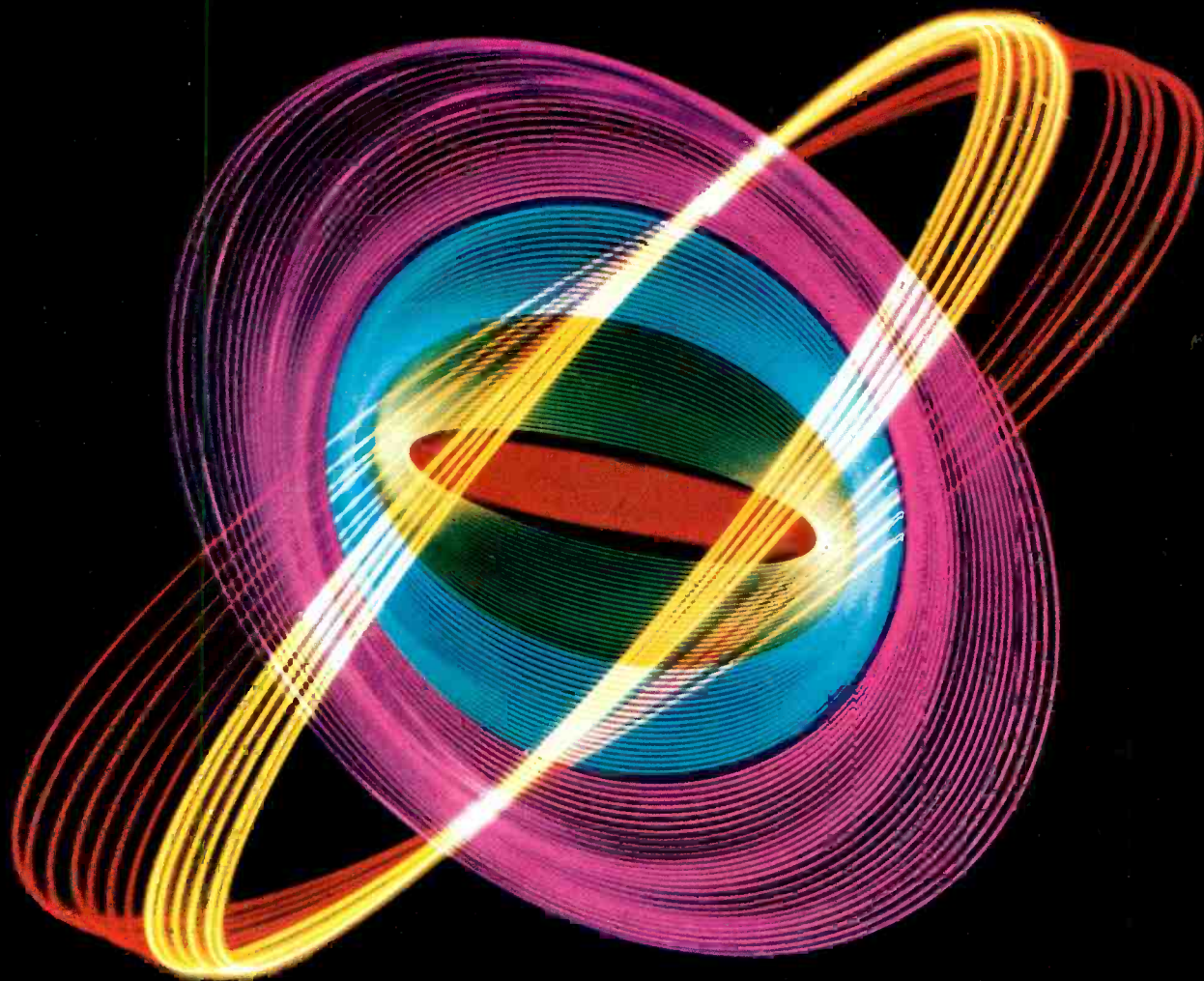




TAPE RECORDING

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A MIRACLE IN SOUND



September, 1959

35c

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SETTING BY PAUL MCCOBB



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Back Space Bar provides instant replay of a word, phrase, or musical passage as desired.



Illuminated "record" and "play" keys on panel light up when pressed.



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Repeats any passage. Rewinds or turns
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Exclusive "Balanced-Tone" emphasizes treble and bass, giving exquisite depth, more realistic high-fidelity quality. Full range of 40-16,000 cps., simplified drop-in loading; dual speeds of $3\frac{3}{4}$ and $7\frac{1}{2}$ ips.; 2-level record indicators; index counter; accepts 7" reels which play for four hours, using long play tape.

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AMPEX 960

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Tony Schwartz, unique documentary recordist, has created numerous prize-winning records from thousands of tape-recorded sounds of everyday life and folk songs.

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*"Mylar" is Du Pont's registered trademark for its brand of polyester film. Du Pont manufactures "Mylar", not finished magnetic recording tape. Tapes of "Mylar" are made by all manufacturers.



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TAPE RECORDING

VOL. 6 NO. 11

OCTOBER 1959

MARK MOONEY, JR.
Editor and Publisher

JOHN L. ALLEN
Circulation Manager

JEAN COVER
Assistant Editor

ROBERT W. LAPHAM
Art Director

JAMES H. MILLS, SR.
Technical Consultant

ANTHONY J. MORIN, JR.
National Advertising Manager
274 Madison Ave., New York 16, N. Y.

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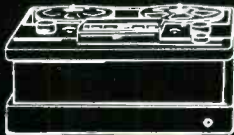
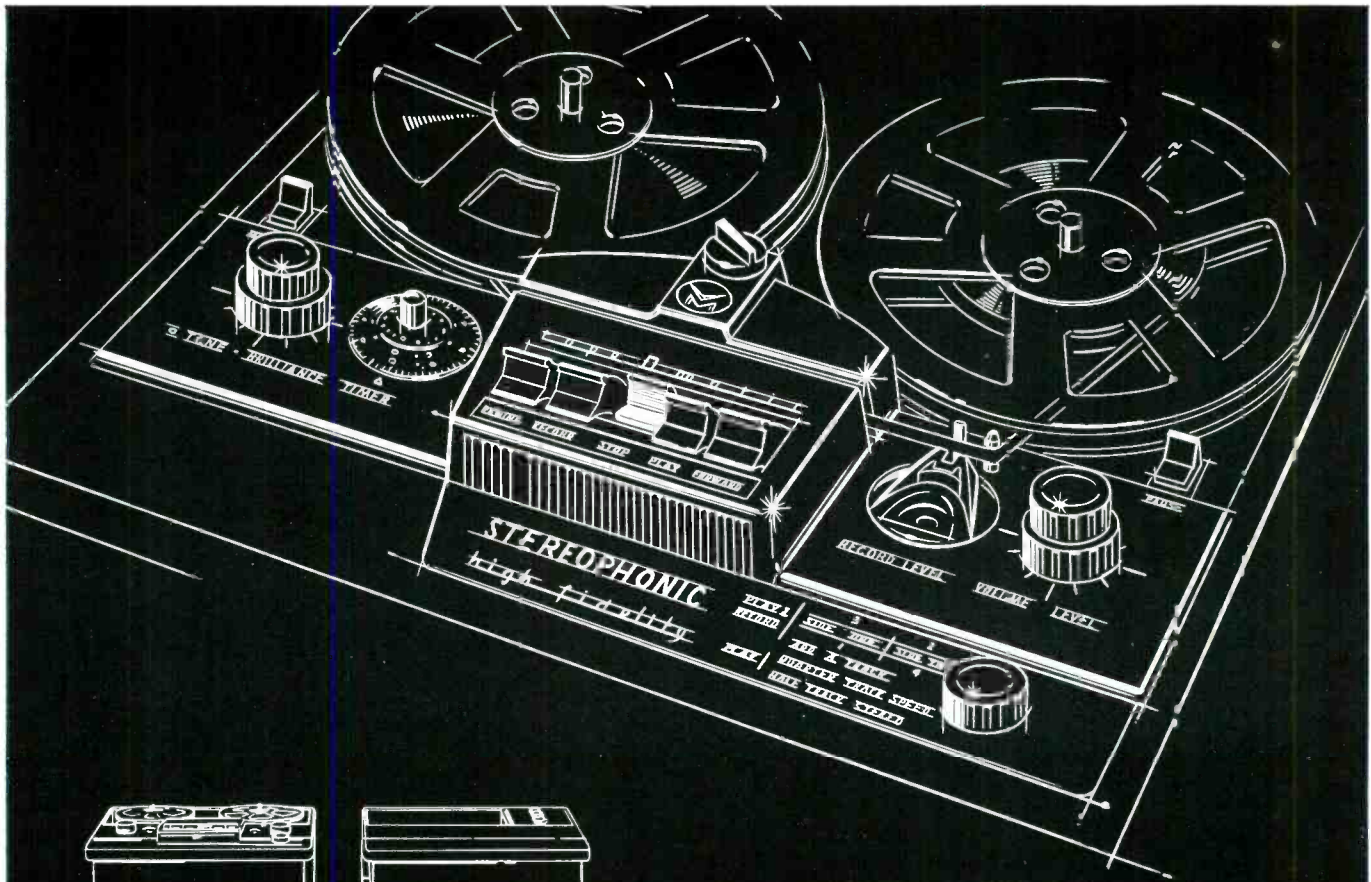
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NEW TAPES

CLASSICAL

CONCERTO FOR ORCHESTRA: BARTOK
MEPHISTO WALTZ: LISZT

Sequence A: Concerto for Orchestra: First, Second and Third Movements

Sequence B: Concerto for Orchestra: Fourth and Fifth Movements—Mephisto Waltz

Chicago Symphony Orchestra, Fritz Reiner, conductor
RCA KCS-4000
4-track stereo, 3¾ ips, cartridge
\$9.95 50 mins.

Bartok composed the Concerto for Orchestra during the last years of his life when he was plagued by economic difficulties as well as an undiagnosable illness. Fritz Reiner, in association with Joseph Szigeti, arranged for a commission from the Koussevitzky Foundation for Bartok to begin composing again after a period of time when he had no enthusiasm for work. Within a few months Bartok completed the Concerto for Orchestra score.

Having assisted in the creation of the work, Mr. Reiner is the logical conductor for it and he handles it magnificently. There is excellent depth and directionality for such a difficult composition.

Liszt's Mephisto Waltz is based on an episode from Lenau's "Faust": Dance in the Village Inn. The music is light. The episode concerns Faust and Mephisto's coming upon a marriage ceremony where there is much gaiety. They join the merry-making and when Mephisto takes the violin from the fiddler and plays music with an irresistible seductiveness, Faust grabs a village maiden and begins a wild dance with her. Eventually, he and the maiden dance out of the inn and into the woods.

Just as most folks must cultivate a taste for such goodies as caviar or olives, so too must most individuals cultivate a liking for classical compositions. If you are among those graduates already schooled to appreciating classics, you will appreciate this release. It is uniform. Fidelity is clean and clear.

Mr. Reiner and the orchestra render an equally fine job on this score. Overall balance is uniform.

MUSIC OF JOHANN STRAUSS

Overture to "Die Fledermaus," Pizzicato Polka, Blue Danube Waltz, Emperor Waltz, Perpetual Motion, Tales from the Vienna Woods

The Musical Arts Symphony Orchestra conducted by Leonard Sorkin
CONCERTAPES 4T-3005
4-track stereo, 7½ ips, reel-to-reel
\$6.95 30 mins.

Comforting, soothing melody flows throughout this tape and in stereo it is doubly rewarding to the ears. A joy to listen to, until we suddenly hit the ending on the "Blue Danube Waltz."

As one of the staff remarked, "somebody goofed." On the last couple of notes, it sounds as if the whole orchestra were reading misprinted music sheets, and the notes

went sour. We don't know what happened, but we believe it must just be our copy.

Otherwise these well known Waltz King works are done justice by Mr. Sorkin and the Musical Arts Symphony Orchestra. There is rich orchestration and Mr. Sorkin waves his baton with gusto.

The clarity of reproduction is most commendable despite the one slip-up.

POPULAR

JACK KELLER TRIO—PIANO SOLOS
WITH RHYTHM ACCOMPANIMENT

There'll Be Some Changes Made, You And The Night And The Music, Them There Eyes, Stars Fell On Alabama, Shine, Londonderry Air, It's Only A Paper Moon Tenderly, and Bop City

ARTCORDE M-203
2-track stereo, \$8.95
4-track stereo, \$6.95
7½ ips 30 mins.

This trio lends a dreamy, dimly-lit, night club atmosphere when they play. The music is not overly-stimulating, but it is also not hard to take.

We get a twinge of monotony as the tape unwinds. Unfortunately, such becomes the case when you listen to too much of the same instrument, and we find ourselves kind of wishing we could hear the wail of a sombre trombone, or a saucy clarinet join in.

Jack Keller is certainly deft on the keys, however, and must be paid due credit. The accompaniment on the drums seems to have a gravelly sort of sound which we could not tone down.

While this is not the clearest fidelity we have ever heard, it is still quite a listenable tape and one which we believe has a danceable flavor.

MUSIC FOR RELAXATION

Sequence A: Moonlight Serenade, While We're Young, Valse Bluettes, By the Sleepy Lagoon, La Serenata
Sequence B: Berceuse de Jocelyn, Autumn Leaves, Star Dust, Estrellita

The Melachrin Strings and Orchestra, conducted by George Melachrin
RCA KPS-3020
4-track stereo, 3¾ ips, cartridge
\$8.95 30 mins.

While listening to this tape, the temperature outside is about 95°—in our sound room about 100°, so we got as comfortable as possible, picked up a cooling snowball and took full advantage of the title for this release. We settled back to relax midst reviewing.

To our delight we found the music had rich orchestration, beautifully balanced, with a floating quality. This release is just to listen to and to savor what you hear. There is no brassy blare, nor constant whanging, just a glorious combination of strings and now and again a piano or soft rhythmic beat is heard.

Call it praise if you wish—our much tossed words like perfect, superb, top notch, etc., for RCA's tape recording engineering



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all there
on

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world's best
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LAWRENCE WELK



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stereophonic
tape!**

skill, cause that's just what it is. Now and then they pull a boo-boo (who doesn't) but with excellent recording facilities, equipment, and personnel, how can it be anything else but perfect, superb or top notch.

CHA CHA CHA

Blue Skies Cha Cha, Should I Cha Cha, Home Sweet Home Cha Cha, Honey Cha Cha, Nola Cha Cha, Stars and Stripes Forever Cha Cha, Why Do I Love You Cha Cha, Wall to Wall Cha Cha, I Can't Give You Anything but Love Cha Cha, Humoresque Cha Cha, Jealous Cha Cha, Pan Amore Y Cha Cha Cha
Eduardo Fernandez and his Cha Cha Kings
STEREOPHONIC MUSIC SOCIETY S7
4-track stereo, 7½ ips, reel-to-reel
\$7.95... 34 mins.

Attention cha cha fans—you'll want this tape for your next dance gathering. This release is perfect for those up-to-date folks who like to cha cha. In the past few years this intriguing dance step from Cuba has found increasing favor in the States.

Eduardo Fernandez and his aggregation have taken well known tunes (see listing above), added "Cha Cha" to the title, and dressed them up Latin American style. The mesmeric beat fits each surprisingly well.

The "Guiro," or scratcher, is much used in the instrumentation of these cha cha's. It almost seems to be constantly hissing "cha-cha-cha" throughout the tape.

While this is pleasant to listen to, it is even more pleasurable to dance to. You find it difficult to keep your feet still.

Fidelity is notably high.

CHORAL

THE ARMY WAY

On, Brave Old Army Team, The Blue Tail Fly, Sometimes I Feel Like A Motherless Child; World War I Medley: There's a Long, Long, Trail-A-Winding, K-K-K-Katy, It's a Long Way to Tipperary, Till We Meet Again, Mademoiselle from Armentieres, My Buddy, Over There; Onward Christian Soldiers, The Army Goes Rolling Along, While Strolling Through the Park One Day, Yellow Bird, Seventy-Six Trombones, Dixie, Alma Mater
STEREOPHONIC MUSIC SOCIETY S12
4-track stereo, 7½ ips, reel-to-reel
\$7.95... 34 mins.

There's something undefinable about a male choir that stirs you. In a group such as this one, the precision of Army cadets is captured in their singing.

