box’ tapes, either for their price or intended use on inexpensive equipment, they do not carry the guarantee of a reputable manufacturer. These tapes are not of first-line quality and could not pass the rigid quality control checks we give our own nationally advertised Scotch brand magnetic tapes. Broadly speaking, ‘white-box’ tapes are not recommended for such critical performance applications as the recording and playback of stereo music—to say nothing of the possible damage to equipment that could result.” They ought to know.
ONE OF THE easiest and most rewarding activities for tape hobbyists is recording FM broadcasts. Programs are available to suit every taste, and there are continual opportunities to capture on tape everything from Broadway musicals to live opera, from UN debates to once-in-a-lifetime political conventions.

You can make high-quality recordings off the air by following some simple rules. The only right way to record radio programs, in either stereo or mono, is by direct electrical connection between the tuner or receiver and the tape recorder. You can also record the sound portion of TV programs from the earphone jack on the set, but avoid attaching clips across the speaker terminals or volume control, as these can present a dangerous shock hazard for a non-technical person.

In almost all installations, the tuner will connect directly to the amplifier (or preamplifier, if a separate preamplifier and power amplifier are used) and the recorder will take its signals from the amplifier's tape-output jacks. Consult the instruction books of both your recorder and amplifier for details on this.

To an off-the-air recordist, the fact that the playing time of a four-track stereo tape can be doubled by switching the reels and recording in the other direction is not too important—unless, of course, he has one of the recorders that will record in both directions without reel switching. With a non-reversing machine it is important to know how long the tape will run in one direction without interruption, because broadcasters won't stop the music to let you flip the reels. To estimate the playing time of a musical composition, look it up in the Schwann record catalog and figure a maximum of thirty minutes per 12-inch disc side. Some stations note the exact playing time of each selection in their program booklets, but if the information is not available, you may be able to estimate the length of an unfamiliar work by taking the total time scheduled for the concert and subtracting the approximate length of the more familiar selections. The most convenient approach, however, is to obtain a copy of Timetable for Classical Repertoire, a booklet that lists the playing times of over 2,000 compositions. It is available for 25c postpaid from Martel Electronics, 2339 S. Cotner Ave., W. Los Angeles, California 90064 (Attn: Timetable).

If it is evident that you can't fit the whole program on one reel, plan to change reels during a pause between movements. These pauses, particularly in live concerts, will usually be long enough to permit a quick change. Have the fresh tape pre-threaded onto an extra takeup reel; then all you have to do is lift off the reels that are on the recorder, drop the fresh ones on, guide the tape into its travel path, and start the recorder running again. With a little practice, you should be able to complete a reel change in under five seconds. Use the same brand and type of tape for these quick changes or you may find that there is an audible change in frequency response or signal level between reels.

Always load up with more tape than you think you will need. It is easy enough to clip off the blank excess later and use it for something else, but if your tape runs out before the end of the program, nothing can be done about it. You can use thinner tape to give you up to three times the capacity of a reel of standard-play tape. The Tape Timing Chart later in this article makes it possible to estimate the amount of one-direction stereo recording time you can get from a variety of standard tape lengths.
If the program you want to record starts at 8:30, you'd better be on the job by 8:10 at the latest. Turn on all your equipment to give it time to warm up and stabilize. Station tuning and antenna adjustment is quite critical for optimum stereo reception, so tune carefully. During the warm up, use the preceding broadcast for setting the proper recording level and checking the balance between channels. By the time the clock creeps around to 8:28, everything should be warmed up; then check the tuner one last time for on-the-nose tuning.

Once the program is under way, keep an eye on the record-level indicators. If they seem a bit low or high, resist the temptation to make adjustments for a while, because the station engineer may correct the level at the studio. If level adjustments must be made, though, make them very gradually, and try to follow the expressive contours of the music. For instance, if you must raise the level, wait for a crescendo and then slowly turn up the control along with the swell of music. Remember that the best-engineered recordings are those that show the least evidence of technical tampering.

When the music finishes, let the announcer start talking before shutting off the recorder. This avoids shearing off the tail end of the music. You can easily backtrack and erase or edit out the voice later. Live-performance broadcasts, in which the dying echoes of the last note are often inextricably merged with a rising surge of applause while the announcer's voice comes in simultaneously, present a special problem. In such a case there is no moment of silence, no clean break in continuity to serve as a convenient place for a cut-off. The best way to handle this is to allow a few seconds of the applause to come through at normal volume and then quickly fade out both channels together by turning down the record-level control. The trick is to reach zero volume before the announcer's voice comes on.

After your recording session is over and you have made some prize tapes, what can you use them for? As far as the law is concerned, you can use them for anything you see fit, as long as you do not (1) play them before a public gathering, (2) charge admission to listen to them, or (3) copy them for resale purposes. It isn't illegal to record radio programs, but if a musician's union or a record company caught you using their creations to make money, you would certainly be sued, and you would probably lose the case.

---

"You're re-recording your records on tape? What for?"

"LPs are cheap—why bother putting them on tape?"

"You haven't gotten rid of your old 78’s yet? You’re doing what—putting them on tape? You’re nuts!"

The above remarks are typical of many I have heard in the past few years on the subject of transferring phonograph records to tape. Many of the others were along the same lines, reflecting puzzlement, disbelief, contempt, and a variety of other attitudes and feelings. Suffice it to say that I have withstood them all, and continue to dub away.

I have a strong respect for records, be they ancient one-sided 78’s, "orthophonics," early electrics, late electrics, mono LP’s, or stereo LP’s. I believe they should be heard in optimum condition—even though in the case of 78’s the condition I found them...
in was often less than optimum.

And, like millions of others, I too have space problems. A collector with a variety of interests is always pressed for room. My tape recorder is invaluable both for preserving my records and for making it possible to live in my current surroundings comfortably. I have been taping for twelve years—and I expect to continue.

Further, taping records is a highly creative activity, quite satisfying to someone who is not always pleased with what record manufacturers do in packaging their products. Must I accept their couplings of music on a given disc? No, I need not. I can put together whatever selections I want, in the sequence I want them, according to my own superior whims. I find it gratifying to "collect" the past in record form and preserve it for enjoyment down through the coming years. It pleases me to think that I can play my tapes of precious sound material without wearing out the originals, which are safely stored elsewhere.

You may have some or all of the above reasons for dubbing, plus others of your own. And the physical approaches to the subject are also quite varied, determined by what is being preserved, the sequence of the materials, the equipment being used, and the actual recording techniques. What follows is what has worked for me, my friends, and some acquaintances. It is intended as a suggested guide, not as the final word.

One of the first considerations is the relationship of what you want to put on tape and the length of tape required. Through experience I have found that ten 78-rpm records neatly fill a 1,200-foot reel of tape, recorded at 7 1/2 ips. The same size reel accommodates almost twenty 78's when recorded at 3 3/4 ips. More material could be squeezed into the same length by keeping the time between selections to an absolute minimum, but I prefer at least four to six seconds between selections on a reel containing 78's. This strikes me as a natural time interval in playback, and this pause facilitates locating a desired selection, but permits easy correction later without destroying adjoining material. I may, for example, tape a 78 that is not in good condition, hoping that at some point I may find—or borrow—a better copy. If the spacing between selections was very close, dubbing in the subsequent better copy might result in overlap.

With LP's the problem is somewhat different. They vary much more in length than the average three-minute 78 side. There are a number of ways to determine the length of an LP. One, check the album cover to see if the time length is given—and it frequently is on more recent records. Two, play the record through and time it. Three, if the record is of classical music, get a copy of a guide to playing times for standard classical compositions from Martel Electronics, 2339 S. Cotner Ave., W. Los Angeles, Calif. 90064 (Attn.: Timetable). It costs 25c. The guide is reasonably accurate, but does not reflect variations in the playing times caused by the fact that individual conductors may take a few minutes more—or less—to play a given work.

Generally, an 1,800-foot reel recorded at 7 1/2 ips accommodates one full LP nicely on each side. Many major concertos and symphonies run from 25 to 45 minutes. A 25-minute work can easily be dubbed in stereo on one side of a 1,200-foot reel at 7 1/2 ips. That speed, incidentally, was at one time the only one recommended for recording classical music. However, many of today's recorders will do an excellent job at 3 3/4 ips. If you are in doubt as to which speed to use, simply try the slower speed and see how well—or badly—it does the job. If you tape monophonically on two tracks, the program time will be the same. If you tape monophonically on four tracks, you will get twice as much playing time from a tape as you would in stereo, but you may find that the inconvenience in relocating a selection isn't worth the tape saved.

Often it is not possible to record each side of a tape fully. It is a silly "economy" to juggle playing times in order not to waste a few minutes of tape. Accept
TAPE TIMING CHART

<table>
<thead>
<tr>
<th>Length in feet</th>
<th>Recording Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 7/8</td>
</tr>
<tr>
<td>150</td>
<td>16</td>
</tr>
<tr>
<td>225</td>
<td>24</td>
</tr>
<tr>
<td>250</td>
<td>26</td>
</tr>
<tr>
<td>300</td>
<td>32</td>
</tr>
<tr>
<td>350</td>
<td>38</td>
</tr>
<tr>
<td>375</td>
<td>42</td>
</tr>
<tr>
<td>400</td>
<td>44</td>
</tr>
<tr>
<td>450</td>
<td>48</td>
</tr>
<tr>
<td>500</td>
<td>52</td>
</tr>
<tr>
<td>600</td>
<td>1:04</td>
</tr>
<tr>
<td>625</td>
<td>1:07</td>
</tr>
<tr>
<td>850</td>
<td>1:30</td>
</tr>
<tr>
<td>900</td>
<td>1:36</td>
</tr>
<tr>
<td>1200</td>
<td>2:08</td>
</tr>
<tr>
<td>1250</td>
<td>2:12</td>
</tr>
<tr>
<td>1500</td>
<td>2:36</td>
</tr>
<tr>
<td>1700</td>
<td>3:00</td>
</tr>
<tr>
<td>1800</td>
<td>3:12</td>
</tr>
<tr>
<td>2000</td>
<td>3:28</td>
</tr>
<tr>
<td>2300</td>
<td>4:05</td>
</tr>
<tr>
<td>2400</td>
<td>4:16</td>
</tr>
<tr>
<td>2500</td>
<td>4:24</td>
</tr>
<tr>
<td>3000</td>
<td>5:12</td>
</tr>
<tr>
<td>3280</td>
<td>5:49</td>
</tr>
<tr>
<td>3600</td>
<td>6:24</td>
</tr>
<tr>
<td>4800</td>
<td>8:32</td>
</tr>
</tbody>
</table>

Note: The times shown are for a single pass through the recorder in one direction and should be multiplied by 2 for half-track mono or quarter-track stereo, and multiplied by 4 for quarter-track mono.

Later in shorter lengths when I discovered that I could not listen to even a forty-five-minute side without tiring. Others with whom I have discussed the matter of program times have had quite similar reactions.

There should be a certain amount of preparation of the records to be transferred. For optimum results they must be clean. The best way to clean records—shellac or vinyl—is to use warm water and a mild liquid detergent. Scrub each side gently with a soft brush, rinse, and let drip dry.

Warpage of records is a bit harder to handle. In the case of 78's, you might place them between panes of heavy glass, on a flat surface, in a warm spot. The warmth will eventually soften the shellac of the record enough to straighten it under the weight of the glass. An additional weight, such as a few books, placed on the glass may help. But if the record is badly warped, do not put weight other than the glass on it until it has straightened a bit, otherwise it might crack. Vinyl records can be similarly handled.

Cracks are a nuisance in 78's. If they are small, carefully rub a wax crayon into them. If they are quite noticeable, rub crayon into the grooves along the lower side of the crack to deaden the thumping sound the stylus would make in playing the record. Make sure you clean the stylus after playing a crayoned disc. There is little you can do about a crack or a bad scratch in an L.P. Buy a new record or forget about taping it.

I've talked about tape lengths. Now a word about tapes themselves. I strongly recommend the use of standard major brand tapes. Remember, you are recording for the long haul. Poor-quality tape could mean the loss of many hours of time and effort. And possibly, if the original recordings were not saved, the loss of priceless program material. Also, second-rate tapes are hard on recording heads and other parts of a recorder. (Elsewhere in this issue is an article on white-box tape. Read it before you start your taping project.)

A few words about tape types. Acetate tapes are the least expensive and are quite adequate for recording in the 1.5-mil thickness. However, when it comes to thinner tapes and longer lengths, such as 1,800 or 2,400 feet or more, I recommend polyester (Mylar) at somewhat greater cost, but with the advantage of greater strength and resistance to adverse climatic conditions. Polyester tapes are not as likely to break at the ends, nor are they likely to flake off. They are made for long-term storage.

As for equipment, this, again, is largely a personal matter. Some of you already have equipment that will do a nice job; others may consider buying a whole new setup. It is possible to record from a por-
table or console phonograph into a tape recorder by connecting a patch cord to the speaker leads of the phonograph. You will then be able to control tone, volume, balance, and so forth from the playback source. This will enable you to compensate for variations in the program material—as, for example, in 78-rpm records, to boost bass or treble notes, cut excessive bass, boost volume, and mask surface noise as needed.

You should be sure to disconnect the leads from the speaker as soon as you are finished to avoid any chance of short circuiting them and possibly damaging the phonograph amplifier. In addition, recording from the speaker terminals in a so-called a.c./d.c. set can be a dangerous process. The fact that these sets may have one side of the speaker lead connected directly to the a.c. line can turn your tape recorder into a shock hazard if not a death trap. It’s best to have the wiring checked by a competent electronics man to be sure that you won’t run into trouble.

For those owning a component hi-fi amplifier or receiver, recording from the tape output into the recorder is the ideal technique. For especially noisy records, it’s sometimes preferable to tape from the speaker terminals in order to make use of the amplifier’s tone controls and filters.

The record-player is a vital link in the recording chain. The unit I use permits varying the speed a bit faster or slower; this is ideal when taping old 78’s, which often are not actually 78’s (they may have been recorded at speeds anywhere from 75 to 83 rpm). Many of today’s high-quality stereo cartridges have interchangeable plug-in styli, and you should use a 2.5- to 3-mil diamond stylus to get the most sound out of 78’s. A turntable equipped with a cueing lever for lifting or setting down the tone arm gently is a boon when working with short segments such as are found on 78-rpm records. However, your existing equipment may be perfectly adequate, particularly if you like the “feel” of it.

The importance of the tape recorder is quite obvious. The machine you now have may be excellent for dubbing, but if you are contemplating buying a new recorder for taping records (as well as other purposes), make sure it has some sort of locking pause control to permit stopping the instrument without taking it out of the recording mode. This is almost a necessity when transferring short-play programs, such as 78-rpm records. And it is also especially useful in recording radio programs because it enables you to achieve with ease the split-second timing required to cut out commercial interruptions. And in many other kinds of recording the pause control will make your work much easier.

The modus operandi of recording, is, again, a personal matter, and depends a lot on the kind of equipment you have. I have worked with several different setups in the past, and I find it’s largely a matter of getting used to a given group of components. Good results are possible with less than top-notch equipment once you get the feel of handling it.

After loading the recorder with tape, and the player with a record, do some preliminary taping to get the controls properly set. Note which levels on the recorder’s meter(s) produce the best taped sound. Sometimes recording so that the meter needle rarely dips into the red is best. With other recorders the meter needles can go well into the red area on peaks without causing distortion. When taping 78’s you may have to readjust the recording-level controls between records for an even-sounding tape. This is especially true with pre-electric discs where the sound level on the record not only varies from brand to brand, but also within a company’s own products.

It may seem odd, but your records may sound somewhat better—or worse—when transferred to tape, depending on the frequency-response characteristics of your recorder. Of course, a “perfect” recorder will exactly duplicate the sound of the record, but the average recorder may boost or cut the highs or lows, which may slightly improve or degrade the sound of the dubbed record. Some 78-rpm records played on a modern turntable may sound “thin,” or lacking in “body.” Assuming that you are using a stylus of the proper size, this can result from inadequate tracking force (needle pressure) or the fact that the tonal “ equalization” applied during recording is much different from today’s standard. To solve the first problem, adjust the tone arm for greater pressure or temporarily tape a coin at the end of the pickup arm to get extra force. The second problem you will simply have to live with.

In operating the equipment, determine the best way to get the particular time-spacing you want. I start a record from the outer groove and count off the seconds to the beginning of the music. I then start it again, and, after estimating three seconds before the music starts, start the tape moving. When the record ends, I allow two or three seconds more before stopping the recorder. You may want a shorter break, or perhaps a longer silence between selections.

If you find that your turntable produces clicks or annoying electronic blips of sound between selections, have it serviced to eliminate the noises. In many cases the noise may simply be the result of shaky lifting of the tone arm at the end of the record. Another technique is to start fading out the sound using the record-level control right at the point at
which the music ends. This has the additional advantage that surface noise is reduced during the intervals between selections.

It's easy to find a given selection on a reel of tape by using your recorder's digital tape counter. Set the counter to zero before you record, and as you catalog the selections you are taping jot down the counter number at the beginning of each selection. When you play the tape back, reset the counter at zero, and you should find that the numbers line up pretty well with your notations. However, some counters tend to slip a little when you are winding or rewinding, and if you do this very much during the recording process, simply do your dubbing and then after everything is finished, play the tape through and make your digital-counter notes.

After dubbing a tape you should label it for easy relocation of its contents. At your local stationer's you will find a variety of suitable self-stick labels. One useful type measures $\frac{9}{16}$ of an inch by $\frac{3}{4}$ inches, which provides enough room to type in a general heading for the contents of one or both sides of the tape. This label peels off a master sheet and is merely pressed onto the edge of the tape box. Some recordists merely number their tape boxes—and list the complete contents in a separate catalog.

I splice several feet of leader tape to the beginning and end of each dubbed tape. The leader prevents torn ends and also provides an area on which you can identify the tape by writing in a title. And let me caution you that it is not enough simply to label the box; to prevent misfiling, the reel itself must also contain some identification relating it to the box. Trying to locate a misboxed tape in a large collection is like trying to track down the last echo of the lost chord.

A brief introduction to TAPE EDITING

By Harvey Fondiller

An essential part of the tape art is editing. As with a motion picture or portfolio of photographs, the effect of the final product is enhanced by judicious rearrangement and selection of content. Editing enables you to shape the raw material. You can excise the commercials from musical programs recorded off the air, or add music and narration to documentary tapes by splicing in additional segments. Try to make each tape a work of art—or at least a pleasant listening experience for your friends.

Make certain that all tapes you intend to edit are recorded in one direction only. To edit a four-track stereo tape, it is necessary to re-record each set of tracks on a single-direction tape, edit this tape, then re-record it on a four-track stereo tape. (You needn't follow this procedure if you don't mind losing the program material on one set of tracks, of course.)

Here's what you will need:

- A splicer—a device that holds two pieces of tape in the correct position to be trimmed and joined together. There are perhaps a dozen different types on the market. Professionals prefer to use a tape-splicing block and a single-edged razor blade. Audiophiles usually find a splicer with built-in cutting and trimming blades easier to use.
- Splicing tape—a polyester material with a special non-oozing adhesive.
- Leader tape—colored tape that is spliced to the beginning and end—or between segments—of a reel of tape to provide protection or identification of the recorded material.

There are two aspects of tape editing: the
mechanical and the creative. The mechanics are simple; splicing technique can be learned in a few minutes. The creative aspect, however, could be studied for a lifetime. Creative editing is the master key that enables talented individuals to produce a variety of results from the same raw material—in this case, lengths of recorded tape.

A creative tape editor can produce an artistic entity from a series of unrelated sounds—a sort of audio collage. (A film editor performs a similar function by assembling seemingly unrelated film clips.) By themselves, the pieces may appear meaningless, but spliced end to end they comprise a coherent whole. Each piece of tape, like every shot in a movie, is a link in a dynamic chain.

Tape can be spliced even more easily than movie film. The editing process makes possible both the selection of relevant material and control of how it is ordered—in effect, artistic freedom to produce a composite embodying the desired effect.

Audio tapes broadcast by the networks often appear to be—and are—patchworks of various segments. Here an announcer’s fluff has been removed; there one sound effect has replaced another. The objective is audio perfection, the strategy is editing, and the tactics necessarily include a formidable weapon—the splice.

A good splice is the sine qua non of tape editing. It must produce neither noise nor any interruption of the program material. The tape ends are cut at a 45-degree angle because square ends may produce noise. The ends must be precisely aligned—otherwise pitch fluctuations could result when a splice passes the recorder’s playback head.

A tape splicer should be used, but if one is not available, scissors or a razor blade can do the job. Hold the tape segments parallel, with the two ends overlapping, then make a 45-degree cut at the desired point. (This procedure makes it possible to splice the ends without a gap between them, since the cutting angle is the same for both.) Apply the splicing tape parallel to the cutting angle, then trim off the excess tape, cutting ever so slightly into the edges of the recording tape. This eliminates the possibility of splicing-tape adhesive sticking to the leads when the tape is played back.

The playback head in most non-professional recorders is enclosed by a protective cover. This makes it difficult to ascertain the exact point on the tape where a cut should be made. If possible, remove the cover; otherwise find a convenient point, such as one of the tape guides, to use as a marking spot. Measure the distance between that point and the playback head and then mark the same distance on to your splicer. The idea is that with the mark on the tape lined up with the mark on the splicer, the tape will be cut at just the point originally lined up with the head. With professional recorders, it is possible to move the tape back and forth by hand until it is at the desired position for cutting.

Editing invariably improves a voice track, but if you want to “clean up” a person’s speech, don’t be an extremist. If you eliminate every cough, stammer, and slip of the tongue, you are likely to end up with a soundtrack that sounds unnatural.

When you’re editing, be especially conscious of background sounds. Cutting out a piece of tape may produce an abrupt change of background sound at the splice, making the excision all too evident. Several years ago, I found myself in a predicament while editing tapes for NBC Radio’s Monitor. The subject was Haiti’s military forces, which I discussed with a U. S. Marine officer who trained them. A military band played as we talked. Midway in the interview, my sleeve touched the edge of the recorder’s supply reel, so a few words—as well as about a second of band music—were not recorded. An hour of intensive effort was required to edit the tape so that the officer’s condensed remarks still made sense and the music sounded continuous.

It is possible to “edit” tapes in a rough way without a splicer, provided you have a second recorder. Place one end of a patch cord into the output jack of recorder A and insert the other end in the input jack of recorder B. To transfer portions of a tape, play recorder A until you hear the part that you want to re-record. Press the pause button, start recorder B, then release the pause button. When the re-recorded portion has been completed, stop both machines. Repeat the process for subsequent segments. The result, on recorder B, is an “edited” re-recorded tape.

The faster the recording speed, the easier it is to edit tape, since a given sound will take up more space on the tape. Even at the usual home recording speed of 7½ ips, however, it is difficult to split musical phrases or cut between notes unless you’re an expert. The aural result of most such attempts offends even untutored ears.

Tape recordings aren’t accepted as evidence in law courts—they’re too easy to fake—but they could prove beyond a reasonable doubt that you have mastered the art of editing. Are you ready to face the music?
Anyone who shops for a tape recorder soon learns that, as a general rule, the higher the cost of the machine, the less likely it is to come with microphones. Further, except for extremely inexpensive machines, when microphones are included, they are almost never of high enough quality to match the recorder’s capabilities completely. This is easily explained: high-quality microphones are expensive, and the decision of which is the “best” type depends on the intended use. Therefore, it would be foolish for a manufacturer to put any considerable portion of the cost of his recorder into supplying good microphones of one type, when a potential customer might need an entirely different kind of mike.

This means that the choice of microphones is left to the user. Unfortunately, however, while professional recordists are familiar with the considerations that go into judging proper microphone selection for a given purpose, the average purchaser of a recorder is not. Having mastered the jargon pertinent to other components, he finds himself confronted with a bewildering array of new terms when it comes to microphones: “cardioid,” “volts/microbar,” “low-Z,” and so forth. However, when approached systematically and logically, the choice of a proper microphone is not as difficult as it may appear at first glance.

Unhappily, the first thing that most of us have to think about is cost. While there is a general correlation between quality and price, in shopping for microphones be sure that what you are considering is the actual cost to the buyer and not an artificially high “list price.” For example, I find one popular microphone from a reputable manufacturer “listed” at nearly $85, but it is easily available for less than $50. The best way to avoid being misled by an inflated list price is to check it against that given in the catalogs of electronic parts houses (Allied Radio, Lafayette Electronics, Radio Shack, and so forth).

Having avoided this pitfall, the audiophile must make at least a preliminary decision on the uses to which he intends to put his microphones before deciding how much he will have to spend for them. Strict price limits cannot be provided, but perhaps the following guide will be helpful:

1. For dictation and simple documentation of intelligible speech, where the recorder will be operated at 33 1/3 ips or slower, a microphone with restricted frequency response (about 100 to 6,000 Hz) will suffice. Most crystal and ceramic microphones are in this category and their general price range is $6 to $15 each. Microphones that sell for less than this are likely to be worse than those that are supplied with low- and medium-priced recorders.

2. Most audiophiles should probably consider microphones in the $25 to $60 category. While this is a wide price range, considerations other than cost will help narrow the field, and this is the general price range for good “public-address” microphones. Here you can expect wider and smoother frequency response, adequate for very realistic speech recording and, at the higher-price end, good music recording as well. I have made broadcast-quality organ recordings (including an audible 16-Hz pedal note!) using a popular $60 microphone. From reputable manufacturers, an otherwise unspecified fre-
frequency-response claim is likely to be within a tolerance of approximately ±5 or 6 dB. Dynamic microphones dominate the middle-price category, even though they are available at all price and quality levels.

3. Above about $60 per microphone, you are in the range of professional or “broadcast” equipment. Highest-quality music recordings are almost invariably made with “condenser” or “capacitor” microphones, whose prices usually begin at about $100. Ribbon microphones are also usually limited to the expensive class. Only audiophiles who own studio-quality tape machines are likely to derive sufficient benefit from such microphones to justify their cost.

Knowing, in general, what to expect from microphones in various price categories, the audiophile can now turn his attention to specifics of performance. The most technical factor to be considered in selecting a microphone, and one of the most important, is its rated impedance. There are three “standard” impedance ranges: (1) 50- to 100-ohm microphones are classified as low impedance (lo-Z); (2) 150 to 250 ohms is, technically, medium-Z, but for all practical purposes the audiophile should consider such microphones also as low impedance; (3) high-impedance (hi-Z) microphones usually have a nominal value of 50,000 ohms, though a few as low as 10,000 ohms are classified as hi-Z. Thus, “lo” vs. “hi” impedance becomes the audiophile’s choice. (Note: there are a few microphones available with non-standard impedances—for instance, 3,000 ohms. These are often designed to be used with specific recorders whose input circuitry has been specially tailored to match them. Before buying such a non-standard mike, you should query the manufacturers of both the microphone and of your recorder.)

The choice between hi-Z and lo-Z microphones has little to do with the quality of the microphone per se, but depends instead on the length of cable required between the microphone and the recorder. With cables less than 15 to 20 feet long, hi-Z microphones are perfectly adequate, and on all but genuinely professional recorders they can be directly connected to the recorder. For recording school orchestras and plays, a daughter’s piano recital, or speakers in a large convention room where the recorder can’t be placed close to the lectern, cables longer than 20 feet will be required, and here lo-Z microphones, usually with matching transformers, are mandatory. If in doubt, an audiophile is best advised to select microphones which offer switchable impedance options, as do many of the units available in the middle-price category.

To explain why the microphone cable should play such a critical role in selecting hi-Z or lo-Z microphones, a brief digression is necessary. The input stage of a recorder’s microphone preamplifier is almost invariably what is called a “single-ended” or “unbalanced” circuit. This is simply to say that it “wants” to be fed with single-conductor shielded cable, comparable to that which audiophiles use in hooking up hi-fi equipment. Secondly, when the microphone is connected, the input stage wants to “see” (looking at the microphone through the length of its cable) a high impedance (for example, 50,000 ohms). Both of these requirements can be met by using a hi-Z microphone and single conductor shielded cable, which can thus be directly connected to the input stage, typically through one of the three kinds of plugs shown in Figure 1.

Long cables, however, spell trouble for this simple arrangement. In the first place, the higher the impedance of a circuit, the more likely it is to pick up hum. Since the output signal of a microphone is normally extremely small (less than that of a magnetic phono cartridge), an overly long cable will almost inevitably pick up enough hum in a high-impedance circuit to be distinctly annoying. In the second place, any shielded cable acts like a small capacitor, whose value increases with its length. With high-impedance circuits, not many feet of cable are required before the high audible frequencies begin to be bypassed to ground by this unwanted “capacitor,” and thus they never reach the input circuit of the recorder.

Lo-Z microphones and cables reduce both of these problems, and to make them even less susceptible to hum, they are invariably run as “balanced” lines—that is to say, there are two conductors within the shielded cable, terminating in the kind of plug
shown in Figure 2. But lo-Z “balanced” lines are not compatible with a hi-Z “unbalanced” input, and for matching purposes a “microphone line transformer” is used, connected at the recorder (not at the microphone) end of the cable. Professional recorders whose microphone-input jacks match the connector shown in Figure 2 already have the required transformer built in; for lo-Z operation most audiophiles will have to buy special cable transformers, which cost between $10 and $12 each.

If you already have a good high-impedance microphone and a tape recorder with a high input impedance and you want to use extra cable lengths between them, the job can be done by using an in-line matching transformer at the output of the microphone (which steps down the microphone to a low impedance suitable for long cables) and then using another transformer at the recorder to step up the impedance to the required high value. However, considering the relatively high cost of good transformers, it might be wiser to invest in new microphones with the proper impedances.

Having looked into the matters of wide, smooth frequency response, and having resolved the question of microphone impedance, the next basic choice concerns the directional characteristics desired. There are three basic pick-up patterns from which to select: omnidirectional (or nondirectional); bidirectional (or figure eight); and unidirectional (or cardioid). Bidirectional microphones are rare. Their primary use is in studio interview shows, where two guests sit on opposite sides of a table, sharing the same mike, or in making studio recordings of two-instrument music, where background noise is not a consideration. The rather sharp figure-eight pick-up pattern (see Figure 3) tends to make bidirectional microphones difficult for the average audiophile to use, so his normal choice is the omnidirectional or the cardioid.

Where several speakers or performers must share a single microphone, an omnidirectional type is the easiest to position properly. In theory, as the name suggests, a nondirectional microphone has a spherical pick-up pattern, being equally sensitive to sounds coming from any direction. Actually, at high frequencies, such microphones tend to be more sensitive to sounds coming from the front (see Figure 4), but for recording a small group of people around a table (or an unaccompanied soloist, string quartet, and so forth), the easiest placement will be achieved with omnidirectional pickups. The same consideration applies where it is necessary to cover a wide stage with the smallest possible number of microphones. Against these advantages, however, must be balanced a basic difference between a microphone and the human ear.

The human hearing mechanism is, roughly, omnidirectional in its pick-up pattern, but nature’s microphones have a built-in feature which the “ears” of a tape recorder do not: selective attention. Even across a crowded room, with conversations going on all around one, it is usually possible to focus on the words of a desired conversation, ignoring all others as so much extraneous noise. Microphones do not have this ability, and omnidirectional types will pick up unwanted as well as wanted sounds from any direction. Thus, if one is recording a school glee club, orchestra, or play, for example, and omnidirectional mikes are placed toward the front edge of the platform, they will pick up considerable audience noise—coughs, program rustlings, and seat squirmings. Or, at a cocktail party, the voice of a slightly boisterous guest will frequently drown out that of the desired speaker if the latter is slightly farther away and speaking more moderately.

Thus, to help the recordist discriminate wanted from unwanted sounds, the unidirectional or cardioid microphone was developed. While tending to become less and less directional at low frequencies, at middle and high frequencies cardioids have the roughly hemispheric, almost heart-shaped, pick-up pattern shown in Figure 5. (“Cardioid,” like “cardiac,” comes from the Greek kardia, meaning “heart.”) They reject a significant amount of sound from behind the microphone, while giving a relatively wide frontal coverage. Special techniques can be employed to narrow the pick-up angle further, ultimately resulting in the highly focused “shotgun” microphones often used to pick out questions from an audience or the quarterback’s signals on televised football games.

Used for stereo recording, cardioids demand some
care in placement, for just as they can eliminate audience noise, they will also eliminate a performer who is far enough off axis from the microphone. To cover a wide angle it is sometimes necessary to pull a pair of cardioid mikes well back from the performers, resulting in a rather "hollow" sound which lacks presence. On the other hand, overly close positioning with unidirectional microphones may result both in eliminating pick-up of the natural reverberation of the hall and, in stereo, an exaggerated separation.

Nevertheless, for general recording of speech and music, the cardioid probably has an edge in usefulness over the omnidirectional microphone. A person naturally tends to aim a microphone (even an "omni") in the direction of the desired sound source, and it is a tremendous advantage to be able to eliminate some of the unwanted noise from the rear. Since learning to position unidirectional microphones properly requires some practice, however, the recordist must make his decision between the two types for himself, bearing in mind that for good stereo recording he will have to use slightly less physical separation between mikes (to avoid a "hole in the middle") if he selects cardioids, which results in a slightly narrower total range of coverage. The polar-pattern pick-up diagrams for various frequencies supplied by reputable manufacturers will frequently help one make the choice.

By this time the range of possibilities has been narrowed very considerably—probably to three or four microphones at the average dealer's. Obviously the best further tests would involve actually using the contemplated alternative units in normal recording circumstances. However, even in the showroom there are a couple of short but informative performance tests you can make. To make these evaluations it is important to use either your own recorder or its exact equivalent. Further, if lo-Z operation is contemplated, even though the cable run here will be very short, it is important that the transformer be installed, for some microphones which have adequate output in hi-Z operation fail to generate a strong enough signal for a particular recorder when switched to lo-Z, even with the transformer.

To check the characteristics of two microphones against each other, place them side by side on a table and connect each to a different channel of the recorder. Then, have a friend (or the dealer) stand 10 to 15 feet from the two microphones and begin to talk at a normal speaking level while you adjust the gain on the recorder until the indicators show peaks of zero VU. Then have the friend rattle a ring of keys vigorously, walking slowly in an arc around the microphones, keeping at a constant distance from them. Finally, reduce the record level and have the friend speak normally into the microphone, head on, from a distance of 3 to 4 feet. The tape should now be rewound and played back, one channel at a time, through the very best amplifier and speaker system in the showroom. Here's what to look for:

1. By turning up the record level high enough to get full-scale indication at a greater-than-normal speaking distance, check to see whether or not the microphone in question has a high enough signal output to ensure a "safety margin" before the recorder's own amplifier noise level becomes obtrusive. Since few home recorders possess the very high gain and low noise of professional microphone preamps, it may be necessary to eliminate an otherwise excellent microphone simply because it has inadequate output for your own particular recorder. A typical "normal" output level for a microphone is approximately -35 dB, but except for units made by the same manufacturer, you cannot always be sure that the measurement method used to arrive at that specification was the same. However, a microphone from the same line with a -49 dB rating will be 6 dB "hotter," and will permit turning down the record gain control by this amount while still achieving the same recorded level. This will often eliminate the noise that originates in a less-than-perfect recorder microphone preamp. On the other hand, it may sometimes be necessary to choose a less sensitive microphone (for example, -59 dB) if you intend to record live rock groups often, for in this application the output from a sensitive mike can get high enough to overload the preamplifier stages ahead of the record-level control.

2. Surprisingly, jingling keys produce harmonics as high as those present in live music, and so the ability to record and reproduce this sound naturally is a good index of high-frequency response. By carrying the jingling keys in an arc around the microphones to be tested, you can quickly detect a unit whose off-axis treble pick-up is deficient. There is an analogy here with the importance of good dispersion of the highs from a speaker. A microphone which becomes overly directional at the treble end will alter the tonal balance of an instrument located slightly off to the side in a group of performers.

3. In checking the naturalness of reproduction of a voice at normal recording level and distance, it is necessary to use some other voice than your own, for a person never hears himself as others hear him. Here, in comparing the recorded tracks of the two microphones being tested, you should be especially on the lookout for a somewhat "boomy" reproduction of the male voice (indicative of "peaky" bass response) and for a tendency to over-emphasize sibilants ("she ssellss ssea sshellss . . . etc.").

Having selected the better of two microphones, you can then test it in the same way against a third, and so on. To insure against being misled by a fault in one of the two channels of the recorder, it is a good idea to switch the preferred microphone to the other channel, checking to see that it still sounds the same.

Microphones are the key which opens up the full range of usefulness of the tape recorder, and it's worth spending a little time and thought to come up with the best pair for your own recorder and your own needs.
KEEPING IT CLEAN
MAINTENANCE TIPS FOR YOUR TAPE RECORDER
By Judy Raskin

If you've just bought a tape recorder, chances are that it's working perfectly. And there's no reason why it shouldn't go on reproducing quality sound either—if you operate it properly and invest a little time in cleaning it periodically.

It takes but a few minutes to perform the simple housekeeping chores that keep the machine operating as well as the manufacturer intended, so there's really no reason to allow your tape recorder to deteriorate until it sounds as if it cost $200 less than you paid for it. And I'd recommend a careful reading of the instruction manual that came with your recorder. The manufacturer may have spent thousands of dollars preparing it so that you'd have a better idea of what your machine is all about. It's true that all tape recorders perform the same basic record and playback functions, but each model has its own design characteristics and idiosyncrasies, and knowing what they are is the key to getting the most out of the machine's capabilities.

The major source of "dirt" on a tape recorder is the tape itself. Recording tape consists of oxide particles in a binder laminated onto a base material. But even the best tapes shed some of this oxide during normal play, and if you want to really enjoy your tapes and recorder, periodic cleaning of the tape heads is mandatory. At least once a month (or more often, depending upon use) clean the heads with a cotton swab that has been moistened with alcohol or some other cleaner intended for tape heads or specifically recommended by the manufacturer. But under no circumstances should you use carbon tetrachloride, or any other general-purpose cleaner, as it may damage heads or the rubber or plastic parts adjacent to them.

Gaining access to the tape heads is easy—remove the head cover by lifting it, sliding it, or loosening a few screws, depending on the model you own. Here's where your manual can help if you're uncertain. When I bought my first machine, I kept it going incessantly. The time came when everything sounded terrible, and I went back to the store where I'd bought the machine. "Clean the heads," the salesman advised, and I rushed home to do just that. It did not occur to me then that the head cover was removable, and in cleaning the tape heads that first time I performed contortions that were worthy of an adagio dancer.

The reasons for cleaning the tape heads are clearly not aesthetic. The high-frequency response and, to a lesser extent, the signal output of the heads depend on the intimacy of contact between the oxide coating on the tape and the gap in the head. A buildup of oxide on the playback head thinner than a human hair can cause an audible loss of the highest frequencies. Buildup of oxide can also cause tape squeal and speed irregularities that result from the slippage that occurs in the system driving the tape past the head. If
your machine has pressure pads, clean them the same way and at the same time as the heads. This may help eliminate squeal. Glaze on the pads causes a loss of resiliency; if they harden and seem to have no more “give,” it’s time to get replacements. Check an equipment catalog or with the manufacturer of your unit for the proper pads for your machine.

Tape-head demagnetizing should be done at least as often as you clean your machine. Since tape recording is a magnetic process, any spurious or unwanted magnetism shows up as noise mixed with the output signal. A major cause of unwanted magnetic fields is the effect of the bias current that is present in the record head. This current tends to leave a residual magnetic field on the heads if steps are not taken to prevent it. (Some tape recorders have special circuitry built in to help prevent the buildup of head magnetism.) Other possible sources of magnetism may be the tape itself or electromagnetic radiation from other parts of the recorder.

A tape-head demagnetizer will get rid of such noise, but before you use it, it’s a good idea to put cellophane tape over the part that’s brought in contact with the tape heads to prevent scratching them. Then, turn it on or plug it in, depending on the model, and bring the demagnetizer into contact with the heads, tape guides, posts, capstan—anything that may have built up a magnetic field. Move it over each part for a couple of seconds and then, with the demagnetizer still on, move it away a few feet and turn it off. If you turn the demagnetizer off too close to the machine you may wind up with more residual magnetism than you started with. There is a wide variety of demagnetizers available for under $5, and they all work equally well. However, if the tape slot on your machine is very narrow, you may need one with narrow pole pieces.

In respect to general servicing, don’t as a rule, oil your recorder unless you’ve got a pretty good reason (does the idler squeak?). Use a needlepoint dispenser and the right kind of oil for the job—here again the instruction manual will be helpful—but at all costs, avoid getting oil on rubber parts or drive belts. If some does get where it shouldn’t, get it off fast. Also be very sparing with the oil, because rotating parts may spray the oil onto areas where it should not go.

If you have a tube-type machine and it appears to be noisy or makes staticy sounds when recording or playing back, it may be that a tube has become noisy (microphonic). You can check by lightly tapping each tube with the end of a pencil and noting which one seems to cause most of the rumpus. (It’s most likely a preamplifier tube such as the 12AX7/ECC83.) Such a fault is not likely to show up in a tube tester, especially of the drug-store variety.

