

# Engineering News



ALTEC LANSING

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A Division of ALTEC LANSING ALTEC, INC.

## PROTECTION FOR HIGH FREQUENCY DRIVER UNITS

Technical Letter No. 121

### GENERAL

When high-frequency driver transducers are employed in sound systems, some means of protection must be provided in order to prevent damage to the HF diaphragm. Such damage occurs because of the excessive HF diaphragm excursion caused by the presence of unwanted low-frequency signals which the driver is unable to reproduce. In two-way systems (i. e., those utilizing separate transducers for the high and low frequencies), dividing networks are employed which, in addition to providing the needed protection referred to, also channel the high and low portions of the audible spectrum to the high and low frequency speakers which will correctly reproduce them.

In addition to the high pass filter on most Altec power amplifiers, Altec also supplies the engineering sound contractor with two proven means of providing HF driver protection; the dividing network, which also serves to correctly channel the high and low frequencies, and the combination line transformer and high pass filter, used in systems where driver protection only is desired (i. e., without any frequency division as only the HF transducer is employed. For such usage, refer to the Altec 15045A transformer, described on page 3.

Another form of protection is often necessitated when HF drivers are employed in outdoor installations within relatively short distances from high-powered radio, television, and RADAR transmitting stations. In addition, ungrounded speaker lines are subject also to accumulated static discharges under certain atmospheric conditions. A discharge, in the voice coil gap, from either of these causes, may produce damage and eventual malfunction of the coil; preventive measures for such occurrences may be found on page 4.

### ALTEC N500C DIVIDING NETWORK

The Altec N500C is a full-section, two-way dividing network, used to effect a 500-cycle crossover in two-way loudspeaker systems consisting of such low-frequency components as the Altec 414, 515, or 803 speakers and the Altec 288, 290, 730, 802, or 804 high-frequency reproducers used on 500, 400, or 300 cycle horns (Altec sectoral or multicellular horns). The network also provides for high-level paging and public address usages where the high-frequency unit only is to be employed. When the network is used in this manner, the low-frequency output taps must be loaded with a power resistor having a value of 12 to 16 ohms and a power rating equal to at least one-half the maximum power delivered to the network by the amplifier used.

The N500C (Figure 1) provides five varying HF response curves in steps of 1 db from a uniform response to -4 db. The five taps, on the front of the unit, are easily selected by means of the link. The network provides a slope of 12 db per octave at the 500-cycle crossover frequency.

(Note: The 802-type driver unit, when used with the N500C Network, should always be attenuated 2 db or more.)

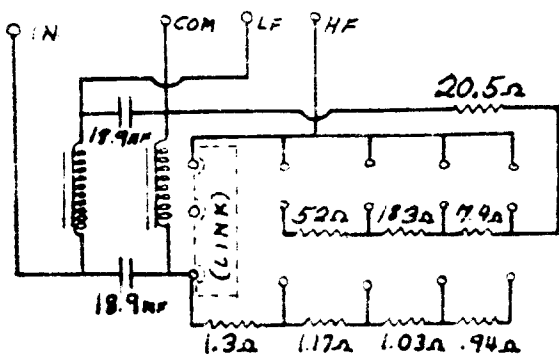
**SPECIFICATIONS - ALTEC N500C NETWORK:** Type: Full-section, 500-cycle crossover network.

Power: 250 watts (maximum)

Impedance: 12 - 16Ω

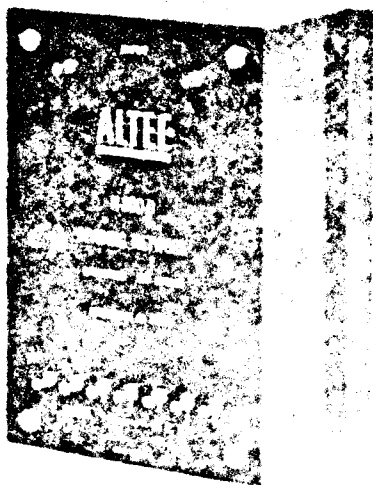
Dimensions: 10" H x 8" W x 4-11/16" D

Weight: 22 lbs.