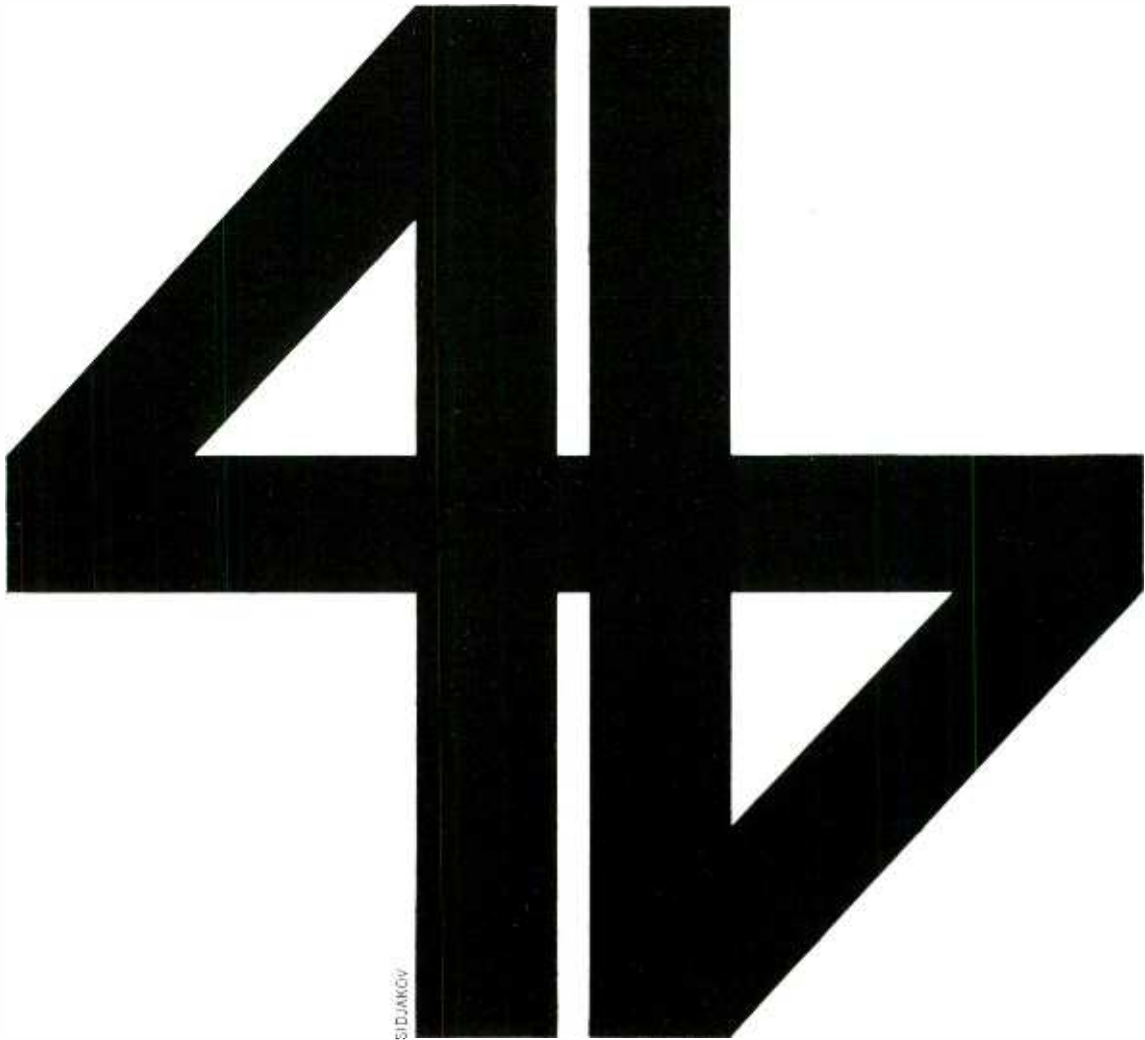
The only accompaniment supposedly is a piano, and this is all the choir needs. We note, however, a stringed instrument used on "Yellow Bird"—very effectively too. The men sing clearly, deeply and as if they were one instead of many. First formed with 25 members, present strength is now 200. For each off-post appearance, a group of 95 cadets is selected.

We liked the barbershop-like harmony on "While Strolling Through the Park One Day."

You just have to sing, whistle, hum, snap your fingers, or something, when the men sing the familiar World War I tunes.

We think of the fidelity on this one as having a true purity of sound.

Music sounds best on tape—it always has—but now you can afford it! 4-track, 7½ ips stereo tapes bring you twice as much music at half the cost, with “master recording” fidelity and infinite wearability. Hundreds of new 4-track stereo tapes now in stores . . . produced by 17 leading recording companies: Audio Fidelity / Bel Canto / Concertapes / Dot / Everest / Hi-Fi Tapes / Kapp / M-G-M / Mercury / Omega-tape / S-M-S / Vanguard / Verve / Vox / Warner Bros / Westminster / World Pacific. For list of 4-track tapes and dealers write 1024 Kifer Road, Sunnyvale, California. **UNITED STEREO TAPES** 



SIDJAKOV

FEEDBACK

Excerpts from readers' letters will be used in this column.

Address all correspondence to: The Editor, Hi-Fi TAPE RECORDING, Severna Park, Maryland.

Crestwood Parts

To the Editor:

We note the letter of Mr. J. S. Szanyos concerning the difficulty he has had securing a replacement motor for a Crestwood 402 Tape Recorder.

We are a firm long specializing in tape recorder service and for a number of years were associated with Daystrom as a Crestwood Service Station.

The elusive motor is carried in stock by us. We do not consider it practical to secure a General Industries motor because of the precision machining necessary to insure concentricity of the motor pulley. The suggestion of your reader Mr. Peter F. Gilles to rebuild the present motor seems the better approach.

If we can be of assistance to any of your readers with this or similar problems please feel free to contact us.—*W. Goldstick, Sigma Electric Co., 11 E. 16th Street, New York 3, N. Y.*

Our thanks to Sigma Electric for coming to the rescue. Present owners of Crestwood recorders should make note in case anything might go wrong in the future with their own machines.

Did You Tape Program?

To the Editor:

I have been recording the television program "Music for a Summer Night" each Wednesday evening but on June 17 the program was preempted by a baseball game and I was unable to get it on our local station. I wonder if one of your readers happened to tape this program, "A Musical Tour of the Mississippi River" and would loan me their tape so I could dub one of my own.—*Elmer A. Anderson, Poole Road, RR 4, Westminster, Md.*

Any readers who might be able to oblige please write directly to the inquirer at the address given.

Recorded Tape Info

To the Editor:

It seems to me that TAPE RECORDING Magazine can help its readers and the tape industry in general by giving full information on recorded tapes. If lists of these tapes—aside from reviews—could be made each month the reader could get a broader picture of what is available on the recorded tape market and thereby have some guidance in his buying. I for one, find it

extremely difficult to learn what recorded tapes are available and where they can be obtained. Information of this sort would be most welcome.

Secondly, it appears to me that the purchaser of recorded tapes could use more information as to their care, storage, etc. What may be expected of recorded tapes in the long run? How long will they last without deterioration? What may be expected to happen to them over a period of time? What kind of tape is best, Mylar or acetate? If Mylar is better than the acetate variety then the buyer should know about it and TAPE RECORDING magazine should show an interest in inducing the manufacturer to use this type of tape or, if not, to indicate on the box the type of tape he does use.

We are going into a new era of recorded music and there is much to be told of the drawbacks and advantages of tape, what to guard against and what to look for in buying it. If TAPE RECORDING magazine could answer some of these questions it would do a great service to its readers.

In general I am pleased with the magazine although at times I feel it is too greatly interested in the sensational gimmick side of tape. I regard my tape recorder not as a toy but as an important and treasured piece of equipment and I am looking forward to building up a library of recorded tape. I hope your magazine will assist me and its other readers in this respect.—*Leonard B. Nolley, Baltimore, Md.*

Our thanks to reader Nolley for his excellent comments. Next issue will see an article covering recorded tape, its preparation, care and use. It will be just what you ordered. We will also list all tapes received for review in addition to the reviews themselves. We agree that we are entering a new era of recorded music and we plan to be in the vanguard.

Slide Changer

To the Editor:

With reference to the article in the August issue "Slide Soundorama by Bart Pierson:

I have an automatic slide changer projector and I have operated it from my recorder by means of metal tabs placed on the shiny side of the tape.

A better way, I think, is to use one side of the stereo tape to send out the signal that would, through an amplifier, operate a relay to change the slides.

I understand such a machine is already on the market. Could you advise where such a machine could be purchased? Why not give us the details in your magazine on how to build such a machine, the type of relay for best results, capacity of condensers needed, etc. I think many of us would appreciate such an article.—*Raymond H. Bagg, West Springfield, Mass.*

The LaBelle Co., Oconomowoc, Wisconsin, makes a recorder that places a signal on the second track to actuate a slide projector. The recorder contains a signal generating device which is operated by a pushbutton on the recorder. On playback the signal operates a relay which works the slide projector. Chief difficulty up to

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The only recorder at any price that does everything **BETTER!**

THE NEW 728 "PROFESSIONAL"

Records stereo
Plays back either two or four track stereo tapes.

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DIVISION OF MIDWESTERN INSTRUMENTS / manufacturers of electronic data acquisition instruments

now in working the scheme on ordinary recorders is that there was no way of recording the signal on the lower track since most machines had stereo playback only. Now however, with the increasing number of stereo recorders on the market, such a device becomes worthwhile and we will cook one up and publish the results. Also coming up is a story on a very simple, commercially available device that uses metal tabs on the tape.

Sound Effects

To the Editor:

I was quite interested in the article "Make Your Own Thunder" by L. L. Farkas in your June 1959 issue.

For some years I was a sound-effects man in radio, having done over 7000 live dramatic broadcasts. In my work I've encountered just about every imaginable sound cue—from the screech of a prehistoric pterodactyl to the whine of a galacto-disintegrator in science fiction.

At the urging of Rinehart & Co. I got together a 320 page book on "Radio and Television Sound Effects." It is a standard college text. I am sure that many of your readers would find helpful material in the chapter on "Improvising Sound Effects." I might add, the rest of it is pretty interesting stuff, if I say so myself.

All kidding aside, I know what a hassle it is to create sound—maybe some of your readers can benefit by my experiences.—Robert B. Turnbull, Los Angeles, Cal.

We are glad to hear of this work and doubtless a good many readers will be likewise. Rinehart's address is 232 Madison Avenue, New York. Sorry we don't know the price.

Records 4 Separate Tracks

To the Editor:

I enjoy your informative magazine very much and was glad to read about the new four-track tapes in your July issue. Near the end of the article you state that "now machines record monaural by using tracks 1 in one direction and 4 in the other. Only the Tandberg records and plays all four tracks separately."

I recently bought a Pentron Emperor II Model NL-4 stereo record and playback tape recorder. This recorder will also record all four tracks separately. Using the new long-play tape I can record more than two hours on one channel at $3\frac{3}{4}$ ips. I hope I have not misunderstood.—Edward L. LaGrone, Jr. San Antonio, Texas.

At the time that was written the Tandberg was the only one but since that time a number of manufacturers have brought out equipment that will record the tracks separately. This is a point to check when buying a new recorder.

Bel Canto Sold to T-R-W

Thompson-Ramo-Wooldridge, Inc., electronics and space-age firm has purchased Bel Canto Magnetic Tape Co. It will be operated as a wholly-owned subsidiary in the commercial electronics group. Other companies in the group are Bell Sound and Dage television. Russ Molloy will be the head of the new division and will continue to direct operations.

WE are old-fashioned enough to believe that ultimately the reputation of a Tape Recorder must stand or fall by the quality of its recording and reproduction—and by nothing else. True, some people may be influenced by style and presentation—others by novel mechanical devices or electrical features—or by an attractive price. But styles change—new ideas often fail to live up to their designer's expectations and rarely is it wise to buy on price. That is why it has always been our policy to devote our entire resources

unceasingly — almost exclusively, in fact — to the rewarding pursuit of near-perfection in sound recording. Not for us the frequent parade of new models bristling with new ideas. Instead, design improvements are incorporated only after a long and searching period has proved their worth. As a result, the reputation of the Ferrograph to-day is well-nigh legendary. Its name is known and respected throughout the world — especially among Broadcasting Companies, Government Departments, professional musicians and high fidelity enthusiasts who appreciate and need the highest attainable standards of performance.

These cautious British!

If quality appeals to you, too, then the incomparable Ferrograph 4A (in either of its two forms) will satisfy your most exacting requirements in conventional half-track monophonic recording and playback. But if you believe — as we do — that stereophony opens up entrancing new fields of recording then you should investigate the Ferrograph Stereo 808 which, besides offering complete stereo facilities, also permits monophonic half-track and virtual full-track recording and playback. Truly a most versatile Tape Recorder.



Ferrograph Series 4

Standard half-track monophonic recording and playback.

$3\frac{3}{4}/7\frac{1}{2}$ or $7\frac{1}{2}/15$ i.p.s. Available as transportable (as illustrated) or in chassis form, without speaker, for building into own cabinet.

Ferrograph Series 808

In transportable form only, giving full recording and playback facilities both mono and stereo, at $3\frac{3}{4}-7\frac{1}{2}$ i.p.s.

Model 808/2 provides conventional width stereo tracks; Model 808/4 caters for those desiring quarter track stereo facilities. The matched outputs in all cases end at low-level to feed into user's own hi-fi amplifier systems.

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CROSTALK

from the Editors

THE TAPE RECORDING INDUSTRY is on the threshold of the biggest boom it has ever known. How soon that will come will depend, to some extent, on when the industry decides to remove the bushel basket from its light.

* * * * *

IN FOUR-TRACK TAPE the industry now has the best means of music reproduction in the home at a price that is competitive with any other means. It is tops in fidelity—and it stays that way for any number of playings.

* * * * *

NOT TWO YEARS ago the prophets of gloom and doom were stating that stereo tape was dead and that the industry had better go back to selling recorders because they could record and forget the music end of the business. The stereo disc had come—there was no longer a need for tape for stereo.

* * * * *

EVENTS HAVE PROVED that the prophets of G & D could not have been "wronger". The industry came back with four-track tapes which had been cooking on the back burner for a good many years.

* * * * *

THE NEW METHOD was made possible by great improvements in heads that produce four-track sound that is equal to or better than the old two track.

* * * * *

THESE TECHNOLOGICAL IMPROVEMENTS have put an utterly different complexion on the music business. It has long been foretold but now it has come. It is definitely the beginning of a revolution which will see tape emerge as the medium for home entertainment in stereo.

* * * * *

THERE ARE TWO tried and proven mediums for music. One is the LP disc and the pop single which have been with us for ten years and have proved their right to the consumer's dollar. The other is tape which has likewise proved itself over a period of years—in both monaural and stereo.

* * * * *

CHIEF DRAWBACK to tape was the cost. This point was raised by both the dealer and the buying public. Four-track has licked this problem. Even at the former high cost, those who wanted the best, bought tape—and millions of dollars worth of it.

* * * * *

THIS SWITCHOVER is not going to happen overnight. It took the phono industry ten or twelve years to discontinue the 78 rpm records. We think the tape takeover will be swifter than this, in fact, an officer of one of the largest record firms said he thought that within five years everything except pop singles would be on tape. . . . and this statement was made more than a year ago.

* * * * *

ACTUALLY the recording companies have one basic product to sell—and that product is music. They can sell it just as well on tape as they can on a disc, so it should make little difference to them.

* * * * *

AS THE NUMBER of four track machines increases, the market for these new tapes will continue to grow and expand. You will see more and more companies entering the field. It will be like a snowball rolling down hill, gathering momentum with every revolution. Present estimates of four-track machines now in the homes is 100,000. It is expected to rise swiftly.

* * * * *

THE PERSON WHO WANTS THE BEST will buy tape. The dealer who wants his customers to have the best will sell tape. We believe that Americans want the best. . . . We believe the tape recording industry is on the threshold of the biggest boom it has ever known.

* * * * *

TO TOP IT OFF remember that tape recorders can record, too.

QUESTIONS AND ANSWERS

Questions for this department may be sent by means of a postcard or letter. Please address your queries to "Questions and Answers," HI-FI TAPE RECORDING, Severna Park, Maryland. The most interesting and widely applicable questions will be used in this department.

Squeal Troubles

Q—I have been following your questions and answers feature since buying my recorder nine months ago but so far my own problems haven't appeared. Can you help me?

I have been unable to obtain any advice locally as to whether the symptoms on my machine are the result of my operation or the faults of the machine. I was referred to the manufacturer's local representative whose only help was to offer to sell me a manual for 50¢.

The two symptoms I have are these:

1—When recording from the radio there is a whistle immediately upon depressing the record key. This rises in pitch until in about 15 to 30 seconds it is above audibility. To avoid recording the whistle I hold back the instant stop and record lock to stop tape feeding until the whistle is too high to hear. Is this normal? If not can it be prevented? I record from the speaker leads.

2—Two or three months after recording on one tape there suddenly appeared an even pitched whistle on both sides. The pitch of the music also seems to have changed. I am enclosing a length of tape which will probably explain it better than words. The same whistle has appeared less pronounced on other tapes and I have found it cannot be erased when recording. Your February 1959 issue mentions a hiss developing if one does not demagnetize the heads. I have no demagnetizer at present. Could this be the result?—H. S., Toronto, Canada.