When you do your tube testing, pay particular attention to the power-output (if your machine has them), bias-oscillator, and rectifier tubes (your manual will help you identify them). If you have to lift out the transport mechanism to get to the tubes, be extra careful to avoid bending the multi-bladed fan that is frequently attached to the rear shaft of the motor. If the fan blades are bent, they will cause a very distracting mechanical noise every time you turn on the recorder.

There isn’t much you yourself can do to investigate trouble in a transistorized tape recorder; take it to a reliable serviceman. The manufacturer’s warrantee station is usually the best bet. Read the manufacturer’s warrantee first, though: repair or replacement of a defective part, providing it is made during the term of the warrantee or under conditions set down by the manufacturer, may cost little or nothing. This is true for tube-type machines too.

One more source of trouble may be your microphone. If it develops a steady or intermittent hum, or if it stops working altogether, odds are that the problem is in the cable rather than in some microphone element. Check the cable at the point where it enters the plug that fits into the tape-recorder jack. You may be able to spot a bad connection or a break just by simple visual examination. A few minutes with a soldering iron should cure the trouble.

There are other problems that may pop up, although it is unlikely they will happen very often, it all at. If you think you detect inconsistency in the speed at which the tape is being driven, you can use a tape strobe to get the answer, but you’ll probably need a serviceman to make any necessary repairs.

Give your tapes their share of tender loving care too, because even the best machine can’t do much for an ill-kept tape. Store tapes at least two feet away from any sources of heat, or magnetic fields such as are found near miniature high-intensity lamps or loudspeakers. You shouldn’t experience any difficulty if you keep your tapes in the same place all the time, where temperature and humidity are relatively constant. I don’t know what would happen if you took your tapes to the Arctic tundra and an Amazon rain forest in the same week, but the manufacturers advise against it, and they know their business. And get in the habit of storing your tapes in individual boxes, standing up, to avoid warping the reels or damaging the edges of the tape.

As you can see, keeping your tape recorder in good shape really isn’t complicated or time consuming. Give it about ten minutes a month; the amount of pleasure you get from a smoothly running machine will be worth many times that.
by Burt Hines

standard, n. That which is set up and established by authority as a rule for the measure of quantity, weight, extent, value or quality.

Nature is, as a rule, prodigal but rather sloppy, and it sometimes seems that a good part of man's business here on earth is to impose enough standard order on her chaos that he can profit from her generosity. One of Adam's first duties in the Garden of Eden was to put names to the contents thereof, and man has continued his example ever since, naming, defining, and ordering his way through history. Thus, a pound is a pound, an inch an inch, and a gallon a gallon from Maine to California. Standardization is, if anything, even more important in our galloping technology: bolts must fit nuts, bulbs must fit light sockets, and 60-hertz current must be just that wherever it appears. Practically every new manufactured product has had to face up to this as soon as it emerged from the laboratory, and the tape recorder was no exception. Although standards benefit the consumer, he is very seldom made aware of them; it is usually enough that things work as they should. At least a nodding acquaintance with standards, however, is useful in understanding how things work, why they sometimes do not, and in appreciating the enormous complexity of the mechanical and electrical servants we take so much for granted. With these purposes in mind, author Burt Hines examines below the standards now in force which guide the manufacture of tape recorders in this country. —Editor

The tape-recording standard issued back in 1953 by the NAB (National Association of Broadcasters) fast became antiquated as tape-recording technology spawned new developments. In 1965, therefore, the NAB issued a revised set of standards that attempted to catch up with the industry's transitions to slower speeds, quarter-track format, stereo, thinner tapes, and the overall improved technology. Although the NAB standards are basically intended for professional machines in professional use, they are significant for the home tape enthusiast in at least four ways:

1. Home machines must conform to professional equalization standards if interchangeability of tapes among machines is to be assured. When equalization standards are followed, commercial prerecorded tapes will play back "flat" on home machines, and tape hobbyists can exchange tapes without encountering difficulties caused by frequency-response differences.

2. Specification of the widths of recorded tracks and of islands (spacing between tracks) assures interchangeability with respect to format. If the width and spacing of tracks on a prerecorded tape (or on a tape a friend has made with his machine) do not correspond to the width and spacing of the gaps of the stereo head in your machine, you'll find your machine playing half a track—or a track and a half.

3. Published high-quality performance standards tend to spur engineers to design such performance into home machines. If a home machine claims to be "high-fidelity" or of professional quality, it can hardly do less than meet the NAB standards. Previously, home machines had an out, because the 1953 standards referred only to the faster speeds (30 and 15 ips) and not to those generally available in home machines (7 1/2 and 3 3/4 ips).

4. The new standards help to assure that professional master tapes, whether ultimately converted into phono discs or into prerecorded tapes, are made on high-grade machines. Therefore, the recorded product eventually reaching the consumer has a better chance of being of high quality.

Now let us examine the specifics in the NAB standards pertaining to such matters as tape speeds, equalization, track format, and so forth.

- Tape Speeds. Whereas the 1953 standards applied only to speeds of 15 and 30 ips (seldom encountered in home machines), the latest standards apply to 15, 7 1/2, and 3 3/4 ips, the latter two popular in home use. In fact, the prevailing home-recorder speed of 7 1/2 ips is also designated by NAB as the "preferred" professional speed. Speeds of 3 3/4 and 15 ips are designated as "supplementary." The NAB also has something to say about 1 7/8 ips, although this is indicated as being for use only in "special-purpose limited-performance systems."

Required speed accuracy is ±0.2 per cent throughout the reel. (An error of 0.2 per cent corresponds...
to 7.2 seconds in an hour of recorded material.)

- Playback Equalization. For a long period before 1965 it was a frequent—but not universal—practice for home tape machines to use the 15-ips playback equalization (1953 standard) for recording at the 7½ ips speed. The 1965 standards make this official. The playback characteristic (in other words, the electrical equalization plus the specific playback-head characteristic) for 15 and 7½ ips is shown in Figure 1. Referenced to 0 dB at 400 Hz, there is about 15 dB of bass boost at 50 Hz and 17 dB of treble cut at 15,000 Hz.

A second playback-equalization characteristic is given for 3½ and 1½ ips tapes. This is also shown in Figure 1. The low-frequency equalization characteristic is the same as that for the higher speeds, but there is about 5 dB less treble cut at high frequencies. This is intended to help compensate for the inherent loss of highs that troubles tape recorders at the slower speeds. A word about “characteristic”: it must be understood that the playback characteristic in Figure 1 is not simply an equalization curve produced entirely by an electronic circuit in the tape-playback amplifier such as is used, for example, in the magnetic-phono preamplifier section of amplifiers. Rather, the tape-playback equalization is the joint product of the electronic circuit and the frequency-response irregularities of a specific playback head. Stated differently, the recorder’s electronic circuits are designed to produce the playback curve shown in Figure 1 by taking into account the performance idiosyncrasies of the particular playback head in the machine.

The NAB standards state that accuracy of the playback characteristic should be measured by playing an appropriate-speed NAB test tape that contains test tones covering the whole audio range. If the machine’s playback characteristic is correct, response will be flat or nearly so as measured by an audio voltmeter connected to the recorder’s output. If a machine is to meet the NAB frequency-response performance standards, it must remain within the permissible deviations from flat response shown in Figure 2 (see next page). At 7½ ips, response should be up no more than 1 dB between 20 and 20,000 Hz; down no more than 1 dB between 100 and 10,000 Hz; and down no more than 3 dB at 30 and 15,000 Hz. The specification is the same for the 15 ips speed, except that response may be down no more than 1 dB at 15,000 Hz. At 3½ ips response may be up no more than 1 dB; down no more than ½ dB between 100 and 7,500 Hz; and down no more than 3 dB at 50 Hz and 4 dB at 10,000 Hz.

- Record-Playback Response. There is no specification for record-playback response of a machine. Instead, the NAB standards state: “The recording equalization of a recorder-reproducer should be adjusted for an overall response which matches as nearly as possible the response of the reproducer from the NAB Standard Test Tape.” Any errors in the playback characteristic are not to be compensated by corresponding errors in the recording characteristic. In other words, a machine should be designed to produce tapes that can be played back flat on any NAB-equalized machine. There should be no attempt, for example, to compensate for a particular machine’s treble playback inadequacies by souping up the treble during recording.

The NAB does provide a specification for permissible deviations from correct recorded response, as shown in Figure 3. At 7½ ips, recorded response should be up no more than 1 dB between 20 and 20,000 Hz; down no more than 1 dB between 30 and 10,000 Hz; and down no more than 2 dB at 15,000 Hz. The specification is a shade tighter at 15 ips, and rather looser at 3½ ips. To measure deviations from correct recorded response, the NAB stipulates the following procedure: (1) measure playback frequency response with an NAB test tape—this serves as a reference; (2) measure the machine’s record-playback response; (3) the difference between the two sets of measurements consists of deviations from correct recorded response. (To illustrate, assume that at 5,000 Hz the response is 2 dB high when playing the test tape and record-playback response is also 2 dB high; recorded response is correct at 5,000 Hz.)

- Tape Dimensions and Format. Although it is generally stated that tape is one-quarter inch or 250 mils (thousandths of an inch) wide, its actual rated width, according to the NAB standards, is 246 mils. And the standards also provide that this width may vary ±2 mils—from 244 to 248 mils. In contrast, the 1953 standards permitted a range of 244-250 mils. The narrower permissible range under the new standards is advantageous: it reduces the chance that the tape will deform or shift (cup or skew) as it passes through guides, with consequent azimuth and head-contact problems.

The 1965 standards contemplate use of tapes with thicknesses of 1½ mils (regular) and 1 mil (extra-play), but ½-mil (double-play) or thinner tapes are in general “not recommended” for professional use.

With the tape moving from left to right and the oxide facing away from the operator, the quarter-track format (stereo or mono) is as shown in Figure 4. From top to bottom the tracks are numbered from 1 through 4. For stereo, tracks 1 and 3, respectively, carry the left and right channels in one direction of tape travel; tracks 4 and 2, respectively, carry the left and right channels in the reverse direction;
tracks 1 and 3 are recorded first; then tracks 4 and 2. For mono, the recording sequence is 1-4-3-2.

For quarter track operation, as shown in Figure 4, each track has a standard width of 43 mils; each blank area (island) between tracks, 24 mils. The four tracks plus three islands must span exactly 244 mils (minimum tape width). Hence, there is a 1-mil margin between the tape edges and the outer edges of tracks 1 and 4 when the tape width is exactly the rated value of 246 mils. Tracks may vary between 39 and 43 mils; islands may correspondingly vary between 24 and 29⅓ mils.

For half-track operation (stereo or mono), as shown in Figure 4, the tracks are numbered 1 and 2.

---

Figure 1. The NAB tape-reproducing characteristic not only results from electronic equalization, but also takes into account the characteristics of the specific playback head being used. There is reduced treble cut at the slower tape speeds to compensate for the normal high-frequency drop-off.

Figure 2. To meet NAB standards, a recorder must be within limited tolerances from flat playback. The playback response is measured with a special test tape of the appropriate speed and track width that has a series of test tones covering the frequency range of 50 to 15,000 Hz.

Figure 3. The recording characteristic must also remain within NAB response limits. A recorder’s equalization should be adjusted to produce tapes that will play back flat on any NAB-equalized machine, and not to make up for the performance inadequacies of a particular unit.
Crosstalk refers to signal leakage between adjacent tape tracks (which on four-track tapes do not have the same program material), whereas channel separation refers to leakage between the right and left channels of a stereo system—either in the electronics or in the tape heads. The NAB standards specify that between 200 and 10,000 Hz the crosstalk level should be at least -60 dB and that channel separation between 100 and 10,000 Hz be at least -40 dB.

- Adjustment of VU-meter Reading. VU meters (or meters claimed to be such) are found in most of today's home machines, perhaps less because they offer an advantage over the electronic-eye tube as a record-level indicator than because of their "professional" appearance and ready adaptability to transistor circuits. Be that as it may, the 1965 NAB standards provide that the meter shall swing to 0 VU when recording a 400-Hz tone at a level that in playback produces the same output as the NAB test tape's Standard Reference Level. Inasmuch as the SRL tone is recorded on the test tape at 8 dB below the level that produces 3 per cent distortion (a level considered an acceptable "ceiling" for tape recording), the indicated setting of the VU meter provides the recordist with about 8 dB of "headroom" before overload. This headroom is needed because the mechanical lag of the meter prevents it from indicating the true magnitude of brief, loud sounds. (Many engineers will argue that 8 dB is not always enough headroom with a VU meter, and rather than debate just what is enough headroom, they prefer an electronic eye, a fast peak-reading meter, or an oscilloscope as a record-level indicator.)

- Standard NAB Test Tapes. Each of the four test tapes (for 15, 7½, 3¾, and 1¾ ips) has five sections: (1) an azimuth tone for head alignment (vital for maintaining treble response); (2) a 400-Hz tone at NAB Standard Reference Level for measuring signal-to-noise ratio and adjusting the VU meter; (3) another 400-Hz tone for crosstalk and separation measurements; (4) a series of signals for testing frequency response; and (5) a 1,000-Hz tone at the NAB Standard Reference Level for measuring signal-to-noise on a weighted basis.

All in all, the 1965 NAB standards reflect great progress in the state of the art and serve as a call for designers of tape machines—professional and home units alike—to reap the fruits of this progress. Furthermore, these standards promote a uniformity of practice that permits interchangeability, so that a tape recorded on one machine can be satisfactorily played on any machine. Though this bugaboo of uniformity no longer appears to plague the reel-to-reel portion of the audio-tape industry, it still remains to be laid to rest in the cartridge portion, and in the video-tape industry as well.
Students at the University of Wisconsin can review their fencing form and style immediately after a match with an assist from the Ampex VR-7100 Videotrainer system

Progress Report on

HOME VIDEO TAPE RECORDERS

By Fred Petras

Two years ago, the home video tape recorder (HVTR) was still quite new and was just beginning to appear in major department stores, large audio stores, and a few specialty shops. Today, you find them not only in these same stores, but in many others, big and small, and by now most readers have been exposed to the concept of "instant home movies" on tape.

But the HVTR scene has not changed in one key respect: the oft-promised $500, or under-$500, video recorder is still not here—and it is not likely to be for some time to come. The problem appears to be a kind of which-comes-first, chicken or egg, proposition. If there were HVTR's available for $500 or less, I'm certain there would be lots of interest, based on what we've all been hearing for the past four years. The fact that prices start at $695 seems to indicate that the industry is bypassing the home video tape recorder market to concentrate on where the money is—the industrial and educational fields. The manufacturers are not to be blamed for this. Profit is the oil that lubricates the ball bearings of economic and technological progress. Ultimately, I'm sure that the manufacturers can produce an HVTR that is priced at the same level as a quality audio recorder, but when that will be, I have no way of knowing.

For the moment, then, the market offers home video tape recorders starting at $695. For those readers who have been holding off, waiting for a lower price, I suggest you wait no longer, but (atten your budget a bit and explore the magical world of video tape recording.

First off, I'd like to ease your fears that the video recorder is for sophisticated users only. Most of today's HVTR's are about as easy to operate as the average stereo tape recorder. Except for a different tape "path," the units both look and operate much like audio recorders. They have fast-forward and
ewind controls, digital counters, gain controls, level meters, and so forth, just like audio recorders. Except when used with a closed-circuit camera, they require no more effort and care to operate than an audio recorder.

There is a variety of equipment on the market, available as components or as complete systems. Some people buy a deck as a starter, then graduate to a full system. Others prefer to start out with the systems approach. Some buy monitor/receiver sets specially designed for use in systems, others prefer to have an existing TV set modified to accommodate a VTR deck.

The variety also includes a range of tape sizes—from quarter-inch to one-inch widths. Most of the quarter-inch tape units operate on the “brute-force” principle; that is, the tape is run past fixed record or playback heads at high speed—from 60 to 120 ips. Sets using half- or one-inch video tape all use the helical-scan, slant-track system in which a rapidly rotating head traces a slanting pattern of information on the tape as it passes by. Of the two approaches, the helical-scan system offers higher quality at this point in VTR development, with potential resolution of 350 lines in the one-inch format for non-broadcast machines, and more than 220 in the half-inch format. So far, horizontal resolution of the quarter-inch models is around 200 lines. Although a high figure indicates a sharper picture, resolution of 200 lines is considered quite satisfactory for non-critical viewing. (The average TV picture received in the home has a resolution ranging from 240 to 320 lines.) But horizontal resolution is only one of many elements in a TV picture and is only a relative guideline. Other important aspects are contrast, brightness, stability, and freedom from interference.

Most of the helical-scan VTR's sold for home use in the past few years have been of the half-inch variety, because the cost of the instruments and the tapes they use is lower than the one-inch format. The cost of an hour's worth of tape in the half-inch format is about $40. An hour's worth of programming on one-inch tape costs about $60. The lowest price for helical-scan video tape programs in the quarter-inch format is about $15 for 37 minutes, as recorded on a recently-introduced Roberts machine. (This unit is also capable of producing a video recording using ordinary low-noise audio tape at a cost of about $7, but the quality is substantially degraded).

The lowest-price HVTR system available at this writing is from Mastercraft Electronics Corp., New York City. Called “Playback,” the system, which is tentatively priced in the $695 to $750 range, consists of a camera with tripod, an 11-inch video monitor, a microphone, and a longitudinal-drive (brute-force) deck running at 90 ips and using quarter-inch tape. It can function as a closed-circuit TV system, with the camera as program source. It can also be used to record from another TV set that has undergone the required modification to connect with Playback. The system is also available with an imported TV receiver, designed to work with the system, for about $80 additional. Playback offers approximately 15 minutes of play or record time per tape side, using 7,800 feet of tape on a 10½-inch reel. The company is planning a second model that will run at 60 ips for a full hour of program material on one reel of tape. This will be followed by a compact system using five-inch reels and offering a half hour of program per tape. Playback uses high quality half-mil audio tape. Picture resolution (horizontal) is claimed to be better than 200 lines.

The next lowest-price VTR currently on the market comes from Sony. Their Model CV2100, a helical-scan record/playback VTR deck, is priced at $795. It replaces—with additional features—a deck originally offered at $695, formerly the lowest price for a helical-scan instrument. The CV2100 uses half-inch video tape. A tape made on this machine is compatible with any other half-inch Sony VTR and also half-inch General Electric units (which are made by Sony). A camera for use with the unit costs $995. An 8-inch receiver/monitor costs $195, and an 18-inch monitor receiver costs $250. Among its features, the deck offers video editing and sound dubbing, which means you can add either a sound track or picture independent of the other. Horizontal resolution is said to be better than 220 lines.

Running close in third place is the Model NV8000 from Panasonic, priced at $800. This half-inch helical-scan deck also offers 220 lines of resolution and has sound dubbing among its features. A camera for the unit costs $300. A monitor that can also be used as a program source for recording off the air is available at $200. The NV8000 was formerly priced at $1,050.

Trying for fourth place in two different categories at $995 are the Roberts Model 1000 and the Ampex Model VR5000, both of which are helical-scan units. The former uses quarter-inch tape, the latter one-inch tape. The Roberts 1000 also doubles as an audio recorder, running at 7½ and 3⅓ ips. As a video unit, it has a horizontal resolution of 200 lines and a signal-to-noise ratio of 40 dB. It provides 37 minutes of program time on a 7-inch, 2,130-foot reel of tape. A TV receiver/monitor is available at $200. A Roberts camera costs $300. The Ampex Model VR5000 offers horizontal resolution of 250 lines. A camera designed
for use with the VR5000 is priced at $600, and a monitor/receiver costs $285. At this writing, the set is the lowest-price one-inch HVTR on the market.

There are several other VTR systems priced under $2,000. Among companies marketing such ensembles are Apeco Video Systems Division, Craig Panorama, Concord Electronics, General Electric, and Shibaden Corp. of America. Additionally, several companies—including those mentioned—are working on other VTR systems to be priced under $2,000.

The cost of color VTR’s is markedly higher. Currently on the consumer market are three instruments priced close to $5,000. Bell & Howell has an entry at $4,700 in deck form. Sony sells a deck at $3,750 which requires a color adaptor at $1,000 and a special monitor at $945. These units can record color programs from auxiliary TV sets. The hurdle of a low-cost color TV camera has not yet been crossed. The lowest-price color TV camera for use with consumer VTR’s comes from Bell & Howell and costs $14,000.

As far as the future is concerned, the next breakthroughs are likely to occur in the area of color. For example, scheduled for introduction in 1969 or 1970 by Arvin Industries, Inc., is a color VTR using cartridges of half-inch tape. According to tentative pricing, the console unit containing recorder and receiver/monitor will sell for “under $1,500.” An hour’s worth of taped color programming would be priced at “a fraction of $60,” company officials stated. The $60 figure was used as a reference point because that is the current overall cost of an hour’s worth of home-moving color film. Another breakthrough is expected from Playtape, Inc. According to Frank Stanton, president, the company will introduce within the next year or so a “dramatic video-cartridge system.”

Those who have resisted buying an HVTR because they have been hoping for a single standardized tape width had better forget about such a standard. The industry is not about to settle on one tape width. Why? For a number of reasons. In the words of Jack Trux, vice president and general manager of tape products for Bell & Howell and chairman of the Electronic Industries Association’s tape-equipment subdivision: “It is not likely that the video tape recorder industry, being in Europe, the United States and Japan, as it is, will get together and arrive at any specific kind of format. First of all, I doubt that the laws of the United States would allow that.” In addition, he commented that industry members with heavy financial commitments to their current formats are not likely to back off from them to endorse another firm’s approach. Further, he said, “We are, unfortunately, at that point in our history where there are more people to be heard from, and we have probably not seen the final expression of the art of making pictures on tape.”

---

**SOME TERMS USED IN HOME VIDEO TAPE RECORDING**

- **Brute Force**: A technique for recording picture and sound on standard quarter-inch recording tape by moving it past a stationary head at high speed.
- **CCTV Camera**: Closed-circuit television camera—a home version of the cameras used in TV studios, this accessory may be wired to your home TV set which, in turn, is wired to your video recorder. CCTV camera prices depend, in part, on the quality of their lenses. A $350 kit, for example, offers a simple low-cost lens suitable for recording in the living room. A $1000 camera might offer a zoom lens and a variety of other features. Lenses and other accessories generally are interchangeable with movie cameras.
- **Color Compatible**: Any video recorder now on the market will record color-TV programs in black and white. Ampex claims that all fast-speed recordings made on its 6000 series will be playable in black and white on tomorrow’s color decks.
- **Helical Scan**: A technique for recording picture and sound on video tape in which a rapidly rotating head within the housing traces a slanting pattern on the tape as it passes by. The tape—usually wider than standard quarter-inch audio tape—is wrapped around a circular head housing in an omega pattern, with the right leg lower than the left. Head-to-tape speed is much higher than is practical with brute-force recording.
- **Slant-Track Recording**: Another name for helical-scan recording.
- **Sync or Synchronization**: The technique for providing a stable TV picture. The TV image must be synchronized both horizontally and vertically to prevent the picture from tearing or rolling. A strong pulse signal is added to the tape to keep the picture framed properly. One of the difficulties in home video tape recording seems to be that of putting a strong vertical and horizontal synchronization signal onto tape. Many home video recorder pictures have a tendency to flicker to the left upon occasion—a relatively minor imperfection.
- **Writing Speed**: Tape-to-record head speed. In the case of stationary record/playback heads, the writing speed is the same as that of tape speed. In the case of helical-scan recording, the writing speed is basically determined by the rate of the revolution of the record/playback head or heads.
- **Video**: Those frequencies having to do with television-picture reception and playback.
# DIRECTORY OF MOST POPULAR, LOW-PRICED

<table>
<thead>
<tr>
<th>PHOTO</th>
<th>VIDEO</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMERICAN PHOTOCOPY EQUIPMENT CO., 2100 West Dempster Street, Evanston, Ill. 60204</td>
<td></td>
</tr>
<tr>
<td>AMPLEX CORP., 2201 Lunt Ave., Elk Grove Village, Ill. 60007</td>
<td></td>
</tr>
<tr>
<td>BELL &amp; HOWELL, 7100 McCormick Rd., Chicago, Ill. 60645</td>
<td></td>
</tr>
<tr>
<td>CONCORD ELECTRONICS CORP., 1935 Armacost Ave., Los Angeles, Calif. 90025</td>
<td></td>
</tr>
<tr>
<td>CRAIG CORP., 2302 E. 15th St., Los Angeles, Calif. 90021</td>
<td></td>
</tr>
<tr>
<td>GENERAL ELECTRIC CCTV Busiess Section, 600 Old Liverpool Rd., Liverpool, N.Y. 13088</td>
<td></td>
</tr>
<tr>
<td>MASNISHITA ELECTRIC CORP. OF AMERICA, 200 Park Ave., N.Y., N.Y. 10017</td>
<td></td>
</tr>
<tr>
<td>PHILIPS BROADCAST EQUIPMENT CORP., PO Box 426, Paramus, N.J. 07652</td>
<td></td>
</tr>
<tr>
<td>REVERE-MINCOM DIV., 3-M CO. 3-M Center, St. Paul, Minn. 55101</td>
<td></td>
</tr>
<tr>
<td>SONY CORP. OF AMERICA, 47-47 Van Dam Street, Long Island City, N.Y. 11101</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Number of Heads</th>
<th>Tape Width (in.)</th>
<th>Tape Speed (in/s)</th>
<th>Record/Playback Time (min)</th>
<th>Input (V)</th>
<th>Level (V)</th>
<th>Output (V)</th>
<th>Level (V)</th>
<th>Response (MHz)</th>
<th>Horiz. Resolution (lines)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMERICAN PHOTOCOPY EQUIPMENT CO.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMPLEX CORP.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BELL &amp; HOWELL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONCORD ELECTRONICS CORP.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRAIG CORP.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GENERAL ELECTRIC CCTV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MASNISHITA ELECTRIC CORP. OF AMERICA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHILIPS BROADCAST EQUIPMENT CORP.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REVERE-MINCOM DIV., 3-M CO.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SONY CORP. OF AMERICA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- recorder, monitor as package; b. camera; c. monitor; d. tripod; e. audio mixer; f. video switcher; g. microphone; i. v.f.f. converter; j. remote control; k. connector panel; a. mixer/lexer; l. superimposer; s. special-effects generator; m. sync generator; o. two audio
### VIDEO TAPE RECORDERS

#### AUDIO

<table>
<thead>
<tr>
<th>Micro (dB)</th>
<th>Line (dB)</th>
<th>Output (dB)</th>
<th>Response (Hz)</th>
<th>Dimensions (in)</th>
<th>Weight (lb)</th>
<th>Price ($)</th>
<th>Special Video</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>-60</td>
<td>10k</td>
<td>-14</td>
<td>10k</td>
<td>-14</td>
<td>60-10,000</td>
<td>18%</td>
<td>10%</td>
<td>15%/14</td>
</tr>
<tr>
<td>1.8mV</td>
<td>80k</td>
<td>-14</td>
<td>96mV</td>
<td>47k</td>
<td>6dBm</td>
<td>90-9,000</td>
<td>23¾ 18¼ 12½</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>50k</td>
<td>.5V</td>
<td>8dBm</td>
<td>6dBm</td>
<td>-</td>
<td>90-9,000</td>
<td>29 15 18</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td></td>
<td>29 15 18</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td></td>
<td>45 44¾ 23½</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td></td>
<td>29¾ 13¼ 20½</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td></td>
<td>29¾ 13¼ 20½</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td></td>
<td>34 15 19</td>
<td>140</td>
</tr>
</tbody>
</table>

| .2mV      | 200       | -           | 4dBm          | 600             | 80-10,000   | 19 11¼ 13½  | 65     | 1200  | k,l,m,n  |
| 1mV       | 1k        | 1V          | 1meg          | 600             | 17 10 16½   | 52        | 1150   |         |         |
|           | 1k        | 1V          | 1meg          | 600             | 17 10 16½   | 52        | 1050   |         |         |
|           | 1k        | 1V          | 1meg          | 600             | 17 10 16½   | 60        | 1495   |         |         |
|           | 1k        | 1meg       | 1V            | 600             | 17 10 16½   | 52        | 995    |         |         |
| -60       | 10k       | -10         | 30k           | -               | 70-10,000   | 18½ 10½ 17½ | 59     | 1200  | k,l,m,n  |
| .775mV    | 600       | -           | -             | -               | 11½ 4½ 11¼  | 15       | 1295   | -       | p,batt. |
| .775mV    | 600       | -           | -2 10k        | 600             | 15½ 9½ 16½  | 62       | 1348   | -       | b,c,g,p  |
| .775mV    | 600       | -           | -2 10k        | 600             | 15½ 9½ 16½  | 62       | 1374   | -       | b,c,g,p  |
| .775mV    | 600       | -           | -2 10k        | 600             | 14½ 9½ 16½  | 58       | 975    | -       | c         |
| -60       | 20k       | 0 1meg      | -20 600       | 80-10,000       | 16¾ 9¾ 16¾  | 54½ 800  | -       | h       |
| -20       | 20k       | -           | -20 600       | 80-10,000       | 17¾ 10¾ 17  | 52      | 1050   | -       | h       |
| -65       | 600       | -           | 0 600         | 80-8,000        | 24¾ 12½ 16½  | 975 4250 | -       | A       |
| 1mV       | 1k        | 200mV       | 500k 1V 20k   | 120-12,000      | 24 16½ 15¼  | 100 1295 | D       |         |
| 1mV       | 1k        | 200mV 500k  | 1V 20k        | 120-10,000      | 24 16½ 15¼  | 100 1395 | E       |         |
| .2mV      | 1k        | 200mV 6k    | 2V 600k       | 120-10,000      | 19½ 9½ 15½  | 145 1573 | F,G     |         |
| .2V       | 10k       | .2V 10k     | .5V 10k       | 50-10,000       | 20 9½ 14    | 50      | 275    | 2495    | u       |
|           |           | .2V 10k     | .5V 10k       | 50-10,000       | 20 9½ 14    | 50      | 275    | 2495    | v       |
| -         |           | 600         | -             | 50-10,000       | 21½ 21½ 13¼ | 120     | 4995   | -       | European std |
| -60       | 10k       | 14 10k      | -14           | 60-10,000       | 30 11 17½   | 130     | 1295   | -       |         |
| -60       | 10k       | 14 10k      | -14           | 60-10,000       | 30 11 17½   | 130     | 1295   | -       |         |

- Channels: p, special; s, video duplicating adapter; t, test tape; s, mounted in cart; b, battery-powered; w, 1-year warranty on head; v, completely mobile; A, color; B, adaptable for color; C, electronic editing; D, stop motion; E, slow motion; F, a.g.c.; G, dubbing.
Our Grandads had the Brownie camera. We have the equally ubiquitous tape recorder. In their respective ways, both record a segment of life—and preserve it better than our best recollection can. On tape, we can again hear an historic speech, the drollery of a political convention, the first burbling of our offspring, the sounds of our everyday existence. The scope goes from the most intimate to the most public; from lightness and entertainment to the serious life-and-death events of our times.

The use of the tape recorder, its pleasures, conveniences, and economy, are all taken for granted. Beneath this innocent appearance, however, lies a maze of legal ramifications, from the right of privacy to the complications of the copyright laws. Our own home is still our castle. What we do for our own private use is still pretty much our own business. Though it may be a possible technical violation of the copyright laws, an off-the-air recording for our own use is safe. Big Brother is not here yet. But take this recording and give it further circulation—whether or not for commercial payment—and the copyright violation becomes immediately real and public. And this despite whatever guise such circulation might be made under.

And the recording need not be off-the-air. When a well-known nutritionist gave a speech in Tulsa, Oklahoma, and a recording of it later came into unauthorized hands for commercial exploitation, the whole set-up came to a halt when the lady called in her lawyers. It was not necessary for a Court action to be started: lawyers in California, Oklahoma, Pennsylvania—and myself, in New York—all agreed that the lady had a pretty good claim. She got her way and the unauthorized recordings were promptly destroyed.

But things are different when we come to the public domain. A speech by the President could be recorded and circulated without permission or arrangement with the speaker. Many of us remember General MacArthur’s “Old Soldiers Never Die” speech and the many different recordings of it that appeared. Perhaps it will be reissued for the new generation in phony stereo; we’ll wait for that. But it could be done without permission of the MacArthur Estate.

However, with the exercise of common sense and prudence, the amateur recordist will have little to worry about. If you record friends, parties, or entertainers; copy records; tape programs off the air or live performances; do not sell or distribute your recordings unless proper legal permission is gotten from all parties involved. This means the performer, his agency, his recording company, the copyright owner of the material, ASCAP perhaps, the broadcasting company, the producer, the record manufacturer, the original tape licensor (perhaps a foreign producer) and—well, maybe more.

As a hobby, tape recording is free. Make it into anything resembling business and it becomes restricted and serious. Be guided by the summary below, and you are fairly sure to avoid legal entanglements. These little caveats aside, have fun!

IF YOU
A. record yourself, friends, parties, or famous personalities (in person)
B. copy phonograph records or prerecorded tapes either directly or off the air
C. tape programs off the air
D. tape live performances—DO NOT
sell or distribute your recordings unless you obtain permission to do so from the following, wherever applicable:
1. the persons involved
2. the performer(s) and person, company, or agency to which he may be under an exclusive service contract
3. the copyright owner of the subject matter of the performance, if it is a work protected by copyright
4. the program’s broadcaster and producer
5. the manufacturer of the recording.
IN a recent demonstration, the $600 KLH home tape recorder was compared to a professional machine that sells for some $3,500.

Both recorded from the same wide-range, noise-free source; in fact all conditions of comparison were equal, with one exception: The KLH Model Forty operated at 3 3/4 ips, quarter-track, the professional machine at 15 ips, half-track.

When the recordings were played back, listeners said the only difference they heard was $2,900.
In any audio recording or reproducing system the input and output transducers represent the most critical link.

Take microphones, for example. They should perform the task of converting sound waves into electrical impulses with absolute faithfulness. AKG microphones are characterized by extended wide range and smooth response. They are an unsurpassed investment value.

On the output side...headphones should convert electrical impulses into audible sound of ultimate fidelity. Listen to natural, clean sound through AKG headphones and discover the only "humanized" headphones available...scientifically designed to complement the characteristics of human hearing.

Ask any professional — the trademark AKG is synonymous with the highest standards in quality and performance.
TAPE RECORDER DIRECTORY

RECORDERS, PLAYERS, AND TRANSPORTS

TAPE-CARTRIDGE MACHINES

RAW TAPE

TAPE ACCESSORIES

MICROPHONES

HEADPHONES

65
90
105
111
117

AIWA

TP-1013 Portable Stereo Recorder
Solid-state stereo, 2-speed (3½ & 1½ ips), 4-track design. Features 5" max. reel; will operate from 4 "D" cells or 120 V a.c.; has two 4" x 2½" speakers (one detachable); remote control sw.; supplied with 2 dynamic mics (one with remote control), batteries & accessory case. 3½" x 7½" x 15" d. $99.95

TP-719 Portable Recorder
Solid-state mono, dual-track, 3-speed (7½, 3½ with switch, and 1½ ips capstan change) design; wow & flutter 0.25% @ 7½ ips. Has 3" x 5" spkr. with 1½ W output. Operates from 8 "D" batteries, 120 V a.c. or 12 V car battery. Will accept 7" reels. Supplied with attach-size case with locking provision, car battery adapter, dynamic mic with "on-off" switch, batteries, and earphone. 16½" x 13" x 3¾"...$149.95

TP-1001W Recorder
4-track solid-state, stereo, dual-speed (7½ & 3½ ips) design. Has record-playback & erase heads; 2 4" x 8" speakers; counter; vu meters. Response 70-15,000 Hz @ 7½ ips; wow & flutter 0.15% @ 7½ ips. 14½" x 13¾" x 10" d. Supplied with two mics...

TP-1012 Tape Recorder
Solid-state stereo design for a.c./d.c. operation (117 V a.c., 8 "D" cells, or 12 V battery). Features 4-track, 7" reel: automatic shut-off; two vu meters; pause controls; 2 speeds (7½ & 3½ ips; 1½ ips with capstan change); counter; 1.25 W/ch dynamic output;.

TP-1006W Tape Recorder
Solid-state; 4-track; 7¾" reel size; 2 speed (7½ & 3¼ ips; 1¼ ips with capstan change) design. Response 50-18,000 Hz @ 7½ ips; 5 W/ch dynamic power (EIA 5% dist); wow & flutter 0.2%. Features sound-on-sound; sound-with-sound; vu meters; counter; pause control; 4" dynamic monitoring speaker. For use with external spkrs. 20½" x 14" x 8¾". Supplied with DM-51 dynamic microphone...

ALLIED

1040 Stereo Tape Recorder
Records & plays 4-track stereo & mono at 7½, 3¾ & 1¼ ips. Has detachable speakers, two vu meters, two mic & two aux. inputs. Response 40-16,000 Hz @ 7½ ips; flutter & wow 0.15% @ 7½ ips. Supplied with 7½ reel and two microphones. 15C7106U...$179.95

TD-1030 Tape Deck/Preamp
Solid-state, 3-speed (7½, 3¼ & 1¼ ips.) stereo design. Has record/play preamps for 4-track stereo and mono; digital counter; two mic inputs; two aux. inputs. Response 40-16,000 Hz ±3 dB @ 7½ ips; flutter & wow 0.15% @ 7½ ips; S/N ratio 50 dB; 110 2.5%. Supplied with wood base, 7½ reels & dust cover. 15C7103U...$135.00

12C7162 Dynamic mic...$12.95

TD-1070 Tape Deck/Preamp
4-track, mono/stereo design featuring automatic-reverse. Will record & play in both directions; has continuous replay. Features 3-speed (7½, 3¾ & 1¼ ips); sound-on-sound; pause control; solid-state stereo preamps with stereo mic & aux. inputs. Response 40-20,000 Hz at 7½ ips; flutter & wow 0.15% at 7½ ips. 12⅞" x 19" x 17⅞". Less microphones. 15C7378U...$299.95

TR-1080 Tape Recorder
Features same basic tape mechanism as TX-1070 except has additional stereo power amp with speakers. Portable case vinyl
TR-1035 Tape Recorder
Solid-state, 4-track design with built-in stereo speakers. Has 3 speeds (7½, 3½, 1½ ips); inputs for stereo mics & aux. Response 40-14,000 Hz at 7½ ips. Flatter & wow 0.008% @ 7½ ips. Vinyl covered case. 12½" x 19¾" x 12½". With two mics. $349.95

TAPE RECORDER ANNUAL

602-1 Series Recorders/Preamp
Full-track or half-track recorder; 3 heads; erase, record, playback; frequency response 20-20,000 Hz ±2 dB @ 7½ ips; power output 8 W/ch continuous r.m.s. Flatter and wow 0.008% @ 7½ ips. 2150 unassorted deck with stereo preamps only $399.00

602-2 Series Recorders/Preamps
Stereophonic tape recorder using Model 602-1 tape transport and two Model 602-1 electronics chassis for stereo record/playback; two-track erase head, record and playback heads; all performance specifications identical to Model 602-1. Response 50-15,000 Hz ±4 dB @ 7½ ips. Signal-to-noise ratio: full track, over 75 dB. 

861 Tape Recorder
Four-track stereo, ½ track & mono; transistorized; dual capstan drive, no pressure pads; vu meter: 3-speed (7½, 3½, 1½ ips). Response 50-15,000 Hz ±0.008% @ 7½ ips. Signal-to-noise ratio: -46 dB @ 7½ ips. Woof & flutter: 0.008% @ 7½ ips. Complete portable design includes 6 W/ch continuous sine-wave power amplifiers; two 813 slide-on speaker systems. 19½" x 13½" x 7½". $249.00

1161 Tape Recorder
Four-track stereo, ½ track & mono; automatic threading; electronic & manual reversing; transistorized; dual capstan drive, no pressure pads; vu meters; 3 speed (7½, 3½, 1½ ips); has provision for automatic slide projector actuator. Performance at 7½ ips: response 50-15,000 Hz ±4 dB, S/N -46 db, wow & flutter 0.008%.
CONCORD MEANS TAPE RECORDERS

Here are 10 of our 18 quality models.

