

dynaco **QD-1** **QUADAPTOR**

SERIAL NUMBER

This number must be mentioned in all communications concerning this equipment.

INSTRUCTIONS FOR ASSEMBLY OPERATION



dynaco inc. 3060 Jefferson St., Philadelphia, Pa. 19121 U.S.A.

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INTRODUCTION

The Dynaco QD-1 Quadaptor serves as a junction box between the outputs of a conventional two channel stereo amplifier or receiver, and four loudspeaker systems. It is a passive device, requiring no AC power.

The Quadaptor provides the simple but essential circuitry to recover four separate signal components from two stereo channels utilizing the Dynaquad system. It facilitates accurate electrical balance in the system to attain maximum separation. It also provides for listening to the front speakers alone as conventional two-channel stereo.

The Quadaptor does not add anything to the original program, nor does it in any way alter the content or distortion levels of the signals. It is not a synthesizer. A substantial portion of the recorded material in normal two channel sources has been hidden up to now and the Quadaptor simply makes maximum effective use of *all* of the information which has been recorded. A uniquely simple technique of ambience recovery in Dynaquad sound reveals this added "presence" or realism in your present stereo record and tape libraries, and from stereo FM broadcasts. New source material utilizing the Dynaquad recording technique will contain the four directions of sound in the two conventional channels.

A diagram of the connections appears on page 22.

THE DYNACO QD-1 QUADAPTOR

OPERATING INSTRUCTIONS

AMPLIFIER SUITABILITY

The QD-1 Quadaptor may be used with nearly all component stereo amplifiers and receivers. All Dynaco amplifiers are of course recommended. A very few amplifiers (notably those with a "floating" output circuit) *cannot* be used with the Quadaptor. The Dynaquad system requires that a common ground reference exist between the two channels.

Any restrictions against joining the *common* (ground) output terminals of a stereo amplifier or receiver will be pointed out in its instruction manual. Do not confuse this with the normal prohibition against paralleling the outputs of a transistor amplifier (direct connections between the "hot" or "high" side terminals of the left and right channels). The Quadaptor circuit protects against such an accidental occurrence.

The Quadaptor may be safely used with *some* amplifiers which caution against common ground connections, too. If you are in doubt about the suitability of your equipment, you should ask the manufacturer of your amplifier or receiver (1) If the circuit includes a common ground reference between the channels? (2) If not, is it safe to make a 40 ohm connection between the output ground terminals? If the answer to either question is "yes", you may use the Quadaptor.

If separate mono amplifiers are used, they should be similar circuits so that proper phase relationships are maintained between the two channels. It may be desirable to connect their ground terminals together.

When more speakers are added in the same room, the amplifier power requirements do not increase. Therefore, the Quadaptor can be used even with relatively low-powered amplifiers if such equipment is capable of providing quality sound at adequate volume from similar speakers in conventional stereo.

AMPLIFIER CONNECTIONS

For your convenience in making secure connections, and to avoid problems which may arise from stray strands of wire, twelve "spade lugs" have been supplied which should be attached to the bared wire ends that will connect to the Quadaptor. These may be either soldered, or crimped around the wire with a pair of pliers.

The four connections from the left and right amplifier speaker outputs are made directly to the lower terminal strip on the Quadaptor. No other equipment should be connected to the same set of amplifier terminals, to avoid any possibility of excessively loading the amplifier. Correct polarity is essential. The left ground or common amplifier terminal is connected to the extreme left Quadaptor input terminal, etc.

If the amplifier provides connections for more than one set of speakers, it is assumed that the main outputs will be used for this Dynaquad system. If the amplifier includes switching provision for *simultaneous* operation of an additional set of speakers (a remote system) you should *avoid such use*. When used as directed with 8 ohm speakers the Dynaquad system provides a load on the amplifier between 4 and 8 ohms. Some amplifiers may not be safely operated with loads of less than 4 ohms—a condition which may occur if additional remote speakers are playing at the same time as the Dynaquad system. Thus an amplifier speaker selector switch which provides Main (A), Remote (B), and Main+Remote (A+B) should not be used in the latter position when listening to 4-dimensional sound.

Simultaneous connection of *dynamic* headphones is usually permissible because such outputs normally include series resistors to raise the operating impedance.

Most current solid state amplifiers provide only a single output, nominally 8 ohms. If a 4 ohm output is provided from a transformer, or from a tube amplifier, the Dynaquad system may be connected to this output.

You may wish to fold out page 22 of this manual for a diagram of the speaker and amplifier connections.

