

AR LOUDSPEAKERS



OWNER'S INSTRUCTION MANUAL



TELEDYNE
ACOUSTIC RESEARCH

CONTENTS

Owner's Record	2
Preface	3
Inspecting for damage	3
Amplifier Recommendations and Power Handling	4
Connecting the Loudspeakers	6
To strip and tin the wires	7
To connect the loudspeakers	7
Placing the Loudspeakers in Your Room and Room Acoustics	9
Adjusting Midrange and Highrange Level Controls	11
To adjust the midrange and highrange controls	13
Fusing AR Speaker Systems	14
Removing the Drivers	15
To remove the drivers	15
To replace the drivers	16
Maintaining the Appearance of Your Speakers	17
In Case of Difficulty	18
What to Do	18
In case of failure in both channels	18
In case of distortion or buzz in both channels	19
In case of distortion or buzz in both channels with records only	20
In case of hum or rumble	20
In case of failure, intermittence or distortion in one channel only	22
In order to determine which driver is defective	23
Servicing	24
Specifications	Inside back cover



Welcome to the ever-increasing number of listeners who have purchased and use Acoustic Research products. Well over one million stereo systems at present incorporate products made by Acoustic Research. This is in no small part due to our operating under the belief that a loudspeaker's performance is as dependent on the care with which it is manufactured as it is on the theoretical principles by which it is designed.

At AR every part which goes into the manufacture of a speaker is individually tested. Contrary to general industry practice, every driver which goes into our loudspeaker systems is manufactured in our own plant. We know of no other manufacturer who tests **each** driver individually in anechoic chambers for resonance, frequency response, power response, distortion, phase, slopes, etc. After assembly is completed, each AR loud-

speaker system is again tested in an anechoic chamber for **all** its operating parameters. It is only our Quality Control which permits us to give a **Full 5-year Warranty on the performance** of each loudspeaker—a warranty that, to the best of our knowledge, is given by one other manufacturer alone. (See the **Full 5-year Warranty** booklet packed with your speakers.)

At Acoustic Research, the emphasis has always been on research. The ongoing investigations in our Engineering Department have resulted in many principles and developments that are incorporated in most loudspeakers sold today—the more noticeable ones being acoustic suspension, the dome, plus wide dispersion midranges and highranges with flat power response. Every loudspeaker of AR manufacture has been totally designed by an engineering team dedicated to "Truth in Listening", accuracy, and long-term performance. This dedication is exercised equally on the least as well as the most expensive speakers.

The remarkable performance similarities are immediately evident upon listening to two AR loudspeakers of different model designation; the only limitations in the lower-priced loudspeakers are those of power handling and extreme low-frequency response, since both were designed, manufactured and tested to the same parameters of smooth frequency and power response, low distortion, and accuracy.

AR's philosophy has always been to design products which will provide you, the owner, with true listening satisfaction for very extended periods of time. We do not subscribe to the concept of planned obsolescence.

We hope you will enjoy your AR loudspeakers for many years to come—and remember, we will always be here to assist you in any way possible.

OWNER'S RECORD

For your convenience, for referral in the future and to help expedite any services you might need in connection with your speakers, attach your sales slip to this page and record the date of

purchase, serial number(s) and your dealer's name and address in the spaces provided below. Please make reference to this data any time you correspond with Acoustic Research. In the event that your speakers are

ever lost or stolen, the availability of this information will be of invaluable help in the filing of an insurance claim and in the report required by your local authorities.

Model Number_____

Serial Number(s)_____

Date of Purchase_____

Month	Day	Year
-------	-----	------

Dealer Name_____

Dealer City & State_____

NOTE:

You will find the serial number of your speaker(s) on the logo plate attached to the front panel of the enclosure,

under the foam grille. To remove the grille, pinch the foam firmly at the top, in the center, and pull outward. The tearing sound you'll hear is normal and is caused by the Velcro hook fasteners

releasing the foam. To replace the grille, refer to the instructions in the section "**Maintaining the Appearance of Your Speakers.**"

A SHORT PREFACE

Your AR loudspeakers are high-precision devices designed and built to tolerances comparable only to professional studio microphones. Considering their complexity, they are easy to install and use. However, to be certain you derive total enjoyment and the performance of which they are capable, we strongly suggest you read this manual thoroughly. The information contained in it will, we are sure, not only be educational, but will also insure that your system will operate at the level of performance to which it was designed.

It should not take much more than a half hour to interconnect your system completely and get everything working, but to obtain the longevity of operation you are entitled to and should receive, allot the small extra time necessary to read the manuals for each piece of equipment you are installing. This minimal effort will assure you many more years of enjoyment.

INSPECTING FOR DAMAGE

Although the carton and packing materials of your AR loudspeakers were designed to protect them from the roughest handling in shipping, abuse or severe drops may cause injury to the cabinets or speaker elements. Therefore, while you are unpacking your loudspeakers inspect them for physical damage to the cabinet and loose, rattling parts. Your loudspeakers left AR in perfect condition, so if any damage is evident, the following procedures must be observed. If your speakers were received directly from a dealer (if they were not shipped to you via a public transportation agency), they should be returned to the store immediately for inspection. If they were received by you via public transportation, **report the damage at once, in writing, to the shipping company and request instructions for filing a claim in order to recover any charges that may be made for freight damage repairs. Please remember that freight damage is not covered by the Warranty. Under no circumstances discard any of**

the packing materials or reship your loudspeakers prior to an inspection by the carrier or unless advised to do so in writing by the shipping company. Please bear in mind that notification of damages must be made to the carrier in writing within 15 days of receipt. To ignore these recommendations may result in your forfeiting the right to all freight damage claims and, if so, you will gain no redress for expenses incurred in having the damages repaired.

NOTE: Notification by phone to the carrier does not fulfill legal requirements. Notification must be made in writing preferably by Certified Mail.

AMPLIFIER RECOMMENDATIONS AND POWER HANDLING

At the back of this manual you will find a comparative chart listing all AR loudspeakers, their power amplifier requirements and other pertinent technical data. While all the information given as to power requirements are the minimum recommendations for average program material in a normal home environment, there are certain other situations and types of program material which will require much greater amplifier output capability. (Since present day recordings can have a dynamic range or peak levels approximately 10 to 15 times that of the average power being delivered to the speakers, a suitable amplifier with adequate reserve power should be selected if uncompressed reproduction of dynamics is desired and frequent amplifier "clipping" is to be avoided.)

With these factors as reference, estimates of power requirements for your individual application can be easily determined if you consider that power requirements rise and fall with the desired ultimate acoustic pressure levels, with the volume of the room, and with the amount of acoustically absorbent material in the room. For each 3 dB increase in required acoustic pressure level, the amplifier power must be doubled. Also, a corresponding doubling of amplifier power is required if room volume is doubled and a 3 dB decrease in listening level is to be avoided. The quantitative effect of absorbent materials cannot be defined as easily. Because their effect is frequency selective and because most absorbent materials are effective mainly in the upper regions of the audio spectrum in which music power density is not at maximum, the presence of such materials may require careful setting of tone controls and speaker controls but, in general, will not require an increase in amplifier power.

The comparative chart also lists the maximum power handling capability of each speaker on **conventional speech or music input material**. It does **NOT** imply continuous input of sinusoidal or other very-high-average-power waveforms. It is impossible to make a simple statement of continuous power handling of test signals since adequate monitoring capability of these signals is beyond that of most service labs' equipment. (Phase angle of voltage and current as well as impedance versus frequency must be very accurately monitored during tests before any meaningful statement as to continuous power handling can be made.)

When using very high-powered amplifiers and especially when bass boost or the "loudness" control is used, it is imperative that your record player's rumble be minimal and that its suspension isolate it well from its environment, particularly the surface on which it rests. Low frequency noise (turntable rumble or "thumps" resulting from tonearm oscillation and caused by record warps, eccentricity

or walking near the turntable) and/or acoustic feedback, even when subsonic, must be kept to a minimum. Otherwise, the woofer cone will tend to make excessively large excursions in its magnetic gap. As a result, the response at low frequencies will become intermittently nonlinear, causing muddy or ill-defined music reproduction, and distortion may be audible during high level passages if they also include low frequency components. In severe instances, when excessive rumble and thumps are overemphasized by large bass boosts, "bottoming" of the woofer cone, identifiable by a sharp "crack" from the speaker, may be experienced with subsequent rubbing of the voice coil in the gap. Please note that such damage is **NOT** covered by the Warranty.

