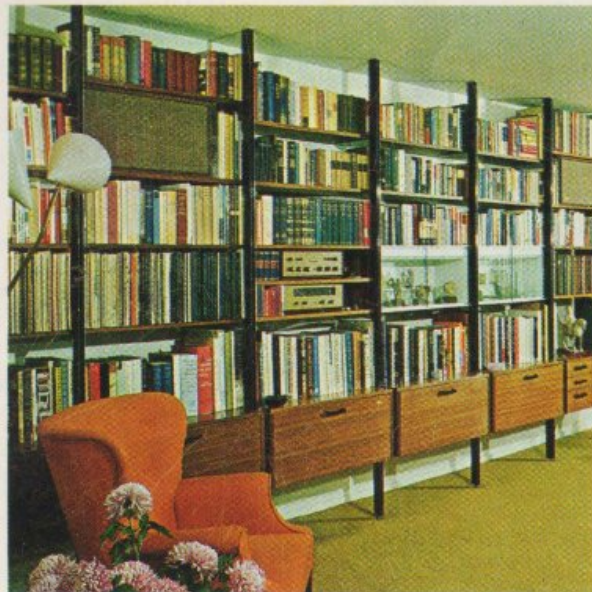


\$2.00

THE NEW FISHER HANDBOOK

A BASIC GUIDE TO HIGH FIDELITY AND STEREO



ENTIRELY NEW, REVISED AND ENLARGED EDITION

THE NEW FISHER HANDBOOK

An entirely new, revised and enlarged edition of The Fisher Handbook, the original Fisher reference guide, idea book and component catalogue for the high fidelity stereo buyer; with special articles by John M. Conly, Ralph Freas, C. G. McProud and Emanuel Vardi.

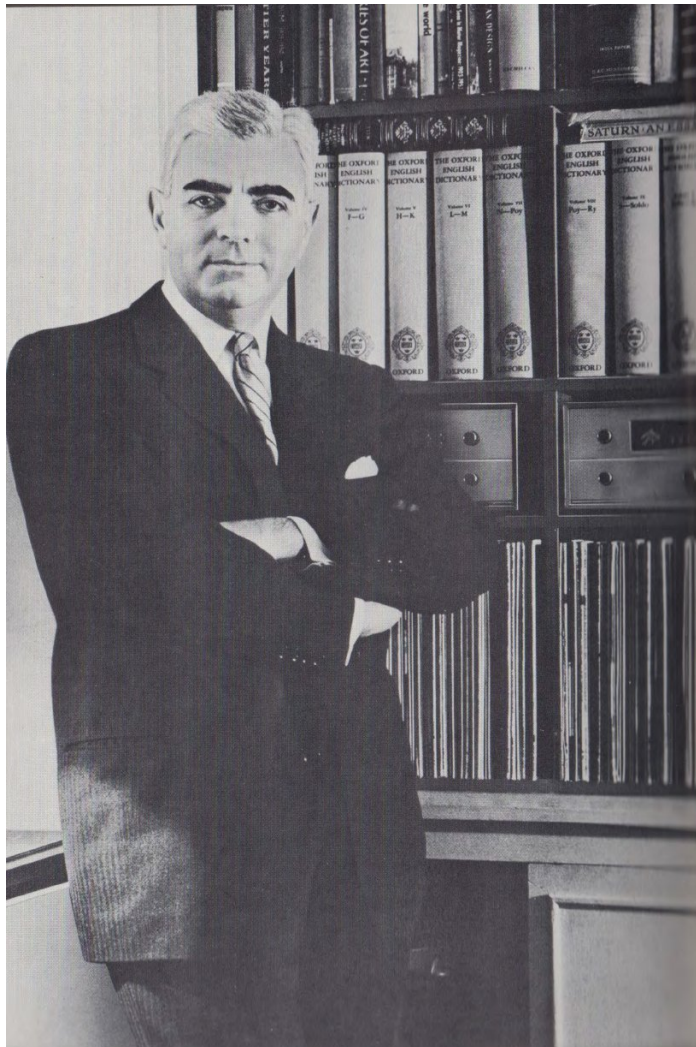
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FISHER RADIO CORPORATION, 21-21 44TH DRIVE, LONG ISLAND CITY, N. Y. 11101

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A Word from Avery Fisher

When the Fisher Radio Corporation published the first version of this Handbook several years ago, it was primarily out of a sense of obligation. We had decided that, as the world's largest producer of high fidelity components, we owed our prospective customers more than just a catalogue. The result was a lucid, down-to-earth manual on the fundamentals of stereo, which at that time was a new development much in need of clarification. The demand for such a publication proved to be overwhelming, and the original Handbook had to be reprinted many times and regularly brought up to date.

This completely new and greatly expanded edition thus bears the obligations of popularity as well as of leadership. It is offered mainly in response to the vast number of music lovers who have recently discovered the world of high fidelity stereo and would like to acquire the know-how of veteran high fidelity enthusiasts. It therefore takes up the subject on a more basic level than the old Handbook but then pursues it just as far. New articles of universal interest have been contributed by the outstanding authorities in this field.

Of course, the principal function of the Fisher Radio Corporation is still the design and manufacture of fine electronic equipment, rather than book publishing. Our first objective remains what it has been since 1937, when this firm saw its beginnings: the creation of sound reproducing equipment that satisfies the musically sensitive and educated ear. This Handbook is merely our dutiful signpost for those who seek this ultimate personal satisfaction.

Avery Fisher

Founder and President

What You Should Know

Before Investing in a Home Music System

It takes a team of dedicated and highly specialized engineers to develop outstanding high fidelity equipment, but it takes only a reasonably sophisticated amateur to select and buy a high fidelity system with outstanding skill and judgment. On the pages that follow, you will find authoritative articles that can provide you with the necessary background. Armed with this kind of knowledge, plus a love of music (without which high fidelity is mere gadgeteering), you should be able to plan your high fidelity investments and conduct your high fidelity shopping like a seasoned audiophile.



Components of a high-quality stereo system, including Fisher tuner, Fisher amplifier and Fisher speakers. To see the same system properly installed in a home, turn to page 18.

What Is High Fidelity?

By John M. Conly

Former Music Editor of *The Atlantic Monthly*;
former Editor in Chief of *High Fidelity* magazine.

This is the age of adventure in the living room — and perhaps the finest adventure you may enjoy there is the exploration of the world of sound, meaning mainly music. It involves a wonderful experience, the awakening of the ears. And the chief lure to it is something else rather wonderful, called high fidelity.

Of course, a lot of things are called high fidelity today that aren't, and that aren't very wonderful, either. I'll assume that you know this, if you are intelligent and discriminating, or at least that you suspect it. Perhaps further clarification will come naturally if I tell you a little about some of the people to whom you owe the availability of high fidelity — the real thing.

How It All Started

With all due and fond credit to the inventors and makers of audio equipment, the producers of records, and the managers of certain radio stations, all of whom were essential in bringing you this boon, I am going to focus first, instead, on a rather small coterie of people I shall call simply 'us.' It may be helpful to know who 'we' were and are, and what we did — and still do; because, after helping the gestation and growth of high fidelity over nearly three decades, we remain its hardest critics, its best salesmen and, on your behalf, its main guarantors of quality.

Our name was not legion; we were only thousands. We didn't, to begin with, know a blessed thing about electronics, acoustics, or even, in any scholarly sense, music. Call us, if you wish, the original amateurs, remembering that the word amateur comes from the Latin *amare*, to love. Among the original

amateurs in my personal memories, for example, there were a lawyer's wife, an editorial researcher, a student pathologist, a librarian and a police reporter (me). And what we loved was music.

I will specify — as of that time — classical music. I don't know anyone who joined the high fidelity vanguard out of a want for the Andrews Sisters, Guy Lombardo, or even Count Basie. So perhaps love isn't a strong enough word; maybe it was need. We needed Beethoven's "Emperor" and Debussy's ocean and "Sheep May Safely Graze." And we needed them somehow *alive*, with us at our sudden, urgent wish, and in sound that could really speak the totality of what was in the composer's mind. (Later came the sprightlier joys of surf sounds, cannon shots, and other pure unholy racket.)

We had something else in common, I think, we happy few. We had inquiring minds and a certain breadth of interest, so that somehow we knew what was going on, even in technical realms. So we knew, right after World War II, that the means to our desire was at hand. It wasn't in the convenient stores in familiar wooden cabinetry. But we knew it existed, because, for one thing, the movie industry plainly had it, and so did radio transcription studios, since delayed short-wave rebroadcasts were more sonically lifelike than their network originals (which were confined by telephone lines to very limited fidelity).

Some of this intimation had been manifest before the war, but not enough. I'd say our starting gun, for the real action, was the news, not very vigorously spread, of lightweight, wide-range magnetic pickup cartridges, or

High Fidelity, Circa 1937. America's first commercially manufactured high fidelity radio-phonograph system, built by Avery Fisher in 1937, is presented by Mr. Fisher to Dr. Leonard Carmichael, Secretary of the Smithsonian Institution, March 18, 1960. The Institution made this technological milestone part of its permanent collection.



'heads,' *usable in the home*. For here had been our missing link. This preceded the incentives of LP records and FM broadcasting. I was already \$500 into high fidelity — on \$62 a week! — when microgroove made its bow.

We had then to use our brains, usually our hands, and — everlastingly — our ears. To get what the professionals had, we had to shop where they did, in the byways, at wholesale electronic parts houses. And we had to name what we were shopping for. That is when the words high fidelity, in use for a decade as an occasional compound adjective, came to encompass and denote a whole concept and phenomenon.

The Basic Facts

Also, we had to know our stuff, since some of the wholesalers' sales people simply didn't grasp our requirements. We had to know that the human ear can (at its best) sense sound waves ranging in frequency from 16 cycles (vibrations) per second at the bass end to perhaps 16,000 at the top treble end, and that conventional radio-phonographs were giving us less than half this range (no violin overtones, no deep organ fundamentals). We had to know, too, that the ear can detect, in sounds both loud and soft, distortions of the true natural tone amounting to fractions of one per cent — something that some equipment sellers (*and makers*) were at first loath to believe.

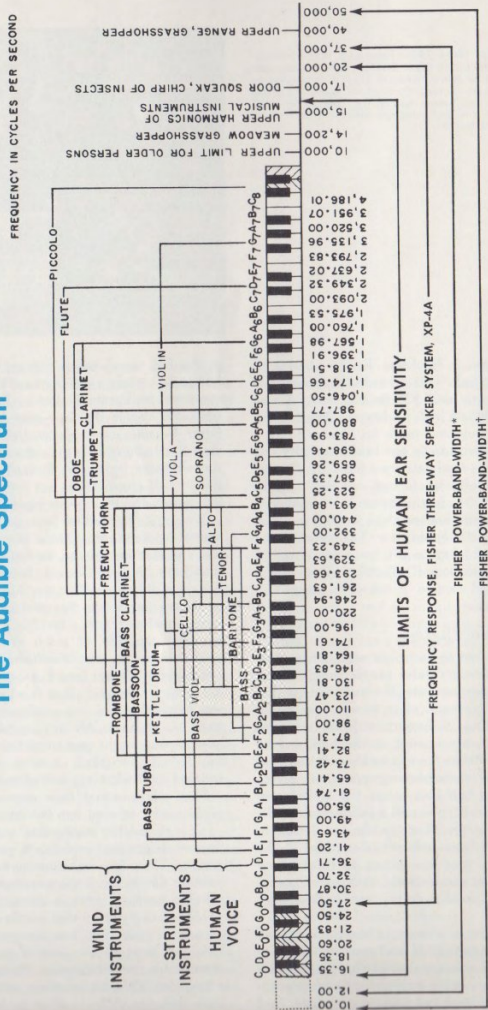
This meant precision: in the tracking and impulse generation of pickups; in the magnification of the impulse by the preamplifier and amplifier; in the loudspeaker *and* its properly sized, shaped and padded enclosure. And

in the FM tuner, when FM got going, there had to be utterly precise on-station focus and complete background silence. In the record turntable and in the tape recorder, when the latter became available in living-room size, there had to be exactly the right speed, without the slightest 'wow' or 'flutter.' Everywhere, the over-all requirement was for ample, effortless power and thrice-tested precision.

We got it. We had to. Because, you see, you cannot invite Pablo Casals to play — and that's what it amounts to, for five dollars — and then have his cello *squeak*, because of something *you* did wrong. The good high-fidelitarian is always partner to his performer. And we were ourselves terribly, terribly articulate and extremely audible, as much so as our treasured devices; so that manufacturers and record makers always heard us and invariably did what we wanted. That is why, I may say, you folk — those of you newly venturing in — have life so easy. All the big bloopers have been made, caught and corrected. In general, the corps of original amateurs is very well satisfied with what you are offered today.

That might sound false or venal, from a perfectionist clique, but the fact is that the good high fidelity equipment manufacturers themselves are perfectionists in perfect accord with us. There is a real kinship, even as to the amateur flavor, the devotee attitude. As a very suitable instance, here is Avery Fisher, who publishes this Handbook and is a long-time friend of mine. He has immense technical lore, but most of the best of it he learned through his own discoveries. He trained to be a biologist. Then he became a very successful book designer. (Years after he had left this

The Audible Spectrum



field, he was invited to design Winston Churchill's monumental *History of the English Speaking Peoples*, an assignment he accepted with pleasure and acquitted with mastery.) Radio and audio were his avocation, before they became his business. He has been a violinist since boyhood, plays whenever he can in chamber music groups, and can hold up his bow in pretty good musical company, too.

I won't say Mr. Fisher is typical, but he is not unique in this respect. I know at least a half-dozen high-ranking high fidelity executives who can read a Brahms score as easily as a schematic diagram. You can see what this does for you. It is a guarantee not only of a wide-ranging experimental mind, but of a fellowship in objectives, and of good taste.

The Listening Room

We had a taste problem in the early days that you don't. The loudspeakers we could get were mostly of theater origin and needed plenty of sealed back-space, say nine cubic feet. That's a lot of cabinet. And speakers cannot always be placed simply where they look best. The room may have a say in that, meaning that it may disclose wild resonances or echoes of its own with the speaker in some positions. Yet furnishing a room with aural beauty ought not to make it monstrous visually.

The makers today, by cannily redesigning speaker units and enclosures, have almost obviated the size problem. And stereo, in a very real sense, creates its own space—an illusion of concert chamber between and behind the twin speakers. In effect, it can make a small room into a very large one, if not quite a concert hall. I do not think it is possible for, say, the Mahler "Resurrection" Symphony to be heard in its true, huge dimensions in a small room, stereo or no (except through earphones, if you are willing to be antisocial). It has to be cut down. On the other hand, a Haydn symphony played in Philharmonic Hall is indignly dwarfed, a mockery. You can have much more nearly its intended concise power and lucency in your own living room.

What we shopped for and assembled, in the beginning, were completely separate components—turntable motors, transcription pick-up arms, cartridges, amplifiers, stripped-down tuners, separate 'woofers' and 'tweeters.' That's what there were. Being professional equipment, they came in bare metal and gray paint. We wired them up and housed them ourselves,

with saw, soldering iron, sometimes blood, sweat, clutter and profanity. But the end was sublime. I am not saying that you must, for fulfillment, start as a spiritually famished classicist and trepidant technician; that's been done for you: a whole high fidelity industry has grown from these efforts. What I am suggesting is that this industry's highly streamlined new products still embody the early craftsmanship, even artistic, approach. They have personality and are meant to fit and reflect yours, and it is really with this in mind that you should do your buying.

I shall throw in a small argument about thoughtless parsimony. You would not think it wild to spend quite a lot of money on a good baby grand piano. With the proper stereophonic high fidelity music system—and please don't call it 'hi-fi,' it isn't a toy—you can have the very best of concert grands, with Town Hall thrown in, and with Serkin, Richter or Horowitz to play it for you.

What You Can Listen to Today

The world behind the twin speakers is almost illimitable, an endless fascination. There are of course Beethoven and Benny Goodman. But also you can have Mercutio's tragic clash with Tybalt right in front of your mantelpiece (and your mind's eye). Or an acre of South American rain forest, with its myriad tiny life sounds. Or a curve in the sports car track at Sebring. Or the prayers and deliberations of an Ecumenical Council. Or a quickstep formation of the music company of the Bersaglieri, Italy's historic mountain soldiers, each man with his brass-basin helmet and his silver trumpet. Or even the Beatles, unless, by some benign freak of fate, they are obsolete by the time you read this.

At the start of 1964 William Schwann, publisher of the encyclopedic Schwann Catalog of LP Records, estimated that his average issue carried *thirty thousand* entries. That, friends, is about twenty thousand hours of disc listening. How many thousand entries there are in the Harrison Catalog of Stereo Tapes I do not know, but there will be more next month. And city after city offers one or more FM Stereo (multiplex) stations broadcasting three-dimensional sound. It is fantastic.

Discover your ears. They are a main, perhaps the main, avenue of access between you and your culture; indeed, the world you live in. They deserve to be served properly. And that is — isn't it? — what I've been talking about.

The Why and How of High Fidelity Components

By C. G. McProud

Publisher and former Editor in Chief of Audio magazine; Fellow and former President of the Audio Engineering Society.

If you understand the basic concept of high fidelity, you are ready to take a look at the 'hardware' necessary to provide a working system, and that is where you have to start making decisions.

First, you must decide what you are going to listen to — radio programs, phonograph records or recorded tape. Certain elements of your system will be 'musts,' regardless of your source material, but if you are planning to listen to records exclusively, you have no need to provide facilities for receiving radio programs off the air. On the other hand, if you happen to live in an area where there are several stations that play the music you like, you may feel that you would just as soon let someone else play the records for you, even though you have to accept that someone else's choice. If you then listen to the radio exclusively, you save money on records, but you will never be sure that you can hear what you want to when you want to. Therefore, most high fidelity systems include facilities for playing records, even though they may not have a tuner to receive radio programs.

Within the last ten years the tape recorder has become more and more important as a source of program material. You may buy tapes already recorded, or you may record your own music to suit yourself. Tape recorders are used to exchange information between people from many different countries through the medium of tape correspondence clubs; parents can make permanent recordings of their children as they are growing up, thus building an album of sound to go along with their albums of photographs. Tape recorders seem to have almost as many uses as there

are users, and new applications come to light almost daily.

The three common sources of program material — radio, phonograph, and tape — all require different kinds of devices to implement their various functions, but every high fidelity system will have some form of AMPLIFIER and some form of LOUSPEAKER. Let us look at each of these devices individually.

The Amplifier

The purpose of the amplifier is — simply enough — to amplify. All of our sources of program material provide signals which are not nearly strong enough to operate a loudspeaker. From a phonograph record, we get a signal of approximately 2/1000 of a volt via the cartridge, which is the device that translates the undulations of a tiny groove into an electrical signal. From the radio station we pick up a signal measured in millionths of a volt, and from a reel of tape the signal is likely to be just about a thousandth of a volt. Each of these signals must be boosted in strength to drive the loudspeaker. In addition, to provide properly balanced sound from the speakers, the proportion of bass and treble in the signal must in certain cases be changed according to a standardized formula; we call this process equalization. The common tone control is another form of 'equalizing' familiar to everyone.

Amplifiers are often divided physically into two or more parts, but regardless of their physical form they all perform the same functions. For example, we may have a PREAMPLIFIER as a separate small unit built into the record-playing device; or the preamplifier may be combined into a larger unit with a number of

controls and still be called a preamplifier, or simply a preamp, or even a preamp-control. Then we may have a POWER AMPLIFIER, which provides still more boosting of the signal and converts it into a form suitable for the loudspeaker. And just to make it more complicated, we may combine the preamplifier and the controls and the power amplifier into one package, which is then called an INTEGRATED AMPLIFIER or CONTROL-AMPLIFIER. In still another permutation, we add a radio tuner to the control-amplifier and we now have a RECEIVER that gives us the whole amplifier and radio program source in a single unit, making for simplicity in locating the system at some suitable spot in the home.