Complete portable design includes 6 W/channel continuous sine-wave power amps & two slant-on speaker systems. 19" x 13½" x 7½" S$699.00

Accessories
#702 mic.; Omnidirectional dynamic type, 3½" dia. with stand........$9.95
#1101 mic. Omnidirectional dynamic type..................$19.95
#2001 mic. Omnidirectional dynamic type, 7" x 1½" dia. with stand ....$29.95
Recording Accessory Kit: Complete maintenance kit. Includes head demagnetizer, head cleaner, tape splicer, leader tape, splicing tape, and cotton swabs...$22.50

415 Cube speaker system using 6" speaker available separately. Walnut finish. ..................$429.00
415 Cube speaker system using 6" speaker available separately. Walnut finish. ..................$429.00

985 Tape/ Radio System
Combines stereo tape recorder with an AM-FM stereo tuner in a single, compact walnut cabinet with tambour door. Recorder specifications similar to 1100 Series tape recorder. Has automatic reverse & pause control. Will record directly from tuner. Supplied with two mics & pair of cube-shaped speaker systems which can be placed within carrying case. 23½" x 14" x 8½"...$369.00

761 Stereo Tape Recorder
Features 3-head design providing tape monitoring, sound-on-sound, sound-with-sound & echo effect. Response 50-15,000 Hz ±4 db at 7½ ips; flutter & wow 0.15% at 7½ ips; response 40-18,000 Hz ±3 dB at 7½ips; S/N ratio 47 dB min. Wow & flutter less than 0.5%. Comes with two dynamic pencil mics with stands; aux. patch cords; 7" reel. 14½" x 10¾" x 7" in vinyl-covered wood cabinet. ..................$239.95

1461 Stereo Tape Recorder
Same as Model 761 except has 4 heads. Features automatic reversing & threading with two mics. ..................$599.95
Matching speaker systems, Model 830..................Pair $99.95

141R-806 Stereo Tape Recorder
Four-speed, solid-state deck; S/N ratio from peak record level better than 51 db at 7½ ips; response 40-18,000 Hz ±3 dB at 7½ips; (preamp output); wow & flutter less than 0.09% at 7½ips; THD (preamp) under 1%; THD under 1% from 35-20,000 Hz; source input dynamic range 50 db at preamp output; mic input dynamic range 32 db. ..................$349.95

14R-806 Stereo Tape Recorder
Comes with two dynamic pencil mics & stands, aux. patch cords for recording direct from tuner or TV, 7" reel. 12" h. x 14" w. x 7½" d. ..................$119.95

BELL & HOWELL
2293 Tape Deck/Preamp
Solid-state, 4-track design; response 40-17,000 Hz ±3 db at 7½ ips; wow & flutter 0.09% at 7½ ips. Has high-level & mic inputs; 4 speeds (7½, 3, 17/8 & 1½ ips); pause control; automatic head demagnetizer; source input mixing. Features automatic loading & air jet carries tape through. Fully automatic reversing ..................$299.95

2263 Tape Deck/Preamp
Same as Model 2293 except does not have automatic loading feature ..................$259.95

Model 2295 Stereo Recorder
Four-speed, solid-state recorder; 15 W (EIA) output per channel. Frequency response 40-18,000 Hz ±3 db at 7½ ips (preamp output); wow & flutter less than 0.09% at 7½ ips. Amp response 50-20,000 Hz; THD under 3% at rated output. Preamp THD (35-20,000 Hz) under 1% re 10 vu. S/N ratio from peak recorded level better than 51 db at 7½ ips. ..................$399.95

Model 2291 Stereo Deck
Four-speed, solid-state deck; S/N ratio from peak record level better than 51 db at 7½ ips; response 40-18,000 Hz ±3 dB at 7½ips; (preamp output); wow & flutter less than 0.09% at 7½ips; THD (preamp) under 1% from 35-20,000 Hz; source input dynamic range 50 db at preamp output; mic input dynamic range 32 db. ..................$349.95

CHANNEL MASTER
Model 6430 Stereo Tape Recorder
Solid-state, 4-track, 2-speed (7½ & 3¼ ips) stereo recorder; cabinet drive; 4-pole induction motor; a.c. bias, 50 kHz. Response 50-50,000 Hz at 7½ ips; 50-9000 Hz at 3¼ ips; S/N ratio 47 dB min. Wow & flutter less than 0.5%. Two 4" speakers in removable lids. Digital counter with reset button; automatic shutoff at end of reel; two vu meters; power "on" indicator; transistorized amp provides 3 W audio output each channel. 14½" x 13" x 10½" in vinyl-covered wood cabinet. ..................$239.95

CONCERTONE
700 Portable Mono Recorder
Cordless & a.c. operated, 2-track, transistorized, 4-speed (7½ips, 1½, 3¼ & 7½ ips) remote-control design using 2" reels. Operates from six "D" size flashlight cells & has built-in 117 V.a.c. power supply. Flut-
4000 Tape Recorder
Solid-state stereo design; 3 speeds, 4-tracks.

Features sound-with-sound $199.95

302-D Stereo Tape Deck/Preamp
Solid-state design; 3-speed (7 1/2, 3 3/4 & 1 7/8 ips); 4-track: has two heads (cassette & record/play); cue control; dual-type vu meter. Response 50-15,000 Hz @ 7 1/2 ips; wow & flutter 0.17%. S/N ratio 50 dB. Mahogany cabinet. 14 1/2" x 12 1/2" x 4 1/2" under $160.00

790 Tape Recorder
Solid-state; 4 speeds (15, 7 1/2, 3 3/4 & 1 7/8 ips). Response 20-22,000 Hz. Has built-in Nicad battery charger. Features sound-with-sound & 7" reels $259.95

CONCORD
510-D Tape Recorder/Preamps
Solid-state, 4-track, 3-speed (1 1/8, 3 3/4 & 7 1/2 ips) stereo record & playback design; has two vu meters; 7" reels; automatic shut-off; cue control; counter. Response 30-18,000 Hz ±3 dB @ 7 1/2 ips; wow & flutter 0.17%. S/N ratio 50 dB. Mahogany cabinet. 14 1/2" x 11 1/4" x 5 1/4" supplied with omnidirectional mic & special dictation mic & remote start/stop switch Less than $160.00

776D Tape Recorder/Preamps
Solid-state, stereo, 2-speed (3 3/4 & 7 1/2 ips), 4-track record & playback design. Features "Reverse-A-Track"; sound-with-sound. Response 30-20,000 Hz ±3 dB @ 7 1/2 ips; wow & flutter 0.15%. Has stereo line outputs; 7" reels; walnut cabinet. 20" x 13 1/2" x 7" $259.95

350 Automatic Portable Recorder
Features automatic tape reversal & voice-operated start/stop; 2 speeds (3 3/4 & 1 7/8 ips); solid-state circuits; battery operation (six "D" cells); vu meter/battery level indicator; dual track; counter; cue button; external monitor; 3" x 6" speaker; mono operation. Uses up to 5" reels; response 50-10,000 Hz. Supplied with remote control mic & cartridge. 11 1/2" x 11" x 4" 10 lbs. $149.95

Model 444 Tape Recorder
Solid-state preamps; 3-speed (7 1/2, 3 3/4 & 1 7/8 ips) design with built-in amplifiers and speakers; record/playback, 2-track stereo or mono; separate erase & record/play stacked heads; response 50-15,000 Hz ±2 dB @ 7 1/2 ips; wow & flutter 0.2% r.m.s. @ 7 1/2 ips; S/N ratio better than 40 dB; HD less than 2% @ 3 dB below rated output; two inputs/ch (47 ohms to ext...
amp & 8 ohms to ext spkr); 30A5 output tubes are used; split speakers in case cover for remote placement; 5 W/ch output; has 2 vu meters; features sound-on-sound recording; supplied with two dynamic mics & mahogany carrying case; 11 1/4" x 13 3/8" x 14 1/8" d. $199.95

700 Series Recorders
Solid-state, 4-track stereo with detachable speaker enclosures. Features vu meters. Mics & high-Z inputs: "Trans-A-Track" recording facility. Model 727 2-speed (7 1/2 & 3 3/4 ips); one ea erase & record/playback heads; unidirectional tape transport; response 30-20,000 Hz ±2 dB; wow & flutter 0.15% @ 7 1/2 ips; S/N ratio 50 dB; 6" speakers; 7 1/2 W/ch output; automatic shut-off. Mahogany $269.95
Model 776 Same as 727 except has automatic "Reverse-A-Track" feature; with 2 ea erase and record/playback heads; automatic electronic shut-off. 13" x 20" x 6 1/2" plus speaker 6 1/2" x 6 1/2" x 10". Mahogany $299.95

Model 300 Dual-Power Recorder
Will operate from six "C" batteries or 120 V a.c. Features dual speed (1 1/2 & 3 1/2 ips) 2-track, mono operation. Has record/battery level indicator; automatic record level control, "Reverse-A-Track" feature; takes up to 4" reel; response 60-10,000 Hz @ 3 1/2 ips. Solid-state design. Supplied with remote control mic. 3" x 10" x 9"; 6 1/2 lbs. $89.95
Optional equipment: VM-10 voice-operated mic; FT-2 stool swt; TP-2 telephone pickup.

CRAIG
"Craig 910" Stereo Tape Recorder
Solid-state, 4-track, dual-speed (7 1/2 & 3 3/4 ips) design. Features sound-on-sound: built-in stereo preamps & power amps & two 4" x 5" spkrs. Has vu meters, radio & mic inputs. Response 50-15,000 Hz @ 7 1/2 ips. 17" x 14" x 5 1/2" d. Supplied with mics. $179.95

2106 Portable Recorder
Mono design; battery (six "D" cells) or optionally a.c.-operated; features 5" reel; 2 speeds (1 1/2 & 3 1/2 ips); wow & flutter 0.3% @ 3 1/2 ips; S/N ratio 40 dB; 0.35 W output. Response 150-70,000 Hz @ 3 1/2 ips; records on ½" track with d.c. erase; has mic & radio inputs; 3" x 6" speaker & remote-control mic. 10 1/4" x 11 1/16" x 4 1/4". $69.95

2403 Stereo Tape Recorder
3-speed design with automatic shut-off; 7" reels; dual vu meters; counter; 2 3/4 W/ch. Walnut Cabinet $239.95

2404 Tape Deck/Preamps
Same as Model 2403 except does not include power amps $154.95

2402 Stereo Recorder
Features automatic reverse; three speeds (7 1/2, 3 3/4 & 1 1/2 ips); 4-tracks; sound-on-sound; sound-with-sound. Wow & flutter 0.15% r.m.s. at 7 1/2 ips. Output 4 W/ch dynamic power; response 30-18,000 Hz ±2 dB; S/N ratio 60 dB. $995.00

CROWN
SX700 Series Tape Recorders
Record and play response 30-25,000 Hz ±2 dB @ 7 1/2 ips; has three-speed complete recorder; solid-state design, built-in a/c/battery operation; 1 1/2 W output; a/c bias; 2-track: 100-10,000 Hz, response to 15 1/4" speaker. With mic. 3 1/16" x 16 7/8" x 12 3/8". $169.95

SX700 Series Solid-State Recorders
Uses SX700 electronics and CX800 transport.
Model 2403 Full-track mono $995.00
Model 2404 Half-track mono $995.00
Model 2405 Quarter-track stereo $995.00
Model 2406 Four-channel in-line $1295.00
Complete series of SP700 and SP800 players are available.

CROWNORDER
CRC-6250F Tape Recorder
Attaché-case mono type recorder/AM-FM radio combination with automatic tape repeater (will repeat any 15-second segment of tape); 2 speeds (3 1/2 & 1 1/2 ips); 5"

CX800 Series Solid-State Recorders
Can be remote controlled; features computer logic control photocell automatic stop; three motors; differential magnetic braking; three speeds. Handles up to 10 1/2" reels; wow & flutter 0.06% @ 15 ips. Available with either mono electronics or stereo control center; response @ 7 1/2 ips 30-30,000 Hz ±2 dB; S/N ratio 60 dB. Four-channel stereo control center. Basic unit with 4 unbalanced line inputs, 2 mixing inputs per channel; line (basic) or microphone, RIAA phono (using optional plug-in modules). Outputs 0 level, 5000 ohms unbalanced, or up to + 18 dBm (using optional amp module); two 5" vu meters. Available with low-impedance mic, input and balanced 600-ohm output.
CX811 Full-track mono $1495.00
CX812 Two-track mono $1495.00
CX822 Two-track stereo $1790.00
CX824 Quarter-track stereo $1790.00
CX844 Four-channel in-line $2880.00
Complete series of SP700 and SP800 players are available.

DYNACO
Transistorized Tape Recorder
Imported from R&O of Denmark; fully transistorized, 3-speed complete recorder with built-in power amplifiers; three inputs (200-ohm mic, RIAA equalized phono, radio tuner) mixed via professional-type slide potentiometers; provision for sound-on-sound and echo; two record-level meters; hysteresis synchronous motor; separate record and playback heads; tape-input monitoring; preamp output; all plug-in circuit boards; 40-16,000 Hz ±2 dB; r.m.s. flutter less than 0.075%; peak-to-peak flutter less

CXTR6650S Tape Recorder
Solid-state monaural design with 5" reels. Has built-in a/c/battery (6 "D" cells) operation. Response 100-10,000 Hz; a/c bias; 2-track: 1 1/2 W output. Has automatic tape repeater, 2 speeds (3 1/2 & 1 1/2 ips); 3" x 5 1/2" speaker. With mic. 3 1/16" x 16 7/8" x 12 3/8". $169.95

CTR-6650S Tape Recorder
Solid-state monaural design with 5" reels. Has built-in a/c/battery (6 "D" cells) operation. Response 100-10,000 Hz; a/c bias; 2-track: 1 1/2 W output. Has automatic tape repeater, 2 speeds (3 1/2 & 1 1/2 ips); 3" x 5 1/2" speaker. With mic. 3 1/16" x 16 7/8" x 12 3/8". $199.95

TAPE RECORDER ANNUAL
than 0.2%; S/N ratio 50 dB. $498.00 Portable version of the above machine includes a pair of monitor speakers built into the case. $525.00

**GENERAL ELECTRIC**

Model M8060 Stereo Recorder
Two-speed (3% & 7½ ips), 4-track stereo with 6” matched dynamic speakers. Has pause control, continuous bass/treble control; push-button function controls; storage space for mics, mic stands, and external speaker cords. Hinged speakers may be separated from cabinet. Digital counter; vu meter with stereo balancing sw.; record interlock. 15½” w. x 14½” h. x 9¼” d. Carrying handle. Walnut grain finish on polystyrene. $164.95

**GRUNDIG**

TK 247 Stereo Recorder
4-track, 2-speed (7½ & 3½ ips) design; response 40-16,000 Hz. Has sound-on-sound, sound-with-sound, pause bar, automatic shut-off, two 6” x 4” speakers. 17½” x 13” x 7½”. $249.95

TS-340U Stereo Recorder
4-track, 3-speed (7½, 3½ & 1½ ips) recorder with solid-state amplifier (can be used separately); synchronized sound-on-sound and sound-with-sound; echo effect. $249.95

**HARMAN-KARDON**

Model TD-2 Tape Deck/Preamp
Features solid-state stereo design; 3-speeds (7½, 3½ & 1½ ips); response 30-20,000 Hz; wow & flutter ±0.1% at 7½ ips. Two 7” x 5” PM speakers; output 12 W music power ea. channel. Various optional accessories available. 20¼” x 15¼” x 8½”. Comes with stereo mic, tripod, matching cables, 7” take-up reel, patchcords for both American & European jacks. $349.95

Model TK-341 Stereo Recorder
Four-track, 3-speed (7½, 3½ & 1½ ips) recorder with synchronized sound-on-sound and sound-with-sound; monitoring of input signal or tape; level indicator; push-button operation; pause bar; automatic shut-off; digital counter with push-button reset. Freq. range 40-18,000 Hz, S/N ratio 50 dB; wow & flutter ±0.1% all at 7½ ips. 12 W music power/ch. Has two 6” x 4” 5-ohm speakers. 20¼” x 15¼” x 8¼”. Various optional accessories available. $269.95

**HITACHI**

Model TRQ-717 Stereo Recorder
Three-speed (7½, 3½ & 1½ ips), four-track stereo recorder with built-in deflection speakers. Push-button operation; automatic level control; tape counter; tone control; speaker monitor; pause control; automatic tape shut-off; 7” reels. 15½” w. x 14½” h. x 13¾” d. Can be operated vertically or horizontally. $169.95

Model TRQ-707 Stereo Recorder
Three-speed (7½, 3½ & 1½ ips), four-track stereo recorder. Push-button control; automatic level control; tape counter; tone control; speaker monitor; pause control; automatic stop; 7” reels; detachable speakers. 14¾” w. x 8½” h. x 14” d. Can be operated vertically or horizontally. $229.95

Model TRQ-727 Stereo Tape Deck
Four-track, three-speed (7½, 3½ & 1½ ips) stereo deck; push-button controls; automatic level control; 7” reels; two vu meters; tape monitor. $349.95

**CRAIG CORPORATION**

Products Division, 2302 E. 15th Street
Los Angeles, California 90021

For the finest in stereo recording or listening, Craig has 7 different cassette, reel-to-reel, recorder and deck models to choose from.

*Suggested retail price

Craig Stereo Cassette Recorder. This complete system features easy-to-load cassette cartridge convenience in handsome walnut finish and slim-line design. Model 2703. Price $199.95*

Craig Auto-Reverse Stereo Tape Recorder. Unequaled performance with three speeds, automatic reversing system, sound-on-sound and many more outstanding features. Model 2402. Price $349.95*

CRAIG EDITION

Circle No. 13 on Reader Service Card.
**JVC NIVICO**

1684 Stereo Tape Deck/Preamps

Solid-state, 4-track, 2-speed (7 1/2 & 3 3/4 ips) design. Has built-in preamps & is supplied with wood cabinet and dust cover. 15%" x 13 3/4" x 6 3/4" $149.95

1224 Stereo Tape Recorder

Solid-state, 4-track, 3-speed (7 1/2, 3 3/4, 1 3/8 ips) design. Has automatic reverse, sound-on-sound, sound-with-sound; 5 W/ch dynamic power; 30-18,000 Hz response; Supplied with twin microphones & matching speaker enclosures with 6 1/2" woofer & 3" tweeter. 12 3/4" h. x 38 3/4" w. x 7 3/4" d. $349.95

1551 Portable Tape Recorder

Two-speed (3 3/4 & 1 3/8 ips), solid-state, a.c.-or battery-operated (six "D" cells) portable. Features electronic motor governor; 1.5 W output; single rotary function control; tone control; level meter/battery checker; various inputs. Will handle up to 5" reels. 3 3/4" h. x 12 1/4" w. x 9 3/4" d. 7.3 lbs. $89.95

1351 Portable Tape Recorder

Two-speed (3 3/4 & 1 3/8 ips), a.c.- or battery-operated (six "C" cells) portable; features 3-digit tape counter; fast-forward button; monitor switch; rotary function lever; remote control from mic. Comes with full-length carrying handle and all accessories. 13 3/4" w. x 11 1/2" h. x 9 1/4" d. 7.3 lbs. $69.95

1171 Mono Recorder

Two-speed (3 3/4 & 1 3/8 ips) mono recorder will handle up to 5" reels. Features built-in speaker monitor so unit can be used as p.a. system, instant stop, continuous a.v.c., 3-digit counter, 3" x 6" speaker, and 2 W output. Leatherette case 13 3/4" h. x 12 3/4" w. x 6 3/4" d. 15 lbs. $99.95

KLH

Four-Track Stereo Deck

Features Dolby Audio Noise Reduction System to optimize 3 3/4 ips speed for record/playback applications; single-band version begins operation at about 1700 Hz; effective audible noise reduction 10 dB; system can...
be switched out. 7 1/2 ips provided for compatibility with older tape and editing live recordings. 3-motor tape transport; solenoid-operated controls; belt-driven capstan; high-speed rewind & fast-forward; 3 heads (erase, record, playback); full-source tape monitoring. Single vu meter reads louder of two channels being recorded or either channel individually. Individual level-controlled mics & aux inputs for each channel with full mixing capability; single master control for setting record level; pause control. Features automatic rewind; automatic shut-off; amplified headphone output; duplicate inputs and outputs. Walnut base available extra.

$600.00

KNOTH-KIT
KG-415 Tape Deck/Preamps
Solid-state stereo design with pre-assembled Viking tape transport. Has six solid-state plug-in modules, including headphone amplifier and bias test oscillator modules. Features separate monitor switch with monitor-level controls, mixing facilities, push-to-reset digital counter, easy-edit head cover. Three 4-track hyperbolically-contoured heads permit direct tape monitoring, echo, sound-on-sound recording. Six-position "selector" control with record and playback operation shown by illuminated windows. Two vu level indicators for record and playback of each channel. Response 50-18,000 Hz ±2 dB at 7 1/2 ips; 50-14,000 Hz ±2 dB at 3 1/2 ips. Flutter & wow 2% r.m.s. Signal-to-noise ratio 50 dB. Features solid-state design. Permits stereo playback when used with external amplifier. Features two heads; tape counter; vu meter; tape head output jacks; external speaker jack and stereo headphone jack. Response 40-15,000 Hz ±3 dB at 7 1/2 ips; wow & flutter 0.15% @ 7 1/2 ips, 0.1% ratio 40 dB. In solid vinyl case with removable cover, accessory compartment, dynamic microphone. 11 1/2" x 12 1/4" x 6 3/4" d. $199.95

LAFAYETTE
RK-960 "Automatic Reversing" Tape Recorder
4-head, 4-track solid-state stereo design. Features one manual & three automatic tape reversing positions; 3 speeds (1 3/4, 3 & 7 1/2 ips); sound-on-sound; sound-with-sound; two 4-pole induction capstan driver motors; vu meters; stereo headphone jack; 6 inputs. Response 30-2,000 Hz ±3 dB @ 7 1/2 ips; S/N ratio 50 dB; flutter & wow 0.25% r.m.s. @ 3 1/2 ips. Housed in black leatherette-covered wood case. 22" x 15 1/2" $299.95

RK-920 "Automatic Reversing" Tape Deck/Preamps
Same design as RK-960 except without stereo amplifier. $199.95

RK-810A Tape Recorder
Solid-state, 4-track, 3-speed (1 3/4, 3 & 7 1/2 ips) design. Features sound-on-sound, sound-with-sound, plus direct stereo disc-to-tape copy through magnetic photo inputs. Makes direct recording from FM stereo tuners. Has two 5 x 7" speakers. Response 40-18,000 Hz ±3 dB at 7 1/2 ips; wow & flutter 0.15% @ 7 1/2 ips; S/N ratio 50 dB. Includes wood utility base. 12 1/2" x 10" x 6" d. $199.95

RK-845 Stereo Tape Recorder
Solid-state, 4-track stereo & mono, 3-speed (1 3/4, 3 & 7 1/2 ips) design. Features sound-on-sound, sound-with-sound, plus direct stereo disc-to-tape copy through magnetic photo inputs. Makes direct recording from FM stereo tuners. Has two 5 x 7" speakers. Response 40-18,000 Hz ±3 dB at 7 1/2 ips; wow & flutter 0.15% @ 7 1/2 ips; S/N ratio 50 dB. Includes wood utility base. 12 1/2" x 10" x 6" d. $199.95

RK-855 Stereo Tape Recorder
Solid-state, 4-track stereo & mono, 3-speed (1 3/4, 3 & 7 1/2 ips) design. Features sound-on-sound, sound-with-sound, plus direct stereo disc-to-tape copy through magnetic photo inputs. Makes direct recording from FM stereo tuners. Has two 5 x 7" speakers. Response 40-18,000 Hz ±3 dB at 7 1/2 ips; wow & flutter 0.15% @ 7 1/2 ips; S/N ratio 50 dB. Includes wood utility base. 12 1/2" x 10" x 6" d. $199.95

Circle No. 14 on Reader Service Card.
The new McIntosh 36-page catalog gives you all the details on the new McIntosh solid state equipment. In addition, you’ll receive absolutely free a complete up-to-date FM Station Directory.

MAGNERCord

"1020" Stereo Tape Deck
4-track design without built-in power amplifiers or speakers. Features 2-speed (7½ & 3½ ips) operation; takes up to 8½" reels; vu meters; counter automatic shut-off; three separate heads. Solid-state stereo preamp with 900-mV output & dual mic and line inputs with mixing facility. Response 45-18,000 Hz ±3 dB @ 7½ ips; wow & flutter 0.2% at 7½ ips. Has walnut wood case. 12¼" x 11¾" x 6" d. $179.95

"1022" Stereo Tape Recorder
Two-speed (3¼ & 7½ ips) stereo unit; ¼-track stereo or ¾-track mono operation; full-track mono record & erase and half- or full-track mono playback. Wow & flutter 0.2% @ 7½ ips; response 45-18,000 Hz ±2 dB @ 7½ ips; S/N ratio 52 dB @ 7½ ips; flutter & wow 0.18% @ 7½ ips. Has walnut wood case. 12½" x 11¾" x 6" d. $179.95

"1028-2X" 2-track stereo or ¼-track mono; less case $179.95
"1028-24X" with 4th head (¼-track stereo play); less case $179.95
"1028-4X" ¼-track stereo or ¼-track mono; less case $179.95

"1048" Stereo Tape Recorder
Same as Model "1028" except for tape speeds 3¼ & 7½ ips; response 40-18,000 Hz ±2 dB @ 7½ ips; 3½ ips play & pause. Two vu meters; two "on/off/volume" controls; left & right channel record buttons; two tone controls; digital counter. Has inputs for radio monitoring and external speakers. Comes with 2 mics with stands, 1 empty 7" reel, 1 demo tape, alligator patch clips. Leatherette, luggage-type carrying case. 22" w. x 14" h. x 7" d. $139.95

NORDMENDE

8001/T Mono Recorder
Solid-state, four-track, 3-speed mono recorder. Frequency response 40-18,000 Hz at 7½ ips 40-15,000 Hz at 3½ ips. 40-10,000 Hz at 1⅛ ips. Has 3 heads & 3 Pabst motors. Features sound-on-sound; remote control; monitoring before and after application of signal; echo & reverb; pause. S/N ratio 54 dB, 3 W continuous sine-wave power/each. Has built-in mixer for recording from four separate sound sources; volume of each source controlled separately by means of 4 slide controls; fade control. Built-in speakers for monitoring. Comes with dust cover. Case extra. $429.95

NORELCO

4408 Stereo Tape Recorder
4-track, 3-speed design; response 40-18,000 Hz at 1⅛ ips. Has 3 heads & 3 Pabst motors. Features sound-on-sound; remote control; monitoring before and after application of signal; echo & reverb; pause. S/N ratio 54 dB, 3 W continuous sine-wave power/each. Has built-in mixer for recording from four separate sound sources; volume of each source controlled separately by means of 4 slide controls; fade control. Built-in speakers for monitoring. Comes with dust cover. Case extra. $429.95

Circle No. 24 on Reader Service Card.

Circle No. 26 on Reader Service Card.
How to flip over the sound without flipping over the reel.

For years you've flipped over a little thing called a reel. You flipped because the tape would run out at inconvenient times like 30 seconds into the Minute Waltz, or three and a half movements of your favorite symphony.

Something had to be done about it. Panasonic, the world's leading manufacturer of tape recorders, did something. That something is the Panasonic Symposium. It's a Solid-State 4-track stereo deck that's unflippable.

Unflippable because of continuous Automatic Reverse. You'll never flip over another reel again. And the turnaround is so quick you'll hardly miss a beat.

And the beat is steady. That's because there's Dual Capstan drive on all three speeds. That way the Tijuana Brass won't sound like 76 Trombones and vice versa.

Of course, if you don't want it to run forever, use the automatic shutoff.

Will the Symposium match your rig at home? Yes. It has 30-20,000 CPS response, and the signal-to-noise ratio is more than 52 dB plus a recording system that has an AC bias of 90 ke. For sound-on-sound or sound-with-sound that's plenty of fidelity.

You'll be crazy about our control panel features, too. Like headphone output and Pause Control for easy editing. Then there are two big VU meters, each sensitive enough to catch the difference between a wheeze and a whisper. Plus a 4-place digital tape counter for some of that long-distance taping you might get involved in.

Top it all off with a smoked-glass dust cover that doesn't cost extra—and everything's beautiful.

So why not go down to any dealer we permit to carry the Panasonic line. We think that once you hook up our Model RS-796, you can stop flipping over its reel and really start flipping over what you hear.
Hz. Has 2 vu meters & facilities for mixing, monitoring & automatic stop. Supplied with stereo mic & cabinet plus two separate speaker systems. $350.00

PANASONIC

All Panasonic designs are solid-state, 3-speeds refer to 7 ½, 3 ¼ & 1 ¾ ips; 2-speeds 3 ¾ & 7 ½ ips. Response figures shown are at fastest tape speed; 7" reels unless otherwise specified & power figures are dynamic measurements.

RQ-501S "The Bandleader"
Mono solid-state portable recorder: 2-track, 2-speed (3 ¾ & 1 ¾ ips) design; operates from 117 V line or 6 "D" cells; has 4 heads; response 80-80,000 Hz; a.c. bias; 2 W; 3 ½" speaker; vu meter; battery indicator. Has automatic level control & will play & record in both directions. 11¾" x 3¾" x 10" d. Supplied with remote mic. $99.95

RS-1000S "The Concert Master"
Solid-state 4-track, 4-head continuous automatic reverse stereo tape deck with preamps; features vu meters; tape counter; fast-forward; pause control; two 6" x 4" woofers, two 2¾" tweeters. 16¾" x 15¾" x 11½" $279.95

RQ-780S "The Impresario"
Four-track, 3-speed design; mono & stereo; response 30-18,000 Hz; S/N better than 52 dB; 8 W/ch; vu meters; tape counter; fast-forward; pause control; two 6" x 4" woofers, two 2¾" tweeters. 16¾" x 15¾" x 11½" $279.95

RS-760S "Band Wave" Recorder
Stereo design: 2 tracks, 4-speed (3 ¾ & 1 ¾ ips) response 100-7000 Hz; has pause control; two 6" x 4" speakers; vu meter; two microphones. 14" x 12" x 6½" $125.00

RQ-194S "The Vista" Recorder
Mono design; 5" reel; a/c/battery operation (4" "D" cells); 4 tracks; 2 heads; 1 W dynamic power; response 100-8000 Hz; a.c. bias. Has 4¾" x 3¾" speaker; vu meter; battery indicator; sound-on-sound; sound-with-sound. With mic. 14¾" x 3¾" x 11" $125.00

RS-796US "Symposium" Deck/Preamp
Stereo design; 4-track, 4-head; 3-speed. Response 30-20,000 Hz. Has pause control; continuous automatic reverse; records & plays in both directions; sound-on-sound; sound-with-sound. 19½" x 14" h. x 7¾" $249.95

RS-790S "Console-Aire" Recorder
Stereo design. 2-heads; 3-speed. Response 30-20,000 Hz. Has 6:400 two 7" x 5" speakers built-in; pause control; meter. Continuous automatic or manual reverse; sound-with-sound; sound-on-sound. With 2 mics. 17" x 16½" x 9" $329.95

RQ-706S "The Encore" Recorder
Mono design; 2-track, 2 head; 3 speed. Response 50-15,000 Hz; 4 W. Has two 6" x 4" speakers; vu meter; pause control. With 41/4" speakers. 14" x 12" x 6½" $125.00

RS-766US "System Maker" Deck/Preamp
Stereo design; 4-track, 2-head; 3 speed. Response 30-18,000 Hz. Has pause control; mounted in wooden case. 13¾" x 11" x 5¼" $149.95

RQ-706S "The Encore" Recorder
Mono design; 2-track, 2 head; 3 speed. Response 50-15,000 Hz; 4 W. Has two 6" x 4" speakers; vu meter; pause control. With 41/4" speakers. 14" x 12" x 6½" $125.00

RS-761S "La Scala" Recorder
Stereo design; 4-track, 2 heads; 3-speed. Response 30-20,000 Hz. Has pause control; continuous automatic or manual reverse; sound-with-sound; sound-on-sound. With 2 mics. 17" x 16½" x 9" $329.95

RQ-156S "The Pilot"
Two-track mono design: two speeds: 5" reel; 100-7000 Hz response: 1 W; 3¾"

RS-761S "La Scala" Recorder
Stereo design; 4-track, 2 heads; 3-speed. Response 30-20,000 Hz; 8 W/ch. Has two 6¾" woofers & two 2¾" tweeters; pause control; detachable speaker systems; sound-on-sound; sound-with-sound. Supplied with 2 mics. Over-all size 7¾" x 11¾" x 6½" $229.95

RS-796US "Symposium" Deck/Preamp
Stereo design; 4-track, 4-head; 3-speed. Response 30-20,000 Hz. Has pause control; continuous automatic reverse; records & plays in both directions; sound-on-sound; sound-with-sound. 19½" x 14" h. x 7¾" $249.95

RQ-706S "The Encore" Recorder
Mono design; 2-track, 2 head; 3 speed. Response 50-15,000 Hz; 4 W. Has two 6" x 4" speakers; vu meter; pause control. With 41/4" speakers. 14" x 12" x 6½" $125.00

RS-760S "Band Wave" Recorder
Stereo design. 2-heads; 3-speed. Has two 6" x 4" speakers; pause control;
REVOX
A-77 Series Stereo Recorders
Two-speed (3¾ & 7½ ips), 3-motor deck; electronically governed capstan motor; all-silicon transistors; plug-in PC cards; frequency response 50-15,000 Hz ±1.5 dB @ 7½ ips; dist. 2% @ 7½ ips at 1 kHz. Inputs per channel: switchable hi-lo mic; radio; aux. Output power @ 8 ohms: 10 W/ch. Two built-in speakers per channel. 1304 4-track deck in metal housing for custom mounting. $499.00
1104 4-track deck in wood base. $499.00
1124 4-track recorder in wood base. $569.00
1124 4-track portable recorder. $599.00
Clear plastic dust cover. $9.95
Black nylon lock-on NAB adapters. pr. $15.00
Two-track versions of above also available. 15 ips versions available at $100.00 additional.

RHEEM CALIFONE
3080T Mono Recorder
Dual-track, 3-speed (1½, 3¾ & 7½ ips) design; wow & flutter 0.15% @ 7½ ips; 10 W dynamic power output. Response 50-15,000 Hz ±2 dB. Has vu meter; 8" speaker; monitor selector sw.; counter. Can be used as a p.a. system. Supplied with high imp. mic. Over-all size 13¾" x 13½" x 9½"; frequency response 50-15,000 Hz ±1.5 dB (±7½ ips; dist. 2% ± 7½ ips at 1 kHz). Inputs per channel: switchable hi-lo mic; radio; aux. Output power @ 8 ohms: 10 W/ch. Two built-in speakers per channel. 3200-A Tape Recorder
Stereo tape recorder with three-speed option; edit lever. Tracks may be recorded independently & played back simultaneously. Mono to 4-track stereo recording with 2- & 4-track stereo playback. Has two 7" built-in speakers. Output 5 W/ch dynamic power; digital counter; frequency response 40-18,500 Hz; 16¼" x 13½" x 7½"; bridge plate 16½" x 13½". $299.50
74-TC Tape Recorder
Mono, solid-state design. Features instant pause & repeat controls; 3-speed (3¾, 7½ ips) -15 ips optional); vu meter; automatic shut-off; horizontal or vertical operation; monitor & public address circuitry. Response 50-15,000 Hz ±2 dB; output 20 W; wow & flutter 0.18% r.m.s.; S/N ratio 50 dB. Has 7" reels. 8" speaker, record/play & erase heads, mike & high-level inputs. 13¼" x 13½" x 9¼". Supplied with mike ... $300.00 Optional foot control for backspace & pause $7.50

ROBERTS
Model 400X Stereo Recorder
Features 22,000 Hz Cross Field record head design; echo-chamber effects; replay double reverse for automatic, continuous 4-track stereo tape replay; repeat (replays any part
of tape over & over; sound-on-sound; sound-with-sound; special bias for FM recording. Dual speed (7 1/2 & 3 3/4 ips). Has stereo amplifier, two 6" (8 ohm) speakers; 2 vu meters; automatic stop; edit guide; 3 leads (record-play-erase) S/N -45 db; 8 W/ch output; 2 V preamp output; wow & flutter 0.2%; channel separation 50 db; 17 3/4" x 16" x 12 3/4". $799.95

Model 455 Same as 400X Except without automatic forward & reverse play and Cross Field head. $599.95

5000X Tape Recorder
Features 22,000 Hz transistorized professional recording studio Cross Field stereo operation; takes all size (including 10 1/2") reels without adapters. 3 speed; electrical speed change; 4-digit counter; 2 vu meters; hysteresis-synchronous direct-drive capstan motor; 2 large speakers; equalized preamp outputs; 4 heads; 16 W/channel output. $699.95

Model 1700 2-Track Mono Recorder
2-speed (7 1/2 & 3 3/4 ips) design with built-in p.a. system. Has input mixing facility, vu meter; counter; response 40-12,000 Hz ± 3 dB (2 1/2 ips); S/N ratio 45 db; wow & flutter 0.2% @ 7 1/2 ips; record/play & erase heads; 3 W peak output; vacuum-tube design; 4 x 6" spkrs. 15 3/4 x 13 1/2 x 7 3/4" d. Supplied with dynamic mic. $179.95

1719 Stereo Tape Recorder
Solid-state; 2-speed (7 1/2 & 3 3/4 ips) optional. 4-speed design. Features sound-with-sound; separate volume & tone controls for each channel; speaker "on/off"; record monitoring; track select; sound adding; 2 vu meters; counter; 3 leads (record, play, erase) 5 W/ch dynamic music power (3 W/ch continuous sine wave). Response 40-15,000 Hz ± 3 dB @ 7 1/2 ips; S/N ratio 45 db; Wow & flutter 0.2% @ 7 1/2 ips; 4 as two speakers, one each side of case. Supplied with portable Pyroxylin covered case. Comes with 2 mics. $219.95

1720 Stereo Recorder
Same as Model 1719 but has two separate detachable speaker enclosures instead of built-in. Supplied with portable Pyroxylin covered case. 15 3/4 x 14 3/4 x 10 1/2". Comes with 2 mics. $299.95

770X Cross-Field Recorder
20,000 Hz Cross-Field stereo; sound-on-sound; electronically switched hysteresis-synchronous motor; 4 speeds (1 1/2, 3 3/4 & 7 3/4 ips, 15 ips optional); two built-in extended range hi-fi speakers; mute monitor and p.a. switch. Separate tone and equalization controls for each channel. $429.95

778X Cartridge & Reel Recorder
Cross-Field recording on reels even at new LP speeds; 1 micron gap record head for recording on 8-track-type cartridge; two speeds for cartridge record & play; built-in cartridge erase. Records cartridge from reels or external record player, tuner, mics, or another deck. Illuminated read-out indicators for track selection. 4-speed option for standard reel record and play...$429.95

1725-8L III Cartridge & Reel Recorder
4-track stereo reel-to-reel plus "Stereo 8" track cartridge combinations; record & play; 18,000 Hz audio; two speeds (3 3/4 & 7 3/4 ips); cartridge track selector sw.; illuminated cartridge program indicator; two mics included. $359.95

1725-8L III Cartridge & Reel Recorder
Model RD-709 Stereo Recorder
Solid-state, four-track, four-head stereo re-
The **A-6010**. The top of the TEAC line, totally professional in every single specification. Unique electric phase sensing automatic reverse gives four hours of uninterrupted music pleasure without the use of sensing foil. Symmetrical control soft-touch push-button operation.

**Outer-rotor motors for reel drive.**

---

**Tough decision.**

---


---

**The A-1200.** Unusual value—a professional deck at a budget price. All push-button system, on-sound recording and stereo echo, instant off-the-tape monitoring. Two outer-rotor motors for reel drive. Measured wow and flutter 0.12% at 7½ ips. Remote control accessory optional.

---


---

Can't make up your mind? See your TEAC dealer. He'll demonstrate all four models and pass along the technical specifications we didn't list here. You'll be surprised.

---

**TEAC CORPORATION OF AMERICA 1547 18th St. Santa Monica, Calif. 90404**

In Canada: American General Supply of Canada, Ltd.

