



# The Aerovox Hi-Farad Condenser

## Operates efficiently over a wide range of temperatures

EXPERIMENTS made to determine the effects of wide variations of temperatures on our Hi-Farad Condensers and those of other types makes of wet electrolytic condensers show conclusively the superiority of Hi-Farad DRY Electrolytic condensers in this regard.

Best Results Obtained When Operated in Cool Section of Receiver



Aerovox Triple-8Mfd.  
Dry Electrolytic Condenser  
500 Volts D. C. Peak

As is the case with wax paper condensers, it is essential that all types of electrolytic condensers be placed in the coolest section of the receiver or amplifier assembly. If the temperature of the air surrounding any electrolytic condenser is raised to 120 degrees Fahrenheit (approximately 49 degrees Centigrade), no harm or appreciable change in characteristics will occur.

Best results are obtained with the Aerovox Hi-Farad Condenser when a temperature of 120 degrees F. is not exceeded, in the space surrounding the condenser, when the condenser is operated at or near its maximum rating of 500 volts peak. On lower voltages, such as 475 volts peak, a temperature of 125 degrees F. is not excessive. At 450 volts peak, a temperature of 130 degrees may be used and at 400 volts peak, a temperature as high as 135 degrees F. will not cause any excessive leakage current to flow.

When subjected to temperatures as high as 170 degrees F. (approximately 77 C.) which is far in excess of the

Aerovox Hi-Farad Condensers  
Will Not Freeze

The electrolyte used in wet electrolytic condensers will freeze and render the condenser inoperative at temperatures ranging from 21 to 29 degrees F., temperatures normally met with in winter transportation when shipping of radio receivers and equipment is at its height, or in normal outdoor operation in cold weather.

Aerovox Hi-Farad DRY Electrolytic Condensers are still operative at temperatures as low as 40 degrees below zero F. The fact that they remain operative at such low temperatures makes it possible to use them in receivers, amplifiers, public address systems and sound recording apparatus under all conditions of outdoor use or in cold or unheated places during the winter months.

The only change in characteristics of Hi-Farad condensers at extremely low temperatures is a drop in capacity to approximately 50% of their normal rating when operated at temperatures as low as 40 degrees below zero F. After exposure to such low temperatures, Hi-Farad condensers require only a short exposure to normal room temperatures to regain their full, normal capacity ratings.

From this standpoint, the advantages of Aerovox Hi-Farad DRY Electrolytic Condensers are obvious. The loss in capacity of Hi-Farad condensers at temperatures of 21 to 29 degrees F., (at which point wet electrolytic condenser freezes and become inoperative) is negligible.

temperatures encountered in actual operation, the leakage current of electrolytic condensers will increase.

In wet electrolytic condensers which employ an aqueous solution, loss of solution, due to evaporation results in loss of capacity and shortened life. Enough solution may be lost under high temperature conditions to render the condenser inoperative in a comparatively short time.

The non-aqueous (non-water) composition and special ingredients used in Hi-Farad condensers provide stable characteristics which prevent any possibility of evaporation under operating conditions.

THIS BOOK GIVES THE LATEST AND MOST COMPLETE INFORMATION ON  
ELECTROLYTIC CONDENSERS

**FREE!** A copy of this 32-page book, containing information on all types of electrolytic condensers will be sent free of charge on request. Just mail the coupon below. The book treats in detail the very im-

portant factors that affect the operation and life of electrolytic condensers of various types; the characteristics necessary in filter and bypass condensers to perform their functions satisfactorily and many other subjects of vital importance in the proper use of such condensers.

If you want to know whether leakage is a reliable indicator of filtering efficiency; what electrolyte characteristics are necessary for efficient electrolytic condenser action; how the filtering efficiency of various types of electrolytic condensers compares with paper condensers; in short everything you should know about electrolytic condensers you will find the information in this book. A copy is yours for the asking.



Aerovox Wireless Corporation,  
70 Washington Street,  
Brooklyn, N. Y.

Please send me, without charge or obligation, a copy of your book, "The Hi-Farad DRY Electrolytic Condenser."

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Manufacturers of

The Most Complete Line of Condensers and Resistors in the Radio and Electrical Industries

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## The Essential Factors in the Design of Receiver and Amplifier Systems

Part IV\*

By the Engineering Department, Aerovox Wireless Corporation

A TRANSFORMER coupled amplifier is used when only low plate voltages are available and where it is desired to use but few tubes. From a single high- $\mu$  tube used in a resistance or impedance coupled stage and its associated input and output circuits a gain of about 20 can be obtained. From a single tube and

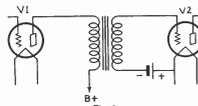


Fig. 9

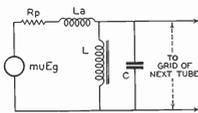


Fig. 10

associated input and output transformers a gain of from 50 to 100 can be obtained. As in the case of the resistance coupled amplifier, an analysis of the frequency response must be considered, from the standpoint first of low frequencies and second of high frequencies. Fig. 9 is the fundamental diagram of a single stage of transformer coupled audio amplification. Fig. 10 is the approximate equivalent circuit at low frequencies. In the latter circuit  $\mu\epsilon g$  is the signal voltage in the plate circuit,  $R_p$  is the a. c. plate resistance of the tube,  $L_a$  is the leakage reactance of the transformer,  $L$  is

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the inductance of the primary of the transformer and C is the input capacity of V2 together with the distributed capacity of the transformer windings.

