

6 Feb, 73

INSTALLATION AND USE

OF THE

AR *amplifier*



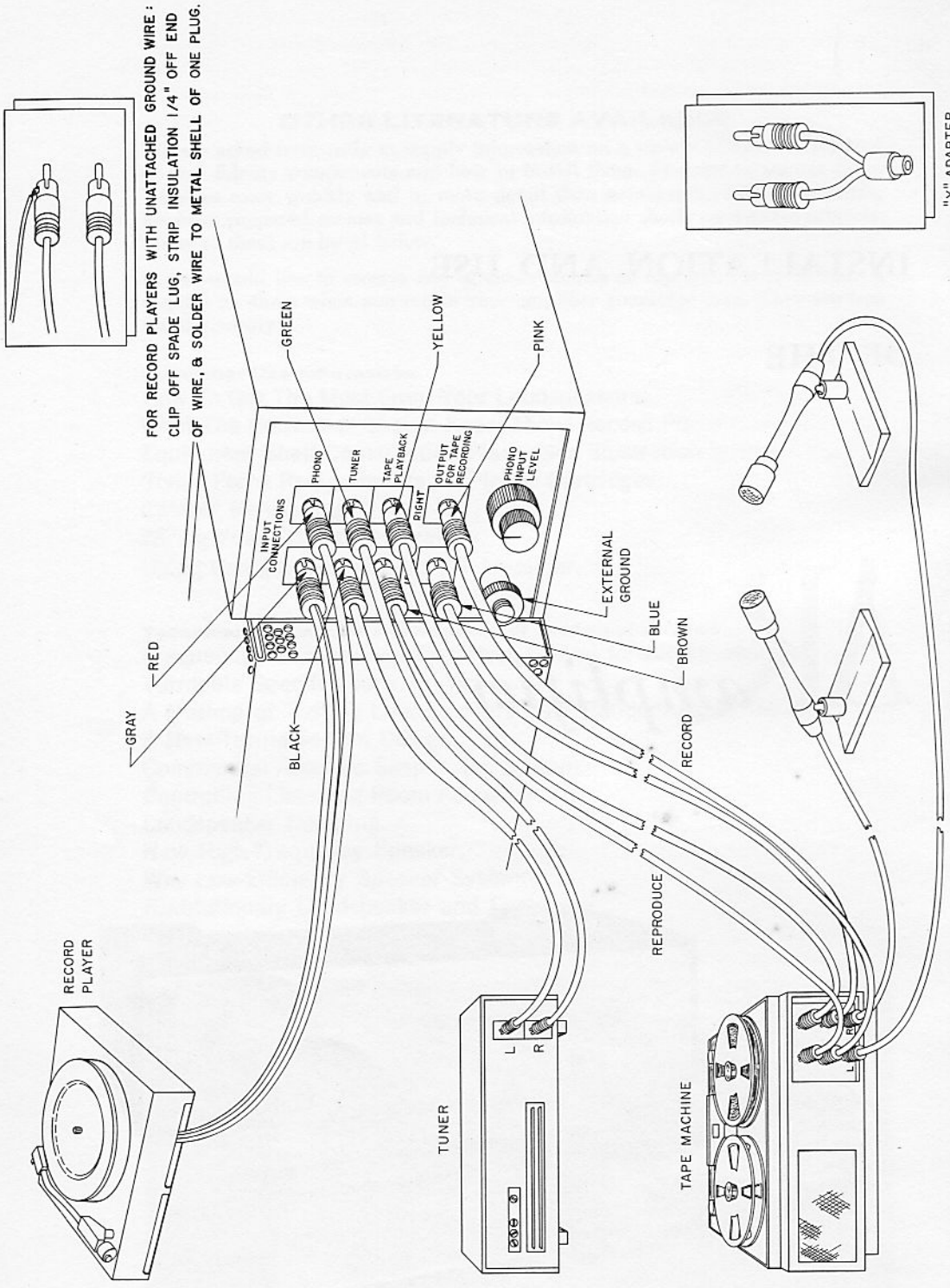


Figure 1

The AR amplifier contains, in a single case, all the stereo preamplification and control facilities needed in a high-fidelity system, and a stereo power amplifier capable of meeting professional quality requirements and power demands.

The only other components needed for a complete stereo high-fidelity system are a pair of loudspeaker systems and a source of music: a record player (changer or manual) with pickup cartridge; a stereo FM tuner; or a tape player. Any one of these music sources can be used alone, any two can be used, or all three can be connected to your AR amplifier which has provision for switching to the desired signal source.

In addition to driving loudspeaker systems, the AR amplifier has connections available to feed a tape recorder so that you can record from whatever music source is switched into the amplifier. You can listen to the source as you record, or silence the loudspeakers, as you prefer.

CONNECTIONS

All connections to and from the amplifier are made at the rear. Please refer to the drawing labeled Figure 1. NOTE: The words "left" and "right" in the following sections refer to orientation as viewed from the rear of the amplifier.

Input Connections Three color-coded pairs of input jacks are supplied for stereo signals from three sources. Jacks in the left vertical row are for left-channel inputs; those in the right vertical row are for right-channel inputs.

The top pair (marked PHONO) is for connection of a record changer or manual turntable and arm. Colors are gray and red, corresponding to the left- and right-channel plug colors of the amplifier cable from an AR turntable. This pair of phono inputs has high gain and is RIAA-equalized for a magnetic phono pickup cartridge. High-quality ceramic pickup cartridges can be used with this pair of inputs also.

There are input level controls, associated with the phono circuits, on the back panel under the input jacks. Their use will be explained in the section on Adjustments, page 13.

The second and third pairs of input jacks are marked TUNER and TAPE PLAYBACK, respectively. These are intended for the output signal cables from a radio tuner and from a tape machine with its own internal playback preamplifier.

The input selector switch (and the tape monitor switch) on the amplifier's front panel determine which of these three music sources will be heard.

Signal Cables. Shielded cables with standard RCA phono plugs should be used for making all input connections. These are supplied on the AR turntable, color-coded so that you need only plug the gray turntable plug into the gray amplifier input jack, and the red turntable plug into the red amplifier input jack.

The plugs on signal cables from your tuner and tape machine (and record player if it is not an AR turntable) can be daubed with paint of the colors to match those of the AR amplifier input jacks to which they are connected.

The signal cable from an AR record player has a separate ground wire in the center, which is already attached internally to the shell of the left-channel phono plug. No extra connection need be made. Some record players and changers have an unattached ground wire. Do *not* connect this extra wire to the "External Ground" post; connect it to the metal shell of one of the phono signal cable plugs, as shown in Figure 1.

You can avoid soldering plugs on signal cables by buying them assembled. They are readily available at high-fidelity component stores in various lengths, with plugs attached.

When plugging a signal cable into a jack, be sure that the metal shell of the plug makes a good sliding connection with the outer part of the jack.

Monaural Sources. The AR amplifier, although a stereo component, will accommodate single-channel (monaural) signal sources. When the amplifier's mode switch is turned to MONO position, the left and right channels are combined and the same signal is fed through both power amplifier circuits to both loudspeaker systems. If there is a music source feeding only one input channel (a monaural source), and you wish to hear that source reproduced through both loudspeakers, simply turn the mode switch to MONO when you switch in that source.

