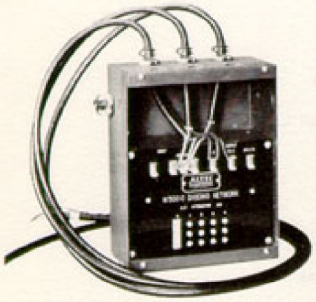
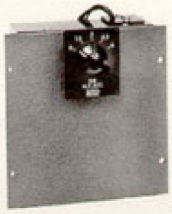
Dividing Networks



N 500C Network



N 500G Network

N501-8A Network

N 800D Network

N 500F Network

N801-8A Network

All Altec Dividing Networks are designed for use in two-way loudspeaker systems or in one-way voice-only paging and announcing systems. When any network is used with only a high-frequency driver (as in paging and public address applications), the low-frequency connections of the network must be terminated with a power resistor having a resistance equal to the output impedance of the network and a wattage rating equal to or greater than the maximum output power delivered by the amplifier being used.

Smooth Crossover

In quality loudspeaker systems, the operating frequency range is divided into two bands and a separate loudspeaker is provided for each frequency band. Altec manufactures low-frequency and high-frequency loudspeakers of exceptional quality. Altec has also developed Dividing Networks for use between the final power amplifiers and the loudspeakers. These networks provide a smooth crossover from the low-frequency loudspeakers to the high-frequency loudspeakers, delivering the correct frequency band to each loudspeaker and preventing the low frequencies from damaging the high-frequency drivers. (The frequency where both loudspeakers in a two-way system receive equal amounts of energy is called the crossover point.)

High Power Capabilities

The Altec Dividing Networks are designed to withstand the output of a 75-watt, 80-watt, 100-watt or 250-watt amplifier (depending on network model number) when the amplifier is driven to its maximum output with program material.

Full-Section, Dual LC Filter Types

Each Altec Dividing Network is a full-section, dual LC filter-type network. All the networks provide an attenuation of 12 dB per octave above and below the crossover point, thereby affording a certain amount of overlap between the assigned frequency bands to the loudspeakers being used.

High-Frequency Shelving Control

Each Altec Dividing Network is provided with a shelving control that is used primarily in music systems when deemphasis of the high frequencies is desired. The shelving control introduces attenuation in the high-frequency range by means of a continuously variable "L" pad, or a five-position rotary switch or strapped terminals, depending on the network model number. The zero position of the shelving control on any network model provides an unshelved (flat) high-frequency response characteristic. Switch- and strap-type shelving controls introduce attenuation in steps of 1 or 1.5 dB, depending on the network model number.

ALTEC®

A DIVISION OF ALTEC CORPORATION

1515 S. Manchester Ave., Anaheim, Calif. 92803

ALTEC Dividing Networks

SPECIFICATIONS

DESCRIPTION	MODEL N500C	MODEL N500F	MODEL N500G
Type:	Full section Dual LC (12 dB per octave)	Full section Dual LC (12 dB per octave)	Full section Dual LC (12 dB per octave)
Power Rating:	250 watts	250 watts	80 watts
Crossover Point:	500 Hz	500 Hz	500 Hz
Impedance:	12 ohms	16 ohms	16 ohms
High-Frequency Shelving:	Four 1-dB steps	Four 1-dB steps	Four 1.5-dB steps
Dimensions:	10" High 8" Wide 4-11/16" Deep	12" High 11" Wide 5-3/8" Deep	2-3/4" High 6-1/4" Wide 6-3/4" Deep
Weight:	13.25 lbs	18 lbs	4.5 lbs

	MODEL N501-8A	MODEL N800D	MODEL N801-8A
Type:	Full section Dual LC (12 dB per octave)	Full section Dual LC (12 dB per octave)	Full section Dual LC (12 dB per octave)
Power Rating:	For sound system use with amplifiers having continuous power rating of up to 100 watts	75 watts	For sound system use with amplifiers having continuous power rating of up to 100 watts
Crossover Point:	500 Hz	800 Hz	800 Hz
Impedance:	8 ohms	16 ohms	8 ohms
High-Frequency Shelving:	"L" pad continuously variable from 0 dB to approximately 20 dB	Four 1-dB steps	"L" pad continuously variable from 0 dB to approximately 20 dB
Dimensions:	5-1/2" High 4-13/16" Wide 5-5/8" Deep	6" High 4-3/4" Wide 5-5/8" Deep	5-1/2" High 4-13/16" Wide 5-5/8" Deep
Weight:	3.5 lbs	2.7 lbs	3.5 lbs