Whenever any form of distortion is heard, generally one or more of the system components is being operated well beyond its capability and the overall demand for sound level should be reduced if damage to some part of the system is to be avoided.

All AR loudspeakers are designed to operate optimally with an amplifier or receiver having a damping factor (DF) of 10 or higher. All other things being equal, very high damping factors will not in any way affect the low frequency performance of the speaker system.

Acoustic Research speakers are designed to reproduce all types of music. However, they cannot generate constant deafening volume levels associated with discotheques without damage being sustained eventually by some component in the system. Damage caused by such demands is **NOT** covered by warranties and if these very-high-playback levels are desired or required it is suggested that multiple speakers be used on each channel via parallel or series-parallel configurations.

The preceding incidentally is true of any wide-range, low-distortion high-fidelity loudspeaker made for home use. Interestingly such volume levels can be achieved in the home

only by driving home-type receivers and amplifiers into clipping and overload almost constantly and exceeding their proper operation points. It should be pointed out that speakers used during rock concerts and in discotheques are custom designed, highly specialized speakers used specifically for sound reinforcement only and almost always used in large multiples.

NOTE: As is the case with loudspeakers designed for home music reproduction, AR loudspeakers should not be fed sine waves, or other test waveforms from a generator, test record or other sources at high level or for prolonged periods of time. Test signal inputs should never exceed 6 volts RMS (a very moderate listening level) or a duration of three minutes. To exceed this recommendation will result in thermal overload of the voice coils which can cause damage to the speaker **NOT** covered by the Warranty.

CONNECTING THE LOUDSPEAKERS



All AR loudspeakers are supplied with an input terminal plate recessed into the rear panel of the speaker enclosure. Connection to the speaker itself is made through two knurled-nut-binding-post terminals, labeled “-” and “+”, so you will need no tools when using ready-made cables with tinned wire ends or spade lugs. These are generally available at reasonable cost from your dealer. The knurled-nut-binding-post design facilitates connection to the loudspeakers and reduces the possibility of shorts and loose connections.

When making loudspeaker connections, it is very important to use the correct type of wire in order to avoid unnecessary loss of amplifier power in the cable and reduction of amplifier damping factor (DF). For runs under 25 feet, “miniflex” cables, made of #20 or #22 stranded wire or flat TV wire, may be used. For runs up to 50 feet, ordinary “zip” or lamp cord, made of #18 stranded wire and obtainable in a variety of insulation colors, must be used to prevent power losses. For lengths over 50 feet, use #16 stranded wire only.

If the connections are made following the procedure below, the loudspeakers will automatically be "in phase"—that is, both cones will move forward and backward, in unison, rather than in opposition, when fed the same electrical signal (as is the case when the amplifier or receiver mode switch is in the mono position). For correct stereophonic and monaural performance, the loudspeakers must be in phase.

If you want to shorten either cable once you have found the best routing for the wires and wish to make a neater installation, be certain, when splicing the wires, that the two ends of the coded wire are connected to each other and not to the other conductor in order to maintain phase. It is recommended whenever wires are spliced that you solder the splice and carefully insulate each conductor with electrical tape.

If you wish to verify that your loudspeakers are in phase, once the connections have been made, place the loudspeakers about two inches apart, facing each other. Play a recording with extended bass response at normal volume with the amplifier or

receiver mode switch in the mono or A + B position. Note the amount of bass present in the music material and reverse the leads to one of the speakers (that is, switch the wire connected to the knurled-nut terminal on the loudspeaker input marked "—" to the terminal marked "+", and vice-versa). Switch the wires sufficiently to determine which connection results in maximum bass. This will be the in-phase connection and should be made permanent. Whenever possible and if you have the tools, it is suggested that the wire to the loudspeakers and receiver or amplifier be tinned to facilitate connection and to prevent shorts.

TO STRIP AND TIN THE WIRES:

1. Measure as accurately as possible the length of wire necessary to interconnect each speaker to the amplifier or receiver. Be certain to follow the path you intend to use ultimately—that is, around furniture, etc.
2. After the wire is cut to length, split the insulation to separate both conductors at the ends of each cable.

3. Strip about $\frac{1}{8}$ of an inch of the insulation off the wire, being careful not to cut into the wire strands.

4. After twisting each of the conductors to prevent loose strands, tin the ends of the wire with solder and a soldering iron. Do not use excessive solder on the wire. Run the hot iron up and down the wire end to insure good, even solder flow.

5. Shake off excess solder that may collect on the wire ends while the solder is still hot.

TO CONNECT THE LOUDSPEAKERS:

1. Determine the coding used in your wire to identify the conductors. All double conductor cable is supplied with a means of identifying the wires at either end. Some wire is furnished with a coding ridge or flat along the edge of the insulation of one of the conductors. Other wires have a colored thread tracer inside the insulation or internal color coding (one wire is copper, the other silver).
2. Connect one of the cables to the left speaker by securing the wire with the tracer or identification to the knurled-

8 To connect the loudspeakers

nut terminal labelled "+" on the loudspeaker. Connect the unmarked wire to the knurled-nut terminal labelled "-". The easiest way to secure the wire to the knurled-nut terminal is to form a "hook" on the stripped end (if lugs were not provided with the cable), place it on the terminal screw stud between the nickel plated washer on the terminal and the bottom bearing surface of the knurled nut and firmly tighten the knurled nut onto the wire.

3. At the other end of the left speaker cable, secure the wire with the tracer or identification to the amplifier's or receiver's left channel speaker output screw terminal or binding post labelled 8 OHMS, POS, "+" or color-coded red. Connect the unmarked wire to the left speaker output terminal labelled NEG, C, COM, COMMON, "-", G, GROUND or color-coded black. Do not confuse the special turntable ground terminal, generally placed on the chassis well away from the amplifier's speaker outputs, for the negative or common loudspeaker output connection. If you are in doubt, please consult your amplifier's or receiver's owner's instruction manual.

4. Connect the wire with the tracer or identification of the second cable to the right speaker by securing it to the knurled-nut terminal labelled "+", connect the unmarked wire to the right speaker's knurled-nut terminal labelled "-".
5. At the other end of the second cable, secure the wire with the tracer or identification to the amplifier's or receiver's right channel speaker output screw or binding post terminal labelled 8 OHMS, POS, "+" or color-coded red. Connect the unmarked wire to the right channel output terminal labelled NEG, C, COM, COMMON, "-", G, GROUND or color-coded black.
- NOTE:** The most important point in phasing loudspeakers is that they both be connected identically at both ends of the cable—that is, that the wires connected to the "+" knurled-nut terminal of the speakers be attached to corresponding contact points at the amplifier or receiver outputs (e.g. screws or binding posts labelled 8 OHMS, "+" or color-coded red).
6. Carefully examine all the connections to the loudspeakers and receiver or amplifier loudspeaker output terminals to see that no wire is frayed and to make sure no loose strand from any conductor is touching another conductor, other binding post, other knurled-nut terminal or other metal part of the loudspeaker, receiver or amplifier.

If you would like to make a professional-appearance installation, avoiding visible wiring (and you live in a house with a basement), you may find it expedient to drill a small hole in the floor, lead the speaker cables in and through the basement, and bring them up through a hole drilled behind or near the speakers.

If not, you may want to "dress" and staple or tack your wires along a baseboard for a neater installation once you have decided on the best routing for the cables. There are many inexpensive staplers available which are designed specifically for stapling wire to baseboards and walls. Be careful, however, when stapling or tacking wire, not to cut through the insulation and short the wires together. Shorted wires may cause intermittent or distorted operation of the amplifier or receiver and damage to its output stages.

PLACING THE LOUDSPEAKERS IN YOUR ROOM AND ROOM ACOUSTICS

Your loudspeakers were designed to yield flat power output in an average room when placed on a shelf or against a wall. Very often, in rectangular rooms, the most natural sounding and unobtrusive placement for a speaker is on a wall, 3 to 5 feet from the floor, away from the corner, with the cabinet in a vertical or horizontal position. However, depending on your particular room and its furnishings you may be able to place the loudspeakers in seemingly extreme positions (near the ceiling, for instance) with excellent results.

Although loudspeakers should be at approximately the same height and on the same wall, it is not required that they be placed symmetrically in the room. For example, it can be perfectly correct to place one loudspeaker near a corner and the other in the middle of the same wall. Similarly one loudspeaker may be placed a foot or so higher on one side of the room than the other without experiencing any sound difficulties.