For a monaural tuner, plug the signal cable from the tuner into either the left or right TUNER input jack, and leave the other TUNER input jack empty.

For a monaural tape machine, plug the signal cable from the tape machine into either the left or right TAPE PLAYBACK input jack, and leave the other TAPE PLAYBACK input jack empty.

For a monaural record player, plug the signal cable from the record player into the *left* (gray) PHONO input jack. Obtain a shorting phono plug and plug it into the right (red) PHONO input jack (this is to prevent excessive noise). Alternatively, obtain a flexible cable Y-adapter (one female RCA phono jack to two male RCA phono plugs); plug the signal cable from the phono source into the female end of the adapter; and plug the male ends of the adapter into both left- and right-channel PHONO input jacks on the amplifier.

Output Connections for Tape Recording There is a fourth pair of connectors, labeled OUTPUT FOR TAPE RECORDING, just below the three pairs of input jacks. These enable you to record from any of your music sources. They supply high-level output signals to feed to a tape machine for this purpose. (Of course, the tape machine must be of the type that can make its own recordings.)

The jack on the left (blue) is for the left channel; the jack on the right (pink) is for the right channel. Recording input connections at the tape machine should be made to input connectors which may be marked RADIO, HIGH LEVEL, LINE, AUXILIARY, or some other legend to differentiate them from the microphone input connectors (see the tape machine instruction manual for this information).

Standard shielded cables, of the same kind used for input signal connections, should be used. RCA phono plugs will be required at the amplifier end, and possibly at the tape machine end also. Many tape machines, however, have input connectors which require *phone* plugs. If you have such a machine, and cables with *phono* plugs on one end and *phone* plugs on the other end were not supplied with it, these cables too are available at hi-fi component stores.

The amplifier's input selector switch determines which source of music is set up for tape recording. The signals appearing at the OUTPUT FOR TAPE RECORDING jacks are *not* affected by the amplifier tone controls or volume control, so that you can make adjustments for listening to a phonograph record or radio program without disturbing a tape recording you are making of the same thing at the same time. As a matter of fact, you can make a recording without listening to the loudspeakers at all, simply by turning down the amplifier's volume control.

Connections to Loudspeakers Loudspeaker connections are made from the screw terminal boards on the amplifier's left rear panel.

If you have a set of color-coded AR speaker cables,^o please refer to and follow the instructions supplied with them.

If you do not have AR speaker cables, use ordinary lamp cord for connecting speakers to the amplifier. No. 18 gauge cord is suitable for cable lengths up to 50 feet. Use No. 16 gauge if the cable length will exceed 50 feet.

Lamp cord (sometimes called "zip cord") can be obtained in a variety of insulation colors at hardware stores, electrical supply stores, and other retail outlets.

1. Please refer to Figure 2 on the following page. The left-channel output terminals are in a vertical row on the left; the right-channel output terminals are in a vertical row on the right.
2. Decide how you are going to route the speaker cables (see section on Installation, page 11, for suggestions) and cut them to proper length.
3. Lamp cord consists of two conductors inside plastic insulation which can be torn apart at the center, for as much of its length as desired, once the tear is started properly with a knife cut. Make a lengthwise cut in the *exact* center of the insulation at both ends of both left and right cables, and tear all four cable ends apart for a distance of about 6 inches.
4. Carefully cut the insulation off both ends of all the conductors, leaving about $\frac{3}{8}$ inch of bare stranded wire exposed. At both ends of all four conductors, twist the individual strands of each conductor together into a tightly knit mass. (Do not join the conductors — only the strands in each conductor individually.)
5. Wrap short pieces of cellophane tape or adhesive tape of any kind around the *left-channel* speaker cable, about 6 inches from *both* ends. This is merely to provide positive identification when making connections.
6. MAKE CERTAIN THAT THE AMPLIFIER POWER SWITCH IS TURNED OFF.
7. Loosen all four terminal screws at the amplifier.
8. Lamp cord has a coding ridge or a flat all along the edge of the insulation for one of the conductors. Identify this coded conductor for the left-channel cable at the amplifier end. Wrap the exposed wire of this conductor in a clockwise direction around the lower of the left-channel terminal screws (identified by a green plastic rivet head below the terminal). Tighten the terminal screw firmly with a screw driver. Dress any loose wire strands close to the terminal.
9. Attach the other conductor of the left-channel cable in the same way to the upper left-channel terminal screw (identified by a white plastic rivet head above the terminal).
10. Attach the coded conductor of the right-channel speaker cable to the lower of the right-channel output terminals, identified by a black plastic rivet head below the terminal.
11. Attach the other conductor of the right-channel cable to the upper right-channel terminal screw, identified by a red plastic rivet head above the terminal.

^o AR speaker cables are available in 30 or 50-foot lengths and in dark brown, medium gray, or white at your dealer or directly from Acoustic Research, Inc. at \$6.00 per pair.