A—Your tape when played on one of our machines showed no evidence of squeal at all which leads us to believe that the pressure pads or tape guides on your unit are glazed and in need of cleaning or replacement. The pressure pads are the small pieces of felt that hold the tape to the head. After considerable use, they pick up dirt from the back of the tape and become hardened and glazed. Clean them with a bit of carbon tetrachloride or isopropyl alcohol to dissolve the dirt and rough up the surface again with a fingernail file. If badly worn, they should be replaced. Be careful not to scratch the heads when working on the pads.

The rising pitch whistle is most probably due to the interaction of the bias oscillator in your recorder with the intermediate frequency oscillator in your radio.

As you probably know, a bias current is added to the sound signal in order to make the sound record properly on the tape. This electrical oscillation is beating against the one in the radio receiver and what you hear is the result of the two. Even though it goes beyond the range of audibility, it is still there and can cause distortion in the recordings. In fact, we

have heard it come sliding back down the scale again in the middle of a recording.

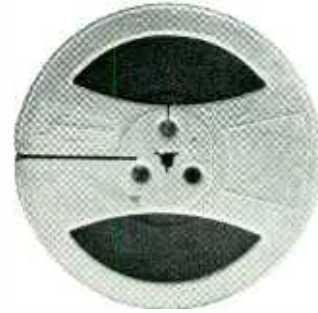
You might try placing your radio at a greater distance from the recorder. This may or may not improve things, as the signal may still come through along the cord attaching the radio to the recorder. If the howl persists there is little that can be done except to use another radio. Shielding is almost impossible and changing the IF frequency only upsets the dial settings.

Bulk Eraser

Q—Could a bulk eraser be used to demagnetize recorder heads by placing it close to the heads and slowly drawing it away as per instructions for reels of tape? Would the eraser damage any parts of the recorder with its powerful magnetic field, such as the magnet of a PM speaker?—J. F. M., Chicago, Ill.

A—If you can get it close enough it will demagnetize the heads. It is also capable of reducing the magnetism in permanent magnets and caution is advised in its use near them.

HOLD UP TO LIGHT



For Party fun unlimited—

A Webcor Royalite Hi-Fi Tape Recorder!



Your new Webcor Royalite will add tremendously to your parties—because everyone's a 'performer' at heart, every guest wants to get into the act.

It's easy to operate, and so light you can take it anywhere. Two elliptical hi-fi speakers—three speeds—stands up to hardest use. Royalite High Fidelity Tape Recorder—\$189.95. Ask your Webcor dealer for a demonstration soon! Webcor Tape Recorders from \$159.95.

Prices slightly higher in South and West.

WEBCOR—*World's best-selling Tape Recorders*

NEW PRODUCTS



WE THINK OUR MAGNETIC TAPE
WAS MEANT TO BE PACKAGED
THIS WAY AND NOW IT IS!

FERRODYNAMICS CORP., LODI, N. J.

STUZZI MAGNETTE



Ercona Corp. is distributing the Stuzzi Magnette recorder, which is manufactured in Austria. This fully transistorized, battery operated machine weighs only 8 pounds, and has speeds of $1\frac{7}{8}$ and $3\frac{3}{4}$ ips. It has a self-contained high-flux loud speaker system, is completely vibration proof, and incorporates a modern-design amplifier system embodying 7 transistors and 2 diodes. Other features include: battery life indicator (battery life is up to 100 hours); can be used as a portable PA system; wow and flutter are held below the minimum acceptable by professional standards through the use of a large capstan fly wheel; separate motors for fast wind/capstan drive; can be replaced via external amplifier/hi-fi systems; frequency range at faster speed is 50-9,000

cycles; a 3-digit counter; and VU level magic-eye modulation. Price is \$269.50 including moving coil microphone, reel of tape, empty reel, and special screened connecting cable with plugs and operating instructions. For further information, write to the Ercona Corp., 16 West 46th St., New York 36, N. Y.

SHURE MIKES



Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill., is marketing their Model 55S Unidyne microphones, professional-quality mikes perfectly matched and balanced for stereophonic recording. These mikes are precision-produced and are guaranteed by the manufacturer to be within 2 decibels of each other across their entire frequency range from 50 to 15,000 cps. Unidynes have unidirectional dynamic multi-impedance switches to permit matching low, medium, or high impedance inputs. For price and additional information, contact the manufacturer.

THE EVOLUTION OF A FAMOUS TAPE RECORDER



(MODEL EL 3536)
SPECIFICATIONS

◆ Self-contained, including hi-fi pre-amps, recording and playback amplifiers, Norelco wide-range loudspeaker and stereo dynamic microphone (dual elements) ◆ Fully compatible with conventional monaural and stereo pre-recorded magnetic tapes ◆ Three speeds— $7\frac{1}{2}$, $3\frac{3}{4}$, $1\frac{7}{8}$ ips ◆ Can be played back through your hi-fi system

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CONTINENTAL
"400" a new
**4-track stereo-record/
stereo-playback
tape recorder**
**guild-crafted for you by
Philips of the Netherlands**

For additional descriptive literature write to:
North American Philips Co., Inc.
High Fidelity Products Division
230 Duffy Avenue
Hicksville, L. I., N. Y.



SPLIT-OUTS



A new line of "Split-Outs" for feeding a single source to two or more fully isolated loads has been announced by Studio Supply Company, a division of Studio Electronics Corp. These "Split-Outs" will combine networks for such uses as complete recordings of two or more in-

dependent sources, as in the case of making monophonic recordings simultaneously with two and three-channel stereo systems without disturbing the independent stereo channels. For further information on the design and use of these devices, write Gordon Edwards, Studio Supply Co., 711 S. Victory Blvd., Burbank, Calif.

NEW BRIEFCASE MODEL



The Amplifier Corporation of America, 398 Broadway, New York 13, N. Y., is marketing its new 12 lb. transistorized secret recorder which is securely built into a briefcase. The briefcase may be opened for insertion or removal of papers, closed, carried, or put down without revealing in any way the quietly operating recorder concealed in a false compartment. With the sensitive, built-in microphone cleverly hidden in the upper folds of the briefcase, to simulate the sound collecting properties of the human ear, normal speech may be recorded at a distance of 25 feet. Five single speed and four two-speed models are available. At 1 7/8 ips, up to 3 hours recording time is available on a 5" reel of tape, dual track. Six easily replaceable or rechargeable dry batteries power the electric motor. Amplifier batteries last 125 hours, motor batteries, 40 hours. Furnished complete with in-built microphone, earphone, batteries, reel of long-play tape and instructions, unconditionally guaranteed for two years. Complete specifications are available by writing to Secret Recorder Division, Amplifier Corp. of America.

CORRECTION



In our July issue, page 11, we should have used the above photo under AMPEX TUNER, but instead a photo of an Eric tuner found its way into the slot. Our apologies to both companies.



your stereo and hi-fi
tapes last longer
sound better with

ROBINS TAPE CARE ACCESSORIES

Reduce distortion, background noise for better recordings.



ROBINS TAPE HEAD DEMAGNETIZER MODEL HD-6

Removes any residual permanent magnetism from recording heads eliminating high noise level and harmonic distortion caused by magnetism. Extended pole-piece for easy access to all leading makes of tape recorders. Model HD-6 List \$10.00.



ROBINS MAGNETIC BULK ERASER ME-99

Assures greatly improved recordings by removing completely, recorded and unwanted signals. Reduces background noise levels of tape from 3 to 6 db below normal erase level. If tape deck is geared to stereo and does not have stereo erase, ME-99 does the job quickly and eliminates sending tape through single-track erase head twice. Demagnetizes tapes up to 1/2". Accepts reels up to 10". List \$33.00.



Professional Splices In Seconds

ROBINS GIBSON GIRL* TAPE SPLICERS

The accepted standard of professional and industrial users of recording tape. The Gibson Girl shape (waist formed in a splice) prevents adhesive from contacting critical parts of recording mechanism, layer-to-layer adhesion—frequent causes of wow, flutter, distorted performance.

No Scissors—No Razor Blades Needed

TS4A-DLX Gibson Girl Deluxe list \$11.50.

TS4A-STD Gibson Girl Standard list \$8.50.

TS4A-JR Gibson Girl Junior list \$6.50.

SP-4 Gibson Girl Semi-Pro list \$3.50.

H-4 Gibson Girl Hobbyist list \$1.75.



Everything for better recording and editing

ROBINS TAPE CARE KITS

Each kit contains tape accessories to protect your tapes and equipment, to help you get more tape recording enjoyment.

TK-4 STD—Gibson Girl Standard splicer, splicing tape, tape threader, head cleaner, tape cleaning cloth, tape clips, reel labels, tape editing book list \$12.00.

TK-4 JR—Gibson Girl Junior splicer plus all other accessories in TK-4 STD list \$10.00.

TK-4 H—Gibson Girl Hobbyist splicer, tape cleaning cloth, splicing tape, tape clips, tape editing book list \$3.50.

TK-2 head cleaner, tape cleaning cloth list \$2.00.

Upgrade Your Present Tape Recorder, Convert To Stereo



ROBINS M/M MAGNETIC RECORDING HEADS

A complete line of upgraded replacement heads for direct replacement of heads on 75% of all recorders.

Model 5Q8, a 1/4 track stereo record/playback head, precisely engineered for conversion of many popular tape recorders. Features: exclusive "golden gap" of 80 micrometers for performance at 3 3/4 IPS., 1/4 track approaching performance at 7 1/2 IPS., 1/2 track; flush shield construction for greatest hum rejection and less pole-piece wear; crosstalk figure of merit: 50 db or better; colinearity and straightness of gaps: within 5 millionths of an inch. \$30.00 list.

Also available Model 9QE3—1/4 track erase head. \$14.00 list.



Robins Tape and Record Care Accessories are available at dealers everywhere, or write for FREE catalog.

ROBINS INDUSTRIES CORP.

36-27 Prince Street, Flushing 54, N. Y.

Simply "Snap-load" AND RECORD



RCA SOUND TAPE CARTRIDGE

A truly great advance in magnetic tape recording—the new RCA Sound Tape Cartridge now makes tape wonderfully easy to use! Magazine-loaded, it eliminates tape handling, and its compact, space-saving size makes it great for cataloging and storing when not in use. Simple to edit, easy to splice. RCA SOUND TAPE CARTRIDGES are available wherever superior quality tape recording products are sold.



**RADIO CORPORATION
OF AMERICA**
Electron Tube Division Harrison, N. J.

STEREO-SUITE



Webster Electric Company of Racine, Wis., has introduced the "Stereo-Suite" which consists of a stereo-monaural tape recorder and playback control center and two matching speakers. Each speaker cabinet contains one 3" and one 8" speaker with crossover network. Tape Deck: speeds of 3¾ and 7½ ips; heads are inline quarter track recording and playback, dual erase; wow and flutter are 0.2% max. at 7½ ips. Preamplifier: signal-to-noise ratio is 45 db; frequency response is 30 to 15,000 cycles; six inputs, four outputs. Power Amplifiers: harmonic distortion less than 1% at 12 watts; proportionately less at lower output; intermodulation distortion less than 1% at 12 watts; 0.8% at 5 watts output. Speakers: frequency response plus or minus 5 db from 70 to 12,000 cycles; the enclosure has modified Holmholz utilizing slits instead of conventional parts to provide enough acoustic resistance at the

resonant frequency so that a low magnitude octave of additional bass is obtained. For price and more details, write manufacturer.

HEAVY-DUTY SPLICER



Robins Industries Corp., 36-27 Prince St., Flushing, N. Y. has announced a line of heavy-duty Gibson Girl Industrial tape splicers for tape sizes up to two inches. These ruggedly constructed units, are designed to handle heavy work-loads in the expanding fields of computers, TV, general purpose and specialized industrial applications. The two inch model is mounted on a heavy cast base. Other features include precise blade centering adjustment and long-life blades which are easily replaceable. This company manufactures an extensive line of industrial and home-use tape splicers. For prices and further information, write to Robins.

BOOK REVIEW

High Quality Sound Reproduction by James Moir, 591 pages, 5½" x 8¾", cloth bound, illustrated. Chapman & Hall Ltd., 37 Essex Street W.C. 2, London; distributed by The Macmillan Company, 60 Fifth Ave., New York 11, N. Y.

This book is written for professional engineers and amateurs well versed in the field of sound reproduction. It is written understandably well for those already somewhat acquainted with the technical terms which are used when and where necessary.

Among the 19 chapters are included: Performance of the Hearing System, Microphones, Microphone Mixers, Reproduction from Gramophone Records, Magnetic Recording and Reproduction of Sound, Voltage Amplifiers, Output Transformers, Rectifier Circuits, Stereophonic Sound Reproduction, etc. Each chapter is followed by a references listing for additional information.

Over three hundred diagrams and illustrations are included in this work, as well as a useful glossary of acoustical terms and definitions.

Many years were spent by the author in designing, developing and studying the performance of high quality sound reproducing systems. The subjects discussed are written from this personal experience.

This book covers the entire sphere of sound reproduction rather than concentrating on one particular aspect of it. It is most complete and a worthy addition to the reference library of any advocate of high quality sound reproduction.

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TAPE IN EDUCATION

BY MAJOR JOSEPH J. KRAMP, USAF, RET.

WE have received a letter from Mrs. Augusta Barnell which contains some points that might be pondered by educators, teachers and tape recorder manufacturers alike. Mrs. Barnell is Vocal Supervisor of Atwater Schools, Merced, California. Her letter follows:

"In a recent article you wondered why the tape recorder has not been generally accepted by the public school teacher. There are several reasons for this, any one of which is a strike-out reason:

"1st—Lack of uniformity and abundance of idiosyncrasy even among the same models. Too many times I've been called to help a teacher or teachers who have been trying vainly to do a tape recording program or play back a tape only to have everything go wrong or nothing go. Teachers are scared of a tape recorder.

"2nd—Administration policy of supplying one recorder to a school. Teachers say, 'Why should we learn how to use it when everyone else will want to use it at the same time.' Teachers have to learn to share before administrators can feel justified in purchasing more equipment.

"3rd—Lack of good technical men for servicing—men approved by the industry.

"4th—Impractical AV courses—probably due to lack of equipment, possibly the instructor sees too much mass fumbling. Inexpensive dummy machines might be the answer.

"It might pay the industry to look into some of the problems and find out why teachers are so slow to take to the tape recorder. It is such a time and energy saver that I can't imagine a teacher without one once she became adept at using it."

We feel that Mrs. Barnell's points are well taken.

For the most part, the recorders used in the schools are exactly the same kinds of machines that are used in the home. We recall only one machine that was specifically designed for educators and that was a beefed-up model of heavy plywood that could take hard knocks without spoiling the finish. But the layout and controls were identical with the consumer model.

The fewer controls, the better the teachers will like it. We sometimes wonder if the engineers are in a rut and afraid to step out with something different—or maybe the fault lies with the sales department.

For instance, is fast forward and rewind really needed on a recorder? Could those two controls be dropped without loss?

On an educational model is there need for a tone control? Just because recorders always have had these features is no reason to keep putting them on.

The educational market is a rapidly expanding one for tape recorders. This is especially true in the language lab field—

and there you will find recorders specifically designed to do a definite job.

We are not prepared to say exactly what an educational recorder should be like because this would take research among the teaching profession to find the real and basic needs. Someone should undertake it.

One recorder per school is a pitifully small number for such a versatile machine, capable of covering so many subjects so well. In this, we think the administrators are going to have to move first. It would be easier and more productive to supply enough machines for all instead of attempting to convince the teachers that they must share them more. We rather imagine that it could be disheartening to a teacher to draw up a lesson program which depended upon a recorder and then find it was not available. Such uncertainty would mean that she would plan not to use it to be on the safe side.

As the number of recorders grows in use, the corresponding number of technicians capable of keeping them in good working order will increase. A number of firms have lists of authorized service stations where the mechanics are trained to repair that particular make. The names of nearby service stations can usually be secured by writing to the manufacturer.

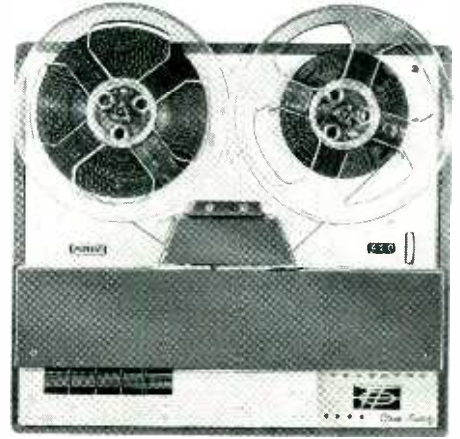
Regarding the impractical AV courses we feel that the blame here rests with the educators. We have seen some of their efforts in this direction as applied to tape and the results are very far from what they could be—or should be.

Somehow the industry is not consulted on such projects, and it would be very willing to lend its aid. Instead a few people with an idea and a tape recorder attempt to do a lone wolf job that only results in the blind leading the blind. The need for such a course in tape recorder operation is great. There are any number of people who could put such a course together but if someone in the industry does it then they should call in the educators and discuss their particular problems before the course is written. Conversely, if more of such efforts are attempted by educators in audio-visual centers or elsewhere, they should call on the Educational Committee of the Magnetic Recording Industry Association or other industry people who know the entire field to give them a hand on the project. This will result in benefit to the teachers and the industry.