N500C Dividing Network: The N500C network has a 500-Hz crossover point and is designed for use in high-level 250-watt two-way loudspeaker systems consisting of low-frequency loudspeakers (Altec models 414, 416, 515, etc.), and high-frequency driver loudspeakers (Altec models 730, 288, 290, etc.) coupled to multicellular sectoral horns (Altec models 511, 805, 1005, 1505, etc.). Five taps are provided on the network; one tap produces an unattenuated (flat) high-frequency response and four taps present increasing amounts of high-frequency shelving in steps of 1 dB. The 12-ohm input impedance of the N500C network enables it to be used in a system containing Altec 288 or 290 driver loudspeakers (when an Altec 15067 auto-transformer is used with the network for impedance matching).

NOTE

If the N500C network is used with the 802 driver loudspeaker, the network must be tapped to provide at least 3 dB of high-frequency shelving because of the extreme overall efficiency of the driver.

N500F Dividing Network: The N500F network has a 500-Hz crossover point and is designed for use in such high-level 250-watt two-way loudspeaker systems as described for N500C, except the fixed input impedance of the N500F network is 16 ohms. Five taps are provided on the network that produce the same shelving control as described for the N500C. The N500F network also contains an RC circuit, in parallel with the low-frequency load, to provide a constant impedance match for the network and any associated Altec low-frequency loudspeaker. Space is available within the network housing to mount up to three impedance-matching transformers, such as the Altec model 15067 auto-transformer. Adding the transformers enables the fixed input impedance to be transformed from 16 ohms to 4, 8 or 32 ohms and the output impedance to be matched to load impedances of 4, 8, 16 or 32 ohms.

NOTE

If the network is used in a system without a low-frequency loudspeaker, remove the RC circuit (R3 and C3) by clipping the lead adjacent to the shelving control taps and then terminate the low-frequency connections with a power resistor as described above.

N-500G Dividing Network: The N500G network has a 500-Hz crossover point and is designed for use in 80-watt two-way loudspeaker systems featuring the same loudspeaker components described for the N500C. This network has a 5-position rotary shelving switch with one position for zero attenuation and four positions for increasing attenuation in steps of 1.5 dB. Like the N500F, this network also contains an RC circuit that compensates for the normal rise in inductive reactance inherent in low-frequency loudspeakers, to maintain a constant impedance condition. The N500G network is designed to operate only in a two-way loudspeaker system; do not operate it without a low-frequency loudspeaker. (Use the N500F network if one-way operation is planned.)

N501-8A Dividing Network: The N501-8A network has a 500-Hz crossover point and is designed with an input impedance of 8 ohms for use in two-way loudspeaker systems such as the Altec A7-500-8 "Voice of the Theatre" ® loudspeaker system. This network has a continuously variable "L" pad for shelving adjustment from 0 dB to approximately 20 dB attenuation. This network is rated for use with amplifiers having power rating of up to 100 watts.

N800D Dividing Network: The N800D network has an 800-Hz crossover point and is designed with an input impedance of 16 ohms for use in two-way loudspeaker systems such as the Altec A7 "Voice of the Theatre" loudspeaker system. Five taps are provided on the network that produce the same shelving control as described for the N500C. This network is rated for use with amplifiers having power rating of up to 75 watts.

N801-8A Dividing Network: The N801-8A network has an 800-Hz crossover point and is designed with an input impedance of 8 ohms for use in two-way loudspeaker systems such as the Altec A7-8 "Voice of the Theatre" loudspeaker system. Like the N501-8A, this network has a continuously variable "L" pad for shelving adjustment from 0 dB to approximately 20 dB attenuation. This network is rated for use with amplifiers having power rating of up to 100 watts.

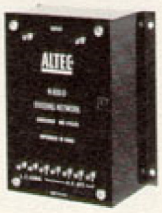
LITHO IN U.S.A. CP-673-5K

Specifications and components subject to change without notice. Overall performance will be maintained or improved.

