

TYPE 219 Decade Condenser, a zero capacitance common to all the units and residual impedances between the units is added as shown in Figure 9. The largest unit is placed next to the terminals and, therefore, has the smallest residual impedances. The added zero capacitance is about  $8 \mu\text{f}$  with a dissipation factor of about 0.05 at 1 kc. Their variation with frequency is the same as those of the separate units as shown in Figure 5. It is most convenient to add together all of the zero capacitances, for the box and for the three units. This gives a total of  $41 \mu\text{f}$  for the TYPE 219-M and  $46 \mu\text{f}$  for the TYPE 219-K Decade Condensers. Their respective DC products are  $2.05 \mu\text{f}$  and  $2.30 \mu\text{f}$ . These values are sufficiently large so that they must be considered in calculating the dissipation factors of all settings for both of the two lower decades.

Values of the residuals indicated in Figure 9 are given in Table III. It is also most convenient here to add together all of the residuals associated with each unit. These totals are given in the last two columns. The increases in capacitance and dissipation factor caused by these larger residuals are shown in Figure 10. These curves differ from those of Figure 6 mainly by having larger increases at the higher frequencies.

When more than one decade unit is used it is generally sufficient to assume that all of the capacitance is associated with the highest decade. This assumption will be safe except when the capacitances in the two higher decades are nearly equal, 18 or 19, or in the TYPE 219-K Decade Condenser where the TYPE 380-F Unit is so much better than

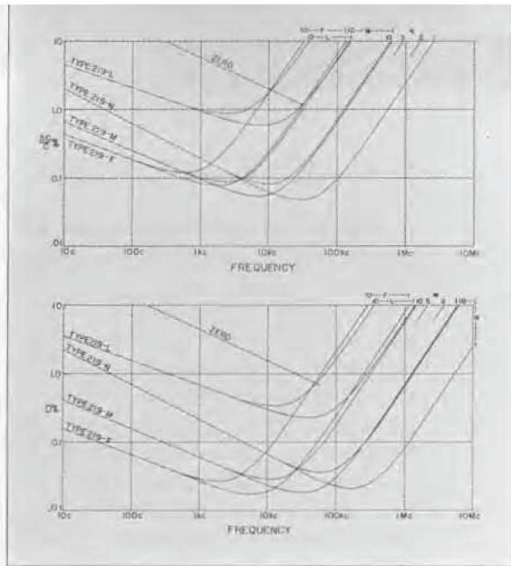


FIGURE 10. Frequency characteristics of TYPE 380 Decade Condenser Units when mounted to form TYPE 219-M and -K Decade Condensers. As compared to Figure 6, the high-frequency parts of the curves are shifted to lower frequencies.

the TYPE 380-M Unit. In any case, however, it must be recognized that the data and curves given in this article are average values, considerably smaller than the catalog limits, which may at times be approached. Divergencies from the given average values will be least for residual inductances, and most for the dissipation factors from dielectric polarization. High relative humidity can greatly increase the dissipation factor of the zero capacitances and to a lesser extent the capacitances and dissipation factors of the condensers themselves. The dissipation factors of the separate condensers may vary by a factor of two or three among themselves, and their capacitances are only adjusted within  $\pm 1\%$ ,  $\pm 2\%$  for TYPE 380-L. It follows, therefore, that accurate values of any particular decade condenser can be obtained only by extensive measurements on that particular instrument.

— R. F. FIELD