LOUDSPEAKER CONNECTIONS

The Dynaquad system is designed for use with 8 ohm speakers in back. The existing matched pair of stereo speakers is connected to the top terminal strip on the Quadaptor. Connect the speakers which will be used in the back of the room to the middle terminal strip. The back speakers do not have to be the same as the front speakers, but the two back speakers must be alike. The designation of all speakers refers to their position when viewed from the usual listening position.

It is essential that correct polarity of the speaker connections be maintained. The "C" or common terminal is often identified thus, or it may be marked with a (-), (Gnd), or a black terminal, if the other terminal is red, or bright. Most speakers are now manufactured with consistent markings (in terms of cone movement) but since it is important for the proper functioning of the system that all connections be in correct phase (a common signal causes all cones to move alike), you may wish to verify consistent phasing of your speakers.

Two speakers are connected in phase when maximum low frequency output is heard when they are driven from a monophonic source. Lowered output is observed when the connection to *one* of the speakers is reversed (out of phase, or reversed polarity). This is most apparent when the speakers are connected to the same amplifier channel, and are placed side by side, or facing each other a short distance apart for test purposes.

The most commonly used speaker connecting cable is #18 stranded two conductor lamp cord ("zip cord"). Phasing is easily maintained with lamp cord because one lead is coded, either with a "tracer" thread wound around one of the wires under the insulation, with a molded ridge on the outer insulation of one conductor, or with different color conductors. Do not use wire smaller than #18. If the speaker leads exceed 50 feet it is recommended that heavier gauge wire be used, such as #16 lamp cord, or #14 BWG cable. As higher power levels are employed, the more reason justifies the use of heavier gauge wire to preserve maximum amplifier damping, or control over the speaker.

When making connections you should be certain that each bared wire end does not contact any other point than the intended terminal. You must keep it clear of the amplifier or Quadaptor chassis, any other strands of bared wire, and adjacent terminals.

LOUDSPEAKER SUITABILITY

Best results are achieved when all speakers in the system are similar, and of 8 ohms impedance. It is most important that the *back* speakers be 8 ohms, and further, that the back speakers in particular have a smooth impedance curve (as close to 8 ohms as possible) over the entire frequency range. The aperiodic, or essentially non-resonant design of Dynaco speakers makes them uniquely suited for this application because they provide very smooth bass response with unusually uniform 8 ohm impedance.

It is desirable that the front and back speaker pairs have nearly the same efficiency. The Quadaptor has provision for reducing the level of the back speakers up to 12 db, since listeners will sit in the rear of the room. No provision is made for attenuating the front speakers.

Optimum results will be obtained with full-range back speakers having sonic qualities and fidelity comparable to the front speakers. Irregular response from poor speakers will cloud the capabilities of the main speakers, and weaken the reproducing chain. Although there are proponents of low cost limited range back speakers, the back information includes signal components in the complete audio spectrum. The lowest bass response often benefits the most from high quality back speakers, for this is the range which frequently contributes the most in added ambience, or "hall sound"—those sonic characteristics which define the acoustic properties of the recording location. The higher frequencies determine the localization of various voices. As new recordings include specific sources in the rear, proper reproduction of that material dictates comparable quality speakers.

Speakers which require electrical equalization are suitable only if all speakers used require the same equalizing networks in the amplifier stages. It is not feasible to mix equalized speakers with conventional speakers. It is also not possible to use speaker systems which use special feedback connections to the amplifier.

It is permissible to use 16 ohm speakers for the front, but if 16 ohm loudspeakers must be used in back, write to Dynaco for instructions on altering the Quadaptor. Operation with 4 ohm speakers is generally not recommended because of the risk of unduly loading the amplifier (load impedance well below 4 ohms). Dynaco amplifiers, however, can drive to reasonable levels with most front 4 ohm speakers and rear 8 ohm speakers.

LOUDSPEAKER PLACEMENT

While personal taste and room furnishings, as well as the floor plan of the listening room, are decisive factors in determining speaker placement, these general suggestions may help get the best results from a Dynaquad music system.

The present positions of the left and right (front) speakers need not be changed in most instances. They are normally placed along the wall opposite the listening area, spaced equally to the right and left, and usually separated by nearly the same distance as the listener is from each speaker. It is assumed that the listener will be centrally located near the back wall of the room. The relative position of the listener and the four speakers must accommodate any left-to-right balance considerations, as the amplifier's balance control serves another purpose in the Dynaquad system.

The back speakers should likewise be placed at equal distances to each side of the listener, and usually to the rear and relatively far apart. All speakers should normally face the listener. In most cases the back speakers will be against the back wall, and somewhat closer to the listener than are the front speakers.

Though referred to as a "4 corner" placement, the speakers should not necessarily be put in the corners, but they generally will form a rectangle. Those who favor a lot of bass will likely prefer corner locations.