The receiver and the control-amplifier are probably the most popular forms for the average system because of their compactness, but as we go to bigger and more powerful systems we may want to employ the various sections individually in order to provide the greatest flexibility in placement, even though much more space is required. A separate preamplifier is also likely to offer a greater choice of control features than is generally obtainable in an integrated instrument. The biggest advantage of completely separate sections, however, is in heat dissipation: large amplifiers usually give off quite a large amount of heat, so it is desirable to keep other components somewhat removed from them. On the other hand, properly designed receivers can provide considerable power without a heat problem, as long as the installation has adequate ventilation. Some receivers also incorporate certain convenience features not found on separate components.

Regardless of the form, we must have some means of selecting the program source, ampli-

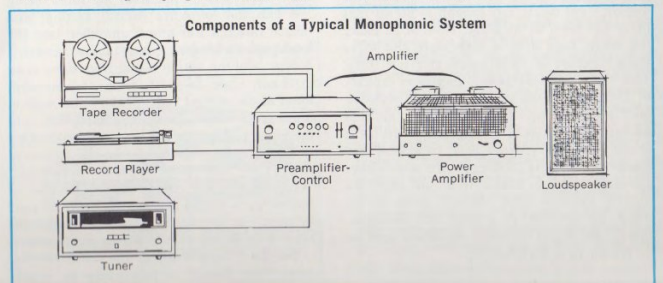
fying it suitably, and controlling its volume and its tone to suit our hearing. All of these are amplifier functions.

The Loudspeaker

To use this word in the singular does not give a true picture of the modern loudspeaker system, for it is a rare system nowadays that employs only one loudspeaker unit in its overall enclosure or cabinet. It is actually the ensemble that we mean today when we say loudspeaker.

In most cases, the loudspeaker is the only portion of a high fidelity system you will find separately enclosed in some form of 'furniture.' Acoustically, the cabinet or enclosure is a very important part of the loudspeaker system, and it is well recognized that a loudspeaker unit of the highest possible quality can have its performance completely spoiled by being placed in a poorly designed cabinet. Almost any loudspeaker works fairly well in the midrange frequencies — say from an octave below middle C to three octaves above middle C. It is the extremes that become difficult to radiate into the air.

A loudspeaker must move a lot of air to perform properly at low frequencies, and consequently the *woofer* — that's the unit that handles the low tones when two or three separate units are employed — is usually fairly large and with a heavy cone structure; whereas in a unit designed for the midrange only, the cone will be smaller and lighter. For the very high tones, the *tweeter* unit used is sometimes of horn construction; or it may have a tiny and light radiating area, often in the form of a hemisphere. An effective combination of several separate loudspeaker units in a properly designed cabinet is usually the



best-sounding speaker. Aside from housing the units physically, the cabinet in many designs has the function of reinforcing low frequencies, but the cabinet itself should not resonate or vibrate at all. This is so important that some loudspeaker designers employ concrete or brick, while others make their cabinet sides out of hollow wood panels which are filled with sand.

While it is generally true that a good large loudspeaker sounds better than a good small one, many homes simply do not have adequate space to accommodate cabinets that may range up to ten or fifteen cubic feet. Consequently there has been a trend toward 'bookshelf' speakers (although most of them will not quite fit into most bookshelves) in order to conserve space. The most recent trend, however, seems to be again toward larger speakers.

Selecting a loudspeaker is a personal problem. Tastes differ among people — what one individual likes may not be acceptable to another. While it might seem that there could be a 'perfect' loudspeaker, we must admit that not even the finest products of different manufacturers sound alike; and since each manufacturer must theoretically be doing his best to achieve quality, the buyer has plenty of room for choice.

In addition to differences in sound, loudspeakers differ in *efficiency*. One may perform perfectly well and give sufficient sound with a power of only five watts from the amplifier, while another may require thirty. Unreasonable as it may seem, when we *double* the power fed to a loudspeaker, the increase in sound volume is just barely perceptible to the untrained ear on musical material. Suppose we are listening to a piece of music at a volume level which, let us say, represents five watts. Now let's turn up the volume just a little — not much, but enough to notice that there has been an increase. Now we're using ten watts. Turn it up a little more and we're using twenty; a little more and it's forty. That's why we need power amplifiers capable of 25 to 50 or even more watts, for while we may not turn up the volume, the musical passage may contain a long crescendo, or a sharp (and loud) drum beat, or a loud and sustained trumpet passage. We must have sufficient power available from our amplifier, or else we must have efficient speakers, for when we attempt to exceed our available power the sound becomes distorted and we no longer have high fidelity.

Thus, in the selection of components for a

system, it is probably the best practice to choose the loudspeaker first. Knowing the type of speaker and the power it requires, we can then choose an amplifier which will provide enough power. This is the one area where components *must* be matched. Don't be misled by the thought that a very large loudspeaker must necessarily require a large amount of power. In most cases the largest loudspeakers are usually the most efficient and can be driven with relatively low power, whereas many of the small 'bookshelf' types will require far more power in order to operate satisfactorily.

The Tuner

If you have elected to use radio programs as part of the source material for your high fidelity system, you will need a TUNER. Everyone is familiar with a 'radio set' in one form or another. While it would be possible to connect an ordinary radio set to a high fidelity system, it is rarely done because the average set does not have an electrical output of sufficiently high quality to feed into a carefully planned system. Consequently we add a high fidelity tuner to our amplifier and loudspeaker, and we can then enjoy radio programs.

There are two basic types of radio broadcasting in use today: AM and FM, standing, respectively, for amplitude modulation and frequency modulation. Both have their uses, but FM offers somewhat higher quality, including a greater dynamic range, from pianissimo to fortissimo, and a wider frequency response, from the deepest bass to the highest overtones. In addition, FM is much less susceptible than AM to atmospheric noise and 'man-made' static. For a complete system, it is not unusual to provide both AM and FM facilities in the same tuner, the output from the tuner being fed into the amplifier control section, and thence through the power amplifier into the loudspeaker. Modern tuners are remarkable devices, and the output signal from them is an extremely close facsimile of the signal monitored in the control room of the radio station. Their sensitivity is specified in microvolts, and the numerical values are usually considerably lower than 10 — commonly in the range of two to three microvolts. The *lower* the numerical figure, the more likely you will be able to receive signals from stations distant from your location — an especially desirable feature for those who do not live in urban communities.

But don't be misled by the sensitivity figures; even though a tuner may be highly

sensitive, it should still have a good aerial system if you wish to enjoy good, noise-free reception. While AM stations may often be heard for hundreds, or even thousands, of miles, FM reception is usually limited to some 30 to 50 miles from the station for reliable noise-free performance. Highly directional and rotatable antennas are usually necessary for distances greater than 50 miles.

The Record Player

This term is inclusive in that it encompasses a number of vastly differing devices. One is, of course, the mechanical unit which rotates the record, and this may be a TURNTABLE or a RECORD CHANGER. (The latter is now more often called an AUTOMATIC TURNTABLE.) The device which actually contacts the record groove is called the STYLUS, and it is an integral part of the PICKUP or CARTRIDGE. The cartridge is mounted on the ARM (or tone arm). It is the cartridge that converts the mechanical motion of the stylus tip into a minute electrical signal, which is then amplified by the preamplifier. The arm guides the cartridge across the record in an arc that provides optimum stylus-to-record contact.

There are many different types of cartridges, usually magnetic in operating principle; and there are many different types of arms of a myriad configurations. Here again the choice must be governed largely by personal preference as to sound quality, for pickup specifications today are uniformly good throughout.

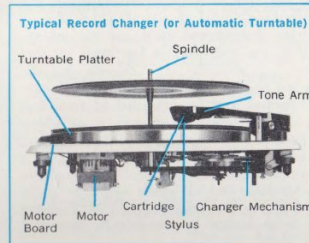
In the realm of the record rotating device, one must look for low values of *wow* and *flutter*, which are the names given to slow and rapid variations in turntable speed; and one must look for a minimum of *rumble*. The early hi-fi enthusiast generally preferred the turntable to the record changer, but in recent years the

automatic turntable has been so greatly improved that today there is little difference in most cases. The automatic has the advantage of being able to play several records in sequence without attention, while the manual turntable needs attention at the end of each record.

The Tape Recorder

To the uninitiated, TAPE RECORDERS all seem to look alike — that is, they invariably have two reels and a number of knobs. To a certain extent, they all do about the same things, too — but there the similarity ends. There seems to be an almost endless variety of tape machines, and the selection demands considerable thought. If you are buying your first tape recorder, you should probably consult a really knowledgeable recorder specialist, describing the use to which the unit is to be put, the type of program material to be employed, the maximum length of time needed for a given selection (such as an opera, for example), and the sound quality desired. It might well be said that you only need to name what you want and you can have it. Some users want a machine only to play recorded tapes, as one would play phonograph records, so their machines can be considerably simpler. Others want all sorts of flexibility in their machines, and it can be had. This is a long subject, however, and should warrant a thorough study by the potential buyer. One caution only — if a tape recorder costs less than fifty dollars, you can safely bet that it is not much better than a toy and certainly not a high fidelity component.

It will be apparent at this point that all of these individual high fidelity components *can* be put into one piece of furniture to provide an 'entertainment center,' but this becomes a large unit which must usually be fixed in its location in the average home. Separate components, on the other hand, can be placed on shelves, built into music walls or any other suitable space within the home, or simply put on appropriate tables. Components have many advantages over and above the principal one of quality; they may be placed in the home most flexibly, and one individual unit may be replaced without disturbing the rest of the system whenever some new function is provided. This was noted only recently when FM stereo broadcasting was started. Those people with component hi-fi simply added *one* unit and they were ready, all without disturbing any other part of their installation.

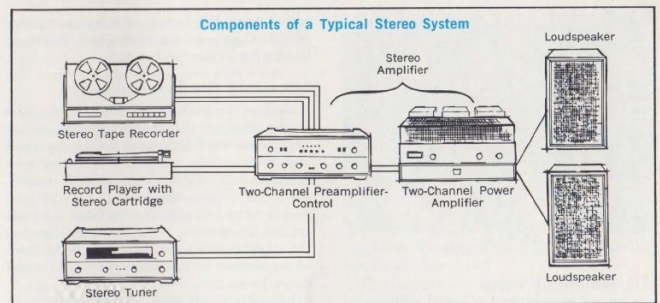
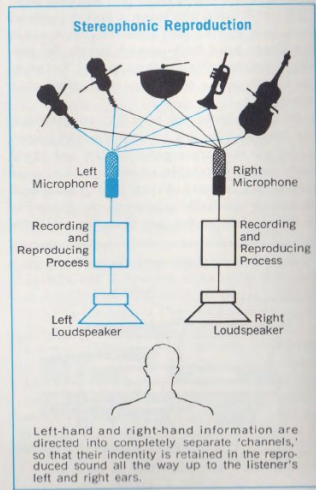
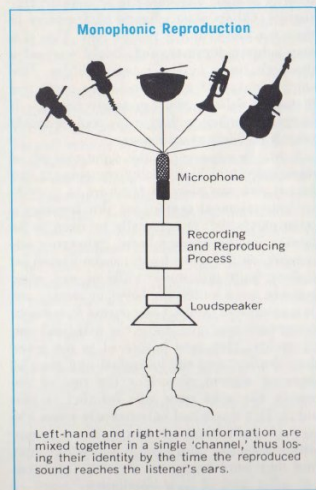


Stereo: An Important Refinement, Not a Revolution

So far, no specific mention has been made of *stereo*, largely because a stereo system must be judged by the same standards as a single-channel *monophonic* system as far as its individual components are concerned.

Stereo is not a revolution in high fidelity, as has been sometimes claimed, but a subtle (though very real) improvement. Stereo expands the program material into an additional dimension, so that one can perceive the physi-

cal location of instruments or singers or sound effects. Now this may not be important when one considers that to a person at the back of a large hall, listening to a string quartet or even an orchestra, the sound may appear to be coming from a small point. However, if the listener is sitting in a front row close to the orchestra, the violins may appear to come from the left and the basses from the right, with the other instruments distributed in between. Locating



the instruments may not be important, but the principal advantage of stereo is in the over-all spaciousness and transparency of the sound. The advantage of following the action of an opera is really about the only plus to stereo if we think *only* of localizing the sound source. The clarity and transparency are the really great gains.

What is Stereo?

Stereo in a high fidelity system means that a second channel has been added all the way from the microphone to the loudspeaker. Sound picked up by a microphone at the right of the orchestra is fed through the complete reproducing and processing chain to the loudspeaker at the right of the listening area — and the same is done on the left. By this process, we are able to portray in the listener's ears the acoustic conditions in the studio; the over-all effect is much closer to the original, which, of course, is the ultimate aim of high fidelity. From performer to loudspeaker, the two channels are kept separate, whether in FM stereo broadcasting, or on disc and tape recordings. The mechanics of this two-channel process are somewhat complicated, particularly in radio and on records; on tape it is relatively simple.

In FM broadcasting, the right and left signals must be 'operated on' in a fashion that results in a monophonic signal which is approximately that which would be picked up by a single microphone in the studio, and in another single-channel signal which simply represents the area where the two channels are different. If an instrument plays equally in both channels there is no difference, so the 'sum' signal is a true monophonic signal and

the 'difference' signal is zero. If an instrument plays *only* in one channel, both sum and difference signals are the same. When these sum and difference signals are acted upon in a stereo tuner, they come out again as separate signals just as they were in the original two microphones. This type of broadcasting is known as *multiplex* and is technically quite complex, but it does work and it does improve the resulting sound heard in the home.

With tape, the two channels are simply recorded on different tracks of the same tape, on what amounts to a divided highway, so the entire operation is simple and straightforward. Separate amplifiers are required, of course, in both record and playback operations.

In the case of the stereo record, the two channels are recorded on the two walls of the same groove — in the form of undulations of the flat walls of the groove. The stereo pickup is so constructed that the undulations on one wall of the groove affect only one half of the pickup and the undulations on the opposite wall affect only the other half. Thus with two outputs from the stereo pickup, we can then feed them through our two amplifier channels to our two loudspeakers, and we have our original sound again just as it was captured at the outset by the two microphones.

The only problem in stereo is to have two matched channels all the way from microphones to loudspeakers, and high-quality high fidelity components do this with an extraordinary degree of perfection.

With all these new developments, sound in the home today is a far cry from what it used to be as recently as fifteen years ago — and it is continually coming just a little closer to an exact replica of the sound in the concert hall.

How to Play Hi-Fi by Ear

By Emanuel Vardi

Violist, conductor, composer and arranger; member of the late Arturo Toscanini's NBC Symphony Orchestra; recording director and producer for several record companies.

The phonograph record has always been a source of wonder and amazement to me. Just think: the record is placed on a turntable, an arm is lowered and—lo and behold—out comes music. A miracle!

However, in a short space of time I discovered that there are Grade A, B, C and D miracles even in the world of high fidelity phonographs. Although all high fidelity component systems reproduce, more or less, what is on the record (or on the air, in the case of broadcasts), the *quality* isn't always good.

What Is Quality?

Component manufacturers give you specifications in electronic terms. You see on paper that machine X has such and such bass response, that the treble goes up to umpteen cycles that even bats can't hear, that the distortion is a fraction of one per cent, etc. If you go by figures, it seems almost impossible to go wrong today. All these components should sound absolutely great, yet that isn't the case at all. Why? First of all, because the figures may be, in some cases, no more than wishful thinking. And mainly because quality can't be measured on paper alone.

I've had the same experience when I played on various violas. All of them were beautifully made, but all of them didn't 'sound.' That little something—quality—was missing. Quality in this case is synonymous with *beauty*. It's something that reaches you 'way down inside, transcends the mechanical and makes music beautiful. It gives you an emotional experience. It is this quality that I want when I listen to a

record or an FM broadcast. Like the knights of old in quest of the Holy Grail, I've been looking for beauty of sound.

Choosing the Loudspeakers

Each of the components of a stereo system is important to the final sound, but in my experience the selection of the loudspeakers and of the pickup cartridge—in that order—will make the biggest difference. Naturally, the amplifier and the preamp (or the integrated control-amplifier) must be of the highest quality in order to feed a clean signal to the speakers—but the speakers are the voice of the system. That's where the actual sound comes from.

I spent a lot of time listening to all sorts of speakers before I found the ones that I like. I looked mainly for that elusive beauty of sound, which I can only vaguely describe in terms like warmth, brilliance, fine texture, etc. I also found that I had to try the speakers in my listening room before I could finally make up my mind.

The one thing I don't like in any speaker is an individual coloration or 'personality.' I don't want the characteristics of the speaker to be *added* to those of the recording itself. I know the trouble that every producer goes through when he makes a record, trying to give the listener a true reproduction of whatever he is recording, and I also know that most modern records are very faithful to the conductor's intentions in dynamics, tone and color. All of this can be ruined if, for example, the recorded sound is warm-toned and silky in texture, but the speakers, having some peculiar characteristic of their own, reproduce it with a hard and shrill quality. Then the playback is simply not true and the beauty is lost. Therefore the speakers must be absolutely *neutral* in character.

Another quality I look for is spaciousness. I hate a 'canned' sound. The music must have air around it. It must breathe, be alive, and it must never seem to be boxed in.

The cartridge is perhaps the next most important factor. (The speaker and the cartridge are the two *transducers* in a component system—they act as go-between for both electrical and mechanical energy—and that's not easy.) I recall a stereo system I once heard, in which every component was of the finest possible quality, but the cartridge used was an inferior one and the sound was terrible. Actually, it wasn't anybody's fault; the cartridge was one of the first stereo models ever made, and since

then there have been great improvements. Today there are many good ones and, judging them the same way as I do speakers, I haven't had much trouble finding one that I like.

The Lows and the Highs

In building a house, the foundation is all-important. The same goes for music. The foundation is everything. Without a good 'bottom,' the harmonies are lost and the music sounds thin. Therefore the first thing I look for in a speaker, over and above its general beauty of sound, is the bass response. I listen carefully to all the bass instruments and ascertain whether they sound as they're supposed to.

The celli and the basses must not only produce low tones but must sound like *string* instruments. I want to hear the bows on the strings. The low bassoons and the bass clarinet must have a reedy sound. The tuba must sound brassy. For example, in the opening of "Thus Spake Zarathustra" by Richard Strauss, there is a very low pedal note on the organ. I must hear it clearly because I *know* it's there.

After I am satisfied with the bass, I turn my attention to the high and middle range. In the strings, that means the violins and the violas. Of the two, the violins are the more difficult to reproduce. One of the most irritating sounds is that of strident upper strings. The violin section has a thrilling, singing sound when properly reproduced. The same goes for the high wood winds and brass—they don't sound harsh or grating, even though they have bite. All the instruments involved in making music *must* have this degree of realism to give me the illusion of the orchestra in my living room.

Where the Amplifier Comes in

There is also the emotional content of music to be reckoned with. In technical terms this can be broken down to crescendos, diminuendos, warm tone, cold tone, percussive sounds, and many other effects involving dynamics and tone colors. Music is an emotional experience, and if it becomes limited in these respects, I won't be getting its full content.

In the third movement of Tchaikovsky's Sixth Symphony, for example, there are great climaxes—tremendous fortissimo passages. How horrible it would be if at those moments the machine were to distort the sound. It would feel like having the rug pulled out from under you. My first reaction would be to throw out the record, but normally it isn't the record's fault. Something in the system couldn't take the peaks. That something is probably the



amplifier: it may not have enough power to handle all that sound.

The function of the amplifier is to take the information from the cartridge or the tuner, amplify it, and pass it on to the speakers. If the amplifier isn't adequate, something gets lost in the reproduction. An amplifier must have enough reserve power to take the biggest bumps cleanly. And it must never put a veil or film over the sound, as if you were seeing the music through a dusty window. The amplifier can't be directly responsible for the beauty of sound, but it can affect the final sound of the system indirectly. The same goes, of course, for a separate preamp-control unit. I, for one, don't even like to fool too much with the tone controls and usually check them for flat response with a test tone. The more the sound is tampered with, the more chance of distortion.

