



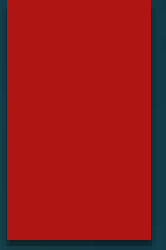
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**Topic**

# **AC Distribution System**



# AC Distribution

Now-a-days electrical energy is generated, transmitted and distributed in the form of alternating current. One important reason for the widespread use of alternating current in preference to direct current is the fact that alternating voltage can be conveniently changed in magnitude by means of a transformer. Transformer has made it possible to transmit A.C power at high voltage and utilize it at a safe potential. High transmission and AC Distribution System voltages have greatly reduced the current in the conductors and the resulting line losses.

There is no definite line between transmission and distribution according to voltage or bulk capacity. However, in general, the AC Distribution System is the electrical system between the step-down substation fed by the transmission system and the consumers' meters. The AC Distribution System is classified into

- Primary distribution system and
- Secondary distribution system

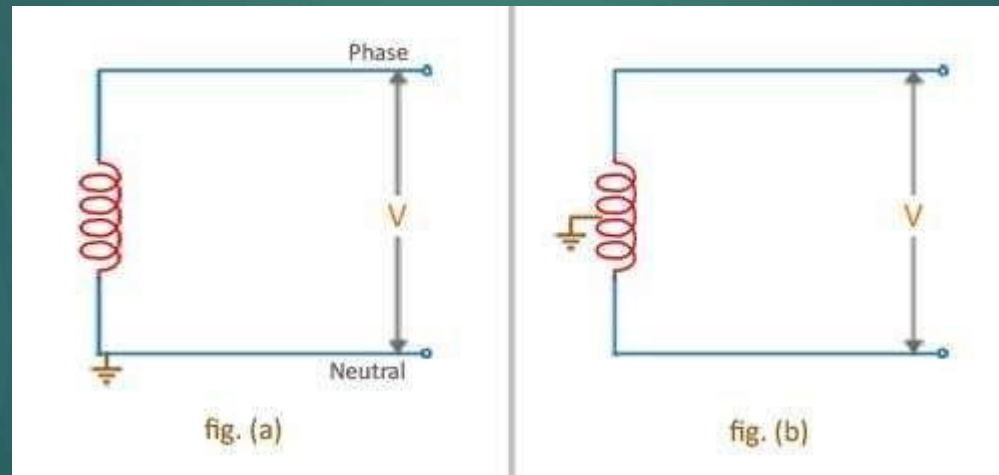
# Types Of AC Power Distribution Systems

According to phases and wires involved, an AC distribution system can be classified as

- I. Single phase, 2-wire system
- II. Single phase, 3-wire system
- III. Two phase, 3-wire system
- IV. Two phase, 4-wire system
- V. Three phase, 3-wire system
- VI. Three phase, 4-wire system

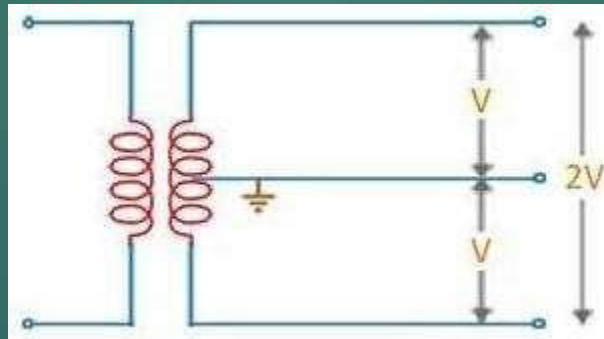
# Single Phase, 2-Wire Distribution

This system may be used for very short distances. The following figure shows a single phase two wire system with - fig (a) one of the two wires earthed and fig. (b) mid-point of the phase winding is earthed.



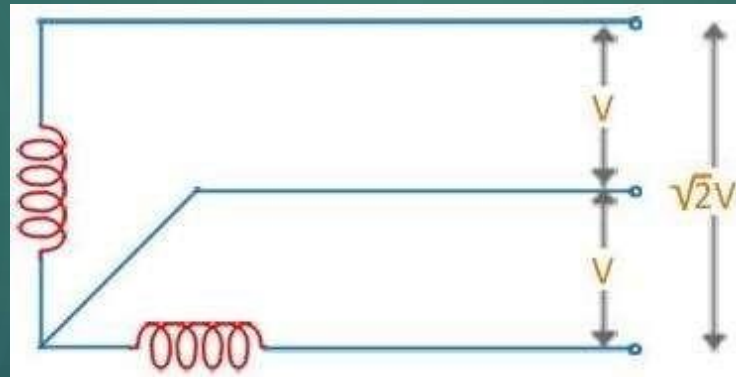
# Single Phase, 3-Wire System

This system is identical in principle with 3-wire dc distribution system. The neutral wire is center-tapped from the secondary winding of the transformer and earthed. This system is also called as split-phase electricity distribution system. It is commonly used in North America for residential supply.