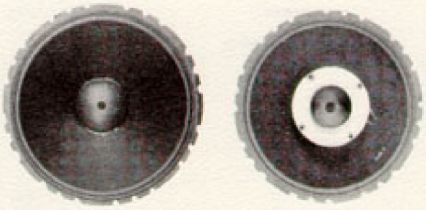
AL-1436-10

Dividing Networks and Diaphragm/Voice Coil Assemblies

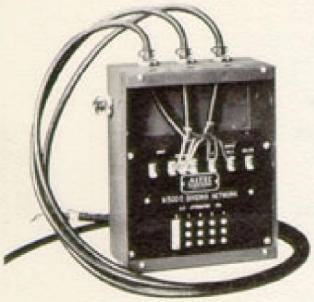
N-500D Network



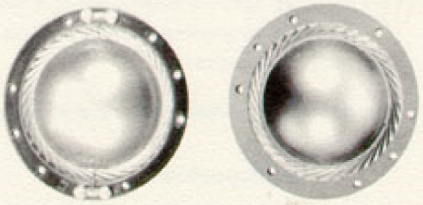
N-800D Network



20248 Diaphragm/Voice Coil Assembly



N-500C Network



20221 Diaphragm Voice Coil Assembly

N-500C DIVIDING NETWORK

The N-500C is a full-section, dual LC dividing network, used to effect a 500-cycle crossover in two-way loudspeaker systems consisting of such low-frequency speakers as the Altec 414, 515, or 803, and the Altec 288, 290 (with the 15067 auto-transformer for impedance matching), or 730 high-frequency reproducers used on Altec multicellular horns (805, 1005, 1505, etc.). The network also permits high-level paging and public address usage where the high-frequency unit only is to be employed; hence driver protection must be provided. Five taps are provided on the N-500C; four of these represent increasing amounts of high-frequency shelving (in steps of 1 db); the fifth produces an unattenuated high frequency response. When the N-500C network is used in conjunction with a high-frequency driver only, for use in paging and public address or sound system work, the low-frequency connections of the network must be terminated with a power resistor having a value of 12 ohms and a rating of at least equal to the maximum output power delivered by the amplifier used. The N-500C network provides an attenuation of 12 db per octave above and below the 500-cycle crossover point.

NOTE: Because of the extreme overall efficiency of the 802-type high frequency driver at least 3 db of attenuation must be provided if used with the N-500C network.

N-500D DIVIDING NETWORK

The N-500D is a full-section, dual LC network which provides a 500-cycle crossover for two-way speaker systems consisting of Altec low-frequency speaker(s), (414, 803, and 515) and high-frequency driver loudspeaker(s), (804 and 802) mounted on the 511 sectoral horn(s). The N-500D network contains a shelving control utilizing a five position rotary switch which provides one position of "0" db attenuation and increasing high-frequency attenuation in four steps of 1.5 db. When the N-500D network is to be used for high frequency driver protection without a low-frequency speaker, the low frequency section (output) must be loaded with a power resistor having a value of 16 ohms and a power rating of at least the maximum output power delivered by the amplifier used. The N-500D network provides an attenuation of 12 db per octave above and below the 500-cycle crossover point.

N-800D DIVIDING NETWORK

The N-800D is also a full-section dividing network of highest quality, enabling a smooth crossover at 800-cycles to be obtained with Altec high-frequency driver units such as the 802 and 804, mounted on the 811 sectoral horn. Five high-frequency output taps are provided on the network, four of which provide increasing amounts of high-frequency shelving (in steps of 1 db), the fifth providing an unattenuated high-frequency response.

The N-800D network provides an attenuation of 12 db per octave above and below the 800-cycle crossover point.

ALTEC LANSING CORPORATION

1515 S. Manchester Ave., Anaheim, Calif.

New York

A Subsidiary of Ling-Temco-Vought, Inc.

SPECIFICATIONS

	N-500C	N-500D	N-800D
Crossover:	500 cycles	500 cycles	800 cycles
Power:	250 watts (max.)	80 watts (max.)	75 watts (max.)
Impedance:	12-16 ohms.	16 ohms.	16 ohms.
High Frequency Shelving:	4-1 db steps	4-1.5 db steps	4-1 db steps
Type:	Full section Dual LC (12 db per octave).	Full section Dual LC (12 db per octave).	Full section Dual LC (12 db per octave).
Dimensions:	10" High 8" Wide 4 11/16" Deep	2¾" High 6¼" Wide 6¾" Deep	6" High 4¾" Wide 2⅝" Deep
Weight:	13.25 lbs.	4.5 lbs.	2.7 lbs.