In a field which produces such a wide variety of machines to handle tape, from continuous cartridges to reel-to-reel and from simple, inexpensive models to complicated professional machines, it is a vital necessity that for any A-V course the authors consult the industry people.

This is the only way in which up-to-date and practical information can be given to the teachers.

TELECTRO Series 900 Stereo Tape Deck



ADDS VERSATILITY...



3-speeds, 4-track head for every kind of stereo and monaural tape, with interchangeable head assemblies. Stereo and monaural recording and playback facilities.

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Unique pushbutton controls for fast, positive tape handling. Special brake design permits easy reel rotation. Solenoid operated auto shut-off.

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Twenty, fifty, five hundred playings from now, your tapes will still sound clean, crisp, mint-fresh, long after discs have developed pops and scratches.

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Professional Transistorized
Electric-Motor Battery-Operated
PORTABLE FIELD RECORDER



Check These Unusual Features:

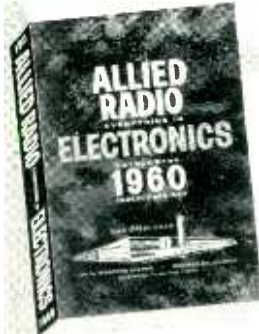
- ✓ Weight: 8 lbs.; Size: 5½ x 9 x 12 inches.
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- ✓ Battery Life: Amplifier 125 hrs., Motor 40 hrs.
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- ✓ Choice of 5 Single-Speed Models.
- ✓ Full unconditional Two Year Guarantee.
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Write for complete information to Dept. HF

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TAPE CLUB NEWS

Mrs. 2,000



Mrs. Margaret C. Neuman, 60-year-old widow of St. Petersburg, Florida, recently was designated as "Mrs. 2,000" and received a free lifetime membership in Tape-Respondents, International. She was the 2,000th person to join T-R-I since the club was founded by the late Fred Goetz, and it was the first such honor conferred by the present secretary, Jim Greene, since Madelyn Skarnes of Minneapolis was designated "Miss 1,000" in January, 1946.

Mrs. Neuman, a native of Lima, Ohio, moved to Florida 15 years ago. She once played violin with the Lima Civic Symphony Orchestra, and she hopes to entertain her new T-R-I friends with a bit of music "if I can get my fingers back in shape, she says." Mrs. Neuman has one living daughter and two grandchildren.

T-R-I Personals

Jim Greene, secretary of Tape-Respondents, International, reports that his veteran assistant, Mrs. Sara Early of Shreveport, Louisiana, and her hubby Louis, became the proud parents of Keven Scott Early on June 25.

Constance A. Fohl, T-R-I's assistant secretary in Parma, Ohio, became Mrs. James A. Wycoff in a July 18 ceremony at Cleveland. Connie had met James through T-R-I work about a year ago.

T-R-I's newest secretarial assistant is Miss Patricia Buxton of Kenton, Ohio.

WTP Radio Programs

World Tape Pals Australian Section began regular 30-minute monthly programs in February over Radio Station 3SR, Shepparton, Victoria.

George Pappas, representative of Melbourne, opened the first program with an introduction to the general public of the aims and ideals of the club, and some insight into its functioning. Excerpts from several tapes featuring WTP's in Washington (U. S.), South Africa, and other countries, were included. Conrad Hilton's recording of his prayer for peace, "America on It's Knees," also was included.

Producer of the program, WTP Nevelle Pellitt, who is chief announcer for the station, edited the tape excerpts to highlight the unique ability of tape exchange in promoting international understanding.

Second broadcast in the series featured WTP's traveling good-will ambassadors, Ito and Dorothy DiLuck, as interviewed in

Shepparton by Mr. Pellitt. Included also was an Irish ballad sung by WTP Father Phil Kehoe, O.S.A., formerly of Ireland, and now residing in Kyabram, Victoria, Australia.

The Third Program featured World Tapes for Education, sponsored by WTP for the purpose of encouraging educational tape exchange between teachers and students of many countries.

Fight on Illiteracy

World Tape Pals headquarters recently received a communication from Jaime R. Daly of Caracas, Venezuela, telling of his desire to help eradicate illiteracy in his country through the use of magnetic tape.

He points out that one of the main problems in his country is illiteracy, and he has now discarded a number of hobbies in favor of concentrating on magnetic tape recording as an experimental means to transmit knowledge to the illiterates. In this way an uneducated man can hear what he cannot read.

Mr. Daly hopes that by interchanging his experiences in this field with others, he will make new friends and learn many new things in this novel field.

Around The World With Music

An "Around the World With Music" tape is being organized by the American Tape Exchange Club's secretary, Stuart Crowner, with members from various corners of the earth participating. Folk music from each member's country will be recorded with an appropriate narrative by the member.

Ten countries will be represented: Chile, Japan, Australia, Germany, Belgium, England, South Africa and Canada. Each will have nine minutes of playing time on the tape.

Participants have been contacted regarding their interest in the tape. When complete, the club officers feel this tape will have a great deal of educational as well as entertainment value.

Tape Contest

"Taping My Hobby" will be the theme of an exciting new British Tape Recording Society competition open to any member of any tape club or society in the world. Several substantial contributions of equipment prizes have been received from British equipment manufacturers. American tape and high fidelity equipment and accessory companies who wish to donate equipment samples as prizes are urged to contact the club's U. S. representative (see box) immediately. Full details of the contest and prizes will be announced shortly.

Tape Distribution Center

The Catholic Tape Recorders of America reports that Reverend Father G. Joseph Putnam, Deanery Director for the Confraternity of Christian Doctrine, writes that a Tape Distribution Center will be set up for the entire Archdiocese in the state of Louisiana. Mr. Ray N. Toups, who designed the electronic equipment for St. Scholastic Academy in Covington, Louisiana, will col-

laborate with Father Putnam in this new project.

They also intend to promote the use of tape recordings in the Confraternity of Christian Doctrine, Discussion Clubs, the training of lay Catechists, the teaching of Latin pronunciation for participation in the Mass and hymns and chants for High Mass. Rev. Father Naspy, Dean of Music at Loyola University, will collaborate also in regard to hymns and chants, etc.

Anyone interested can contact Rev. Father Putnam at the following address: Rev. G. Joseph Putnam, St. John the Baptist Church, Edgard, Louisiana.

British Division—C.T.R.A.

Rev. Father Robert Warren of Our Lady Immaculate Church decided to form an independent division in England for Catholic Tape Recorders. Reverend Father Warren

is organizing secretary, and headquarters will be established at his address: Pateley Bridge, Harrogate, Yorkshire, England. Those interested in joining may contact him at this address. Membership dues have been set at the nominal fee of 10/-S.

Aussie Taperespondents Wanted

The Australian Tape Recordists Association has informed its members that many inquiries have been received from overseas tapers who wish to taperespond with Australians, but that there are many more overseas recordists than there are Australian. In order to encourage more taperespondence between countries, the A.T.R.A. is going to publish the names, addresses and other information of all inquiries it receives in their club bulletin and request more of its members to join in overseas tape exchanges.

Recording a short tape does not take

long, and it costs relatively little to mail compared to the fascinating experience of hearing voices from overseas.

URC Library Addition

The United Recording Club Library was presented with another recording entitled "Can We Wave the Flag Too Much," by Sidney L. DeLove. It was presented to the club from Independence Hall, Chicago. Narration is by Carl Grayson; (B Side) Fly the Flag, by Helen Higgins; with vocal by The Encores, and George Rank and his orchestra.

The club library requests members to please be patient if they do not receive a recording immediately due to its already having been loaned out and they ask that second requests be withheld. Members are advised if their requests cannot be filled within 30 days.

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Audiotape "speaks for itself" in a spectacular recording

—available in a money-saving offer you can't afford to miss!

DETAILS OF THE PROGRAM

The program includes these colorful selections:

- Tschaiowsky .. Russian Dance
- Sibelius..... from Finlandia
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DETAILS OF THE OFFER

This exciting recording is available in a special bonus package at all Audiotape dealers. The package contains a 1200-foot reel of standard Audiotape (on 1½-mil plastic base) and the valuable "Blood and Thunder Classics" program (professionally recorded on standard Audiotape). For the entire package, you pay only the price of two boxes of standard Audiotape, plus \$1.

HERE'S a reel of musical excitement that belongs on every tape recorder. "Blood and Thunder Classics" is a program of great passages of fine music, specially selected to show you how vibrant and colorful music can be when it is recorded on Audiotape.

"Blood and Thunder Classics" is available RIGHT NOW from Audiotape dealers everywhere. (And only from Audiotape dealers.) Ask to hear a portion of the program. Then, take your choice of a half-hour of rich stereo or a full hour of monaural sound—both at 7½ ips. Don't pass up this unusual opportunity.

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RCA VICTOR ANNOUNCES MAJOR BREAK-THROUGH IN RECORDED SOUND:

THE STEREO TAPE CARTRIDGE PLAYER/RECORDER

① GIVES YOU THE LIFETIME FIDELITY OF SUPERSTRONG MYLAR TAPE FOR LITTLE MORE THAN THE PRICE OF RECORDS ② YOU CAN RECORD AS WELL AS PLAY IN STEREO OR MONAURAL HIGH FIDELITY ③ NO THREADING, REWINDING OR FUSSING—A CHILD CAN DO IT.

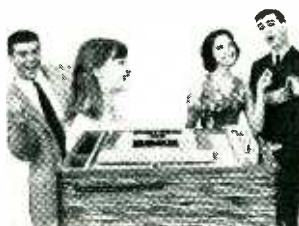
This is the all-in-one player-and-recorder that music lovers have sought for 4 decades. It is the perfect way to hear music in stereo high fidelity. And it's a tape recorder, too—perfect for making your own home recordings. Push-button controls, two microphones, 3 speakers, 17-watt dual amplifier, transistorized pre-amplifier, the economy of 4-track tape. This high fidelity machine, featuring "tape at a touch," belongs in your home—alongside your TV, radio and phonograph. See, hear, and record on it at your RCA Victor dealer's now.



Specifications subject to change without notice.



Hear finest stereo high fidelity. Music-on-tape matches the original performance so closely it's the choice of experts and recording studios. For stereo, simply add second speaker.



No tape wear after thousands of plays. MYLAR tape keeps its gilt-edge quality for a lifetime...is almost unbreakable. Tape Cartridges just click in. No threading, rewinding, fussing.



Preserve children's voices—practice speeches. Record up to 2 full hours electrically or live on a single Tape Cartridge. 4-track tape cuts Hi-Fi recording costs 36% over 2-track tape.

YOUR FAVORITE CLASSICAL AND POP MUSIC is now on pre-recorded RCA Victor Tape Cartridges from \$5.95. Among them:

"The New Glenn Miller Orchestra in Hi-Fi"
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The Three Suns... "Love in the Afternoon"
Harry Belafonte... "Love is a Gentle Thing"
Rachmaninoff: Rhapsody on a Theme of Paganini, Op. 43—
Rubinstein/Chicago Symphony/Reiner
Tchaikovsky: Violin Concerto—
Heifetz/Chicago Symphony/Reiner
Beethoven: Concerto No. 5—
Rubinstein/Symphony of the Air/Krips
Copland: Billy the Kid and Rodeo—Marian Gould
Mendelssohn: Symphonies Nos. 4 and 5—
Boston Symphony/Munch

this
lifetime
tape...



clicks in easy as a record



TWO-TRACK BECOMES FOUR-TRACK

... latest improvements follow line of development at least ten years old—makes tapes cheaper and better.

by Mark Mooney, Jr.

THE art of tape recording has just gone through a TBT (Technological Break Through) which will result in great benefit for all concerned.

This breakthrough is the placing of four tracks on the tape instead of the two that has been with us for ten years. It has been made possible by dramatic improvements in head manufacture, in tape, and for recorded stereo tapes, in improved methods of high-speed duplication. It is a complete package.

As with the two-track method, we believe the four-track concept is here to stay. This effectively ends the talk of "confusion."

Those who buy stereo tapes will find that prices have been cut almost in half because of the four-track concept. Those who do their own recording will be able to place as much as four times the amount of monaural recording on the tape as was formerly possible with savings in the amount of tape used.

Best of all, in making this shift, quality has not been sacrificed. The improved heads on the recorders and the better duplication of recorded tapes has maintained the

quality of the two-track system while incorporating the greater savings.

Further, those who presently have two-track recorders can convert them to four-track operation. Kits will be made available by most manufacturers to make the switch if desired. Average cost of conversion will be about thirty dollars which can quickly be regained through savings on the purchase of four-track tapes.

In addition, those owning a library of two-track tapes will still be able to play these on a four-track machine.

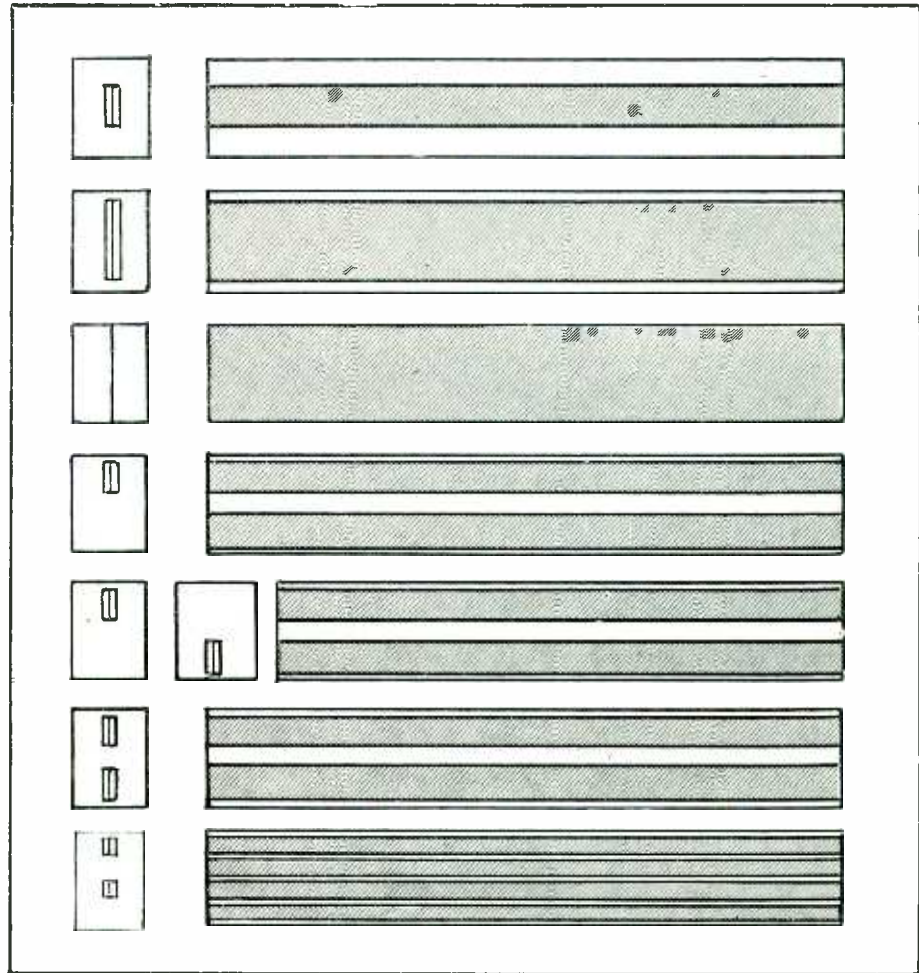
It is a credit to the engineers of the tape recording industry that they have been able to make these changes without obsoleting present equipment in the hands of owners.

Actually, only three basic changes in the number of tracks on the tape have been made since recorders were first developed. The early machines had only one track on the tape. In this country, Brush brought out its Soundmirror, the first models of which had a single track down the middle of the tape. This was 100-thousandths of an inch in width, leaving 75-thousandths of clear tape on each side. The first Magnecord increased this width to 200-thousandths which left only



Above is shown two of the "early-birds." At the left is the Ampex 200 which was patterned after the German Magnetophon and right is an early Magnecord, both machines were full track and were used by professionals and radio stations.

The history of track changes over the last twelve years is shown by this chart. At top is single track down middle of tape used by Brush Soundmirror. When Magnecord started in 1948 they used a wider single track and finally went to the full width of the tape. As home type machines appeared on the market, they were equipped with dual track heads (actually only one pole piece), the second track being secured by turning the tape over and running it through again. Staggered head stereo, secured by turning one head upside down was next followed by stacked head as manufacturers learned to make them. At bottom is new four track head which might be thought of as dual track, dual track. This will be the last change for a long time to come.



25-thousandths on each side of the track and finally they went to a full tape width track of $\frac{1}{4}$ inch (250-thousandths). The early Ampex was also full track.