Some users may like the effect of aiming the back speakers so that the sound bounces off an adjacent wall surface. This arrangement may heighten ambience effects, but it rolls off the high frequencies, and thus will soften back directionality. Some listeners, too, will prefer to mount the back speakers above ear level for the sense of spaciousness this provides.

The marked simplicity of the Quadaptor, avoiding the need for extra amplifiers, is based on two premises: 1) that all four speakers have reasonably similar efficiencies and sonic characteristics; 2) that the listener will sit in a centered location in the rear 1/3 of the room. If the present (front) speakers are of markedly higher efficiency, the back speakers will have to be placed much closer to the listener, since the back channel signals are (except for a rear signal source) at a lower level than the front signals.

HOW TO USE THE QUADAPTOR

Rear Level Control

This simultaneously adjusts the volume level of the two back speakers. It does not affect the loudness of the front speakers. In the fully clockwise position, with four similar speakers, the back speaker level is the same for a rear signal source as is the front speaker level for a front source. Because the listener will normally be seated closer to the back speakers, this control provides attenuation if needed. The control will likely be used at or near the *fully clockwise position* with 4 similar speakers.

Mode Switch

This 3-position switch provides Dynaquad 4-dimensional sound in its normally centered position. In the lower position the back speakers are disconnected, and the front speakers are heard in conventional two channel stereo. If you wish to use another remote pair of 8 or 16 ohm speakers simultaneously with some speakers in the main (4-D) listening area, you should be sure to use the **FRONT ONLY** switch position to protect the amplifier from undue loading. This will provide conventional stereo sound in both rooms. Be sure you switch off the remote speakers at the amplifier *before* the Quadaptor is switched back to the 4-D position.

In the upper (spring-return) **BALANCE CHECK** position, the speakers are connected to reproduce only the *difference* between the channels. Here there will be no output from a monophonic source (where both channels are identical).

Balancing the System

Set the Rear Level control to the maximum clockwise rotation, and the Mode Switch to *Front Only*. Play the desired stereo program at the normally used volume level. Now switch the amplifier or receiver to a *monophonic* operating mode, so that identical signals are appearing at the left *and* right amplifier outputs. This is usually identified as "Mono", "A+B" or "L+R" on the amplifier controls. On the Dynaco PAT-4 preamplifier, switch to "A - Mono". If your amplifier has no mono switch provision, play a mono record or an AM or mono FM radio program.

Hold the Quadaptor switch in the Balance Check position. You should hear little or no sound from any of the speakers. To obtain precise electrical balance and maximum separation, adjust the amplifier's Balance Control *slowly* for a "null" or minimum sound output. If your amplifier uses individual volume controls on each channel rather than separate volume and balance controls, the two volume controls must be adjusted for the "null".

If your amplifier provides independent left and right channel bass and treble controls, the two bass controls should be nulled, as well as the two treble controls. Normally this will be in their "flat" positions, or where the tone controls are not affecting the circuit. If you prefer some tonal modification, the controls should be nulled with the amount of boost or cut which you normally employ.

Once a "null" has been established, release the Quadaptor switch, *return the amplifier mode to normal stereo*, and you will be listening to 4-dimensional sound. Adjust the Rear Level control so that the back speakers are just perceptible in the normal listening position.

This simple balancing procedure may be repeated whenever changes in the volume control setting on the amplifier, or differing program sources make it advisable.

Because the Balance Control setting is critical to obtaining optimum separation, you should no longer use this control for shifting left-to-right emphasis when listening in the 4-D mode. Thus the listener is advised to shift his position to adjust balance inequities.

If you encounter reduced separation, lowered output level, an uncertain centering of soloists, or an ill-defined "null", the cause is most likely to be reversed polarity (phase) in one of the connections to the Quadaptor.

LISTENING TO DYNAQUAD SOUND

The degree of increased realism which the Dynaquad system provides over conventional two channel stereo will vary with the program material. There will be material which is specially recorded to take advantage of the capabilities of this system. With existing two-channel material the benefits you will derive are largely random and will depend on the particular recording techniques employed. However, such benefits are dramatic on many recordings, and it is a rare performance which does not show some improvement.

From your current recorded library select material which was recorded "live" with an audience, as well as recordings made in halls particularly noted for their fine acoustics. Among the pop material, look for selections which employ special sonic effects, too. Works which employ sizeable choral ensembles are also good candidates for 4-dimensional benefits, as well as material noted for unusually wide stereo separation.