Unfortunately, the inaccurate impression persists that, for proper stereophonic reproduction, there is only one placement for correct interaction between the loudspeakers, the

room, and the listener. This is perhaps the result of a basic misunderstanding about the advantages of stereo. The primary benefits of stereophony are the sense of depth, detail, acoustical spaciousness and instrumental choir definition possible through the use of two separate channels. A listener is able to follow individual lines of music and speech, and profits from the ambience of the hall in which the performance originally took place. Although these benefits are perceptible to some extent even when the speakers are placed in the worst possible arrangements, it is relatively simple to find loudspeaker locations that will project a satisfactory sense of spaciousness over the main listening area and beyond.

There is no special formula to determine minimum and maximum separation of the loudspeakers, but two general observations may help you decide on an initial placement for your speakers. The minimum separation of the speakers will be determined by their distance from your favorite listening position. The area of stereophonic perception will broaden as the speakers are moved apart up to the point where you become aware of two

separate sound sources—with no blend of the speakers and a "hole-in-the-middle". If you are in doubt, a distance of 6 feet between speakers is a good one to begin with and, in most situations, will prove optimal as long as the listening area is centered between the speakers and its distance from the speakers is greater than 3 feet.

Although almost any speaker location will not critically affect stereo reproduction, the overall sound of any system can be influenced to an almost unbelievable extent by variations in loudspeaker positioning. Therefore, it is very worthwhile to experiment with different placements. This is especially true if a particular location in a room causes "triggering" of an undesirable room resonance or "standing wave", imparting a hollow or boomy coloration to bass frequencies. When experimenting, the simple rule of thumb to keep in mind is that very low bass frequencies, the proportion of which determine the overall "weight" and balance of any loudspeaker's sound, are substantially affected by the distance of the speaker from room surfaces. Bass flows fairly evenly in all directions from any speaker. If you

place a loudspeaker on a table in the middle of a room, its sound is markedly thinned out by dissipation of bass in all directions. If you move the loudspeaker toward the wall, floor, or ceiling, you will begin to "focus" the bass toward you along these surfaces, increasing the apparent weight of the sound. The closer you place the speaker to intersecting room surfaces (wall and wall, wall and ceiling, wall and floor), the greater the relative bass output. The greatest proportion of bass will result from placement near three intersecting surfaces (in a room corner at or near the floor or ceiling). It must be stated here, in view of the above, that "most" bass is not always "best" bass, nor desirable. Proximity to more than one reflective surface, as is the case when a loudspeaker is installed in a corner, or on the floor, does not increase the relative level of bass smoothly, as would be the case if you increased the bass controls of your amplifier or receiver slightly. Rather, this type of bass augmentation, which is the result of too many nearby surfaces, is peaky and rough and is generally characterized by a big peak and subsequent dip in the bass region imparting a hollow and unnatural quality to the bass. The above is a

physical phenomenon which affects all speakers equally except those (such as the AR-10 π) in the design of which this variation in room loading has been observed, and in which special adjustments are provided within the speaker to maintain flat, unaccentuated bass response.

The rules above make it reasonably easy to find the position that provides the best proportion of bass for the overall balance of the system, without exaggeration of bass with respect to midrange and treble. Keep in mind that your own taste and furnishings—rather than any set of arbitrary requirements—determines the best arrangement. Listen long enough to decide which placement is the most preferable and when you have made a decision, move the speakers a foot or two to make certain no noticeable improvement is possible.

Your loudspeakers are finished on four sides to permit either vertical or horizontal placement. When in a vertical arrangement, the speakers should be positioned with the highrange (which is on the end of the speaker away from the AR logo) as near ear level as possible, and unobstructed by furniture or other objects. To mount the smaller, lighter speakers on a wall, use

two 50 lb. "picture hooks" for each speaker preferably nailed into the wall joists for strength. Mating brackets may be used for the larger, heavier speakers but be certain that they are properly secured to the wall or plasterboard. Special mating brackets for wall mounting the larger AR speakers are available from the AR Customer Service Department at nominal cost.

If in your particular situation you find it necessary to place the speakers on the floor, we recommend that you use a stand, raising the speaker off the floor 12 to 15 inches. At this height you will be assured smoother bass response and you will prevent resonances, which are easily excited when the woofer is near the floor, at the base of a wall. Acoustic Research manufactures an optional set of black metal stands, model number S1, which will accommodate the larger AR speakers. These are available at your AR dealer.

If you decide to place the speakers horizontally on a shelf or bookcase and want to straighten the AR logo, simply rotate it on its pivot. Be careful not to exert undue pressure on the ends of the logo as you rotate it since it can be bent and the edge or corner of the logo plate might scratch the walnut cabinet surface.

ADJUSTING MIDRANGE AND HIGHRANGE LEVEL CONTROLS

All AR loudspeakers are supplied with level-control switches for adjustment of their midranges and highranges. The switch or switches (depending on the specific model) are located on the input terminal plate recessed into the rear panel of the speaker enclosure. The positions on the switches (again depending on the specific model) are labelled "0", "-3" and "-6" and indicate the absolute reference acoustic output of the driver they control (midrange, highrange or both). These level controls are designed to permit matching of the midrange and treble of the speaker to your individual environment and are meant as important adjuncts to the tone controls in your receiver or amplifier. Therefore, make certain when setting these switches initially that your amplifier tone controls are placed in the "flat" or "0" position, and that the "loudness" control is off.

In most rooms and situations in which there is normal acoustical absorption and treble diffusion effected by drapes, shelves, book cases, furniture, etc., and where associated equipment and source material of very high quality are being used, the switch or switches should be placed in the "0" position.





In rooms that are paneled, where hard surfaces abound, or in sparsely furnished rooms, or if very bright sounding source material is normally used, you may find that the “-3” or “-6” positions of the switches will result in best overall music balance.

It is easy to determine the specific sonic character of your room. If your voice sounds dull and muffled or if you clap your hands and the sharp sound seems lifeless, you probably have an over-damped, acoustically dead room. If when you speak your voice is

very reverberant (much like singing in the shower) and your hand clap causes “flutter echo” (a tick-tick-tick-sound caused by the mid and high frequencies being reflected by hard, parallel surfaces), you probably have a very live room. The norm, of course, lies between these two extremes.

To liven a dead room, all that is required is to open drapes and expose some window glass. A few glass picture frames around the room and a hard-surfaced coffee table will also liven it up substantially.

To tame an over-reverberant room, a few throw rugs on the floor and a bookshelf or two along with mounted posters on the wall will serve to break up most flutter echo situations. Always try to place shelves or posters asymmetrically so that bare wall on one side faces a poster or shelf on the other. The idea is to have a hard surface face a “softer”, less reflective surface across the room.

The correct setting of the midrange and highrange switches in your particular environment is that which will result in the best balance from bass through midrange to treble without a preponderance of any part of the range being evident.

The fastest and easiest way to

reach the most satisfactory setting of the midrange and highrange controls is to adjust one speaker at a time rather than to try and make simultaneous adjustments to a stereo pair. Additionally, there are few living rooms, if any, in which both speakers will face identical acoustical environments. Most rooms will differ enough that individual setting of the controls is advised.

TO ADJUST THE MIDRANGE AND HIGHRANGE CONTROLS:

1. Set the mode switch of the amplifier or receiver to the mono or A+B position.
2. Rotate the balance control fully clockwise or counterclockwise so that only one loudspeaker is operating.
3. Select a number of recordings with which you are familiar and which are of as high a quality as possible.
4. Start playback and comparison of the recordings through the single loudspeaker with the midrange and highrange switch or switches in the "0" position, until you are thoroughly familiar with the overall sonic character of the speaker in your room.
5. Before setting the midrange switch, first place the highrange switch at "-6".

6. Select and play recordings rich in midrange material such as piano, woodwinds and voice and slowly change the position of the midrange switch to "-3," "-6" and back to "0" until you feel you have achieved, in one position of the switch, a smooth transition from low bass through mid-bass to midrange and there is no preponderance of any part of the midrange or bass.

7. Once you have set the midrange satisfactorily, adjust the highrange switch similarly using solo violin, massed strings, brass and voice noting particularly the transition from midrange to treble. Check that there is no preponderance of instrumental harmonics, sibilants, etc., and that you are not particularly aware the highrange is operating.

NOTE: To adjust the balance on those loudspeakers supplied with only a highrange switch, play recordings of piano, woodwinds, brass, violin and voice and adjust the single switch until a smooth transition is achieved between woofer and highrange. Make certain there is no preponderance of sibilants and instrumental harmonics and that you are completely unaware of the transition from woofer to highrange.

8. Rotate the balance control on the amplifier or receiver fully in the opposite direction to operate the other loudspeaker.