# Two Phase, 3-Wire System

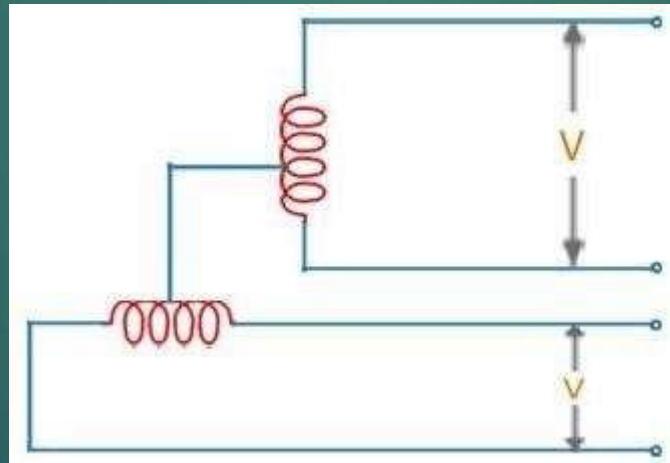
In this system, the neutral wire is taken from the junction of two phase windings whose voltages are in quadrature with each other. The voltage between neutral wire and either of the outer phase wires is  $V$ . Whereas, the voltage between outer phase wires is  $\sqrt{2}V$ . As compared to a two-phase 4-wire system, this system suffers from voltage imbalance due to unsymmetrical voltage in the neutral.





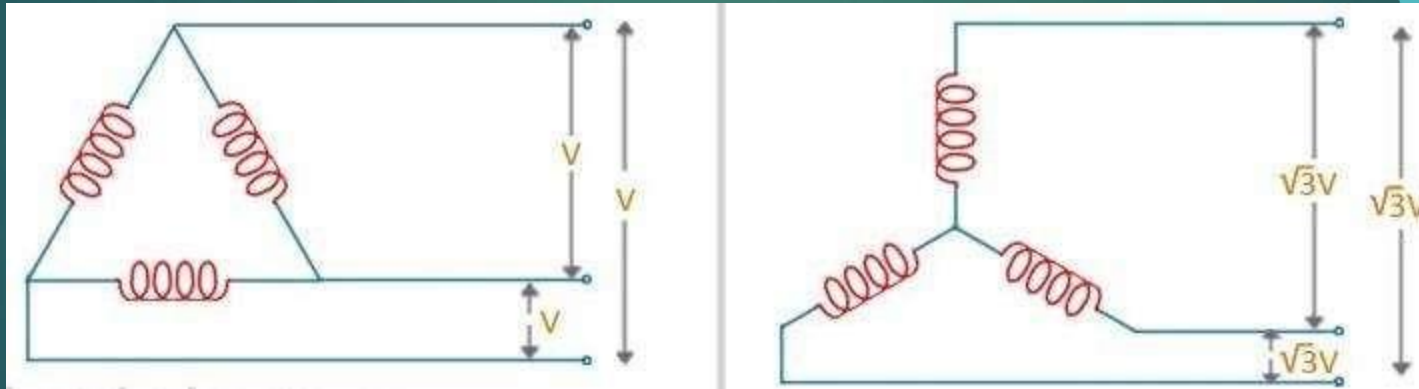
# Two Phase, 4-Wire System

In this system, 4 wires are taken from two phase windings whose voltages are in quadrature with each other. Mid-point of both phase windings are connected together. If the voltage between the two wires of a same phase is  $V$ , then the voltage between two wires of different phase would be  $0.707V$ .



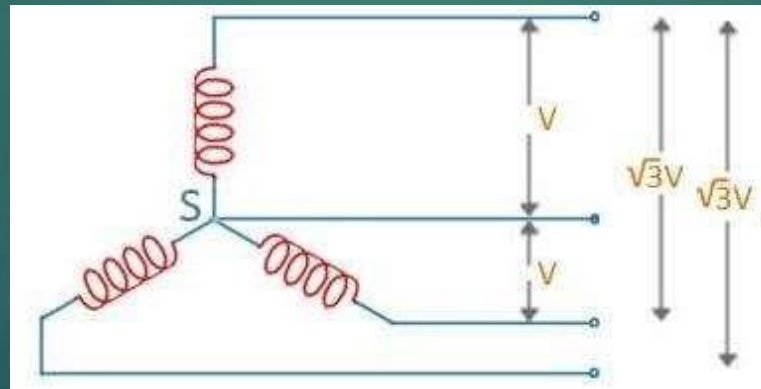
# Three Phase, 3-Wire Distribution System

Three phase systems are very widely used for AC power distribution. The three phases may be delta connected or star connected with star point usually grounded. The voltage between two phases or lines for delta connection is  $V$ , where  $V$  is the voltage across a phase winding. For star connection, the voltage between two phases is  $\sqrt{3}V$ .



# Three Phase, 4-Wire Distribution System

This system uses star connected phase windings and the fourth wire or neutral wire is taken from the star point. If the voltage of each winding is  $V$ , then the line-to-line voltage (line voltage) is  $\sqrt{3}V$  and the line-to-neutral voltage (phase voltage) is  $V$ . This type of distribution system is widely used in India and many other countries. In these countries, standard phase voltage is 230 volts and line voltage is  $\sqrt{3} \times 230 = 400$  volts. Single phase residential loads, single phase motors which run on 230 volts etc. are connected between any one phase and the neutral. Three phase loads like three-phase induction motors are put across all the three phases and the neutral



# Classification On The Basis Of Connection Scheme

Distribution system can be classified according to its connection scheme or topology as follows –

- I. Radial system
- II. Ring main system
- III. Interconnected system



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