Listen to the Music, Not the Fi

My high fidelity system is a musical instrument, not a machine; and my pleasure is in music, not in hi-fi gadgets. Some of my friends are amateur photographers who continually buy new equipment and never have a picture to show. They are gadget-happy. The same holds true in hi-fi. I know many who spend a fortune on every new piece of equipment that comes on the market—and never really listen to music. They are only interested in sound for itself—ping-pong stereo, directional effects and so forth.

What a waste of this modern miracle! Now we can have the concert hall in our home, with great artists playing for us at our will. Who cares, then, if there is a bongo on the far right or the left? Remember: stereo is three-dimensional sound, with depth and breadth; not just left and right. It has substance and solidity. That's why it makes a monophonic system sound small and dismal by comparison. That's why it sounds like real music. And that's why I couldn't be satisfied with anything else.

How to Install a Home Music System

By Ralph Freas

High Fidelity Columnist of the *American Home Magazine* and *Esquire*.

When high fidelity was in its infancy, the notion that one had to suffer an unsightly snarl of wires in one's living room prevailed — and with good reason. Early seekers after fine sound naturally cared most about what fell upon their ears. Appearances mattered little.

Today's fidelitarian has the best of both worlds. His audio equipment sounds better than that of a decade ago. And it looks as good as it sounds. Componentry, like a set of beautifully bound books, fits — no, belongs — in well-appointed surroundings. It makes fine sound one of the natural graces of The Good Life.

Never before has music-reproducing equipment offered such a wide flexibility of use. You can hide it or display it proudly. You can show it on a bookshelf or build it into your Aunt Minnie's antique credenza. It will fit into a sleekly modern, sophisticated environment or in a room where Louis Quinze or Duncan Phyfe hold sway. And it can *always* be moved.



Here you see the stereo components first shown on page 4 unobtrusively installed in a beautiful modern setting. The record player is in one of the large drawers.

Decorating Your Home with Music

Putting a component music system together is almost as easy as adding an extension cord to a lamp. One unit is linked to another with signal-carrying or power-carrying cables. But there's a right and wrong way of doing it. Here, we'll consider the step-by-step means of proper installation. While we're about it, we'll also consider the things you can do to keep your music system operating at the positive peak of performance.

The first thing to do after unpacking your unit(s) is to put the warranty card in the mail. No, nothing's going to go wrong. The warranty card is simply a bit of free insurance. It assures you of free service — so use it.

Two Cardinal Rules

Now, to business. Where will you locate your amplifier or receiver controls? Let's establish a Rule of Two. The first rule is: Ventilate Adequately. The second: Consider Convenience.

Adequate ventilation did not precede Rule Number Two through any whim on my part. It's important. Heat is the greatest enemy of all electronic equipment. It causes the deterioration of tiny electronic parts and, while the lessening of sound quality is not a dramatic one, it speeds the aging process that leads to lower fidelity.

You certainly won't place your components on a radiator or near the kitchen stove. So we're concerned with dissipating self-generated heat. Be assured that an amplifier is designed to 'run cool' and, unless you operate it in a totally enclosed space, the heat that it creates will simply flow into the surrounding air.

High fidelity equipment has greater power-handling capacity than — let's say — a little five-tube radio. It requires greater ventilation. If you must put it in a closed door cabinet, operate it with the door open. If placed on a shallow shelf, the partition above the unit should be slotted or holes provided to permit rising warm air to escape.

And now, Rule Number Two. One of the

virtues of component high fidelity is flexibility of arrangement. You'll get more pleasure from your music system if it's placed where it's easy to use. Locate controls where they can be operated without your having to squat, squint or do a handstand.

Connecting the Speakers

Next, hook up the speakers. Don't turn on the amplifier or receiver just to see if the panel light works — *until after the speakers are attached*. Otherwise, the surge of amplifier power has no place to go; a hooked-up speaker accepts the surge and translates it into mechanical energy, which is to say cone movement.

Ordinary lamp cord is fine for hooking speakers to the amplifier. If you intend to string it around the baseboard, buy it with color in mind. (Lamp cord with white insulation looks better on a white baseboard, for example.) Do you prefer to run the wire beneath the carpeting? Use twin-lead antenna wire — the same as you use on your television set. It lies flat; doesn't bulge under the rug.

In attaching the leads to the terminal strip on the rear of the amplifier, be sure they are kept apart. A wire will sometimes loop around the screw to touch the terminal holding the other wire. To avoid short-circuiting, twist the strands and inspect the finished connection.

If FM radio is part of your system, you're ready to try it as soon as the speakers are attached. You can tune in nearby stations but you'll pull in more stations with greater clarity and fidelity if you attach an antenna first. The twin-lead antenna provided with your tuner or receiver is quite a performer. For proof, try operating your unit with and without it. Of course, in some difficult locations you will need a roof antenna. But that's the one installation problem which is better left to a professional serviceman.

Where will you place your speakers? In general, they should be placed to beam their sound to cover the greatest area of your listen-



Rear panel of a typical Fisher stereo receiver, illustrating the simple, logical arrangement of all necessary connection points in a working stereo system.

ing room. There are no hard, fast rules about the distance between stereo speakers. All listening situations differ in dimensions and you can make your own rules. Actually, this is part of component high fidelity's fun. Try your speakers in various positions for maximum effect.

The Record Player

Locate the record-playing equipment — changer or turntable — as close as possible to the amplifier or receiver, for two reasons.

First, you can take advantage of the convenience receptacle on the back of the chassis; plug the record player into it.

Second, the leads from the turntable to the 'phono' inputs should be kept as short as possible. Extra-long leads are to be avoided; they can diminish signal strength and add to hum and noise pickup. They may also result in some loss of high frequencies.

Whether you locate your changer or turntable in a cabinet well, lift-top cabinet or sliding drawer, you'll want to keep it level and shock-free. Both precautions help prevent groove-jumping; shock-mounting insulates the unit from the normal vibration you can feel around almost every house. Every good turntable or changer is spring-mounted (if bought with a base) or provided with springs and linkages for proper mounting in a custom installation. A sponge-rubber cushion may also be used for additional insulation from vibration.

The Wiring

The electrical linkages — the leads and wires — connecting your music system components are of two kinds: power-carrying (those that carry the house current) and signal-carrying. Keep them apart. Think of signal carriers as highly impressionable. If they associate for too long with a power-carrying lead, they'll pick up a 60 cycle pulse from it (or a multiple thereof). This will be amplified and heard

as an annoying hum. You will find that a music system is virtually impossible to install without having these leads cross or otherwise contact each other. Don't fret. Where they have to cross, let them do so at right angles and no hum will result. Avoid having them run parallel for any distance, however. One exception: speaker leads should be kept apart not from the power carriers but from the other signal carriers.

A curious oversight that afflicts many fideleers is adequate provision for record storage. When you locate your record playing equipment, give a thought to storing records nearby. And bear in mind that they should be stored vertically.

Don't forget about the tape deck. It is true that your music system can get along without one, but the ability to record and play back extends its versatility even further. And you don't have to buy the deck right away. It is mentioned here merely as a reminder to you to reserve the necessary space. (Meanwhile you can use the space to store records.)

Accessibility Is Important

Finally, build in your components in such a way that you can get at them, that you can take them out if need be. There are many reasons for you to do so — reasons that have nothing to do with service or repairs. Suppose, for example, that you want to add extension speakers for patio, terrace, kitchen or den. Doing so is extremely simple — if you don't have to tear apart a cabinet or even a wall to get to the back of the amplifier. The same is true if you want to change your record changer or turntable, if you want to add that tape deck, or if you feel the need of a more high-powered FM antenna to pull in those far-distant stations. And you may someday want to get at the amplifier for service reasons. In five years, I haven't had to so much as check or replace a tube. When I do, it will be easy because the amplifier was built in to be taken out.

How Others Have Done It

When you first uncrate your high fidelity components, you may suddenly feel a sense of inadequacy. Where, you may wonder, shall I put them for best results? How can I be sure? Where will they look nicest? What do others do? This feeling is as common as it is fleeting. On the next few pages, you'll see how others have succeeded. And you will see — as we said at the outset — that today's music-reproducing equipment offers previously unparalleled flexibility.



This modern arrangement appears to have been planned when the room itself was built. Not so. The music system was custom-installed to make it an integral part of the room. Note the Fisher XP-4A loudspeaker system built into the teakwood column (upper left-hand corner of picture). Its stereo mate occupies a similar position at the opposite end. The Fisher-Lincoln automatic turntable slides out smoothly on its own base beneath the electronic heart of the system: the Fisher X-202-B stereo control-amplifier and the Fisher FM-100-B stereo tuner.



Space-saving compactness is the outstanding feature of this installation. The face panel of the turntable drawer matches the veneer of the panel holding the Fisher components. The placement of the X-202-B control-amplifier above the FM-100-B FM-multiplex tuner is not arbitrary. Rising heat from the amplifier would raise the temperature of the tuner if their positions were reversed.

The versatility of component high fidelity in custom installations is dramatically illustrated here. The single-chassis simplicity of a Fisher 500-C stereo receiver and easy access to records are noteworthy features. The entire system can be hidden by the doors that match the paneled walls.



Installation Ideas That Work

Nothing could illustrate more emphatically how component high fidelity fits into The Good Life than the magnificent Fisher installation at right. Tape deck and record player glide out on ball-bearing slides in drawers below the 400-CX preamplifier-control and the MF-300 stereo tuner. The SA-1000 power amplifier is hidden from view. The speaker pair—Fisher XP-4A's—are unobtrusively integrated into the overhead paneling. Nestling snugly between the books just above the installation is an RK-20 Remote Control unit and a Speaker Switch for powering speaker pairs in various rooms.



An existing piece of furniture in the home can often be adapted to house components. In this case, it is a large breakfront. The lower third of the cabinet houses the entire system; the Fisher 800-C stereo receiver in the center is flanked by a pair of XP-4A speaker systems.



A little ingenuity goes a long way!

This devoted fidelitarian enjoys a complete 'music wall,' as well as a wall that plays music. The former holds his components, with television, tape deck and short-wave radio. The latter (inset) illustrates how the Fisher KS-2 loudspeaker systems can be recessed. Components built in *above* the waist-high cabinet provide maximum accessibility.



Further versatility in component installation is shown in the vertical configuration of this shuttered cabinet. Built out from the wall in a corner of the room, the cabinet has the straightforward simplicity of Early American provincial furniture. Note the pull-out drawers for filing long-playing records. The third and fourth shelves, counting from the bottom, hold tape deck and record player in slide-out drawers, and both are lighted from above. And topping it all, there's the Fisher 800-C stereo receiver. Switches built into the panel on either side of the receiver enable the user to route music to different stereo speaker pairs in various rooms throughout the house — another major benefit of component high fidelity.



With the shutters closed, the installation is as unobtrusive as a door or a window of the room.

High Fidelity Terms: a Technical Glossary

AC (ALTERNATING CURRENT) A back-and-forth movement of electric charge. The rate of change of direction is called *frequency*.

ACOUSTIC FEEDBACK An undesired form of feedback, occurring whenever sound vibrations from the loudspeaker cause a turntable or pickup to vibrate, thus introducing noise into the system.

AF (AUDIO FREQUENCY) Frequency within the range of human hearing—approximately 20 to 20,000 cps. Applicable both to sound waves and the electrical signals to which the latter are converted for amplification, recording, broadcasting, etc.

AFC (AUTOMATIC FREQUENCY CONTROL) A circuit which corrects for any inaccuracy in FM tuning by 'locking in' the station being tuned. In inexpensive tuners, it is often used to achieve stability. With the temperature compensation and wide-band design incorporated in Fisher tuners, AFC is only used to provide an extra measure of tuning convenience.

AM (AMPLITUDE MODULATION) Modulation accomplished by varying the instantaneous amplitude (intensity) of the carrier. Since an AM receiver must therefore be able to detect amplitude variations, it responds equally well to naturally produced amplitude peaks: lightning, ignition interference, etc.

AMPLIFIER Any circuit or instrument which strengthens (or 'amplifies') a signal. Audio amplifiers, RF amplifiers and IF amplifiers are all used in high fidelity equipment. (See *preamplifier*, *power amplifier* and *control-amplifier*.)

AM REJECTION (AM SUPPRESSION) Since FM broadcasts consist solely of variations in *frequency*, the response of FM tuners to changes in amplitude is undesirable. This

figure, expressed in *db*, indicates how well such unwanted responses are suppressed; the higher the figure, the more effective the suppression.

AUDIO Used interchangeably with AF. Also, the science of sound recording and reproduction, including acoustics.

BANDWIDTH The range of frequencies occupied by a signal, or the frequency range which an amplifier can handle. (See *power bandwidth* and *wide-band*.)

CAPACITOR (CONDENSER) Circuit device capable of storing electric charge. It also has the property of passing alternating current while blocking direct current and of presenting a greater resistance to the flow of alternating current as the frequency decreases. These properties are all used in electronic circuits.

CAPTURE RATIO Ability of a tuner to reject unwanted FM stations and interference on the same frequency as a desired one; measured in *db*. The lower the figure, the better the tuner's performance.

CARRIER A steady RF alternating current radiated into space by a transmitter-and-antenna system. This signal, when *modulated*, is used in the transmission of all types of broadcasts. (See *modulation*.)

CASCODE Circuit, designed around two triode tubes, which provides approximately the same amplification as a pentode, but with less noise. This makes it ideal for amplification of weak FM signals.

COMPLIANCE The flexibility of a speaker cone suspension. High compliance is important in a woofer, where a flexible cone suspension is required for accurate reproduction of low-frequency signals of large amplitude. (Also applied to the flexibility of a pickup stylus at the point of suspension.)

CONTROL-AMPLIFIER A preamplifier and amplifier combined on the same chassis. This enables both sections to be matched precisely for optimum over-all performance.

CPS (CYCLES PER SECOND) The number of back-and-forth vibrations of an alternating current in one second.

CROSSOVER NETWORK Circuit for dividing the audio spectrum into two or more ranges before feeding the signals to separate 'specialized' speakers: woofer, midrange and tweeter.

DB (DECIBEL) Unit of measurement to indicate relative levels of voltage, current, power, or sound.

DC (DIRECT CURRENT) A movement of electric charge in one direction only.

DERIVED CENTER CHANNEL Monophonic composite signal derived from the *sum* or *difference* of the left and right stereo channels, often fed to an extra speaker to fill in an aural 'hole' between the left and right speakers. The signal from a *voltage-derived* center-channel output must be fed to an external power amplifier before it can drive a speaker. A *power-derived* center channel can drive a speaker directly.

DIODE A tube or semiconductor device which converts AC to DC.

EQUALIZATION Correction for nonuniform recording of low and high frequencies. For valid technical reasons, disc records are cut with low frequencies attenuated and high frequencies boosted. Equalization compensates electrically for this imbalance and produces a uniform response.

FEEDBACK Taking a portion of the amplifier output signal and 'feeding' it back to the input. *Negative* feedback tends to make an amplifier self-compensating; irregularities in the output signal (distortion) which are not present at the input are cancelled. This principle can also be used to reduce hum or noise and to correct a nonuniform frequency response.

FILTER A circuit which removes undesirable frequencies from power supplies and amplifiers. In power supplies, it removes

virtually all traces of AC (to eliminate hum). In amplifiers, it prevents amplification of objectionable frequencies, such as record scratch or turntable rumble. (See *high filter* and *low filter*.)

FM (FREQUENCY MODULATION) Modulation of a carrier by changing its instantaneous *frequency*, rather than its amplitude, in accordance with speech or music signals. By designing the FM receiver to respond only to FM, and to reject AM (caused by lightning or auto ignition pulses), noise-free reception becomes possible. This is one of the advantages of FM which has helped make it popular for high fidelity.

FREE PISTON A Fisher concept in loudspeaker design. Combines the advantages of high *compliance* and *long-throw* suspension design.

FREQUENCY Number of back-and-forth vibrations of a sound wave or alternating current in a second. Expressed in *cps*, *kc* and *mc*.

FRONT END The section of a tuner or receiver which is used to select the desired station from either the AM or FM band, and to convert the RF signal to IF. To do its job properly, a front end requires a high-gain, low-noise RF stage, a mixer and an oscillator. The degree to which a desired station can be received without interference and without adding noise is expressed by *sensitivity*, *selectivity* and *signal-to-noise ratio*. The Fisher GOLDEN SYNCHRODE and GOLDEN CASCODE front ends both excel in each of these respects.

GAIN Amount of amplification (in amplifiers or amplifying stages).

GOLDEN SYNCHRODE An exclusive Fisher-engineered FM front end which provides high gain at low noise, combined with superior image and IF rejection. It uses a single high-transconductance frame-grid triode, neutralized for stability and matched for low noise. It is used in conjunction with two Nuvistor triodes.

HARMONIC DISTORTION Undesired harmonics (overtones) which were not present in the original program material. Expressed as a percentage.

HEAT SINK A metal structure which conducts heat away from heat-sensitive semiconductor devices, such as transistors and diodes. Heat sinks are therefore especially important for reliable, conservative operation of transistors handling large amounts of power, such as those in the output stages of power amplifiers.

HIGH FILTER A circuit designed to remove undesired high-frequency noise from the program material. Such noises include record scratch, tape hiss, AM whistles, etc.

HUM An undesirable low-pitched, steady tone produced in an amplifier by the AC power frequency (60 cps) and its harmonics.

IF (INTERMEDIATE FREQUENCY) Difference frequency produced by mixing an incoming RF signal from the antenna with a signal generated in the set's oscillator. By varying the frequency of the oscillator, it is possible to keep this intermediate frequency constant, permitting its efficient amplification in fixed-tuned IF stages.

IM (INTERMODULATION) DISTORTION Distortion which results from the mixing of two or more pure tones in any nonlinear stage of the amplifier. The distortion elements, which (in contrast to harmonic distortion) are not harmonically related to the input signals, are expressed as a percentage. Because of its nonlinear nature, this type of distortion is particularly unpleasant to the ear, and therefore should be kept as low as possible.

IMPEDANCE Resistance to the flow of alternating current, expressed in ohms. In most cases, it changes with the frequency of the applied alternating current.

KC (KILOCYCLE) A thousand cps.

LIMITERS FM stages that, in addition to amplifying, reject unwanted amplitude variations (from atmospheric noise or ignition pulses) and leave a pure FM signal of constant amplitude. The FM signal fed to such stages must have a certain minimum strength for limiting to occur. As with IF stages, the more stages the better, other factors remaining equal. In order to maintain optimum limiting over a wide range of input signal strengths, several limiters with overlapping action are required.

LONG-THROW A method of speaker design where the woofer moves freely through long excursions, providing excellent low-frequency response with low distortion.

LOUDNESS CONTOUR Compensation for the ear's reduced sensitivity to low and high frequencies at low volume levels. It is achieved by boosting extreme lows and highs progressively as the volume level is lowered.

LOW FILTER A circuit designed to remove low-frequency noises from the program material. Such noises include turntable 'rumble,' tone arm resonances, etc.

MC (MEGACYCLE) A million cps.

MODULATION Process of superimposing voice, music or other intelligence on a carrier wave. (See *AM, FM, carrier.*)

MONOPHONIC (MONO) Pertaining to single-channel reproduction of sound. (See *stereophonic.*)

MULTIPLEX (MPX) Transmission of two or more channels on a single carrier so that they can be recovered independently at the receiver; in FM stereo, transmission of left-plus-right (sum) signal and left-minus-right (difference) signal on main carrier and subcarrier, respectively. The multiplex decoder in the receiver recovers independent left and right stereo channels from the multiplexed signal.

MUSIC POWER The short-term power available from an amplifier for the reproduction of program material. The music power output exceeds the RMS power rating to a greater or lesser extent. Its measurement is standardized by the Institute of High Fidelity (IHF) and represents a practical means of stating an amplifier's actual capabilities for the reproduction of program material.

NOISE Unwanted random sound created in small amounts by electronic equipment, often heard as hiss. Good design reduces it to negligible levels.