9. Repeat steps 5 to 7 above to adjust the controls on the second speaker.

10. Return the mode switch to the stereo position, place the balance control in its "0" or normal position and make any other adjustments to the tone controls and loudness control you may feel are desirable.

Please note that in many instances, the speaker switches for midrange and highrange control will not be at the same position in both channels. That is, one speaker's midrange may be optimally set at, say, "-3", while the other might require a "0" or "-6" position. This type of occurrence is perfectly normal and is due to the differences in the immediate acoustical environment to the speaker. For example, one speaker may be placed close to a drape while the other speaker may be next to a wall with little absorptive material.

FUSING AR SPEAKER SYSTEMS

All AR speaker systems can handle easily the output power of any amplifier while playing music in a normal home listening situation and within the limits specified in the comparative chart at the end of this manual. There are abnormal conditions, however, under which your speakers may receive far more average power than they can tolerate. A few such situations may occur:

1. When an amplifier of greater output capability than the maximum stated for your particular speaker is used.
2. When the system is subjected to frequency response testing.
3. If your amplifier develops a defect.
4. If your tape deck or recorder generates large amounts of ultrasonic power when in the fast forward or rewind modes.
5. When you exceed the output power capability of the amplifier so that it clips and distorts excessively.
6. When the loudspeakers are used in a discotheque application in which the demands for overall volume levels far exceed normal home listening levels.
7. When you feed the loudspeakers waveforms from a synthesizer at very high levels, or any other waveform

whose average level is much greater than that of music waveforms.

If you wish to protect your speakers from thermal overload due to most abnormal inputs, the fuses we recommend are Buss Fusetron Dual Element type:

- FNM-2 for the AR-11
- FNM-1 $\frac{6}{10}$ for the AR-12
- FNM-1 $\frac{1}{4}$ for the AR-14, AR-15, AR-17 and AR-18

These fuses will permit the following power levels to be fed into the speakers without blowing of the fuse.

FNM-2 (calculated on the basis of a 4-ohm nominal impedance):

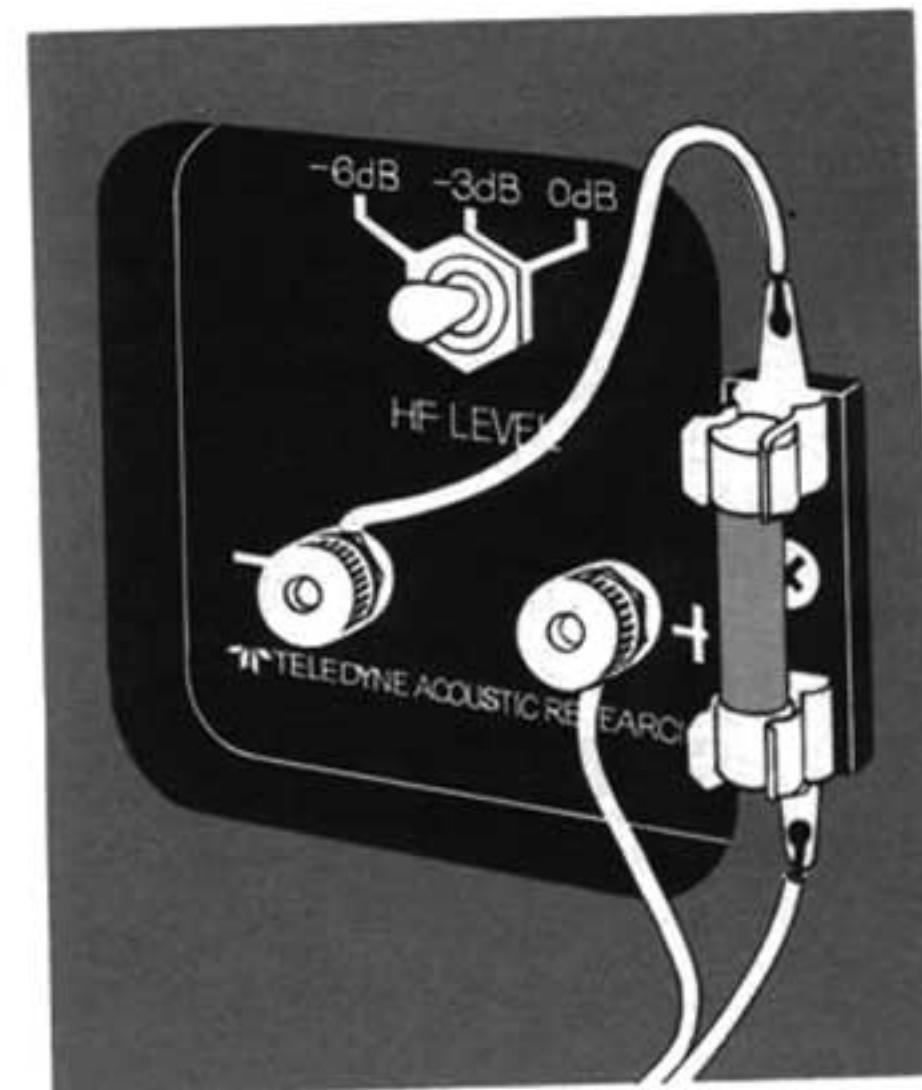
- 25 watts long-term average
- 64 watts for 30 seconds
- 180 watts for 10 seconds

FNM-1 $\frac{6}{10}$ (calculated on the basis of an 8-ohm nominal impedance):

- 33.5 watts long-term average
- 72 watts for 30 seconds
- 185 watts for 10 seconds

FNM-1 $\frac{1}{4}$ (calculated on the basis of an 8-ohm nominal impedance):

- 19 watts long-term average
- 46 watts for 30 seconds
- 128 watts for 10 seconds



To operate properly these types of fuses must be mounted in an open fuse holder, not a cartridge-type fuse holder. Specifically, we recommend the Buss Fusetron type number 4421 which should be connected in series with one of the leads from the amplifier (see sketch for a typical hookup). The fuse holder may be attached permanently to the rear panel of the loudspeaker enclosure with a $\frac{3}{4}$ inch, flat-head, #8 wood screw. It is advisable

REMOVING THE DRIVERS

to drill a pilot hole for the screw before mounting or at least make a screw-starting hole with an awl or heavy nail.

Should any of the fuses recommended above blow frequently, interrupting operation of one or both speakers, the indication would generally be that the power output capability of the amplifier is being exceeded or that one or more parts of the system is not operating properly.

Please note that there is no fuse which can safeguard a loudspeaker from every type of overload. Even the specialized fuses recommended will **NOT** protect the speakers from short-term, very-high-peak-power inputs. It will not protect the woofer, for example, if the system is plugged into an AC wall outlet. Nor will it prevent speaker damage if your amplifier feeds a large-amplitude "thump" to the speaker during turn on or turn off.

Since the speaker fuses and fuse holders we recommend may not be available locally, you may purchase them directly from AR at nominal cost. A price list for all fuses is available from AR upon request with a self-addressed, stamped envelope.

All AR loudspeakers have removable drivers. If at any time you experience difficulty and would rather return a single driver than the whole speaker please follow the instructions below. All the drivers, except for the AR-11 midrange, are secured to the enclosure with hex-socket-head machine screws. In order to loosen and remove the screws you must use a hex, or Allen, wrench. These are available in most department and hardware stores. Most hex-wrench sets contain the necessary wrenches to remove all the drivers. To remove the AR-11 midrange all you require is a medium-to-large Phillips screwdriver.

For your convenience, the specific-size hex wrench required for each driver of each speaker is listed below.

	Woofer	Midrange	Highrange
AR-11	1/8	Phillips	5/32
AR-12	1/8	1/8	5/32
AR-14	1/8	—	5/32
AR-15	1/8	—	1/8
AR-17	3/32	—	3/32
AR-18	3/32	—	3/32

TO REMOVE THE DRIVERS

1. Place the enclosure on its back on a rug or a table. If you are placing the cabinet on a table, protect the surface of the table and the rear panel of the cabinet from scratches by stretching a towel on the table prior to putting the cabinet down.

2. Insert the correct hex wrench in its socket and loosen and remove all the machine screws on the outer edge of the driver holding it onto the enclosure.

3. Once all the screws have been removed, insert an awl or nail into one of the screw holes in the driver chassis and lift it sufficiently to insert your fingers under the chassis and lift it partially out of the enclosure. **Do not pull the driver out of the enclosure.**

There are wires attached to it leading from the crossover.