(Figure 1)

**SCHMATIC: ALTEC N500C NETWORK**



### ALTEC N800D DIVIDING NETWORK

The N800D is also a full-section, two-way dividing network, providing an 800-cycle crossover in two-way loudspeaker systems consisting of such components as the Altec 414, 515, and 803 LF speakers, and the Altec 802 or 804 HF driver coupled to the 811 horn.

The N800D (Figure 2) provides five different high-frequency response characteristics in steps of 1 db, easily selected by connecting one side of the HF loudspeaker line to the tap having the desired characteristic. The network provides a slope of 12 db per octave at the 800-cycle crossover frequency.

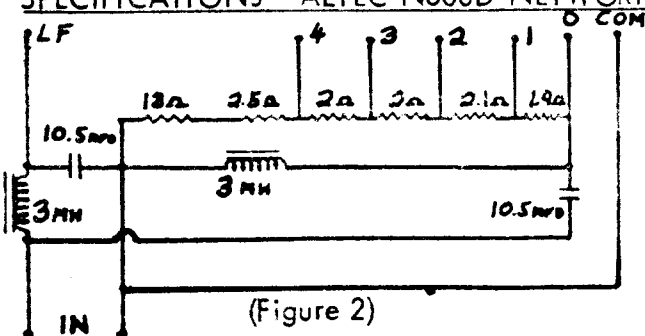
**SPECIFICATIONS - ALTEC N800D NETWORK:** Type: Full-section, 800-cycle crossover network.

Power: 75 watts (maximum)

Impedance: 16Ω

Dimensions: 6" H x 4-3/4" W x 2-5/8" D

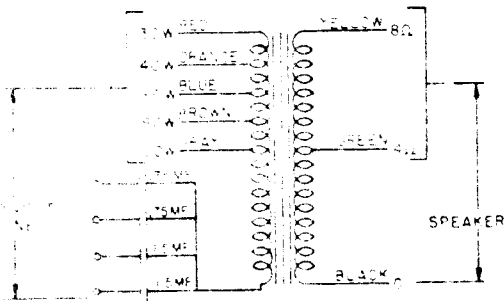
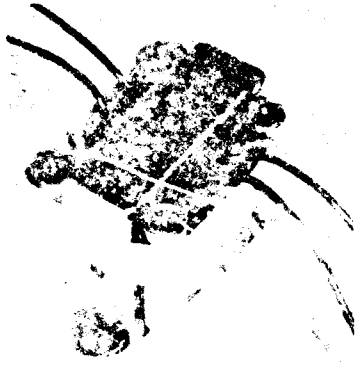
Weight: 8 lbs.



(Figure 2)

**SCHMATIC: ALTEC N800D NETWORK**

## 70-VOLT LINE SYSTEM: ALTEC 15045A TRANSFORMER



The 70-volt system of amplifier-source to speaker-load connection is very popular, owing to its convenience, efficiency and economy which permit an immediate selection of the needed power for each speaker without lengthy computation of impedances.

Many applications require the attenuation of the low frequencies, in order that these signals will not damage the high-frequency diaphragm of the driver due to low-frequency energy causing over-excursion of the HF diaphragm. With the introduction of the Altec 15045A 70-volt line transformer and high-pass filter, the function of line matching and correct low frequency cutoff have been combined in a single unit -- easily mounted on the frame of the Altec 290D and 730C driver units; also on the Altec 50A horn.

The 15045A provides a variable high-pass filter with sharp cut-off characteristics, easily selected from 300 to 500 cycles (See table, Figure 4).

The complete 15045A assembly, as shipped, consists of a special 70-volt line transformer, together with four capacitors, two large and two small (2 - 1.5 mfd; 2 - .75 mfd) firmly affixed to the transformer frame. The lower lead of each capacitor is internally connected to one of two lugs which, in turn, is connected to the primary common lead.