**1969 EDITION**

Circle No. 37 on Reader Service Card.
Tape Recorder Annual

Model RD-708 Stereo Recorder
Three-speed (7½, 3¾ & 1⅛ ips), four-track, solid-state recorder; 7" reel; two heads; 5 W/ch output. Outputs: 2000-ohm ext. amp, 8-ohm ext. speaker. Inputs: 200-ohm mic, 470k aux. Frequency response 40-16,000 Hz at 7½ ips; S/N ratio 45 dB. Comes with detachable speakers, two dynamic mics, 7" tape, 7" take-up reel; patch cords; speaker cords; splicing tape; reel retainer. 15½" x 15¼" x 10¾" d. $179.95

Model RD-711 Portable Stereo Recorder
Solid-state; 3-speed (7½, 3¾ & 1⅛ ips) stereo unit; 7" reels; 3.5 W/ch output; sound-with-sound; vu meters; tone controls; 3-digit tape counter; sound monitoring system with crossover switch for earphone listening. 19½" x 15½" x 11½" d. External speakers (8 ohms) available extra. $159.95

Sonymatic 105 Recorder
Solid-state, 4-track mono record/playback; 3-speed (7½, 3¾ & 1⅛ ips) design. Features 10 W dynamic power output; vu meter; mic & line mixing; pause control; automatic volume control; sound-on-sound; automatic shut-off; counter; response 40-18,000 Hz at 7½ ips; wow & flutter 0.12% @ 7½ ips. Suppliers with F-98 dynamic mic. $139.50

Sonymatic 104A Recorder
Solid-state, 2-track, mono record/playback, features Sonymatic recording control; instant tape threading; 7½, 3¾, 1⅛ ips; pause control. Response 40-18,000 Hz at 7½ ips; S/N ratio 48 dB. With F-98 cardiod dynamic microphone. $112.50

155 Dubbing Tape Deck/Preamp
Complete stereo tape duplicating and playback deck with built-in solid-state playback preamps. Features pause control, automatic sentinel shut-off. Response 30-18,000 Hz at 7½ ips; wow & flutter 0.09% @ 7½ ips; S/N ratio 50 dB. With walnut base. $179.50

250A Tape Deck/Preamps
All-transistor stereo design; with record & playback preamps. 4-track; vu meters; automatic shut-off; automatic tape lifters; single-knob operation; 7½ & 3¾ ips; flutter & wow 0.09% @ 7½ ips; response 30-18,000 Hz; S/N 50 dB. Has mic & line inputs. 14½" x 6½" x 9" h. $119.50

255 Stereo Deck/Preamps
Features 3 speeds; a.c. bias; mic & line mixing; pause control. Response 30-18,000 Hz at 7½ ips; wow & flutter 0.09% @ 7½ ips; S/N ratio 52 dB. Walnut base with vinyl dust cover. $179.50

500 Stereo Tape Recorder
Solid-state, 4-track, 3-speed (7½, 3¾ & 1⅛ ips) design; features automatic reverse; symmetrical 3-motor system; stereo headphone jack; sound-on-sound. Push-button controls; three speeds (7½, 3¾ & 1⅛ ips); 8 W/ch output; two-way, 4-speaker system in separate wing-type enclosures. Has vu meters; 4-digit tape counter; line input jacks for direct FM-stereo recording. Response 25-18,000 Hz at 7½ ips; wow & flutter less than 0.07% at 7½ ips; S/N better than 50 dB. Control unit 16¼" w. x 18½" h. x 7½" d. Speaker enclosure 16¼" w. x 18½" h. x 5½" d. Comes with mics & stands; 7" tape; 7" take-up reel; speaker cables; splicing tape; sensing tape; two connecting cords. $325.00

560 Stereo Tape Recorder
Solid-state, 4-track, 3-speed (7½, 3¾ & 1⅛ ips) design with 10 W/ch dynamic power; response 30-18,000 Hz at 7½ ips; wow & flutter 0.09% @ 7½ ips; S/N ratio 52 dB. Walnut base and vinyl dust cover. $229.50
SHARPE HA-10A

The outstanding HA-10A is a prime example of Sharpe quality and value. Experts have tested it, top rated it... agreed that it meets today's critical sound performance specifications. Rate it... to your own performance standards. You will find the HA-10A outperforms the finest stereo speaker systems. Visit your authorized Sharpe Dealer, and personally test Sharpe's complete line of quality stereophones. From $19.95 to $100.00.

Model 530 Stereo Recorder
Solid-state, 4-track stereo or mono record/playback; 3-speed (7 1/2, 3 1/4, 1 1/4) design. Features 20 W/ch dynamic power; sound-on-sound; automatic shut-off, vu meters; remote control; pause control. Response 30-18,000 Hz @ 7 1/2 ips; S/N ratio 50 dB; flutter & wow 0.09% @ 7 1/2 ips; has detachable speaker systems. Supplied with two F-98 dynamic mics. 15 3/4" x 19 3/4" x 10" d. $399.50

ServoControl 800 Mono Recorder
Battery or a.c. operation; 3 speed (7 1/2, 3 1/4, 1 1/4) design. Features Sony E-S-P, electronic control; automatic reverse; a.c. bias; automatic shut-off; sensor automatic; audible warning system; input for magnetic phono. Has walnut cabinet. $575.00

You rate it!

This is the SHARPE HA-10A

Price $32.95

- Freq. Response: Full 15,000 Hz, 40-3,000 Hz ± 2 db, 3,000-8,000 Hz ± 3 db
- Max. Input Power: 2 watts ea. phone
- Max. Acoustical Output: 130 db s.p.i.
- Impedance: 8 ohms, others optional
- Harmonic Distortion: @ 1 vlt. less than 1%
- Sensitivity: 115 db re 0.0002 dyne CM² @ 0.5 vlt. input

Sharpe guarantees materials and workmanship for one full year when registered with authorized warranty card. Covered by U. S., Canadian patents. FREE literature and detailed specifications sent upon request.

SHARPE INSTRUMENTS
Div. of Scintrex, Inc.
955 Maryvale Drive, Buffalo, N. Y. 14225
Available in Canada
910 Mono Portable Recorder
Battery or a.c. power; features solid-state circuitry; 3¾" reel capacity; 2-track operation; 3⅛ & 1⅛ ips; record indicator meter; aux input for radio & TV recordings; S/N ratio 45 dB; wow & flutter 0.17% at 3⅛ ips. With dynamic remote mic; vinyl carrying case. 6 lbs. .................. $69.50

Model 760 Reel-Changing Deck
Will handle five reels of pre-recorded tape & play them in automatic sequence. Features reel-changing mechanism; automatic reel threading; automatic reel reversing; ejection of completed reel after both tracks have been played. Reels can be intermixed and can vary from 3" to 7". Features solenoid push-button control for manual operation. Deck operates at 7½, 3⅛ & 1⅛ ips. .................. $995.50

TANDBERG
Series 6X Tape Deck/Preamps
Features separate erase, record & playback heads in addition to a special bias head for extended frequency response. Permits sound-on-sound & tape monitoring after recording. Has individual mixer record controls; separate playback controls; pause button; 4-digit counter & optional remote control. Tape speed 7½, 3⅛ & 1⅛ ips. Has preamps only. Mono center channel output 1 V @ 200 ohms & dual stereo outputs 1.5 V @ 2000 ohms & 150 mV @ 10,000 ohms. Oscillator is transistorized, balance tubes. Dist. 0.5% at max. record level & 0.2% at max. playback level. Response at 7½ ips is 30-20,000 Hz ±2 dB; wow 0.1%; S/N 62 db. 15⅛" x 11⅛" x 6¾". Has teak wood cabinet. Model 6X Four-track .................. $549.00
Model 62X Two-track ........................ $549.00
Model 65 Stereo Playback Deck
Three-speed (7½, 3⅛ & 1⅛ ips), 4-track stereo playback tape deck; response 30-20,000 Hz @ 7½ ips, 30-15,000 Hz @ 3⅛ ips. 50,000 Hz @ 1⅛ ips; 4-pole synchronous motor; lever knob for playback, fast forward, fast reverse; 4-digit revolving counter; complete mechanical drive; overall size of the deck 16" x 12" x 6". Model 64X Four-track .................. $209.50

TANDBERG
Model 11 Tape Recorder
Battery-operated (10 1.5-V cells or rechargeable type can be used); battery eliminator for connection to 110/220 V, 50/60 Hz. Three speeds (7½, 3⅛ & 1⅛ ips); electronic speed control; maximum reel diameter 7", with cover 4", Response 40-16,000 Hz @ 7½ ips; S/N ratio 56 dB at maximum recording level @ 7½ ips; wow & flutter better than 0.2% @ 7½ ips, vu meter; solid-state. Inputs: radio & mic; outputs: line & headphone. 13" x 10" x 4", 7 lbs. .................. $494.50

TEAC
A-1500 Tape Deck
Features "Add" recording & stereo echo. Has 4 heads for automatic reverse play & monitoring actual sound on tape while recording. Response 30-20,000 Hz; wow & flutter 0.12%. Does not have power amps or speakers. Has preamp output 1 V and mic & line inputs. All mechanical functions are solenoid operated. 17¾" x 17½" x 9¾". Walnut wood cabinet ......... $495.00

A-1600 Tape Recorder
Stereo design featuring "Add" recording & stereo echo, with separate record & playback amplifiers; line & mic inputs. Response 30-20,000 Hz @ 7½ ips; wow & flutter 0.12% @ 7½ ips; S/N ratio 50 dB; 8 ohms; 2 W/ohm dynamic power output. Features electrically automatic reverse for uninterrupted play of up to four hours. Solid-state design. 16" x 16¾" x 11¾". $519.50

A-1900 Tape Deck Preamp
Has 3 heads; features stereo echo & "Add" recording. Response 30-20,000 Hz; wow & flutter 0.12%. Does not have power amp & speaker. Has mic & line input & 1 V preamp outputs. 17" x 15¾" x 9¾". Walnut cabinet .................. $299.50

A-4010S Tape Deck/Preamp
Features contact tape automatic reverse play & monitoring actual sound on tape

A-4000S Tape Transport
Same as A-4010S tape deck/preamp except does not have preamplifiers. 17½" x 13" x 9¾". Walk-in cabinet .......... $329.50

A-2020 Stereo Recorder
Four-head, four-track, two-channel stereo design. Three speeds (7½, 3⅛ & 1⅛ ips); wow & flutter 0.15% @ 7½ ips; response ±3 dB 50-15,000 Hz @ 7½ ips; S/N ratio 50 dB. Sound-on-sound; automatic reverse. 21¼" x 13½" x 10½". .......... $399.50

TEAC
A-1200 Tape Deck/Preamp
Has 3 heads; features stereo echo & "Add" recording. Response 30-20,000 Hz, wow & flutter 0.12%. Does not have power amp & speaker. Has mic & line input & 1 V preamp outputs. 17" x 15¾" x 9¾". Walnut cabinet .................. $299.50

A-4010S Tape Deck/Preamp
Features contact tape automatic reverse play & monitoring actual sound on tape
The best thing in electronics is ALLIED ELECTRONICS FOR EVERYONE 1969

Brand new! Fresh off the press! Allied's 1969 Catalog. The world's most famous catalog of electronic equipment featuring hundreds of new and exclusive items and special Allied values.

536 pages—including the most complete inventory of Hi-Fi, Radios, Tape Recorders, CB, Electronic Equipment, Parts and Tools ever assembled...all at money-saving prices.

BIG SAVINGS ON THE BEST IN ELECTRONICS FOR EVERYONE

- Stereo Hi-Fi
- Electronic & Hobby Kits
- Tape Recorders and Tapes
- Citizens Band Equipment
- Walkie-Talkies
- Shortwave Receivers
- Phonographs
- Speakers
- Record Changers
- FM, AM & VHF Radios
- Portable TV Sets

- Amateur Gear
- Intercoms
- P. A. Equipment
- Test Equipment
- Antennas
- Tubes and Transistors
- Automotive Electronics
- Tools & Hardware
- Books
- Cameras
- Needles
- Headphones
- Microphones
- Integrated Circuits
- Wire & Cable
- Parts and Batteries

NO MONEY DOWN • UP TO 2 YEARS TO PAY!

ALLIED RADIO, Dept. 157
P.O. Box 4398, Chicago, Illinois 60680
Send me your free catalog for 1969

(please print)

NAME

ADDRESS

CITY

STATE

ZIP CODE

Write for your copy today!

1969 EDITION

Circle No. 2 on Reader Service Card.
Model A-2040 Stereo Tape Deck
Three-speed (7½, 3 ½ & 1¼ ips), three-head, quarter-track stereo deck; includes power amps but not speakers; four tracks; hysteresis synchronous outer rotor. 7" max. reel size. Frequency response 30-20,000 Hz; S/N 50 dB; wow & flutter 0.12%. Includes power amps but not speakers; four tracks; hysteresis synchronous outer rotor. 7" max. reel size. Frequency response 30-20,000 Hz; S/N 50 dB; wow & flutter 0.12%; crosstalk 50 dB at 1000 Hz channel to channel, 40 dB between adjacent tracks at 100 Hz. Inputs: mic: 600 ohms/line 100,000 ohms, 0.1 V min. Outputs: line 0.5 V for 50,000 ohms min., 8-ohm speakers (10 W/ch). Has foil-sensing automatic reverse & playback; pause button; 4-digit counter; vu meters. $379.50

Model A-2050 Stereo Tape Deck
Features bidirectional record/playback; four heads; automatic reverse record/play mechanism; synchronized band brake; solid-state amplifier; 8-ohm headphone amp for monitoring; 4-digit index counter; automatic drive shut-off. Three speeds. 11½" x 10 1/4" x 5". $349.50

Model A-7030 Stereo Tape Deck
Two- & four-track (switchable); four heads (½-track & ¼-track switchable); 15 & 7½ ips; max. reel size 10½"; response 40-14,000 Hz @ 3½ ips; S/N ratio -46 dB; wow & flutter ±0.3%. Has 2½" x 4" speaker; 1 W output. Will operate on five 1¼ volt flashlight cells or storage battery. Has a/c power supply/battery charger. 10½" x 3½" x 11". $159.95

A-4020 Tape Recorder
Features automatic reverse, bi-directional recording. Response 30-20,000 Hz; wow & flutter 0.12%; has line & mic inputs; 8 ohms; 20 W dynamic output each channel. 18¼" x 12¾" x 4½". $349.95

TOSIBHAK
Model GT-611P Portable Recorder
Battery (six "D" cells) or a/c operation; two speeds (3½ & 1¼ ips); solid-state; push-button control of record, play, stop, rewind, and fast-forward; input jack for direct cable tapping from radio, record player, TV, or other recorder; monitor sw. permits speaker-monitored or silent recording. Has 6" x 3" dynamic speaker; 3-digit tape counter with 0 reset; handles up to 5" reels. Comes with mic with remote-control sw., 5" reel of tape, 5" take-up reel; connecting cable; dust cover. $79.50

Model GT-701V Tape Recorder
Solid-state, two-track, two-speed (7 1/4 & 3⅞ ips) mono unit with automatic record level, 6" x 4" dynamic speaker; 7" reel capability; output jack; tone control; 3-digit tape counter with reset; meter-type record level indicator; accidental erasure protection. Response 70-10,000 Hz; wow & flutter 0.2%; S/N 40 dB (all at 7¼ ips). Fast-forward 240 sec., rewind 180 sec. (both with 7½ reel). Comes with mic; 5" reel with tape, 5" take-up reel; connecting cable; dust cover. 13" h. x 13" w. x 7½" d. $119.50

Model PT-850S Stereo Tape Deck
Solid-state, four-track deck; two speeds (7½ & 3¼ ips); pause-edit control; record amp; playback preamp; 3-digit tape counter with 0 reset; private listening & monitoring headphone jack. Frequency response 50-15,000 Hz; S/N 45 dB; wow & flutter 0.2% (all at 7½ ips). Will handle up to 7½ reels. 5¼" h. x 15¼" w. x 13¼" d. $179.50

Model GT-840S Stereo Tape Recorder
Solid-state, four-track, two-speed (7½ & 3¼ ips) stereo unit. Features two-way tape transport, automatic reverse, bi-directional recording. Response 30-20,000 Hz; wow & flutter 0.12%; has line & mic inputs; 8 ohms; 20 W dynamic output each channel. 18¼" x 12¾" x 4½". $349.95
It's also a tape recorder.

At a glance you can see that this Fisher compact stereo system will play records and receive FM-stereo broadcasts. (FM sensitivity: 2.0 microvolts, IHF.) But look again. Built into the Fisher 127 you'll find our RC-70 cassette deck. So this system will also let you tape records and FM-stereo broadcasts on a tiny cassette. And it'll also play them back anytime through the XP-55B speaker systems.

Also, the cassette deck in the Fisher 127 has separate VU meters for left and right channels. Clutched record-level controls (they work together or separately). A digital counter with pushbutton reset. A pair of professional-quality microphones, and many other professional features.

The price of the Fisher stereo system that's also a tape recorder is just $449.95. And if you already own a record changer, receiver and speakers, you can still own the new Fisher cassette tape deck.

It's also available separately, for just $149.95.

Mail this coupon for your free copy of The Fisher Handbook 1969. This reference guide to hi-fi and stereo also includes detailed information on all Fisher components.

Fisher Radio Corporation
11-35 45th Road, L.I.C., N.Y. 11101

Name: _____________________________
Address: ____________________________
City: __________________ State: ______ Zip: ______

The Fisher Handbook 1969

Circle No. 18 on Reader Service Card.
### UHER

**Model 4000L Portable Recorder**
- All-transistor, 2-track, 4-speed (7 1/2, 3, 1 1/2, 3/4 ips) mono design; powered by five Ni-Cd cells or rechargeable battery.
- 6-12 V or separate 120 V a.c. supply; electromagnetic start/stop remote control by means of microphone or remote switch; digital counter; vu meter and power supply indicator; acoustic switch available for sound control for start and stop of tape; response 40-20,000 Hz ± 5 dB @ 7 1/2 ips; S/N 52 dB; wow & flutter ± 0.05% ± rms; output 0.75 V @ 10,000 ohms.
- Model 7300 same as Model 7000 except without controls on front panel.
- Model 88 Stereo Deck/Preamps
  - 4-speed, record/playback, 2-speed (7 1/4, 3 1/2 ips);
  - response 20,000 Hz ± 2.5 dB @ 7 1/2 ips; single 7 1/2-ips speed; full-track; 7" reels max.
  - Features automatic photoelectric level control; overload filter; "Pilotone" level adjust; battery condition checker; monitoring off the tape; stroboscopic speed control; built-in speaker; pause control.
  - Designed especially for sound synchronization of motion picture films.
  - Model 10,000 "Royal Deluxe" 4-speed, record/playback stereo design with 10 W/ch continuous sine-wave amplifiers & two built-in speakers. Features built-in "Dia-Pilot" for sound/slide synchronization; sound-on-sound; sound-with-sound; echo single channel & stereo mixing. Amplifiers can be used independent of tape recorder. Wow & flutter 0.025% @ 7 1/2 ips.

### VIKING

**Model 88 Stereo Deck/Preamps**
- Solid-state, 2-speed (7 1/4, 3 1/2 ips), 4-track design. Response 30,000 Hz ± 3 dB @ 7 1/2 ips.
- Features counter, vu meters, monitor facilities, sound-on-sound, automatic shut-off. Preamp outputs 2 V...$339.95
- 1500 Cabinet, walnut...$18.95

### UHER

**Model 4400 Stereo Recorder**
- 4-track version of Model 4000L; has additional stereo amplifiers & one speaker.
- Basic machine...$450.00
- Mark IV package...$600.00
- Model 4200 Two-track version of Model 4400. Mark IV package...$625.00
- "Universal 5000" Recorder
  - All-transistor, 4-speed (7 1/4, 3, 1 1/2, 3/4 ips), 6" reel design. Response 40-20,000 Hz @ 3 1/2 ips; S/N 48 dB; wow & flutter 0.2% ± 3/4 ips; output 2 W @ 4 ohms. Has digital counter, automatic recording level control, completely solenoid controlled; vu meter & inputs for low-impedance mic.; radio, phone. Playback outputs 2.5 V @ 4 ohms & 0.9 V @ 47,000 ohms. 6" x 10" x 13"...$219.50

**Model 5900 "Royal Deluxe" Tape Deck**
- Same as Model 10,000, less output amplifiers & speakers...$450.00
- Model 88 Stereo Deck/Preamps
  - 4-speed, record/playback stereo design with 10 W/ch continuous sine-wave amplifiers & two built-in speakers. Features built-in "Dia-Pilot" for sound/slide synchronization; sound-on-sound; sound-with-sound; echo single channel & stereo mixing. Amplifiers can be used independent of tape recorder. Wow & flutter 0.025% @ 7 1/2 ips. Response 20-20,000 Hz ± 2 dB at 7 1/2 ips.

---

**TAPE RECORDER ANNUAL**

Page 86
FREE! World's Largest Electronic Kit Catalog

New . . . Over 300 Kits
For Every Interest . . .
Save Up To 50%

- Deluxe Color TV . . . the sets you've heard and read about that give better performance yet cost no more; three models: 295, 227 & 180 sq. in. rectangular; with exclusive built-in self-servicing aids for best pictures always. Custom, wall, or cabinet installation. New optional wireless remote controls, and new Heathkit antenna line. Also deluxe 12" B&W portable TV.

- Transistor Organs . . . deluxe 19-voice "Paramount" and low cost 10-voice Thomas models in kit form with instant play "Color-Glo" - save up to $60. Also VOX "Jaguar" combo organ at $200 savings over assembled version.

- Electric Guitar Amplifiers and accessories . . . 20, 25 & 120 watt amps, "fuzz" booster, headphone amp, plus famous name microphones and speakers.

- Portable and Table Radios and Phonographs . . . choose AM, FM, and shortwave radios . . . mono or stereo phonographs.

- Stereo/Hi-Fi Components . . . transistor stereo receivers (including the world famous Heathkit AR-15), amplifiers, tuners, speakers, turntables, cartridges, furniture.

- Transistor Organs . . . deluxe 19-voice "Paramount" and low cost 10-voice Thomas models in kit form with instant play "Color-Glo" - save up to $60. Also VOX "Jaguar" combo organ at $200 savings over assembled version.

- Amateur Radio Gear . . . world's most complete (and popular) line . . . SSB transceivers, transmitters, receivers, and accessories.

- Citizen's Band Radio . . . 5-watt fixed and mobile transceivers, walkie-talkies, crystals, antennas.

- Test and Lab Instruments . . . a complete line for home & hobby, shop, educational and industrial use. Newly designed and styled for professional use.

- Scientific and Educational . . . the famous Berkeley Physics Lab, Malmstadt-Enke instrumentation, including Analog/Digital equipment, IMPscope and kits for home & classroom study.

- Marine Electronics for safety and pleasure afloat . . . radiophones, RDF, depth sounder, fuel vapor detector, and accessories.

- Photographic Aids . . . Heath/Mitchell Fotoval® and Colorval® darkroom computers for perfect B&W and color printing; electronic photo timer.

MAIL COUPON NOW!

- Biggest Selection . . . Over 300 Kits
- Up to 50% Savings
- Easiest To Build
- World Famous Easy-To-Understand Construction Manuals
- Highest Quality Components
- Best Performance
- Unique Creative Satisfaction
- Pride Of Achievement
- Free-Tech Technical Consultation
- Easy Credit Terms

HEATH COMPANY, Dept. 170
Benton Harbor, Michigan 49022

Please send FREE Heathkit Catalog

Name ____________________________ (please print)
Address ____________________________
City _________________________ State ______ Zip ______

CL-338
Model 754 BK Same except in vinyl-covered speaker case. Carrying handle. 14" h. x 16" w. x 8" d. 

Model 733 BK Tape Recorder
Compact mono unit with three speeds. 7" reels; headphone jack; safety interlock.

Model 744 Stereo Recorder
Three-speed (7 1/2, 3 3/4 & 1 1/4 ips), four (1/4-track) channel, solid-state design. 7" reels; safety interlock; twin vu meters; headphone jack; automatic shut-off; 3-digit tape counter; push-button control; "Add-A-Track." Power output 20/W peak music power (EIA) output; response 50-15,000 Hz; wow & flutter less than 0.25% r.m.s. at 7 1/2 ips. Frequency response 50-15,000 Hz. 14 1/4" h. x 22" w. x 11 1/4" d. Vinyl-covered 1/2" plywood enclosure. Speakers detachable & usable up to 20 feet apart.

Model 748 Stereo Recorder
Solid-state, three-speed (7 1/2, 3 3/4 & 1 1/4 ips), four (1/4-track) channel unit. Response 50-15,000 Hz; S/N 46 dB; track separation 50 db; wow less than 0.25% r.m.s. at 7 1/2 ips. 7" reels; 3-digit counter; push-button controls; pause button. Two 6" speakers. Heavy-duty plywood case has handle for portability. 14" h. x 21 1/4" w. x 11 1/4" d.

Model 734 Stereo Recorder
Three-speed, solid-state record/play unit. Will handle up to 7" reels; frequency response 50-15,000 Hz; wow & flutter less than 0.25% r.m.s. at 7 1/2 ips; two built-in 6" speakers; has "Add-A-Track"; twin vu meters; headphone jack; 3-digit counter; push-button controls; pause button. Heavy-duty walnut-finished veneer case. Center unit 14 1/4" h. x 27 1/4" w. x 9" d. Each speaker 14 1/4" h. x 13 3/4" w. x 3 3/4" d.

WOLLENSAK
5710 2-Track Mono Recorder
Solid-state, 3-speed (7 1/2, 3 3/4 & 1 1/4 ips) design. Features 4" x 6" built-in speaker; vu meter; pause control; counter; automatic shut-off; monitor facility; automatic head demagnetization. Response 40-17,000 Hz ± 3 db @ 7 1/2 ips; wow & flutter 0.2% @ 7 1/2 ips; S/N ratio 48 db @ 7 1/2 ips; 

Model 734 AM-FM Tuner/Recorder
Solid-state system includes stereo recorder and provision for AM, FM, FM-stereo recep-
tion. Three-speed (7 1/2, 3 3/4 & 1 1/4 ips), four (1/4-track) channels; response 50-15,000 Hz; power output 20 W peak music power (EIA)/ch; S/N & track separation 50 db; wow & flutter less than 0.25% r.m.s. at 7 1/2 ips. Features "Add-A-Track"; twin vu meters; 3-digit tape counter; headphone jack; interlock to prevent accidental erasure; push-button controls; pause button. System housed in walnut finished veneer case. Center unit 14 1/4" h. x 27 1/4" w. x 9" d. Each speaker 14 1/4" h. x 13 3/4" w. x 3 3/4" d.
5740, 5750 & 5800 are all 1969 EDITION

WOLLENSAK MODELS 5720, 5730, 5740, 5750 & 5800 are all solid-state, 3-speed (7 1/4, 3 3/8 & 1/4 ips) design, 4-track stereo & mono play & record designs. Response 40-15,000 Hz ±3 dB @ 7 1/4 ips; S/N ratio 48 dB; output 10 W dynamic power at 5% HD. Features built-in speaker; vu meter; counter; automatic shut-off; monitor facility. Accepts optional speaker, preamp. Has tandem tone controls; vu meters; automatic reel locks; solid-state circuitry. Recorder 16 1/2" w. x 13 1/4" h. x 6 1/2" d.; speakers 13 1/2" w. x 8 3/4" h. x 6" d. ...$199.95

Model 6200 Same as Model 6300 except with self-contained speakers. ...$199.95

Model 6100 Same as Model 6300 but deck only. ...$159.95

3500 Portable Mono Tape Recorder
Operates from six "D" cells or 117-V a.c. hum & noise 25dB below normal power, 9 W continuous @ output 3 W dynamic power at 5% HD. Features built-in speaker; vu meter; counter; automatic shut-off; monitor facility. Accepts optional speaker, preamp. Has tandem tone controls; vu meters; automatic reel locks; solid-state circuitry. Recorder 16 1/2" w. x 10 1/4" h. x 7 3/4" d.; enclosed 21 1/3" w. x 10 1/4" h. x 10 1/4" d.; recorder 21" w. x 11" h. x 9" d. Supplied with a dynamic mic & wall mounting hardware. ...$259.95

5810 AM-FM Stereo Tuner
Walnut cabinet matches 5800 system. FM usable sensitivity 10 µV; response 40-12,000 Hz (stereo); separation 25 dB @ 1 kHz; hum & noise 25 dB below 1 V output. ...$259.95

Model 6300 Stereo Recorder
Three-speed (7 1/4, 3 3/8 & 1/4 ips), four-track stereo unit; frequency response 40-15,000 Hz ±2 db at 7 1/4 ips; wow & flutter less than 0.15% at 5 W. Inputs: low-imp. mic, high-level phono/tuner; outputs: 8-ohm speaker, preamp. Has tandem tone controls; vu meters; automatic reel locks; solid-state circuitry. Recorder 16 1/2" w. x 13 1/4" h. x 6 1/2" d.; speakers 13 1/2" w. x 8 3/4" h. x 6" d. ...$299.95

Model 6200 Same as Model 6300 except with self-contained speakers. ...$199.95

Model 6100 Same as Model 6300 but deck only. ...$159.95

TAPE CASES
Record Cases are available in three sizes: for 7", 10" and 12" records. Each case, with a center divider that separates your records for easy accessibility, holds an average of 20 records in their original jackets. The Recording Tape Case holds 6 tapes in their original boxes.

- The Tape Cases and the 7" Record Cases (with catalog forms) are only $4 each; 3 for $11; 6 for $21.
- The 10" and 12" Record Cases (with catalog forms) are $4.25 each; 3 for $12; 6 for $22.

Add an additional 75¢ per order (regardless of number of cases ordered) for shipping and handling. Outside U.S.A. add $1 per case ordered. Add a special 75¢ for special handling on orders over $25.

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

1969 EDITION

PAYMENT MUST BE ENCLOSED WITH ORDER
**Admiral**

**CTRF150 Cassette-Corder**
Solid-state portable cassette recorder with built-in AM-FM radio. Can record direct from radio (bypassing mic), play prerecorded tapes, and record. 14 transistors; record level/battery meter; 2 1/2" speaker; push-buttons for record, forward, stop, rewind, fast-forward. Black walnut cabinet, leatherette carrying case, mic stand, batteries & a.c. charger included. $84.95

**Allied**

**1150 Cassette Recorder**
Solid-state, 2-track mono design; operates from six "C" cells or a.c. line. Response 200-11,000 Hz. Has auto level control, battery level meter, remote start/stop mic. 9 3/4" x 6" x 2 3/4" $89.95

**1100 Cassette Recorder**
Similar to Model 1150 except operates from five "C" cells or a.c. adapter. Supplied with a.c. adapter & remote start/stop mic. 12" x 6" x 4". 1157138X $59.95

**Aiwa**

**TP-728 Cassette Recorder**
Solid-state, a.c.-d.c. design. Features capstan drive; mono record & playback; output 500 mW dynamic power (EIA 5% dist.). Has 4" x 2 1/2" spkr.; a.c. bias & erase. Supplied with mic, earphone, batteries, case & a.c. line cord. 10 1/4" x 6" x 3 1/2" $69.95

**TP-1009 Cassette Tape Deck**
Solid-state, stereo, 117 V a.c. design; response 50-10,000 Hz; has preamps only for record & playback; pause control; 1 V output each channel; two vu meters; a.c. bias & erase. 11" x 10" x 3 1/2" $19.95

**TP-707PJ Cassette Recorder**
Solid-state, dual-track, mono, capstan drive design. Features a.c. bias; 1 3/8 ips; tape (all cassette cartridges are 3/4" in width); 2 1/4" speaker; 200 mW dynamic power; operates from 4 "C" cells; has record level/battery indicator meter. Supplied with remote control mic & earphone $54.95

**AmpeX**

**Micro 50 Cassette Deck/Preamp**
Solid-state stereo cassette player/recorder; a.c. operated; does not have power amp & speaker. Features counter, vu meter, pause & record level controls. Has two omnidirectional mics & walnut case. 14 1/2" x 8 1/4" x 3 1/2" $139.00

**Micro 20 Cassette Recorder**
Solid-state, a.c.-d.c.-battery operated mono recorder with remote mic. 12 1/2" x 8" x 2 1/4" $99.90

**Micro 85 Cassette Recorder**
Solid-state stereo cassette player/recorder; a.c. operated. Features record level, tone & pause controls & counter. Supplied with two omnidirectional mics & two separate speaker systems. Walnut cabinets. 14 1/2" x 8 3/4" x 3 1/2" $189.00

**Micro 1 Cassette Player**
Portable mono design; operates from 6 penlight cells & with optional adapter for a.c. line. 6" x 2 1/2" x 10" $29.98

**Micro 30 AM-FM-Cassette System**
Mono design includes AM & FM radios and a cassette player/recorder. Is battery or a.c.-line operated, solid-state. 12" w. x 3" x 7" h. Less microphone $129.00

**Micro 10 Cassette Recorder**
Portable design operating from 5 "C" cells. Features 2-track, mono, 1 3/8 ips. Includes mic with remote sw. 8" x 4 1/2" x 2 1/4"; 4 lbs. $69.90

**Micro 5 Cassette Deck/Preamp**
Solid-state, walnut-encased stereo playback design. 8 3/4" x 5 1/4" x 2 1/2" $54.90

**Micro 12 Cassette Recorder**
Solid-state, portable, mono with mic. Powered by 5 "C" cells or with optional adapter from a.c. line. Mic has remote sw. 4 3/4" x 2 1/4" x 7 1/4" $59.90

**Arvin**

**97C38 Stereo Cartridge Player**
Complete system consisting of 4- and 8-track cartridge player, stereo amp, and two matching speakers. Will handle 4", 6", or 8" wide...
MAIL THIS CARD TODAY FOR YOUR FREE 1969 LAFAYETTE CATALOG 690

Use LAFAYETTE'S Easy-Pay Budget Plan
No Money Down...
Up to
24 Months to Pay
Satisfaction Guaranteed or Money Refunded

MAIL THIS CARD TODAY FOR YOUR FREE 1969 LAFAYETTE CATALOG 690

FREE LAFAYETTE CATALOG

LAFAYETTE 1969 CATALOG 690 our 48th Year
BETTER THAN EVER
Your Complete Buying Guide to Everything in Electronics

Over 500 Pages

Featuring Everything in Electronics For
• HOME
• INDUSTRY
• LABORATORY

Do A Friend A Favor
Give Him This Card To Send For His

Mail The Coupon Today for Your FREE 1969 LAFAYETTE CATALOG 690

Please send the FREE 1969 LAFAYETTE Catalog 690

Mail This Card Today

FREE LAFAYETTE CATALOG

STORE LOCATIONS

NEW YORK
Brooklyn
Jamaica
Lynbrook
Manhattan
Scarsdale
Syosset

NEW JERSEY
Newark
Paramus
Plainfield

MASSACHUSETTS
Boston
Natick
Saugus

CONNECTICUT
Hamden
W. Hartford

PENNSYLVANIA
King of Prussia
Monroeville
Philadelphia
Pittsburgh

WASHINGTON, D.C.
Falls Church, Va.

(LAFA YETTE Radio ELECTRONICS
Dept. 05118 P.O. Box 10
Syosset, L.I., N.Y. 11791

(Miracle of the Space Age)

NAME
ADDRESS
CITY
STATE
ZIP

(Please Give Your Zip Code No.)
Your Electronic Buying Guide

Stereo Hi-Fi • Citizens Band • Ham Gear • Tape Recorders • Test Equipment • TV and Radio • Phonographs, Accessories • Intercoms and PA • Closed Circuit TV • Tubes and Parts • Cameras • Auto Accessories • Musical Instruments • Tools • Books

REVOLUTIONARY NEW

Electronic Miracle of the Space Age

Award winning LR-1500T IC solid state Receiver

New

Dynta Com Super Series Walk-e-Talkies

New

Solid State "IC" 2-Way Radios

New

Criterion Speaker Systems

New

Solid State Stereo Tape Recorders

New

Musical Instruments and Accessories

FREE!

Mail This Card Today

LAFAYETTE
RADIO ELECTRONICS
P.O. BOX 10
SYOSSET, L.I., N.Y. 11791
cartridges with machine making the necessary adjustments automatically. 3/4 ips; capstan drive system; program selector: automatic and/or manual; automatic eject and shut-off. 14" w. x 8" h. x 13" d. Walnut woodgrain vinyl cabinet $159.95

97C18 Stereo Cartridge Player
Solid-state, 4- or 8-track stereo/mono cartridge player designed to be used with component hi-fi systems. Has two aux. input jacks for phono, tuner, or reel-to-reel; automatic switching; automatic channel selection; automatic cartridge eject & switch off. Handles 4", 6", and 8" cartridges; 3 1/4 ips; capstan drive. Preamp output 0.5 to 1 volt. Includes two 4 ft patchcords, two external amp. jacks. 14" w. x 8" h. x 13" d. Walnut veneer cabinet $119.95

30L71-1K 4-Track Recorder
4-track solid-state stereo unit with two extendible enclosures each with 5 1/2" x 3" speaker. Records and plays 4-track stereo or 2-track mono; automatic cassette loader/unloader; push-button controls for play, fast forward, rewind, stop; record interlock button; counter with auto-reset; dual controls for individual speaker balance; a.c. erase; capstan drive for constant IN ips speed. Has output jacks for stereo headphones, external amps, monitor; 2 mic jacks & 2 aux. input jacks. 12 1/4" w. x 5 1/4" h. x 8 1/4" d. Comes with two mics with fin stands & blank cassette. Beige. $179.95

40L31-19 Recorder/AM-FM Radio
Battery or a.c. operation; records from mic or radio; 2-track mono: 500 mW output; capstan drive; push-button controls for stop, fast-forward, play, rewind, record. Has remote-control mic with stand; aux. input; combination vu/battery meter; response 50-15,000 Hz; output 4 W dynamic power (2 W/ch); 12 V negative ground. Features solid-state circuitry, automatic switching of channels at end of each play. Supplied with two 5" speakers. 6 1/4" x 2 3/4" x 6" d. $79.95

SFB-6802 4-Track Stereo Player
Designed for car or boat; 12 V d.c. operation. Supplied with two 5" speakers. $59.95

SEA-6801 8-Track Stereo Player
Designed for car or boat; 12 V d.c. operation. Solid-state; auto switching to each of the 8 tracks. Supplied with two 5" speakers $69.95

HTC-8102 Convertible Player
Same as GES-8111 except for 117-V home operation. Tape deck/preamps only. $79.95

GES-8111 Convertible Player
Will play stereo 8-track & 4-track with optional "gidget". Will also play AM, FM or FM-stereo when optional cartridges are inserted in machine. For 12 V d.c. car or boat operation. Has 4-way speaker balance; solid-state circuits; 5 W/ch dynamic power; response 50-15,000 Hz. For home use optional speakers & 117 V power supply are available. Supplied with four 5" speakers $149.95

HMX-4000 AM-FM Tape System
Home design features built-in AM-FM stereo tuner, 10 W/ch power amp & an 8-track tape player (4-track also with "gidget"). Speakers not supplied. 19 1/2" x 4" x 9 1/2" $199.95

BELL & HOWELL

292 Cassette Player
Two-track mono design; operates from six "C" cells; output 400 mW; response 300-8000 Hz; earphone output. 10" x 6' x 2 1/8" $29.95

332 Cassette Tape Changer
Four-track stereo deck/preamps for playback only, 117 V a.c. operation; response 63-4000 Hz ±8 db. Will store and play six cassette cartridges automatically. Line output 0.4 V at 20,000 ohms. 15" x 9 1/4" x 4 1/4" $129.95

337 Cassette Tape Changer
Same basic design as Model 332 except stereo 10 W/ch r.m.s. amps have been added. Has stereo record facilities and separate speakers. 15" x 9 1/4" x 4 1/4" $269.95

295 Cassette Recorder
Two-track mono play/record. Operates from six "C" cells & 117 V a.c. Output 0.8 W; response 100-5000 Hz ± 6 db. Has line output for ext. speaker & mic input. 10" x 7 1/2" x 2 3/4" $99.95

327 Cassette Recorder
Four-track stereo play/record; 10 W/ch r.m.s. output; response 63-8000 Hz ±8 db; 117 V a.c. operation. Appearance same as Model 326. 14 1/2" x 8 3/4" x 3 1/2" $229.95

1969 EDITION
322 Cassette Player
Five-track stereo deck/preamps; 117 V a.c. operation. Response 63-8000 Hz ± 8 dB. Has 0.4 V, 20,000-ohm line output. 8 x 4 1/2” x 2 3/4” $99.95

326 Cassette Recorder
Four-track stereo play/record deck/preamps; 117 V a.c. operation; response 63-8000 Hz ± 8 dB. Has line output (0.5 V at 18,000 ohms). 3 3/4” x 8 3/4” x 3 1/2” $59.95

BLAUPUNKT
"Snob 100" Cassette Recorder
Solid-state with 0.5 W output & in car adapter 2.5 W. Has built-in speaker; state-of-battery indicator; mic with remote control. Will operate from drycells or rechargeable battery, 12 V car adapter, or 117 V power lines $139.95

BORG-WARNER
Deluxe 8-Track Tape Player
Solid-state stereo, 12 V negative-ground design; features 3 3/4 ips operation; response 70-10,000 Hz; 0.75 W/ch power; 8 ohm outputs. Supplied with two 5 1/2” waterproof speakers. 3” x 8” x 7 1/2” $109.95

"Cart/able 8" Cartridge Tape Player
Portable 8-track, 120 V a.c. design; has detachable speaker cases. Supplied with battery condition meter; push-button controls; 4” dynamic speaker; separate remote-control mic; separate mic input for conference recording; 4 W output. 12” x 9” x 4 1/2” d. Wt. 8 lbs. $119.95

200-S Cassette Recorder
Complete solid-state system including matched pair of walnut speaker systems. 50-10,000 Hz response; built-in stereo speakers. Supplied with remote-control dynamic mic. 12 3/4” x 9 3/4” x 3 1/4” $179.95

CONCERTONE
210 Cassette Recorder
Solid-state, mono design with 3 3/8” speaker; a.c. adapter, mic & leather-type case. $89.95
2703 Cassette Recorder

Same basic design as 2704 except has 1.25 W/c'ch stereo dynamic power ampls. Supplied with 2 dynamic mics & a pair of speaker systems (each with 5" x 7" speaker). Main unit 14¼" x 3¼" x 9¼" d. Speaker cab. 7" x 10" x 6" d. Walnut cabinet. Walnut cabinet. $189.95

3110 4-Track Car Stereo Player

Plays all sizes of 4-track cartridges; output 2 W/ch; response 100-7500 Hz @ 3⅛ ips.