4. Carefully note to which specific terminal of the driver the wires are attached. **Polarity is very important.** If you replace the driver you must reconnect the wires with the proper polarity in order to maintain the loudspeaker's performance and its flat frequency and power response. The

16 To remove the drivers / To replace the drivers

polarity of all drivers is marked with a "+" or a red dot at or near the positive terminal.

5. Note which wire is connected to the positive terminal, make a small label with Scotch or masking tape and attach it to the wire. Do not trust your memory in this instance. It is very easy to become confused with a device the complexity of which is unfamiliar to you.

6. The drivers are connected via quick-connect, push-on terminals. Slide these off the driver terminal tabs.

7. Lift the driver out and away from the enclosure.

8. Replace the machine screws in the threads in the enclosure and finger tighten to prevent their loss.

NOTE: The special sealing gaskets on each driver are **NOT** reusable. If you loosen and remove a driver from the enclosure, the gasket **must** be replaced with a new, unused gasket to maintain the seal of the enclosure. All

AR replacement drivers are shipped with new gaskets. To ignore this recommendation may result in a loss in bass performance or "bottoming" of the woofer and damage **NOT** covered by the Warranty. Special shipping cartons for drivers are available upon written request to the AR Customer Service Department. It is recommended that these cartons be used whenever shipping a driver, to prevent damage. A driver damaged in shipping cannot be properly evaluated as to failure. In addition, damage to drivers in shipping which are improperly packed will not be recognized as an insurance claim by the carrier, and shipping damage is **NOT** covered by the Warranty. As a result, you may incur expenses for the repair of freight damages which are not reimbursable.

TO REPLACE THE DRIVERS

- 1. Remove the machine screws from the enclosure.**
- 2. Make certain the replacement gasket is centered in the enclosure cutout and that the clearance holes for the mounting screws in the cabinet and gasket are directly over each other.**

3. Push the quick-connect terminals on the wire onto the terminal tabs of the replacement driver making sure that the wire terminal is all the way onto the driver tab. Make certain to observe the polarity you have previously marked on the wires.

4. Make certain when replacing a woofer that the connecting wires from the crossover are well out of the way of the woofer cone and tucked behind the magnetic structure in the back of the woofer. Also make certain that the fiberglass and its "kimpak" sheet, which prevents the fiberglass from shifting and contacting the woofer cone during operation, are both properly tucked under the front panel "lip" and well away from the woofer cone.

5. Center the mounting holes of the driver directly above the enclosure and gasket mounting holes. Start all the screws in their threads. Some drivers have a reticulated foam gasket on their mounting surface to improve performance at high frequencies and to cosmetically finish the surface. Shift the driver slightly, as you finger-tighten

MAINTAINING THE APPEARANCE OF YOUR SPEAKERS

the screws to make certain the screw head is centered and will go through the holes in the reticulated foam gasket. If this procedure is ignored, you may cause the foam to tear while tightening the screws imparting an unfinished appearance to the driver. The acoustic performance of the driver, however, will not be impaired.

6. Insert the correct hex wrench in each of its sockets and tighten all the screws. The best way is to tighten screws which are diametrically opposite in a criss-cross fashion.

7. Check each screw with the wrench to make sure it is as tight as possible proceeding in a clockwise fashion around the driver, beginning with the top-most screw. Excessive torque is not required to insure a good seal. Simply use normal force on the wrench.

NOTE: The crossover and/or portions of the crossovers, such as switches, capacitors, etc., are not removable or field repairable. Refer any such service to your dealer, Authorized Service Agency or the AR Customer Service Department.

The hand-rubbed furniture grade, oiled walnut surfaces of your loudspeakers have been sealed at the factory through natural action of the finish applied. To protect their appearance, we suggest you apply two coats of a high-grade paste wax, such as Butcher's Wax or Staple's Paste Wax, observing the directions on the can. By controlling the buffing of the wax, you can achieve the desired luster. For a dull finish, use a brush for both coats. For higher gloss, use a brush for the first coat and a flannel cloth for the second.

Alternatively, you may re-oil the enclosure by periodically rubbing in a boiled linseed oil compound. These are generally available from department, furniture or hardware stores. Before applying oil make certain to remove the foam grille panel to prevent staining of the grille. Be sure also to place the cabinet on its back, on a table, and protect the surface of the table from stains by covering it with a layer of newspapers. Apply a generous film of linseed oil, to the walnut surfaces only, with a lintless rag and permit the oil to soak into the wood for approximately 15 minutes. Remove

the excess oil with another clean lintless rag and rub the cabinet surface in the direction of the grain until the desired luster is achieved.

The AR-18 enclosure is veneered with a walnut grain vinyl and will not respond to wax or linseed oil finishes. To clean the AR-18 enclosure surfaces simply spray the surfaces with Windex or similar glass cleaner, wipe with a moist rag and buff with a clean soft cloth.

NOTE: Rags soaked with linseed oil and not cared for properly are a fire hazard due to spontaneous combustion caused by heat generated as the oil oxidizes. Do not store such rags indoors. They should be spread on an outside window sill exposed to good ventilation and should not be discarded in a trash container unless thoroughly dry. **DO NOT THROW OUT IN A BALL UNLESS THE OIL HAS THOROUGHLY DRIED.**

The foam grille panel on your loudspeakers is easy to care for. Simple, periodic vacuuming using an upholstery attachment or crevice tool

IN CASE OF DIFFICULTY

is all that will be required. Although vacuuming can be performed while the foam grille is on the speaker, you will find it much more efficient and effective if you remove the foam grille from the loudspeaker enclosure. The grille is secured to the enclosure by special Velcro hook fasteners. To remove the grille pinch the foam firmly at the top, in the center, and pull outward. The tearing sound you will hear is normal and is caused by the hook fasteners releasing the foam. To replace the grille, first note the location of the special Velcro fasteners on the speaker front panel, carefully center it on the speaker and press firmly on the surface of the foam directly above the locations of the Velcro. Be careful not to press any area of the foam that is directly above any driver. Some of the cone drivers on AR loudspeakers can be damaged if excessive force is applied to their cones while replacing the foam grille. Note also that the inside surface of all the speaker grilles has mating cutouts to clear each driver when the grille is in place. Always replace the grille panel so that the largest cutout is directly in front of the woofer.

If your loudspeakers, when installed and adjusted in accordance with the instructions in this manual, do not operate correctly, please make the simple checks outlined below.

If your loudspeakers have worked properly since they were first installed but now seem to have developed a malfunction, please reread the instructions in this manual to make sure you are operating the system correctly in every way; then make the checks below. You may often save time, trouble and needless expense by taking a few moments to try and track down the trouble yourself. In most instances you will be able to locate the specific problem and rectify it easily.

WHAT TO DO

IN CASE OF FAILURE IN BOTH CHANNELS

It is almost impossible for both loudspeakers in a system to fail totally and simultaneously short of a catastrophic occurrence. In almost all cases at least part of the speaker, woofer or highrange, will operate. Therefore, fail-

ure in both channels will be found elsewhere.

1. Check the receiver or amplifier to make certain it is energized. If the dial or pilot light is off, make sure the AC line cord is plugged into a standard wall outlet. If it is, plug a lamp or other appliance into the wall outlet to make certain it is energized. If the AC outlet is energized, check the AC fuse or circuit breaker in the receiver or amplifier to be certain it is not blown. If you replace it and the fuse blows again, it may be an indication that there is an internal short in the amplifier. If the fuse blows only while playing loud music passages, it may indicate you are exceeding the output capability of the power amplifier.

2. Make certain that the volume control in the amplifier or receiver is not in its maximum counterclockwise position. Sometimes "loudness" controls can decrease the apparent volume level substantially if at their maximum clockwise (or counterclockwise) position. Rotate the loudness control to make certain.

3. Make sure the correct music source has been selected by the source switch on the amplifier or receiver.

4. Make sure, if the amplifier or receiver has multiple speaker switches, that one has not been placed accidentally in a position which disconnects internally the speakers you are using.
5. Check the tape monitor switch in the amplifier or receiver to make sure it is in the source or out position.
6. Check the speaker cables to make certain no strands of wire are shorting out the speaker outputs at either the speaker inputs or the amplifier outputs. Shorts of this type may cause the amplifier outputs' protective fuses to blow or internal safety circuits to be triggered interrupting operation. If you experience this type of short, tin the wires or install spade lugs to prevent a recurrence.
7. Be certain there are no breaks in the cables. If the cables have been spliced at any time, check the splices to see that the wires are not touching each other at a point where they are not insulated and that the splice is still firm, with a good connection.
8. If while experimenting with the speaker cables, operation is restored at any time, replace the cables with a new set and make sure to tin the wires

or put spade lugs on the ends of the cables to prevent shorts.