NUVISTOR A ruggedly built tube of unusually small size, originally developed for military communications in ground-to-ground and satellite systems. Because of its rigid internal structure, compact construction,

good shielding properties and excellent heat dissipation, it is ideal for use as a high-stability oscillator and low-noise mixer in front-end circuits.

OSCILLATOR Electronic generator of alternating current. Produces the signal used to mix with incoming signals in a tuner. (See *IF.*)

PEAK Maximum instantaneous voltage or power. Also, a sudden, momentary burst of sound.

PEAK POWER OUTPUT This figure is a theoretical one, used to express an amplifier's maximum short-term capabilities by taking twice the RMS power. It is not representative of the actual capabilities of an amplifier and has been superseded by the IHF music power rating.

PHASE SHIFT The 'lagging' of certain frequencies behind others as they pass through an amplifier, due to delay characteristics which depend upon frequency. In an IF amplifier, high phase shift results in high distortion, especially in multiplex reception. In an audio amplifier, high phase shift tends to produce instability, which results in audible distortion, especially at very high and low audio frequencies.

POWER AMPLIFIER A circuit configuration which produces an audio output large enough to drive a speaker. It may be built as a separate component, such as the Fisher SA-1000, or as part of a receiver, such as the Fisher 500-C.

POWER BANDWIDTH A term which states the frequency range throughout which half the rated power of an amplifier is available at rated distortion. It is determined by using a measurement procedure standardized by the Institute of High Fidelity (IHF). This specification indicates how much power is available at the critical high and low frequencies. The wider the power bandwidth, the better the amplifier.

PREAMPLIFIER A device which takes a small signal, e.g., from a tuner or record player, and amplifies it to a magnitude where it can drive a *power amplifier*. Most preamplifiers incorporate controls, like the Fisher 400-CX. It may be built as a separate component, or as part of a *control-amplifier* or of a *receiver*.

RATED POWER OUTPUT The maximum power a given amplifier can produce without exceeding its specified distortion rating.

RATIO DETECTOR A circuit in an FM tuner which converts frequency variations to amplitude variations, i.e., inaudible IF to audible AF. It is superior to the 'discriminator' circuit (which serves the same purpose) because it provides AM suppression and is more linear over a greater bandwidth.

RECEIVER A tuner, preamplifier and amplifier built on one chassis. This design approach permits precise matching of all sections for optimum over-all performance.

RECTIFIER A device which changes AC to DC. (See *diode.*)

RESISTOR Circuit device that offers resistance to the flow of alternating or direct current. When current flows through a resistor, a voltage proportional both to the current and to the resistance exists across it. This property and the fact that a resistor absorbs electric power, dissipating it as heat, are used in electronics. Resistors are made of wire, metallic film, carbon, and other materials.

RESPONSE The range of frequencies to which a tuner, amplifier, speaker, etc., will respond, and the relative amplitude with which these frequencies are reproduced.

REVERBERATION Repetitive reflection of sound (from walls, etc.). Also, the spatial effect created thereby, which adds brilliance and warmth to sound, and helps to convey the size of the studio or hall. It can also be created artificially.

RF (RADIO FREQUENCY) Alternating current of higher frequency than 15 or 20 kc. Specifically, alternating currents transmitted and received for communications or entertainment.

RMS POWER A power measurement which provides an indication of an amplifier's *sustained* power capabilities, at a specified distortion level.

RUMBLE Low-frequency noise resulting from turntable vibrations and reproduced by the amplifying system.

SELECTIVITY The ability of a tuner or receiver to reject stations on channels other than the one being received. The higher the figure (expressed in *db*), the better the selectivity.

SEMICONDUCTOR An electronic device (e.g., transistor, diode, etc.) which uses a solid material such as germanium or silicon (instead of a vacuum), as a medium to conduct electric charge. Unlike tubes, semiconductor devices need no filament to 'boil off' charges into a vacuum, and are therefore more efficient and generate less heat.

SENSITIVITY The ability of a tuner or receiver to provide usable reception of weak signals. For FM tuners, this is measured in *microvolts* (millionths of a volt) required for a given number of *db* quieting (noise suppression). The *lower* the number in microvolts, the more sensitive the tuner.

SEPARATION The degree to which two stereo signals are kept apart. Stereo effect depends upon preventing 'leakage' of program material from one channel into the other.

SIGNAL-TO-NOISE RATIO Figure in *db*, expressing the ratio of desired signal voltage to random noise voltage. Look for a *high db* figure; the better the signal-to-noise ratio, the less background noise there will be in the reproduced program material.

SOLID-STATE Pertaining to circuits and components using semiconductors.

SPEAKER SYSTEM Two or more speakers and a crossover network in one enclosure. This approach permits the designer to match speakers, crossover and enclosure for optimum performance.

STEREOPHONIC (STEREO) Pertaining to sound reproduction by means of two (or more) channels. This technique recreates the spatial effects of the original performance.

TAPE MONITOR A circuit which permits the checking of recordings by taking the signal directly from the tape, a moment after the recording is made. This is only possible on three-head tape recorders.

TONE CONTROLS Controls that affect the overall tonal balance of the music, by varying the proportion of bass and treble frequencies. Their primary use is to correct for defects in the program material and to adjust the sound characteristics to the acoustic environment of the listening room.

TRANSFORMER Electrical device which steps up or steps down the voltage. A *power transformer* is used to 'transform' 117-volt AC power ('house current') into various voltages needed to operate a tuner or amplifier. An *output transformer* is used to match the high impedance of amplifier output tubes to the low impedance of speakers.

TRANSIENT RESPONSE Ability of an amplifier, loudspeaker or pickup to follow accurately abrupt changes in volume, such as the sudden burst of sound when a drum or cymbal is struck, or a string is plucked. Good transient response is vital to 'clean' and 'crisp' over-all sound.

TRANSISTOR A solid-state device which can perform most of the functions of vacuum tubes, such as amplification, oscillation, etc. It offers certain advantages in performance. (See *semiconductor*.)

TUNER A component which receives radio broadcasts and converts them into audible signals (*audio*). It may be built on a separate chassis, or as part of a *receiver*.

TWEETER A speaker designed to reproduce the treble (high) frequencies, such as the higher overtones of the violin and the tones of the piccolo.

WIDE-BAND Capable of passing a broad range of frequencies (said of a tuner or amplifier). This is especially vital to good multiplex reception, and for faithful audio reproduction.

WOOFER A speaker designed to reproduce the bass (low) frequencies, such as those of a bass viol or tuba.

WOW A wavering of pitch which is due to minute variations in turntable or tape recorder speed.

Fisher High Fidelity Stereo Components

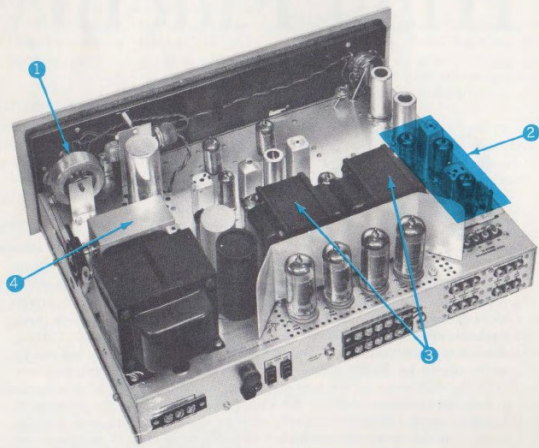
Even if you are a newcomer to high fidelity, you are undoubtedly aware of the significance of the Fisher name on a component. Fisher has been the gold standard of audio professionals and quality-conscious music lovers since the earliest days of the hi-fi era. (Your favorite FM station most probably monitors and relays its own broadcasts with a Fisher tuner.) However, you may not be fully aware of the uniquely *wide* choice of equipment offered by Fisher today. The pages that follow will acquaint you with the full scope of the current Fisher models.

It is an important part of the Fisher philosophy that the component buyer is entitled to select precisely what he needs — and no more than he needs. For this reason Fisher makes virtually every type of component in every category. But the basic standard of fidelity is the same for all Fisher equipment; the simpler models do not *sound* strikingly different from the more elaborate and costly ones. The advantage of the latter lies mainly in their greater versatility and an extra margin of performance for specialized needs or particularly demanding circumstances. All Fisher components, regardless of price, will give you distortion-free stereo reproduction plus unqualified durability in service.

No matter what you buy from Fisher, it will always *sound* like a Fisher.



Everything You Need — All on *One* Compact Chassis!



The Fisher 400

- 1 Heavy flywheel for smooth and effortless tuning.
- 2 Time-division multiplex section.
- 3 Heavy-duty output transformers with grain-oriented, laminated steel cores.
- 4 GOLDEN SYNCHRODE front end.

A World-Famous Fisher Concept: All-in-One Stereo Receivers

These best-selling instruments combine the tuner, amplifier and controls of an advanced stereo system on *one* compact chassis. Simply connect a pair of speakers and you are ready to play — and *outplay* other systems.

The Fisher 400

65-Watt FM-Multiplex Stereo Receiver

Incorporating a high-sensitivity FM-multiplex tuner, a flexible stereo preamplifier and a 65-watt (IHF Standard) stereo power amplifier, the Fisher 400 represents an outstanding receiver at a price even the most economy-minded music lover can afford. No compromise was made in the essential design characteristics, in the quality of workmanship, or in the rigorous test procedures and standards characteristic of the finest Fisher products.

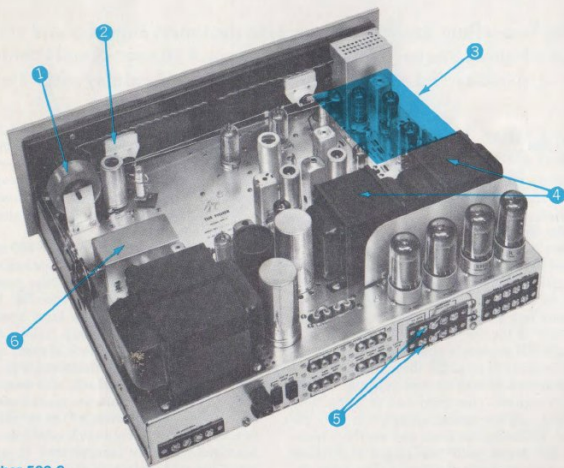
In the FM section, a new front end of exceptional sensitivity employs three tuned circuits for increased selectivity and rejection of unwanted signals. The front end is completely shielded, and the tuning capacitor is fully enclosed. Following the front end are three wide-band IF stages, with two stages of limiting (including the ratio detector.) The ratio detector, which utilizes a matched pair of germanium diodes, is linear over an extremely wide range. This results in accurate detection of even the most complex multiplex signals and in lowest distortion on monophonic FM. The multiplex demodulator utilizes the superior time-division method and incorporates the

STEREO BEAM indicator, plus a stereo filter to eliminate background noise on weak multiplex signals without impairing the treble portion of the stereo program material. The STEREO BEAM tube is also used as a tuning indicator, for microaccurate tuning on both mono and stereo broadcasts.

The audio control center of the 400 includes all the most-wanted features, including tone controls, balance control, loudness compensation, a sharp-cutoff high frequency filter, a speaker on-off switch and tape monitoring facilities. Separate bass and treble controls, with the Fisher friction-lock system, are provided for each channel. Monitored tape recording and immediate playback, with unrestricted use of all audio controls, are made possible by the exclusive Fisher DIRECT TAPE MONITOR system. A single selector switch combines all the functions normally incorporated in separate input and mode selectors, thus greatly increasing the convenience and simplicity of operation. Other extras include a center-channel output (for a separate power amplifier), choice of 'normal' or 'local' antenna inputs to prevent overloading on strong local signals, and DC on all filaments of the low-level audio stages to reduce hum and noise to inaudible levels.



Everything You Need — All on *One Compact Chassis!*



The Fisher 500-C

- 1 Heavy flywheel for smooth and effortless tuning.
- 2 D'Arsonval tuning meter.
- 3 Time-division multiplex section.
- 4 Heavy-duty output transformers with grain-oriented, laminated steel cores.
- 5 Power-derived center channel.
- 6 GOLDEN SYNCHRODE front end.

The Fisher 500-C 75-Watt FM-Multiplex Stereo Receiver

Here, without question, is the industry standard. Incorporating the most advanced principles not only of electronic design but also of 'human engineering,' the 500-C is capable of achieving maximum performance in the hands of novice and audio connoisseur alike.

Perhaps the best way to understand the reasons for the superiority of the 500-C is to follow a signal through the entire receiver. The first group of circuits encountered by an incoming FM broadcast signal are those of the new *Nuvistor-GOLDEN SYNCHRODE* front end, which affords far higher sensitivity, a wider overload margin, and better rejection of spurious and image signals than previous designs. Low-noise nuvistors, used for both mixer and oscillator, provide a higher degree of mechanical and electrical stability, and a better signal-to-noise ratio. The signal is then amplified by four wide-band IF stages and is converted to an audio signal by a wide-band ratio detector that utilizes two balanced germanium diodes. The high amplification of these IF stages, combined with the progressive action of three limiters (including the ratio detector), assures a maximum degree of freedom from noise and interference.

The detected audio signal is fed to the circuits of the famous Fisher *STEREO BEACON*. Here the receiver senses whether the signal is of a monophonic or a stereophonic broadcast. If the broadcast is stereo, the receiver is automatically switched into the stereophonic mode of operation. A newly developed electronic switch in the *STEREO BEACON*, utilizing four silicon diodes to eliminate all clicks and pops from the loudspeakers during switching, routes the signal to the multiplex converter. The converter is of the superior time-division type and consists of two balanced 4-diode bridges and a 38-kc synchronous oscillator, acting as an elec-

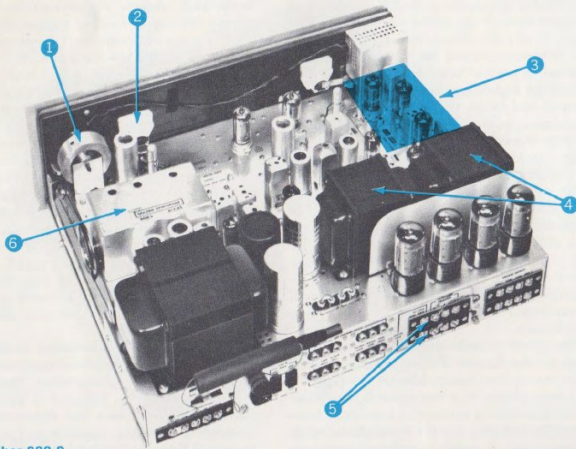
tronic switch. Various exclusive circuit refinements prevent the receiver from switching into the stereophonic mode of operation through false triggering due to noise pulses or high-frequency audio transients. The tuning meter, which is included to provide pinpoint tuning accuracy, also indicates the point of lowest distortion, greatest separation and highest AM suppression.

From the multiplex section the signal goes to the audio stages. The preamplifier section offers a full complement of audio controls, including separate friction-lock bass and treble controls, high and low sharp-cutoff filters, plus a front-panel headphone jack. A four-position speaker selector switch is provided, permitting the receiver to act as the control center for both the main set of speakers and one or more remote speaker installations. The same switch silences all speaker systems for completely private listening with headphones. The exclusive Fisher *DIRECT TAPE MONITOR* permits monitoring while a tape is being recorded, followed by immediate playback with full use of all audio control facilities—without any change in cable connections. For greatest simplicity and most convenient operation the separate mode selector and input selector switches normally found on stereo amplifiers are now combined in a single switch.

From the preamplifier-control section the signal finally passes into the left-channel and right-channel power amplifiers. These are capable of a combined output of 75 watts (IHF Standard) at extremely low distortion, with outstanding transient response and stability. At normal listening levels the distortion is virtually nonmeasurable. It is inaudible at all levels. Advanced circuitry is combined with superior, oversize output transformers to make this performance possible. A derived 'third' power output is provided in addition to the left and right speaker connections, for either center-channel use or an extension speaker.



Everything You Need — All on *One Compact Chassis!*



The Fisher 800-C

- 1 Heavy flywheel for smooth and effortless tuning.
- 2 D'Arsonval tuning meter.
- 3 Time-division multiplex section.
- 4 Heavy-duty output transformers with grain-oriented, laminated steel cores.
- 5 Power-derived center channel.
- 6 Integrated AM and FM sections with fully shielded GOLDEN SYNCHRODE front end.

The Fisher 800-C 75-Watt AM-FM-Multiplex Stereo Receiver

This superb receiver is identical to the 500-C as described on page 37, except that it includes, in addition, a high-performance AM tuner section. The AM circuitry features a

high-gain pentode RF amplifier, a pentagrid converter, and an IF amplifier with switchable bandwidth. (A front-panel switch selects either 'broad,' for widest frequency response, or 'sharp,' for maximum selectivity.) A high-sensitivity ferrite rod AM antenna is mounted outside the chassis of the 800-C, for best possible reception.

Technical Features and Specifications of Fisher Receivers

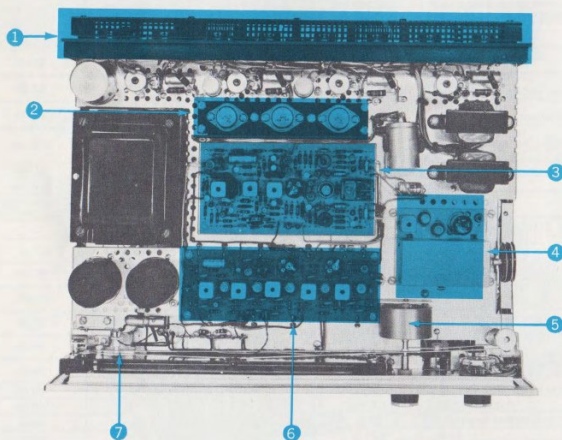
AMPLIFIER SECTION	400	500-C	800-C	600-T
Total Music Power (IHF Standard)	65 watts	75 watts	75 watts	110 watts
Harmonic Distortion (at 1 kc and rated output)	0.5%	0.5%	0.5%	0.5%
RMS Power (0.7% harmonic distortion at 1 kc, left/right)	28/28 watts	32/32 watts	32/32 watts	45/45 watts
IM Distortion (60 cps + 7 kc, 4:1)	0.8% at 30 watts, both channels	0.7% at 35 watts, each channel	0.7% at 35 watts, each channel	0.5% at 45 watts, each channel
Frequency Response: Overall	25-25,000 cps ± 1 db	25-25,000 cps ± 1.5 db	25-25,000 cps ± 1.5 db	20-25,000 cps ± 1 db
Frequency Response: Power Amplifier Section	10-40,000 cps + 0, -2 db	5-45,000 cps + 0, -2 db	5-45,000 cps + 0, -2 db	5-50,000 cps + 0, -2 db
Hum and Noise (High Level Input)	80 db below rated output	80 db below rated output	80 db below rated output	90 db below rated output
Channel Separation (at 1 kc)	50 db	50 db	50 db	55 db
Bass Controls (total variation at 50 cps)	22 db	23 db	23 db	32 db
Treble Controls (total variation at 10 kc)	22 db	23 db	23 db	26 db
Input Sensitivity (for rated output)				
Phono Low	4.4 mv	3.3 mv	3.3 mv	2.8 mv
Phono High	14 mv	13 mv	13 mv	5.5 mv
Tape Head	2.8 mv	2.5 mv	2.5 mv	1.8 mv
Aux	280 mv	230 mv	230 mv	380 mv High; 210 mv Low
FM TUNER SECTION				
Usable Sensitivity (IHF Standard)	1.8 μv	1.8 μv	1.8 μv	1.8 μv
Signal-to-Noise Ratio (100% Modulation)	70 db	70 db	70 db	70 db
Selectivity (alternate channel)	60 db	60 db	60 db	55 db
IF Rejection (at 100 Mc)	85 db	90 db	90 db	90 db
Image Rejection (at 100 Mc)	57 db	65 db	65 db	65 db
FM Harmonic Distortion (400 cps, 100% Modulation)	0.5%	0.5%	0.5%	0.4%
FM Stereo Separation (at 1 kc)	35 db	35 db	35 db	40 db
Capture Ratio	2.5 db	2.5 db	2.5 db	2.0 db
Calibration Accuracy	0.2%	0.2%	0.2%	0.2%
Drift	0.01%	0.01%	0.01%	0.01%
AM TUNER SECTION				
Sensitivity (for 2 watts output, at 1 mc)			5 μv	
Selectivity (SHARP position, at 1 mc)			55 db	
Image Rejection (at 1 mc)			70 db	
IF Rejection (at 1 mc)			80 db	
Dimensions	17½" wide 5¾" high 13" deep	17½" wide 5¾" high 13½" deep	17½" wide 5¾" high 13½" deep	16¾" wide 5¾" high 11¾" deep
Weight	30½ lbs.	36½ lbs.	37 lbs.	31 lbs.