F-105 Stereo Cassette Recorder/Preamps

Solid-state design with preamps. To be used with external hi-fi power amplifiers; has 4 tracks; 1½ ips; separate vu meters; aux. & mic inputs. Response 40-18,000 Hz; wow & flutter 0.1%; S/N ratio 45 dB. 8½" w. x 2½" x 8". under $99.95

3201 8-Track Cartridge Deck/Preamp

Home version stereo tape player. Response 50-10,000 Hz; wow & flutter 0.35% r.m.s. Walnut cabinet. 14¼" x 3¾" x 9¼". $139.95

CRAIG

2602 Cassette Recorder

Battery-operated with battery life indicator & a.c. adapter jack. .............................................$69.95

3104 4/8-Track Tape Player

Compatible 4 & 8 track stereo playback. Features automatic selection; lighted track indicators; 117 V a.c. operation. .......$99.95

2603 Cassette Recorder

117 V a.c. or five "C" cell operation. Has mic & aux inputs. Response 100-7500 Hz; $59.95

0.63 W output power; 2¼" speaker; remote-control dynamic mic. 5¾" w. x 9½" x 2¾". Mono design .............................................$59.95

1969 EDITION
SHC 51/500 Music System
Combines an AM-FM stereo tuner; cas-
tette tape recorder & 15 W/ch dynamic
power amplifier. All solid-state and stereo;
response 30-20,000 Hz. Recorder is a 4-
track, 2-channel design. Supplied with two
mics & has facilities for p.a. Walnut cases
CSP-7 speakers optional.

CTR-9650S Cassette Recorder
Attaché-case mono design with built-in
cassette recorder & monaural headphones.
AC/battery operation; has automatic rap-
ping. Response 100-10,000 Hz; a.c. bias;
1 W output; 1 W output; 4" speaker, 4" x 15¾" x
12½". $99.95

CTR9000 Compact Cassette Recorder
Solid-state, 1½ ips design with a.c. bias;
response 100-8500 Hz; 800 mW output.

Will record/play cassette-type cartridges;
mono; 2½" speaker; operates from 4 flash-
light cells (117 V adapter available). Has
ceramic pickup; has recording level/battery condition meter.
Supplied with remote mic: 2¼" x 4½" x
6¾". $99.95

CSC-9350 Cassette/Receiver
4-track, 1½ ips. Features monitor facilities
through speakers or phones; 2 detachable
speaker systems, both battery-operated (4
"D" cells) built-in & 117 V a.c.; records
either mono or stereo; 1.3 W/ch output; 2
track level meters. Response 100-10,000
Hz; 12½" x 4" x 17½". Supplied with 2
mics. $189.95

CRC-9100F Cassette/Radio
Solid-state mono recorder with AM/FM
radio; battery operated (a.c. adapter option-
al); output 1 W; 100-10,000 Hz response;
1½ ips; a.c. bias; 3½" x 9½" x 8". With
dynamic mic. $89.95

**GENERAL ELECTRIC**

Model M8600 Stereo Cartridge Player
Plays standard 8-track stereo cartridges;
monaural design; automatic shut-off; push-
button channel selection. Two solid-state
preamps ready for standard patch connec-
tion to radio or amp; capstan drive; 3½ ips
18" w. x 4½" h. x 8½" d. Walnut finish
on hardwood. $109.95

Model M8610 Cartridge Player System
Plays standard 8-track stereo cartridges
through matched 9" x 6" dynamic speakers.

C-200 Cassette Recorder
Mono design; battery-powered (5 "C"
cells) or optional a.c./d.c. pack; 2-track, 1½ ips.
Response 80-10,000 Hz; 800 mW output.
Has mic with remote-control sw.; level
control. 4½" x 2½" speaker. 6" x 9¼" x
2½". $99.95

C-201 With built-in FM radio $134.95

**HARMAN-KARDOON**

CAD-4 Cassette Tape Deck/Preamp
Solid-state stereo design for record & play-
back; 1½ ips; HD 1½; response 50-
12,000 Hz ±2 dB; a.c. bias; sensitivity:
high level 200 mV, low level 0.2 mV;
output 0.8 V r.m.s. Has two vu meters;
output with frequency response 50-12,000
Hz. Has automatic cartridge eject, tone &
pause controls; speaker monitor; level meter;
3½" speaker. Remote control from mic.
Operates from a.c. or six "D" cells. 2½" h.
6" w. x 9¼" d. 4.4 lbs. $99.95

9300 AM Radio/Cassette Player
Battery-operated player featuring automatic
recording system; 1 W output. Standard

---

**HITACHI**

Model TRQ-220 Portable Recorder
Battery- or a.c.-operated cassette recorder;
push-button operation; cassette
pop-up system; automatic level control; adjus-
table tone control; automatic tape-end
stop. Safety device prevents accidental ero-
sures. 5½" x 2½" h. x 9¾" d. $79.95

**JVC NIVICO**

1600 Cassette Recorder
Portable cassette recorder operating from
four "C" cells. 800 mW output, response

100-10,000 Hz. Features 4" x 2½" speaker;
automatic recording system; provides
1 W output with frequency response 50-12,000
Hz. Has automatic cartridge eject, tone &
pause controls; speaker monitor; level meter;
3½" speaker. Remote control from mic.
Operates from a.c. or six "D" cells. 2½" h.
6" w. x 9¼" d. 4.4 lbs. $99.95

1700 A.C./Battery Recorder
Features auto/manual recording system; ac-
cells; provides 1 W output. Standard

---

**ORUNDIG**

C-200 Cassette Recorder
Mono design; battery-powered (5 "C"
cells) or optional a.c./d.c. pack; 2-track, 1½ ips.
Response 80-10,000 Hz; 800 mW output.
Has mic with remote-control sw.; level
control. 4½" x 2½" speaker. 6" x 9¼" x
2½". $99.95

---

**TAPE RECORDER ANNUAL**

---

96
**KINEMATIX**

**KX-900 4 & 8-Track Recorder**

Includes record and playback electronics to permit use with an external amp. Will record from FM, FM-stereo, phono disc, mics, or other electronic source onto 4- or 8-track continuous-loop cartridges. Automatic shut-off with metallic foil sensing tape. Has vu meter. 110-120 V a.c. but can be converted to operate at 230 V d.c. for use in car.

---

**9400 AM-FM/Cassette Recorder**

Battery (six "D" cells) or a.c. operation; standard AM and FM broadcast bands; standard cassettes. Battery (six "D" cells) or a.c. operation; 9400 AM-FM/Cassette Recorder adapter jacks are provided. Four "D" cells.

---

**FM reception;**

1.8 W output, 80-10,000 Hz response; 5" speaker. Telescopic antenna and a.c. for FM reception; automatic cartridge eject; level meter; battery checker. Accepts all standard cassettes. 8" h. x 10¾" w. x 3¾" d. 7.3 lbs. $199.95

---

**Model 800 Cartridge Deck**

Plays all standard 8-track cartridges through existing hi-fi system; 3¾ ips; wow & flutter less than 0.3%; NAB equalization; output 0 to 1 V per ch (variable); solid-state circuitry. Controls: continuous play; auto off; auto cue; fine tuning; fast-forward; eject; program selector. 117 V a.c. 10" w. x 3¼" h. x 10¾" d. $139.00

---

**Model 801 Cartridge Player**

Plays all standard 8-track cartridges; 3¾ ips; wow & flutter less than 0.4%; NAB equalization. Inputs: phono, tuner, aux. Speaker output imp. 8-16 ohms. All-solid-state. 30 W/ch music power; HD less than 1%; frequency response 10-20,000 Hz ±2 dB; bass & treble tone controls. 117 V, 60 Hz a.c. only. 15¼" h. x 10½" d. x 5¼" h. Walnut and brushed silver finished cabinet. $199.00

---

**LAFAYETTE**

**RK-550 Cassette Deck/Preamp**

Solid-state stereo design using cassette tape cartridges; 4-track record/playback with preamps. Features 2 vu meters, mic & aux. inputs, high-level amp outputs. Response 50 to 18,000 Hz; wow & flutter less than 0.5%; frequency response 10-20,000 Hz ±3 dB. Includes record and playback electronics to operate at 12 V a.c. for use in car.

---

**Circle No. 31 on Reader Service Card.**

**At '400 this would be a great little microphone.**

At '99.50 it's a great big miracle.

---

**HEAR HERE FOR THE UTMOST IN DISCOUNTS ON NATIONALLY ADVERTISED HI-FI STEREO COMPONENTS WRITE FOR OUR QUOTE**

All Merchandise Shipped Promptly Fully Insured From Our Warehouse.

---

**ECONA CORPORATION**

Sole U.S. Representatives for: Leak Speakers and Hi-Fi Components Omega Replacement Stylus 432 Park Ave South, New York 10016

---

**Circle No. 41 on Reader Service Card.**
Model A-239 FM Radio/Stereo Player
Plays 8-track stereo or mono tapes @ 3 1/2 ips; electronic speed control; automatic and/or manual push-button program selector; wow & flutter less than 0.3%. Power output 4 W/ch rms, 16 W peak music power. Operates from 12-volt negative-ground battery systems. 8" w. x 7 1/2" d. x 3" h. $119.95

Model A-219 8-Track Stereo Player
Solid-state circuit; plays stereo or mono 8-track cartridges; 3 1/2 ips; electronic speed control; automatic and/or manual push-button program selector; wow & flutter less than 0.3%. Power output 4 W/ch rms, 16 W peak music power. Operates from 12-volt negative-ground battery systems. 8" w. x 7 1/2" d. x 3" h. $119.95

Model H-349 AM-FM-Cassette Player
Features 24-W peak music power amp, automatic 8-track stereo tape cartridge player. AM-FM-stereo tuner with a.f.c. and FM-stereo broadcast indicator, and two matching speaker enclosures (2 1/2 tweeters, 6" woofers in each). Plays stereo or mono cartridges at 3 1/2 ips; automatic or manual push-button program selector; wow & flutter 0.3%; frequency response 30-18,000 Hz. Output 6 W/ch music power, 24 W total peak music power. 6 1/4" h. x 19 1/2" w. x 10 1/2" d. Speakers each 12 1/2" h. x 7 1/2" w. x 8" d. $239.95

Model H-439 Cartridge Music System
24 W peak music power amp with 8-track stereo cartridge player. Features tape cartridge program selector; program indicator lights; all-solid-state circuitry; integrated speaker system. 5 1/2" h. x 18 1/2" w. x 11" d. $109.95

Model S-749 matching external speakers also available.

Model HSA-940 Cartridge Deck
Designed to play 8-track stereo or mono tapes through existing stereo system. Completely automatic operation; push-button program selector; program indicator lights. Housed in walnut veneer wood cabinet. 6 1/8" w. x 10 1/4" d. x 3 1/2" h. $69.95

Model M-650 Portable Recorder
Operates on batteries or a.c. without adapter; 3 1/2 ips reel-to-reel cassette, capstan drive; push-button controls for stop, play, fast-forward, rewind & record; automatic level and volume controls; inputs for mic and earphone. Comes with remote-control mic, cassette, carrying case, earphone, alligator clip connection. 4 3/4" w. x 9" h. x 3 1/4" d. Gray and black high-impact case with black grille & chrome control panel $59.95

Model M-4400 Stereo Cartridge Player
Solid-state 10 W stereo amp; two side-mounted 6" speakers; operates on 8 "D" cells, a.c. without an adapter, or from 12-volt battery through cigarette lighter. Plays four-track 3 1/2 ips cartridges. Has electronic battery indicator; changeover channel switch; volume, balance, tone and on/off switch; jacks for external speakers. Walnut-grained vinyl covered cabinet with carrying handle/stand. 12 1/4" w. x 9 1/2" d. x 4 3/4" h. Comes with batteries, auto lighter adapter cord, and a.c. cord. $99.95

Model M-8503 Portable Stereo Player
Solid-state 20 W stereo amp; detachable speaker enclosures each with one 6" speaker; volume, balance, and program selector controls; automatic program selector; manual switch for individual program selection; external amp output jacks; instant load and play; cartridge slot door. Housed in poly-styrene case with walnut inlays & brushed chrome knobs. 5 1/2" h. x 17" w. x 10" d. $99.95

TAPE RECORDER ANNUAL
The average embarrassed non-technical music-loving layman's clip-and-save INSTANT GUIDE TO RECORDING TAPE

Lesson 1. The Basic Question—Acetate or Mylar Base?

When you record something, you are magnetizing microscopic particles of iron oxide. If you don't know what iron oxide is, don't worry. Just bear in mind that the particles have to be attached to something or they will blow away, so they are coated onto plastic tape. This base tape can be either acetate or Mylar. Choice of base does not affect fidelity of sound, so why a choice? To save you money and trouble.

Acetate gives you economy. It's not as rugged as Mylar, but professional recording studios prefer it and use it almost exclusively. You may prefer it too.

Mylar® gives you mileage. It survives for years even in deserts and jungles (if you're taping tribal chants, you'll want Mylar). Mylar tapes also can be made exceedingly thin, which means a reel can hold more feet for a longer, uninterrupted program.

Tempering® overcomes Mylar's tendency to stretch under stress, and is used for the thinnest, most expensive tapes (the next 2400 feet of double-recording tape (still thinner Mylar). Easy, isn't it? Now move on to:


Instead of "Play," "Recording," "Length" or "Time," think of "Thickness." Picture a tape-reel 7 inches in diameter. It will hold 1200 feet of standard-recording tape (acetate or Mylar) . . . 1800 feet of longer-recording tape (considerably thinner acetate or Mylar) . . . 2400 feet of double-recording tape (still thinner Mylar). Easy, isn't it? Now move on to:

Lesson 3. Which Speed to Record At.

<table>
<thead>
<tr>
<th>TAPE SPEED</th>
<th>1200 FT.</th>
<th>1800 FT.</th>
<th>2400 FT.</th>
<th>3600 FT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1/2 71/2 ips</td>
<td>128</td>
<td>192</td>
<td>256</td>
<td>384</td>
</tr>
<tr>
<td>3 7/8 15/16 ips</td>
<td>64</td>
<td>96</td>
<td>128</td>
<td>192</td>
</tr>
<tr>
<td>7 1/4 3 1/2 ips</td>
<td>32</td>
<td>48</td>
<td>64</td>
<td>96</td>
</tr>
<tr>
<td>15 7 1/2 ips</td>
<td>16</td>
<td>24</td>
<td>32</td>
<td>48</td>
</tr>
</tbody>
</table>

Your tape recorder probably allows you to record at several different speeds (you, by the way, are a recordist; only your machine is a recorder). What's the reason for this smorgasbord of speeds? The faster the speed, the higher the fidelity; the slower the speed, the more playing time per foot and per dollar.

15 1/2 ips (inches-per-second). Commercial recording companies use this speed when they tape their favorite performer for later transfer to records. Forget it.

7 1/2 ips is what you need for really good hi-fi music at home, and for the clearest reproduction of speech (foreign-language homework, sound-tracks for home movies, cocktail-party capers). An 1800-foot reel will play for 45 minutes—the length of a long-play record.

3 1/2 ips is fine for background music and for most speech applications—dictating to your secretary and recording baby's first words. An 1800-foot reel will play for an hour and a half.

1 1/2 ips is a businesslike speed without hi-fi frills. Good for tape-conferences at the office because it puts a lot of words on a single reel. An 1800-foot reel will play for three hours.

15/16 ips is not recommended for anything but continuous monitoring. An 1800-foot reel will play for 6 full hours. Unless you do wire-tapping, you are probably not in the market for 15/16 ips and you're ready to try this:

Lesson 4 Post-Graduate Course.

Experienced tape recordists, with ears and equipment that are ultra-sensitive, can sometimes hear "echoes" caused by "print-through." Think of it as a leakage of sound from layer to layer when very thin tape is wound on the reel. When you achieve that kind of expertise, you'll want special "low-print" coatings...as well as "low-noise" coatings which eliminate the barely perceptible tape-hiss that only the most expensive amplifiers can pick up anyway.

Advertising Paragraph.

Now that you feel like an expert, you'll want the brand of tape that's used by experts because it's made by experts. Its name is Audiotape. It's made by the people who supply tape for recording studios, corporate computers, Cape Kennedy countdowns and automobile stereo cartridges. It's made in the full range of acetateMylar®temperedMylar standardplaylongerrecordingdoublelength triplatetime lowprint lownoise. It's made better. Ask anybody who knows. They'll tell you to ask for Audiotape.
MERCURY

Cassette Recorder Series
Features record & playback; 1 ½ ips; solid-state design; automatic stop at end of hub; capstan drive; battery-operated; five 1 ½ " C" cells; 2-track; 500 mW output; response 100-7500 Hz; S/N ratio -45 dB; wow & flutter 0.5% r.m.s.; 2 ½" speaker.

Model 8060 Supplied with remote-control dynamic mic. 8 ½" x 4 ½" x 2 ½" mono design. Optional equipment: headphones, a.c. adapter, foot pedal control & telephone pickup coil. $49.95

Model 4450 Tape deck; 4-track stereo design; response 60-10,000 Hz; wow & flutter ±0.3%; automatic record level control; 117 V a.c. operation; does not have power amplifiers or speakers. 10 ¼" x 10 ¼" x 3" $114.95

Model 7200 117-V a.c. & battery operated (12 V-8 "I") cells); 4-track stereo design; power output 2 W; response 60-8000 Hz; S/N ratio -40 dB; wow & flutter 0.4%; 6" x 4" speaker. Will play & record 2-track mono & has stereo play & record preamps with only one channel of power amplifier & speaker. Second channel designed for ext. amp & speaker. Supplied with remote-control mic; same optional equipment as for Model 8060. 10" x 12" x 3 ¼" $129.95

Model TR-4500 4-track stereo record/playback; 117-V a.c. operation; has two detachable speaker systems (6" speaker) with 4 W/ch dynamic power; response 60-10,000 Hz; wow & flutter 0.3%; supplied with 2 mics. 10½" x 10½" x 3 ½"; speaker output. 2 ¼" speaker. 10" x 5 ¼" x 2 ¼". With remote-operate dynamic mic. $59.95

AP-8400 Cassette Recorder
Stereo play, mono record design; 1 ½ W/ch dynamic power; 80-10,000 Hz. 7½" x cases 10" x 7" x 3½" $159.95

TR-1000 Cassette “Minicorder”
Battery-operated (four "AA" batteries); 2-track mono recorder. Has 2" speaker; battery level meter; automatic record level control; output 100 mW dynamic power. Response 250-4500 Hz. Speaker acts as microphone. 6 ¾" x 11 ¾" x 3 ½" Supplied with earphone & telephone pickup $89.95

Model TR-4475 Cassette Deck/Preamp
For stereo play & record. Response 80-10,000 Hz. Supplied with two dynamic mics. Has remote start/stop operation. 10½" x 9½" x 3½" $129.95

NORELCO

All Norleco cassette machines are designed around the Philips reel-to-reel cartridge & 1 ½ ips.

“Carry-Corder 150” Cassette Recorder
Portable design operating direct from built-in batteries. Features 2-track 2 x 60 minutes playing time. Response 80-10,000 Hz ±3 dB; Supplied with mic & carrying case. 7¼" x 4¼" x 2¼"; 3 lbs. $64.95

Car-mount. A special tray-like mounting assembly. When "Carry-Corder 150" is inserted, connections are made to car radio; can then be used as a car player. $29.95

2401 Automatic Stereo Changer Record/Playback System
Twin walnut encased speakers; built-in cassette storage compartment; dynamic stereo microphone; record level indicator; 60-10,000 Hz; 15¼" x 9¾" x 4¾" $249.95

2401A In deck format, without speakers $195.95

“Continental 450” Cassette Recorder
Solid-state stereo design based on the 4-track reel-to-reel cassette; response 60-10,000 Hz; wow & flutter 0.1%. Has stereo record level control; tone, loudness & balance controls; counter; vu meter & can be used as a p.a. system. Supplied with two 100 cases 10" x 7" x 3½" $159.95

AP8300 Auto Cassette
For 10 to 14 volts positive or negative-ground operation; 4 tracks; 1 ½ ips stereo design; 3 W/ch dynamic power; response 50-10,000 Hz; S/N ratio -45 dB; wow & flutter 0.3%; solid-state design. 7" x 6½" x 2½". Supplied with two 5" speakers, dynamic mic with remote switch & mounting brackets $119.95

TR8700 Stereo Cartridge Recorder
Portable 4-track, solid state record/play design using Norleco (Philips system) reel-to-reel cartridge; up to 90 minutes playing time; response 60-111,000 Hz: wow & flutter 0.3%; supplied with 2 mks. 10 ¼" x 10 ¼" x 3" speaker $159.95

AP-8300 Auto Cassette
For 10 to 14 volts positive or negative-ground operation; 4 tracks; 1 ½ ips stereo design; 3 W/ch dynamic power; response 50-10,000 Hz; S/N ratio -45 dB; wow & flutter 0.3%; solid-state design. 7" x 6½" x 2½". Supplied with two 5" speakers, dynamic mic with remote switch & mounting brackets $119.95

TR-5000 Cassette Recorder
For 117 V a.c. or five "D" cell operation. Response 100-8500 Hz; mono; 500 mW output, 2 ¼" speaker. 10" x 5 ¼" x 2 ¼" $129.95
settes
2502 Automatic Stereo Changer
Cassette-playback only; will handle 6 cassettes for up to 6 hours playing time.

2500 Stereo Cassette Playback Deck
For mono & stereo playback; a.c.-operated; has preamps only; response 60-10,000 Hz.

175 Portable Cassette Recorder
Larger version of "Cary-Corder 150". Operates on six batteries. Features mono operation; record/playback level controls; vu meter. Response 80-10,000 Hz. Supplied with remote mic.

...continued

175 Portable Cassette Recorder
Larger version of "Cary-Corder 150". Operates on six batteries. Features mono operation; record/playback level controls; vu meter. Response 80-10,000 Hz. Supplied with remote mic..................$89.95

"Cary-Player 2200" Portable Player
Battery-operated (six 1/2 V cells); response 100-7000 Hz; 300 mV output ...........$29.95

1969 EDITION

2602 Car Cassette Player
Stereo design; playback only; has "on-off" indicator; pause control & cassette reject bar ..............$199.95

2602 Automatic Stereo Changer
Cassette-playback only; will handle 6 cassettes for up to 6 hours playing time.

Model 682.110 Stereo Cartridge Deck
Solid-state, 8-track tape player designed to be used with existing hi-fi systems. 117 V a.c.; amp. output 1 V r.m.s. (adjustable); frequency, response 50-15,000 Hz; 50-15,000 Hz; wow & flutter 0.25%. Outputs: tuner, phono. 17% d. x 13% long x 4 1/2" h. Walnut finished wood cabinet. ............$169.95

Model 690.110 Stereo Cartridge Deck
Solid-state, 8-track tape player designed to be used with existing hi-fi systems. 117 V a.c.; amp. output 1 V r.m.s. (adjustable); frequency, response 50-15,000 Hz; 50-15,000 Hz; wow & flutter 0.25%. Outputs: tuner, phono. 17% d. x 13% long x 4 1/2" h. Walnut finished wood cabinet. ............$169.95

ORTRONICS

Model 682.110 Stereo Tape Player
Solid-state, 8-track playback unit; 3 1/2 ips; 3 W/ch output; automatic switching; response 50-10,000 Hz; S/N 40 dB; wow & flutter 0.25%; push-button track control selector; 11-16 V d.c. @ 1 amp. Reversible gimbals mounting bracket for under dash or floor hump mounting; 7" d. x 8 1/4" w. x 3 1/4" h. (less bracket). Comes with two stereo speakers (Model 625.900). ..................$89.95

Model 682.120 Stereo Tape Player
Solid-state, 8-track player; plays 4-track cartridges with gidget, 11-16 V d.c. @ 1 A negative-ground (adaptable to post-ground by sw.); automatic or manual track sw.; frequency, response 50-10,000 Hz; S/N 40 dB; wow & flutter 0.25%. Reversible gimbals mounting bracket for under dash or floor hump mounting; 7" d. x 8 1/4" w. x 3 1/4" h. (less bracket). Comes with two stereo speakers (Model 625.900). ..................$89.95

Model 690.100 Stereo Player/ Speakers
Solid-state, 8-track stereo playback with optional 4-track @ 3 1/2 ips. 117 V a.c., 60 Hz; amp. output 10 W peak/ch; freq. response 50–15,000 Hz; S/N 45 dB; wow & flutter 0.2% max. Output imp. 4-8 ohms/ch; dist. less than 5% at normal lis-
PLAYTAPE
Model 1605 AM Radio/Player
Transistorized, battery- (four "D" cells) or a.c.-d.c. operated cartridge player with full-range AM broadcast receiver. Has 4" speaker and four controls: volume, tone, channel selector, and radio tuning. 9" h. x 6 3/4" w. x 3 1/2" d. $42.95

"Sapphire II" Auto Tape Deck
Designed to be played through car radio speaker; universal mounting for under dash installation. 3 1/2 W output; 12 V neg.-ground operation. For use with PlayTape cartridges. $49.95

RCA
Model YLD-42 Stereo Tape Player
Solid-state tape player with two 5" speakers; 8 tracks: 3 3/4 ips. Housed in wood cabinet of Danish-style walnut. $49.95

Model YLB-25 Recorder/Player
Solid-state, battery/a.c.-operated recorder/player. Push-button controls; two-tracks; 1 7/8 ips. Comes with batteries, earphone, neck cord, microphone, and blank cassette. $75.00

SONY/SUPERSCOPE
TC-50 Mono Cassette-Corder
Compact, 1 3/4 ips, 2-track design will operate from four type "A-9" batteries. Features automatic record level control; built-in mic; built-in speakers; battery level meter; response 50-8000 Hz @ 1 1/2 ips; wow & flutter 0.28%; S/N ratio 45 dB; with carrying case $169.50

TC-8 8-Track Cartridge Deck/Preamp
Solid-state stereo design for recording/playback @ 3 1/4 ips 8-track cartridges: response 40-12,000 Hz; wow & flutter 0.32%; S/N ratio 45 dB; Has two low-impedance mic inputs; two high-level aux. inputs or mag. phono with RK-66 adapter (optional). $124.50

 funtions: Tape Sentinel end-of-cassette alarm system, a light that blinks on and off as cassette nears end of each side; noise sup-
ressor switch; response 40-10,000 Hz; wow & flutter 0.2%; S/N ratio 54 dB; walnut base ..................$129.50

130 Cassette-Corder
Similar to Model 125; complete stereo system in walnut, with two matching walnut speakers. Features 8 W/ch dynamic power output; noise suppressor sw; stereo monitor sw.; response 40-10,000 Hz; wow & flutter 0.2%; S/N ratio 54 dB, F-99 stereo mic ..................$229.50

TEAC
Model A-20 Cassette Tape Deck
Four-track, two-channel stereo; 1% ips; response 60-10,000 Hz; wow & flutter less than 0.2%; S/N 45 dB; input: mic. 600 ohms, 0.3 mV/line 120,000 ohms, 0.1 V min. Output: line 50,000 ohms 0.5 V/headphone 8 ohms 0.1 mW. Pop-up housing for cartridge; dual vu meter; unidirectional stereo mic; all-silicon transistor amp. 9 1/4" x 10" x 4 1/4" ..................$139.50

Model A-20 Cassette Tape Deck
Records & plays in both directions at 1 3/8 & 3 3/4 ips; response 60-10,000 Hz; wow & flutter less than 0.2%; S/N 45 dB; input: mic. 600 ohms, 0.3 mV/line 120,000 ohms, 0.1 V min. Output: line 50,000 ohms 0.5 V/headphone 8 ohms 0.1 mW. Pop-up housing for cartridge; dual vu meter; unidirectional stereo mic; all-silicon transistor amp. 9 1/4" x 10" x 4 1/4" ..................$139.50

TELEFUNKEN
“Magnetophon” 4001 Cassette Recorder
2-track, 1% ips, mono record & playback design; response 8-10,000 Hz ±3 dB; S/N ratio -45 dB; output 400 mW; operates on five “C” cells. Supplied with remote control mic ...............................$69.95
A.c. power converter available.

TELEX-PHONOLA
Model 9000 Cassette Recorder
Record/playback unit; capstan drive; push-button controls; push-button cassette release; a.g.c. & volume control; 800 mW output:

3 3/4” speaker; input jacks for mic & a.c. adapter; input jacks for earphones. Battery operated, optional a.c. adapter. Comes with dynamc mic & stand; cassette; carrying case; earphone; aux. cables; “C” batteries. 5 3/4” w x 2 3/4” h x 9 3/4” d ..................$59.95

Model TC-48TFM FM Radio/Player
Automatic 4 & 8 track stereo player; fine-tuning control; 12-volt negative ground;
out FM radio. Operates on either 12 V positive or negative ground. ..................$129.95

Model HTC-210-DG Cartridge Player
Plays 4 or 8 track cartridges automatically; fine tuning control adjusts playback head to precise alignment with recorded tracks; separate speakers in matching wood cabinets. 117 V a.c. System housed in oiled walnut cabinets with gold trim. ..................$169.95

TOSHIBA
Model KT-20P Portable Recorder
Solid-state; battery (4 “C” cells), a.c., or 12 V d.c. (with cigarette lighter adapter cord) operation. Response 50-10,000 Hz ±3 dB; S/N 40 dB; wow & flutter 0.4%

1969 EDITION

Don’t settle for low-fi when you can upgrade your K-Set tape player with a Michigan Magnetics head. These heads are completely compatible with Norelco, Mercury, Standard, and most import K-Set machines. The complete family of heads is made in the U.S. and immediately available from Allied Radio

MICHIGAN MAGNETICS
A DIVISION OF VSI CORPORATION
VERMONTVILLE, MICHIGAN 49096
Telephone (517) 259-8911

Send For:
Consumer Audio Catalog # 680
Circle No. 23 on Reader Service Card.

Why?
DO THOUSANDS OF HI-FI ENTHUSIASTS BUY FROM AUDIO UNLIMITED

It’s Obvious!
Franchised Distributors of Top Brand-Name TAPE RECORDERS
SCOTCH and BASF Recording Tapes
and a Complete Stock of HI-FI COMPONENTS

• LOWEST PRICES + FAST SERVICE
• FACTORY SEALED UNITS
• PACKAGE DEALS-SAVE MORE

Write for lowest prices and FREE TAPE LIST
SEND US YOUR LIST FOR OUR AIR MAIL QUOTE TODAY

Visit Our Showroom and Warehouse CLOSED MONDAYS

©AUDIO unlimited, Inc.
396-S Third Ave. (Nr. 28), N.Y., N.Y. 10016
W r.m.s.; 1½ ips. Features keyboard operation; automatic cartridge loading & unloading; record/battery condition indicator; automatic record level; 4" speaker. 2½" h. x 5¼" w. x 10" d. $99.50

Model KT-81 Stereo Cartridge Player
Solid-state amp 10 W/ch; input & output jacks for tuner/record player connection; wide-range tone control; program selector, balance, volume, tone & power controls; 3½ ips; hysteresis synchronous motor. Response 50-15,000 Hz; S/N better than 40 dB; channel separation 50 dB at 1000 Hz. $119.50

Model KT-80 Similar to Model KT-81, but deck only. Output voltage 1 V max. per channel; load imp. 10,000 ohms or more/ch. Comes with 5 ft. connecting cables. 4½" h. x 12½" w. x 8" d. $69.50

VIKING
811 Series 8-Track Tape Players
Automatic & push-button track selection; 40-15,000 Hz response with 0.3% r.m.s. flutter & wow. Has numerical track indication.
Model 811 Table top design in walnut cabinet with preamps only. $99.95
Model 811W Same with power amps; 5 W/ch dynamic power & two 5¼" speakers. $149.95
Model 811P Same as 811W except is a portable design. $149.95

V-M
Model 764 Stereo Recorder
Solid-state cartridge machine that will play all cassettes & record stereo or mono; 1½ ips; response 60-10,000 Hz; wow & flutter 0.3%; r.m.s. max.; detachable speakers; push-button operation; level meter; tape counter; fast-forward & rewind. Speakers & amplifier fit together for easy portability. Center unit 4½" h. x 13¼" w. x 8½" d.; speakers 7¼" h. x 9½" w. x 5½" d. $199.95

Model 762 Portable Recorder
Operates from five “C” cells; records & plays all standard cassettes; 1½ ips; peak music power 800 mW; S/N 45 dB; wow & flutter 0.3%; r.m.s. High-impact plastic case. 9½" long x 4½" w. x 2¼" thick. 4 lbs. $69.95

WOLLENSACK
4000 Cassette Recorder
Battery-operated, mono record/playback; detachable compression-loaded speakers; jam-proof cassette ejector. Frequency response 70-10,000 Hz ±3 dB; wow & flutter less than 0.3% at 1½ ips; S/N ratio 45 dB; output 400 mW continuous sine wave; playing time 90 min. Features vu meter; dynamic mic with remote start/stop switch. Supplied with mic, cassette & carrying case. 4½" w. x 7½" h. x 2½" d. $74.95

Model 4800 Cassette Recorder
Records & plays both stereo & mono cassettes; 1½ ips; interlock start, stop, play & record controls; separate record level meters for each channel; digital counter; detachable compression-loaded speakers; jam-proof cassette ejector. Frequency response 70-10,000 Hz ±3 dB; wow & flutter less than 0.3% at 1½ ips; S/N ratio 45 dB; output 8 W/ch music power (EIA); 5 W/ch at output jack continuous. Outputs: 8-ohm speaker, preamp; inputs: mic & phono. 13½" long x 9½" w. x 4½" high. $54.95

REGARDING PRICES:

As might be expected, prices vary across the country, and those quoted are usually those prevailing in the manufacturer’s immediate vicinity. Obviously, because of sales policies, discounts, etc., prices will vary from place to place, and because of transportation costs, prices in areas remote from the point of manufacture will be higher. And, of course, manufacturers reserve the right to change prices without notice.

104 TAPE RECORDER ANNUAL
**RAW TAPE**

### AMPEX

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 2431T</td>
<td>1800 ft</td>
<td>7&quot; reel</td>
<td>$5.50</td>
</tr>
<tr>
<td>Type 311</td>
<td>900 ft</td>
<td>5&quot; reel</td>
<td>$2.65</td>
</tr>
<tr>
<td>Type 331</td>
<td>900 ft</td>
<td>5&quot; reel</td>
<td>$2.49</td>
</tr>
</tbody>
</table>

- **Acetate Base Tape**
  - Type 2431T, 1800 ft, 7" reel: $5.50
  - Type 311, 900 ft, 5" reel: $2.65
  - Type 331, 900 ft, 5" reel: $2.49

- **Polyester Base Tape**
  - Type 1271, 1200 ft, 7" reel: $4.25

### AUDIOTAPE

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 150-15</td>
<td>1500 ft</td>
<td>7&quot; reel</td>
<td>$5.50</td>
</tr>
<tr>
<td>Type 150-18</td>
<td>1800 ft</td>
<td>7&quot; reel</td>
<td>$6.20</td>
</tr>
</tbody>
</table>

- **Polyester Tape**
  - Type 150-15, 1500 ft, 7" reel: $5.50
  - Type 150-18, 1800 ft, 7" reel: $6.20

### BASF

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 111-6</td>
<td>600 ft</td>
<td>5&quot; reel</td>
<td>$1.35</td>
</tr>
</tbody>
</table>

- **Polyvinyl Chloride Tape**
  - Type 111-6, 600 ft, 5" reel: $1.35

### C-60 Cassette

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 111-6</td>
<td>600 ft</td>
<td>5&quot; reel</td>
<td>$2.25</td>
</tr>
<tr>
<td>Type 190</td>
<td>500 ft</td>
<td>5&quot; reel</td>
<td>$3.00</td>
</tr>
</tbody>
</table>

### C-90 Cassette

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 190</td>
<td>1000 ft</td>
<td>5&quot; reel</td>
<td>$4.00</td>
</tr>
<tr>
<td>Type 120</td>
<td>1000 ft</td>
<td>5&quot; reel</td>
<td>$5.00</td>
</tr>
</tbody>
</table>

### C-120 Cassette

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 120</td>
<td>1000 ft</td>
<td>5&quot; reel</td>
<td>$5.00</td>
</tr>
</tbody>
</table>

### SERIES NO. 111

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 111</td>
<td>900 ft</td>
<td>5&quot; reel</td>
<td>$1.25</td>
</tr>
</tbody>
</table>

- **Plastic Tape**
  - Type 111-3, 900 ft, 5" reel: $1.35
  - Type 111-6, 600 ft, 5" reel: $2.25
  - Type 111-8, 850 ft, 5" reel: $2.85
  - Type 111-12, 1200 ft, 5" reel: $3.50

### SERIES NO. 190

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 190</td>
<td>1000 ft</td>
<td>5&quot; reel</td>
<td>$5.00</td>
</tr>
</tbody>
</table>

- **Mylar Tape**
  - Type 190-15, 1500 ft, 7" reel: $4.50
  - Type 190-18, 1800 ft, 7" reel: $5.50

### SERIES NO. 102

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 102-6</td>
<td>600 ft</td>
<td>5&quot; reel</td>
<td>$2.65</td>
</tr>
<tr>
<td>Type 102-8</td>
<td>850 ft</td>
<td>5&quot; reel</td>
<td>$2.45</td>
</tr>
<tr>
<td>Type 102-12</td>
<td>1200 ft</td>
<td>7&quot; reel</td>
<td>$4.25</td>
</tr>
</tbody>
</table>

### SERIES NO. 150

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 150-25</td>
<td>225 ft</td>
<td>3&quot; reel</td>
<td>$1.00</td>
</tr>
<tr>
<td>Type 150-375</td>
<td>375 ft</td>
<td>3&quot; reel</td>
<td>$1.75</td>
</tr>
<tr>
<td>Type 150-900</td>
<td>900 ft</td>
<td>5&quot; reel</td>
<td>$3.60</td>
</tr>
<tr>
<td>Type 150-12</td>
<td>1200 ft</td>
<td>5&quot; reel</td>
<td>$4.65</td>
</tr>
<tr>
<td>Type 150-15</td>
<td>1500 ft</td>
<td>7&quot; reel</td>
<td>$5.15</td>
</tr>
<tr>
<td>Type 150-18</td>
<td>1800 ft</td>
<td>7&quot; reel</td>
<td>$6.20</td>
</tr>
</tbody>
</table>

### SERIES NO. 020

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 024</td>
<td>2400 ft</td>
<td>7&quot; reel</td>
<td>$6.25</td>
</tr>
</tbody>
</table>

- **Extended Play Tape**
  - Type 142-9, 900 ft, 5" reel: $2.85

### SERIES NO. 101

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 101</td>
<td>900 ft</td>
<td>5&quot; reel</td>
<td>$2.49</td>
</tr>
</tbody>
</table>

- **Mylar Tape**
  - Type 101-9, 900 ft, 5" reel: $2.85

### SERIES NO. 100

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 100</td>
<td>900 ft</td>
<td>5&quot; reel</td>
<td>$3.05</td>
</tr>
<tr>
<td>Type 120</td>
<td>1200 ft</td>
<td>7&quot; reel</td>
<td>$5.45</td>
</tr>
<tr>
<td>Type 120</td>
<td>1200 ft</td>
<td>7&quot; reel</td>
<td>$7.05</td>
</tr>
</tbody>
</table>

- **Mylar Tape**
  - Type 120-12, 1200 ft, 7" reel: $5.50

### SERIES NO. 290

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 290-0</td>
<td>0 ft</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

- **Triple-Length Tape**
  - Type 290-6, 600 ft, 3/4" reel: $2.50
  - Type 290-36, 3600 ft, 7" reel: $11.95

### SERIES NO. 131

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 131</td>
<td>1200 ft</td>
<td>7&quot; reel</td>
<td>$4.40</td>
</tr>
</tbody>
</table>

### SERIES NO. 138

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 138</td>
<td>1200 ft</td>
<td>7&quot; reel</td>
<td>$5.00</td>
</tr>
</tbody>
</table>

### SERIES NO. 175

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 175</td>
<td>600 ft</td>
<td>5&quot; reel</td>
<td>$2.40</td>
</tr>
</tbody>
</table>

- **Mylar Tape**
  - Type 175-6M, 600 ft, 5" reel: $2.40

### SERIES NO. 141

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 141</td>
<td>600 ft</td>
<td>5&quot; reel</td>
<td>$1.75</td>
</tr>
<tr>
<td>Type 141</td>
<td>1200 ft</td>
<td>7&quot; reel</td>
<td>$2.95</td>
</tr>
</tbody>
</table>

### SERIES NO. 140

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 140</td>
<td>1000 ft</td>
<td>5&quot; reel</td>
<td>$4.25</td>
</tr>
</tbody>
</table>

- **Extra-Play Plastic**
  - Type 140-9, 900 ft, 5" reel: $2.85

### SERIES NO. 142

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 142</td>
<td>1200 ft</td>
<td>7&quot; reel</td>
<td>$4.95</td>
</tr>
</tbody>
</table>

- **Mylar Tape**
  - Type 142-9, 1200 ft, 7" reel: $2.85

### SERIES NO. 144

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Reel Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 144</td>
<td>1200 ft</td>
<td>5&quot; reel</td>
<td>$4.50</td>
</tr>
<tr>
<td>Type 144</td>
<td>2400 ft</td>
<td>7&quot; reel</td>
<td>$7.95</td>
</tr>
</tbody>
</table>

- **Mylar Tape**
  - Type 144-12, 1200 ft, 5" reel: $4.50
  - Type 144-24, 2400 ft, 7" reel: $7.95

**Note:** "Luvitherm" is an unplasticized polyvinyl chloride film, used as a backing material. During production it is prestessed, giving the tape excellent mechanical properties.
Features "Dynarange" tapes designed specifically for low-speed, high-fidelity recording. Available in 1 hour, 1 1/2 hours, and 2 hours recording time.