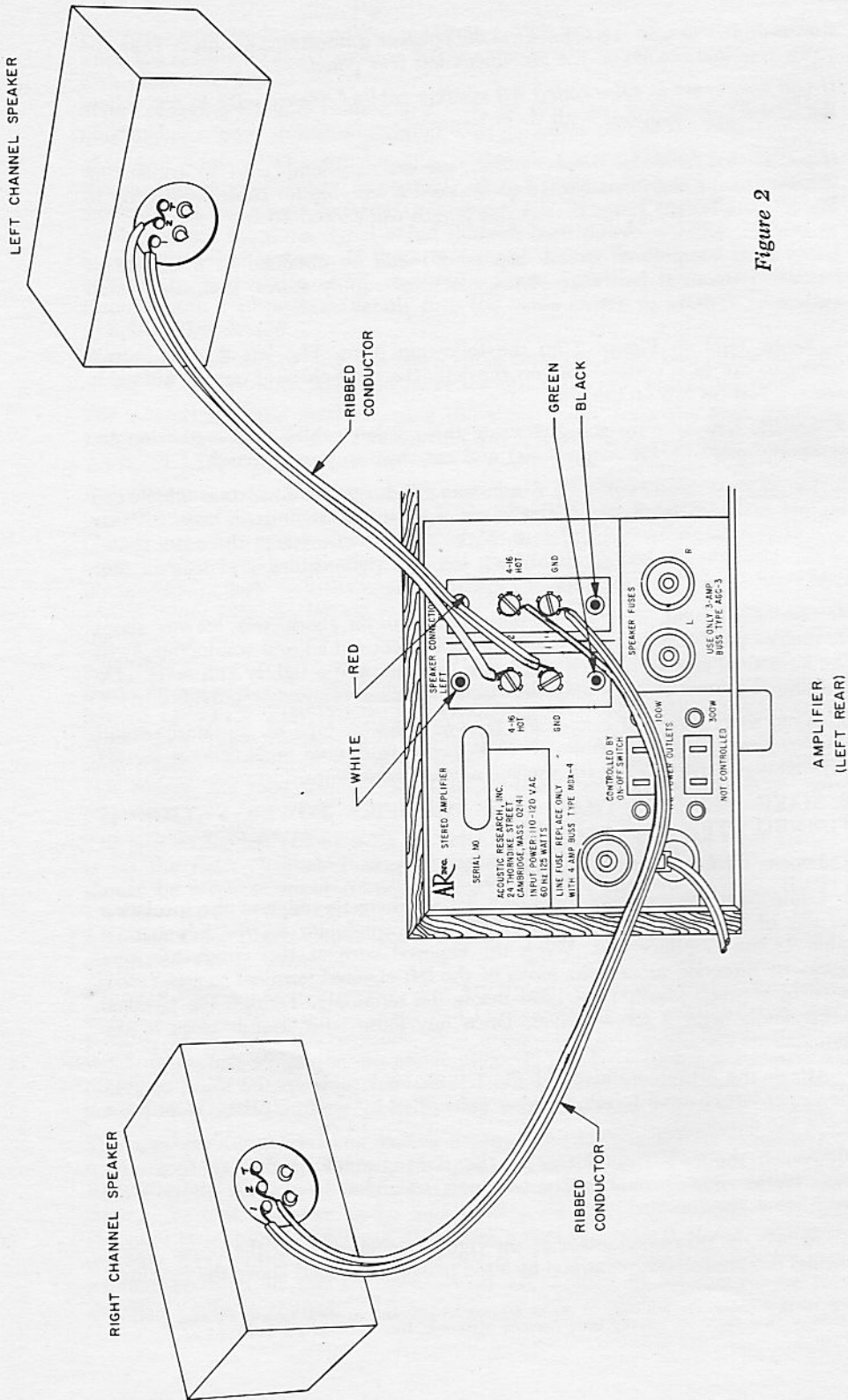


Figure 2

12. Examine all of these connections carefully to make certain that they are secure, and that no loose strand from any conductor is touching any other conductor or any metal other than its proper terminal screw.

13. Now make the connections at the speaker systems. If you are using AR speakers, connect the coded conductor of the left-channel speaker cable to left-speaker input terminal No. 1, and the other conductor of the left-channel speaker cable to left-speaker input terminal No. 2. If you are using speaker systems *not* made by AR, connect the coded conductor of the left-channel cable to one of the left-speaker input terminals, and the other conductor to the other input terminal.

14. If you are using AR speaker systems, connect the coded conductor of the right-channel speaker cable to right-speaker input terminal No. 1, and the other conductor to right-speaker input terminal No. 2. If you are using speaker systems *not* made by AR, connect the right-speaker cable conductors to the right-speaker input terminals in the orientation corresponding to that used, in step 13 above, for the left-speaker connections.

15. CHECK TO SEE THAT THE CONNECTIONS ARE TIGHT AND SECURE, AND THAT NO LOOSE STRAND FROM ANY CONDUCTOR IS TOUCHING ANY OTHER CONDUCTOR OR ANY METAL OTHER THAN ITS PROPER TERMINAL SCREW.

Channel Orientation and Phasing. If the instructions preceding have been followed, the correct channel *orientation* is assured. Correct *phasing* in stereo requires that the diaphragms in the two speaker systems be properly related in direction of motion.

If you are using AR speaker systems in any combination of models, and have followed the preceding instructions carefully, correct phasing is assured.

If you are *not* using a pair of AR speakers, but your speakers are made by one manufacturer and have the same model number, then correct phasing is virtually certain if you have followed the preceding instructions carefully.

If you are using any other combination of speaker systems it is advisable to check phasing, after the rest of the installation has been made except for the speaker systems. To do so, make the speaker cable connections as described in preceding sections and temporarily place the speaker systems as close together as possible. Play any music with heavy bass content, and put the amplifier mode switch in MONO position. Adjust the balance control to provide approximately equal music loudness from the two speaker systems. Taking care to keep the individual conductors separated, loosen only the *left* speaker terminal screws; unwrap the left-speaker conductors from the terminals, and hold the conductor wires on the same terminals by hand, noting the combined bass output from the two speaker systems. Remove the wires from the terminals and quickly reverse the connections, noting whether the bass loudness increases or decreases. If it *increases* with the reversed connections, the *new* connections are correct. Secure the left-speaker cable wires in place again with the new connections. If the bass loudness *decreases* with the reversed connections, the *original* connections were correct. Restore the left-speaker cable connections to the original terminals and secure them tightly.

Do not change the right-speaker cable connections in either case.

Once you have ascertained the connections which provide proper phasing, it is a good idea to make a permanent note of them for future reference.

Connecting Extension Speakers: The AR amplifier is powerful enough to drive extension speaker systems in combination with your main speakers. Because the requirements of such installations are so varied, however, it is beyond the scope of this instruction booklet to supply detailed extension speaker wiring diagrams. If you will write us requesting information regarding your specific requirements, we will reply promptly and in detail.

Connecting Headphones: A pair of stereo headphones can be connected to the speaker output terminals. In order to minimize the danger of excessive power damaging the headphones, however, you should either use the headphone manufacturer's recommended adapter box or connect 150-ohm 2-watt resistors in series with the headphone "hot" wire leads.

More detailed information on headphone connections is available on request.

URGENT WARNING: UNDER NO CIRCUMSTANCES SHOULD THE TWO UPPER SPEAKER TERMINALS (LEFT- AND RIGHT-CHANNEL "HOT") BE CONNECTED TOGETHER, EITHER AT THE AMPLIFIER OR AT THE ENDS OF THE SPEAKER CABLES. This is the one mistake that will cause extensive and immediate damage to the amplifier. It is permissible to connect the two lower (GND) speaker terminals together.

AC Power Connections The AC power cord of the amplifier should be plugged into a wall outlet capable of supplying 4 amperes at 110 to 120 volts, 60 Hz single phase. This is the normal voltage and line frequency of most wall power outlets in the U.S.A. and Canada. **THE AMPLIFIER MUST NOT BE USED ON DC OR VOLTAGES OTHER THAN THE STANDARD 110 TO 120 VOLTS.***

There are two AC power outlets on the rear of the amplifier, into which signal sources (such as a tuner, record changer, or tape machine) can be plugged. The upper outlet is switched on and off by the amplifier's front-panel on-off switch; no component drawing more than 100 watts of AC line power should be plugged into this outlet. The other outlet (the lower of the two) is not controlled by the amplifier on-off switch, but is permanently "live" as long as the amplifier's AC power cord is plugged into a live wall outlet. No component drawing more than 300 watts should be connected to the lower outlet, and it must, of course, be switched on and off separately.

Neither of the back-panel AC power outlets is protected by a fuse in the amplifier. The amplifier itself is protected by a fuse at the extreme left edge of the rear panel. **NEVER BYPASS THIS FUSE, OR REPLACE IT WITH ANY FUSE OTHER THAN A BUSS TYPE MDX-4.** Doing so will void the guarantee.

External Ground Post Below the input jacks there is a screw and knurled nut labeled "External Ground". *Although not required for normal operation of the amplifier,* it is advisable from a conservative safety viewpoint to make secure connections with a heavy wire (No. 16 gauge or heavier) from this terminal to the nearest metal object having a solid earth ground contact — such

* This model *can be* used with 50-Hz current common in many areas outside the United States, provided a transformer is used when necessary to obtain the correct voltage. However, Acoustic Research does not guarantee that the amplifier will meet its rated specifications for power, distortion, and noise under these conditions. Also, the amplifier will probably generate a bit more heat than it would at 60 Hz.