Because its products are subject to continuous improvement, Fisher Radio Corporation reserves the right to modify any design or specification without notice and without incurring any obligation.

All Fisher high fidelity components operate on 50 to 60-cycle AC current.



Everything You Need — All on *One Compact Chassis!*



The Fisher 600

- 1 Four-transistor-per-channel output stage, with massive heat sink.
- 2 Driver transistors and power supply stabilizer.
- 3 Solid-state time-switching multiplex section.
- 4 Nuvistor-GOLDEN SYNCHRODE front end.
- 5 Heavy flywheel for smooth and effortless tuning.
- 6 Five IF stages.
- 7 D'Arsonval tuning meter.

The Unique Fisher 600 Transistor Stereo Receiver

Behind the sculptured, gold-plated panel of this new FM-multiplex stereo receiver is circuitry that represents the latest in solid-state technology and provides the ultimate in both RF and audio performance. The 600-T combines an ultrasensitive FM-multiplex tuner, a versatile preamplifier-control unit with unusually low distortion and noise, and a power amplifier capable of exceptionally clean reproduction even at the highest power levels — all on one extremely compact chassis. This combination of advanced designs results in a receiver that will pull in the weakest of signals and is powerful enough to drive the most inefficient of speaker systems to their maximum output.

Three main design goals were established for the 600-T. First and foremost was performance. Using several newly developed transistor types, significant advances were made in almost every circuit of the receiver. The results are evident everywhere, from the superior sensitivity characteristics of the FM front end and the unprecedented stereo separation of the multiplex section, to the effortless and 'transparent' sound of the amplifier.

Secondly, it was required that the receiver be able to maintain its superior performance over long periods of the most demanding, continuous use. This was assured by designing the receiver for operating conditions many times more severe than those it is likely to encounter in normal use. Here again, transistors provide a singular advantage. The practically indefinite operating life and very low operating temperatures of solid-state circuitry make possible greatly extended component life and peak performance over indefinitely long periods of time.

Lastly, the receiver was designed for compactness. Because of the inherently smaller size of transistors and the reduced size of associated components, plus the use of a design

that eliminates the need for output transformers, the 600-T is less than 12 inches deep, despite its tremendous power capabilities.

AMPLIFIER SECTION:

- 110 watts total IHF Standard music power output at 8 ohms.
- 45 watts per channel RMS power output at 8 ohms.
- 12 to 35,000 cps IHF power bandwidth.
- No output transformers—therefore no limitation of bass performance or of transient response because of transformer characteristics.
- Four output transistors in *each* channel for conservative operation at high power (instead of the conventional *two*).
- Impedance selector switch, for best possible match of output impedance to 4-ohm, 8-ohm or 16-ohm speakers.
- Exclusive Fisher DIRECT TAPE MONITOR.

TUNER SECTION:

- 1.8 μ v FM sensitivity (IHF Standard).
- Exclusive Fisher *Nuvistor-GOLDEN SYNCHRODE* FM front end, for highest sensitivity and lowest noise, plus overload resistance beyond the capabilities of transistor front ends.
- Five wide-band IF stages and five limiters.
- Wide-band (one megacycle) ratio detector of highest linearity and lowest distortion, capable of unusually accurate detection of multiplex signals.
- Better than 40 db multiplex stereo separation at 400 cps — *an industry first*.
- Exclusive Fisher STEREO BEACON for automatic switching between FM-mono and FM-stereo modes, and automatic visual indication of stereo broadcasts.
- Variable-threshold muting, with front-panel threshold adjustment and defeat.
- D'Arsonval tuning meter for perfect center-of-channel tuning.

(Complete specifications on page 39.)

The World's Most Advanced Multiplex Stereo Tuners

The seven stereo tuners currently made by Fisher range from superior to incomparable. Each of them features extremely high front-end sensitivity, wide-band design, multiplex circuitry of the highly preferable time-division type.



The Fisher FM-90-B
FM-Multiplex Stereo Tuner

This instrument ranks among the finest FM tuners available anywhere and is considered the logical choice for those who *must* have Fisher quality, but at moderate cost. All the essentials required for flawless reception—superior sensitivity, outstanding multiplex reception and automatic mono-stereo signalling—are present. Even a front panel tape jack is included to provide an accessible receptacle for the tape recording of broadcast material.

The new Fisher three-gang GOLDEN SYNCHRODE front end is followed by three IF stages and two limiters and attains a sensitivity of 2.0 microvolts (IHF). Rated harmonic distortion is a low 0.5%. The multiplex section, engineered for use with wide-band IF stages and ratio detectors, produces outstanding stereo separation (35 db IHF).

CONTROLS: Selector (Mono, Stereo, Stereo Filter); Power (AC Off, On); Tuning.



The Fisher FM-100-C
FM-Multiplex Stereo Tuner

Even if you are not technically minded, you cannot help but appreciate the operational simplicity and ingenious conveniences inherent in the FM-100-C. Here is a tuner of advanced design that is, quite literally, a model of perfection.

It features highly advanced muting circuitry, with the muting threshold adjustable via a front panel control.

STEREO BEACON automatic switching and a front-panel tape jack are among the other features.

The *Navistor*-GOLDEN SYNCHRODE front-end, followed by 4 IF stages and 3 limiters, and the transistorized, multiplex section of the superior time-division type, bring this instrument into the class of fully professional components. The sensitivity is an unusual 1.8 microvolts; capture ratio—2.2 db; selectivity: 60 db.

CONTROLS: Selector (Mono, Automatic, Stereo Filter); Muting; Tuning.



The Fisher R-200
AM-FM-Multiplex Stereo Tuner

This tuner combines superlative AM reception with the outstanding FM performance characteristics of Fisher tuners. Incorporating a wide-band FM-multiplex tuner and a variable-bandwidth AM tuner, it exemplifies the uncompromising Fisher engineering philosophy in every way.

The FM section of the tuner consists of a GOLDEN SYNCHRODE front end, followed by five IF stages, four limiters, and a wide-band ratio detector. This circuit configuration results in an IHF sensitivity of 1.6 microvolts, a signal-to-noise ratio of 70 db, and a 1.8 db capture ratio. With Fisher multiplex circuitry employing the superior time-division method of demodulation, the R-200 offers superb stereophonic reception, with lowest distortion and highest separation. All manual switching between the stereophonic and monophonic modes of reception has been eliminated by means of the exclusive Fisher STEREO BEACON. When the R-200 is tuned to a stereophonic broadcast, the tuner automatically switches into the stereophonic mode of operation. When changing to a monophonic station, or at the end of the stereo broadcast, the unit automatically returns to the monophonic mode. A d'Arsonval tuning meter is also included, for precise tuning of both AM and FM.

The AM tuner section consists of an RF amplifier, an oscillator-mixer, two IF stages, and a solid-state detector. The IF amplifier has variable bandwidth, governed by the setting of a front-panel switch, so that the AM section can be set for maximum fidelity or maximum selectivity, as receiving conditions dictate. Automatic volume control is also incorporated, to prevent fading or blasting due to changes in signal strength.

CONTROLS: Selector (AM, FM, FM Automatic, FM Stereo); Stereo Filter (Off/On); FM Muting; AM Bandwidth (Sharp, Normal, Wide); FM Antenna (AC Off, Normal and Local positions); Tuning.



The Fisher FM 200-C
FM-Multiplex Stereo Tuner

Rarely has an FM tuner, intended primarily for home use, so closely approached the highest of laboratory standards.

Although surprisingly simple to operate, the FM-200-C yet provides a full complement of convenience features, including variable threshold muting and STEREO BEACON automatic switching. The exclusive MICROTUNE® circuit enables you to apply automatic frequency control and thus correct even the most minute of tuning errors. AFC is automatically and temporarily disconnected the moment your hand touches the tuning knob, for dead-accurate, manual tuning.

Another unique convenience feature is AUTOSCAN (Automatic Stereo Broadcast Scanner). This exclusive Fisher engineering development permits only the reception of stereo broadcasts, and mutes all monophonic signals as one tunes across the dial.

As one might expect, performance is exceptional. And if its 1.8 microvolt (IHF) sensitivity were not enough, the FM-200-C also boasts such unequalled specifications as its astonishing capture ratio of 1.5 db; harmonic distortion of 0.4%; stereo separation of 40 db. It has no less than *five* IF stages and *four* limiters, combined with a *Navistor*-GOLDEN SYNCHRODE front-end.

CONTROLS: Selector (Mono, Automatic, Stereo, Stereo Filter); Muting; Variable AFC; Tuning.

Tuners (continued)



The Fisher MF-300 Remote-Control FM-Multiplex Stereo Tuner

Here is a prime example of the genius for engineering that has made the Fisher name famous for more than a quarter of a century. The MF-300 combines a tuner of the highest sensitivity and lowest distortion with the TUNE-O-MATIC® circuit for automatic station selection. The latter may be activated either from the front panel, or by remote control if desired. Critical tuning is accomplished automatically by a specially designed center-of-channel detector, which stops the motor-powered tuning mechanism at the point of maximum signal, greatest stereo separation and lowest distortion. The need for a tuning meter is eliminated; extended use tests indicate that the TUNE-O-MATIC circuit tunes, on the average, three times more accurately than one can tune manually, even with the greatest care.

The tuner is outstanding quite aside from its automatic features. Using the celebrated GOLDEN CASCADE front end with *four* tuned circuits, followed by five IF stages and five limiters, the MF-300 achieves the remarkable IHF sensitivity of 1.6 microvolts. The multiplex section, which uses the superior time-division system of demodulation, achieves a separation of 35 db.

Several other features of the MF-300 make for unusually convenient, enjoyable operation. The exclusive Fisher STEREO BEACON, a circuit which completely eliminates the need for manual mono-stereo switching, automatically signals the presence of a stereo program and automatically switches the tuner to the proper mode of operation. Switching between the mono and stereo modes is completely silent—

no clicks or pops are ever heard from the speakers. A switchable stereo filter eliminates noise on stereo broadcasts, without changing the unit's frequency response. Also included is a three-position muting switch, to silence interstation noise and to set the sensitivity of the TUNE-O-MATIC® circuit to suit local receiving conditions. In addition, adjustable-strength AFC is provided to achieve the highest possible tuning accuracy. For best tuning, the AFC is not switched on until the dial pointer has come to rest on-station.

A hand-held wire remote-control unit, Model RK-10, is included with the MF-300. It permits remote-control tuning at distances up to 30 feet.

CONTROLS: Selector (Mono, Automatic, Stereo); Stereo Filter (On/Off); Muting (Off, Normal, Maximum); TUNE-O-MATIC; Variable AFC (Off, Normal, Low); FM Antenna (AC Off, Normal and Local positions); Tuning.



The Fisher RK-20 and RK-15

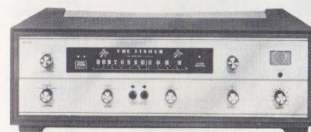
The Model RK-20 wireless remote control makes it possible to select stations and control the volume and on-off power of the high fidelity system from across the room, without any wire connections. Consisting of a hand-held transmitter and a receiver that connects to the MF-300 tuner and to an amplifier or preamplifier, the RK-20 enables you to control all the important functions of the system from your easy chair, at a flick of the wrist. To extend the control of system functions offered by the RK-20 to other rooms or listening areas, Fisher makes the RK-15 *wire* remote-control adapter,

The Exclusive Fisher STEREO BEACON

This remarkable Fisher invention is an exclusive feature of Fisher tuners and receivers. The STEREO BEACON lights up whenever the dial is tuned to a stereophonic broadcast, goes out when the broadcast is monophonic. At the same time, the multiplex section is automatically and silently switched to the correct mode of operation, mono or stereo.



which plugs into the RK-20. This hand-held control, equipped with 40 feet of cable, operates in the same manner as the RK-20 transmitter. With additional cable, remote control stations can be installed in any part of the home or patio.



The Fisher MF-320 Wireless Remote-Control FM-Multiplex Stereo Tuner

This unit is a combination of the MF-300 tuner and the RK-20 wireless remote-control system in a single walnut cabinet and with a single, integrated control panel. All information given above about the latter two models applies equally to the MF-320.



The Fisher FM-1000 FM-Multiplex Stereo Tuner

The FM-1000 (also available in a rack-mounting version as the FMR-1) is the industry standard for monitor-quality FM stereo reception. The unrivalled performance and versatility of this magnificent instrument not only make it the finest tuner ever built by Fisher but place it in a class apart from all others.

The remarkably sensitive GOLDEN CASCADE front end, incorporating *four* tuned circuits and two low-noise novistors, provides matchless sensitivity, selectivity and overload rejection. The *six* IF stages, five cascaded progressive-action limiters and matched-diode ratio detector guarantee the clearest and most enjoyable monophonic and stereophonic reception, even from the weak and distant stations whose presence is not audible on other tuners. By using extremely wide-band design throughout, dynamic and frequency response are sustained at the highest possible levels, while distortion products are kept to an absolute minimum. This is especially important for multiplex. The multiplex circuitry of the FM-1000 represents the most advanced state of the art, achieved by sophisticated application of the superior time-division demodulation technique. Stereo separation, for example, exceeds FCC broadcast standards by a wide margin. The tuner also includes the exclusive Fisher STEREO BEACON, which automatically indicates the presence of stereo signals and completely eliminates the need for manual mono-stereo switching.

Also included is the exclusive Fisher MICRO-TUNE® circuit, which deactivates the AFC during tuning and restores it when your hand leaves the tuning knob. Stereo noise is suppressed by a filter which does not change the frequency response of the tuner. Interstation noise, a frequent source of irritation, is suppressed by instant-action muting, which functions in all modes of tuner operation.

In addition to these many extraordinary features, the FM-1000 incorporates a full complement of professional controls and indicators, such as the calibrated front-panel VU meter and range switch, front end attenuator, switch for selection of 300-ohm or 72-ohm antenna inputs, diversity control and field-strength meter output, and built-in provision for installing a crystal-controlled front end and 600/150-ohm matching transformers.

CONTROLS: Selector (Mono, Automatic, Stereo Filter, Stereo); Audio Level; Power (Off/On); VU Meter Range; Muting; Variable AFC; Front End (Distant or Local, on either Tunable or Crystal); Tuning.

The Superb Fisher TFM-300 Transistor FM Stereo Tuner



This entirely new solid-state tuner is a masterpiece of electronic design. Its circuitry represents the ultimate in solid-state technology and the latest ideas of the engineering group responsible for a long line of distinguished tuners. To develop the TFM-300, Fisher engineers created an extremely sensitive wide-band tuner, a superior multiplex circuit, and an improved version of the exclusive Fisher STEREO BEACON.

First and foremost in the design of the TFM-300 was performance. The tuner was to provide outstanding sensitivity, selectivity and noise rejection, to permit superior reception even in the most difficult locations. Furthermore, it was required that the TFM-300 be capable of very high overload rejection in order to permit its use even in close proximity to high-powered broadcasting stations.

In addition, the tuner was to maintain its performance over long periods of the most demanding continuous use. This last requirement was satisfied by designing the unit for operating conditions many times more severe than it is likely to encounter in normal use. Here, transistors provide significant advantages. The practically indefinite operating life and very low operating temperatures of solid-state circuitry make possible greatly extended component life, markedly increased stability, and peak performance over indefinitely long periods of time.

The remarkable IHF sensitivity of 1.8 microvolts is assured by the exclusive *Navistor*-

GOLDEN SYNCHRODE front end, and the five IF stages and five limiters. The IF strip has extremely low phase shift, while the front end combines the highest sensitivity with an overload rejection unattainable when using transistors alone. A ratio detector with a one-megacycle bandpass follows the limiters and assures optimum detection of multiplex signals, in addition to an unusually good capture ratio. The multiplex section is of the superior time-division type, utilizing a symmetrical transistor switch and a 38-ke synchronous oscillator. This circuit reduces noise to the theoretical minimum and achieves the greatest possible stereo separation—more than 40 db at 400 cps, an industry *first*. Manual switching between the stereophonic and monophonic modes of operation is completely eliminated by the automatic STEREO BEACON, which uses a hermetically sealed relay with solid-gold contacts for long, trouble-free life.

All stages are aligned with special care, so that the maximum reading of the d'Arsonval-type tuning meter indicates the point of lowest distortion, maximum AM suppression and greatest channel separation.

In addition, the TFM-300 incorporates variable-threshold muting, controlled by a front-panel switch, plus a stereo filter, which eliminates noise on weak multiplex signals without affecting frequency response.

CONTROLS: Power (Off/On); Level; Muting; Push-Button Selector (Filter, Stereo, Automatic, Mono); Tuning.

Technical Features and Specifications of Fisher Tuners

	FM-90-B	FM-100-C	FM-200-C	TFM-300	MF-300	FM-1000 (FMR-1)	R-200
Frequency Response* (in cps.)	20-15,000						
Sensitivity (IHF)	2.0 μ v	1.8 μ v	1.8 μ v	1.8 μ v	1.8 μ v	1.5 μ v	1.8 μ v
Signal-to-Noise Ratio (100%)	70 db	70 db	70 db	70 db	75 db	75 db	70 db
Selectivity (Alternate Channel)	55 db	60 db	65 db	55 db	65 db	66 db	65 db
Capture Ratio (IHF)	2.5 db	2.2 db	2.0 db	2.0 db	2.0 db	1.5 db	2.0 db
Harmonic Distortion (100% Mod.)	0.5%	0.5%	0.4%	0.4%	0.3%	0.3%	0.4%
Front-End Circuit	3-Gang GOLDEN SYNCHRODE		NUVISTOR GOLDEN SYNCHRODE			Four-Gang GOLDEN CASCODE	GOLDEN SYNCHRODE
FM IF Stages	3	4	5	5	5	6	5
FM Wide-Band Limiters	2	3	4	5	5	5	4
Wide-Band Ratio Detector	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stereo-Mono Automatic Switching	No	Yes	Yes	Yes	Yes	Yes	Yes
FM-Stereo Separation (at 1 kc.)	35 db	40 db	40 db	40 db	35 db	35 db	35 db
Stereo Indicator	STEREOSCAN		STEREO BEACON				
Interstation Muting	No	Yes	Yes	Yes	Yes	Yes	Yes
Number of Tubes	8	8	12	3	16	18**	15
Number of Diodes	9	9	12	9	24	15	19
Number of Transistors	None	8	8	16	None	None	None
Permanent Bridge-Type Rectifiers	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rated Audio Output	2.0 volts						
Dimensions	15-1/8" wide, 4-13/16" high, 11-7/8" deep					16-15/16" W 4-13/16" H 12 1/4" D	15 1/4" wide 4-13/16" high 11 1/8" deep
Weight	12 lbs.	13 lbs.	13 lbs.	9 lbs.	17 1/2 lbs.	20 lbs.	19 lbs.
Cabinetry	Choice of walnut, Model 50-UW				10-UW	Walnut, 20-UW	Walnut, 10-UW

*The frequency response shown represents the audio frequency range transmitted by the FM stations. The actual bandwidth of Fisher tuners is considerably greater.

**Less crystal front end.

Because its products are subject to continuous improvement, Fisher Radio Corporation reserves the right to modify any design or specification without notice and without incurring any obligation.