At this time, about 1948, tape recorders in the home were a rarity. Most of them were used in broadcasting and other forms of professional recording.

But with the cessation of World War II, home machines began to appear on the market and these used two tracks on

the tape, one being recorded in each direction. For ten years this dual track system has been in use for both monaural and stereo.

With two tracks on the tape, it was possible to bring stereo music to the home. Magnecord started it as far back as 1948, using two separate heads spaced an inch and a quarter apart. This came to be known as the "staggered" system. Livingston brought out a staggered head player to accommodate tapes

Below: one of the first dual track machines was the Eicor, shown below. Revere, Webcor, Pentron, Ekotape and a few others made their debut about the same time and came on the market as dual track machines. At right is shown the Brush Soundmirror which had a single track down the middle of the tape.



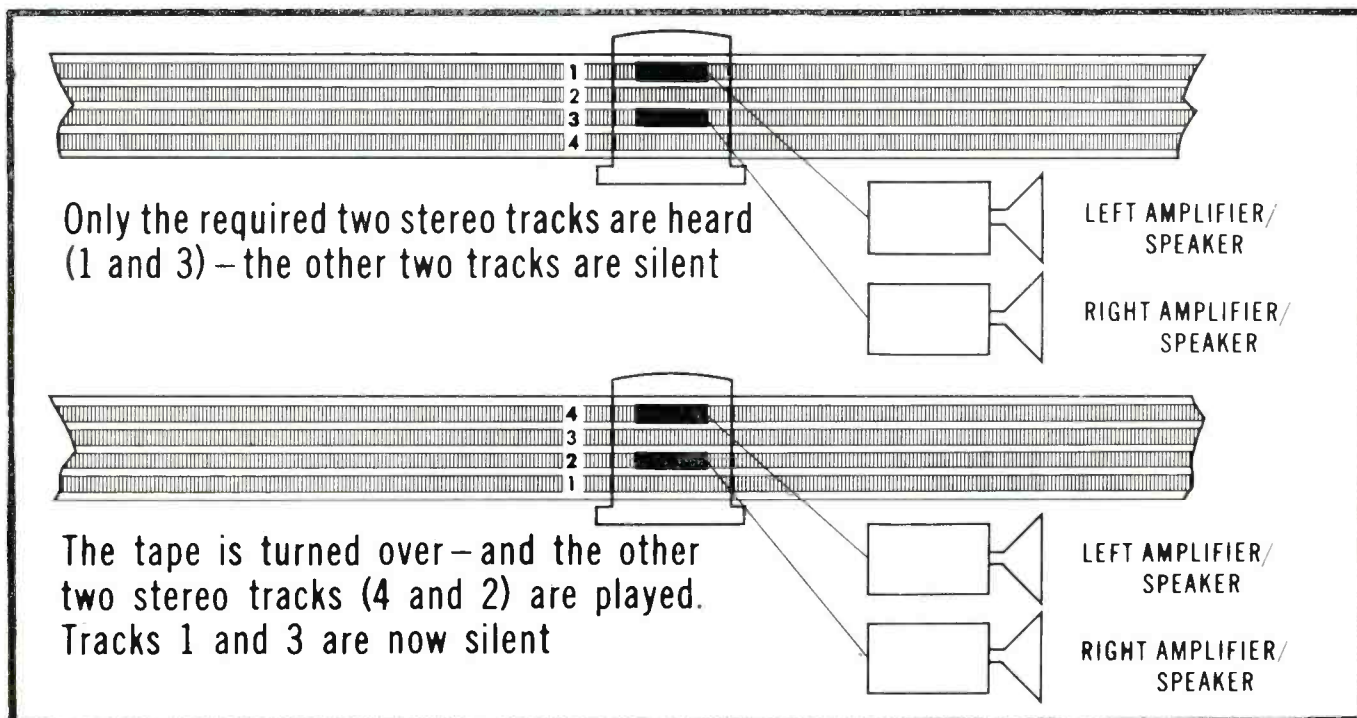


Diagram above shows how four track stereo works. Note how tracks 1 and 3 are played by two pole piece head. Tracks 2 and 4 remain silent. When reel is turned over tracks 2 and 4 are heard with 1 and 3 sliding by between the pole pieces.

made with the Magnecord, and some time thereafter, V-M brought out a home machine using staggered heads.

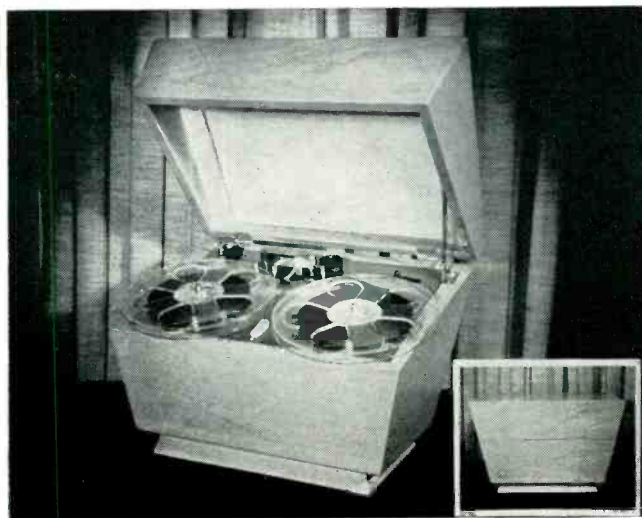
To get the staggered head, it was only necessary to install two dual-track heads in a machine, one upside down in relation to the other.

Further progress in head manufacture, including better magnetic shielding, led to the introduction of the stacked head which was adopted by most firms. Again, when this change took place, most manufacturers made head kits available so that owners could switch to the new tape form.

Just this past summer, four-track really caught on. Actually it had been in existence in professional type equipment, such as that made by Ampex and Berlant, as early as 1950. Obviously there had to be four-track recorders before there could be four-track tapes.

The four-track method reduces the width of the indi-

Below: early Livingston tape player for staggered head tapes and right: the V-M Tape-O-Matic which was the first recorder to incorporate staggered heads for home use.

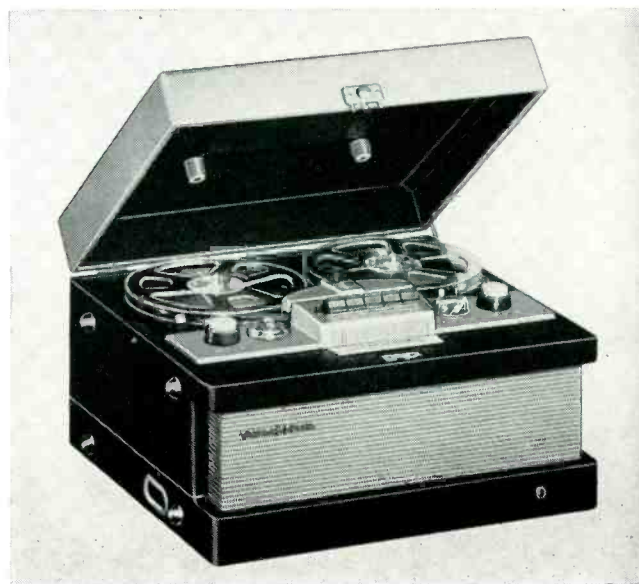


vidual sound tracks by slightly more than half over the two-track system. But the loss is more than made up by the improvements previously mentioned.

With the sole exception of the staggered tapes, which cannot be played on a stacked head—every other tape can be played on the machines which superseded the ones on which the tape was made.

For instance, a full-track tape, made in the very early days of tape recording can be played on the two-track or the modern four-track head. A dual-track tape, which cannot be played on a full-track machine (because you have one track recorded in each direction) can also be played on a new four-track machine, as can a regular two-track stereo tape. Dual-track tape is flipped over as usual to play the second track.

To get an understanding of how this new system works



study the illustration on page 24. You will note that the head has only two pole faces on it, not four. Let us assume you are making a stereo recording. Track 1 takes the signal from the left microphone and track 3 takes the signal from the right. When the reel is finished it is turned over, just as in present dual-track recording on a two-track machine. The tape is then run through again. Because of the spacing of the two gaps on the head, tracks 2 and 4 are recorded with 1 and 3 running interlace fashion between them.

Recorded stereo tapes are the same with tracks 1 and 3 recorded in one direction, 2 and 4 in the other.

At this point we run into some differences. Let us suppose we want to record monaurally on a machine with four track heads.

On the first pass you will record on track 1. The reel is flipped and again the tape is recorded, this time on track 4 which will then be uppermost . . . and that is that. You have, in effect a dual track tape. The section of the head that covers tracks 2 and 3 acts as a playback only head.

Some of the recorders now coming on the market will record and play back each of the tracks separately, thus affording maximum tape economy.

Track 1 is recorded first, the reel is turned over and track 2 recorded, turned again for track 3 and a final time for track 4. No rewinding is necessary, the reels merely being turned each time. The same is true of recorded four-track stereo tape. It is not rewound but turned over and the other side played.

If you presently have a two-track machine which you wish to convert to four-track, it will depend upon the kit furnished by the manufacturer as to whether you will be able to record all four tracks separately and play them back the same way or record monaurally on two tracks but be able to play back four-track stereo tapes.

If your recording activity is of the casual type, then the greater tape economy afforded by being able to record the four tracks separately will be of little consequence.

However, if you are one who records like crazy from the radio or TV, the ability to record and play back the four tracks separately will mean something to you. This is true not only in cash savings in tape purchases but in shrinking the physical size of your tape collection as well, since you will be able to put twice the amount of program material on the same length of tape.

The new tape cartridges also employ four tracks and a reduced speed ($3\frac{3}{4}$ ips). Thus these tapes are able to hold four times the amount of music, securing another 2 times factor through the drop in speed. Most reel-to-reel machines will also operate at $3\frac{3}{4}$ ips.

When the first switch was made from full-track to dual-track years ago some die-hards howled that it wouldn't work. The signal to noise ratio would drop, there would be cross-talk between channels, the quality would be bad, etc.

These same kind of comments are being heard today from some quarters in regard to the new four-track system. But the fears are just as groundless as they were when years ago the shift was made from full-track to dual-track. The people who are complaining are simply those who would resist any change.

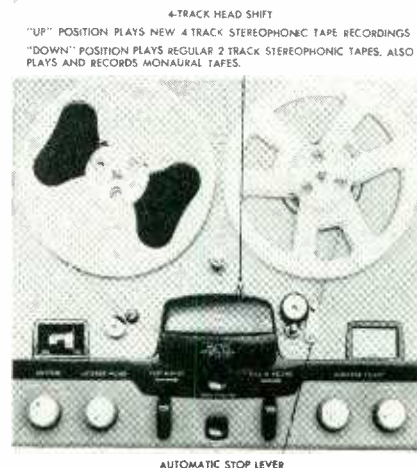
From what we have so far seen, heard and tested of the new four-track equipment and tapes, we say it's the greatest and the beginning of mass use of tape in the American home.

For one reason, the $7\frac{1}{2}$ ips reel-to-reel tapes are of matchless quality—there is nothing to compare with them. The cartridge tapes are as good or better than stereo discs, wear forever and are easier to play than a record.

Since most recorders have the $3\frac{3}{4}$ ips speed, they will be able to play the cartridge tapes.

We feel that four-track will be around for a long, long time and, since there are more than a half million two-track machines that can be converted easily, it will be off to a fast start.

**NEXT ISSUE
BUYERS GUIDE
TO FOUR-TRACK
—
Complete Listings
—
DON'T MISS IT**



Above, prototype of the RCA cartridge machine which uses the four-track principle and cartridge turnover to play the second set of tracks. Right: four-track Ampex machine with shifting head for playing or recording either two or four tracks. Ampex was first on market with four-track. RCA first with reversible cartridge.

4 WAYS TO

4 TRACK

CONVERT PRESENT RECORDER

1. IF your present recorder is set up for playing two-track tapes it may be converted to play four-track tapes (and still be able to play the tapes you have) by installing new heads.

Conversion costs will vary, depending upon the type of recorder, the more expensive the machine the higher the price for the conversion kit. However, as a service to their customers, the recorder manufacturers are keeping the prices as low as possible. Average cost will be about \$25.00, for the more expensive machines, up to \$75.00. Many of the kits can be installed by an inexperienced person, others may require the efforts of a serviceman which will add to the cost. However, since four-track tapes will cost half of two-track tape prices, the cost of conversion will quickly be recovered.

ADD EXTERNAL UNIT

2. ADDING an "outrigger" unit, such as that made by the Nortronics Company, is a way to convert any recorder, either monaural or stereo, to four-track operation. The outrigger is a device which clamps on the side of the recorder and contains a head and tape guides. It does not affect the recorder in any way and installation may



The Nortronics stereo kit has a four-track head and tape guides mounted on a unit which can be attached to the side of any recorder. This is helpful if no conversion kit is available from the recorder manufacturer.

be made with a screwdriver. You will need a stereo amplifier and two speakers, however, since your recorder will be functioning only as a tape transport mechanism, or one side of the head may be connected by means of a jack into the recorder so that only one amplifier and speaker would be needed for the second channel. While the outrigger works fairly well it is not as satisfactory as replacing the heads themselves in the recorder. Four-track replacement heads are not yet available for some types of recorders so the outrigger type of head is about the only solution to the problem of conversion.

BUY A NEW MACHINE

3. BUYING a new recorder with the four-track heads already installed is, of course, the easiest of all the methods of converting to four-track. It is only hard on the pocketbook.

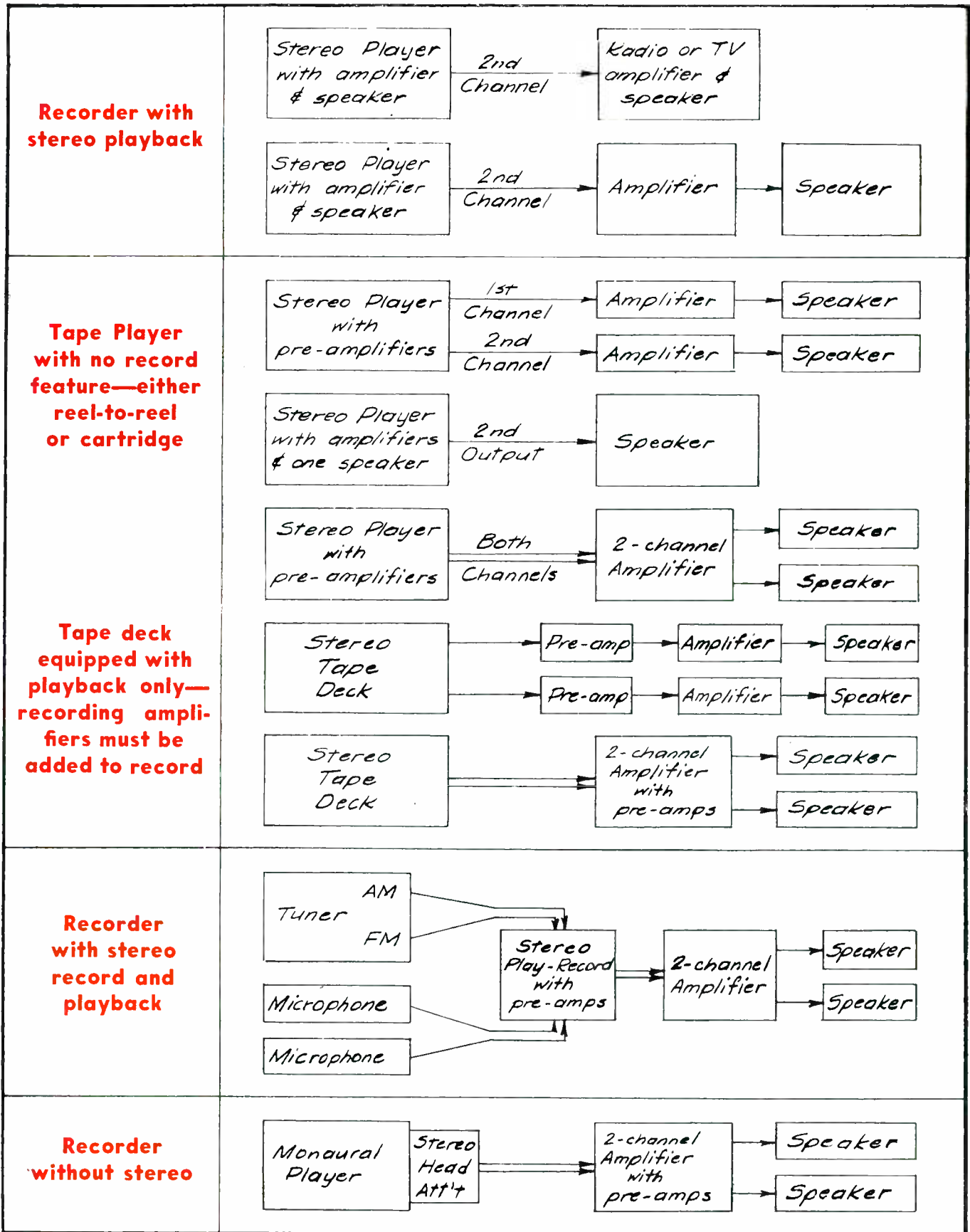
But if your recorder is an old model, it will pay you to consider this step for many are the improvements in mechanisms and heads which have been made over the years and you may not be getting the kind of results that tape is capable of producing.