271-C-60 (mailer package) .......... .320

272-C-90 (mailer package) ............ .476

273-C-120 (album package) ........... .534

No. 102 "All-Purpose" Tape
For all general recording; suitable for long-term storage; on super-high, weather-balanced 1/2"-mill polyester backing.

102-1/4-600 600' 5" $2.65
102-1/4-1200 1200' 7" $4.25

No. 111 "All-Purpose" Tape
For all general recording; 1/2"-mill plastic backing.

111-1/4-150 150' 3" $0.70
111-1/4-300 300' 4" $1.35
111-1/4-600 600' 5" $2.25
111-1/4-1200 1200' 7" $3.50

No. 120 "High-Output" Tape
Over 100% more output, greater dynamic range, and freedom from distortion on signal peaks. 1/2"-mill plastic backing.

120-1/4-600 600' 5" $2.25
120-1/4-1200 1200' 7" $3.50

No. 131 "Low-Print" Tape
Reduces print-through to a point below noise level of most professional machines; allows long-time storage. 1/2"-mill plastic backing.

131-1/4-1200 1200' 7" $4.40

No. 138 "Low-Print, Extra Strength" Tape
Same as No. 131 except on strong 1/2"-mill polyester backing.

138-1/4-1200 1200' 7" $5.10

No. 150 "Extra Length, Extra Strength" Tape
Designed to withstand temperature and humidity extremes; high potency oxide on 1/2"-mill polyester backing.

150-1/4-900 900' 5" $3.60
150-1/4-1800 1800' 7" $6.20

No. 190 "Extra Length" Tape
Provides as much recording time as 1/2"-mils of standard tape; high potency oxide on 1/2"-mill plastic backing.

190-1/4-900 900' 5" $3.50
190-1/4-1800 1800' 7" $5.50

No. 200 "Double Length, Double Strength" Tape
As much playing time as two reels of standard tape; for recording opera, concerts, or conferences; high potency oxide on tansilized polyester backing.

200-1/4-1200 1200' 7" $9.50

"Dynarange Tapes"
Although originally engineered for professional use, these tapes are now available for home recording. Provides high-fidelity recording even at 3/4 ips.

201 1/2"-mill plastic
201-1/4-600 600' 5" $2.80
201-1/4-1200 1200' 7" $4.40

202 1/2"-mill polyester
202-1/4-600 600' 5" $2.85
202-1/4-1200 1200' 7" $5.10

203 1/2"-mill polyester
203-1/4-900 900' 5" $4.25
203-1/4-1800 1800' 7" $7.30

No. 282 "Sandwich" Tape
Micro-thin protective plastic shield over oxide coating to eliminate oxide rub off and increase wear up to 30 times; weatherproof 1/2"-mill polyester backing.

282-1/4-600 600' 5" $3.10
282-1/4-1200 1200' 7" $4.95

No. 290 "Triple Length" Tape
1/2"-mill tansilized polyester backing.

290-1/4-1800 1800' 7" $6.95
290-1/4-3600 3600' 7" $11.95

No. 8000 "Quick-Load" Cartridge
Completely self-contained; threads automatically; available with high potency No. 150 tape in transparent or opaque cases.

8000-1/4-320C 320' 1500$4.00
8000-1/4-560C 560' 1500$4.50
8000-1/4-560C 560' 1200$4.50

"Living Letters" Tape

111-1/2-150-LL 150' 3" $0.90
200-1/4-300-LL 300' 3" $1.85
200-1/4-300-LL 600' 3" $2.95

SONY/SUPERSCOPE

Professional Recording Tape
Extra-heavy formula Oxi-coat homogenized oxide coating. Polyester back; "lubri-cushion" impregnated lubricant.

TP-200-24 2400' 7" reel $11.20
TP-150-18 1800' 7" reel $6.20
TP-200-12 1200' 5" reel $5.25
TP-150-9 900' 5" reel $3.60
TP-150-3 300' 3½" reel $1.75
TP-300-6 600' 3¼" reel $1.95
TP-150-3M 300' 3" reel in self-mailing box $1.60

Tape Cassettes
For use with Models 50, 100, 124, 121CS, 125 and 130.
C-60 60 minutes of recording $2.25
C-90 90 minutes of recording $2.95

SOUNDCRAFT

"Standard" Tape
1.5-mil acetate base; professional quality; economy priced
S-1 150 ft., 3" reel $0.70
S-1 600 ft., 7" reel $2.10
S-12 1200 ft., 7" reel $3.50

"Standard-50" Tape
Long-play version of "Standard" tape on 1.5-mil acetate base.
S-5-9 900 ft. 5" reel $3.29
S-5-18 1800 ft., 7" reel $5.17

"Lifetone" Tape
For use where utmost strength and quality are necessary; 1.5-mil Mylar base.
L-6 600 ft., 5" reel $2.65
L-12 1200 ft., 7" reel $4.25

"Plus-50" Tape
Made on 1.5-mil Mylar for 50% more play- ing time than standard 1.5-mil tapes; combines long play with great tape strength.
LP-2 200 ft., 3" reel $1.80
LP-9 900 ft., 5" reel $3.40
LP-18 1800 ft., 7" reel $5.80

"Triple-Play" Tape
5-mil Mylar base
TP-3 300 ft., 2½" reel $1.45
TP-6 600 ft., 3½" reel $2.29
TP-18 1800 ft., 5" reel $5.10
TP-36 3600 ft., 7" reel $10.00

"Triple-Play" Tensilized Tape
5-mil tansilized Mylar base; extra long play; extra strength.
TP-6T 600 ft., 3¼" reel $2.72
TP-18T 1800 ft., 5" reel $6.80
TP-36T 3600 ft., 7" reel $11.75

"Golden Tone" Tape
High quality special tape; 25% more high-frequency output & 7 dB better signal-to-noise ratio; 7½" reel.
GTA-12 1.5-mil acetate base, 1200'.........$4.70
GTM-18T 1-mil tansilized Mylar base, 1800' .........$7.50
GTM-24T 3-mil tansilized Mylar base, 2400' ........ $11.40

TAPE RECORDER ANNUAL
Now for home recording—
the same kind of tape used by RCA to
capture the greatest sounds around.

RCA Red Seal tape—the tape of the professionals—comes from the same precise technology
used to master record RCA albums and for pre-recorded tapes. RCA’s exclusive formula
gives you smooth tracking, a minimum of friction and wear and professional signal-to-noise
response. Also available: Vibrant series sound tapes for flawless recording at an economi-
cal price. At RCA and independent dealers throughout the country. For all the details write
TAPE ACCESSORIES

AUDIOTAPE
Audio Head Alignment Tape
Prerecorded at 2 kHz, 10 kHz, 15 kHz, recorded at 15° per second; intervals between tones are 5 seconds duration; 300 ft. on 4" reel $10.00
Audio Head Demagnetizer
Demagnetizes tape recorder heads; requires only plug-in to conventional a.c. outlet $10.00

AUDIOTEX
Tape Accessories
Language Lab service kit contains tape splicer; tape threading leader, hi-fi service tool kit; tape stop; head cleaner & lubricant; cloth tape cleaner; head demagnetizer; splicing tape; tape and record labels. 30-099 $54.95
Deluxe tape splicer handles all sizes of splicing tape; tape dispenser simplifies operation; cuts & trims splicing tape with indented cut. 30-106 $8.95
Standard tape splicer has curved cutting blades which give splice two rounded indentations; for use on all ¼" tapes. 30-103 $5.00
Tape splicer for editing or repairing broken tape; all-aluminum construction; cutting blade included. 30-100 $2.75
Professional tapease will demagnetize tape reels of any size up to 10" diameter; erasable spikes included. 30-114 $3.49
Tape recorder care kit includes tape splicer, tape head cleaner, two 6" cleaning brushes, and 10 plastic pouches for storing tape cartridges. 30-636 $6.00
All prices are “list”.

EDITALL
KP-2 Editing Kit
Complete kit includes splicing block, 30 splicing tapes, demagnetized razor blade, grease pencil $3.50
KS-2 Editing Kit
For ¼" tape. Includes 4" x ¼" x 1½" block, marking pencil, roll of splicing tape & cutting blade $7.50
KS-3 Same except larger block (5½" x 1" x ½") $9.00

NORTRONICS
Nortronics has replacements for over 1800 domestic and foreign recorders including all of the following: Airline, Aiwa, Bell & Howell, Bell Sound, Columbia, Concertone, Cotabord, Dukane, Ekotape, Emerson, Grundig, Heath, Knight, Luxor, Panasonic, Pentron, RCA, Recordola, Revore, Rheem-Califone, Roberts, Silvertone, Sony, Symphonic, Tanberg, Telelectron, Viking, VM, Wotear, Webster Electric, Westinghouse, Wollensak, and most 8-track automobile tape players. Dealers have replacements and conversions listed by recorder model number and head number. All replacement heads and “Quick-Kits” (mounting hardware) come with complete instructions for easy installation.
Model T60E Oscillator Transformer
65-kHz bias for recording and erase current for either high or low impedance heads; one-ounce oscillator circuit diagram included $4.50
Model T60-T2 Oscillator Transformer
Similar to Model T60E but designed for transistor circuits. 40-100 kHz; will deliver 25 to 150 volts to erase and record heads $9.95

Model T70-T2 Oscillator Transformer
For printed-circuit board; has plug-in, dip-solder terminals with nylon case; efficient ferrite E-core construction; operating frequency 60-110 kHz; secondary voltage 40-120 V $4.50
T70-T6 Osc. transformer for printed-circuit board. Same as T70-T2 except operating frequency 250-500 kHz for duplicators & secondary voltage 70 V $9.00
Model AT-100 Alignment Tape
7½ ips full-track for checking record/play heads of all types; 40,000 kHz; recorded for checking azimuth, equalization, and head wear $4.95

1000 Series Record/Play Heads
Four-track stereo, laminated core, high-quality heads with all-metal hyperbolic face construction; replaces older CSQ, TLB & TDL-1 designs.
#100M-High impedance; 800 mH inductance; 100 µm gap; for use with vacuum-tube circuits; no-mount type $21.00
#100F-Medium impedance; 600 mH, inductance; 100 µm gap; for use with vacuum-tube or transistor circuits; no-mount type $21.00
#100E-Low impedance; 100 mH inductance; 100 µm gap; for use with transistor circuits; no-mount type $21.00
#100G-Medium impedance; 500 mH; 200 µm gap; for vacuum or transistor circuits; no-mount type $21.00

5600 Series Record/Play Heads
Four-channel, laminated core heads with all-metal hyperbolic face construction.
#5601 Special record-only head; low impedance 50 mH; 500 µm gap space; for use with vacuum-tube or transistor circuits; no-mount type $21.00
#5602 Low imp.; 90 mH; 100 µm gap space; for use with vacuum-tube or transistor circuits; no-mount type $29.00
#5603 Med. imp.; 370 mH; 100 µm gap space; for use with vacuum-tube or transistor circuits; no-mount type $9.90

1200 Series Premium Record, Record/Play Heads
Four-track stereo, laminated-core heads with all-metal, hyperbolic face construction; replaces older TLB, CSQ, and 1100 styles. 

TAPE RECORDER ANNUAL
It's Stereo Review—favorite spokesman on the subject of high fidelity for over 170,000 audiophiles and music lovers everywhere.

And how it speaks up! Straight from the shoulder—with impartial laboratory reports on new hi-fi/stereo equipment. Good verdict or bad, you always get invaluable information that will guide you to the finest components in your price range, throughout the next twelve months!

Our record reviewers are equally outspoken. Each month, they listen to 150 or more of the latest recordings and tapes, mono and stereo, in every musical category from classical to jazz (spoken word, too)… and report their verdicts unflinchingly. Some releases are praised highly—others are thumbed down. Result? You'll avoid disappointment—make every dollar count—as you add outstanding selections to your music library.

You'll also like the informative profiles of your favorite artists…the widely heralded “Great American Composers” series…the special single-subject issues…and the wide scope of engrossing features on the entire wonderful world of music. All crisply written—abundantly illustrated!

Indispensable for every audiophile and music lover, Stereo Review is available to you now, for a limited time only, at this lowest-possible HALF-PRICE rate...

SPECIAL INTRODUCTORY OFFER
12 months $3.00 for only HALFW-PRICE!
(Exactly HALF the regular rate of $6—the equivalent of 6 issues FREE!)

Please enter my subscription to Stereo Review at the special HALF-PRICE rate of:

One year for just $3

[ ] Payment enclosed [ ] Bill me later

print name________________________
address__________________________
city__________________________state_________zip code__________

Mail this coupon today to:
Stereo Review, Dept. 0479
Portland Place, Boulder, Colorado 80302.
110 TAPE RECORDER ANNUAL

#1200 High impedance; 800 mH inductance; 100 µin gap; for use with vacuum-tube circuits, No-mount type $28.20

#1201 Medium impedance; 400 mH inductance; 100 µin gap; for use with vacuum-tube or transistor circuits, No-mount type $28.20

#1408—Low impedance, 2.0 mH, 500 ohms at 60 kHz; for use with transistor circuits; 60 kHz operating voltage: 15-25; 100 kHz operating voltage 20-30; no-mount type $12.00

4100 Series Record/Play Heads Full-track mono; laminated core heads with plastic, hyperbolic face construction; replaces older SE style.

#4100—Medium impedance; 250 mH inductance; 160 µin gap; for use with vacuum-tube or transistor circuits; no-mount type $34.70

#4101—Special record only head; 55 mH inductance; 500 µin gap; for use with vacuum-tube or transistor circuits; no-mount type $34.70

4400 Series Erase Heads Full-track mono; laminated core; double gap; premium quality with full metal face construction; replaces older MEF and ME-250 styles.

#4400—High impedance; 40 mH inductance; 12,000 ohms impedance at 60 kHz; for use with vacuum-tube circuits; 60 kHz operating voltage: 100-150; no-mount type $14.00

#4401—Medium impedance; 3.6 mH inductance; 1000 ohms impedance at 60 kHz; for use with vacuum-tube or transistor circuits; 60 kHz operating voltage: 32-48 volts; no-mount type $14.00

#4402—Low impedance; 0.13 mH inductance; 1000 ohms impedance at 60 kHz; for use with vacuum-tube or transistor circuits; 60 kHz operating voltage: 32-48 volts; no-mount type $14.00

5000 Series Record/Play Heads 8 tracks on ½" tape; 2-channel/mono combination record/play/erase in a single head; laminated face construction; replaces older SEQ and SE-80 styles.

#5000 Medium impedance; 3.5 mH inductance; 1000 ohms impedance at 60 kHz; for use with vacuum-tube circuits; 60 kHz operating voltage: 100-150; no-mount type $28.20

#5001 Medium impedance; 3.5 mH inductance; 1000 ohms impedance at 60 kHz; for use with vacuum-tube or transistor circuits; 60 kHz operating voltage: 100-150; no-mount type $28.20

5800 Series Record/Play Heads Four-track stereo; laminated core; double gap; premium quality with full metal face construction; replaces older MEF and ME-250 styles.

#5800 Medium imp. record/play; 400 mH; 100 µin gap; no-mount type $15.00

#5801 Low imp. record-only; 10 mH; 500 µin gap; no-mount type $21.00

#5810 Low imp. record-only; 10 mH; 500 µin gap; no-mount type $21.00

5830 Series Record/Play Heads Four-channel, 8-track hyperbolic metal faced heads.

#5832 Medium low impedance record/play; 200 mH; 100 µin gap; no-mount type $81.00

1400 Series Erase Heads Four-track stereo; laminated core; double gap; premium quality with full metal face construction; replaces older SEQ and SE-80 styles.

#1400—High impedance; 80 mH inductance; 30,000 ohms impedance at 60 kHz; for use with vacuum-tube circuits; 60 kHz operating voltage: 90-150; no-mount type $12.00

#1401—Medium impedance; 10 mH inductance; 2800 ohms impedance at 60 kHz; for use with vacuum-tube or transistor circuits; 60 kHz operating voltage: 28-42 volts; no-mount type $12.00

#1402—Low impedance, 0.13 mH, 40 ohms imp. at 60 kHz; for use with transistor circuits; 60 kHz operating voltage 3-6; no-mount type $12.00

#8200 Series "Professional" Two-track stereo, laminated core; hyperbolic face construction; finer laminations for increased frequency response; greater depth-of-metal for longer head life.

#8200—Play only; high imp.; 800 mH; 500 µin gap; re-...
“Quik-Kit” 74 Adjustable Head Mounting Assembly
For updating tape decks to use Nortronics no-mount heads. Includes provision for adjustment of tape head for wrap, height, tilt, and azimuth .............................................$2.25

“Quik-Kit” Mounting Brackets
For base or side-mounting of no-mount heads. Nortronics heads are supplied in two basic mounting styles: no-mount and rear-mount. Six basic kits are available to adapt the basic no-mount style to base-mount or side-mount. Complete detailed instructions are included with each kit. “Quik-Kits” are available from your Nortronics supplier at $1.00 each.

To order rear-mount type for Models 1000, 1200, 5600, 5700, 1400, 4400, add “50” to model number (i.e., 1000 rear mount is 1050, etc.). Add $6.00 to cost for Models 5600 & 5700, all others add $1.50.

SCHOBER
RV-3A “Reverbatape” Unit
Electronic reverberation system using a multi-head tape recorder; reverberation time adjustable from 0 to 6 seconds; sensitivity 3 to 3 volts r.m.s. adjustable; 500,000 ohms input impedance; emitter-follower output; gain 1; has 1 record, 3 playback, 1 erase head, and 13 transistors, with walnut case. Available in kit form from manufacturer. ..................................................$140.00

SONY/SUPERSCOPE
HE-2 Head Demagnetizer
Designed with a high flux density to provide maximum reduction of residual magnetism. ..................................................$12.95

FS-5 Foot Switch
Adapts Models 910, 800, 860, 100, 222A, 50 for use in transcribing dictation. Remote, foot-operated stop/start control leaves hands free. ..................Less than $7.95

MX-6S Stereo/Mono Mixer
Connects to all Sony solid-state recorders. Provides mixing facilities for up to three microphones and three high-level sources. Used for both stereo & mono. Required for sound-on-sound recording with Models 530, 560D, 255. ......................Less than $29.95

SOUND CRAFT
“Magna-See”
A non-toxic, non-flammable chemical solution that lets you see the magnetic track recorded on tapes. Complete kit. ..........................$12.00
Can of solution (½ pint) ..................$ 4.25

Nortronics recommends that every tape recorder owner HAVE HIS HEAD EXAMINED!
As the world’s leader in designing and producing tape heads for major recorder manufacturers, we think it’s ridiculous to invest in a high quality tape recorder, spend a lot more on valuable tapes, and end up with inferior performance. But inferior performance is what you’ll get when your tape head wears out—as it will. The simple Look-Touch-Listen test tells you if it’s time to replace your tape head—and restore the crisp, vivid realistic sound you’re entitled to. Details in our Bulletin 7260—ask your dealer or write to us for a free copy.

8101 Tenth Ave. North • Minneapolis, Minnesota 55427
Circle No. 25 on Reader Service Card.

MICROPHONE DIRECTORY

AKG
D-707E Cardioid Microphone
Directional, cardioid pattern dynamic; response 50-15,000 Hz ±3.5 dB; sensitivity —52 dB; impedance 200 ohms. Includes stand adapter, case, and standard 3-pin Cannon connector with 15’ cable. 1½” dia. x 6” $49.50

D-119ES Cardioid Microphone
Directional, cardioid pattern dynamic; continuously variable 0 to —10 dB bass roll-off switch, transformer, and cable with phone plug for high impedance. ..........49.50

D-19E/200 Cardioid Microphone
Same as D-19E/200 except with “on-off” switch, 5-pin Cannon connector for selection of 50 ohms, 200 ohms, and high impedance; with phone plug for high impedance. ....................................................$69.60

D-1000E Cardioid Microphone
Directional cardiod pattern dynamic with 3-position bass roll-off sw.; response 30-15,000 Hz ±3 dB; sensitivity —55 dB; impedance 200 ohms. Includes stand adapter, case, and standard 3-pin Cannon connector with 15” cable, 1½” dia. x 6” ..............................................$120.00

D-200TS Two-Way Microphone
Same as D-200F except with “on-off” switch, transformer, and cable with phone plug for high impedance ..........$84.00

ALTEC LANSING
650A Microphone
Cardioid dynamic moving-coil design; response 50-15,000 Hz; bass roll-off switch

-52 dB; impedance 200 ohms. Includes stand adapter, case, and standard 3-pin Cannon connector with 15’ cable. 1½” dia. x 6” $60.00

D-1000TS Cardioid Microphone
Same as D-1000E except with “on-off” switch, transformer, and cable with phone plug for high impedance ..........$75.00

D-200E Two-Way Microphone
Directional, cardioid pattern dynamic system; uses two coaxially mounted elements with 500-Hz crossover network; system is isolated against handling and stand shock by internal, flexible suspension; response 30-15,000 Hz ±3 dB; sensitivity —55 dB; impedance 200 ohms. Includes stand adapter, case, and standard 3-pin Cannon connector with 15” cable, 1½” dia. x 6” $.60.00

D-200TS Two-Way Microphone
Same as D-200TS except with “on-off” switch, transformer, and cable with phone plug for high impedance ..........$84.00
ohms; output level — 56 dBm/10 dynes/ cm²; discrimination 20 dB average front-to-back; wind/pop filter; locking “on-off” switch; snap-on/stand adapter; carrying case; 15° two-conductor shielded cable ........................................ $75.00

22G Floor stand .............................................. $21.80
26A Desk stand ............................................... $16.50

651A Microphone
Similar in design and style to Model 650A; response 60-15,000 Hz; no bass roll-off switch; output impedance 20,000 ohms; output impedance 20,000 ohms; output level —57 dBm/10 dynes/cm²; discrimination 15 dB average front-to-back; 15° single-conductor shielded cable .......... $62.50

AUDIOTEX
Studio Microphone
Dynamic type; output level — 62 db with flat frequency response 50-12,000 Hz; 50,000 ohms impedance; 6” shielded cable; molded phone plug attachment; 4-1/2” long x 1-3/4” dia. Satin chrome finish ...

30-904 ........................................... $75.00

Studio-Recorder Microphone
Ceramic type for general use; output level —50 dB with flat frequency response 50-10,000 Hz; 6” shielded cable; molded phone plug attachment; built-in MC-4 connector; 1/4”-27 thread; ceramic type for general use; output level —25 dBm; cardioid polar pattern; output level —55 dB; low-impedance. Supplied with mic cable connector but without cable. 6.7” x 0.9” (head 1.79”) For outdoor operation use windshield W584 ........................................... $22.00

M-260 Dynamic Studio Mic
Ribbon design with voice/music switch. Response 50-18,000 Hz. Output —58 dB; hypercardioid polar pattern; output level —200 ohms; supplied without cable but with connector socket. 6.5” x 0.9” (head 1.79”) .................. $80.00

M-610 Dynamic Mic
Moving coil design. Response 50-15,000 Hz. Output —52 dBm; cardioid polar pattern; output level —150 ohms or high impedance; diaphragm shielded from dust; filter to minimize wind blast; on/off switch; pressure cast case; assembly includes hinge; 15 foot cable; size 7-1/4” x 1-3/4”; chrome finish .................. $94.50

Model 636 “Slimair” Dynamic
For p.a., recording, and general use; response 60-13,000 Hz; output —58 dB; pop-proof head; wide pickup range; on/off switch; satin chrome finish; tiltable head; Hf-Z or Lf-Z, by changing one wire in connector; 15-foot cable; 10-3/4” long including stud; 1-3/4” max. dia. ............. $76.00

Model 630 Dynamic Mike
Response 60-11,000 Hz; output —55 dB; has “off-on” switch; available in high-impedance or 150 ohms (matches 50-250 ohms); low impedance balanced to ground; 2” x 6-1/2” .................. $55.00

Model 623 Slim Microphone
Dynamic; omnidirectional; frequency response 60 to 12,000 Hz; output —56 dB; high and low impedance; cast hinge head; on/off switch; built-in MC-4 connector 1/4”-27 thread; satin chrome; 15 foot cable; size 7-1/4” x 1-1/2”; weight 15 oz. ................. $60.00

Model 641 Dynamic Mike
Dynamic type; high output level; wide response range; for p.a., home recording, communications; integral on/off switch; response 70-10,000 Hz; output level —57 dB; omnidirectional; 15-foot cable; Hi-Z or balanced 150 ohms (matches standard low impedances) .................. $141.50

Model 727 Slim Ceramic
Similar in appearance to Model 729; withstands extremes of temperature and humidity; response 60-8000 Hz; output —55 dB; high-impedance only; 1-3/4”-27 thread; available with or without on/off switch; 7-3/4” x 1-1/2” x 1-1/2”; supplied with desk stand and floor stand coupler .......... $21.00

Model 727R With relay control switch .................. $24.50

TAPE RECORDER ANNUAL
Model 647A Microphone
Omnidirectional, dynamic lavalier design.
Response 70-9000 Hz; Hi & Lo impedance selected at cable. Sensitivity -155 dB; output (Lo. imp.) -61 dB (0 dB = 1 mW/10 dynes/cm²). Supplied with 18 ft., 3-conductor shielded cable, neck cord & belt clip; 3½" long x ¼" dia. .........$86.50

Model 624 Dynamic Lavalier
Response 100-7000 Hz; output -56 dB; wire mesh head for wind & moisture protection; available in high impedance or 150 ohms; not balanced to ground; 3½" x 1½" x 1½" ............$47.00

Model 729 Ceramic Microphone
Cardioid design; wide-angle front pick-up; response 60-8000 Hz; high-impedance; on-off switch; output -60 dB; 7½" l. x 1½" w. x 1½" d.; single-conductor shielded 8½ ft. cable .......... $25.50
Model 729R Has relay operating switch and three-conductor (one shielded) cable ..........$28.00

Model 715 "Century" Ceramic
Use in any position (in hand, on table, on stand, or overhead); ceramic element; 60-7000 Hz; output -55 dB; Hi-Z; 5-foot cable; non-directional; rugged and lightweight; 3½" x 2½" x 1" .......... $15.50
920 "Spherex" Crystal Microphone
Omnidirectional pickup. Response 60-10,000 Hz; output -50 dB; wire mesh head treated for wind & moisture protection. Has high capacity & high impedance; 2½" dia., 15" cable; 8 oz. .......... List $29.00

924 Lavalier Crystal Microphone
Supplied with neck cord, support clip & 18' cable. Has wire mesh head for wind & moisture protection. Response 40-8000 Hz; output -60 dB; high imp.; 2½" dia., 1½" x 3½"; 8 oz. .... List $24.50

Model 805 Contact Microphone
For guitar, banjo, other stringed instruments; Hi-Z; scaled crystal; chrome finish; 15-foot cable .................. $21.00

Model 335A Blast Filter
Designed for use with Models 630, 641, 638 & 634 microphones. Will not affect freq. response .................. List $13.00

Model 355 Windscreen

Model 721 Ceramic Mic
Inexpensive design. Response 100-5000 Hz; output -52 dB; high impedance; can be hand held or with integral fold-out stand. 2½" w. x 3½" h. x 1½" .......... $6.80

502B Matching Transformer
Designed for use in series with microphone line. Transformer windings have low distributed capacity and excellent shielding
against inductive hum. Low-impedance output matches 150-25,000 ohm inputs. High-impedance output is 40,000 ohms. Response 30-20,000 Hz, $54.95.

631 Omnidirectional Microphone
Design similar in appearance to Model 635A; response 80-13,000 Hz; dynamic-type design with a sealed magnetic "on-off" switch inside case. Has removable magnetic actuator. Available in hi-Z (25,000 ohms) or low-Z (150 ohms). Has built-in 4" stage windscreen. EIA sensitivity $151 dB for hi-Z and $149 for low-Z. $37.00.

FAROGRAM
Parabolic Microphone
Reflector design for use with transistorized battery-operated tape recorders. Spun aluminum 24" reflector with sighting sunsight on microphone. Impedance 200 ohms; reflector depth 5"; wt. 5 lbs; at 100 ft. from 500-5000 Hz sensitivity of mic. is increased 15 dB with reflector. To be used with any heavy-duty camera tripod with pan-tilt head. Supplied with mic., reflector & gun sight, microphone holder. $98.50.

GELOSO
M11/171X Dynamic Microphone
Dual imp. (50-250/45,000 ohms) cardioid design. Has removable windscreen & 2-conductor shielded cable. Response 60-18,000 Hz; sensitivity (EIA) 149 dB for 250 ohms, 151 dB for high-imp. 4½" x 1½" dia. $54.95.

PML
D-44 Dynamic Microphone
Cardioid design; 200 ohms unbalanced; response 60-16,000 Hz ±5 dB. EIA sensitivity $44.95. $44.95.

Parabolic Reflector
Frequencies over 10,000 Hz contained within 10° angle. Sensitivity increased 14 dB. $59.95

May be used with any mic 18 to 21 mm outside diameter. $54.50.

F-67BS Dynamic Microphone
Cardioid pattern; response 40-16,000 Hz; imp. 200 ohms balanced & hi-imp, unbalanced. Sensitivity $54 dB for 200 ohms at 10 dynes/cm², Supplied with 20' four-conductor shielded cable. 7½" long x 1¼" dia. $99.50. $19.95.

RD-34WS Dynamic Microphone
Cardioid design; 200 ohms balanced; response 30-20,000 Hz ±3 dB. EIA sensitivity $75.00.

Model 548 "Unidyne IV" Microphone
Rugged design with cardioid pickup pattern. Has same feedback & boom suppression as "Unidyne III". Response 40-15,000 Hz. Dual-imp. output: low imp. —57 dB, high imp. —55 dB (0 dB = 1 mV with 1000 ohms) EIA rating. $85.00. Model 566 with vibration-isolation shock mount $140.00. Model 565S "on-off" switch on swivel connector assembly $100.00.

Model 580SA Dynamic Cardioid Mic
Matching coil dual-impedance (150 & 40,000 ohms) design. Response 50-15,000 Hz; built-in wire mesh screen & internal filter protects against wind & "pop". Power level —57 dB (0 dB = 1 mV with 10 ohms) EIA rating. $85.00. Model 566 with vibration-isolation shock mount $140.00. Model 565S "on-off" switch on swivel connector assembly $100.00.

Model 585SA High impedance
Similar to 565 except 150 to 250 ohms and 50-13,000 Hz. Supplied with "on-off" sw. & 15' 2-cond. shielded cable. $65.00. Model 585SA-MP Matched pair for stereo recording; high-impedance complete with plugs attached $118.00.

Model 555W "Unidyne" Microphone
Dynamic type; unidirectional; frequency response 50 to 15,000 Hz; output —55 dB at 35-50 ohms, —56.5 at 150-250 ohms; —57.5 at 50,000 ohms; 3-position impedance switch; Alnico V magnet; die-cast zinc case, satin chrome finish; Amphenol MC3M connector equivalent; self-adjust swivel; ¾" —27 thread; on/off switch; 15' floot 2-conductor shielded cable; size 7¼" x 2½" x 3½"; wt. 1½ lbs., shpg. 3½ lbs. $85.00. Model 55S without switch $83.00.

SHURE
Model 545 "Unidyne III" Microphone
Dynamic type; unidirectional; ideal for controlling feedback in p.a. & home recording applications. Has cardioid pickup pattern; shock-mounted element; "on-off" switch; response 50-12,000 Hz; output —58 dB; choice of hi- or low-impedance models; 6¼" x 1¼" diameter; supplied with 15' cable with strain relief. $59.00. 580SB 150-250 ohms $52.00. 580SA-MP Matched pair for stereo recording; high-impedance complete with plugs attached $118.00.

Model 565 Dynamic Cardioid Mic
Moving coil dual-impedance (150 & 40,000 ohms) design. Response 50-15,000 Hz; built-in wire mesh screen & internal filter protects against wind & "pop". Power level —57 dB (0 dB = 1 mV with 10 ohms) EIA rating. $85.00. Model 566 with vibration-isolation shock mount $140.00. Model 565S "on-off" switch on swivel connector assembly $100.00.

Model 585SA Dynamic Cardioid Mic
Similar to 565 except 150 to 250 ohms and 50-13,000 Hz Supplied with "on-off" sw. & 15' 2-cond. shielded cable $65.00. Model 585SA-MP Matched pair for stereo recording; high-impedance complete with plugs attached $118.00.

Model 555W "Unidyne" Microphone
Dynamic type; unidirectional; frequency response 50 to 15,000 Hz; output —55 dB at 35-50 ohms, —56.5 at 150-250 ohms; —57.5 at 50,000 ohms; 3-position impedance switch; Alnico V magnet; die-cast zinc case, satin chrome finish; Amphenol MC3M connector equivalent; self-adjust swivel; ¾" —27 thread; on/off switch; 15' foot 2-conductor shielded cable; size 7¼" x 2½" x 3½"; wt. 1½ lbs., shpg. 3½ lbs. $85.00. Model 55S without switch $83.00.

580SA "Unidyne A" Dynamic Microphone
Unidirectional design; ideal for controlling feedback in p.a. & home recording applications. Has cardioid pickup pattern; shock-mounted element; "on-off" switch; response 50-12,000 Hz; output —58 dB; choice of hi- or low-impedance models; 6¼" x 1¼" diameter; supplied with 15' cable with strain relief. $59.00. 580SB 150-250 ohms $52.00. 580SA-MP Matched pair for stereo recording; high-impedance complete with plugs attached $118.00.

Model 565 Dynamic Cardioid Mic
Moving coil dual-impedance (150 & 40,000 ohms) design. Response 50-15,000 Hz; built-in wire mesh screen & internal filter protects against wind & "pop". Power level —57 dB (0 dB = 1 mV with 10 ohms) EIA rating. $85.00. Model 566 with vibration-isolation shock mount $140.00. Model 565S "on-off" switch on swivel connector assembly $100.00.

Model 585SA Dynamic Cardioid Mic
Similar to 565 except 150 to 250 ohms and 50-13,000 Hz Supplied with "on-off" sw. & 15' 2-cond. shielded cable $65.00. Model 585SA-MP Matched pair for stereo recording; high-impedance complete with plugs attached $118.00.
1969 EDITION

515SA High imp. (−58 dB output) $40.00
515SB Low imp. (25-200 ohms, −59 dB) $35.00

578 Omnidyke Ultra-Slim Probe
Designed as a dynamic omnidirectional type p.a. microphone; response 50-15,000 Hz;
output: −59 dB high impedance, −60 dB low impedance; built-in wire mesh "pop" filter reduces breath noises; dual impedance (200 ohms & high); %/" dia., %/"e over-all length; complete with "on-off" switch and special slip-in swivel stand adapter; available in matched pairs for stereo recording (matching to ± 1 dB in level and within ±%/"d in frequency response) $82.50

578S Dynamic Microphone
Omnidirectional; fixed standard design with "on-off" sw. Response 50-15,000 Hz; 50-250 ohms imp.; open-circuit voltage .10 mV; EIA sensitivity −155 dB; supplied with 15" two-cond. cable; .78" diameter. Model 550S "Probe-Dyne" Microphone Rugged, omnidirectional, dynamic design. Response 50-15,000 Hz; dual impedance, choice of 50-250 ohms & high; output 57.5 mV for low imp. & 58.5 mV for high imp.; complete with on/off sw., swivel & 15" cable. Chrome finish. Model 575SB (low impedance) $19.45
Gold finish. Model 575S (high impedance) $21.00

5405 "Sonodyne II" Microphone
Dynamic type; unidirectional; response 50-13,000 Hz (provisions for altering response to increase voice intelligibility); output: −57 dB at 50-250 ohms, −54.5 dB at high impedance: adjusts for high or low impedance; modern die-cast zinc and Armo-Dur case; satin chrome and black finish; self-adjusting "lifetime" swivel; 15-foot, 2-conductor shielded cable; .695" x 11/4"" x 21/4". Model 570 Lavalier Microphone Miniature size professional-quality dynamic microphone designed for lavalier use; features special "shaped" response; output −59 dB; reduces pickup of clothing and cable noise; lightweight, flexible, 30" microphone cable attached; response 50-12,000 Hz with rising response to 6000 Hz; impedance 150 ohms to match low-impedance inputs; omnidirectional; %/" dia. x 21/2" over-all length; net weight 2 oz. $95.00

M68 Microphone Mixer Solid-state design; will mix 4 mic channels plus aux. Has individual gain controls & master. High & low imp. input selection. 23/4" x 1⅞" x 5⅞" $125.00
M68FC Same as M68 except input connectors are Cannon XLR-1 type instead of XLR-3-14 type. $135.00

4500 Hz; high & low (150 to 250 ohms) impedance; open-circuit voltage level 1.48 mV (high imp.) & 149 mV (low imp.); with 18" two-conductor cable; 1356" dia. $535.00

560 Dynamic Microphone
Lavalier, dual-impedance design; response 40-10,000 Hz with rising characteristic to calibration signal to balance signal levels. Response 20-20,000 Hz ± 2 dB. Automatic switchover to battery if a.c. fails. Gain 90 dB max. (150-ohm mic into 600-ohm line) 11⅞ x 7⅞ x 2⅛" $245.00 Battery pack $21.00

Model 245 "Uniplex" Microphone Ceramic type; uni-directional; response 50-7000 Hz; output −59 dB; high imped...

Model 250 335S, $12 500 ohms; response 170-9500 Hz; sensitivity −58 dB $19.45

Model 245S (with "on-off" switch) $37.00

523 "Spher-O-Dyne" Microphone
Omnidirectional design; has built-in wind, breath, and pop filters for close-talking applications. Response 40-11,000 Hz. Has "on-off" sw. $21.00

Model 315 Gradient Microphone
Ribbon type; bi-directional; frequency response 50 to 12,000 Hz; output: −63 dB at 30-50 ohms; −62 dB at high impedance; 3-position impedance switch; Alnico V magnet; die-cast zinc case; satin chrome finish; self-adjust swivel; %/"−27 thread; Amphenol MC3M connector equivalent; 20 foot 2-conductor shielded cable; size 6" x 1⅝" x 1⅝"; wt. 1 lb., shpg. 3½ lbs. $89.50

Model 315S with switch. $91.50

575S "Versadyne" Microphone Dynamic type; omni-directional; response 40-15,000 Hz; output: high-imp. $57.50

Model 275S (low impedance) $38.50
Model 275SB (high impedance) $39.50

Model 216S High impedance with adj. volume control $57.50

20-20,000 Hz ± 2 dB. Compression action 40 dB input change, 6 dB output change. For single mic. Has "on-off" sw. for bypass. Can be battery operated or from M68 mixers. 11⅞ x 5⅞ x 2⅛" $90.00

SONOTONE

M62 Audio Level Controller
Basically an automatic volume control; prevents "close-up" blasting. Output can be adjusted to predetermined level. Response 40-10,000 Hz ± 2 dB $50.00

Model 450 High impedance, −52 dB $19.45

Model 455 Low impedance, −52 dB $19.45

Model 450 RB (with "on-off" switch) $21.00

Model 455 RB (with "on-off" switch) $24.50

Model 533SA High impedance, −55 dB output $50.00

Model 533SB Low impedance, −55.5 dB output $47.50

Model 330BG High impedance; 170-9500 Hz; sensitivity −55 dB $24.00

Model 330BG Low impedance; 170-9500 Hz; sensitivity −58 dB $21.00

Model 370BG High impedance, −55 dB $27.50

Model 370BG Low impedance, −55 dB $15.00

Model 333SA High impedance with adj. volume control $30.00

Model 333SB Low impedance with adj. volume control $25.00

M100 Series Dynamic Mics
DM10-100 Impedance 50,000 ohms; response 8-16,000 Hz; sensitivity −57 dB $24.50

DM10-200 Impedance 10,000 ohms; response 8-16,000 Hz; sensitivity −63 dB $24.50

DM10 Series Dynamic Mics
DM10-100 Impedance 50,000 ohms; response 8-16,000 Hz; sensitivity −57 dB $24.50

DM10-200 Impedance 10,000 ohms; response 8-16,000 Hz; sensitivity −63 dB $24.50

DM10 Series Dynamic Mics
DM10-100 Impedance 50,000 ohms; response 8-16,000 Hz; sensitivity −57 dB $24.50

DM10-200 Impedance 10,000 ohms; response 8-16,000 Hz; sensitivity −63 dB $24.50
TAPE RECORDER ANNUAL

DM10-500 Impedance 200 ohms; response 40-18,000 Hz; sensitivity -58 dB $24.50.
DM10-355 Impedance 200 ohms; response 40-18,000 Hz; sensitivity -58 dB, with sw. $25.50.