All Fisher high fidelity components operate on 50 to 60-cycle AC current.

The Famous Fisher Integrated Stereo Control-Amplifiers



The Fisher X-100-C
50-Watt Stereo Control-Amplifier

Although the wide operational versatility and high performance standard of the X-100-C appear beyond its moderate cost, it is nevertheless the first low-cost control-amplifier with all the well-known Fisher qualities including *long-term* reliability, ease of operation, and an overwhelming abundance of convenience features.

The X-100-C has a 50-watt amplifier (IHF) with a low 0.5% harmonic distortion—the result of careful design and the use of top high quality parts throughout. Over-all frequency response is 20 to 20,000 cps, assuring faithful reproduction of a full orchestra or grand organ. The Fisher genius for designing and engineering components with an inordinately wide frequency range and uniform response throughout that range is not only valid at low power (or 'normal listening levels' of only 1 watt) but at full output as well. Audible hum and noise are totally absent, whether in the softest of *pianissimo* passages, or full-throated orchestral passages. Hum and noise are at a very conservative 88 db below rated output. Superior technical specifications usually reflect only one facet of Fisher engineering capability.

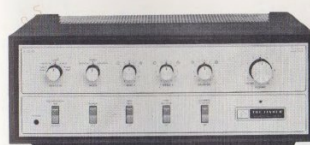
Convenience features, another important criterion, are very readily apparent in the front-panel controls. The X-100-C has a front-panel jack for stereo headphones, with a speaker silencing switch for private stereo listening. The exclusive Fisher DIRECT TAPE MONITOR permits tape monitoring followed by instantaneous playback with *full use* of all audio controls. A high-frequency filter of the sharp-cut-off type facilitates noise-free listening as well as cleaner tape recordings (because it operates *before* the recorder output). These are the *essential* conveniences one requires for today's *advanced* stereophonic systems.

They are not confined to the front panel controls; in the preamplifier a separate section of the power supply applies DC to the filaments of all critical tubes, for lowest hum and noise content. Type 7868 Novar output tubes are employed in the output stages to provide larger amounts of reserve power, plus high heat dissipation for longer tube life.

Another typical essential is a power-derived center-channel output to drive a *third* speaker, either for three-channel stereo or for remote mono. In either case, there is no longer any need for an *additional* amplifier to do the job.

CONTROLS: Input Selector (Tape Head, Phono, Tuner, Auxiliary and Tape Play positions); Mode Selector (Mono, Stereo and Reverse positions); Left/Right Bass (concentric); Left/Right Treble (concentric); Balance; Volume (including AC Off).

SWITCHES: Tape Monitor (On/Off); Speakers (On/Off); High Filter (On/Off); Loudness Contour (On/Off).



The Fisher X-101-D
66-Watt Stereo Control-Amplifier

Here is an amplifier designed for a very particular type of person—discriminating in his musical taste, unwilling to compromise on quality, but who, at the same time, must have the complete ease of handling in spite of full-range flexibility of controls.

The X-101-D represents a goodly degree of technical sophistication at its finest, includes a control panel that is highly advanced in total functions, and simplicity of design, and provides superior performance.

The sixty-six watts of music power (IHF) are more than enough to drive the most inefficient of speaker systems to full and glorious volume. Harmonic Distortion is a low 0.5%.

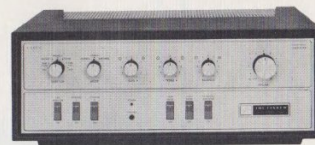
The X-101-D abounds with a treasure-house of convenience and comfort features. The exclusive Fisher DIRECT TAPE MONITOR permits correct monitoring during tape recording *without disabling any control function* for tape playback.

An equalization switch for phono and tape provides accurate compensation for recording characteristics, eliminates excessive high-frequency noise and restores the shape of the original wave-form. The power-derived center-channel enables one to enjoy a *third* speaker for 'three-channel' stereo or a remote monaural speaker. All types of headphones may be connected to the front-panel receptacle. The magnificent panel is die-cast and 24-carat gold plated.

A front-panel jack for headphones and speaker silencing switch is also included.

CONTROLS: Input Selector (Microphone, Tape Head, Phono 1, Phono 2, Tuner, Tape Play and Auxiliary); Mode Selector (Mono, Stereo and Reverse positions); Left/Right Bass (concentric); Left/Right Treble (concentric); Balance; Volume (including AC Off).

SWITCHES: Equalization (Tape/Phono); High Filter (On/Off); Speakers (On/Off); Tape Monitor (On/Off); Loudness Contour (On/Off).



The Fisher X-202-C
84-Watt Stereo Control-Amplifier

The X-202-C is the logical choice for those who seek everything that is truly exemplary in amplificatory components — exceptional performance, extreme flexibility, operational versatility combined with an ease of use that the layman can enjoy and an engineer can admire.

It is designed for the audiophile, music lover and discerning audio connoisseur who *must* have the best.

As an instrument designed to be the virtual 'electronic brain' of any stereo system including the most professional, the X-202-C is amazingly versatile. Its eighteen inputs and ten outputs will accommodate every type of cartridge, tape head, tape recorder, and tuner currently available.

Some of its convenience features are noteworthy: *two sets of low-level phono, and a microphone input* to enable the amplifier to be used, if necessary, as a public address system. This instrument also provides instant switching from any source to the tape recorder, *without* changing cable connections. Two sets of speaker-silencing switches enable one to control two stereo speaker systems from one panel. The loudness contour control corrects even the most minute imbalance of the signal at the low and high frequency ends, for perfectly natural sound reproduction.

A front-panel headphone jack accepts a set of stereo or mono headphones. The X-202-C has facilities for three-channel stereo or remote mono.

CONTROLS: Input Selector (Microphone, Tape Head, Phono 1, Phono 2, Tuner, Tape Play and Auxiliary); Mode Selector (Mono, Stereo and Reverse positions); Left/Right Bass (concentric); Left/Right Treble (concentric); Balance; Volume (including AC Off).

SWITCHES: Tape Monitor (On/Off); Speakers 1 (On/Off); Speakers 2 (On/Off); Low Filter (On/Off); High Filter (On/Off); Loudness Contour (On/Off).



The Fisher 400-CX



The Fisher SA-1000

The Ultimate in Stereo Amplification: the Fisher *Laboratory Standard Series*

Here, in two separate units, is the largest, most elaborate and most perfect amplifier system ever produced by Fisher. There exists no closer approach to the engineer's theoretically 'ideal' amplifier—at any price.

The Fisher 400-CX

Stereo Master Control and Preamp

This unique instrument represents a monumental advance in preamplifier design and construction. It was created for the audio connoisseur and professional user who seeks the widest possible flexibility combined with the highest achievable performance.

Eighteen inputs and twenty-two logically grouped controls and switches are available to implement every conceivable selector and audio control function in any stereo installation, no matter how elaborate. The 400-CX can accommodate up to eight separate stereo program sources and control three stereo channels. Provisions are also made for connection of the Fisher RK-1 remote volume control and of the Fisher K-10 Dynamic SPACEPANDER®. The special stereo dimension control makes it possible not only to diminish but also to *augment* the stereo effect in the original program material. The exclusive Fisher DIRECT TAPE MONITOR is also included.

A special feature incorporated in the 400-CX is *sonic null balancing*, a Fisher development that makes possible perfect acoustic balance between left and right stereo speakers by simple electronic means.

CONTROLS: Push-Button Selector (Low Level, Tuner, Tape Recorder, Auxiliary 1, Auxiliary 2); Low Level Selector (Microphone, 3 $\frac{3}{4}$ ips, 7 $\frac{1}{2}$ ips, 78 rpm, Col-1, RIAA-1, RIAA-2, Col-2); Balance; Stereo Dimension; Left/Right Bass (concentric); Left/Right Treble (concentric); Mono/Stereo (Balance Right, Balance Left, Reverse, Stereo, Mono Phono, A, B); Volume; Center Volume.

SWITCHES (On/Off): Low Filter; High Filter; Tape Monitor; Loudness Contour; Phase Reverse.

The Fisher SA-1000

150-Watt Stereo Power Amplifier

Here is the most advanced and most powerful stereo power amplifier currently available to the audio perfectionist. The probability of its being surpassed by any other design in the foreseeable future seems exceedingly small.

The IHF music power rating of the SA-1000 is 150 watts with *both* channels driven. The RMS power rating, again with both channels driven, is 130 watts (65 watts per channel). However, each channel will deliver 80 watts at 0.5% IM distortion and even lower 1-ke harmonic distortion, thus indicating the extreme conservativeness of the official rating. A home installation requiring even greater amplifier power is virtually unimaginable.

The output stage of the amplifier is engineered around the newly developed Type 8417 beam power pentodes, never before used in any electronic device. The driver stage, the predriver and phase-inverter stage, and particularly the input stage are also original in concept and of the most advanced order. An oscilloscope-type compensated and calibrated input attenuator permits precisely variable adjustment of the input sensitivity without the slightest effect on input impedance or frequency response. The custom-wound output transformers are of giant size and even more impressive in their response characteristics. A switchable subsonic filter and laboratory-type calibration meter are also included. Controls for bias and balance adjustment are concealed behind an attractive hinged cover—another Fisher exclusive.

The SA-1000 is indeed the ultimate in amplifier equipment—in power, distortion characteristics, bandwidth, transient response, as well as audible purity of sound.

The Remarkable Fisher TX-300 Transistor Stereo Control-Amplifier



To describe this new solid-state component in all particulars would be to compile a lengthy list of superlatives. In every aspect of its design, from appearance to performance, this is a master-control-amplifier without peer. Combined within its compact chassis (less than 12" deep) are a versatile solid-state stereo preamplifier, featuring exceptionally low distortion and noise, and a 100-watt (IHF) stereo power amplifier, capable of exceptionally clean reproduction, even at the highest of power levels.

The design of the TX-300 takes full advantage of solid-state capabilities, from the low-noise input stage to the transformerless output stage. The amplifier has an extremely wide power bandwidth, supplying power at the all-important low and high ends of the audio spectrum, at all volume levels. Four output transistors are used in each channel for conservative operation at high power—instead of the conventional two. In addition, the TX-300 features exceptional transient response, down to the lowest bass frequencies, as a result of the outstanding low-frequency characteristics and excellent damping provided by the output-transformerless design.

Another notable characteristic of the TX-300 is its high electrical efficiency. This effi-

ciency is due to the fact that transistors require no filament power, and that the amplifier draws appreciable current only when operated at high volume levels. Because of the lower operating temperature of the unit, as well as the lower average dissipation, over-all life expectancy has been greatly increased.

Sixteen inputs and ten outputs on the TX-300 accommodate every type of program source and recording instrument. Twenty-one controls and switches make possible total control of the sound by the listener. A front-panel jack is provided for the connection of headphones, and tape recorders can be connected to the amplifier via jacks on both front and rear panels. The exclusive Fisher DIRECT TAPE MONITOR permits monitoring followed by instant playback, with uninterrupted use of all audio controls.

CONTROLS: Push-Button Input Selector (Tuner, Tape Player, Auxiliary, Low Level); Mode Selector (Mono, Stereo and Reverse positions); Left/Right Bass (concentric); Left/Right Treble (concentric); Volume (incl. AC Off); Low Level Input Selector (Tape Head, Phono 1, Phono 2, Microphone); Speaker Selector (Off, 1, 2, 1+2); Balance.

SWITCHES (On/Off): Tape Monitor; Low Filter; High Filter; Loudness Contour.

Technical Features and Specifications of Fisher Amplifiers

	X-100-C	X-101-D	X-202-C	TX-300	400-CX	SA-1000
Music Power Output (IHF, Both Channels)	50 watts	66 watts	84 watts	100 watts	(2.5 volts RMS)	150 watts
Harmonic Distortion at Rated Output	0.5%	0.5%	0.5%	0.5%	0.04%	0.25%
Power Output (RMS) per Channel	24 watts	27 watts	35 watts	36 watts	(Max. 2.5 volts RMS)	65 watts
IHF Power Bandwidth	25-40,000 @ 1.0%	22-43,000 @ 1.0%	22-45,000 @ 1.0%	12-50,000 @ 1.0%	NA*	12-45,000 @ 1.0%
Intermodulation Distortion (SMPTE) at Rated Output	0.5%	0.5%	0.4%	0.4%	0.2%	0.4%
Hum and Noise below Rated Output	80 db	80 db	80 db	80 db	80 db	NA*
Frequency Response Overall (in cps.)	20-20,000 ±1 db	20-20,000 ±1 db	20-20,000 ±1 db	20-25,000 ±1 db	20-25,000 ±1 db	NA*
Power Amplifier Section	10-80,000 +0, -1.5 db	8-140,000 +0, -1.5 db	7-150,000 +0, -1 db	5-50,000 +0, -1 db	NA*	5-100,000 ±2.5 db
Sensitivity for Rated Output (High Level Inputs)	320 mv	350 mv	265 mv	200 mv	200 mv	0.7 to 2.75 volts
Sensitivity (Phone Inputs)	3.5 mv	3.5 mv	3.5 mv	2.8 mv	2.8 mv	NA*
Sensitivity (Tape Head Inputs)	2 mv	2 mv	2 mv	1.8 mv	1.5 mv	NA*
DIRECT TAPE MONITOR**	Yes	Yes	Yes	Yes	Yes	NA*
Headphone Jack on Front Panel	Yes	Yes	Yes	Yes	No	No
Power-Derived Center-Channel Output	Yes	Yes	Yes	No	NA*	No
High Filter	Yes	Yes	Yes	Yes	Yes	NA*
Rumble Filter	No	No	Yes	Yes	Yes	NA*
Number of Low Level Stereo Inputs	2	2	4	4	4	NA*
Number of Tubes	10	10	10	None	10	9
Number of Diodes	2	2	4	4 plus 1 selenium rectifier	2	4
Number of Transistors	None	None	None	31	None	None
Dimensions	15-1/8" wide, 4-13/16" high, 11-7/8" deep				15 1/8" wide 4-13/16" high 12" deep	15 1/8" wide 7 1/2" high 12" deep
Weight	23 lbs.	28 lbs.	30 lbs.	24 lbs.	18 lbs.	70 lbs.
Cabinetry	Walnut, Model 50-UW				Walnut, 10-UW; metal in simulated leather, MC-2.	Includes protective cage.

* NA - Not Applicable ** Patent Pending

Because its products are subject to continuous improvement, Fisher Radio Corporation reserves the right to modify any design or specification without notice and without incurring any obligation.

All Fisher high fidelity components operate on 50 to 60-cycle AC current.

Fisher Free-Piston 3-Way Loudspeaker Systems

The Free-Piston Concept

It is generally agreed that one of the most difficult design goals to achieve in speaker systems of reasonable size is clean, extended low-frequency response without doubling. Many low-frequency drivers (woofers) have a tendency to distort, especially at high volume levels, by producing tones that are multiples of the input frequency, or by actual changes in the shape of the speaker cone, which take place when the cone cannot quite make the wide excursions required to reproduce bass tones of high amplitude.

Fisher engineers have surmounted this difficulty by developing the free-piston design, which incorporates a long-throw voice coil and suspension system, a high-compliance cone surround, and a high-flux-density magnet system. The special design of the suspension system permits the cone to move the long distances that accurate reproduction demands. To assure precise control of cone motion, a voice coil segment of specified length is always within the magnetic gap, thus maintaining uniform interaction between magnet and voice coil. This results in linear cone motion, and prevents overshoot and the resultant cone oscillation.

The Fisher XP-1A

Here is an outstanding example of compact speaker design, providing low distortion and high power-handling capabilities throughout the audio spectrum.

A 12" free-piston woofer with a special surround reproduces the lower octaves of the audio spectrum, down to less than 30 cps. This bass register is reproduced without muddiness or boom. Frequencies between 1800 and 3000 cps are reproduced by a 5" sealed-basket midrange speaker. Interaction between woofer and midrange unit is prevented by acoustically

isolating the two cones. Above 3000 cps, a 3½-inch wide-dispersion cone tweeter provides smooth reproduction to the upper limits of human hearing.

Crossover is accomplished by means of an elaborate three-way network, designed for smooth transition between the frequency ranges of the three transducers. The network and transducers are all designed to complement one another's characteristics, in order to achieve smooth over-all response, without the slightest coloration. The XP-1A also incorporates a brilliance control, for precise adjustment of the speaker response characteristics to match the acoustic conditions of the listening room.

The Fisher XP-2A

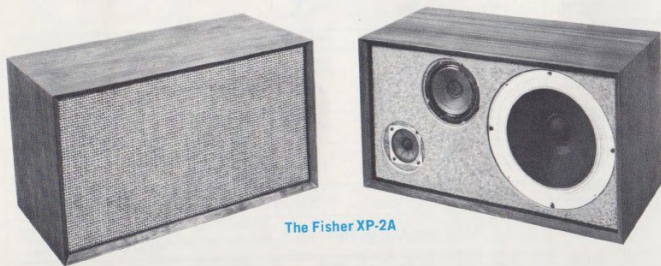
For those who seek a bookshelf speaker combining the advantages of three-way design and moderate price, the XP-2A is the natural choice. Enclosed in its true bookshelf-size cabinet, which measures only 22" by 12" by 11" deep, is a system capable of outstanding reproduction.

A high-compliance, high-efficiency 10" woofer, featuring a butyl-treated cloth surround and extended (¾-inch) excursion range, reproduces the low frequencies down to 30 cps. Bass is exceptionally clean and free of distortion. Frequencies between 1600 and 5000 cps are fed to a special midrange unit, while frequencies above 5000 cps are reproduced by a 3½-inch wide-dispersion tweeter with an unusually flat response. Frequency division is accomplished by an advanced three-way crossover network, which permits smooth, precise transition at the crossover frequencies.

No nails or screws are used in the construction of the XP-2A cabinet. The enclosure is made of dense, nonresonant particle board and finished in fine furniture veneer. All joints are interlocked, and the enclosure is bonded together and sealed at the factory.



The Fisher XP-1A



The Fisher XP-2A



The Fisher KS-1A



The Fisher KS-2A

Fisher Slim-Line 3-Way Loudspeaker Systems

Designing an advanced 3-way system into an ultrathin enclosure without any sacrifice in sound quality is a remarkable engineering feat — even for Fisher. These two units prove for the first time that it *can* be done.

The Fisher KS-1A

Designed in the Fisher no-compromise tradition, this slim-line speaker reflects all the engineering quality and attention to detail expected of Fisher equipment. Within its compact cabinet, which measures only 18" wide, 24" high and 5½" deep, are three precision transducers, carefully matched for optimum performance. Bass tones are reproduced by a 10" woofer having a 30-cps free-air resonance and a high-compliance butyl-coated surround. The woofer magnet structure weighs 4½ pounds. Frequencies between 1400 and 5000 cps are reproduced by a 5" sealed-basket speaker, which has an exceptionally flat response curve within this range. Overtones above 5000 cps are reproduced by a 3" wide-dispersion cone tweeter. The 3-way crossover network employs high-quality air-core coils.

The KS-1A may be placed on the floor, mounted in a bookshelf, or hung on a wall. (Accessories for wall-hanging are supplied.) The speaker requires only 10 watts input to achieve full room volume, but will handle up to 60 watts safely.

The Fisher KS-2A

This speaker system continues and surpasses the precedent for superior slim-line speaker performance set by the KS-1A. Its

effortless and 'transparent' sound quality, characteristic of all Fisher speakers, is instantly apparent to any listener. The extreme clarity, precise transients and rich texture of the KS-2A are, however, absolutely unprecedented in a system of this size and cost.