9. Check the speaker fuses or any other form of speaker protection, such as circuit breakers, to make certain they have not blown, or been triggered, due to a momentary short in the speaker cables or an overload caused by a demand for too high a volume level. Continual blowing of these fuses, or triggering of circuit breakers may indicate a short circuit in the speaker cables, at the loudspeaker input terminals, at the amplifier output terminals or demands for volume level exceeding the capability of the power amplifier.

10. Check any speaker fuses you may have installed, such as the Buss FNM type of fuse recommended, to make certain the connections are properly made and no wire strands are shorting to the other conductor. Short the fuse holder momentarily by bridging with a screwdriver, knife or similar tool the two spring contacts which hold the fuse and see if operation is restored. If operation is thus restored, the fuse is blown. A blown fuse may indicate too high a demand for volume level or a malfunctioning amplifier.

IN CASE OF DISTORTION OR BUZZ IN BOTH CHANNELS

It is extremely unlikely that both loudspeakers in a system will malfunction identically unless they have been abused and the precautions advanced in the previous instructions have been disregarded.

1. If you experience distortion, buzz and rattle during loud passages that disappear when the volume level is reduced, it is usually indicative of an overloading amplifier. Please note that amplifier overload (clipping) is very commonly mistaken for a defective loudspeaker since an overloading amplifier can imitate speaker rattle and distortion to perfection. If the amplifier is not malfunctioning in some way, this occurrence may point to insufficient output power for your specific listening room and listening tastes. If you are using substantial bass boost through either the bass control, loudness control or both and thereby exceeding the output capabilities of the power amplifier, you will have to reduce these demands or replace the amplifier or receiver with one capable of delivering much greater power.

2. If high distortion is present consistently but is specially audible during loud passages or musical peaks, it may be a symptom of transient or incipient supersonic oscillation (ringing) or subsonic oscillation. This condition is an amplifier malfunction that should be remedied immediately if loudspeaker damage is to be avoided.

3. If distortion with only one source (tuner, tape recorder, phono) and particularly during high level peaks is present, it may be the result of the source having an output level sufficiently high to overload the inputs to the amplifier or receiver. In such cases, the output level controls of the source (if any) should be adjusted to the point where distortion is not evident. In those cases where the source has no level controls, consult its manufacturer concerning installation of an attenuator to effectively reduce the output level of the device.

IN CASE OF DISTORTION OR BUZZ IN BOTH CHANNELS WITH RECORDS ONLY

1. Inspect the stylus for dust accumulation and damage. If in doubt, have

the stylus checked by your dealer under a microscope to be sure that it is not worn or damaged.

2. Doublecheck the tracking force (see the instruction manuals supplied with your turntable and cartridge). Be certain the tracking force is set somewhere in the upper half of the recommended range. Insufficient tracking force will cause severe distortion on loud recorded passages.

3. Make sure the tonearm adjustments in your turntable have been properly made. If, for example, the counterweight of your tonearm (if one is provided) is incorrectly adjusted, it may substantially affect the adjustment of the tracking force.

4. If the distortion is present only on certain records, try to find out if the records themselves are faulty. It is unlikely that a defect in the speakers will be audible only on a few records.

IN CASE OF HUM OR RUMBLE

Loudspeakers do not hum or rumble. The cause of the problem will always be found elsewhere in the system.

1. Hum, rumble or rattle present only while playing records, which stops

directly upon removal of the stylus from the record indicates either a faulty turntable or "acoustic feedback", a phenomenon present when bass energy from the loudspeakers is mechanically coupled back to the turntable and stylus. To determine if acoustic feedback is present, turn the volume control of the receiver or amplifier completely counterclockwise, place a record on the turntable with the motor mechanism turned off (in some instances with certain kinds of turntables the AC cord supplying power to the turntable may have to be disconnected from the AC outlet on the wall, or the amplifier or receiver AC convenience outlet) and put the stylus in the lead-in grooves of the record. Increase the volume control setting to a position roughly equal to or slightly higher than that required for your normal listening levels and lightly tap the chassis or base of the turntable. If hum, lengthy "boom" or rumble building in intensity become evident, immediately reduce the setting of the volume control to prevent self-sustaining acoustic feedback which may damage the loudspeakers, blow the amplifier or receiver loudspeaker outputs' protec-

tive fuse, or trigger its internal safety circuits. To lower the sensitivity of a system to acoustic feedback, the mechanical coupling between the turntable and loudspeakers must be reduced. If the speakers are on the same surface or shelf as the turntable, move them to another location. If relocating the speakers is unfeasible, try placing a thick sheet of foam rubber or other resilient material between them and the surface on which they rest. If the speakers are in another part of the room, move them to a firmer spot on the floor or shelf. You may also reduce the setting of the bass control or make use of the rumble or low-frequency filter, if one is provided on your amplifier or receiver, to reduce the low-frequency output from the speakers and decrease acoustic feedback. It bears noting that the wider the range of an audio system the more susceptible it is to this type of phenomenon. If the hum or rumble is not due to acoustic feedback, check to make sure that all the "transit" or shipping bolts on your turntable have been released (refer to your turntable instruction manual), otherwise the suspension of the turntable may not be effective and

motor vibration is probably being coupled to the record and stylus. Make sure also that nothing (wires or other objects) under the turntable is pushing against the motor housing reducing the effect of the motor isolation mounts.

2. Reverse the AC plug of the amplifier or receiver in the wall socket to see if hum is reduced. Reverse also, one at a time, the AC plugs of the turntable and any other accessory devices which you may have connected to your system and leave the AC plugs in the position resulting in lowest hum. It is possible, for example, to have high hum level in the phono position of the selector switch if another device connected to the amplifier or receiver has its AC plug improperly phased with respect to the other AC plugs.

3. Hum in the phono position of the selector switch which varies with the position of the tonearm and cartridge generally indicates the presence of a hum field from the transformer of an auxiliary source such as a tape or cassette recorder or the amplifier or receiver itself. Move the turntable away from electronic accessories near it. If the hum decreases, you will have

to place the turntable further away from the auxiliary source until hum is minimal. In some cases, changing the relative positions of the turntable and the source of hum will suffice.

4. If any auxiliary source such as a tape recorder is connected to the amplifier or receiver, reverse its AC plug in the wall socket. Some AC-DC-battery tape recorders may generate hum when connected to the amplifier or receiver while its AC converter or battery charger is being used. If reversing the AC linecord of the battery charger does not decrease the hum, check with the dealer from whom you bought the recorder concerning the use of an AC isolation transformer or other means of hum reduction.

5. If hum is apparent only during use of a tape recorder or other auxiliary source, make sure the correct audio cables were used for interconnection and that the plugs are tight and properly seated in their jacks. Persistent hum even with the correct cables and AC plug orientation may indicate a faulty recorder or source or, in some cases, excessively long interconnecting cables.

IN CASE OF FAILURE, INTERMITTENCE OR DISTORTION IN ONE CHANNEL ONLY

1. Check the connections at the knurled-nut terminals on the loudspeaker input plate recessed into the rear panel of the loudspeaker enclosure to determine that the wire has not been accidentally pulled off the connectors and that wire strands are not shorting out the speaker input terminals. Tin the wires or install spade lugs to prevent this occurrence.
2. Check the appropriate loudspeaker output terminals on the amplifier or receiver to make sure proper connections have been made and the wires are not loose, broken or shorting out at the terminals. Again, tin the wires or install spade lugs to prevent problems.
3. Bend and twist the speaker cables at any point where they are led over a sharp corner or edge to determine if the wire is broken.
4. Interchange the cable connections at the amplifier or receiver (connecting the left speaker cable to the right loudspeaker output terminals and vice-versa). If the trouble remains in the

same speaker regardless of the channel to which it is connected, the speaker is at fault. If the trouble shifts from one speaker to the other as you reverse cable connections, the fault may lie in the amplifier or receiver. Check the possibility of a faulty speaker cable by trying each cable from each set of loudspeaker output terminals on the amplifier or receiver to each speaker.

5. Try different sources (phono, FM, AM, etc.) to determine if the trouble is in only one source and not all sources.
6. If you are using the tape out jacks of the amplifier or receiver with a tape recorder, unplug the cables from the amplifier or receiver to determine if a short is present in either the cables or recorder.