Because the components are conservatively rated and the built-in protective devices are extremely effective, we believe that no harm will occur under these operating conditions. Therefore, the regular two-year guarantee covering parts, repair labor, and freight to and from the nearest service station is still valid.

Acoustic Research has available a special Universal Model of the amplifier designed to operate at either 100, 120, 220, or 240 volts, 50 or 60 Hz. This model will meet or exceed all specifications given when operated at the proper voltage. For more information on this unit, consult your dealer or write to Acoustic Research International, 24 Thorndike Street, Cambridge, Mass. 02141.

as a cold-water pipe or waste pipe. Your electrician can provide this service best; if your house is properly wired, he can make the proper connection from the closest wall outlet.

The advantage of such a connection is that, no matter what failure may occur in any of your components, you cannot ever receive a shock by touching the amplifier.

PHYSICAL INSTALLATION

The front-to-back dimension of the AR amplifier has been held to the minimum possible so that it will fit on most bookshelves. It can be used in the open, on a shelf or table, either with or without its optional wood cover.

Although the amplifier (in common with other all-transistor amplifiers) does not generate as much heat as tube units, it does require ventilation to cool the output stage "heat sinks". With prolonged continuous use it is normal for the metal cover to become hot to the touch. It will not become dangerously hot under any circumstances, but the more power the amplifier is called on to deliver, the more heat it generates internally — and the more important it is to provide good ventilation.

Under no circumstances should the amplifier be used without the four rubber feet attached to it, or in a small totally-enclosed space. If put between shelves, there must be at least 1½ to 2 inches between the top of the amplifier case and the shelf above. Do not put the amplifier on padding material which would effectively reduce the clearance beneath it. There must always be allowed a path for a flow of cooling air from below the amplifier, through the entry holes in the bottom of the case, out the exit holes in the top of the case, and thence in a continuing *upward* flow to the room atmosphere. The sketches in Figure 3 show two acceptable methods for obtaining such ventilation.

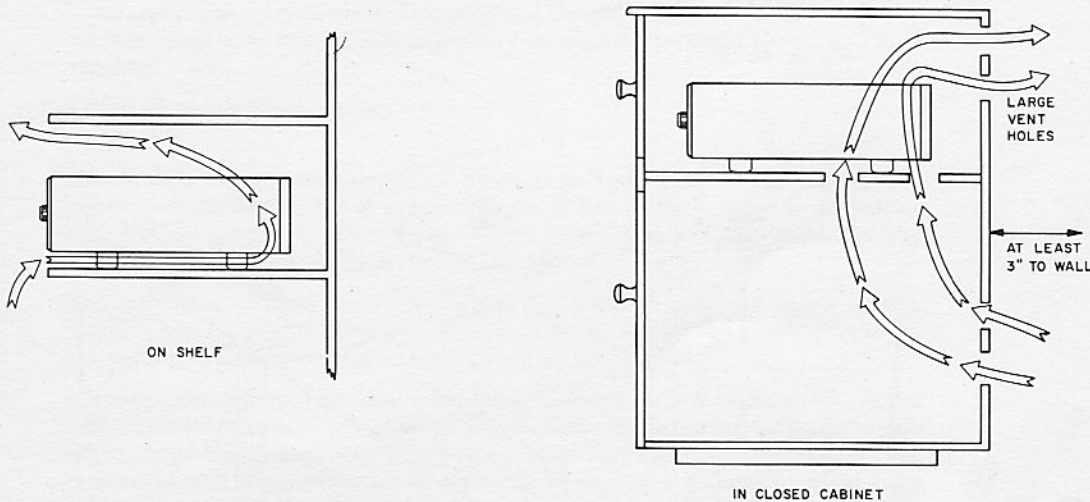


Figure 3

Custom Installation The AR amplifier can be "customized installed" — built into a cabinet or wall unit — with only the front escutcheon and knobs showing. Figure 4 shows the panel cutout dimensions required, and the relationship

of the cutout location to the four holddown bolt holes. The holddown bolts and washers are those used to hold the amplifier to its wood shipping base. Both the panel and the platform wood thickness may be up to $\frac{3}{4}$ inch (plywood) or 1 inch (solid lumber).

A finished wood escutcheon frame to be used with the AR amplifier for custom mounting is available from AR free upon request. The instructions which follow are based on the use of this frame.