DM70 Series Dynamic Mics
- DM70-150 Impedance 50,000 ohms; response 50-15,000 Hz; sensitivity -59 dB, with sw. $29.50.
- DM70-250-B Impedance 10,000 ohms; response 50-15,000 Hz; sensitivity -59 dB, built-in windscreen & switch. $42.50.
- DM70-350-B Impedance 10,000 ohms; response 50-15,000 Hz; sensitivity -58 dB, built-in windscreen. $29.50.

DM70-B Series Dynamic Ball Mics
- DM70-100-B Impedance 50,000 ohms; response 40-18,000 Hz; sensitivity -58 dB. $34.95.
- F-121 Cardioid Dynamic Mic Response 30-18,000 Hz; four impedances: F-121-12, F-121-151, F-121-181, F-121-200; output 0.15 mV/µbar. 6116” long x %” dia. $56.95.
- MB -150 Dynamic Microphone Omnidirectional, 500 ohms; 60-16,000 Hz; output 0.12 mV/µbar. 5%” long x %” dia. $18.00.
- MF-215 Dynamic Microphone Omnidirectional, 100-10,000 Hz; output 0.22 mV/µbar. 5%” long x %” dia. $40.00.

CDM80 Dynamic Cardioid Mic
- Dual-impedance 50,000/200 ohms; response 80-12,000 Hz; sensitivity -59 dB at 50,000 ohms, -61 dB at 200 ohms; with switch $43.50.
- “Studio 70” Dynamic Mics Lavalier and multi-application microphones. 70-L: Low-Z; omnidirectional; imp. 150-

DM70 Series Dynamic Mics
- DM70-150 Impedance 50,000 ohms; response 50-15,000 Hz; sensitivity -59 dB, with sw. $29.50.

SONY/SUPERSCOPE
- MB -115 Dynamic Microphone Cardioid pattern, 200 ohms; 50-18,000 Hz; output -55 dB; 20-25 dB discrimination over entire freq. range; built-in wind screen; “on-off” sw. 20’ cable. Satin chrome finish $55.20.

35 Lavalier Mic Hi-low impedance combination; 70-12,000 Hz response. Supplied with 3-cord shielded cable, lavalier clip & cord. ½” x 3”. $39.00.

2800 Dynamic Mic Omnidirectional; high impedance; 70-12,000 Hz response; output -63 db, 12’ cable $12.00.

UNIVERSITY SOUND
- 2000 Series Omnidirectional Mics Variable impedance, dynamic design. Response 50-14,000 Hz; 50 or 20,000 ohms; sensitivity -143 dB; output level 50 ohms: 30 dBMW/10 dynes/cm²; 20,000 ohms 28 mV/10 dynes/cm². hum reference -120 dB/0.001 gauss; 2000 Series Omnidirectional Mics $19.00.

8000 Series Cardioid Mics Variable impedance, dynamic design. Shock mounted for home recording. Response 70-15,000 Hz; 250-20,000 ohms; sensitivity -154 db; output level 250 ohms: 60 mV/10 microbar, 20,000 ohms 8.5 mV/10 microbar, 1%2” dia. $34.95.

6000 Attaché Cardioid Lavalier Mic Dynamic design; response 50,15,000 Hz; 150 ohms impedance; sensitivity: -151 dB; output level: -57 dB/1 mV/10 microbar. Supplied with neck cord $39.75.

5000 Series Super-Cardioid Mic Highly directional, dynamic type. Response 25-18,000 Hz; variable impedance 250 & 20,000 ohms (wired at plug); sensitivity -157 db (EIA); output @ 250 ohms -54 dB/1 mV/10µbar; at 20,000 ohms 13 mV/10 µbar. Over-all size is 2½” dia. x 9½” long. Model 5000 has wired-in cable & stand adapter $51.60. Model 5020 has bond adapter & detachable cable $59.95. Model 5050 has “on-off” switch, swivel-type stand adapter, and detachable cable $59.95.

TURNER
- 500 Dynamic Mic Cardioid design; response 40-15,000 Hz; output -55 dB; high or 150 ohms select- ed at terminal end of cable. 20’ cable $54.00.
- 560 Same except with “on-off” switch $54.40.

701 Dynamic Mic Cardioid design; response 100-13,000 Hz; output -56 dB. Has “on-off” sw. & built-in pop/blaster filter. High impedance only. $37.20.

700 Dynamic Mic Hi-low impedance combination; unidirectional cardioid; pop/blaster filter; response 40-15,000 Hz; output -55 db; 20-25 db discrimination over entire freq. range; built-in wind screen; “on-off” sw. 20’ cable. $55.70.

70 Dynamic Mic Hi-low impedance combination; 70-12,000 Hz response. Supplied with 3-cord shielded cable, lavalier clip & cord. ½” x 3”. $39.00.

2800 Dynamic Mic Omnidirectional; high impedance; 70-12,000 Hz response; output -63 db, 12’ cable $12.00.
HEADPHONES DIRECTORY

AKG

K-60 Stereo Headphones
Dynamic, moving coil driver units; frequency compensated to match hearing characteristics; response 20-20,000 Hz ±3 dB; imp. each driver 600 ohms; designed for use on 4 to 10,000 ohms without matching transformer; requires 0.001 W input for sound pressure level of 112 dB. Ear cushions rotatable for comfort. $24.95

K-20 Stereo Headphones
Budget version of K-60. Same response, sensitivity, and wide-range impedance matching features of K-60. $39.50

CLARK

Model 100 Stereo Headset
Moving-coil (dynamic) design with plastic diaphragms; response 20-10,000 Hz ±3 dB; distortion less than 2% @ 100 phon level; sensitivity 1 mW @ 100 Hz produces 105 dB sound pressure relative to 0.0002 dyn/c㎡. Max. input 60 W/ch music power. Dist. 1% at max. output. Supplied with 10' 4-con. cable. $69.00

Model 220 Stereo Headset
Permanent magnet design; response 20-17,000 Hz; sensitivity 1 mW input @ 1000 Hz produces 105 dB per earpiece (reference 0.002 µbar). Max. input 1 W/phone. $45.00

Model SP-3XC "Stereophones"
Extremely sensitive 3½" sound reproducers mounted in each earpiece; response 10-15,000 Hz; impedance 4-16 ohms; comes complete with adapter plate that connects to any system that will drive 400 Hz; will produce 127 dB sound pressure (0.0002 dyn/c㎡). Max. input 10 W/ch r.m.s. (60 W/ch dynamic power). Weight 15 oz (less cord). $26.50

Model 1000 Stereo Headset
14 karat gold-plated hardware; earpiece dome simulated walnut grain. $85.00

JENSEN

CC-1 Headphone Control Center
4-8 ohm electrodynamic phones; operates with any 10-watt/channel amplifier; stereo design; new "Space-Perspective" design provides complete controls for personal listening; controls—speaker "on-off," left- or right-channel only or stereo with channel reversal; mono or stereo with choice of "Space-Perspective" or regular; balance; volume; 4½" h. x 11¾" w. x 3" d. $69.00

HS-2 Stereo Headphones
For stereo or mono listening; response 20-17,000 Hz, 4 ohms, 1 mW input required for adequate listening, 8-foot input cable and 3-conductor phone plug. Accessory jack panel is M-1648. HS-2 Stereo headphone $24.95. M-1648 Jack panel $4.95

KOS"S

K-6 Stereophones
4 ohms (can be used with 4, 8, 16 ohm outputs); 10-15,000 Hz. Sensitivity 1 V at 400 Hz; will produce 127 dB sound pressure (0.0002 dyn/c㎡). Max. input 10 W/ch r.m.s. (60 W/ch dynamic power). Weight 15 oz (less cord). $26.50

Model SP-100 Same as Model SP-3XC except for impedance of 100 ohms; for special and multiple installations. $24.95

Model SP-55M "Stereophones"
Stereo and monaural phones in one; switch in lavaliere changes operation from stereo to monaural or vice versa. $24.95

KO.727 "Stereophones"
Wide-range 10-15,000 Hz design; 4-ohm imp but can be used for 4, 8, or 16 ohms. Sensitivity 1 V applied to driver will develop 127 dB of sound pressure relative to 0.0002 dyn/c㎡. Max. input 60 W/ch music power. Dist. 1% at max. output. Supplied with 10' 4-cond. cable. $34.95

Model T-1 Junction Box
Contains matching transformers for monitoring; 600-10,000 ohm outputs; two output jacks for Stereophones. $7.95

Model Pro-4A Headset
Response 30-20,000 Hz; max. input 10 watts/channel (60 W/channel music power); distortion less than 1/2% at maximum output; 4 ohms (600 ohms available); 10-foot coiled cord; rugged, shock-proof and fluid-filled ear cushions. $50.00

Model T-5 Remote-Control Listening Station
Junction box for connecting Stereophones to existing stereo or mono system; impedance er); distortion less than 1/2% at maximum output; 4 ohms (600 ohms available); 10-foot coiled cord; rugged, shock-proof and fluid-filled ear cushions. $24.95

1969 EDITION
HA-660/Pro Stereo Headphones
Features dynamic drivers with response 20-20,000 Hz ± 3 dB. Impedance 8 ohms standard, 500 ohms optional. Fuses are used to protect headphones from overload. Supplied with 4-conductor cord & stereo plug ........................................... $60.00

HA-770/GP Dynamic Headphones
Stereo design; 20-20,000 Hz ± 3 dB; 8 ohms/phone (500 ohms optional); max.
input 1.5 W/channel matched, individually calibrated drivers, configured dampers & attenuators; liquid-filled ear cushions; volume controls and overload fuses; 24 k white-gold finish; response curves furnished with each unit ....$100.00

SONY/SUPERSCOPE
DR-3A, DR-3C Headphones
Dynamic stereo design provide full-range frequency response. Available in 8 ohms
(DR-3A) or 10,000 ohms (DR-3C). Both models are complete with adj. headband; vinyl-covered foam ear cushions. Supplied with connecting cord and binaural phone plug.
DR-3A ........................................... $22.90
DR-3C ........................................... $27.90

SHURE
SA-1 "Solo-Phone"
Stereo amplifier for headphones permits 2 sets of headphones to be used simultaneously; has its own balance control; dual input for tape/tuner or phone; phone input 47,000 ohms equalized for mag. cartridge. Tinter input 250,000 ohms; output 100 mV; with walnut case, 10 1/4" x 3 1/2" x 3 1/4" d ........................................... $45.00
SA-1F "Solo-Phone" Same basic performance as Model SA-1 except panel mtg. Panel opening 10 1/4" x 3 1/2" x 3 1/4" deep ........................................... $57.00

STANFORD/MB
MB-K61 Headphones
16 ohms; stereo or mono. Response 20-16,000 Hz. Cushions are fluid-filled. Supplied with 8' cable & phone plug. Weight 12.35 ounces ........................................... $14.95

MB-K660 Headphones
16 ohms; stereo or mono. Response 20-17,000 Hz. Cushions are fluid-filled. Supplied with 8' detachable cable & phone plug. Max. constant load 400 mV. ........................................... $65.00

SUPEREX
ST-M Stereo "Masters" Headset
120 V operation ........................................... $99.95
SA-10M Same as Model SA-1 except has Garrard 4-speed manual turntable. Accommodates 7", 10", and 12" records at 4 speeds ........................................... $99.95
Low-impedance: 8-16 ohms; has two-way sound reproducers each phone—dynamic low freq. & ceramic high freq.; response 20-20,000 Hz; frequency response adjustable by control on ea. phone; complete with crossover network $29.95. Model ST-M-24 15,000 ohm impedance $40.00. 600, 2000, or 50,000 ohms also available.

**ST-S Stereo "Standard" Headset**
Dynamic reproducer for 30-15,000 Hz response; adjustable headband and plastic ear cups; has built-in surge protection $24.95. Model ST-SH Same as ST-S except high impedance $29.95. 600, 2000 & 50,000 ohms also available.

**ST-PRO-B Stereo Pro Headset**
Coaxially mounted dynamic reproducer for low frequency and ceramic for high frequency in each earpiece; 4 to 6 ohms; 16-22,000 Hz, 30 mW, maximum power 2 watts $50.00. Model ST-PRO-H High-impedance 600, 2000, 15,000, 50,000 ohms $55.00.

**"The Communicator" Headphones**
Mono design using dynamic elements. Response 100-10,000 Hz; 4 to 16 ohms imp. Model COM-S $13.95.

**ST-C "The Challenger"**
Stereo design; 4-16 ohms imp. with response 40-15,000 Hz. Max. power 2 W. Dynamic type with 7' cord $19.95.

**ST-VC Stereo Headset**
Designed for the hard-of-hearing; has separate volume controls; response 30-15,000 Hz; nominal power 15 mW; max. 2 W; has 7' cable & standard stereo plug; dynamic design $27.95.

**TELEX**
ASH-1 "Amplitwin" Headphone
Stereo design with built-in battery-operated solid-state amplifier. Has low & high level inputs on each ear cup. Will operate direct from phono cartridges, tape heads & tuners. Response 16-15,000 Hz $79.50.

**"Serenata" Stereo Headset**
Features tone control; comfort control buttons to adjust earphone pressure; liquid cushions; Mylar cone drivers. Response 20-20,000 Hz; 4-16 ohms; 8' detachable cord & plug $59.95.

**“Serenata II” Same except without tone control & detachable cord. Also available in 600 ohms $49.95.**

**“Adjustatone” Stereo Headset**
Features 3 1/2" speakers; plastic ear cups; comfort foam cushions; response 10-15,000 Hz; 4-16 ohms, 8' cord & plug $24.95.

**“Combo” Stereo Headset**
Same as "Adjustatone" but with removable foam-filled vinyl cushions $15.95.

**ST-20 Stereo Headset**
Revised version of former design features one-piece headband & remote control of stereo balance & volume. Response 16-15,000 Hz; 4-16 ohms; 8' cord & plug $34.95.

**ST-10 Same except does not include individual controls $24.95.**

**Stereo Control Kit**
Remote control of stereo program; allows speakers to be switched on & off and sound level to be adjusted at each earpiece; comes complete with instructions for installation & 15 ft. cord. STC-1 $10.50.

**"Encore" Stereophone**
Response 50-18,000 Hz. Has 8' cord, 3-circuit molded plug & removable foam-filled cushions $8.95.

---

**1969 TAPE RECORDER ANNUAL CLASSIFIED**

**TAPE AND RECORDERS**
SCULLY MASTER RECORDERS, one to sixteen track, automatic players priced $1800.00 to $23,000.00. WIEGAND AUDIO LABORATORIES, 3402 Windsor Road, Wall, New Jersey 07719.

OLD RADIO PROGRAMS ON TAPE. Gangbusters, Jack Armstrong, Whistler, etc. Sample 2-hour track, $5.00. 3402 Windsor Road, Wall, New Jersey 07719.

MAIL ORDER OPPORTUNITIES WAITING FOR YOU!
Classified Advertisers find more outlets for their products and service advertising in Ziff-Davis Electronics Publications.

Whether in a monthly publication such as POPULAR ELECTRONICS, ELECTRONICS WORLD, STEREO REVIEW, or in Annuals such as the ELECTRONIC EXPERIMENTER'S HANDBOOKS—Classified Advertising is responded to regularly by an audience of active electronics enthusiasts.

Prove to yourself the effectiveness of Classified Advertising in Ziff-Davis Electronics Publications. Write today for information, assistance or sample copies to:
Hal Cymes
Classified Advertising Manager
Ziff-Davis Publishing Company
One Park Ave., New York, N.Y. 10016
A t this date, nearly two decades after the introduction of prerecorded tape as a medium of home entertainment, it seems hardly necessary to expound certain virtues of tape vs. disc reproduction. A reel then can be put on a single twelve-inch long-playing disc—is still frequently enough ignored by the tape industry itself to warrant some comment here. The increasing use of the 3⅞-ips speed for prerecorded tapes has improved the industry’s performance in this respect to some degree. But even at the 3⅞-ips speed, there are tape releases that contain no more material than can be found on a twelve-inch disc.

All the manufacturers are guilty of this transgression, but some are guiltier than others. Angel, for example, which in many respects pioneered longer-playing musical tapes at the 3⅞-ips speed, is nevertheless sometimes content to ignore the slower-speed’s advantage. Cases in point that come to mind immediately are the tapes of Barbirolli’s performance of the Beethoven “Eroica” Symphony and Boult’s of Holst’s Planets. Each is contained on an individual 3⅞-ips reel; they could have been combined on one reel, the Beethoven on one sequence, the Holst on the other—thus allowing each work to be heard straight through with no artificially imposed breaks in continuity.

To my way of thinking, the longer playing time of prerecorded tape is one of its primary advantages over disc reproduction. For the manufacturers themselves to be indifferent to this fact is to stunt the potential growth of the tape medium. For this reason, most of the reels in the following enumeration of my favorite twenty-five tapes are longer-playing programs, whether at 3⅞ ips or 7½ ips. Only a really outstanding disc-length reel can qualify in such a list—and I am surprised to find as many as five among my favorite twenty-five.

**MY 25 FAVORITE TAPES**

By Martin Bookspan

**Beethoven: Missa Solemnis.** Soloists, Chorus and New York Philharmonic/Bernstein. Columbia MQ 509, 7½ ips. Bernstein’s highly charged reading excites all the participants. The performance has enormous drama and power, and the recorded sound on tape is extremely vivid.

**Beethoven: Symphony No. 9.** Soloists, Chorus and Vienna Philharmonic Orchestra/Schmidt-Isserstedt. London 90121, 7½ ips. This is the most satisfactory performance of the Ninth Symphony on tape. Schmidt-Isserstedt stresses the warmth and nobility of the score, the orchestra and chorus respond to his every wish, and the vocal quartet—headed by Joan Sutherland and Marilyn Horne—is the finest ever to have participated in a recording of the music. The whole is brilliantly engraved in sound that is clear, full, and rich, with a wide dynamic range.

**Berg: Wozzeck.** Dietrich Fischer-Dieskau, Evelyn Lear and other soloists, with Chorus and Orchestra of the German Opera, Berlin/Höflich. Deutsche Grammophon P 8901, 7½ ips. This already classic performance of Berg’s masterpiece makes an overwhelming impression on tape, perhaps because there is only one break to interrupt its inexorable flow.

**Berlioz: Romeo and Juliet.** Soloists, Chorus and Boston Symphony Orchestra/Munch. RCA FTC 7003, 7½ ips. Of all Munch’s masterly Berlioz recordings, this performance of Romeo and Juliet is arguably his finest. He responds with equal sensitivity to the intimate and extrovert qualities of the music, and the processing in the tape medium is a model of the authentic choral and orchestra sound of Boston’s Symphony Hall.

**Bernstein: Chichester Psalms; Facsimile.** Chorus and New York Philharmonic/Bernstein. Columbia MQ 789, 7½ ips. Bernstein’s Chichester Psalms is surely one of the most beautiful works in all music. It is a deeply felt spiritual communication, ideally performed here under the composer’s direction and with a marvelous sense of airiness in the tape reproduction. Facsimile is an earlier, more ponderous score that is also well-served by the open sonic textures.

**Brahms: Piano Concerto No. 2; Tchaikovsky: Piano Concerto No. 1.** Vladimir Horowitz, with NBC Symphony Orchestra/Toscanini. RCA TR3-5027, 3⅞ ips. On this single reel (in monophonic sound) are combined the prodigious concerto collaborations by Toscanini and his son-in-law. The sound is immeasurably richer than the discs of the 1940’s disclosed, and the whole enterprise is part of a unique RCA project that from time to time gives us on tape immortal performances from the pre-tape and pre-stereo era.

**Britten: War Requiem.** Soloists, choirs and London Symphony Orchestra/Britten. London 90067, 7½ ips. This score gains in stature as it becomes more familiar. The composer-conducted performance is superb, and the various levels of sound that contribute so effectively to the overall impact of the music are delineated most successfully by the highly expert recording technology. The tape issue is even more successful in this regard than the corresponding two-disc album.

**Bruckner: Symphony No. 8.** Vienna Philharmonic Orchestra/Solti. London 80201, 7½ ips. Bruckner, perhaps more than any other symphonic composer, benefits from the longer playing time afforded by the tape medium. The huge vaults of Bruckner’s architecture demand uninterrupted spans. This glowing performance and recording are absolutely stunning on tape.

**Chopin: Waltzes, miscellaneous piano pieces.** Artur Rubinstein. RCA TR3-5013, 3⅞ ips. Heard in uninterrupted succession, as made possible by this superbly processed tape, the Chopin Waltzes emerge as an elaborate and many-sided apotheosis of his piano style. In these, as well as in the over-sequent miscellaneous pieces, Rubinstein is at the very top of his form. A cherishable reel.

**Dvořák: Symphonies Nos. 6 and 7.** London Symphony
Orchestra/Kertész. London 80189, 71⁄4 ips. These performances are among the best in the complete Kertész-London Symphony traversal of all the Dvořák symphonies. On this tape each score is heard uninterrupted; the quality of the orchestral playing is awesome in its discipline, and the sound is luxuriously full and rich.

**Haydn on Mount Scopus.** Vocal soloists, chorus, Isaac Stern and Israel Philharmonic Orchestra/Bernstein. Columbia MQ 954, 71⁄4 ips. This tape recaptures in thrilling fashion the impact of the extraordinary series of concerts conducted in Israel by Leonard Bernstein in July, 1967, shortly after the end of the six-day Arab-Israeli War. Isaac Stern gives a radiant performance of the Mendelssohn Violin Concerto, and the last movement of Mahler’s Second Symphony is heard (sung in Hebrew) in a resplendent performance by the Tel Aviv Philharmonic Chor with Netania Davrath and Jennie Tourel. The emotional immediacy of the moment is extraordinary. Most moving of all is the playing and singing of the national anthem of Israel, the Hayyikah, as recorded at the concert given in the amphitheater atop Mount Scopus. This reel has rare documentary and musical qualities.

**Haydn: Symphonies Nos. 99-104.** Vienna State Opera Orchestra/Václavike. Vanguard-Everyman 1916, 33 1/4 ips. Here, on one reel, are all six of the second set of “London” Symphonies Haydn composed for the British impresario Johann Peter Salomon. They are stylishly performed and impeccably recorded. Especially marvelous is the performance of the last symphony, No. 104 in D Major. An indispensable reel.

**Horowitz at Carnegie Hall.** Music by Schuman, Chopin, Scriabin and others. Vladimir Horowitz (piano). Columbia M2Q 745, 71⁄4 ips. Like the “Hayyikah, on Mount Scopus” reel, this is another on-location recording that captures the full excitement and drama of an occasion—in this case, the now-fabled return of Vladimir Horowitz to the concert stage on May 9, 1965, after an absence of twelve years. Horowitz is simply overwhelming in everything he plays here, and the engineering and tape processing are excellent.

**Mahler: Das Lied von der Erde.** James King and Dietrich Fischer-Dieskau with Vienna Philharmonic Orchestra/Bernstein. London 90127, 71⁄4 ips. The flaming conviction of a totally committed performance, superior recording technology, and crystal-clear tape processing all combine to make this one of the outstanding reels in the catalog.

**Mozart: Don Giovanni.** Elisabeth Schwarzkopf, Joan Sutherland, Giuseppe Taddei and others with the Philharmonia Orchestra and Chorus/Giulini. Angel YAS 3665, 33 1⁄4 ips. Though a product of the early years of stereo recording, this performance benefits from expert and practical utilization of the stereo medium. Giulini delivers one of the greatest accounts of the music in my experience, and the joy of having the two acts of the opera uninterrupted for home listening—one act per sequence—is one of the most extraordinary experiences in recorded music.

**Mozart: Four Horn Concertos; R. Strauss: Two Horn Concertos.** Dennis Brain, with the Philharmonia Orchestra/Karajan (in the Mozart) and Sawallisch (in the Strauss). Angel YAS 3669, 33 1⁄4 ips. These performances originated in pre-stereo times, but they have been electronically reprocessed for stereo reproduction, and the sound is quite serviceable. The playing is miraculous, and the reel is one of the finest available memorials to Dennis Brain's art.

**Mozart: Quartets Nos. 14-19.** Juilliard String Quartet. Epic ESC 854, 33 1⁄4 ips. The six Mozart string quartets dedicated to Haydn, all contained on a single tape reel. The performances by the Juilliard players are immaculate, and the sound on the tape is remarkably full and lifelike.

**Prokofiev: Symphonies Nos. 4 and 6.** Moscow Radio Symphony Orchestra/Rozhdestvensky. Angel YAS 4105, 33 1⁄4 ips. Though the Moscow Radio Orchestra is not exactly a virtuoso organization by American standards, the conviction of the playing in these two masterful scores is irresistible. Rozhdestvensky has emerged in the past few years as perhaps the most impressive Prokofiev conductor now before the public. The recording and tape processing are both very impressive.

**Puccini: Madama Butterfly.** Renata Scotto, Carlo Bergonzi, and others, with Rome Opera Chorus and Orchestra/Barbirolli. Angel YAS 3702, 33 1⁄4 ips. Sir John Barbirolli’s meltingly lyrical way with this most popular of all operas written in the twentieth century is one of the great accomplishments of recorded music. The principals are glorious in their roles, and the recorded sound is vibrant.

**Saint-Saëns: Symphony No. 3.** Berj Zamkochian (organ) and Boston Symphony Orchestra/Munch. RCA FTC 2029, 71⁄4 ips. The athletic excitement of Munch’s reading and the virtuoso playing by Zamkochian and the Boston Symphony demand recording of the most exacted technical accomplishment. That is precisely what the engineers and processors have provided here—a reel with an enormous musical and technological wallop.

**Shakespeare: Hamlet.** Richard Burton, Hume Cronyn, and others. Columbia DOQ 665, 33 1⁄4 ips. As a souvenir of the never-less-than-impressive Broadway production of a few years ago, this Richard Burton production of Shakespeare’s great tragedy is a unique document. The transfer of the performance to the medium of recording has been most successfully accomplished, and on tape the three-and-one-half-hour playing time with only one interruption works wonders in sustained tension and emotion.

**Sibelius: Symphonies Nos. 1 and 2.** Vienna Philharmonic Orchestra/Barbirolli. London 80162, 71⁄4 ips. Maael and the marvelous Vienna Philharmonic deliver absorbing accounts of these two scores—dramatic, romantic, and exciting. The orchestra is given voluptuous sound reproduction and the tape sonics are simply gorgeous.

**R. Strauss: Der Rosenkavalier.** Elisabeth Schwarzkopf, Christa Ludwig, Otto Edelmann and others with the Philharmonia Orchestra and Chorus/Karajan. Angel YAS 3563, 33 1⁄4 ips. Recorded more than ten years ago, this performance of Der Rosenkavalier is one of the classics of disc literature. And to have the entire opera complete on a single reel makes the tape medium a true partner in the extraordinary artistic experience.

**Vaughan Williams: Symphonies Nos. 2 and 8; Elgar: Enigma Variations.** Hallé Orchestra/Barbirolli. Vanguard Everyman 1915, 33 1⁄4 ips. Three great orchestral scores by English composers are given extremely idiomatic performances on this reel. The Vaughan Williams “London” Symphony and Elgar’s “Enigma” Variations are better here than in Barbirolli’s rerecordings of both works for Angel. Vanguard’s sound, though lacking somewhat in fullness, is never less than agreeable. A splendid reel.

**Verdi: Requiem.** Soloists and the Philharmonia Chorus and Orchestra/Giulini. Angel ZB 3649, 71⁄4 ips. Giulini invests his performance of this great work with a dignity and simplicity that are most winning. He has an excellent vocal quartet (Schwarzkopf, Ludwig, Gedda, and Giurato) and the engineers have registered it all in imposing sound that has great power and extraordinary dynamic range.

Performance: Worthly
Recording: Excellent
Stereo Quality: First-rate
Speed and Playing Time: 7 3/4 ips; 74'23"

The pedal harpsichord, a two-manual instrument with a pedal mechanism, makes a very good impression here in Bach's six trio sonatas, which are more usually heard on the organ. True, this instrument does not have the sustaining power or the variety of registers that the organ does, but Biggs succeeds in making the pedal harpsichord an effective alter- nate (there is some possibility that the sonatas might have been intended originally for either a pedal harpsichord or pedal clavi- chord). The instrument has been recorded extremely vividly here, and I am delighted that Columbia has chosen to release the tape (minus the disc album's two solo concertos, BWV 592/3) at a speed of 7 3/4 ips, rather than at a slower speed, which might likely have resulted in flutter.


Performance: Good
Recording: Good sound but lots of hiss
Stereo Quality: Okay
Speed and Playing Time: 3 3/4 ips; 70'37"

I like these performances, particularly that of the "Emperor." Oddly enough, Rubinstein is often at his best in (for him) less familiar repertoire—where the mannerisms have not formed over the years. He approaches this music with a fresh combination of dignity and zest; there is no false reverence for "classical" style but the kind of straight-forward biz that allows the pianist's remarkable natural musicianship to come through. The orchestral approach is—the usual cliché about Leinsdorf the super-technician notwithstanding—rather hearty and gruff, and this is not inappropriate to the "Emperor." (It doesn't work quite so well in the G Major.)

As in the case of the recent tape transfers of the Rubinstein-Leinsdorf Brahms concertos, you get a lot of music on a reel but also a lot of hiss. If you are as sensitive to tape hiss as I am, you may want to cut the treble even at the cost of sacrificing some of the highs. Otherwise the recorded sound is good, and the transfers are generally superior to those of the Brahms concertos.


Performance: First-class
Recording: Very good
Stereo Quality: Good with one reservation
Speed and Playing Time: 7 3/4 ips; 52'11"

To the best of my knowledge neither of these piano and wind quintets has been available on tape before, although there have been some excellent disc couplings of these two pieces. The combination of Ashkenazy and the London Wind Solists (Jack Bremser, clarinet; Terence MacDonagh, oboe; Alan civil, horn; William Waterhouse, bassoon) is a felicitous one. The pianist plays most beautifully (although I think his Mozart could show a little more personal in volvement), and the wind execution is ex quisite in blend, tone, and precision. I had the distinct impression that the disc version of this coupling did not spread the piano quite as much as one hears on this tape, and for this reason I prefer the greater naturalness of the disc. In no way, however, is the tape to be considered in itself other than satisfactory.

Donizetti: Lucrezia Borgia. Montserrat Caballé (soprano), Lucrezia (cymbals), Ezio Flagello (bass), Alfonso; Alfredo Kraus (tenor), Gennaro; Shirley Verrett (mezzo-soprano), Orsini; Giuseppe Baratti (tenor), Rustiglioni; Robert El Hage (bass), Astolfi; other solists; R.A. Italiana Opera Orches tra and Chorus, John Perle cond. RCA Victor ® TRS 38001 $17.95.

Performance: Compelling
Recording: Very good
Stereo Quality: Not spectacular
Speed and Playing Time: 3 3/4 ips; 134'42"

As an operatic production, this album must be counted a success, not least because of the efforts of Montserrat Caballé in the title role. All the others are in good voice as well, and the performance has a lot of dramatic and vocal eloquence. Caballé, of course, is the mainstay, and although her portrayal of the morally ambiva lent Lucrezia is temperamentally rather plac id, it is impossible not to be affected by the

lovely sounds she emits. The final cabaletta, after the death of Lucrezia's son, also affords this outstanding singer some opportunities for vocal display, and she acquits herself quite stunningly.

Finally, it must be noted that Jonel Perlea holds his forces together very well and effectively conveys both the gracefulness and the dramatic vigor of the score. Regarding the recording, this is one of the first to be issued by RCA Victor in 3 3/4 ips, and the results are surprisingly good. Disc and tape versions are more closely matched than with many tapes of this speed, the only obvious exception being a slightly thicker, less open sound in the massed ensembles and some slight loss of highs (i.e., cymbals are clearer and have more presence on the disc set). Stereo is only moderately well used for suggestion of move ment or depth. The disc-version libretto can be obtained at no charge by sending the usual postcard.


Performance: Excellent
Recording: Attractive
Stereo Quality: Good
Speed and Playing Time: 7 3/4 ips; 91'28"


Performance: Good
Recording: Good
Stereo Quality: Fair to good
Speed and Playing Time: 7 3/4 ips; 35'37"

The trouble with the Dvořák D Major Sym phony (formerly No. 1, now correctly num bered 6) is that great chunks of it are so obviously cribbed from Beethoven and Brahms that it is really a bit embarrassing. Still, its very thievery has a certain innocent air about it that is almost charming, and the work as a whole gives pleasure—and, most particularly, in this excellent performance, matched up with equally fine readings of the great D minor Symphony (the old No. 2) and the Carnival Overture. These are first-class rendi tions, full of spirit, beautifully shaped by Kertész and the London players; they are admirably recorded and, with over an hour and a half of Dvořák on the tape, it constitutes an excellent buy.

There's barely a third as much music on

PERRECORDED TAPE ROUNDUP

REVIEWS OF SOME OF THE MOST OUTSTANDING
PRERECORDED STEREO TAPES
RELEASED DURING RECENT MONTHS
the DGG tape of the G Major Symphony (No. 8, formerly No. 4), and the Berlin musicians lack some of the finesse and sheer beauty of sound that their English colleagues provide. Still, this is by no means an inferior recording; quite the contrary, Kubelik, a Bohemian himself after all, has it in him to feel for the pulse and lyric flow of this music, and for the singing qualities that are its special claims to glory. The DGG stereo sound is typically resonant, but without much directness. I prefer the English use of stereo, which clarifies the music without loss of quality. The Ampex transfers are all well done.

GERHSHWIN: An American in Paris; "I Got Rhythm" Variations; Rhapsody in Blue; Cuban Overture; Concerto in F. Earl Wild (piano); Boston Pops Orchestra, Arthur Fiedler cond. RCA VICTOR ® TR3 5006 $10.95.

Performance: Light and bright
Recording: Bright and reverberant
Stereo Quality: Fair
Speed and Playing Time: 3/4 ips; 87 30".

All of the "serious Gershwin" with orchestra is included here, except for the Second Rhapsody. There is no other tape of the "I Got Rhythm" Variations, and to my surprise, none of the Concerto either. However, Leonard Bernstein offers formidable rivalry in his Columbia taping of the Rhapsody in Blue and American in Paris.

Arthur Fiedler, with Earl Wild playing glittering solo piano, turns in readings best described as light, bright, and perhaps a shade rigid. American in Paris not only comes off the best in performance here, but for me it remains the freshest and Wittiest in its musical substance.

This is my first experience with RCA Victor 3/4 ips tape, and the recorded sound is well balanced and free of excessive midrange equalization. The general miking of the Fiedler performances, however, allows a bit too much reverberation, thus obscuring unnecessarily the musical texture at climactic points of the Concerto and the Rhapsody.

HOLST: The Planets. The New Philharmonia Orchestra; Ambrosian Singers; Sir Adrian Boult cond. ANGEL ® Y 156 3420 $7.98.

Performance: Galactic
Recording: Superb
Stereo Quality: Incomparable
Speed and Playing Time: 3/4 ips; 50 45".

When Holst launched this mammoth seven-movement symphonic suite in 1914, shortly before the outbreak of World War I, he did not regard it as one of his best achievements, and was rather astonished at the tumultuous welcome his music of the spheres received in England and later throughout the world. The Planets is the apotheosis of all we have come to think of as science-fiction music, and yet it is distinguished from most works in this category by the formality of its structure, the originality of its melodic content, and the ingenuity of its orchestration. Although the palette of the instrumental coloring is wide and unorthodox, the piece does not rely on weird sounds or "special effects" to seize and hold the listener's imagination. It does so by legitimate dramatic and musical means. If it lacks profundity, it still sweeps us up...

holds us, through its moods and magicality, in a strange fusion of astral and mythological associations. It has not dated.

The recording history of the suite is like a summing-up in miniature of the industry's technological development. Skokowski, Kazarjan, and Sargent have all contributed vigorously interpretations of the score, but Boult, Holst's fellow Englishman and life-long champion, has made it his own. His Mars is simply more martial, his Jupiter more jovial, his Saturn more saturnine, his Mercury more mercurial than the readings by his rivals. When his monophonic recording with the Philharmonic Promenade Orchestra for Westminster replaced an older, 78-rpm version with the BBC Symphony on the HMV label in the early 1950's, it seemed at the time that recorded sound had reached the limit of its possibilities. Then he did it again with the Vienna State Opera orchestra in stereo, and again one was freshly astonished. This Bernstein's sense of the shape of the work and his singularly intense identification with its sentiments are, for me, unique—Solti's version has a lot going for it.

The performance, for one thing, is a miracle of technical precision. If the London Symphony Orchestra had never played better on records, I haven't heard it do so. And Solti himself imbues the work with a driving intensity that, in London's spectacular recorded sound and stereo, can be hair-raising. Strictly speaking, his performance is rather more disciplined than Bernstein's, but the latter has a gift for making what some might view as excesses in this composer's work believable as abstract musical "theater."

Solti's performance comes closest to matching Bernstein's in the finale. It is held under control, the choral work is unbelievably lucid in both musical and textural detail, and the conductor's restraint and sense of timing make the closing pages uncommonly moving. Helen Watts sings the "Magic Horn" movement nicely, but here I find Jennie Tourel's collaboration with Bernstein unforgettable. Taken in sum, Solti's recording is a live wire—good enough to make one almost regret the fact that there is a superior one available. The stereo effects, by the way, are as effective as any I have ever heard.


Performance: Sleek and brilliant
Recording: Close and clear
Stereo Quality: Good
Speed and Playing Time: 3/4 ips; 95 34".

It is the utterly breathtaking performance of the Mendelssohn Octet by this galaxy of virtuosos—recorded along with the other works on this tape following a 1961 series of concerts in Hollywood—that make this package uniquely worth having. The lightness, precision, and tonal warmth simply beggar description; and once you hear the famous Scherzo as played here, you will never again settle for the orchestral version.

A somewhat frantic pacing of the outer movements in the Mozart Quintet leads me to prefer the Griller-Primrose taping on Vanguard as an alternate. A choice between the present reading of the great Schubert Quintet and the nobly lyrical version by members of the Vienna Philharmonic London is a matter of personal taste—the tautly dramatic against the piercingly lyrical. The recorded sound somewhat lacks the special tonal warmth that can come with a wider range of overtones, but the sonic texture as a whole is admirably clean.

BERNSTEIN: "I Got Rhythm" Variations, and to my surprise, none of the Concerto either. However, Leonard Bernstein offers formidable rivalry in his Columbia taping of the Rhapsody in Blue and American in Paris.

Arthur Fiedler, with Earl Wild playing glittering solo piano, turns in readings best described as light, bright, and perhaps a shade rigid. American in Paris not only comes off the best in performance here, but for me it remains the freshest and Wittiest in its musical substance.

This is my first experience with RCA Victor 3/4 ips tape, and the recorded sound is well balanced and free of excessive midrange equalization. The general miking of the Fiedler performances, however, allows a bit too much reverberation, thus obscuring unnecessarily the musical texture at climactic points of the Concerto and the Rhapsody.

HOLST: The Planets. The New Philharmonia Orchestra; Ambrosian Singers; Sir Adrian Boult cond. ANGEL ® Y 156 3420 $7.98.

Performance: Galactic
Recording: Superb
Stereo Quality: Incomparable
Speed and Playing Time: 3/4 ips; 50 45".