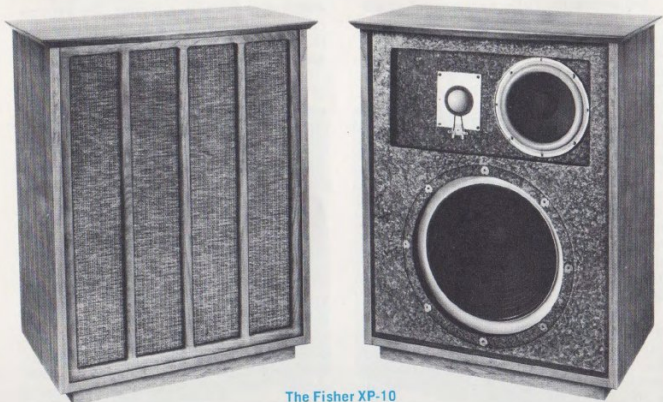
The KS-2A lends itself to virtually any type of installation, for it blends with and complements any décor. Measuring only 20" wide, 25" high and 6½" deep, the system may be mounted on a wall, placed on the floor, or mounted in a bookshelf, while maintaining full bass response.

All three speakers in the system are accurately balanced and matched for over-all smoothness of response. The bass range is reproduced by a 12" free-piston woofer with a 25-cps free-air resonance, a dual-diameter 6-lb. magnet structure and a 2" voice coil. Frequencies between 1200 and 2800 cps are reproduced by a 5" sealed-basket speaker. The 3" cone tweeter, with its massive 2-lb. magnet assembly, provides smooth, silky response beyond the upper limits of audibility. A hemispherical dome, bonded directly to tweeter voice coil, assures wide dispersion, eliminating the 'point source' effect. The crossover network uses low-loss air-core coils. A tweeter level control is provided, to adjust the tonal characteristics of the KS-2A to those of the listening room.

The Two Most Advanced Fisher Speakers



The Fisher XP-4A



The Fisher XP-10

The Fisher XP-4A

This widely acclaimed unit represents a new departure in loudspeaker design, embodying two significant advances in the science of electroacoustics.

The first is eddy-current damping, a method of woofer design that succeeds in achieving linear low-frequency response without 'hang-over.' When the cone of the 12" free-piston woofer moves, eddy currents are generated in the voice coil core, which is made of electrolytic copper — a special form of the metal even more conductive than that used in electrical wiring. These eddy currents apply a force to the cone, which damps out oscillations when a driving signal is not present, such as may occur after sudden transients like a double-bass *pizzicato*.

The other innovation is that the metal supporting frame (or basket) of the woofer has been completely eliminated. Instead, the rigid walls of the cabinet are utilized as the supporting structure, thus preventing the possibility of reflections and resonances which could color the sound.

The middle portion of the sound spectrum is reproduced by two 5" speakers, which are acoustically isolated from the woofer. The remarkable Fisher 2" hemispherical tweeter provides smooth, distortion-free reproduction of the upper frequencies, beyond the limits of audibility. Because of the unusual shape of the tweeter, the treble range is reproduced with the remarkably broad dispersion angle of 120° in all planes.

The over-all sound of the XP-4A is exceptionally smooth, homogeneous, solid and detailed — the sound of a large and very costly speaker, when in fact it is medium-sized and medium-priced.

The Fisher XP-10 Console

Here is the most advanced speaker system ever offered by Fisher, designed for the uncompromising music lover and the audio perfectionist. It incorporates many of the engineering advancements pioneered by Fisher Radio

Corporation, such as eddy-current woofer damping and free-piston action. The XP-10 is not much larger than bookshelf size, but it sounds many times larger because of the increased cone dimensions of its drivers.

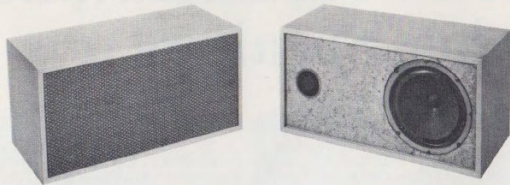
The woofer, for example, is a mammoth 15" transducer with a 6-lb. magnet structure and a free-air resonance of 19 cps. The midrange speaker is a full 8 inches in diameter — as large as the woofer in some economy systems. As a result of its relatively large size and special design, this speaker can handle the entire range of middle frequencies from 200 to 2500 cps, thus eliminating the possibility of phasing problems between woofer and midrange. The midrange unit is housed in a separate, airtight sub-enclosure heavily packed with AcoustiGlas, preventing interaction with the bass speaker.

The high frequencies are reproduced by a peripherally driven hemispherical tweeter, with a soft cotton dome bonded directly to a light copper voice coil. By using a soft diaphragm driven on its periphery, high frequency resonances are eliminated, resulting in exceptionally pure, uncolored sound, extending well beyond the human limits of audibility. Transient response is also unsurpassed, thanks to the unusually high flux density of the tweeter magnet structure (14,000 gauss) and the low moving mass of the tweeter diaphragm (13¼ grams).

The crossover network utilizes both capacitive and inductive elements for controlled response and smooth transition at the two crossover points of 200 and 2500 cps. Continuously variable balance controls for midrange and treble speakers are provided on the rear panel. The cabinet is constructed from heavily braced sheets of dense, nonresonant flake board, with bonded walnut veneers.

The sound of the XP-10 must be heard to be believed. It is equal or superior to that of speaker systems at three and four times the price. What's more, the XP-10 is at the same time a most handsome piece of furniture.

The Ultracompact XP-5



Here is a bona fide advancement of the state of the art. The XP-5 is the first really small loudspeaker system that doesn't *sound* small — in fact, as well as in claim. Though it measures only 20" by 10" by 9" deep, its bass is round and solid — very close to that of large speakers and at the same time free of artificial correctives like shaping networks that alter the bass output of the amplifier. Its treble has a smooth, rich texture and a genuine 'see-through' quality.

The most important part of the secret is in the woofer. This is an 8" unit with a magnet structure weighing 2½ pounds, a flux density of 12,500 gauss and a totally new suspension system utilizing a long-throw inverted half-roll

surround. The free-air resonance is at 25 cps, an almost incredible figure for an 8" driver. The completely enclosed baffle is heavily damped with AcoustiGlas packing. The result is fundamental bass response down to 38 cps, without doubling.

The 2½" tweeter has a new low-mass cone made of a combination of the usual fibrous material plus a special polyurethane foam, resulting in peak-free response out to 20,000 cps, without coloration. The LC-type crossover network uses low-loss air-core inductors.

The XP-5 is the first loudspeaker system of its size that will satisfy the audio perfectionist. It can be unhesitatingly recommended for all applications where space is at a premium.

Technical Specifications of Fisher Speaker Systems

	XP-1A	XP-2A	XP-4A	XP-5	XP-10	KS-1A	KS-2A
Frequency Response (in cps)	30-18,000	35-18,000	28-20,000	38-18,500	28-20,000	40-18,500	35-18,000
Bass Speaker Diameter	12"	10"	12"	8"	15"	10"	12"
Voice Coil Diameter — Bass Speaker	2"	1½"	2"	9/16"	2"	1½"	2"
Midrange Speaker Diameter	5"	5"	(Two) 5"	—	8"	5"	5"
High-Frequency Speaker Diameter	3½"	3½"	2" (hemispherical)	2½" wide-dispersion cone-type	2" (hemispherical)	3"	3" (hemispherical)
Crossover Points (in cps)	1800 3000	1600 5000	1200 2500	2000	200 2500	1400 5000	1200 2800
Impedance in Ohms	8	8	8	8	8	8	8
Speaker Dimensions	24" W 13¼" H 11¾" D	22" W 12" H 11" D	24½" W 14" H 12" D	10" W 20" H 9" D	24¾" W 30½" H 14¾" D	18" W 24" H 5¾" D	20" W 25" H 6½" D
Shipping Weight	45 lbs.	35 lbs.	60 lbs.	15 lbs.	84 lbs.	28 lbs.	35 lbs.
Cabinetry	Available in Scandinavian Walnut, Mahogany, Unstained Birch and Cherry			Walnut or Un. Birch	Scandinavian Walnut	Scandinavian Walnut, Mahogany and Unstained Birch	

All Fisher speaker systems provide adequate volume levels with 10 watts amplifier power, but will handle up to 60 watts program material.

Because its products are subject to continuous improvement, Fisher Radio Corporation reserves the right to modify any design or specification without notice and without incurring any obligation.

Fisher High Fidelity Stereo Accessories

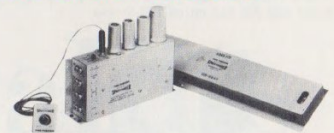


The Fisher WS-1

WIDE-SURROUND® Speaker System

This extremely compact unit is designed to augment the sound from a primary speaker system by giving the reproduction added breadth, so that every seat in the room seems to have a 'front-row-center' location. The Fisher WIDE-SURROUND® system will overcome the 'point source' effect and give the listener the illusion that he is sitting in one of the most desirable seats in the concert hall.

Each unit incorporates a 10" by 2¾" oval permanent-magnet speaker. Frequency response is 250 to 15,000 cps, with sharp cutoff at 250 cycles. Available in Modern walnut or mahogany, French Provincial cherry, and Italian Provincial distressed walnut. Size: 11½" wide, 3¾" high, 4¾" deep. Weight: 4½ lbs.



The Fisher Model K-10 Dynamic SPACEXPANDER®

With this remarkable device, the owner of a home music system can now add a new dimension to listening—the dimension that comes from the addition of natural reverberation to the program. One control regulates the desired degree of reverberation.

The basic principle involved is quite simple. Natural reverberation is created by the reflection of sound from the walls and ceiling. These reflections reach the listener's ears a fraction of a second later than the direct sound from the orchestra or soloist. It is this slight 'delay' that makes it possible to sense the size of the room or auditorium.

The Fisher K-10 Dynamic SPACEXPANDER® recreates electronically the reverberation of the concert hall and, in this manner, makes for *auditorium* listening pleasure even in the smallest of rooms. The K-10 works equally well on records, tape and broadcasts.



The Fisher PR-6

Basic Preamplifier

This is a simple, high-performance, single-channel preamplifier without controls, designed to adapt a low-gain amplifier channel for use with a magnetic cartridge, tape head or microphone. It is self-powered and incorporates two high-gain triode stages (6SC7).

SPECIFICATIONS. Gain: Phono, 1 volt output for 10 mv input; microphone, 1 volt output for 1 mv input; tape, 1 volt output for 5 mv input. Frequency Response: 30 to 20,000 cps within ± 2 db. Hum: Better than 60 db below 1 volt for phono; better than 70 db below 1 volt for microphone. Equalization: RIAA for phono, NAB for tape. Dimensions: 3¾" wide, 3¾" high, 3¾" deep. Weight: 1½ lbs.



The Fisher RK-1 Stereo Remote-Control Unit

(for use with the 400-CX or X-202-B)

Now the listener can balance the volume level in a stereophonic system simply by turning the dials of this remote control unit. The RK-1 consists of a control assembly, 30 feet of cable and an adaptor plug. When in operation, the left dial controls the volume from speakers at the left, the right dial from speakers at the right.

Universal Multiplex Adapters

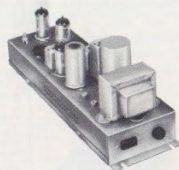
Your present stereo system is not obsolete! Add a Fisher multiplex adapter to any quality tuner and you can enjoy FM-Stereo.



The Fisher MPX-100
(with exclusive STEREO BEACON)

OUTSTANDING FEATURES

- Selector (AC Off, Tuner, Stereo-Mono Automatic, Stereo Manual).
- Two-position Noise Filter.
- Auxiliary AC receptacle on rear apron.
- Dual output level controls.
- Variable separation control.
- Two output and four input jacks.
- Cabinets in walnut (Model 40-UW) and mahogany (Model 40-UM).
- Dimensions: 4¾" wide, 4-13/16" high, 12" deep.
- Weight: 9 lbs.



The Fisher MPX-200
(for concealed installation)

OUTSTANDING FEATURES

- Self-powered.
- Can be placed up to three feet from tuner or receiver.
- Two level controls match the volume of the stereo programs to phono, tape, etc.
- Selector switch to record stereo programs monophonically.
- Precision separation control matches adapter to any tuner or receiver.
- Unusually effective filtering, for flawless tape recording.
- Dimensions: 12" wide, 4" high, 3½" deep.
- Weight: 3½ lbs.



The Fisher Model 300
Multiplex Generator

This is a complete multiplex test generator, with built-in FM signal generator, designed and constructed to rigid laboratory specifications. It features high accuracy and extreme stability, more than necessary to meet the strict requirements of the multiplex system approved by the Federal Communication Commission.

OUTSTANDING FEATURES

The front panel output meter is a true peak-to-peak indicator, providing the only correct method of measuring the complex waveform of the composite multiplex signal.

The phase relationship of the 19 kc pilot carrier and the composite signal can be monitored (with an oscilloscope) from the special 19 kc output on the front panel.

The amplitude of the 19 kc signal can be monitored simply by depressing a front-panel push-button. Amplitude and phase adjustments of the 19 kc signal are also available on the front panel.

A built-in switchable pre-emphasis network permits both rapid checks of the de-emphasis circuits and introduction of standard FM transmission equalization. Audible tests can be conducted under perfectly simulated transmission conditions.

The built-in FM signal generator, although aligned at the factory at 100 mc, is adjustable within a range from 97 to 103 mc. This makes it possible to avoid interference with local stations.

(Technical specifications on request.)

Fisher StrataKits



Now anyone can build just as fine components as Fisher.

That's right! The exclusive Fisher StrataKit method makes it so easy to build a high fidelity kit that all differences between the experienced and inexperienced kit builder become totally irrelevant. Whether you are a skilled electronic technician or a fashion model, you can now build a Fisher tuner, amplifier or speaker that is every bit as fine as a factory-wired unit.

Assembly of a Fisher StrataKit takes place by simple, errorproof stages (Strata). Each stage corresponds to a separate fold-out page in the uniquely detailed instruction manual. Each stage is built from a separate packet of parts (StrataPack). Major parts come already mounted on the extra-heavy-gauge steel chassis. Wires are pre-cut for every stage — which means every page. All work can be checked stage-by-stage and page-by-page, before proceeding to the next stage. You can't help ending up with a faultless Fisher high fidelity component when you build a StrataKit.

Fisher Stereo Amplifier StrataKits



The Fisher KX-100 StrataKit
50-Watt Stereo Control-Amplifier

This master-control amplifier kit combines economy, versatility and high performance in a remarkably easy-to-build unit. Fifty watts of IHF music power output at a harmonic distortion of only 0.5% assures ample reserve power to drive even low-efficiency speakers. Through careful design and the use of DC on all low-level tube filaments, hum and noise are held 80 db below rated power, thus keeping the signal 'clean' even in the quietest of passages.

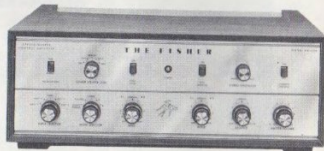
Full control facilities have been provided, including a speaker silencing switch, high filter, loudness contour switch, and the famous Fisher DIRECT TAPE MONITOR. The input and output circuitry of the KX-100 assure the greatest possible versatility. Provision has been made to allow each pair of low-level inputs to accept either a tape head of a phono cartridge, thus permitting connection of a turntable and a changer, or a changer and a tape transport, or two tape transports, etc., without need for additional switching. A power-derived center-channel output has also been included for three-channel stereo or a remote mono extension speaker. A headphone jack is available on the front panel of the amplifier.

From its complete input facilities to the large, conservative design of its output transformers, the KX-100 represents a top value at moderate cost to the audiophile.

CONTROLS: Input Selector (Tape Head,

Phono, Tuner, Auxiliary and Tape Play positions); Mode Selector (Mono, Stereo and Reverse positions); Left/Right Bass (concentric); Left/Right Treble (concentric); Balance; Volume (including AC Off).

SWITCHES: Equalization (Tape/Phono); High Filter (On/Off); Tape Monitor (On/Off); Loudness Contour (On/Off); Speakers (On/Off).

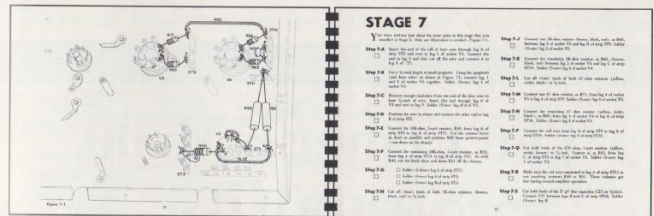


The Fisher KX-200 StrataKit
80-Watt Stereo Control-Amplifier

Without question the finest control-amplifier kit currently available, the KX-200 is a prime example of Fisher engineering genius.

With a rated IHF music power output of 80 watts at a harmonic distortion of only 0.5% and a response of 10 to 110,000 cps (+0, -1 db) through the power amplifier section, this superb amplifier will provide flawless reproduction, from the most delicate violin pianissimo to the loudest orchestral crescendo. Beginning with the low-level stages, which use DC on all filaments for minimum hum and noise, all the way to the massive output transformers, the circuit of the KX-200 reflects careful, conservative design and a no-compromise engineering philosophy.

A look at the control panel and the chassis will give instant evidence of the remarkable versatility of the KX-200. Beside the full complement of controls which typifies every Fisher master-control-amplifier (such as dual friction-



Typical pages from a Fisher StrataKit instruction manual.

lock bass and treble controls, a high filter, the exclusive Fisher DIRECT TAPE MONITOR, etc.), a stereo dimension control is also included, enabling you to vary the channel separation at will, from full stereo to monophonic. At the rear of the chassis, there is a precision d'Arsonval meter for setting and maintaining the bias and balance conditions in the output stage. A power-derived center-channel output is also included, permitting connection of a third speaker for either three-channel stereo or remote mono. A center-speaker level control enables you to vary the volume of this third speaker.

CONTROLS: Input Selector (Magnetic-1, Magnetic-2, Tuner, Auxiliary-1, Auxiliary-2); Mode Selector (Mono Phono, Reverse, Stereo, A, B); Center Speaker Level; Left/Right Bass (concentric); Left/Right Treble (concentric); Balance; Stereo Dimension; Volume (incl. AC Off).
SWITCHES: Equalization (Tape/Phono); High Filter (On/Off); Tape Monitor (On/Off); Loudness Contour (On/Off).



The Fisher K-1000 StrataKit
150-Watt Laboratory Standard
Stereo Power Amplifier

This incomparable unit is nothing less than the world's finest and most powerful stereo power amplifier in kit form. When assembled,

it is fully the equivalent of the celebrated Fisher SA-1000 Laboratory Standard power amplifier.

The IHF music power rating of the K-1000 is 150 watts with both channels driven. The RMS power rating, again with both channels driven, is 130 watts (65 watts per channel). However, each channel will deliver 80 watts at 0.5% IM distortion and even lower 1-kc harmonic distortion, thus indicating the extreme conservativeness of the official rating. A home installation requiring even greater amplifier power is virtually unimaginable.

The output stage of the amplifier is engineered around the newly developed Type 8417 beam power pentodes, never before used in any electronic device. The driver stage, the predriver and phase-inverter stage, and particularly the input stage are also original in concept and of the most advanced order. An oscilloscope-type compensated and calibrated input attenuator permits precisely variable adjustment of the input sensitivity without the slightest effect on input impedance or frequency response. The custom-wound output transformers are of giant size and even more impressive in their response characteristics. A switchable subsonic filter and laboratory-type calibration meter are also included. Controls for rarely needed adjustments are concealed behind an attractive hinged cover—another Fisher exclusive.

The K-1000 can be precisely adjusted by the kit builder to operate with optimum specifications and to maintain these at all times. The exclusive Fisher StrataBalance—a simple, foolproof invention—makes it possible to balance the push-pull circuitry for minimum distortion by means of an ordinary light bulb!

Here, indeed, is the ultimate in amplifier equipment—a kit that puts you ahead of owners of the costliest ready-made power amplifiers.

The Fisher KM-60 StrataKit

FM-Multiplex Stereo Tuner



(with exclusive STEREO BEAM)

The KM-60 necessarily ranks among the finest tuners available — kit or no kit. With its wide-band design and 1.8 microvolt IHF sensitivity, this outstanding tuner delivers superb reception, even in fringe areas. Further evidence of its superior performance are the signal-to-noise ratio of 70 db and the harmonic distortion of less than 0.5%.