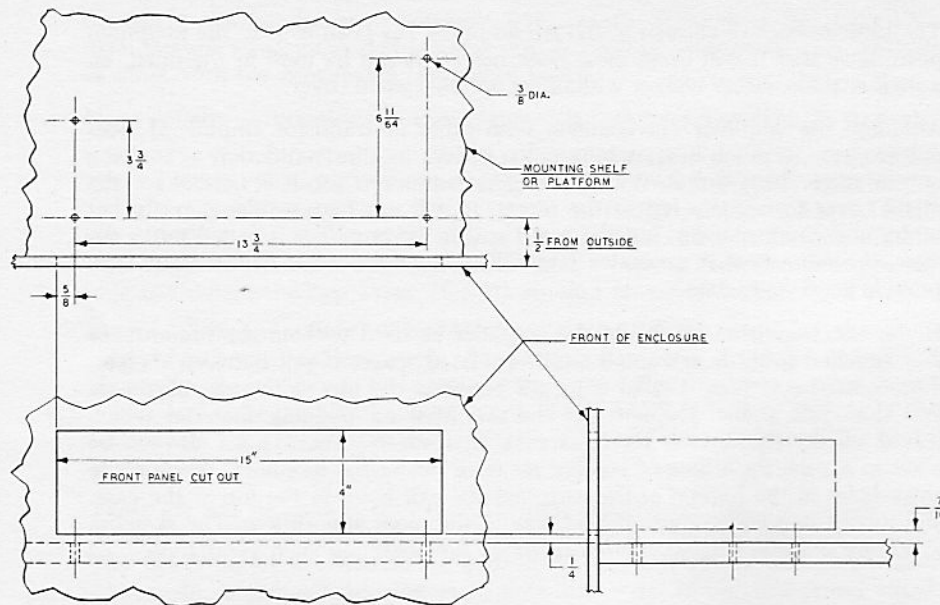


Figure 4a

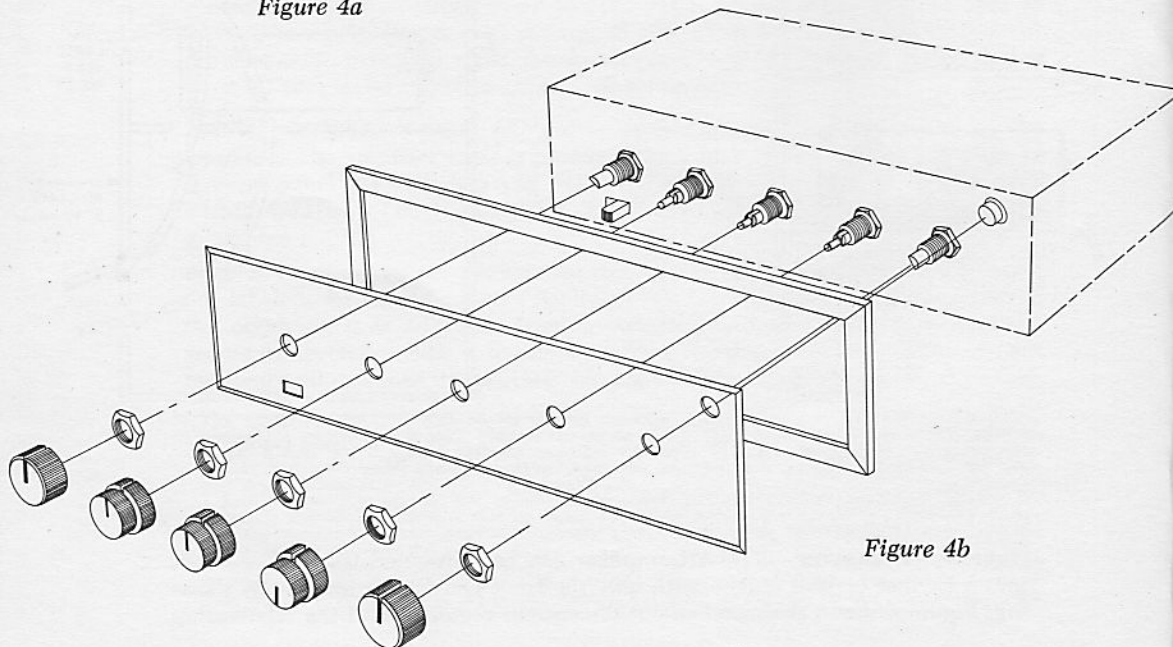


Figure 4b

The same considerations regarding ventilation apply with custom mounting as without. Provision must be made for a plentiful supply of cool room air to enter at the bottom of the enclosure in which the amplifier is placed, to flow vertically through the amplifier case from bottom to top, and to escape at the top of the enclosure. For that reason also **THE AMPLIFIER MUST NEVER BE MOUNTED IN ANY POSITION EXCEPT WITH ITS FEET AT THE BOTTOM.**

After you have made the panel cutout and platform bolt holes according to Figure 4,

1. Remove all the front control knobs by pulling them straight forward. Make a careful note of the positions of the index marks on the three sets of concentric controls in the middle, and **DO NOT** mix the balance and mode switch set of knobs with the tone control knobs. There are small but important differences.
2. With an adjustable wrench, **CAREFULLY** loosen the hex nuts holding the front escutcheon in place. Remove the hex nuts by hand (so as to avoid scratching the escutcheon) and take off the escutcheon. Do not remove the nuts behind the escutcheon.
3. Slide the front of the amplifier through the panel cutout from behind the panel, until at least $\frac{1}{4}$ inch of the chassis extends beyond the front of the panel.
4. Slip on the wood escutcheon frame over the chassis, finished side to the front.
5. Replace the escutcheon. Replace the hex nuts, taking care when tightening them not to scratch the escutcheon.
6. Push the amplifier back onto the platform as far as the wood frame and escutcheon will permit. Insert the four holddown bolts with washers up through the platform holes into the threaded retainer nuts in the bottom of the amplifier chassis, and tighten the bolts.
7. Center the wood escutcheon frame behind the escutcheon. If necessary, loosen the holddown bolts temporarily to permit centering of the wood frame, and then retighten them.
8. Install the amplifier knobs.

Distance to Other Components There is no restriction on the distance between the amplifier and the speaker systems. For cable lengths of 50 feet or less, No. 18 gauge lamp cord can be used (see Connections, page 4). For longer runs it is necessary only to increase the wire size.

The maximum distance from the amplifier at which a tuner or tape playback machine can be used is determined by these units, not by the amplifier. Follow the recommendations of the manufacturer in this matter.

A record changer or turntable must be connected to the amplifier by signal cables not more than 5 or 6 feet in length, however, in order to preserve full fidelity from the pickup cartridge. Some pickup cartridges are more susceptible to hum pickup than others; it is advisable to maintain a distance of at least 1 foot from a record player tone arm to the amplifier or any other electrical component.

If you have a tape *recorder* and plan to make use of the AR amplifier's **OUTPUT TO TAPE RECORDER** connections, the signal cables to the recorder should not be more than 6 to 8 feet long.

What to Do with Speaker Cables You will want the speaker cables to be out of the way and as inconspicuous as possible. The best way to accomplish these objectives will vary with each installation. Small holes drilled through the floor at the locations of the amplifier and of the speaker systems will make it possible to run most of the cable length under the floor; before experimenting with this approach, however, be reasonably sure of the permanent speaker locations. Alternate and not quite so drastic procedures include taping or clamping the cables in place along baseboard moldings, under baseboard radiators, under carpeting, or atop picture molding. Small transparent cable clamps or insulated staples can be used to hold the cable at intervals where required.

Whatever kind of fastener is used to hold the cable in place, **EXTREME CARE MUST BE TAKEN** that it does not short-circuit (form a metallic connection between) the individual conductors of the cable by penetrating the insulation. This will cause partial or complete loss of volume, increased distortion, and shortened amplifier life if not discovered and corrected fairly soon.

It is good practice to keep speaker cables away from phono signal cables.

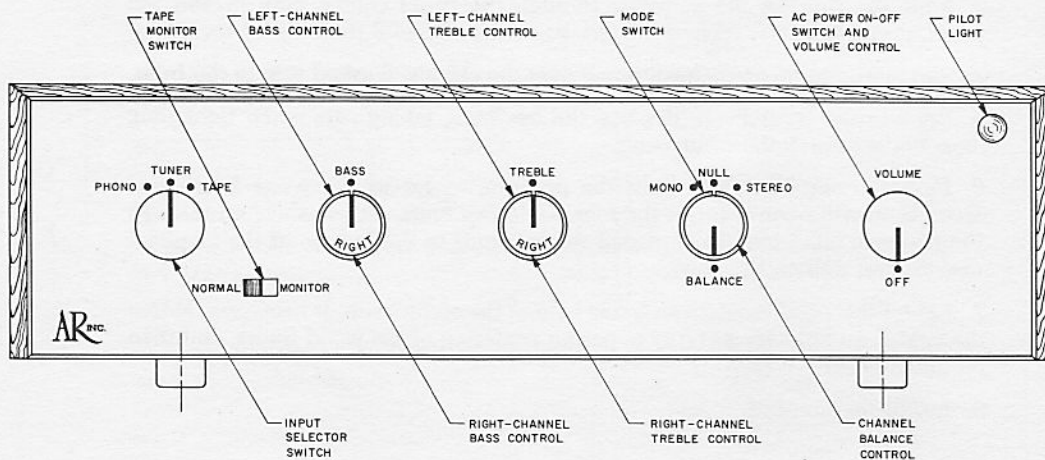


Figure 5

ADJUSTMENTS AND CONTROLS

Control Functions The front-panel controls, identified in Figure 5, have the following functions:

Selector Switch: This switch connects to the main amplifier circuits any of three music sources—a record player, tuner, or tape machine—that are plugged into the rear-panel input circuits. It also connects that source to the amplifier's output jacks for feeding a tape recording machine. See the section on connections, pages 2 and 3. **WARNING:** Do not put the selector switch in the TAPE position when the tape machine is in a recording mode.