You may be able to get a trade-in offer from your dealer but don't take his offer as an insult to your old faithful. Remember he will have to adjust and refinish it before he can sell it again at a reduced price as a second-hand, old model and if he makes no profits his children don't eat. It may pay you to keep your old machine for copying tapes and like chores.

ADD A DECK OR PLAYER

4. IF you already have a two-channel hi-fi system you can get an inexpensive deck or tape player in either reel-to-reel or cartridge models. This can be connected to your present rig and you are in business to reproduce the finest in home music. If you also wish to record you will need to add recording amplifiers to the deck but for playback, all you need is the tape transport mechanism equipped with four-track heads and some shielded wire to connect them to the preamps you now have.

Since the advent of four-track stereo tapes at prices beginning at \$4.98 and running to an \$8.95 top such a deck or player can be substituted for the stereo record player which can then be converted back to monophonic operation.



There are many ways to secure stereo from the new four-track machines and tapes. Starting at the top: a recorder with stereo playback may be hooked up to a radio or TV set to get the second channel, or a separate amplifier and speaker may be used. A tape player, either cartridge or reel to reel may be hooked up to a pair of amplifiers and speakers or, if the unit contains a dual amplifier and speaker, the second channel needs only a speaker. A tape deck can be used for playback as shown but for recording, it is necessary to add recording amplifiers. A complete stereo-record, stereo-playback machine may require a dual amplifier and speakers as shown or, if the unit incorporates amplifiers and one speaker, only an external speaker is needed. For a monaural recorder, new heads may be installed and the necessary amplifiers added or an "outrigger" attachment used.



The Cartridge and How it Works

by Bart Pierson

... new concept in tape handling eliminates threading of tape.

WHILE tape in a case is not a new idea, the RCA developed cartridge shown above life-size, has several distinctive features.

Most other cartridges are of the endless loop type which will repeat themselves until shut off. The RCA unit is not, but instead has the tape wound on a hub which winds off and onto another hub—just like the reels on regular tape recorders.

The biggest objection, for ordinary music playing use, of the continuous type cartridges was that they went in one direction only. It was not possible to rewind them rapidly to find a particular selection.

The RCA unit may be wound or rewound at high speed to locate a particular spot on the tape. Playing time is up to one hour.

The case is made of gray plastic and measures 7¼ inches long x 5 inches wide by ½ inch thick. Webbed internally to resist bending, it will withstand considerable abuse. The tape is completely encased except for the front edge where it is exposed.

The cartridge may be opened by removing the two screws found on the front. It is then opened by lifting up the top cover carefully so as not to disturb the tape.

Inside, as shown in the photo, are two white plastic hubs on which the tape winds. Each end of the tape is looped and fastened to itself with splicing tape. The loops fit over the pins on the hubs so there is no danger of the tape detaching from the hub when the end is reached.

The inside of the case, both top and bottom is fitted with a piece of clear Mylar film. This serves as a friction reducing medium as the tape slides around on it and it also prevents dust from entering the cartridge through the windows found alongside each hub.

There are safeguards built into the cartridge to prevent accidental recording on a recorded tape. At the rear of the unit, as can be seen in the photo, are two openings. If the cartridge is a recorded one then the openings are not blocked. This permits a pin on the machine to enter the opening and the pin is not depressed. Any attempt to put the machine in record will automatically be rejected by the



This shows the interior of the cartridge with the tape wound on the left hand hub ready for playing. The triangular piece of metal is the hub lock which prevents the tape from moving when the cartridge is removed from the machine. The heads and capstan and roller fit in the openings as shown. To play the second set of tracks the cartridge is turned over. Tape speed is $3\frac{3}{4}$ ips.

mechanism.

On cartridges intended for home recording these openings are closed, as can be seen in the photograph. When the cartridge is placed on the machine, the plastic fingers blocking off the opening depress the pin and the machine may then be placed in record position.

Recorded tape cartridges may be used for recording by breaking out the H shaped blocking pieces with a screwdriver. To protect a recording you have made from accidental erasure, a piece of adhesive may be placed over the holes to block them.

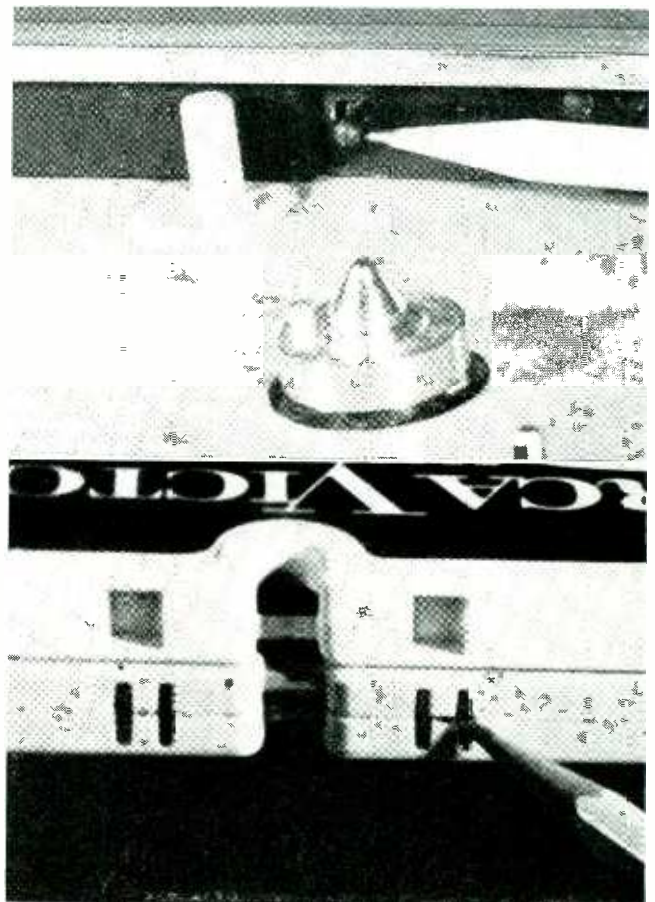
Between the two openings, at the back of the case, is a metal piece which is pushed in by the small post on the machine. This unlocks the hubs and permits them to turn. When the cartridge is removed from the machine a spring pushes the metal piece outward. This permits a toothed piece of light metal to contact the hubs and hold them still. The piece can be seen in the illustration at the top of the page.

Toward the front end of the case are two curved openings. These permit the shutoff fingers to come through the case. As the end of the tape arrives, it is drawn taut and this exerts a pressure against the finger which in turn shuts off the drive.

The openings in the front of the cartridge are clearance holes for the heads, and the capstan and roller. The photograph at the top of the page shows how these fit into the cartridge.

The tape is four track at $3\frac{3}{4}$ IPS speed and to play the second stereo side, the cartridge is turned over so that the B side is uppermost.

To insert the cartridge in the machine, the back edge is slipped under the ledge and the front pressed down. Before doing this, the tape should be tightened by turning the right hand hub with the fingers, otherwise it may hang up on the heads. Care should be taken to see that there is always tape on the left hand hub. This can be noted through the windows.



Top: a closeup of the pin which is the interlock to prevent accidental erasure of a recorded tape. The post pushes in the hub lock so that the reels may revolve. Lower: the back of a recorded cartridge (top) and a blank suitable for home recording (lower). Pencil points to H shaped blocking areas which press in pin shown in photo above and allow machine to be put in record position. If holes are not blocked, as in recorded cartridge, machine will reject attempts to put it in record position.

Synthesizing Sound Effects

by Joseph Zelle
Station WERE

... sound effects via
tape speed changes

Tones for the Monitor-like beeps were made by using a signal generator and doubling the frequencies. Here Nick Demchak adjusts frequency with left hand and signal level with right hand on signal generator while counting.



*Photos by James C. Hopewell,
WERE Studio Supervisor*

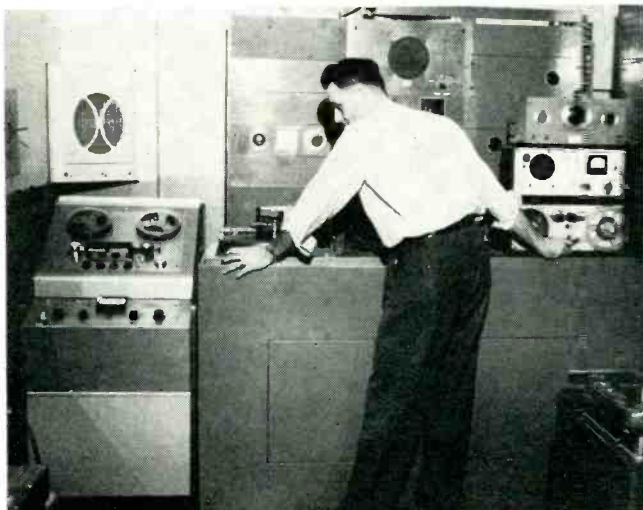
"THE agency is hot after us," said Don Goldberger of the WERE sales staff, "for a sound effect, simulated or duplicated, of *Monitor*. They don't want *Monitor*'s sound effects, but something close enough to attract the listener's attention. Why don't you work on a gimmick or something, and see what you can come up with?"

To a broadcast or television technician such a request does not come as a surprise. There is a constant plea for "attention-getters" to tie-in with a sponsor's commercial,

or a jingle to identify the sponsor and his product.

First part of the problem was tape recording and picking out the *Monitor* sound. This recording was then slowed down to half speed and played over and over again. It was slowed down again to half speed, or to one-fourth its normal speed. In this way, the sound effect was observed and studied much as slow-motion pictures enable us to observe action too fast for the normal eye.

A few runs indicated that the slow speed musical tones



Ed Moravek multiplying the originally recorded pulses. Magnecorder on right is playing back a double speed, Ampex at left is recording at slow speed. Process is then reversed to double the frequency again.



After the tape was completed on the Ampex Jim Schraitle transcribes it to a disc on the Presto recorder which is shown to the right of the Ampex machine in the picture.

were three and four in number and that they had a certain kind of "bounce" or echo on them. The faster moving set of tones, similar to the slower ones, did not have any liveliness. In addition, the sequence of the musical tones was observed.

In order to get a perspective of cadences and rhythm, the same Monitor sound effect recording was speeded up to twice its normal speed. From all this information, along with the sponsor's and agency's requirements, a synthesis was started of the musical attention-getter.

In the second part of the problem, now, the musical tones were tried on a piano. Using middle C as the start, the chord of C major was picked out, middle C, E above middle C, and G above middle C. In theory of music, C₄ (middle C) is called the tonic of the C major chord, G₄ is the dominant, or the second most important note in the scale, and F₄ is the sub-dominant, or the third most important note in the scale.

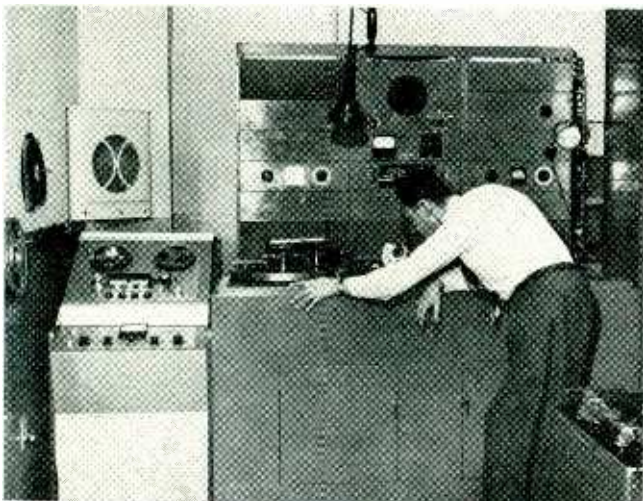
A little fingering on the piano keys came up with the combination, C—E—G—F—C—E—G—F—C—E . . . This was to be the musical combination which would have to have the rhythm of Monitor. By using four tones instead of three, the sound would be far enough away from Monitor, yet it would remind the listener and attract him.

Next came the problem of determining the actual frequencies of the notes in the C₄ major chord. Just in case the tones of middle C would be too low, the octave above middle C, or the C₅ major chord, was also tabulated. All this information was obtained from a college textbook on music.¹ The tones and frequencies were:

C ₄ — 262	C ₅ — 523
E ₄ — 330	E ₅ — 659
G ₄ — 392	G ₅ — 784
F ₄ — 349	F ₅ — 698

Some experiments were made with a telegraph key and an audio signal generator. It was soon evident though that the change in frequencies and manual keying was impossible at such high speed.

¹*Musical Engineering*, Harry F. Olson, McGraw-Hill Book Co., Inc., New York 1952.



For broadcast purposes the author cuts the finished product on an acetate blank on the Presto. The sounds had to have not only a variation in tone but a variation in time to match the text.

This difficulty led to a new attack: slowing down the pulses to give enough time to manipulate key and a-f oscillator. This meant, though, that the pulses had to be long, the breaks between pulses short, and the frequencies very, very low originally. It all broke down as follows:

Since the frequency of C₄ was about 262 cps, and our Hewlett-Packard signal generator went no lower than 16 cps, a multiplication factor of 16.4 would be needed to bring the 16 cps up to 262 cps. The remaining tones would have to be treated similarly:

C ₄ — 16.4 x 16	C ₅ — 32.7 x 16
E ₄ — 20.6 x 16	E ₅ — 41.2 x 16
G ₄ — 24.5 x 16	G ₅ — 49. x 16
F ₄ — 21.8 x 16	F ₅ — 43.6 x 16

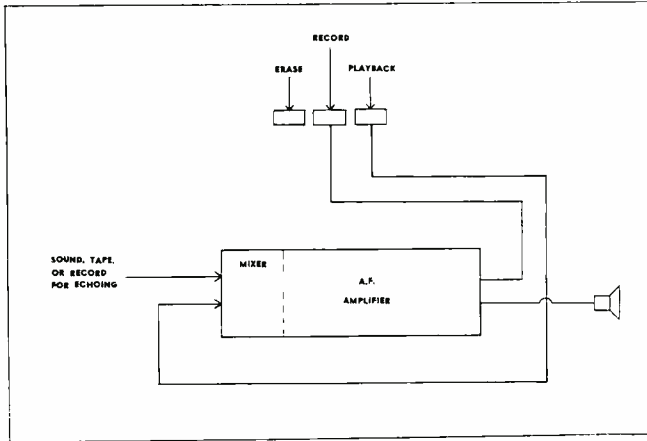
However, under actual conditions, this could not be realized. Originally the scheme had been outlined to give a "musical effect to the gimmick. This was important to avoid sharps or flats, if haphazard low frequencies were speeded up. It was next to impossible though to pick out the desired frequencies accurately fast enough even under the slowed down conditions. Of course, the recording could have been slowed down still more, but this would require still lower frequencies (about 5 to 10 cps) and such an instrument was not ready at hand. Consequently, approximate frequencies were decided upon as 17, 20, 25, and 30 cps. When these frequencies were speeded up 16 and even 32 times, they still gave a good and satisfactory musical effect resembling Monitor. Here they are tabulated:

17 x 32 — 544cps	C ₅ (C ₅ — 523.251)
20 x 32 — 640	D ₅ [#] (D ₅ [#] — 622.254)
25 x 32 — 800	G ₅ (G ₅ — 784)
30 x 32 — 960	B ₅ (B ₅ — 987.767)
17 x 64 — 1088	C ₆ [#] (C ₆ [#] — 1108.731)
20 x 64 — 1280	E ₆ (E ₆ — 1318.510)
25 x 64 — 1600	G ₆ (G ₆ — 1567.982)
30 x 64 — 1920	B ₆ (B ₆ — 1975.533)

²*Musical Engineering*, Harry F. Olson, McGraw-Hill Book Co., Inc., New York 1952. Table 3.14 p. 48, Frequencies of the tones in 10 octaves in the Scale of Equal Temperament.



Before the transcription is turned over to the advertising agency Jim Schraitle checks its quality and timing to make sure it meets the specifications. Solving such audio problems can bring added income.



Block diagram of a hookup for producing echo effects. The recorder must have separate record and playback heads. The echo is added to the original through the mixer and amplifier.

Once the frequencies had been settled, the length of the pulses and spaces had to be determined, for recording. The time of the long Monitor tones had been estimated at $\frac{3}{4}$ a second. Since the tape was to be speeded up 32 times, the actual low frequencies would have to be 32 times as long. This meant the pulses had to be 24 seconds long. For convenience, 25 seconds was chosen for long pulses, with 2 seconds given between pulses, for changing frequencies.