7. If the problem is traced to one source only and this source is separate from the amplifier or receiver (as would be the case with the turntable or a tape recorder), check the points at which the interconnecting audio cables enter the plastic strain relief on the plugs by gently bending and twisting the cable. Any intermittent, broken or suspect cable should be replaced at once to prevent future difficulties. If the problem persists even though the cables appear intact and connections

well made, exchange the cables on the channel with the problem with the cable on the properly operating channel, to determine if the cable is at fault, rather than the source.

8. If harshness or distortion is experienced, exchange the amplifier leads (connecting the left speaker cable to the right loudspeaker output terminals on the amplifier or receiver and vice-versa). It is not sufficient to operate the channel reverse switch on the amplifier or receiver since the output stages of the power amplifier are **NOT** reversed by this switch and will continue to drive their respective speakers. The cables **must** be interchanged. If when the cables are interchanged the distortion remains on the same speaker, the speaker is at fault. If the trouble shifts from one speaker to the other, the fault may be in the amplifier or receiver.

9. If the distortion or buzz is traced to the loudspeaker, the probability is that the speaker is defective. However, be certain to check loose objects, shelves and pictures on walls in the vicinity of the loudspeaker. Very often these articles will buzz when triggered by sound from the speaker, particularly at loud volume levels, and can create the impression of a defective loudspeaker.

IN ORDER TO DETERMINE WHICH DRIVER IS DEFECTIVE

1. Place the amplifier or receiver volume control at a setting lower than normal, the mode switch on mono and tune to a point on your tuner dial between stations with the "mute" control on the tuner off so that the interstation noise is audible.
2. Rotate the balance control on the amplifier or receiver so that only the defective loudspeaker is operating.
3. Remove the foam grille panel by pinching the foam firmly at the top, in the center, and pulling outward. The tearing sound you will hear is normal and is caused by the Velcro hook fasteners releasing the foam.
4. Place your ear close to each driver to determine if one is not operating. If you locate the defective driver, remove it following the instructions in the section "**Removing the Drivers**".
5. If you are experiencing distortion, select the music on which the distortion is most evident, with the volume control at its normal position, the mode switch on mono and the balance control positioned so that only the defective loudspeaker is operating.
6. Determine whether the distortion is being caused by the woofer, midrange

or highrange. Turn the volume control down and the power off.

7. Disconnect the suspected driver following the instructions in the section "**Removing the Drivers**". If a driver other than the woofer is disconnected, it must be remounted in its cutout to insure a good enclosure seal. Otherwise, the woofer will have insufficient "stiffness" or "loading" and may "bottom" during the tests following, causing woofer damage **NOT** covered by the Warranty. Make sure also that the gasket is properly installed and that all the driver screws are securely fastened. **When replacing the driver in the enclosure cutout, with its crossover wires still disconnected, make certain the quick-connect terminals on the ends of the crossover wires are widely separated, or insulated, to prevent shorting.**

8. Turn the power on and the volume control up to its normal position and see if the distortion is gone. It is difficult to identify a distorting driver easily if the distortion occurs in or near the crossover region.

9. If the distortion is still present, reverse the driver disconnection and connection procedure. That is, if the highrange is disconnected first and the distortion is still present, reconnect

the highrange and disconnect the woofer (in a two-way system) to determine exactly which driver is causing the distortion. In a three-way system, the difficulties in determining which driver is defective will appear only between woofer and midrange or highrange and midrange.

10. Replace the foam grille panel by first noting the location of the special Velcro fasteners on the speaker front panel, carefully centering the grille on the front panel and pressing firmly on the surface of the foam directly above the locations of the Velcro. Be careful not to press any area of the foam that is directly above any driver. Some of the cone drivers can be damaged if excessive force is applied to their cones while replacing the foam grille. Note also that the inside surface of all speaker grilles has mating cutouts to clear each driver when the grille is in place. Always replace the grille panel so that the largest cutout is directly in front of the woofer.

SERVICING

If you are unable to find the reason why your loudspeaker is not operating properly by reading through this manual and following the procedures listed under the section "**In Case of Difficulty**", please follow the instructions outlined below.

Whenever possible, please contact the dealer from whom the system was purchased to arrange for verification of the defect, replacement if your unit is brand new, or shipping if it requires repairs. If your dealer is not within the immediate area or cannot inspect your unit for any reason, write directly to the Customer Service Department, Teledyne Acoustic Research, 10 American Drive, Norwood MA 02062, describing the trouble and any tests you have made, with as much detail as possible, giving the name of your dealer, date of purchase and the serial number of your

loudspeaker. You will find the serial number on the logo plate attached to the front panel of the enclosure, under the foam grille. Alternatively, you may take your loudspeakers directly to the regional AR Factory Authorized Service Agency. A list of these was packed with your loudspeakers and is available upon request from the AR Customer Service Department. AR will make every effort to remedy any problem you may be experiencing at minimum inconvenience to you.

Do not ship your loudspeaker or any of its parts to the Acoustic Research factory without requesting and receiving a Return Authorization Form and Special Shipping Label prior to shipment.

Freight charges must be prepaid when a loudspeaker is shipped to AR for repairs. If the repairs are covered by the Warranty, all **surface** freight expenses will be reimbursed upon completion of the repair and submission of both the green Freight Refund copy of the Return Authorization Form and original freight bill.

It is the responsibility of the sender to see that the loudspeaker, or any of its parts returned for service, are properly packed. Damage to loudspeakers in shipment due to incorrect packing will not be recognized by the carrier as an insurance claim, and the sender will be charged for any parts and labor required to return the unit to proper operating condition. To insure freedom from damage in shipment, the loudspeaker **must** be packed as it was when it left the AR factory. If you no longer have the original factory carton and packing materials, you may obtain a replacement by making a written request to the AR Customer Service Department.

DO NOT SHIP LOUDSPEAKERS, REGARDLESS OF CIRCUMSTANCES, VIA PARCEL POST WITHIN THE CONTINENTAL UNITED STATES. THEIR PACKAGING WAS NOT DESIGNED FOR THIS METHOD OF SHIPMENT. WE SHALL NOT ASSUME ANY RESPONSIBILITIES IF THIS METHOD OF SHIPMENT IS USED.

SPECIFICATIONS

Cabinet finish: All enclosures have oiled walnut veneer finish, except the AR 18 which has walnut-grain vinyl veneer finish.
Specifications are subject to change without notice

Drive units: AR11

300 mm (12 in) acoustic suspension woofer,
38 mm (1 1/2 in) hemispherical dome midrange,
19 mm (3/4 in) hemispherical dome highrange

Crossover frequencies:

525 Hz, 5000 Hz

Impedance:

4 ohms nominal

Controls:

Two 3-position switches for midrange and highrange level control

Efficiency:

1 watt will produce 86 dB SPL on axis at 1 meter

Amplifier power requirement:

25 watts (into one speaker only) will produce 100dB SPL in a 3000 cu ft room of average reflectivity (energy absorption coefficient of 0.15), 50 watts (25 watts per channel) will produce 103dB SPL in the same room

Power-handling ability:

May be used with amplifiers capable of delivering up to 150 watts continuous power per channel being driven to clipping 10 percent of the time, on normal music source material

Crossover network:

Half-section LC network on each driver using air-core chokes and computer grade bi-polar electrolytic capacitors; acoustic output of midrange and highrange drivers is controlled by switchable resistive networks

Driver resonance frequencies:

Woofer 18 Hz (free air), midrange 400 Hz, highrange 2000 Hz

System low-frequency response:

-3 dB at 35 Hz

Effective system Q:

0.75

Flux density:

Woofer 8,200 gauss, midrange 13,000 gauss, highrange 14,000 gauss

Volume of enclosure:

41.9 liters (1.48 cu ft)

Cabinet dimensions:

354 x 635 x 273 mm deep (13 15/16 x 25 x 10 3/4 in)

Weight:

Packed in carton 24.9 kg (55 lb),
unpacked 22.6 kg (49 1/4 lb)

Drive units: AR12

250 mm (10 in) acoustic suspension woofer,
56 mm (2 1/4 in) cone midrange with integral rear loading cavity and magnetic fluid suspension of drive system, 19 mm (3/4 in) hemispherical dome highrange

Crossover frequencies:

700 Hz, 4000 Hz

Impedance:

8 ohms nominal

Controls:

Two 3-position switches for midrange and highrange level control

Efficiency:

1 watt will produce 86 dB SPL on axis at 1 meter

Amplifier power requirement:

25 watts (into one speaker only) will produce 100dB SPL in a 3000 cu ft room of average reflectivity (energy absorption coefficient of 0.15); 50 watts (25 watts per channel) will produce 103dB SPL in the same room