In practice, one or more of the free leads (i. e., those not attached to the primary common side of the transformer) of the capacitors are connected to the low side of the 70-volt amplifier output; the high side of the amplifier is then connected to the desired wattage tap on the transformer primary. A great range in both speaker power and cutoff frequency is available by making the proper connections, as shown in the following table:

(70-VOLT LINE CONNECTION)			
DESIRED POWER	LF CUT-OFF	LEAD COLOR	CAPACITORS
100 watts	450 cycles	Gray	All
80 watts	500 cycles	Brown	2 large; 1 small
80 watts	350 cycles	Brown	All
60 watts	500 cycles	Blue	2 large
60 watts	300 cycles	Blue	All
40 watts	500 cycles	Orange	1 large; 1 small
40 watts	300 cycles	Orange	2 large
30 watts	300 cycles	Red	1 large; 1 small

(Figure 4)

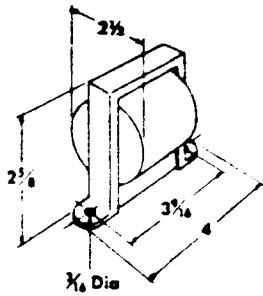


Figure 5

Frequency response of the 15045A is uniform ( $\pm 1$  db) above the region of the selected cutoff frequency to 10,000 cycles; the maximum insertion loss (above cutoff region) is 0.5 db.

The 15045A weighs 2-1/2 pounds; mounting centers and dimensions of the unit are shown in the diagram at left (Figure 5).

### PREVENTION OF POSSIBLE SPEAKER DAMAGE FROM RF AND STATIC DISCHARGES...

The following procedures are recommended in order to avoid static discharges within the voice coil gap, caused by outdoor speaker installations which are near powerful RF transmission sites. In addition, a method for avoiding similar undesired effects, owing to atmospheric conditions, is illustrated in Figure 6:

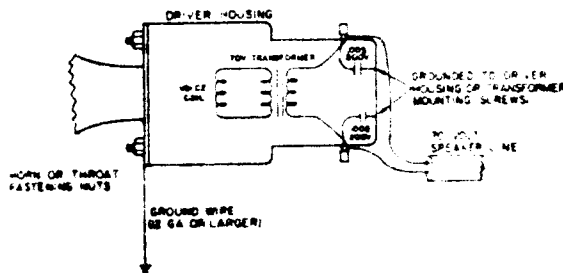


Figure 6

1: When the 70-volt line is 'floating' (i. e., no ground connection exists at either side of the amplifier output to the speaker line), two .005 mfd, 200 volt ceramic capacitors should be connected from each side of the 70-volt speaker line to the frame of the horn (Figure 6). In most cases, an accessible connection point may be found under the 70-volt transformer mounting screws. Each speaker line should be bypassed in this manner at one speaker of the array.

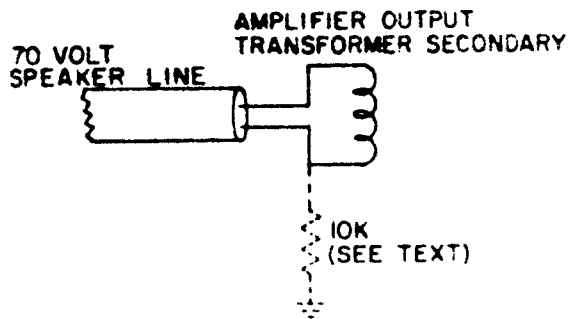


Figure 7

A wire, 12 gauge or larger, should be connected between the horn frames or driver housings of all horns; after all horns are interconnected in this manner, a single wire (12 gauge or larger) is run from one horn or driver housing to ground (earth) by means of a suitable driven ground, water pipe, etc.

A 10,000 ohm resistor is then connected between one of the 70-volt output terminals and ground at the amplifier location (Figure 7).

2: When the speaker line is already grounded at the amplifier output, the preceding instructions continue to apply with regard to the RF bypass within the speaker housing itself and the grounding of the horn frame or driver housing of each horn; however, the 10,000 ohm resistor at the amplifier location may be omitted.