Tape Monitor Switch: In the NORMAL position of this switch (pushed to the left) the main amplifier circuits are connected to the music source determined by the selector switch, as explained above. In the MONITOR position (pushed to the right), the main amplifier circuits are connected to the TAPE PLAY-BACK input jacks, regardless of the position of the selector switch.

The purpose of the tape monitor switch is to provide a means for listening to the playback *from the tape* at the actual time you are making a tape recording from your tuner or record player, and thereby "monitor" the recording quality. In order to do this you must, of course, have a tape machine with separate record and playback heads and amplifiers; *i.e.*, a machine that can make a recording and reproduce the recording simultaneously.

Bass Tone Controls: These controls affect the balance of the bass tones relative to the middle and treble registers. There are two concentric controls — the larger one controls bass on the left channel; the smaller one controls bass on the right channel. Counterclockwise rotation from the dot decreases bass progressively as they are turned farther, and clockwise rotation from the dot increases bass progressively as they are turned farther.

Treble Tone Controls: These controls affect the balance of the treble frequencies relative to the bass and middle registers. They act in a manner similar to that of the bass controls: "flat" frequency response is obtained when the control indexes are at the dots; clockwise rotation increases the treble progressively, and counterclockwise rotation decreases the treble progressively.

Although both sets of controls — bass and treble — are individually adjustable for each channel, you must hold the control for one channel to keep it from turning also when you turn the control for the other channel. This permits a permanent offset in tone control settings for each channel, to compensate for permanent differences in speaker system tonal balance or differences in room effects on the speaker systems. But simultaneous changes in settings can be made quickly on both channels by simply turning one of the bass or treble knobs. The other knob will turn with it.

Both sets of tone controls are meant for full day-to-day use; they are not just for show. Their action is not as exaggerated as will be found on some amplifiers, but far more musical even in their extreme positions. Their response has been carefully tailored to meet practical tone adjustment requirements. You will find it difficult to make the amplifier sound objectionable with any tone control settings. Bass boost curves, for example, have been designed specifically to complement the *differences* in Fletcher-Munson loudness curves, not the curves themselves. Thus the bass controls can do the job of a "loudness" switch, but do it more precisely and in a more logical fashion — you set the volume control to give you the desired loudness, and then set the tone controls for best musical tonal balance.

Balance Control: Each AR amplifier is adjusted at the factory so that, with the channel balance-control index pointing straight down at the dot, there is precisely equal amplification in both stereo channels. Sometimes a stereo signal source does not have balanced output in both channels, however, or dissimilar speaker systems are used which do not have equal efficiency. In such cases one amplifier channel should have more amplification than the other, in order to restore a balance in loudness from the speakers.

Turning the balance control clockwise progressively decreases the left-channel output. Turning it counterclockwise from the dot progressively decreases the right-channel output. The balance control should be adjusted as required to provide a proper stereo spread between the speakers; or, on monaural input material, to supply a virtual sound source centered between the speakers.

Mode Switch: There are three positions available on the mode switch: MONO, NULL, and STEREO. In the MONO position of the switch, the left- and

right-channel inputs are combined in phase and this combination is fed through both channels of the amplifier to both speakers (thus converting a stereo input signal to two-speaker monaural). If there is a monaural signal present on only one input channel, putting the mode switch into MONO position will feed that single input to both amplifier channels and both speaker systems.

In the STEREO position of the mode switch, complete separation of left and right channels is maintained all the way through the amplifier. This is the normal mode of operation for stereo music sources.

The NULL position of the mode switch is used in conjunction with the balance control to achieve electrical balance of signal sources quickly. It *cannot* be used to establish balance between speakers of differing efficiency and so is of little use in such rare cases.

In the NULL position one input channel is reversed in phase, with unity amplification; it is then combined with the other channel, and the combination is fed to both amplifier outputs. If the input signals are identical except for amplitude, a sharp reduction in loudness (a null) is obtained through cancellation when the balance control is properly adjusted.

Because the operation of the NULL circuit depends on the similarity of the left and right input signals, the music sources should be made to supply monaural output signals on both channels for the null-balance operation. A monaural record should be played on a stereo record player; a stereo FM tuner should be tuned to a station broadcasting a monaural program; a full-track monaural tape should be played on a stereo tape machine, or its own mode switch set to a monaural position.

On-Off Switch and Volume Control: With the control index at the dot, the main amplifier AC power switch is turned off. The upper AC power outlet on the rear panel is also switched off.

Turning the control clockwise until it clicks switches on the amplifier and the controlled AC outlet. The pilot light should glow red. Further clockwise rotation progressively increases the amplification, and the volume, of both channels simultaneously.

Adjustment of Phono Input Level Controls In the lower right corner of the amplifier's rear panel there is a set of concentric controls marked PHONO INPUT LEVEL. They are auxiliary volume controls effective only on the phono input circuits. The larger control is for the right-channel phono input; the smaller control is for the left-channel phono input. Their purpose is to reduce noise and distortion to the absolute minimum.

To set these controls properly, proceed as follows.

1. Turn the selector switch to PHONO, the bass and treble controls to their flat (indexes at dots) positions, the balance control to its center (index at dot) position^o, the mode switch to STEREO, and the volume control so that the index points approximately at 2:00 o'clock. Turn both phono input level controls to minimum (fully counterclockwise).
2. Put a *monaural* record on the record player. Advance both phono input level controls until the loudness on loud passages of the record is as great as you think you would ever require.
3. Switch the mode switch to its NULL position. Holding the large (right-

^o If your system has music sources other than a record player, adjust the balance control to the setting you have found to be correct for the other sources.

channel) phono input level control to keep it from turning, increase or decrease the setting of the small (left-channel) phono input level control until minimum volume is obtained.

4. Put the mode switch back into STEREO position. If necessary, make a slight readjustment of both phono input level controls simultaneously to obtain the same loudness level as in step 2.

5. The phono input level controls are now adjusted for your present phono pickup cartridge. If you should change the cartridge or replace the needle, however, this adjustment procedure should be repeated.

PROBLEMS AND PRECAUTIONS

Protective Devices The AR amplifier contains two basic protective systems for itself. There is a fuse in the AC power line — a slow-blow 4-ampere fuse, Buss Type MDX 4. NEVER ATTEMPT TO BYPASS THIS FUSE FOR ANY REASON, AND NEVER REPLACE IT WITH A FUSE OF ANY OTHER TYPE. If the fuse should blow repeatedly something is wrong. Please write us for instructions on how to get your amplifier checked and repaired.

The second protective device is a set of thermostatic circuit breakers, which will shut off the AC power if the output transistors get hotter than normal. They are self-resetting; after a cooling-off period of several minutes they will turn the amplifier back on automatically.