In the first trial runs with a tape recorder and the signal generator, a regular telegraph key was used and the recording done by counting. Unfortunately, when the synthesized recording was speeded up 16, 32, and even 64 times, the key-clicks at opening and closing became very annoying. Moreover, during the silent periods, when the key was up, noises were present which could not be detected at slow speed. All this gave the finished product an unclean and noisy musical jangle.

This difficulty was eliminated by using the signal generator's gain control to open and close the signal level. This method gave the advantage of using the left hand to pick out the frequency and the right hand to open and close the audio impulse. The signal when speeded up had a hollow rounded effect on each pulse and made it almost weird.

When the recording was finally started, the vibrations were so low that they could not be heard. However, the VU meter on the tape recorder showed modulation. The levels on recorder and associated equipment were pre-set conveniently. The signal generator gain control then could be raised from the 7 o'clock position to 12 and back while making pulses. Although there was some variation in level output at these low frequencies, it was corrected during subsequent re-recordings.

Once the initial recording had been made on the tape at slow speed, it was played back at double speed. In this case the recording was made at $7\frac{1}{2}$ IPS and played at 15 IPS. The playback was fed into another tape recorder recording at $7\frac{1}{2}$ IPS. This second recorded tape was now played back at 15 IPS, yielding a four-fold multiplication of the low frequencies. By now these low frequencies were begun to be heard.

This process of recording at slow speed and playing at fast speed was continued until multiplications of 16, 32, 64, and finally 128 were obtained. The last speed at 128, however, was too fast and unusable in this instance. The 32nd multiplication at $\frac{3}{4}$ seconds per pulse simulated the slower Monitor sound effect, while the 64th multiplication

at $\frac{3}{8}$ seconds duplicated the faster Monitor sound effect.

Still another multiplication, though, was tried. This was caused by unsatisfactory final tones caused by merely doubling the frequencies. Consequently, one of the low multiplied frequencies, the second or third, were recorded on a disk at 33 rpm. This recording was then played at 78 rpm, giving an odd multiplication of $78/33$, or 2.34 instead of an exact multiple of 2. Other combinations could also be tried, using 45 rpm in combinations with 16 $\frac{2}{3}$, 33, or 78 rpm.

Once the desired tones were obtained, the slow musical tones were fed through an echo chamber. The final cuts of the slow and fast Monitor effects were recorded on disks. This arrangement allowed the studio engineer to combine the slow echo effect with the faster Monitor effect in proper proportion much more easily than with tapes.

The success of a synthesized Monitor effect led to other requests from sponsors. The Monitor tones were to be done in time and cadence, for example, to a catch phrase like: *THAT'S THE PLAN OF NATIONAL BANK OF DETROIT!* Using the same system as above, the following table was composed based on the accented and unaccented words, together with their approximate duration.

—	U	—	U	—	U	—	U	U	—
That's	the	plan	of	Nation-	al	Bank	of	De-	troit!
30	5	25	10	25	10	20	10	10	25

When speeded up 16 times, the tones followed the phrase of the announcer musically.

Word	Time		Original Frequency	Final Frequency
THAT'S	30	tone	20	320
	2	silence		
THE	5	tone	17	272
	2	silence		
PLAN	25	tone	20	320
	2	silence		
OF	10	tone	25	400
	2	silence		
NATION-	25	tone	30	480
	2	silence		
AL	10	tone	20	320
	2	silence		
BANK	20	tone	20	320
	2	silence		
OF	10	tone	17	272
	2	silence		
DE-	10	tone	20	320
	2	silence		
TROIT	25	tone	30	480

The demand and the variety of such sound effects is practically endless. Those who may frown on actually copying commercial gimmicks, can still use their own ingenuity in concocting a fascinating and absorbing "startler." A few hours of experimenting with low-frequency pulses, timing, and speeding up will give one the skill in synthesizing sound effects. Not only will such a task present a challenge, but it is a sure way to get tagged as an "electronic genius" besides earning some extra and usually much needed revenue.

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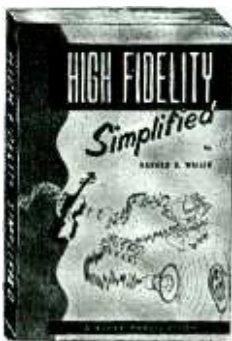
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NEW PRODUCT REPORT

STAFKSTED



AMPEX 960 RECORDER-REPRODUCER

*. . . . features stereo play or record,
advanced recording effects, shifting head.*

THE Ampex 960 is a stereo-record, stereo-playback machine. The two channels are independent of each other and thus there is, in effect, two recorders in one. This, of course, would apply to any stereo recorder.

Because of the independent channels a lot of things, such as sound-on-sound, echo effect, etc. are possible which cannot be done with a recorder which records monaurally but only plays back stereophonically.

In fact, so numerous are the possibilities of this machine that Ampex has brought out a chart in slide-rule form which shows the proper knob settings for everything from straight monaural recording to the echo effects.

The unit is finished in gray, is housed in a scuff-proof case and weighs 36 pounds. It measures 9" x 15" x 17½" and is also obtainable without the case for mounting in permanent home music systems.

The machine will play the new four-track recorded tapes and, for optimum results from these, a head shift has been incorporated on the playback head. In

the up position it is aligned for playing four-track tapes. In the down position, it is aligned for the older two-track tapes and for stereo recording. The stereo recordings made on the machine are of the two-track variety.

The heads have the improved 90 millionths of an inch gap and are precision lapped to optical flatness. In fact, the heads are inspected optically, so small are the tolerances allowed. The timing accuracy is such that it will hold within one-third of a half tone. This is important when a recorder is used in musical instruction.

There are two sets of inputs, both high impedance. One pair, located at the end of the case, are for the microphones. These are controlled by separate knobs on the deck of the recorder.

The other set of inputs is for connection to a tuner or stereo phonograph to record programs from the air or from stereo records. These are controlled by different knobs than the mikes.

The playback output is ½ volt from cathode follower and must be fed to power amplifying equipment and

Product: Ampex 960 Recorder

Manufacturer: Ampex Audio, Inc., 1020 Kifer Road, Sunnyvale, Cal.

Price: \$650

speakers. Matching amplifier-speakers are available at additional cost.

Automatic shutoff of the tape drive at the end of the reel or in case of a break is achieved by running the tape over a switch lever following the capstan and roller. A very accurate counter is situated on the left side of the deck and will accurately locate programs within a tape reel.

The machine is two speed, 7½ ips and 3¾ ips. Choice of speeds is obtained by raising or lowering the speed change lever located directly back of the head shield cover. This must be done when the equipment is on.

Volume control in recording is by means of a VU meter. This shows the input on one channel at a time and the channel to be read is selected by the appropriate recording selector control.

The controls on the recorder are grouped along the front edge where they may be conveniently operated. The first control is the playback selector which is the inside knob. It turns on the power and selects the monitor or playback function desired.

The outside knob is the recording selector and selects single or stereo record as well as the record level meter for



The recorder with the case closed. The openings in the end of the case take the microphone plugs when stereo recording is done.



Top: left side of recorder has counter, playback/recording selector and listening volume knobs, fast forward and rewind control, record and stop button. Lower: right side of unit has recording volume controls for radio/phono and microphone, play/record lever and VU meter. Capstan and roller with end of tape cutoff switch is above knobs.

the right or left channel. The second pair of knobs are the listening level controls for right and left channel.

Next in order is the fast forward or rewind lever and two push buttons, one the record button and the other the stop button which stops the tape in any mode and frees the record button.

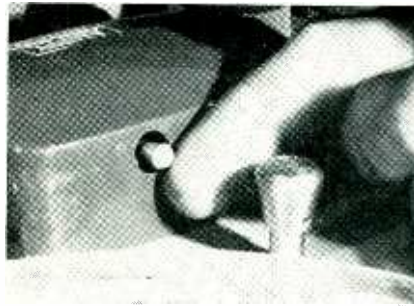
The two sets of knobs directly below the VU meter control the recording volume from radio or phono on both channels and the recording volume for the microphone, both channels.

The old adage "When all else fails, read the directions" certainly applies to this recorder. We strongly advise that the directions be read very thoroughly and experiment made with the machine before undertaking any serious recording that has to come out right the first time.

Like a good camera, you have to know the instrument and its adjustments before you can fully exercise its capabilities and make the kinds of recordings of which it is capable.

While we found the machine easy to operate, we also found that it required a knowledge of the function and proper use of each control to get the maximum benefit from it.

The recorder is capable of very wide frequency response, up to 20,000 cps at the 7½ ips speed and 15,000 at the 3¾ speed. This capability exceeds that of most microphones and speakers that might be used with it, hence the actual



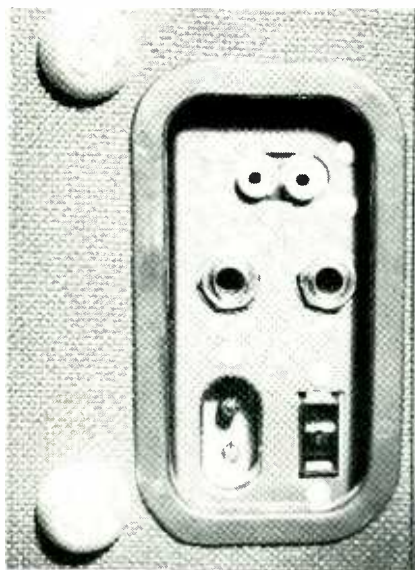
To insure optimum output from both two and four track tapes the head can be shifted by moving a lever at the rear of the head cover. Speed change knob is in foreground.

limitation will depend upon the auxiliary equipment rather than the recorder itself.

Mechanically, the recorder is very well made and it is quiet in operation. For those who would like to mount the recorder permanently, the mechanism is available without the case. Also available separately are such items as a stereo tuner, amplifiers, etc. which are matched to the recorder.

There is only one feature on the unit for which we did not care. That is the fact that in rewinding a stereo tape, the listening volume knobs must be turned down. Since four-track tapes do not have to be rewound, this is a small point but the machine is such a fine one we have no doubt that this will be taken care of in later models.

If you are in the market for a recorder which represents versatility and quality we suggest you consider the Ampex.



Connection panel at rear of recorder has left and right inputs for radio-phono recording and left and right outputs for connection to amplifier speakers. Power input and auxiliary 110 volt output receptacle.

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NEW PRODUCT REPORT

STA **F**OK **S**TED



RCA CARTRIDGE PLAYER/RECORDER

... a new concept in tape handling is offered in this machine.

THE RCA Cartridge Recorder is the first machine offered to the public which employs a reversible cartridge.

The cartridge, essentially consisting of two small hubs on which the tape is wound in a plastic case makes fast forward or rewind possible. Heretofore, cartridges have been of the endless loop type.

The tape is recorded with four tracks, two in one direction and two in the other. To play the second, or B side, the cartridge is turned over and reinserted in place.

Before inserting the cartridge in the machine, the right hand hub should be turned with the fingers to make certain that any slack is taken up. Failure to do this may result in tape breakage. Likewise, there should be tape on the left hand spool, as can be observed in the window of the cartridge. The pull of the capstan and roller is considerable and may result in tape breakage if forced to pull against the empty hub.

Inasmuch as the machine has an automatic shut-off as the end of the tape is

reached, such breakage will not occur under operating conditions but only if the owner fails to observe he is putting an empty hub on the feeding side.

The unit will record stereophonically or monaurally. Monaural recording may be done on all four tracks separately. Stereo recording uses a pair of tracks in each direction.

Provision is made for recording either with a microphone or from stereo tuners or a stereo disc. The inputs are on the top of the machine where they may be reached conveniently. Two RCA mikes are provided with the instrument. Record level is controlled by two neon lights, one for normal and one for overload.

The provisions for protecting already recorded material are part of both the cartridge and the machine. A recorded tape cartridge has two holes on the back edge which are open. These fit over a pin and since the pin is not depressed, the mechanism cannot be put into record. In fact, this is also the first recorder that talks back at you. Should you attempt to record on an already re-

Product: RCA Cartridge Recorder/Player
Manufacturer: RCA, Camden, N. J.
Price: \$299

corded cartridge, the machine gives out with a loud buzz to remind you of the fact.

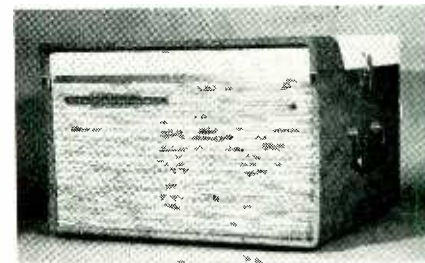
Cartridges meant for recording have the holes filled in. The protecting pieces may be removed by breaking them out after the cartridge has been recorded and, unless covered with a piece of adhesive, the holes will then protect the tape from further recording.

Preamps and power amplifiers are built in so all that is needed for stereo is an external speaker. A connecting cord is also provided equipped with a pin jack on either end.

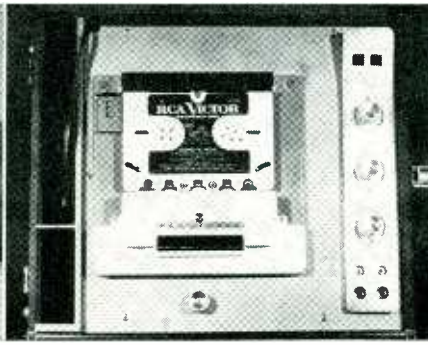
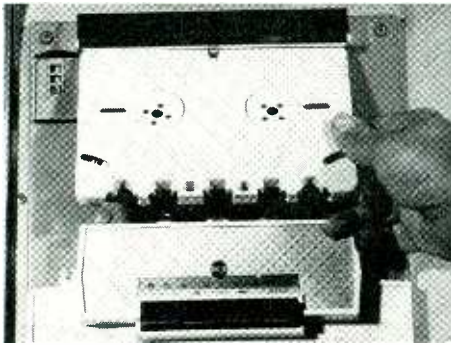
An odometer-type counter is provided for indexing cartridges, either to rapidly find a favorite selection on a recorded cartridge or for indexing your own recording efforts.

The operating controls are grouped in front of the cartridge holder and consist of a play/record button, fast forward and rewind and stop. The latter should be pushed when the machine is left inoperative or to clear the keyboard before inserting or removing the cartridge. This lifts the pressure pads from the heads allowing the tape a clear channel to seat properly.

At the front of the machine is the balance control which varies the loudness between the left and right speakers. The loudness control is the knob on the first of the three controls on the right side. It controls both channels at once, or one monaural channel at a



The player with the case closed. Red indicator jewel on front shows when power is on. Finish is attractive two-tone gray and cream with touches of gold trim.



The cartridge is placed on the machine by slipping the back edge under the ledge and then lowering the front in place. Before inserting cartridge, tape should be tensioned by turning right hub with fingers. Photo at upper right shows view of machine from top with cartridge in place. Tone, volume, recording and playback controls are at right. Function controls, play/record, fast forward or rewind, and stop are push button operated and are grouped in center.

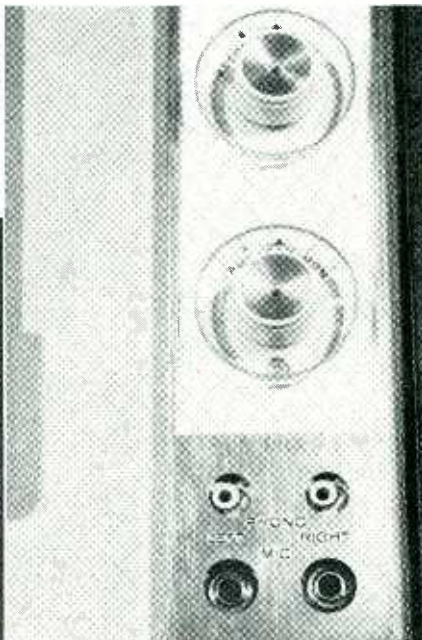
time. It also serves as the on-off switch which is raised to turn the unit on.

The tone control is the disc below the loudness knob. Next on the control panel is the record/play control. For recording it is turned to "record" after the play record button has been depressed. It cannot be turned to record if a recorded cartridge is on the machine.

The last control is the function knob which in "AUX" permits the use of the recorder amplifiers and speakers as a left channel for other stereo gear. In "STR" it permits stereo record or playback and in "MON," monaural record and playback.

To play monaurally, the function knob is set to "MON-1" for tracks A-1 or B-1 or to "MON-2" for A-2 or B-2.

Below: two neon bulbs are used for recording, one for normal and one for overload. On-off knob is lifted for "on," disc controls loudness of both channels. Right: Record/Play knob cannot be placed in record position unless proper cartridge is on machine. Inputs are at bottom of panel for both microphones and leads from stereo tuners or phonographs.



The machine is equipped with an automatic shutoff that stops the drive mechanism but allows the amplifiers to remain hot and ready to play.

To record monaurally, the function selector is placed on MON-1 to record tracks A-1 or B-1 (depending on which side of the cartridge is up) or MON-2 for tracks A-2 or B-2.