Begin by playing the selection with the Quadaptor switch in the Front Only position, and then switch to 4-D. Audience participation, including applause, will surround you, rather than appearing in front of you. In pop material, you may even find certain instrumentalists coming from behind you—the result of unintentional microphone misphasing. Organ works will frequently reveal added low end power. On many classical recordings, the initial impression when switching from two to four dimensions may not seem so dramatic, but after extended listening in 4-D, conventional playback will seem dry and lifeless by comparison. It is not uncommon to find that the transition from 4-D back to normal stereo loses more realism than the switch from stereo to mono.

The benefits of 4-dimensional sound will often be most apparent in smaller rooms, where space restrictions were previously a significant handicap in reproducing organ pedal fundamentals, or in creating any sense of "hall sound".

You should not expect (or want) to hear four separate and distinct channels, as this would be in essence 4-channel monophonic sound. Realistic musical reproduction implies a relationship between all sound channels and significant overlap, or commonality between them. The Dynaquad system takes advantage of this principle to develop the full reproduction potential of the two sound channels and of their phase and amplitude interrelationships. In effect, more information has always been on the

record or tape than has been previously reproduced, ever since stereo recordings began. Recording engineers have long striven to find microphone pickup techniques and performer placement in the studio or hall which could uncover more of the "flavor" of the live performance on playback. What no one realized until now was that the prime restriction lay in the basic concept of stereo playback as a two-speaker environment, rather than in the lesser limitations of a dual-channel transmission medium.

The Dynaquad system provides normal stereo reproduction from the front speakers. If you switch off the back speakers, you will hear the same left-to-right separation you always had. If a soloist was recorded in a central location, blended into the two channels, the solo will come from a virtual front center location between the front speakers. A monophonic program played through the Dynaquad system will likewise appear as a centered front source.

Normal Dynaquad program reproduction (in the absence of a specific back signal source) will provide somewhat lower signal levels from the back speakers, even with the Rear Level control at maximum. This assures that in the usual listening environment, where the listener sits nearer the back speakers, proper placement of instruments or voices will be retained on the sound stage in front of you. Since the back speakers are closer, and form a wider listening angle, the fact that each back speaker reproduces some of the left or right channel information, in addition to the reflected sounds from the rear, provides the more sharply defined differences in intensity which preserve maximum directionality. In effect, the ear senses greater effective aural separation than the electrical signals apparently provide.

The 4-dimensional effects are achieved because the information in front and rear speakers is *different*—not because there is some front information appearing with reduced level in the rear. As explained later, the added back speakers make it possible for the ear to perceive new signal information which contributes to realism, but which has previously gone unnoticed.

Four dimensional sound cannot improve poor recordings or inadequate equipment. The better the reproducing system, the more it may show up any shortcomings. As one example, the proper azimuth alignment of tape heads is essential to full recovery of 4-dimensional information. As the quality of a music system's components goes up, so do the benefits of 4-D sound.

HOW DYNAQUAD WORKS

Everyone is aware of the increased feeling of ambience and directionality achieved when changing from a single channel (monophonic) sound to two channel (stereophonic) reproduction. The two channels have broadened the sound source and increased the life-like quality of the sound. There are two factors which are involved in this enhancement: one is added directionality, so that we hear some specific sounds from the left, some from the center, and others from the right; the second is increased spaciousness which is created in a rather subtle way.