TABLE 2.

Xl	Percentage of total
Rp	Voltage Across L
4.0	97
2.0	89
1.0	71
0.5	44.6

At low frequencies the reactance of C is very large in comparison with the reactance of L and therefore at low frequencies the available signal voltage divides between Rp and L. The percentage of the total voltage that appears across L depends upon the ratio of the reactance of L (Xl) to Rp and varies as indicated in column 2 of Table 2. Let us apply the same criteria to the performance of this transformer coupled circuit as were used in discussing the resistance coupled amplifier, and state that the voltage amplification at 50 cycles should not fall to less than 90 percent. From Table 2, we find that the reactance of L (Xl) should therefore be approximately twice as great as Rp at 50 cycles to maintain a voltage amplification of 90 percent. If the tube is a type 327 Rp will be approximately 10,000 ohms and therefore the reactance of L must be 20,000 ohms. The reactance of a coil is determined as follows:

$$Xl = 6.28fL$$

where

Xl is the reactance in ohms  
f is the frequency in cycles per second

L is the inductance in henries. In this case Xl must be 20,000 ohms when f is 50 cycles. Therefore L must be

$$L = \frac{20,000}{6.28 \times 50} = 66.6 \text{ henries}$$

Therefore a transformer which is to give 90 percent response at 50 cycles must have a primary inductance of about 67 henries. If the inductance of the primary is smaller the response falls off at low frequencies.

At high frequencies the reactance of L is very large in comparison with that of C and therefore the voltage divides between Rp, La and C, and L

can be neglected. Essentially we then have a circuit consisting of Rp, La and C in series. At a certain frequency La and C will produce a resonant circuit, the overall impedance of the circuit will thereby be decreased, and more current will flow, tending to increase the voltage across C, which is the voltage applied to the following tube. However the voltage across C is inversely proportional to the frequency and this helps to prevent an undue rise. In some transformers, especially those made a few years

back, there was a pronounced peak in the curve around the frequency at which La and C were resonant. The point at which resonance occurs should be made high in frequency, which means that the magnetic coupling between the windings must be practically complete.

To obtain good frequency response characteristics in a transformer coupled amplifier therefore it is necessary to use transformers having a high primary inductance, low leakage and low distributed capacity.

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and dealers, but if you have any difficulty in getting Aerovox Products from your own dealer you may obtain them direct by addressing your order and remittance to the Aerovox Wireless Corporation, 70 Washington Street, Brooklyn, N. Y., and be sure that your order will receive prompt attention.

### Aerovox Replacement Filter Condensers for Quick Repairs at Low Cost



THESE sections are in every respect the same as the sections used in the Type 202, 402, 602, and 1002 condensers. They are all non-inductively wound using the highest grade 100% pure linen paper, free from acid, alkali, bleaching material and impurities.

They are thoroughly impregnated with the same high melting point compound to protect them against heat.

The only difference lies in the

fact that they are sealed in cardboard boxes instead of metal cans. These units are ideally suited for use as replacements for punctured sections in existing filter blocks of power supply units. When existing punctured sections are removed from filter units and replaced by Aerovox replacement units of the proper capacity and voltage rating no more trouble will be experienced from blown out condenser sections.

Complete Details on These Units Will Be Found in the New 1931 Aerovox Catalogue

## Announcing Our New 1931 Edition Condenser and Resistor Manual

A Free 40-page Manual and Catalogue

*That Should Be in the Hands of Every Engineer and Purchasing Agent  
in the Radio and Electrical Industries*

The time, effort and expense put into the preparation of our new, 40-page "Condenser and Resistor Manual and Catalogue" has been amply repaid by the many comments which we have been receiving from both engineers and purchasing agents. These men have been kind enough to say that it is the most usable and most complete catalogue of its kind that they have ever seen.

In preparing this Manual and Catalogue, the needs of the Engineer and Purchasing Agent for detailed electrical and mechanical specifications of every unit were kept in mind. The result is a manual that contains not only the usual general information found in most catalogues but a wealth of detailed data on the characteristics, and use of the units under all conditions of operation.

It contains dimensioned working drawings of every unit, Tables of Standard Sizes, Information on ordering special sizes, Ratings of Resistors under different conditions of operation, List Prices of all units and two pages of formulae and data useful in Condenser and Resistor calculations.

In this catalogue you will find a standard condenser or resistor for every radio and electrical requirement. Special units can be made to order at short notice.

A copy of this manual will be a handy addition to your catalogue files. We shall be glad to send you as many copies as you may need for the various members of your organization who may be interested in the characteristics and use of condensers and resistors.

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