The recorder operates at only one speed 3 3/4 ips and will not accept regular reels, only cartridges.

No difficulties were encountered in the operation of the machine during test. It is attractive in appearance but we felt the size 12" x 18 1/4" x 16 5/8" was a bit large. It proved easier to operate than a phonograph and the sound quality is good.



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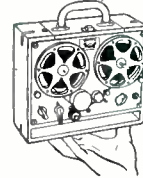
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RENT STEREO TAPES—over 800 different—all major labels—free catalog. Stereo-Parti, 1608-F Centinela Ave., Inglewood 3, California.

INDUCTORS for Crossover Networks. 118 types in stock. Send for brochure. C & M Coils, 3016 Holmes Avenue N.W., Huntsville, Ala.

LEARN WHILE ASLEEP, hypnotize with your recorder, phonograph or amazing Electronic Educator endless tape recorder. Free catalog lists over 200 unusual tapes, records, equipment for experimenters. Sleep-Learning Research Association, Box 24-TR, Olympia, Washington.

LEARN HYPNOTISM, SELF-HYPNOSIS from recorded tapes! Other helpful Tapes, Books, Recordings! Free Catalog. Write Philanthropic Library, Drawer TR697, Ruidoso, New Mexico.

STEREO TAPES FOR RENT. For the very best tapes at lowest prices write Box 1387, Milwaukee 1, Wis.

BERLANT MODEL 32, equipped with Ampex four-track stereo playback head and custom installed index meter. A really beautiful outfit in spotless condition with construction features far superior to most recorders. Cost \$875. \$450. or highest bid takes it. Rev. Don Coke, Greenwich, N. J.

SACRIFICE—35 mm Konica 111A camera with case, cost \$142.90. Absolutely perfect; 100% like new. Used for only six rolls film, \$85. Well-maker, 1053 East 13 St., Brooklyn 30, N. Y.

FOR SALE: RCA portable (Wilcox-Gay) two speed recorder in working condition. \$45 FOB. Want battery operated portable. Bob Forman, Monmouth, Illinois.

WOULD LIKE TO EXCHANGE tapes with country music fans. Country music lovers send your tape or letter to Dee Bullion, Box 239, Raymondville, Texas.

SCOTCH recording tape at "Profit Sharing" prices—send for catalog—you'll be glad you did!—Tapeco, Dept.-F, P.O. Box 4353, Inglewood 3, California.

WILCOX-GAY #674 hi fi recorder, 2 recording speeds, 5 speakers, good as new, \$100. Blum, 396 E. Whittier St., Columbus 6, Ohio.

FOR SALE: Tandberg Quadruple Stereo Model 5-2, new guarantee, original carton. Records/Plays dual or quadruple stereo and up to 4 tracks monaural. Special—save \$125. off now! New Model Recordio #602 latest model. Regular \$129. value—will lose \$35. Also Bell BT-76 3-speed stereophonic model good condition. Cost \$174.50—will sell for only \$120. Gotra move—if the above prices are too high—make a bid. All goes. Box 48, Lewisburg, Tenn.

FOR SALE: Concertone 20/20 recorder. Good condition. Checked to factory specifications. Cost

We specialize in TRADE-INS — highest allowances — Ampex, Bell, Concertone, Crown, Ferrograph, Presto, Tandberg, Hi-Fi components, accessories. Catalog.

BOYNTON STUDIO

10 Pennsylvania Ave., Dept. TR
Tuckahoe, N. Y. Tel. SP 9-5278

over \$500 new. I want \$285. Avron Gordon, 2206 Vincent Avenue North, Minneapolis, Minn.

RECORD CUTTING for every occasion from your tape to unbreakable disc—weddings, socials, lectures, schools. Free information. Albergo Recording Studio, 121-18 Rockaway Blvd., South Ozone Park 20, N. Y.

LEARN VENTRILLOQUISM VIA TAPE as taught by a professional. All tapes given personal attention. Dick Bruno, 4 East 60th Street, New York 22, N. Y.

TAPE RECORDERS, RECORDING TAPE, Bell tape decks, Hi-Fi, Norelco speakers. We will not be undersold! Send for our free catalog and see why. Commissioned Electronics, 1776 Columbia Road, Washington, D. C.

TAPERS'. Here's an opportunity to use your talent and technique in a good work. Recording for the Blind operates units in Athens, Georgia; Lenox, Massachusetts; Charlottesville, Virginia; Chicago, Illinois; Denver, Colorado; Detroit, Michigan; Los Angeles, California; Louisville, Kentucky; Miami, Florida; New Haven, Connecticut; New York City; Oak Ridge, Tennessee; Phoenix, Arizona; and Princeton, New Jersey. They will be happy to have you volunteer your skills to assist blind students. From the tapes you record, long play records are embossed and distributed throughout the country. Please help!

WANTED—Imperial Rek-O-Kut disc-recorder. Write to Tony Konecny, 1907 Vermont, Saginaw, Mich.

AMPEX "SIGNATURE" Music Center. Sold for \$2,600. In April. Absolutely like new. Delivered within 100 miles for \$1,850. Other used Ampex bargains. P-J Associates, Greenwich, N. J.

DON'T BUY stereo equipment until you check our prices. Bayla Co., 1470-T Elmer Road, Waukegan, Ill.

WANTED: Used Rek-O-Kut recording lathe with 78 RPM lead screw. Give Model, price and condition. Forrest Fox, 711 S. 9th St., Richmond Indiana.

FOR SALE: Amplifier-Home Made in good working condition—10 watts, used few times \$30. Write or buzz tape: William C. Graves, 543 Roseland Parkway, New Orleans 23, La.

LIMITED SUPPLY—Reeves Soundcraft acetate tape. Slightly used professionally. 1800' boxed and on 7" reels. Money back guarantee. Shipped postpaid. \$1.99 each. Broadcast, P.O. Box 231, Wallingford, Conn.

PROFESSIONAL RECORDING TAPE—First quality of a prime manufacturer. Full frequency response. Finest polished and lubricated tape available. Money back guarantee. Acetate 1200', 1 1/2 mil, 4/\$5.20. 1800', 1 mil, 4/\$6.75. Mylar 1200', 1 1/2 mil, 4/\$7.00. 1800', 1 mil, 4/\$9.00. 2400', 1/2 mil, 4/\$13.00. Postage 15¢ per reel. Hisonic, Box 86KK, New York 63, N. Y.

FOR SALE: Professional Roberts stereo recorder with multi erase head. Used less than 20 hrs. Original cost \$349, will sell for \$235. Recorder will be shipped in original carton. Also one Heathkit Model TR-1A tape recorder (Tapedeck, Recorder Electronics and Mike). Completely assembled and in perfect working condition. Used less than 10 hrs. \$90. Herman Eggers, Box 172, Bismarck, North Dakota.

BALLET FAN, GRADUATE STUDENT (Psychology), Chronic HiFi addict, sports car lover, semi-beat, slightly frayed around the edges, sarcastic, cynical, bored, wants to meet new people. If you're a people, why not send a tape? John A. Goodson, 271 1/2 Somerset Street, New Brunswick, New Jersey.

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You can now purchase all your HI-FI from one reliable source and be assured of perfect delivery. Carston makes delivery from NY stock on most HI-FI, Recorders and Tape within 24 hours. SEND US A LIST OF YOUR HI-FI REQUIREMENTS FOR OUR WHOLESALE QUOTATION and our FREE wholesale catalogue.
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AMPEX 960

STEREOPHONIC

RECORDER/REPRODUCER



RECORDS STEREO
OR MONOPHONIC

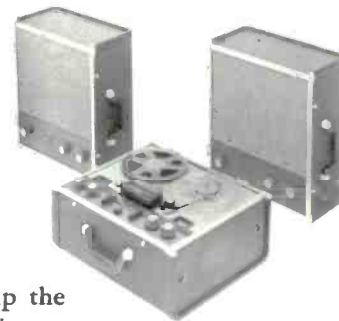
Stereo Portable PLUS!

Guiding the Ampex engineers who created the 960 was a dual objective—that of building a machine which was not only a superb example of engineering skill, but one which would also offer its user a range of capabilities far exceeding that of any other recorder made today. The result was not merely an improved stereo recorder, but an *entirely new concept* in home entertainment.

The STEREO 960 fits into family life in literally dozens of ways, contributing many tangible benefits in musical, educational and recreational fun. You'll use it to keep up the family correspondence by sending "letters in sound", to tape stereo programs off the air, to preserve your best monaural and stereo discs on tape, and to acquire new musical and language skills. You'll have endless fun exploring the 960's many fascinating recording capabilities, including sound-on-sound, echo chamber effects, and other advanced techniques.

ABOVE--960 PORTABLE STEREO
RECORDER/REPRODUCER

BELOW--MODEL 2560 PORTABLE
STEREO SYSTEM CONSISTING OF
960 AND PAIR OF 2010
AMPLIFIER-SPEAKERS



AMPEX STEREO

SIGNATURE OF PERFECTION IN SOUND

RECORDER/REPRODUCER SPECIFICATIONS

The true values of a recorder are best assessed through careful evaluation of its performance specifications and operating features. It is worthwhile noting here that these specifications are based not on theoretical design parameters but on actual performance tests. They are specifications which the recorder not only meets or exceeds today, but which years from now will still hold true.

The Ampex Model 960 Stereophonic Recorder/Reproducer is capable of essentially distortionless frequency response from 30 to 20,000 cycles per second at the operating speed of 7½ inches per second, and from 30 to 15,000 cycles per second at 3¾ inches per second. Its precision-engineered timing accuracy is such that it offers perfection of pitch held to tolerances of less than one-third of a half-tone. Playing times, using standard (.002"), long play (.0015"), and extra-long play (.001") tapes are as follows:

	(a) 4-Track Stereo Tapes	(b) 2-Track Stereo Tapes	(c) Monaural Tapes, half-track
1200 foot reel	3¾ ips - 2 hrs. 8 min. 7½ ips - 1 hr 4 min.	3¾ ips - 1 hr. 4 min. 7½ ips - 32 minutes	3¾ ips - 2 hrs. 8 min. 7½ ips - 1 hr 4 min.
1800 foot reel	3¾ ips - 3 hrs. 12 min. 7½ ips - 1 hr 36 min.	3¾ ips - 1 hr. 36 min. 7½ ips - 48 minutes	3¾ ips - 3 hrs. 12 min. 7½ ips - 1 hr 36 min.
2400 foot reel	3¾ ips - 4 hrs. 16 min. 7½ ips - 2 hrs. 8 min.	3¾ ips - 2 hrs. 8 min. 7½ ips - 1 hr. 4 min.	3¾ ips - 4 hrs. 16 min. 7½ ips - 2 hrs. 8 min.

RECORD INPUTS: High impedance line inputs (radio/TV/phono/auxiliary) 0.3V rms for program level; high impedance microphone inputs

PLAYBACK OUTPUTS: Approximately 0.5V rms from cathode follower when playing program level tapes

PLAYBACK FREQUENCY RESPONSE: 30-20,000 cps at 7½ ips; 30-15,000 cps at 3¾ ips

Within ±2 db 50-15,000 cps at 7½ ips, 55 db dynamic range

Within ±2 db 50-10,000 cps at 3¾ ips, 50 db dynamic range

FLUTTER AND WOW: Under 0.2% rms at 7½ ips; under 0.25% rms at 3¾ ips

HEADS: Manufactured to the same standards of precision that exist in Ampex broadcast and recording studio equipment. Surfaces are lapped to an optical flatness so precise that they reflect specified wavelengths of light, resulting in uniform performance characteristics and greatly minimizing the effects of head wear. Azimuth alignment of stereo head gaps in the same stack is held within 20 seconds of arc, equivalent to less than 10 millionths of an inch—a degree of precision achieved through use of a unique process involving micro-accurate optical measurements within a controlled environment. Head gap width is 90 millionths of an inch ±5 millionths of an inch.

KEY TO THE EXCITING FUN FEATURES OF THE 960— THE AMPEX STEREO-GRAPH

Here's the simplest, quickest answer to almost every question about how to perform the operations illustrated at right and numerous other recording functions. The Ampex Stereo-Graph shows you, quickly and clearly, the proper dial settings to make for more than a dozen of the most popular uses for the 960 . . . including sound-on-sound, language and music instruction,



and other special effects. A convenient tape footage/playing time indicator is included on the reverse side.

MODEL 2010 MATCHING AMPLIFIER-SPEAKER

The Ampex Model 2010's ten-watt (20 watts peak) amplifier section provides operating characteristics (unequalized) flat within ±0.1 db, with total harmonic distortion less than 0.5 of 1%, throughout the maximum range of human hearing ability, at rated output. Noise and hum are 80 db below rated output, and input sensitivity is 0.18V to develop rated power.

The specially designed 8" speaker provides smooth, peak-free response throughout a remarkably wide audio range. Such superior design features as its massive die-cast frame and edgewise-wound ribbon coil contribute effectively to higher levels of performance than ever before achieved with a speaker this size.



MODEL 960 DIMENSIONS: Portable cases 9" x 15" x 17½". Unmounted recorder 13" x 15" x 6½" depth below top plate, 1¾" above. Recorder weight 36 lbs., speaker amplifier 31 lbs.

AMPEX AUDIO, INC. • SUNNYVALE, CALIFORNIA AANS

Relax and enjoy the show—let your Ampex do the narration! With the commentary on tape, your color slide shows are more professional, more complete, and more fun!

Your favorite LP's and Stereo Discs are at their exciting best while they're new and unscratched. That's when to tape them on your Ampex, and preserve their original quality for keeps!

When you tape it "off the air" your only cost is for blank tape. Yet your musical repertoire can soon equal that of all the stations you hear!

There's a real future in family fun like this—with your Ampex you can live such happy moments over and over again, with a quality so lifelike you're almost literally carried back.

In the Ampex "Speech Testing Game", you pit your wits against the trigger-quick memory of the Ampex recorder/reproducer. You can't win, but it's fun trying.

Letter-writing is no longer a problem, with an Ampex in the house . . . now it's a family project. And even more fun than sending letters in sound is receiving them!

For "letters in sound", the 3" tape reel holds as much as a 10-page letter, mails as first class anywhere in the United States for 3c.

A command performance, exclusively for you! Whether you prefer jazz, pops, or classical, the privacy of headphone listening is a unique pleasure. You don't disturb the rest of the family, and they don't disturb you!

The Ampex, in private rehearsal, can be a wonderful confidence-builder for people who normally develop rubber knees when faced with the prospect of speaking before a group.

Learning to speak a new language is made immeasurably easier on the Ampex; you can record your own phrases side-by-side with those of the instructor, and play them back for comparison at any time.

When you strike up the band in stereo, you don't need professional musicians to make a professional recording. Advanced techniques are amazingly easy on the Ampex.



Build your own library of 4-track stereo tapes with a Bell Stereo Tape Transport!

The switch to 4-track tape is on! Twice the music—brand new releases. Get a Bell Tape Transport for stereo playback and recording... add a Bell Stereo Amplifier and Stereo Tuner for a complete stereo system.

Add a Bell Stereo Tape Transport to your present hi-fi system. It's beautifully engineered by Bell to give you the most pleasure... the most features... at a surprisingly moderate price. Acclaimed, even by professionals, as a "top buy." Wonderful way to record the stereo music you want to keep!

New Bell Tape Transport models play both 2-track and 4-track stereo tapes—offer Automatic Shut-Off and profes-

sional 3-motor drive for positive tape control. Model illustrated above includes Add-On Record-Playback pre-amps in portable carrying case. Eight other models available.

For playback of your favorite recorded music, you'll want the Bell Model 3030, a complete 2-channel, 30-watt stereo amplifier... plays stereo records, stereo tapes, stereo tuner.

As the perfect matching tuner to the

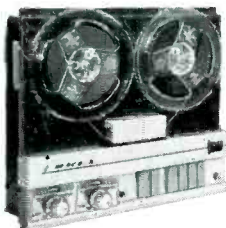
Bell Stereo Amplifier, you now have available the Bell Model 3970 for reception of FM and AM radio programs... and specially designed for FM-AM Stereo broadcasts. See your Bell dealer for demonstration and details.



If you already own a Bell Tape Transport, you can get New Conversion Kits for 4-track playback at 7 1/2 ips for as little as \$25.00. Easy to install. Doubles your listening pleasure.



**PACEMAKER
Model 2221**
One of a complete line of low-cost stereo components



BELL STEREO TAPE TRANSPORT—Nine models available... for 2-track and 4-track stereo playback and recording



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Model 6860**
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Richard Tucker



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Leonard Rose



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FERRO-SHEEN RECORDING TAPE:



It's the best-engineered tape in the world . . . gives you better highs . . . better lows . . . better sound all around! Saves your tape recorder, too – because the **irish** FERRO-SHEEN process results in smoother tape . . . tape that can't sand down your magnetic heads or shed oxide powder into your machine. Price? Same as ordinary tape!

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