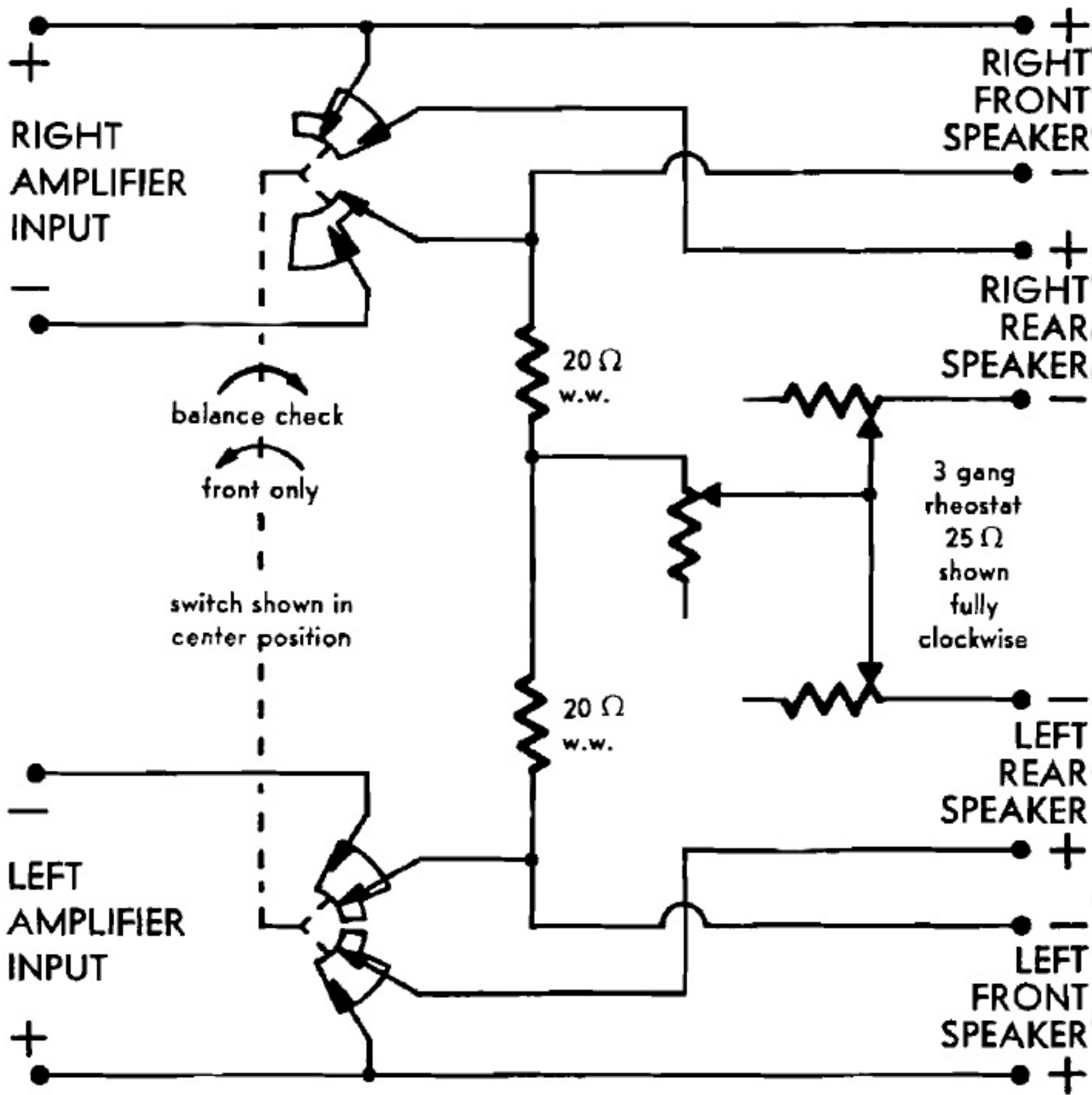
When we listen to sound from one loudspeaker system, we hear the direct and reflected sounds coming from a single source. In contrast, in a concert hall we hear the direct sound from the front, and the reflections from all around. Our ears do not consciously separate direct from reflected sounds. The louder of two sounds, or the one which arrives at the ear first, gives the impression of directionality and localization. The fact that we localize the direct sounds and also are subjected to indirect sounds (echoes) from a different direction is what creates the spatial quality which we call ambience. A single loudspeaker system cannot provide this separation of direct and reflected sounds. However, with two loudspeakers and two channels of sound, some of the direct sounds of one channel have their corresponding reflections in the other channel, and therefore add spaciousness.

Two sources of sound still are limited in spaciousness because the proper localization of a large part of the reflected information is to the rear. If we can use additional channels in the rear, then we can get a far more accurate reproduction of the original ambience. The Dynaquad system provides sound through the rear speakers in which the front (common left and right) sonic components are considerably attenuated so that the reflected sounds (which comprise the difference information between the left and right channels) are not hidden in the direct sounds. This unmasking of the reflected sounds permits them to make their contribution to the overall effect and they are heard from the rear of the room.

The same Dynaquad technique which provides separation of front and rear sound can of course be used to provide ambience in the recording process, and it can produce specific back locali-

zation of instruments and vocalists if the recording engineer so desires. If this rear sound is not controlled in the recording, the effects may still be there in random fashion. Thus many records have some feeling of ambience or back localization of sources without these effects having been intended. The Dynaquad system brings out information which is in the program material. It does not synthesize or artificially add reverberation or ambience. Therefore a recording made with little or no attention to natural hall reverberation is not improved by Dynaquad reproduction. However, the use of the Quadaptor is never detrimental as it will not add any spurious signals, nor will it increase distortion or noise.

To summarize, the Dynaquad technique includes a simple method for introducing rear information into two channel recording, and a way to reduce the front information when it is reproduced through the rear speakers. This reduction of front information in the back speakers enhances their proportion of rear sound to add front and back directionality to the conventional left and right orientation.



SCHMATIC DIAGRAM