DIAPHRAGM/VOICE COIL ASSEMBLIES

The field replaceable diaphragm and voice coil assemblies for Altec loudspeakers are listed below. Care should be exercised when making a replacement; until properly mounted, these assemblies are extremely delicate.

Loudspeaker	Diaphragm/Voice Coil Assembly Code Number
288B, 288C	20221
290C	20927
290D	21136
400B	20509
401A	20748
401B	21085
402A	20882
402B	20882
408A	20733
412A-B	20729
412C	21103
415A	20730
414A	21066
515	20248
515B	21092
555	20303
600B	20464
601A-B (L.F.) (NOTE: The high-frequency unit of the 601 and 602 speakers is model 3000 and is not field replaceable)	20592
602A-B (L.F.)	20593
602C (L.F.)	21106
603B	20419
604 (L.F.)	20593
604 (H.F.)	21144
604B (L.F.)	20248
604B-C-D (H.F.)	21144
604D (L.F.)	20841
605A (H.F.)	20275
605A	20969
720A	ES-670-650-2
713C	BL-163147
730A (Head Assembly, complete)	20607
730B	21127
755A	BO-162761
755C	21021
802B-C	21144
802D	21144
803A	20476
803B	20884
804A	20275
50A Horn (Driver Assembly, complete)	20839

NOTICE

We recommend that you obtain your Altec products from factory trained authorized Altec Sound Contractors and Distributors. This will assure you of proper installation, a continuing source of knowledgeable advice, service, and quick warranty protection.

LOUDSPEAKER PHASING

OPERATING INSTRUCTIONS

GENERAL

In building a two-way loudspeaker system, it is essential to maintain proper phasing relationship between the low and high frequency units at the region of crossover. The low and high frequency transducers are two separate and distinct sound sources; at the crossover point, they should both radiate equal intensities. If the phase of these units is incorrectly maintained, their outputs may cancel or combine in an improper phase relationship. For optimum performance in a two-way loudspeaker system, both the high and low frequency drivers must be in phase at the crossover region.

In the case of two-way systems comprised of individual components, proper phasing of the high and low frequency units may best be accomplished by following the wiring diagrams in figures 1, 2, 3, 4 and 5, dependent upon the components used. These diagrams illustrate the electrical connections between the low and high frequency drivers and the associated dividing network. The engineering, design, and manufacture of such networks provide a simple means of phasing a two-way loudspeaker system. It is virtually impossible to establish and maintain proper phase relationships in three or four way systems; for this reason, Altec two-way loudspeaker systems, which cover the entire audible frequency range, are preferred over three or four way systems in all professional boadcast and recording applications.

In addition to the proper elecrtical phasing required in a loudspeaker system, further improvement may sometimes be achieved by shifting the relative positions of the high and low frequency units until maximum smoothness at crossover is determined by measurements or listening tests.

The principal objective is to establish the voice coils of the high and low frequency drivers in the same vertical plane. In the larger Altec loudspeaker systems, including the A7 and A7-500, this is accomplished by means of a front loaded horn (which also greatly improves the directivity of the bass frequencies) for the LF driver. For home music systems, however, the increased size of such a cabinet occasionally precludes its esthetic value, hence a minor compromise is necessary in those speaker systems which employ a high frequency horn and driver with a low frequency transducer mounted in a straight bass reflex enclosure. All Altec loudspeaker systems of this type are carefully engineered so that proper phasing is maintained within the correct vertical angle required for excellent reproduction of sound for the enclosure.

When Altec high-frequency drivers and horns are used with low frequency transducers of other manufacture, it is best to first connect them as shown on pages 1 and 2, dependent on the network employed. Then, when the system is in operation, the wires connected to the low frequency reproducer should be reversed while the sound continues; one may then judge the proper phase relationship by choosing the connection which produces the best musical quality.

In two way systems, it is advantageous for the listener to be able to adjust the volume level of one component with reference to the other; provision is made for this on all Altec dividing networks, as well as on all of the larger Altec two way loudspeaker systems. The listener is therefore able to attenuate (or 'shelve') the high frequency driver in order to establish the best balance to individual room acoustics.