The circuit breakers may operate for several possible reasons:

1. Inadequate ventilation (see Physical Installation, page 8), or proximity to another source of heat, such as a radiator.
2. Sustained high-power testing, particularly at very high test frequencies.
3. Sustained operation with a partial or complete short-circuit on the output terminals (see Connections to Loudspeakers, page 4, and What to Do with Speaker Cables, page 11).
4. Incorrect connection of extension loudspeakers. The AR amplifier can be used to drive extension speakers as well as the main speakers, but they must be connected properly. Please write us for advice on your particular requirements.
5. Parasitic high-frequency signals from one of the signal sources. Some tuners, for example, have inadequate suppression of the 38-kHz oscillator frequency used in multiplex detectors.

Repeated operation of the circuit breakers also indicates that something is wrong, and it is not good practice to let it continue. The amplifier should be shut off and the trouble corrected.

The AR amplifier also contains fuses in series with the speaker output terminals on both channels. Their primary function is protection of the speakers; in case of a rare type of failure of the amplifier output stage, the speaker fuses will act in time to prevent speaker damage from DC current, whereas the main AC line fuse might not act in time to prevent such damage. The speaker fuses are Buss Type AGC-3, which are of quick-blow 3-ampere rating.

NOTE: The speaker fuses are *not* designed to protect speakers from thermal damage due to high-frequency signal power. The proper fuse for that purpose depends on the individual speaker system; to provide a fuse which would

fully protect all available speaker systems would severely limit the amplifier's capacity to deliver signal power to sturdier speaker systems.

When operating the amplifier *with speaker systems connected*, NEVER install slow-blow fuses of any kind in the speaker fuse receptacles, or quick-blow fuses of greater than 3-ampere rating. Quick-blow fuses of less than 3-ampere rating may be used, if desired.

NOTE: When testing the amplifier with a 4-ohm *resistive* load, the AGC-3 fuses will blow with sustained high-power test signals. *For such test purposes only*, the speaker fuses can be temporarily replaced by fuses of greater current rating.

URGENT WARNING: Under no circumstances should the two upper speaker terminals (left- and right-channel "HOT") be connected together. This is the one mistake that will cause extensive and immediate damage to the amplifier. It is permissible to connect the two lower ("GND") speaker terminals together.

Problem Isolation No matter how carefully they may be designed, manufactured, and tested, high-fidelity components — in common with all man-made objects — can develop defects in shipment, in storage, or in use. Sometimes, incorrect installation is to blame for a persistent problem.

You can avoid annoyance and minimize inconvenience to yourself by isolating a problem to the particular component causing it — before you take steps to have the defect repaired. Returning a speaker system to its manufacturer will do no good if the amplifier is to blame, and vice versa. It will only extend the time your music system is out of service. Consequently it is worth some preliminary effort on your part to make a few simple checks that will help to determine where the fault may be.

If one component doesn't turn on, check to see that its AC power cord is plugged into a suitable outlet. If so, check to see that the outlet is "live" by plugging a lamp into it; if the lamp won't go on either, the house fuse for that outlet may be blown, or a wall switch controlling the outlet may be turned off. If the outlet is "live", check the component's internal AC line fuse if it has one. If it doesn't have a fuse (or if the fuse is all right), and it won't turn on when plugged into a "live" AC outlet, then that component requires service.

Assuming that all the electrical components of the system will turn on, a few general checks should then be made:

Look carefully at the settings of all switches and controls on all the components. Someone may have misadjusted a control knob without your knowledge. Turn the controls back and forth a few times to clear away any tarnish on the contacts and eliminate any intermittent conditions; then be sure to reset the controls to their correct positions. Don't forget tweeter level controls on speaker systems.

Recheck all cable connections, to see that they are firm and secure, and that the cables go to the proper terminals and input jacks.

After you have eliminated poor interconnections and control misadjustments as causes of faulty operation, you can try to pin down the problem to a single component by the following procedures:

1. *If you have more than one music source component*, play them all in turn. If the sound is defective in the same way when playing all of the sources, then you can be reasonably sure that all of the source components are all right, and that the trouble is caused by the amplifier or a speaker. If the sound is bad

PROBLEM ISOLATION PROCEDURE

Select whichever set of circumstances fits your case, and start there.

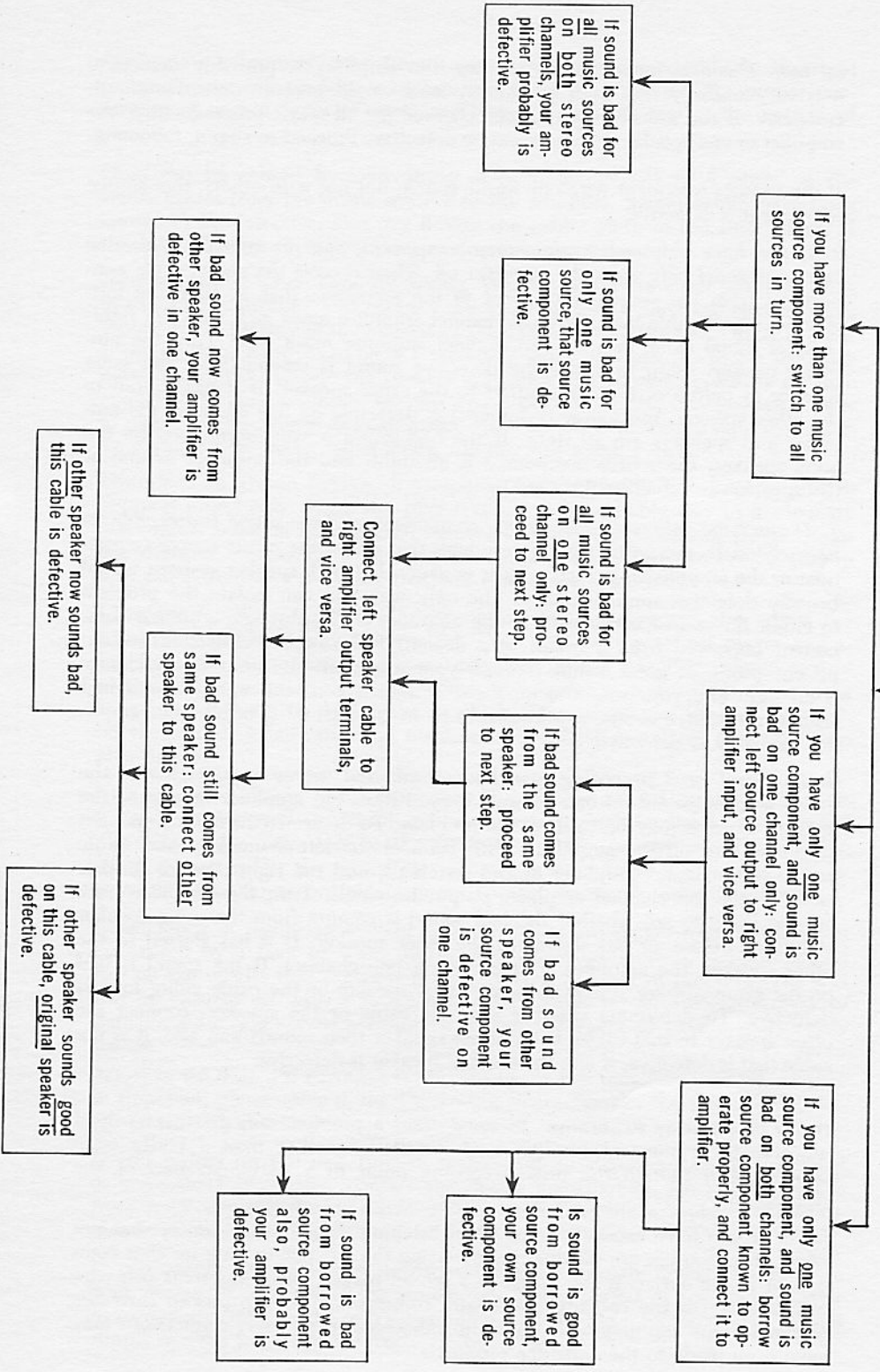


Figure 6

on *both* channels for *all* music sources, the amplifier is probably defective; it is very unlikely that both speaker systems would become defective simultaneously. If the sound is bad on *one* channel for all music sources, either the amplifier or one speaker system could be defective. Proceed to step 4, following.

