

## Transformer Polarity

Transformer polarity is an indication of the direction of current flow through the high-voltage terminals with respect to the direction of current flow through the low-voltage terminals at any given instant in the alternating cycle.

The polarity of a single-phase distribution transformer may be additive or subtractive. A simple test for polarity is to connect two adjacent terminals of the high- and low-voltage windings together and apply a moderate voltage to either winding.

The polarity is **additive** if the voltage across the other two leads of the windings in question is greater than that of the high-voltage winding alone (Fig. A).

The polarity is **subtractive** if the voltage across the other two leads of the windings in question is less than that of the high-voltage winding alone (Fig. B).

By industry standards, all single-phase distribution transformers 200 kva and smaller, having high voltages 8660 volts and below (winding voltage) have additive polarity. All other single-phase transformers have a subtractive polarity.

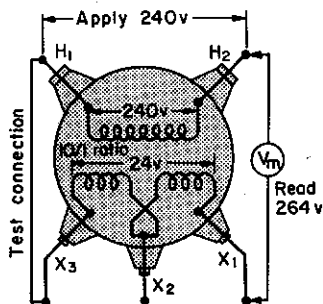


Fig. A. Additive Polarity

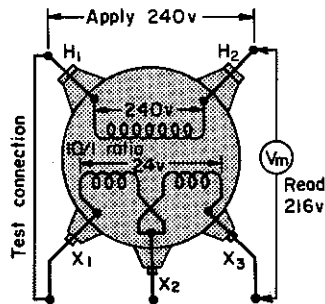


Fig. B. Subtractive Polarity

## Terminal Markings For Single- & Three-phase Transformers (Cont'd)

For single-phase transformers, the low-voltage  $X_1$  terminal is on the right, when facing the low-voltage side of the transformer, for additive polarity ( $H_1$  is diagonally located with respect to  $X_1$ ) and the low-voltage  $X_1$  terminal is on the left for subtractive polarity ( $H_1$  and  $X_1$  are adjacent).

For three-phase transformers, the  $X_1$  terminal is brought out as the left-hand terminal of the "X" group as seen when facing the "X" winding side of the case. The  $X_2$  and  $X_3$  terminals are brought out so that the three terminals are arranged in numerical order reading from left to right when facing the "X" winding side of the case. The  $X_0$  terminal, if present, is located to the left of the  $X_1$  terminal as seen when facing the "X" winding side of the case.  $X_4$  in illustrations H and I on page 9 designates a tap in one of the secondary windings to supply a 120-volt, single-phase circuit between  $X_1$  and  $X_4$ .

## Single-phase Paralleling

If greater capacity is desired, two transformers of the same or different kva ratings may be connected in parallel. Single-phase transformers of either additive or subtractive polarity may be paralleled successfully if connected as shown below and if the following conditions are met:

1. Voltage ratings are identical.
2. Tap settings are identical.
3. Percent impedance of one is between  $92\frac{1}{2}\%$  and  $107\frac{1}{2}\%$  of the other.
4. Frequency ratings are identical.