When Holst launched this mammoth seven-movement symphonic suite in 1914, shortly before the outbreak of World War I, he did not regard it as one of his best achievements, and was rather astonished at the tumultuous welcome his music of the spheres received in England and later throughout the world. The Planets is the apotheosis of all we have come to think of as science-fiction music, and yet it is distinguished from most works in this category by the formality of its structure, the originality of its melodic content, and the ingenuity of its orchestration. Although the palette of the instrumental coloring is wide and unorthodox, the piece does not rely on weird sounds or "special effects" to seize and hold the listener's imagination. It does so by legitimate dramatic and musical means. If it lacks profundity, it still sweeps us up and...
Both the Nielsen and Walton first symphonies are the work of young men, in their late twenties and early thirties, respectively. Nielsen's trimly built and momentum-filled score fits neatly into the classic-romantic post-Brahmsian mainstream; Walton's somewhat sprawling opus is a curious blend of Elgarian lushness and jagged rhythmic fireworks. The Pento con malizia scherzo is one of the high points of Walton's output.

From every point of view the RCA Victor tape is a first-rate buy. Previn captures beautifully the youthful surge and expressive lyricism of the Nielsen Symphony, giving added dimension to the whole by observing repeats where called for in the score. His performance of the Walton Symphony is altogether masterly in its vigor and brilliance. Indeed, only the somewhat tentative treatment of the splendidly virile excerpt from Nielsen's Biblical opera leaves room for criticism. The orchestral playing is fine, the recorded sound spacious and full-bodied. RCA Victor is to be congratulated on the outstanding quality of its 3 3/4 ips tape reproduction.

The fancifully orchestrated evocation of the Pan and Syrinx myth and the amusing jeu d'esprit to the Faeroe Islands constitute the chief attractions of the Ormandy tape. His fast pacing of the opening pages of the Helios Overture deprives this episode of its inherent majesty, and the Symphony—minus repeats—seems rushed and hard-driven. The sound is full and brilliant throughout, though apparently miked more closely than the case with the Previn tape. All the work on these two records are making their first appearance in four-track format.

ORFF: Catulli Carmina. Judith Blegen (soprano); Richard Kness (tenor); Temple University Chamber Chorale; Eugene Ormandy cond.; Philadelphia Orchestra. Eugene Ormandy cond. Columbia MQL 930 $7.95.


For many years the Rachmaninoff First Symphony, written in 1895 when the composer was twenty-two, was little more than a rumor. The young Rachmaninoff was so depressed by the first performance of the work under Alexander Glazunov in St. Petersburg in 1897 that he wouldn't allow the manuscript to be published, finally tore it up, and refused to write another note for three years. Fifty years later, after the composer's death (1943), somebody found the orchestral parts in the archives of the Leningrad Conservatory. The symphony got a performance in Moscow and Soviet critics cheered, but the musical world in general did little to enhance its reputation as a mere amorphous excursion in self-pity and sorrow. The result is a musical achievement that can drown some works which are set to music so beguiling and ravishingly interpreted.

The Halle Orchestra, Sir John Barbirolli cond. Angel Y 11 36425 $7.98.


I am no Sibelius fan, but a performance like this one might even convert me. To my ears this is ideal Sibelius: its Romantic style—very tense, very "held back," big in scope, dramatically conceived—infused with the spirit of the Tonhalle's superb New York Philharmonic, conducted by Szell for Sibelius fans. Superb orchestral playing and a sonorous recorded sound are effectively transferred to tape.

STRAUSS: The Blue Danube; Tales from the Vienna Woods; Voices of Spring; Artist's Life; Wine, Women and Song. London Philharmonic Orchestra, Antal Dorati cond. London LCL 75018 $7.95.


Dorati is a superb conductor for the dance, and, after all, Budapest is—or at least used to be—only a short way down the river from Vienna. Dorati doesn't just make music slip by. Everything is done with great panache, elegance, and style. The English players give a fabulous sound and a beautiful rhapsodic ensemble. Altogether a delightful collection, beautifully put together.


Both sides of this tape come from complete opera recordings that have been available in four-track format for some time. Thus we have here Gerhard Stolze and Grace Hoffman pianists of Vladimir Ashkenazy's generation quite like him. The best of the younger ones eschew what is infelicitously described as the Grand Manner in favor of a more intellectual, sharply profiled, even abstract approach (and heaven knows, a good deal of the Romantic repertoire, in particular, has profited from the cleansing). But among the younger pianists, there are also the eccentrics, the ones who affect the Grand Manner even though it is suited neither to their temperament nor their time.

Ashkenazy, almost uniquely, has it both ways. His playing is sharp, intellectually disciplined, and technically formidable. Schubert's A Minör Sonata comes over with the drive and cohesiveness of the best of Beethoven's sonatas. Yet the pianist yields to Schubert's lyricism without inhibition. And how he manages to bring the variety he does to the stultifying repertory in the A Major Sonata is a mystery. The waltzes are played crisply and stylishly, and the Hungarian Melody is attractively unmanouvered.

The recorded sound and stereo treatment are both very good.
singing the brief but dramatically crucial bits for Herod and Herodias in the Salome closing scene, and Grotloh Fric's voice is actually the last to be heard in the Götterdämmerung finale as Hagen grasps for the ring only to be pulled under the waters of the foiled river by the Rhine maidens who at last have recovered their treasure.

There is no other version of the Götterdämmerung scene on tape, and Leontyne Price's performance (RCA Victor) of the last scene of Salome, without supporting singers, must be considered as a brilliant (and brilliantly recorded) concert performance.

Birgit Nilsson is at her splendid and stunningly powerful best throughout both sides of this London tape, but conductor Georg Solti shows to better advantage in the virtuoso complexities of Richard Strauss than in the tragic solemnities of Wagner. For me, his pacing of the opening pages of the latter is stodgy rather than solemn. Nilsson, too, displays an overt passion in the Salome music that creates a sense of genuine terror and almost unbearable dramatic tension. If the Götterdämmerung side can be called good, the Strauss is altogether great. The London stereo recording has been praised to the skies in previous reviews of the complete operas and needs no further huzzas from me. It is shatteringly effective, especially in the Strauss.

TCHAIKOVSKY: The Sleeping Beauty (excerpts): Introduction; Act I Waltz; Act III March; Pas de quatre; Apotheosis; Romeo and Juliet — Overture-Fantasia. Philadelphia Orchestra, Eugene Ormandy cond. COLUMBIA 5 MQ $7.95.

Performance: Lush, theatrical
Recording: Superb
Stereo Quality: Excellent

Romeo and Juliet is the main point of interest here, inasmuch as the Sleeping Beauty excerpts are culled from Ormandy's more extended four-track tapings of the score (MQ 241 or MQ 376). The Ormandy reading of Romeo is superbly controlled in its rhythmic aspect, yet highly theatrical in its dynamics and lyrical intensity. Taking into further account the wonderfully full-bodied sound on this tape and the combined brilliance and opulence of the orchestral playing, I would call this by all odds the finest of the four-track versions of Romeo and Juliet. The same fine qualities mark the performance of the Sleeping Beauty music.

VERDI: La Traviata. Montserrat Caballé (soprano), Violetta; Carlo Bergonzi (tenor), Alfredo; Sherrill Milnes (baritone), Germont; Dorothy Krebill (mezzo-soprano), Flora; Fernando Iacopucci (tenor), Gastone; Gene Boucher (baritone), Baron Douphol; Thomas Jameson (baritone), Marquis d'Oigny; Harold Enns (bass), Doctor Gavriil; Nancy Stokes (soprano), Nottingham; other soloists; RCA Italiana Opera Orchestra and Chorus, Georges Prêtre cond. RCA VICTOR 3 TR3 8003 $17.95.

Performance: First-rate
Recording: Excellent
Stereo Quality: Good
Speed and Playing Time: 3 1/2 ips; 124'10"

This Traviata achieves its high place in the
face of considerable competition (even in the tape medium) principally through its two leads. Caballé sings her “Ah! fors’ è lai” and the third-act “Addio del passato” as beautifully as I’ve ever heard; hers is not an especially dramatic interpretation, but, histrionics aside, the sheer vocalism is breathtaking. Equally impressive is the virile, ringing tenor of Bergonzi—a superb contribution. The American baritone Sherill Milnes, in the part of the elder Germont, sings with sensitivity though not with great tonal opulence, and the rest of the cast is very worthy. Prévert’s conducting, always well-controlled, sometimes concentrated, surface excitement, but I thought his third-act prelude exceptionally well done. The 3⅛ ips reproduction is extremely good, and the purchaser is able to obtain a full-size record-album libretto by returning the usual enclosed post card. Recommended.


Performance: Rich and vital
Recording: Hondsme
Stereo Quality: A-1
Speed and Playing Time: 7½ ips; 45”/66”

Almost the first symphonic records I ever owned, some thirty-five years ago, were the pair of 1929 Victor discs of the Stokowski-Philadelphia performance of Wagner’s Rienzi Overture, with the orchestral finale of Die Götterdämmerung as filler. I remember as vividly as though it were yesterday how overwhelmed I was by the immense power and vitality of the performance (Stokowski was forty years later. In short, it represents one of the best Wagner tapes around. The stereo illusion here is wholly natural, has seen fit to avoid the stereo gimmickry and the rest of the cast is very worthy. Prévert’s conducting, always well-controlled, sometimes concentrated, surface excitement, but I thought his third-act prelude exceptionally well done. The 3⅛ ips reproduction is extremely good, and the purchaser is able to obtain a full-size record-album libretto by returning the usual enclosed post card. Recommended.

JULIAN BREAM: Guitarist, Bach: Lute Suite No. 1, in E Minor (BWV 996); Lute Suite No. 2, in C Minor (BWV 997, transposed to A Minor); Prelude in D Minor; Fugue in A Minor; Saraband, Prelude and Minuet, Weiss: Pasticc’s: Fantasia; Tombeau sur la mort de M. Comte de Logy; Visée: Suite in D Minor. Julian Bream (guitar). RCA Victor @ TR3 5014 $10.95.

Performance: A Bream dream
Recording: Close and olive
Stereo Quality: Modest
Speed and Playing Time: 3⅞ ips; 82”20”

I am not at all sure that I agree with Mr. Bream and the anonymous annotator of this album that the Bach lute suites are better off played on the guitar, but since I am a guitar fanatic (I have written several pieces involving and annotation. Anyway, it’s a gorgeous recording with a beautiful sound, and the 3⅛ speed not only leaves room for a lot of music but proves remarkably free of noise too.


Performance: Superb
Recording: Good
Stereo Quality: All right
Speed and Playing Time: 3⅛ ips; 104”25”

Throughout this tape, which is taken from two separate operatic recital discs, Leontyne Price’s singing is uncommonly beautiful. She is in excellent voice, and there is not one aria that does not provide evidence of this singer’s great artistry, though one might wish that Handel’s “Care selve” had not been altered in such an unystly, romantically orchestrated version. The orchestral contributions are competent, but not of the same caliber as Miss Price’s performances, and the recording is perhaps a bit muddy on the low end and lacking in brightness, though in general quite satisfactory. Texts and translations can be obtained by sending in the usual post card.

ENTERTAINMENT

THE BEACH BOYS: Wild Honey. The Beach Boys (vocals and instruments). Wild Honey: Aint You Glad; I Was Made to Love Her; Country Fair; Darling; Here Comes the Night; and five others. CAPITOL @ Y1T 2859 $5.95.

Performance: Entertaining
Recording: Excellent
Stereo Quality: Good
Speed and Playing Time: 3⅛ ips; 24”19”

Having heard several of their records and tapes, I have a feeling that the Beach Boys are going to be around for a while. This tape demonstrates a few of the reasons why. The title song is a piece of work with rhythm-and-blues overtones, boasting a very with-it feel in conception and execution. Brian Wilson has composed some good songs here, including Country Fair, Here Comes the Night, and Mama Says. There is quite a bit of creative talent evinced here, sheathed in a personal and honestly contemporary style.

JOHNNY CASH: Johnny Cash's Greatest Hits, Volume 1. Johnny Cash (vocals), orchestra. I Walk the Line; Orange Blossom Special; Ring of Fire; The Ballad of Ira Hayes; and eight others. COLUMBIA @ CQ 1940 $7.95.

Performance: Vital, wide-ranging
Recording: Very good
Stereo Quality: Excellent
Speed and Playing Time: 3⅛ ips; 31”02”

Johnny Cash knew hard times as a boy picking cotton in Arkansas, part Cherokee, a lineage of which he is proud, he identifies most strongly with those who have to struggle—
Now it's easy to make recordings of children
WITH POPULAR PHOTOGRAPHY'S UNIQUE NEW RECORD ALBUM

"TONY SCHWARTZ ON HOW TO RECORD—THE SOUND OF CHILDREN"

To instruct you in the techniques of recording children's voices, the editors of Popular Photography asked famed sound authority Tony Schwartz to prepare this special record, available exclusively and by mail only through Popular Photography magazine and other Ziff-Davis publications. By listening to it you can quickly acquire the skills needed to make top-quality recordings of youngsters—thus preserving permanently the sound of their voices.

YOUR TEACHER: AN EXPERT'S EXPERT
You couldn't have a better instructor than Tony Schwartz. A pioneer in the use of portable tape recorders, he has been capturing the sounds of actuality for 23 years. You've read his monthly column in Popular Photography. Now hear him explain and illustrate in provocative recorded demonstrations the working methods that have helped him to become the world's No. 1 sound collector.

SIMPLE, COMPLETE INSTRUCTIONS

HEAR ACTUAL DEMONSTRATIONS OF

- A tape recording before and after editing.
- The sound of a battery-operated recorder at three tape speeds: 1%, 3%, and 7% inches per second.
- The improvement in fidelity when a quality microphone replaces the mike supplied as a recorder's standard equipment.
- How to reduce unwanted noise while recording.
- Acoustics: the sound of sound in the living room, kitchen, hallway, and street.
- Improving sound quality by re-recording a tape.

EXTRA!
You'll be intrigued and thoroughly entertained by Side II of this superb new album. It's devoted entirely to three of Tony Schwartz's most famous sound essays, all acclaimed as "works of great artistry that will surely be enjoyed by anyone who enjoys and appreciates the sounds of children."

"CHILDREN AND GOD"—a fascinating composite of thoughts expressed by youngsters of various religious faiths. Their naively reverent concepts of God, heaven, good and bad, and prayer will be a revelation to you. This unique presentation is unlike anything you have ever heard before!

"NANCY GROWS UP"—a remarkable sound portrait of a girl's developing personality. In just two minutes, you hear her voice from 20 minutes after her birth, through the years until she's 13—when she reveals: "I've discovered boys!"

"SOUND SNAPSHOT"—a potpourri of chuckles . . . once-in-a-lifetime sayings that could come only from the mouths of babes. These uproarious remarks, all said in the innocence of childhood, include delightfully ingenious observations like these:

"I'm so hot I'd like to take my skin off!"
"I had growing pains yesterday."
"You go up in heaven when you die. You don't have to pay taxes, or anything—I'm positive."

In addition to the tips on selecting and using equipment, you learn how to create complete sound stories with children—even recreate a situation that has already taken place. Actual sound demonstrations enable you to hear the effects of various tape speeds, microphones, and acoustical conditions. You also learn how to eliminate unwanted noise and to improve your tapes by re-recording them. In less than one hour, you get the benefit of years of experience and recording know-how!

Free INSTRUCTION BOOKLET WITH EACH RECORD ALBUM
Packed with valuable facts, it contains scores of helpful tips you can use to make better, more interesting recordings—information that supplements the instructions in the record. And it's yours if you place your order now for "Tony Schwartz on How To Record—The Sound Of Children."

Get the most out of your recording equipment by discovering the easy way to make tapes that you'll always treasure. This instructive and entertaining album should be owned by everyone within the sound of a child's voice and laughter. The special low price is:

only $4.98 postpaid ORDER YOUR ALBUM TODAY

"The Sound of Children"
P.O. Box 3112
Church Street Station, New York, N.Y. 10008

Please send _______ "Sound of Children" albums at $4.98 each, postpaid.

My check (or money order) for _______ is enclosed.

Outside U.S.A. please send $7.00 per record ordered. (N.Y. State residents please add local sales tax.)

Name__________________________
Address________________________
City___________________________
State___________________________
Zip Code________________________

PAYMENT MUST BE ENCLOSED WITH ORDER

1969 EDITION

A high-fidelity 12-inch, 33 1/3 RPM long-playing vinyl album manufactured by the Custom Services Division of Capitol Records.

... plus many more that will make you howl with laughter!
You and your friends will enjoy listening to all of these entertaining essays in sound again and again.
JUDY COLLINS: Judy Collins' Fifth Album. Judy Collins (vocals, guitar); Richard Farina (dulcimer); John Weisberg (guitar); John Sebastian (harmonica); instrumental combo. Pack Up Your Sorrows; Tomorrow is a Long Time; Thirsty Boots; Mr. Tambourine Man; Lord Gregory; Early Morning Rain; It Isn't Nice; and five others. Elektra © EKC 7300 $7.95.

Performance: Beautiful  Recording: Superb  Stereo Quality: Superb  Speed and Playing Time: 7 1/2 ips; 46'37"

Although this tape was recorded two years ago, I think it demonstrates, as well as any of her other items, Judy Collins' growth as a folk singer. Her early recordings were decidedly folk-commercial in a downbeat, wittled-letter sort of way, and she was overshadowed by the more dramatic Joan Baez, who always knew how to sell her own image. Yet, of the two, I think Judy is far and away the better singer and the better interpreter of folk music. Now she has matured, collected along the way some of the savvy of the more theatrical jazz and concert singers without sacrificing her innocent approach to regional music or her own beautiful perfect pitch.

Her voice has never seemed more fragrant, strong, or radiant than this LP, and all of it is good. Bob Dylan's Mr. Tambourine Man has a light euphoric quality that is always consciously absent in his own recordings. Judy Collins' sensitive but controlled and uncluttered reading of Dylan's song is a more people would be adventurous and record his songs. Of equally special interest is It Isn't Nice (by the vastly underrated singer Barbara Dane), and Judy breezes through it with a slightly salty quality. If I had to select five representative examples of folk music of the Sixties to seal in a time capsule for critics of the next eon to examine, I'd include this Judy Collins tape without a moment's hesitation.

BILL EVANS/SHELLY MANNE/EDIE GOMEZ: A Simple Matter of Conviction. Bill Evans (piano), Shelly Manne (drums), Eddie Gomez (bass). Stella by Starlight; Laura; Star Eyes; These Things Called Changes; and four others. Verve © VVC 8675 $7.95.

Performance: Skillful, flowing  Recording: Excellent  Stereo Quality: Very good  Speed and Playing Time: 7 1/2 ips; 37'30"

In previous encounters, Bill Evans and Shelly Manne have proved well matched in their skills for an impressive front. Both are concerned with keeping lines of melody and time subtle, and sensitized to shifting dimensions of feeling through careful attention to dynamics. In Eddie Gomez, they have found a bassist of similar preoccupations and disciplined virtuosity. Had it been possible for this trio to stay together, rather than meet only on a recording date, the results might have paralleled the evolution of the Modern Jazz Quartet into the most precise and lithely lyrical of jazz chamber units. In any case, the results of this meeting should be durably satisfying to those who prefer jazz in- temperently civilized. My own tastes usually veer toward bolder and more visceral improvising, but there are times when a session like this is a calming—though still challenging—respite.

ARETHA FRANKLIN: I Never Loved a Man the Way I Love You. Aretha Franklin (vocals, piano). Respect; Drown in My Own Tears; Soul Serenade; and eight others. Atlantic © ALX 8139 $5.95.

Performance: Thrilling  Recording: Excellent  Stereo Quality: Fine  Speed and Playing Time: 3 1/2 ips; 32'30"

Dear Aretha:

I am only a poor critic, up to my ears in my lonely room with platters and tapes. Each week after my costly, sensitive equipment is assaulted by countless infuriating purveyors of pseudo-rock, fake-roll, phony-folk, and country music manufactured in cities. Most of the time, when I turn them on, they turn me off. But then, Aretha, you came along. Oh, I know I'm not fit to touch the hem of your mini-skirt, but I must speak out, for my faith in the human voice has been restored. How can I say what you have come to mean in my life? Sometimes you're happy, and when you are, you communicate so well I don't want you to ever stop singing. Yes, what you feel good, and sing Good Times; or Dr. Feelgood, you make me feel good too, Aretha. Sometimes you're blue, and you sing sad songs like Drown in My Tears; and I Never Loved a Man the Way I Love You and you make it, as old Lorenz Hart put it, "a pleasure to be sad." And then there are times when you pull out all the stops for a bang-up number like A Change Is Gonna Come, and you make me believe it. Is it simply because you have a great voice and you know how to use it? Is it your wonderful timing? Is it the honesty in every note you sing? I don't know. I only know that in you the best traditions of gos- pel singing, blues singing, pop singing, and the talent for blending the meaning of a lyric with the feeling of a tune are all combined. I mean, you've got it. You're great. I hope you don't mind my going on this way; I just had to tell you. Aretha Franklin, I love you. I never loved a woman the way I love you.
Why We Make the Model 211 Available Now

Although there are many stereo test records on the market today, most critical checks on existing test records have to be made with expensive test equipment. Realizing this, HiFi STEREO REVIEW decided to produce a record that allows you to check your stereo rig, accurately and completely, just by listening! A record that would be precise enough for technicians to use in the laboratory—and versatile enough for you to use in your home.

The result: the HiFi STEREO REVIEW Model 211 Stereo Test Record!

Stereo Checks That Can Be Made With the Model 211

- Frequency response—a direct check of eighteen sections of the frequency spectrum, from 20 to 20,000 cps.
- Pickup tracking—the most sensitive tests ever available on disc for checking cartridge, stylus, and tone arm.
- Hum and rumble—foolproof tests that help you evaluate the actual audible levels of rumble and hum in your system.
- Flutter—a test to check whether your turntable’s flutter is low, moderate, or high.
- Channel balance—two white-noise signals that allow you to match your system’s stereo channels for level and tonal characteristics.
- Separation—an ingenious means of checking the stereo separation at seven different parts of the musical spectrum—from mid-bass to high treble.

Stereo Spread

PLUS SUPER FIDELITY MUSIC!

The non-test side of this record consists of music recorded directly on the master disc, without going through the usual tape process. It’s a superb demonstration of flawless recording technique. A demonstration that will amaze and entertain you and your friends.

NOW...GET THE FINEST STEREO TEST RECORD ever produced for just...$4.98

Featuring Tests Never Before Available Outside Of The Laboratory

**UNIQUE FEATURES OF HIFI/STEREO REVIEW'S MODEL 211 STEREO TEST RECORD**

- Warble tones to minimize the distorting effects of room acoustics when making frequency-response checks.
- Warble tones used are recorded to the same level within ±1 db from 40 to 20,000 cps, and within ±3 db to 20 cps. For the first time you can measure the frequency response of a system without an anechoic chamber. The frequency limits of each warble are within 5% accuracy.
- White-noise signals to allow the stereo channels to be matched in level and in tonal characteristics.
- Four specially designed tests to check distortion in stereo cartridges.
- Open-air recording of moving snare drums to minimize reverberation when checking stereo spread.

All Tests Can Be Made By Ear

HiFi STEREO REVIEW's Model 211 Stereo Test Record will give you immediate answers to all of the questions you have about your stereo system. It’s the most complete test record of its kind—contains the widest range of check-points ever included on one test disc! And you need no expensive test equipment. All checks can be made by ear!

**DON'T MISS OUT—ORDER NOW**

The Model 211 Stereo Test Record is a disc that has set the new standard for stereo test recording. There is an overwhelming demand for this record and orders will be filled by ELECTRONICS WORLD promptly upon receipt. At the low price of $4.98, this is a value you won’t want to miss. Make sure you fill in and mail the coupon together with your check ($4.98 per record) today.

**FILL IN AND MAIL TODAY!**

Stereo Test Record
P. O. Box 3110
Church St. Station, New York, N.Y. 10008

Please send ________ test records at $4.98 each, postpaid. My check (or money order) for $____________ is enclosed.

(Outside U.S.A. please send $7.00 per record ordered.) N. Y. State residents please add local sales tax.

Name ____________________________ (PLEASE PRINT)
Address __________________________
City ____________________________ Zip Code ________

Payment must be enclosed with order.

1969 EDITION
IAN AND SYLVIA: So Much for Dreaming. Ian and Sylvia (vocals); Ian (guitar and autoharp), David Rae (guitar), Robert Bushnell (electric bass), Al Rogers (drums). Circle Game; So Much for Dreaming; Wild Goose; Ched-A-Peeper; and eight others. Vanguard © VGX 9241 $5.95.

Performance: Bright-eyed
Recording: Good
Stereo Quality: Artful
Speed and Playing Time: 3 3/4 ips; 40'01".

Ian and Sylvia are a Canadian couple who sing folk songs and compose creditable facsimiles of them in a familiar vein. They won't raise the roof of your house or crack glasses trying to inspire awe of their vocal powers, but they may win you over, as they easily won me, through the rare, secret ingredient in all their albums: respect for the intelligence of the listener. The program here deals with pretentious matters: grey winter mornings, love gambled on a woman and "lost like summer wages," the flight of seagulls, the dreams of children. The sell is soft, the rhythm gentle, the tone humane and serious. A civilized cheer for Ian and Sylvia.

HENRY MANCINI: The Concert Sound of Henry Mancini; Encore! Henry Mancini Orchestra. High Noon; Over the Rainbow; Norwegian Wood; Moon River; Exodus; Born Free; Golden Earrings; and forty-four others. RCA Victor © TP3 5038 $9.95.

Performance: Classic and classy Mancini
Recording: Excellent
Stereo Quality: Excellent
Speed and Playing Time: 3 3/4 ips; 84'14".

If you can't get to the Hollywood Bowl, where you get Henry Mancini plus stars in the sky, the next best thing is to buy this tape and close your eyes. The stars will come. This massive collection features the best of the fully-orchestrated Mancini works. The first side is divided into four sections: "Academy Award Selections," with the band doing stuff off Over the Rainbow and the playing the best orchestration of Never on Sunday I've heard; "A Tribute to Victor Young," with seven great songs by the maestro, with some great piano work by Jimmy Rowles in Stella by Starlight; "The Music of David Rose," which connects with everything from Holiday for Strings to the seldom-heard American Hoe Down and Manhattan Square Dance; and "Peter Gunn Meets Mr. Lucky," which gets into the jazz groove with some sterling solos.

Side two starts out with the concert version of Mancini's tribute to the Beatles. Special attention should be paid to the artistic piano of Pearl Kaufman. A "Foreign Film Festival" follows, with such diverse concoctions as Forba the Greek and Born Free. "Music from Hollywood" and three compositions from Mancini's movie scores complete the concert. It is light and airy as a summer night, and although the tape takes well over an hour to listen to, it's time well spent.

THE SUPREMES: The Supremes Sing Rodgers and Hart. The Supremes (vocals); orchestra. Lover; The Lady Is a Tramp; Mountain Greenery; My Romance; Thou Swell; and seven others. Motown © MTX 659 $5.95.

Performance: Great
Recording: Excellent
Stereo Quality: Good
Speed and Playing Time: 3 3/4 ips; 30'04".

The Supremes are out of sight. On tape or on record I love them. This said, I can only urge you to buy this tape. Rodgers and Hart might not, on first thought, seem to be ideal material for this sleek and compelling group who are generally surrounded by the biggest of big beats. The beat is still there, although in more moderate proportions, and what it does to something like My Heart Stood Still is almost unbelievably good. But it is Diana Ross and the Supremes who make this tape a marvel of pop entertainment. They glide through twelve standards from the Rodgers and Hart canon with the sinuous aplomb of an adventuress crossing the lobby of the Hotel Negresco; in other words, they often take their time but they know exactly what they are doing. My Romance is my own particular favorite, but then I am sure you will be able to find several of your own. Unreservedly recommended.

NANCY WILSON: Lush Life. Nancy Wilson (vocals), orchestra. Free Again; Over the Weekend; You've Changed; River Shallows; Sunny; Lush Life; Only the Young; and four others. Capitol © YIT 2757 $5.95.

Performance: Very good
Recording: Excellent
Stereo Quality: Excellent
Speed and Playing Time: 3 3/4 ips; 37'07".

At the present moment Nancy Wilson is singing better than she ever has before, and this tape is a nice reminder that beautiful girls very often can sing. The only problem for me in listening to this tape is that Miss Wilson has chosen three songs which in my mind have already received their classic performances: Free Again and Too Long at the Fair seem to me to be the property of Barbra Streisand, and When the World Was Young remains firmly in my memory in a performance by Dinah Shore. Once past those hurdles, however, I enjoyed this recital enormously. Miss Wilson does a lovely job on the André and Dory Previn River Shallow, and her handling of the often melodramatic lyric of Lush Life is exemplary. Midnight Sun didn't move me much, but it's about the only thing here that didn't. Beautiful girl, beautiful voice, beautiful tape.

THEATER MUSIC

HELLO, DOLLY! (Jerry Herman). Broadway-cast recording. Pearl Bailey, Cab Calloway, Emily Yancy, Chris Calloway, Jack Crowder, others (singers); chorus and orchestra, Saul Schectman cond. RCA © T03 1006 $8.95.

Performance: Delicious
Recording: Excellent
Stereo Quality: On-stage realism
Speed and Playing Time: 3 3/4 ips; 44'45".

It will not come as news at this point that, of the long succession of gifted ladies who have kept Hello, Dolly! running on Broadway since Carol Channing left the title role, none was better cut out for the job than Pearl Bailey. Indeed, I would be hard put to choose which of the two Broadway-cast recordings of this still sparkling musical to keep in my collection if I had to give one up. Can a man be in love with two women at the same time? Miss Channing rapped her way into my heart years ago, and the album she made very attractive background music. The all-Negro cast accompanying her is excellent, and brings a mellower, more easy-going quality to the tuneful score. Jack Crowder is not as forceful a Cornelius as Charles Nelson Reilly was, but Emily Yancy has relieved the part of Mrs. Molloy, the milliner, of the operetta-lite quality Eileen Brennan found in it, and delivers Ribbons Down My Back and It Only Takes a Moment with singular ease in a more current idiom. Cab Calloway is altogether right as the prosperous Horace Vandergelder, and Chris Calloway is winning as little Minnie Fay. The chorus and orchestra sound bolder under Saul Schectman's baton than they did when Shepard Coleman was at the helm, but the tunes and the big spectacle numbers such as Put on Your Sunday Clothes and Before the Parade Passes By are as persuasive as ever. The voices of Miss Bailey right up there greeting everybody within earshot, in a style to make the lone-liest listener feel absolutely wanted.

FOR CARTRIDGE AND CASSETTE ENTHUSIASTS

Those who find it difficult to leave their music behind when they take to car, boat, beach, or vacation spot are turning more and more to the sensible compromise with high fidelity represented by the new tape-cartridge and cassette machines. A new bimonthly called The Glass List, a useful guide to the repertoire available in these formats, includes personality sketches and reviews of new releases plus comprehensive listings of all four-track, eight-track, and cassette tapes in the current catalogs. The magazine is available at $50 per copy wherever cartridge tapes are sold or by subscription ($2.50 per year) from the publisher, Glass Publishing Company, 664 N. Michigan Ave., Chicago, Illinois 60611.
THE MOST SPECTACULAR SOUND EXHIBITION OF STEREO FIDELITY EVER AVAILABLE ON ONE DISC.

This record is the result of two years of intensive research in the sound libraries of several of the world's leading record companies. The Editors of HiFi/Stereo Review have selected and edited those excerpts that best demonstrate each of the many aspects of the stereo reproduction of music. The record offers you a greater variety of sound than has ever before been included on a single disc.

AN ELECTRIFYING EXPERIENCE IN LISTENING

The HiFi/Stereo Review Stereo Demonstration Record is a series of independent demonstrations, each designed to show off one or more aspects of musical sound and its reproduction. Entirely music, the Record has been edited to provide self-sufficient capsule presentations of an enormous variety of music arranged in a contrasting and pleasing order. It includes all the basic musical and acoustical sounds that you hear when you listen to records, isolated and pointed up to give you a basis for future critical listening.

WIDE RANGE OF DEMONSTRATIONS

Techniques of Separation and Multiple Sound Sources
Acoustic Depth • The Ambiance of a Concert Hall • Sharp Contrasts of Dynamics • Crescendo and Diminuendo • Very High and Very Low Pitched Musical Sounds • Polyphony (two or more melodies going on at once) • Wind, String and Percussion Instruments • Tonal Qualities of Wind, String and Percussion Instruments • Sounds of Ancient Instruments • Sounds of Oriental Instruments • Sound of the Singing Voice, Both Classically Trained and Untrained • Plus a Large Sampling of Finger Snapping, Hand Clapping, Foot Stamping and Other Musical and Percussive Sounds

13 SUPERB SELECTIONS

STRAUSS: Festive Prelude, Op. 61 (excerpt) Deutsche Grammophon Gesellschaft • Scored for full symphony orchestra plus organ with prominence to the brass instruments. Remarkable for the impressive sense of depth it reproduces.

DEBUSSY: Fauré d’artifice (excerpt) Connoisseur Society • Virtually the entire movement of the piece is used, including the full force of the bass notes. This is the sound of a plane in reverberant surroundings heard fairly close-up.

BEETHOVEN: Wellington’s Victory (Battle Symphony) (excerpt from the first movement) Westminster • The recording emphasizes extreme directionality. It is a dramatic presentation engineered specifically for stereo reproduction.

MASSIAI: Canzone XXXV à 16 (complete) DGG Archive • Performed on old instruments, and recorded with techniques that combine directionality with depth and ambiance, this band reproduces the sound of the music in its original environment, a large and reverberant cathedral.

CORRETTI: Concerto Comique Op. 8, No. 6 “La Pleasure des Dames” (third movement) Connoisseur Society • Recording demonstrates the sound and special layout of a small performing group (harpischord, cello and flutes) in fairly resonant surroundings.

KHAN: Raga Chandranandan (excerpt) Connoisseur Society • This classical Indian music provides some of the most exciting musical experiences imaginable. Directionality between vastly different instruments is the point here, as well as the sheer sound of the instruments themselves.

RODRIGO: Concerto—Serenade for Harp and Orchestra (excerpt from the first movement) Deutsche Grammophon Gesellschaft • This excerpt provides a wealth of instrumental color behind a harp solo. The music is clear, colorful, rather classical and immensely entertaining.

MANITAS DE PLATA: Gypsy Rhumba (complete) Connoisseur Society • The recording puts the listener in the center of a flamenco party by precisely transmitting the directionality, depth and ambiance of this completely impromptu recording session.

MARCELLO: (arr. King) Psalm XVII “The Heaves are Telling” (complete) Connoisseur Society • This arrangement of the brief Marcello Psalm is for brass, choir and organ, who answer one another antiphonally.

PRETORIUS: Trepichios • La Bourée XXXII (complete) DGG Archive • A musical gem played by a raft of renaissance instruments including recorders, viols, lutes, harpsichord, small kettle drums, chimes, bells, and triangle.

BERG: Wozzeck (excerpt from Act III) Deutsche Grammophon Gesellschaft • The acknowledged masterpieces of modern music incorporating the use of many unusual and extraordinary musical devices, including dramatic crescendos for full orchestra.

BARTOK: Sonata for two pianos and Percussion (excerpt from the first movement) Cambridge • The work is a stunning exploration of percussive sounds used as the basic material of the composition.

BEETHOVEN: Wellington’s Victory (Battle Victory) (excerpt from the last movement) Westminster • A demonstration of one of Beethoven’s greatest virtues, its unmatched ability to clarify separate contrapuntal voices being played by similar instruments.

Advanced New Anti-static Vinyl

Recorded with the cooperation of Deutsche Grammophon Gesellschaft, Connoisseur Society, Westminster Recording Company and Cambridge Records Incorporated, the Stereo Demonstration Record is processed and pressed on a newly developed, improved vinyl, it is permanently anti-static, repels dust and dirt and promotes longer stylish wear. The use of this material is conducive to low surface noise and contributes to the production of full dynamics and frequency range. The record continually looks new, sounds new and wears longer.

FREE DESCRIPTIVE BOOKLET ENCLOSED WITH EACH ALBUM

Packed with valuable facts to give you a better understanding of the term “stereo high fidelity,” including a discussion of the selections appearing on the record, plus a complete description of each selection performed and the purpose behind its demonstration.

12” STEREO RECORDING AVAILABLE IN YOUR CHOICE OF 331/3 RPM OR 45 RPM

The 331/3 rpm is of the highest attainable quality at that speed. The higher speed of the 45 enables an even higher quality disc.

ORDER YOUR STEREO DEMONSTRATION RECORD TODAY

Only $4.98 Postpaid

Stereo Demonstration Record
P. O. Box 3463 • Church Street Station • New York, N.Y. 10008

Please send me... HiFi/Stereo Review Stereo Demonstration Record Albums at $4.98 each, postpaid. My check (or money order) for $____ is enclosed.

Check One: [ ] 331/3 rpm [ ] 45 rpm

(take outside U.S.A. please send $7.00 per album ordered.) New York State residents please add local sales tax.

Print Name
Address
City State Zip Code

PAYMENT MUST BE ENCLOSED WITH ORDER
First of a new breed—from Sherwood

This is what high performance is all about. A bold and beautiful new FM Stereo Receiver bred to leave the others behind. 160 crisp, clean watts—power in reserve. Up-front, ultra-now circuitry featuring Field-Effect Transistors and microcircuitry. Front-panel, push-button command of main, remote, or mono extension speakers and loudness contour. Sherwood high-fidelity—where the action is—long on reliability with a three-year warranty.

Sherwood

Sherwood Electronic Laboratories, Inc.
4300 North California Avenue, Chicago, Illinois 60618 Write Dept. T69
Hear every single subtle harmonic, every nuance of music, with these professional recorders featuring exclusive Cross-Field heads; they are the ultimate:

- **Model 770X**
  - Stereo Tape Recorder
  - Less than $400.00

- **Model 770X SS**
  - Solid State Stereo Tape Recorder
  - Less than $430.00

Create your own 8-track stereo cartridges for auto, home, plane or boat with one of these remarkable recorders (complete with speakers):

- **Model 778X**
  - 3-Track Cartridge and Reel Stereo Recorder with Cross-Field Head
  - Less than $430.00

- **Model 1725-8L-III**
  - Stereo 8” Track Cartridge and 4-Track Stereo Reel-to-Reel Recorder
  - Less than $360.00

The portable tape recorder complete with 7” reel adaptor that provides you with true fidelity sound whenever and wherever you want it. Small, compact with 2 built-in speakers.

- **Model 610X**
  - Portable Stereo Tape Recorder with 7” Reel Adaptor + Cross-Field Head
  - Less than $360.00

A superb addition to your home component system... a pro tape deck to plug into your stereo amplifier.

- **Model 450**
  - 3-Head 4-Track Stereo Tape Deck Ready for Custom Mount. Handsome wood-grain cabinet. Less than $200.00

Stereo music wherever you go. A choice of a portable or home model.

- **Model 1725 III Series**
  - Portable with Detachable Speakers

With ROBERTS you’re ahead year after year after year after year after year...

Choose your new tape recorder in just two steps:

**Step 1**
Decide on ROBERTS—because only ROBERTS gives you both advanced engineering and precision craftsmanship.

**Step 2**
Decide how you will be using your new ROBERTS (there is a ROBERTS for every recording application).

Shown here are just a few examples of the 1969 ROBERTS line. To get a good look at all the new ROBERTS models, and to discover what each one can do for you, better jog right over to your nearest ROBERTS dealer.
We saved the best for last.

You've just looked at enough tape recorders and specs and claims to boggle the mind. But you know the best is always last.

So here it is... our reel-to-reel line... out in the open for the whole world to see.

Somewhere in this group there's probably the unit you're looking for. With automatic threading, automatic reverse, sound-on-sound, sound-with-sound, echo, three heads, four heads, etc., etc. All kinds of configurations in all kinds of decks and complete systems to satisfy your needs or taste.

We could try to sell you on a particular recorder in this ad, but that would be foolish. You're the kind of guy who wants to see for yourself. To compare for yourself. And then make your own decisions. So take a look at each recorder. And please be sure to look at Ampex. Feature for feature we think they're your best values.

That's what you would expect from the Sound Idea People. And that's exactly what you get... in whichever Ampex unit you select. No brag. Just fact.

**AMPEX**

A. #985A stereo music center, player/recorder with automatic threading and reverse, stereo FM, FM/AM receiver, $600
B. #2161 portable stereo player/recorder system, bi-directional recording, automatic threading and reverse, $469
C. #761 tape monitor portable stereo player/recorder system, 3 heads, nesting cube speakers, 40 watts peak power, $329
D. #1161 portable stereo player/recorder system, 4 heads, automatic threading and reverse, nesting cube speakers, 40 watts peak power, $369
E. #1461 tape monitor portable stereo player/recorder system, 4 heads, automatic threading and reverse, $299
F. #861 portable stereo player/recorder system, $249
G. #2150 stereo player/recorder deck, bi-directional recording, automatic threading and reverse, $399
H. #1450 stereo player/recorder deck, 4 heads, tape monitor, automatic threading and reverse, $299
I. #750 stereo player/recorder deck, 3 heads, tape monitor, $199...

*Manufacturer's suggested list price.

CIRCLE NO. 3 ON READER SERVICE CARD