Power-handling ability:

May be used with amplifiers capable of delivering up to 150 watts continuous power per channel being driven to clipping 10 percent of the time, on normal music source material

Crossover network:

Half-section LC network on each driver using air-core chokes and computer grade bi-polar electrolytic capacitors; acoustic output of midrange and highrange drivers is controlled by switchable resistive networks

Driver resonance frequencies:

Woofer 26 Hz (free air), midrange 500 Hz, highrange 2000 Hz

System low-frequency response:

-3 dB at 44 Hz

Effective system Q:

1.15

Flux density:

Woofer 7,800 gauss, midrange 8,000 gauss, highrange 14,000 gauss

Volume of enclosure:

41.9 liters (1.48 cu ft)

Cabinet dimensions:

354 x 635 x 273 mm deep (13 15/16 x 25 x 10 3/4 in)

Weight:

Packed in carton 19 kg (42 1/2 lb),
unpacked 17 kg (37 1/2 lb)

Drive units: AR14

250 mm (10 in) acoustic suspension woofer,
25 mm (1 in) dome highrange

Crossover frequency:

1300 Hz

Impedance:

8 ohms nominal

Control:

3-position switch for highrange contour control

Efficiency:

1 watt will produce 86 dB SPL on axis at 1 meter

Amplifier power requirement:

15 watts (into one speaker only) will produce 100dB SPL in a 1500 cu ft room of average reflectivity (energy absorption coefficient of 0.15); 30 watts (15 watts per channel) will produce 103dB SPL in the same room

Power-handling ability:

May be used with amplifiers capable of delivering up to 100 watts continuous power per channel being driven to clipping 10 percent of the time, on normal music source material

Crossover network:

Half-section LCR network on each driver using air-core chokes, bi-polar electrolytic capacitors and highpower noninductive resistors; acoustic output of highrange driver is controlled by switchable contouring network

Driver resonance frequencies:

Woofer 26 Hz (free air), highrange 1050 Hz

System low-frequency response:

-3 dB at 44 Hz

Effective system Q:

1.15

Flux density:

Woofer 7,800 gauss, highrange 16,000 gauss

Volume of enclosure:

41.9 liters (1.48 cu ft)

Cabinet dimensions:

354 x 635 x 273 mm deep (13 15/16 x 25 x 10 3/4 in)

Weight:

Packed in carton 18.1 kg (40 lb),
unpacked 15.9 kg (35 lb)

Drive units: AR15

250 mm (8 in) acoustic suspension woofer,

25 mm (1 in) dome highrange

Crossover frequency:

1700 Hz

Impedance:

8 ohms nominal

Control:

3-position switch for highrange contour control

Efficiency:

1 watt will produce 85 dB SPL on axis at

1 meter

Amplifier power requirement:

15 watts (into one speaker only) will produce 99 dB SPL in a 1500 cu ft room of average reflectivity (energy absorption coefficient of 0.15); 30 watts (15 watts per channel) will produce 102 dB SPL in the same room

Power-handling ability:

May be used with amplifiers capable of delivering up to 100 watts continuous power per channel being driven to clipping 10 percent of the time, on normal music source material

Crossover network:

Half section LCR network on each driver using air-core chokes, bi-polar electrolytic capacitors and highpower noninductive resistors; acoustic output of highrange drivers is controlled by switchable contouring network

Driver resonance frequencies:

Woofer 27 Hz (free air), highrange 1050 Hz

System low-frequency response:

-3 dB at 48 Hz

Effective system Q:

1.15

Flux density:

Woofer 7,800 gauss, highrange 16,000 gauss

Volume of enclosure:

19 liters (0.67 cu ft)

Cabinet dimensions:

298mm x 544mm x 197 mm deep

(11 3/4 x 21 1/2 x 7 3/4 in)

Weight:

Packed in carton 12.2 kg (27 lb),

unpacked 11 kg (24 lb)

Drive units: AR17

200 mm (8 in) acoustic suspension woofer,

32 mm (1 1/4 in) pressure highrange

Crossover frequency:

2000 Hz

Impedance:

8 ohms nominal

Control:

2-position switch for highrange level control

Efficiency:

1 watt will produce 86 dB SPL on axis at

1 meter

Amplifier power requirement:

15 watts (into one speaker only) will produce 100dB SPL in a 1500 cu ft room of average reflectivity (energy absorption coefficient of 0.15); 30 watts (15 watts per channel) will produce 103dB SPL in the same room

Power handling ability:

May be used with amplifiers capable of delivering up to 100 watts continuous power per channel being driven to clipping 10 percent of the time, on normal music source material

Crossover network:

Network using bi-polar electrolytic capacitor; acoustic output of highrange driver is controlled by a switchable resistive network

Driver resonance frequencies:

Woofer 27 Hz (free air), highrange 1500 Hz

System low-frequency response:

-3 dB at 50 Hz

Effective system Q:

1

Flux density:

Woofer 7,800 gauss, highrange 14,000 gauss

Volume of enclosure:

19 liters (0.67 cu ft)

Cabinet dimensions:

254 mm x 473 mm x 222 mm deep

(10 x 18 1/2 x 8 3/4 in)

Weight:

Packed in carton (two speakers) 17.5 kg (38 1/2 lb), unpacked (each speaker) 7.7 kg (17 lb)

Drive units: AR18

200 mm (8 in) acoustic suspension woofer,

32 mm (1 1/4 in) pressure highrange.

Crossover frequency:

2000 Hz

Impedance:

8 ohms nominal

Control:

2-position switch for highrange level control

Efficiency:

1 watt will produce 86 dB SPL on axis at

1 meter

Amplifier power requirement:

15 watts (into one speaker only) will produce 100dB SPL in a 1500 cu ft room of average reflectivity (energy absorption coefficient of 0.15); 30 watts (15 watts per channel) will produce 103dB SPL in the same room

Power handling ability:

May be used with amplifiers capable of delivering up to 100 watts continuous power per channel being driven to clipping 10 percent of the time, on normal music source material

Crossover network:

Network using bi-polar electrolytic capacitor; acoustic output of highrange driver is controlled by a switchable resistive network

Driver resonance frequencies:

Woofer 27 Hz (free air), highrange 1500 Hz

System low-frequency response:

-3 dB at 62 Hz

Effective system Q:

1

Flux density:

Woofer 7,800 gauss, highrange 14,000 gauss

Volume of enclosure:

9.77 liters (0.35 cu ft)

Cabinet dimensions:

244 mm x 419 mm x 159 mm deep

(9 1/2 x 16 1/2 x 6 1/4 in)

Weight:

Packed in carton (two speakers) 13.8 kg (30 1/2 lb), unpacked (each speaker) 6.1 kg (13 1/2 lb)

DIN SPECIFICATIONS

The German DIN standards are generally accepted in Europe as a means of comparing high fidelity equipment and are presented here for that reason.

Frequency range: The limits of frequency range are those frequencies at which response is 8 dB lower than the average level, this average level being taken over the range 100 Hz to 4000 Hz.

Impedance: The nominal impedance of the system.

Sensitivity: The number of watts necessary to produce a sound pressure level of 96 dB at the measuring microphone, the watts being calculated from

$\text{Watts} = V^2/R$, where V is applied voltage and R is numerically equal to the stated impedance.

Nominal power handling: The number of watts of a specially tailored noise spectrum that the system can withstand for one minute in every three over a total time of 300 hours, the power being based on the nominal impedance.

Maximum power handling: The maximum burst of power of no more than 2 seconds duration that the system can withstand at frequencies between 250 Hz and its low frequency limit without audible distortion caused by such factors as limitations of coil or cone movement.

All frequency range, and sensitivity measurements were made in a hemispherical anechoic environment at a distance of one meter on the axis of the loudspeaker.

	AR11	AR12	AR14	AR15	AR17	AR18
Frequency range	27 Hz-30 kHz	36 Hz-30 kHz	36 Hz-25 kHz	40 Hz-25 kHz	43 Hz-25 kHz	48 Hz-25 kHz
Impedance	4	8	8	8	8	8
Sensitivity	9 watts	9 watts	9 watts	10 watts	9 watts	9 watts
Nominal power handling	100 watts	100 watts	50 watts	50 watts	50 watts	50 watts
Maximum power handling	225 watts	100 watts	100 watts	60 watts	60 watts	60 watts



 **TELEDYNE ACOUSTIC RESEARCH**

**10 American Drive
Norwood, Massachusetts 02062
(617) 769-4200**