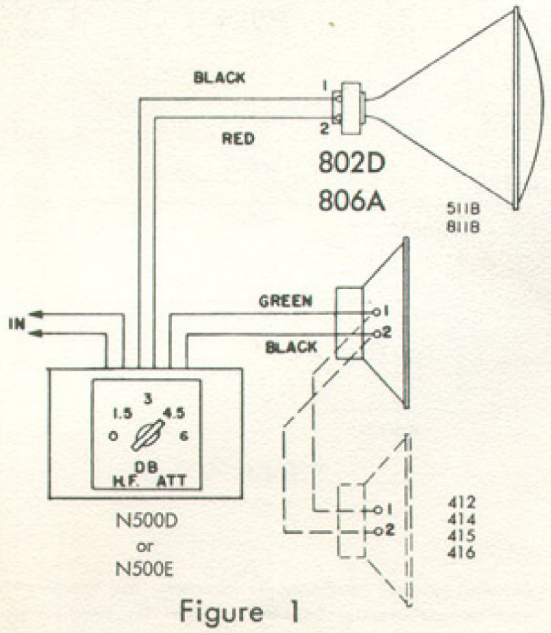


Figure 1

IMPORTANT: When the Altec N500C Network (not shown) is used with the 802D Driver, the network must be attenuated a minimum of 2 db for adequate protection of the driver.

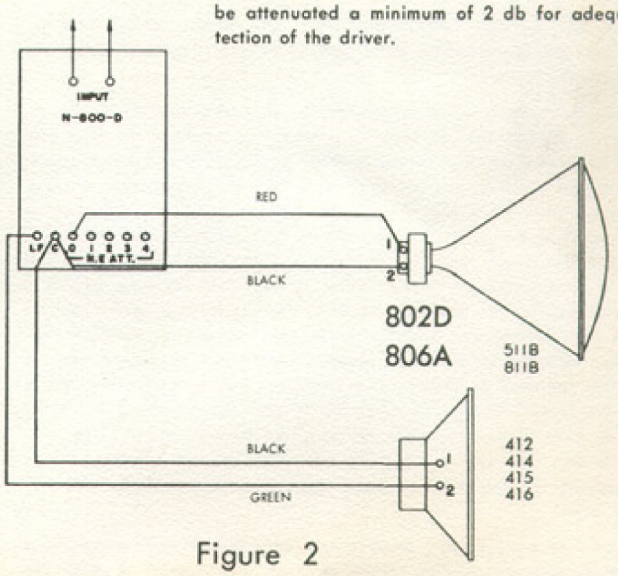


Figure 2

Note: In the Altec A7-500 and A7 'Voice of the Theatre' Systems, the leads to the high frequency driver are connected as shown in Figures 1 and 2; in loudspeaker systems other than these, wherein the voice coils of the high and low frequency reproducers are in differing vertical planes, the leads to the high frequency drivers should be reversed from the connections indicated above.

ALTEC LANSING

A Division of LTV Ling Altec, Inc.

1515 S. Manchester Ave., Anaheim, Calif.

New York

20690-7 Price $ .10

METHOD OF PHASING LOUDSPEAKER SYSTEMS IN STEREO INSTALLATIONS:

The relative phasing of the right and left hand loudspeakers in a stereophonic home music system is essential, in order that sound meant to emanate from the center appears to originate from a point midway between the two systems. Many elaborate methods for determining the correct phase are available but, by using a constant amplitude frequency record (available from most record dealers) it becomes a simple matter. The 100 cycle frequency band is recommended for this purpose.

STEPS FOR PHASING STEREO SPEAKERS:

Maintain constant polarity in loudspeaker wiring, carefully following the instructions furnished with your loudspeakers.

(1) Listen to the system by standing directly between the two side speakers in the correct listening area.

(2) Reverse the polarity of *either* side speaker; the proper connections are found when the volume level of the speakers *increases*.

It is easily understood, therefore, that, to receive the ultimate in stereophonic sound reproduction, three principal factors must be observed:

I: Correct phasing between the components of each individual loudspeaker system.

II. Correct phasing of each complete loudspeaker system, relative to the other system(s) used for multichannel reproduction.

III. Proper placement of the speaker systems within the listening area.

STEREO LOUDSPEAKER PLACEMENT:

Proper positioning of loudspeakers and speaker systems for the reproduction of monophonic sound has seldom posed a problem but care should be exercised in loudspeaker placement for stereophonic reproduction. Audience perspective is important and may best be accomplished by following a few simple, yet necessary, rules in the selection and placement of loudspeakers.

To realize the optimum performance from your stereo system, it is important that the loudspeakers be placed in definite locations within the listening area.