If the trouble is evident with one music source but not with others, that source component is defective.

2. *If you have only one music source component, and the sound is defective on one channel only, turn the amplifier off.* Then reverse the signal cable connections from the source component to the amplifier: that is, plug the left-channel signal cable into the right-channel amplifier input jack, and the right-channel signal cable into the left-channel amplifier input jack. Turn the amplifier on and listen to see if the defective sound is coming from the same speaker as before or if it has shifted to the other speaker. If it has shifted to the other speaker, the source component is defective on one channel; the amplifier and speakers are all right. If the bad sound is still reproduced by the same speaker, the source component is all right, and the amplifier or one of the speakers is defective. Proceed to step 4.

3. *If you have only one music source component, and the sound is defective on both channels,* the probability is very high that either the music source component or the amplifier is defective; it is unlikely that both speaker systems would become defective simultaneously. The only way you can isolate the problem to either the source component or the amplifier is to substitute a source component borrowed from a friend or a dealer. If the replacement source component produces good sound through your amplifier, the amplifier evidently is all right and your source component is defective. If the sound is still bad with a new source component known to be in good working order, your amplifier probably is defective.

4. *In step 1 or 2 preceding, you have eliminated source components* as the cause of poor sound on one channel only. Either the amplifier or one of the speaker systems may be causing the problem. To determine which component is guilty, turn off the amplifier. Then connect the left-channel speaker cable to the right-channel amplifier output terminals, and the right-channel speaker cable to the left-channel amplifier output terminals. Turn the amplifier back on and listen to see whether the bad sound is coming from the same speaker system as before, or has shifted to the other speaker. If it has shifted to the other speaker, the amplifier is defective on one channel. If the sound is bad on the same speaker system as before, that speaker or the cable going to it is defective. To determine whether it is the cable or the speaker, connect the *other speaker* to that cable. If the other speaker then sounds bad also, it is the cable that is defective; if not, the original speaker is defective.

Other Installation Problems In some cases a problem may be the result of unfortunate or unusual conditions of installation rather than a faulty component, even though the tests preceding point to a particular part of the system.

Hum: If you have excessive hum when listening to one music source, but not when other sources are playing, try reversing the AC power plug for that component in the outlet. If the source is a record player, check the tone arm wire connections (or the cartridge shell wire connections) to the pickup cartridge terminals. One clip may be loose or disconnected, or improper connections may have been made to the cartridge terminals.

Connecting a "ground" wire from a record player to the amplifier's "External Ground" post will produce a higher hum level than normal. For proper connection of such a "ground" wire, see Figure 1 and the text at the bottom of page 2.

Hum can be caused by loose-fitting or partially-inserted RCA plugs on the signal cables from the music sources to the amplifier. Signal cables have been known to be defective, also; try flexing the cables close to the RCA plugs. If the hum changes in volume as you do so, replace the cable.

Howling Noises when Tape Recording. When you put the input selector switch in the TAPE position, you connect the tape machine's playback circuits to its input circuits by way of the amplifier's OUTPUT TO TAPE RECORDER jacks. If the machine happens to be in a recording mode, this can produce a feedback howl that might damage the speaker systems if the volume control is set high enough. The cure is simple: use the TAPE position on the selector switch only to play back recordings already made, NEVER when making a tape recording. To monitor a recording being made, use the tape monitor switch.

Distortion on Phono Source. If you hear heavy, muddy bass or a repetitive flapping sound only when you play records, it is probably due to inadequate mechanical isolation between the speaker systems and the record player. Even the slightest mechanical coupling between a speaker and the record pickup arm can introduce a feedback that will cause such symptoms.

Checking for this condition is quite simple. Put on a record and adjust the amplifier controls to play it normally. Then turn off the record player motor, but *leave the pickup arm on the record*. Turn up the amplifier volume control to well above normal playing position. If you detect a growling or flapping sound building up in the speakers, which stops when you lift the tone arm off the record, it indicates that mechanical feedback is present to an undesirable degree.

This condition should never be present if you have an AR turntable, because it has been designed specifically to be immune to such feedback. With record players of other manufacture the feedback usually can be cured by adding shock mounts under the record player base. In some cases it may be necessary to move either the record player or the speaker systems to other locations.

Other kinds of distortion evident only on the record player music source can be caused by a bent or worn pickup needle assembly, or by a collection of dirt on the needle that prevents it from tracing the groove properly. The dirt can be cleaned off with a soft, small artist's paint brush. Since it is easy to damage a delicate needle assembly it is good insurance to have a spare ready for use.

What to Do if an AR Product is Damaged If the unit has suffered damage in shipment, please refer to the Unpacking Instructions or the Concealed Damage instruction sheet.

If you picked up the unit from a dealer, and no shipping damage (external or concealed) is evident, contact the dealer immediately. He should replace from stock any initially defective unit, provided he has a replacement available in stock.

If you cannot get immediate replacement of an initially defective unit from your dealer, or if a defect has developed after a period of use, please write to us directly; refer to the unit's guarantee card for the information you should supply in order to expedite corrective action on our part.

OTHER LITERATURE AVAILABLE

We are asked frequently to supply information on a variety of subjects relating to high-fidelity components and how to install them. In order to answer these inquiries more quickly and in more detail than would otherwise be possible, we have prepared memos and technical information sheets on several subjects. Many of these are listed below.

If you would like to receive any of these memos or reprints, please include a request for them when you return your amplifier guarantee card. They are free for the asking.

Consumer Use Information

How To Get The Most From Your Loudspeakers.
What The Consumer Should Know About Record Players.
Equipment Shelf Construction Plans (See illustration below).
Stylus Force Requirements for Pickup Cartridges.
Cabinet Refinishing.
Wiring Your Extension Speakers.
Using Headphones with the AR Amplifier.

Technical Information and Reprints of Technical Articles

Frequency Response and Distortion Curves for AR Speakers.
Turntable Specifications.
A Method of Testing Loudspeakers With Random Noise Input.
A New Turntable-Arm Design.
Commercial Acoustic Suspension System.
Controlling Listening Room Acoustics.
Loudspeaker Damping.
New High-Frequency Speaker.
Why Low-Efficiency Speaker Systems.
Revolutionary Loudspeaker and Enclosure.



ACOUSTIC RESEARCH, INC. 24 Thorndike Street, Cambridge, Mass. 02141