CAPACITOR VOLTAGE TRANSFORMER

The capacitive voltage transformer step-down the high voltage input signals and provide the low voltage signals which can easily measure through the measuring instrument. The Capacitive voltage transformer (CVT) is also called capacitive potential transformer.

Capacitance voltage transformer are more complex than the resistance type. For measurement of impulse voltages not exceeding 1 MV capacitance dividers can be both portable and transportable. In general, for measurement of 1 MV and over, the capacitance divider is a laboratory fixture. The capacitance dividers are usually made of capacitor units mounted one above the other and bolted together. It is this failure which makes the small dividers portable. A screening box similar to that described earlier can be used for housing both the low voltage capacitor unit C_2 and the matching resistor if required.

The low voltage capacitor C_2 should be non-inductive. A form of capacitor which has given excellent results is of mica and tin foil plate, construction, each foil having connecting tags coming out at opposite corners. This ensures that the current cannot pass from the high voltage circuit to the delay cable without actually going through the foil electrodes. It is also important that the coupling between the high and low voltage arms of the divider be purely capacitive.

Hence, the low voltage arm should contain one capacitor only; two or more capacitors in parallel must be avoided because of appreciable inductance that would thus be introduced. Further, the tappings to the delay cable must be taken off as close as possible to the terminals of C_2. Figure shows variants of capacitance potential dividers.

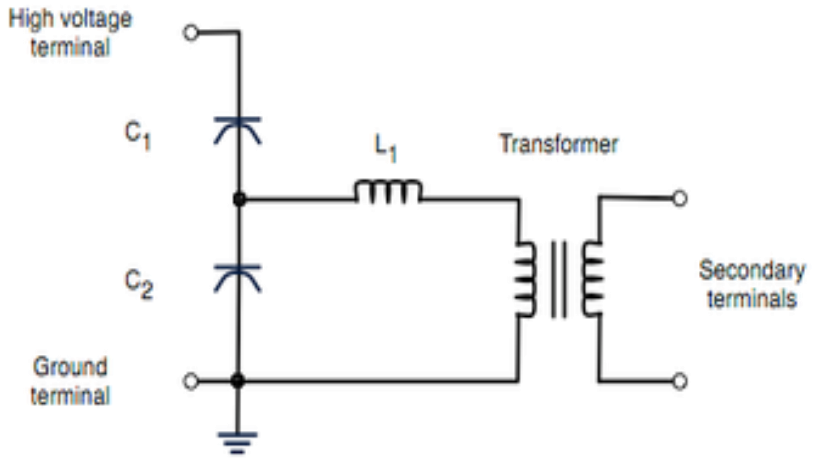

Figure 4.1.1 Capacitive Voltage Transformer

A low Resistor in parallel to C_2 would load the low voltage arm of the divider too heavily and decrease the output voltage with time. Since R and Z form a potential divider and R = Z, the voltage input to the cable will be half of the voltage across the capacitor C_2. This halved voltages travels towards the open end of the cable (CRO end) and gets doubled after reflection. That is, the voltage recorded by the CRO is equal to the voltage across the capacitor C_2. The reflected wave charges the cable to its final voltage magnitude and is absorbed by R (i.e. reflection takes place at R and since R = Z, the wave is completely absorbed as coefficient of voltage reflection is zero) as the capacitor C2 acts as a short circuit for high frequency waves. The transformation ratio, therefore, changes from the value:

However, the capacitance of the delay cable Cd is usually small as compared with C2.For capacitive divider an additional damping resistance is usually connected in the lead on the High voltage side as shown in figure. The performance of the divider can be improved if damping resistor which corresponds to the a periodic limiting case is inserted in series with the individual element of capacitor divider. This kind of damped capacitive divider acts for high frequencies as a resistive divider and for low frequencies as a capacitive divider. It can, therefore, be used over a wide range of frequencies i.e. for impulse voltages of very different duration and also for alternating voltages.