Two separate channels which originate from a dual amplifier are fed to the separate loudspeakers or speaker systems; this provides the time and intensity difference which gives the 'spatial' quality to stereophonic sound. If the speakers are too closely spaced — as in a single enclosure housing two speakers only a few feet apart — the time and intensity difference is so small that spatial quality is severly limited. Except in a very small room, eight feet is considered minimum spacing between speakers for good stereo. In a two channel system, good stereophonic listening begins a distance in front of the speakers equal to their separation and continues for twice this distance. For example, if the speakers are placed eight feet apart, the optimum stereo effect extends from eight to sixteen feet in front of the speakers. In three channel systems, the center speaker (which receives the sum of the signals being fed to each side speaker) should be located as near midway between the two side speakers as possible and, ideally, in line. The use of the third, or center channel speaker, allows wider spacing of the side speakers and a correspondingly broader listening area.

The majority of high quality music power amplifiers provide connections for a center channel speaker. When such an arrangement is used, the sound which originated from the center of the recording stage (such as a solo instrument or voice) will actually emanate from all three speakers or speaker systems but will appear to be confined to the center channel. When two speakers not widely separated are employed, this effect is preserved without the center speaker; the latter will, however, permit a much wider separation of the side systems without an undesirable 'hole in the middle' effect.

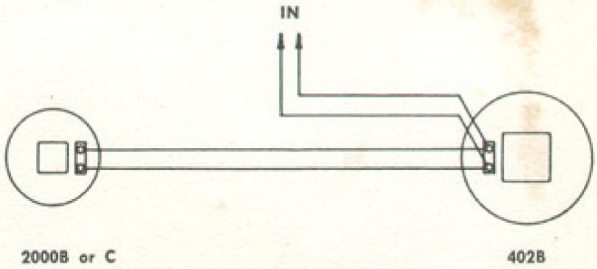


Figure 3

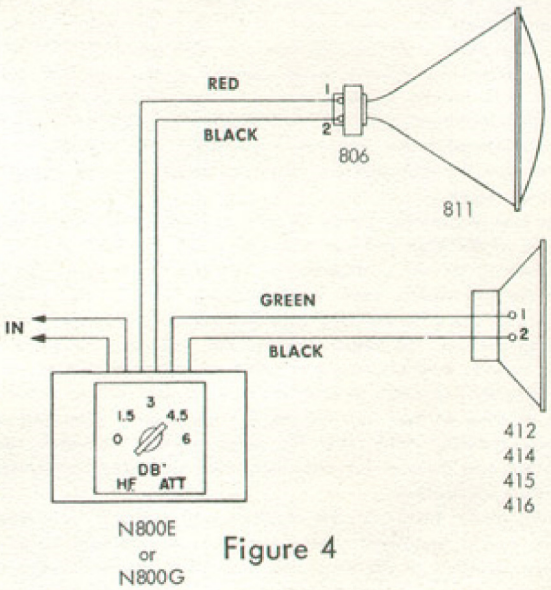


Figure 4

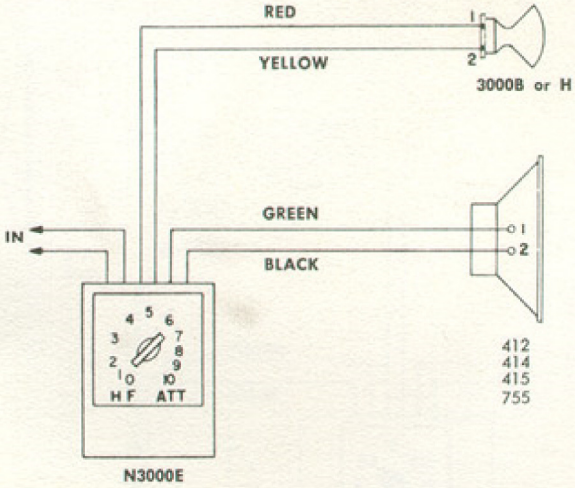


Figure 5

As the distance between loudspeakers increases, the listening area is 'moved back' proportionately; listening too near the speakers gives the impression of two distinct sources of sound; listening too distant produces a nullified effect, with regard to the stereophonic time and intensity difference, and the reproduced sound will appear to differ little from a monophonic system.

If speakers or speaker systems are substantially separated, it is generally best practice to angle the side speakers toward the center of the listening area.