Every detail reflects the caliber of engineering that has made the Fisher name famous throughout the world. A precision d'Arsonval tuning meter is included for exact center-of-channel tuning, while the exclusive Fisher STEREO BEAM indicates *automatically* whether or not a station is broadcasting in stereo. An FM-stereo subcarrier filter eliminates noise on weak stereo signals while leaving the frequency response unaffected.

All difficult wiring and critical alignments

are done in advance at the factory. The front-end and multiplex sections come prewired, pre-aligned and tested for highest sensitivity, lowest noise and optimum stereo reception. All that is needed is a touch-up alignment of the IF stages, which even the least experienced kit-builder can accomplish while simply watching the front-panel meter. Alignment is completely nontechnical and noncritical. Anyone who can handle a screwdriver can adjust the tuner for the best possible performance.

The final result is a tuner of the highest quality, with truly outstanding specifications and such 'extras' as individual level controls for each channel, tape recording facilities, and separate antenna connections for 'local' and 'distant' reception.

CONTROLS: Selector (Mono, Stereo); Stereo Filter (Off/On); Power (Off/On); Tuning.

Technical Features and Specifications of Fisher StrataKits

	KX-200 CONTROL AMPLIFIER	KX-100 CONTROL AMPLIFIER	K-1000 POWER AMPLIFIER		KM-60 MASTER TUNER
Music Power Output IHF @ 1 kc rated distortion	80 watts (both channels)	50 watts (both channels)	150 watts (both channels)	Sensitivity (IHF) 20 db Quieting, 72 ohm antenna	1.8 μ v 0.6 μ v
RMS Power Output @ 1 kc and rated distortion	35 watts (each channel)	24 watts (each channel)	65 watts (each channel)	Capture Ratio (IHF)	2.5 db
Total Harmonic Distortion @ 1 kc and rated power	0.4%	0.5%	0.25%	Signal-to-noise Ratio (100% modulation)	70 db
IM Distortion @ rated power (60 cps/7 kc; 4 to 1)	0.8%	1.0%	0.4%	Selectivity (alternate channel)	60 db
Frequency Response Overall:	20 — 20,000 cps (± 1 db)	20 — 20,000 cps (± 1 db)	NA *	FM Harmonic Distortion (400 cps, 100% modulation)	0.4%
Power Amplifier:	10 — 110,000 cps (+0, — 1db)	10 — 75,000 cps (± 1 db)	5 — 100,000 (± 2.5 db)	Frequency Response†	20 — 15,000 cps†
Sensitivity (Rated Output) High Level:	350 mv	300 mv	0.5 to 2.5 v	FM Stereo Separation @ 1 kc	35 db
Low Level:	3.5 mv	3.5 mv	NA *	FM I.F. Stages	4
Hum and Noise Below Rated Output High Level:	— 80 db	— 80 db	— 90 db	FM Wide-Band Limiters	3
Phono (6 mv ref.):	— 66 db	— 65 db	NA *	Wide-Band Ratio Detector	Yes
Stereo Separation @ 1 kc	better than 50 db	better than 50 db	better than 70 db	Stereo Indicator	STEREO BEAM **
Tone Control Range Treble:	± 30 db @ 50 cps	± 22 db @ 50 kc	NA *	Tuning Indicator	d'Arsonval Meter
Bass:	± 32 db @ 10 kc	± 20 db @ 10 kc	NA *	Front-End Circuit	GOLDEN CASCODE
Switchable Dual Magnetic Inputs	Yes	Yes	NA *	Tube Complement	11: one 6DJ8; one 6AQ8; four 6AU6; one 6BD6; two 12AT7; two 12AX7
High Filter	Yes	Yes	NA *	Power Supply	Permanent bridge-type
Derived Power Center Channel	Yes	Yes	No	Dimensions	15 $\frac{1}{2}$ " W 4-13/16" H 12 $\frac{1}{2}$ " D
Tube Complement	10: six 12AX7; four 7591	10: six 12AX7; four 7868	9: one 6KX8; two 12AX7; two 6HJ6; four 8417	Weight	18 lbs.
Power Supply	4 silicon diodes	2 silicon diodes	4 silicon diodes		
Dimensions	15 $\frac{1}{2}$ " W 4-13/16" H 12 $\frac{1}{2}$ " D	15 $\frac{1}{2}$ " W 4-13/16" H 11 $\frac{1}{2}$ " D	15 $\frac{1}{2}$ " W 7 $\frac{1}{2}$ " H 12" D		
Weight	26 lbs.	24 lbs.	70 lbs.		

* NA — Not applicable

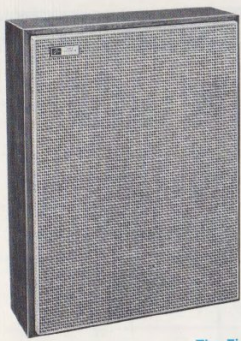
** Patent Pending.

† The frequency response shown represents the audio frequency range transmitted by the FM Stations.

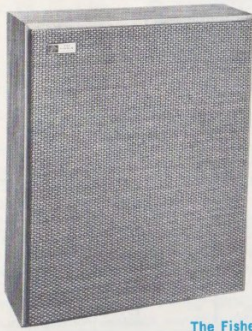
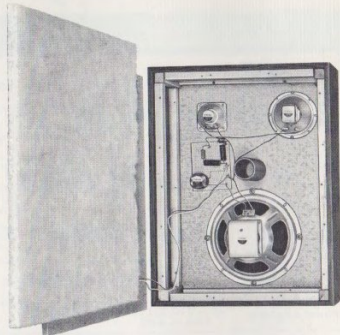
The actual bandwidth of the FISHER tuners is considerably higher.

Because its products are subject to continuous improvement, Fisher Radio Corporation reserves the right to modify any design or specification without notice and without incurring any obligation.

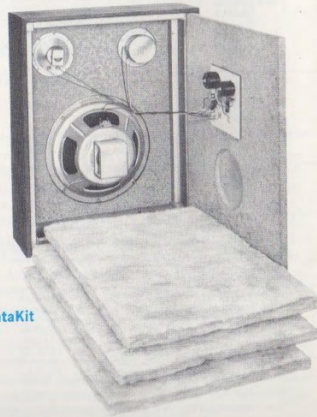
All Fisher high fidelity components operate on 50 to 60 cycle AC current.



The Fisher KS-1 StrataKit



The Fisher KS-2 StrataKit



Fisher Slim-Line 3-Way Loudspeaker StrataKits

You install the three drivers, wire them to the crossover network, put in the padding, complete the assembly of the cabinet — and you are the owner of a genuine Fisher slim-line speaker!

The Fisher KS-1 StrataKit

This was the first true slim-line speaker system available in kit form and it is still the finest value in its field. A high-efficiency three-way system of this caliber in an enclosure only 5¾" deep is a remarkable engineering development even as a factory-assembled unit; as a moderately priced kit it is a technological *tour de force*.

The KS-1 may be placed anywhere on the floor, mounted in a bookshelf, or hung on the wall like a picture. Its sound quality is nothing short of astonishing for its compact size and moderate cost.

Specifications

Woofer: 10" free-piston; high-compliance butyl-coated surround; 30 cps free-air resonance; 1½" voice coil; 4½ lb. magnet structure; over 10,000 gauss flux density.

Midrange: 5" cone; butyl-coated surround; sealed metal back.

Tweeter: 3" wide-dispersion cone.

Crossover: Full 3-way LC-type network with air-core coils; crossover points at 1400 and 5000 cps.

Impedance: 8 ohms.

Frequency Response: 40 to 18,500 cps.

Power Requirement: 10 watts minimum; 60 watts (program) maximum.

Cabinet: 18" wide, 24" high, 5¾" deep; walnut or birch; AcoustiGlas padding.

Weight: 26 lbs.

The Fisher KS-2 StrataKit

Here is the most advanced three-way loudspeaker system ever offered in kit form. Its 6½" depth makes it a true slim-line speaker, suitable for wall hanging, bookshelf mounting or floor placement.

When it comes to performance, the KS-2 rivals some of the costliest professional systems in 'transparency,' transient response and effortless 'bigness' of sound. It can be unhesitatingly recommended for use with the finest amplifiers and associated equipment.

Specifications

Woofer: 12" free-piston; half-roll cotton surround; 25 cps free-air resonance; 2" voice coil; 6 lb. magnet structure; over 10,500 gauss flux density.

Midrange: 5" cone; butyl-coated surround; sealed metal back.

Tweeter: 3" cone; sealed metal back; hemispherical dome bonded to 1" voice coil; 2 lb. magnet structure; 12,000 gauss flux density.

Crossover: 3-way LC-type network with air-core coils; crossover points at 1200 and 2800 cps; variable tweeter level control.

Impedance: 8 ohms.

Frequency Response: 35 to 18,000 cps

Power Requirement: 10 watts minimum; 60 watts (program) maximum.

Cabinet: 20" wide, 25" high, 6½" deep; walnut or birch; AcoustiGlas padding.

Weight: 35 lbs.

Who Owns a Fisher?



"I have just purchased my third Fisher, and it is giving me the same fabulously true reproduction of my phonograph records, and in the reception of high fidelity broadcasts, as do the first two. It is a constant source of enjoyment and relaxation to me."
—ISAAC STERN
Concert Violinist



"I was thrilled and fascinated by the life-like reproduction, not only of my own recordings but those of other artists with whom I have sung at the opera. Many subtle shadings and nuances that I had not realized were in the recordings were fully and beautifully expressed."
—VICTORIA DE LOS ANGELES
Soprano, The Metropolitan Opera Company



"The Fisher is superb! May I congratulate you on creating an instrument that meets my highest professional and personal requirements for the faithful reproduction of recordings and of broadcast music."
—NATHAN MILSTEIN
Concert Violinist



"I have fallen under the spell of Fisher. What used to be only an instrument of necessity has become a source of unlimited pleasure."
—GIAN-CARLO MENOTTI
Composer



"The Fisher is, without question, one of the finest instruments I have ever heard anywhere. Its tone is as close to live performance as I believe it is possible to get, and the high fidelity quality is perfect."
—EUGENE ORMANDY
Music Director
The Philadelphia Orchestra Association



"My Fisher is a magnificent addition to our musical home. It is a constant source of pleasure and a superb instrument for the faithful reproduction of recordings and musical broadcasts."
—RISÉ STEVENS
Soprano, The Metropolitan Opera Company

ARMED FORCES

MAJOR GENERAL J. V. ALLARD, C.B.E., D.S.O., E.D., C.D., HQ, Fourth Division, British Forces
BRIGADIER GENERAL A. J. BECK, USAF
BRIGADIER GENERAL H. MCD. BROWN, USARFUR
LIEUT. GEN. ROBERT W. BURNS, Commander, U.S. Forces, Japan
REAR ADMIRAL R. L. CAMPBELL, USN Headquarters, USEUCOM
MAJOR GENERAL WILLIAM T. HUNNELL, USAF
BRIGADIER GENERAL WILLIAM G. LEE, JR., USAF
U.S. SIGNAL CORPS, Fort Monmouth, New Jersey
U.S.S. ALBANY, Cruiser
U.S.S. ANTIETAM, Aircraft Carrier
U.S.S. CHAMPLAIN, Aircraft Carrier
U.S.S. CONSTELLATION, Aircraft Carrier
U.S.S. KITTY HAWK, Aircraft Carrier
U.S.S. NAUTILUS, Atomic Submarine

BROADCASTING

MR. JAMES ARNESS, Television Star
MR. BOB COLLIER, Radio and Television Star, N.Y.
MR. PETER LIND HAYES, Radio and Television Star, New Rochelle, N.Y.
MR. HENRY MORGAN, Radio and Television Star
DR. FRANK C. STANTON, President, CBS
MR. LOWELL THOMAS, Pawling, N. Y.
MR. JACK WEBB, Producer and Actor

COMPOSERS

MR. IRVING BERLIN, New York
MR. RICHARD ROGERS, New York

DIPLOMATIC CORPS & GOVERNMENT

MR. WILLIAM A. M. BURDEN, U.S. Ambassador to Belgium
MR. JOHN M. CAROT, U.S. Ambassador, Bogota, Columbia
THE HONORABLE THOMAS E. DEWEY, New York
THE HONORABLE JOSEPH P. KENNEDY, Boston, Massachusetts
THE HONORABLE ROBERT F. KENNEDY, U.S. Attorney-General, Washington, D.C.
MR. CLARE BOOTHE LUCE, New York
DR. JOSE A. MOA, Secretary-General, Organization of American States

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BYRN MAWR COLLEGE, Department of Music
DR. LEONARD CARMICHAEL, Secretary (Ret.), The Smithsonian Institution, Washington, D.C.
MR. HOLLI L. CARWELL, President, Teachers' College, Columbia University, N. Y.
INSTITUTO NACIONAL DE BELLA ARTES, (Beaux Arts of Mexico), Mexico City, D.F.
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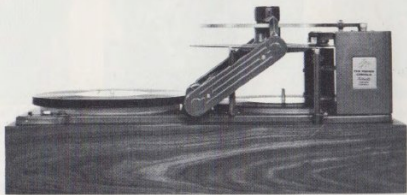
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The Fisher-Lincoln Automatic **TURNOVER** Turntable



The only automatic record player that
turns your records *over*.

Take a look at your own collection of long-playing records. It is the best *raison d'être* for the Fisher-Lincoln.

Even if you have some albums containing two, three or more discs in the so-called automatic sequence, most of your records are undoubtedly *singles*. And nothing but the Fisher-Lincoln will play both sides of a single automatically, then go on to the next single—automatically. (Of course, it can also play your 'automatic' albums in the correct one-side-only sequence.)

You can load the amazing Fisher-Lincoln with up to ten records of any size—including 7", 10" and 12" records *intermixed*—and listen to all twenty sides without lifting a finger. That means more than eight hours of continuous, uninterrupted music, depending on the playing time of each side.

The record changing mechanism itself, protected by six exclusive patents and several others pending, combines unprecedented ruggedness and reliability with almost unbelievably gentle record handling. A special vacuum pump supplies the motive power for each motion except the rotation of the record, thus providing an inherently resilient air cushion that makes the Fisher-Lincoln literally jamproof. Playback performance is of the highest

quality, meeting the standards of the finest single-play turntables. There is only one record in motion at a time, rather than a whole stack, eliminating all the usual difficulties: wow due to slippage, grinding between records, multiplication of warp, changes in stylus angle. The pickup arm is of professional caliber, tracks perfectly at three grams and accepts all standard cartridges. The tripping point at the end of the record is determined by a magnetic proximity switch rather than the inertia of the arm, so that side pressure in the lead-out grooves is completely absent. The center hole of the record is in contact with soft rubber only and cannot be damaged or enlarged.

The special SynDuction motor of the Fisher-Lincoln combines the best features of synchronous and induction motors: fast start plus constant and dead-accurate speed. The combination belt-and-idler-wheel drive keeps wow and flutter under 0.15% at both 10 cps and 3 kc. Teflon bearings, running on polished and hardened steel, eliminate all need of lubrication for the lifetime of the machine.

Specifications: 110 volts; 60 cycles; maximum power consumption 4 amps. *Shipping Weight:* 65 lbs. *Size:* 27" wide, 15 1/2" deep, 19 1/2" high (with optional base). *Clearance:* 14 1/2" above base.

FISHER FIRSTS

Milestones in the History of High Fidelity Reproduction

- 1937 First high-fidelity sound systems featuring a beam-power amplifier, inverse feedback, acoustic speaker compartments (infinite baffle and bass reflex) and magnetic cartridges.
- 1937 First exclusively high-fidelity TRF tuner, featuring broad-tuning 20-20,000 cycle fidelity.
- 1937 First two-unit high-fidelity system with separate speaker enclosure.
- 1938 First coaxial speaker system.
- 1938 First high-fidelity tuner with amplified AVC.
- 1939 First dynamic range expander.
- 1939 First 3-way speaker in a high-fidelity system.
- 1939 First center-of-channel tuning indicator.
- 1945 First preamplifier-equalizer with selective phonograph equalization.
- 1948 First dynamic range expander with feedback.
- 1949 First FM-AM tuner with variable AFC.
- 1952 First 50-watt all-triode amplifier.
- 1952 First self-powered master audio control.
- 1953 First self-powered, electronic sharp-cutoff filter system for high-fidelity use.
- 1953 First universal horn-type speaker enclosure for any room location and any speaker.
- 1953 First FM-AM receiver with a cascode front end.
- 1954 First low-cost electronic mixer-fader.
- 1954 First moderately priced professional FM tuner with two meters.
- 1955 First peak power indicator in high-fidelity.
- 1955 First master audio control chassis with five-position mixing facilities.
- 1955 First correctly equalized, direct tape-head preamplifier with self-powered master audio control.
- 1956 First to use power monitor in a home amplifier.
- 1956 First all-transistor preamplifier-equalizer.
- 1956 First dual dynamic limiters in an FM tuner for home use.
- 1956 First performance monitor in a high-quality amplifier.
- 1956 First FM-AM tuner with two meters.
- 1956 First complete graphic response curve indicator for bass and treble.
- 1957 First GOLDEN CASCODE FM tuner.
- 1957 First MicroRay tuning indicator.
- 1958 First stereophonic radio-phonograph with magnetic stereo cartridge.
- 1959 First high-quality stereo remote control system.
- 1959 First complete stereophonic FM-AM receiver (FM-AM tuner, audio control, 40-watt amplifier).
- 1959 First high-compliance plus high-efficiency Free-Piston loudspeaker system.
- 1960 First to use MicroRay for FM tuning and as a recording audio level indicator.
- 1960 First complete stereo FM-AM receiver with 60-watt power amplifier and new 7591 output tubes.
- 1960 Smithsonian Institution, Washington, D. C., receives for its collection America's first commercially manufactured high-fidelity radio-phonograph, made by Avery Fisher in 1937.
- 1960 First reverberation device for use in high fidelity equipment—the Fisher Dynamic Spaceexpander.
- 1960 First stereo tuner with MicroTune.
- 1960 First FM tuner with six IF stages.
- 1960 First FM tuner with five limiters.
- 1960 First front-panel antenna selector switch, 72-300 ohm, Local-Distant positions.
- 1961 First FM-Stereo multiplex adapter with STEREO BEACON and automatic switching, mono to stereo.
- 1961 First complete FM-multiplex stereo receivers.
- 1961 First FM-stereo tuners with STEREO BEACON and STEREO BEAM.
- 1961 First internal switching system to permit immediate tape playback with use of all controls and switches.
- 1961 First loudspeaker system with frameless woofer cone, to eliminate all parasitic resonance.
- 1962 First simplified-operation control-amplifier, with infrequently used controls behind front-panel cover, yet immediately accessible.
- 1962 First loudspeaker with eddy-current-damped voice coil.
- 1962 First bass speaker with combined serrated-aluminum and fiber cone.
- 1962 First FM tuner kit with separate d'Arsonval meter for tuning and separate cathode ray stereo broadcast indicator (STEREO BEAM).
- 1963 First to use 8417 tubes with unique cavity-anode design.
- 1963 First power amplifier to use oscilloscope-type frequency-compensated input circuit.
- 1963 First amplifier kit with STRATA-BALANCE visual dynamic balancing system.
- 1964 First multiplex adapter with 'flywheel synchronization.' Closely approaches theoretical limit of noise rejection, and of all spurious responses.
- 1964 First AFC with strong locking on weak signals, with no pull-in from adjacent strong signals.



The Largest, Most Modern New Plant in the High Fidelity Industry

Situated in 40-Acre Fisher Park, Milroy, Pa.

This 120,000-square-foot structure, designed by Gerhard E. Karplus, A.I.A., and situated in the rolling hills of Central Pennsylvania, reflects the latest techniques in industrial building. The plant was built to provide facilities for the most meticulous production of advanced high fidelity equipment. There is no other like it.

These new facilities are in addition to those at the Fisher Headquarters Building in Long Island City, N. Y., Lewistown, Pa., and at Belleville, New Jersey.



Fisher Headquarters Building • L.I. City, New York



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