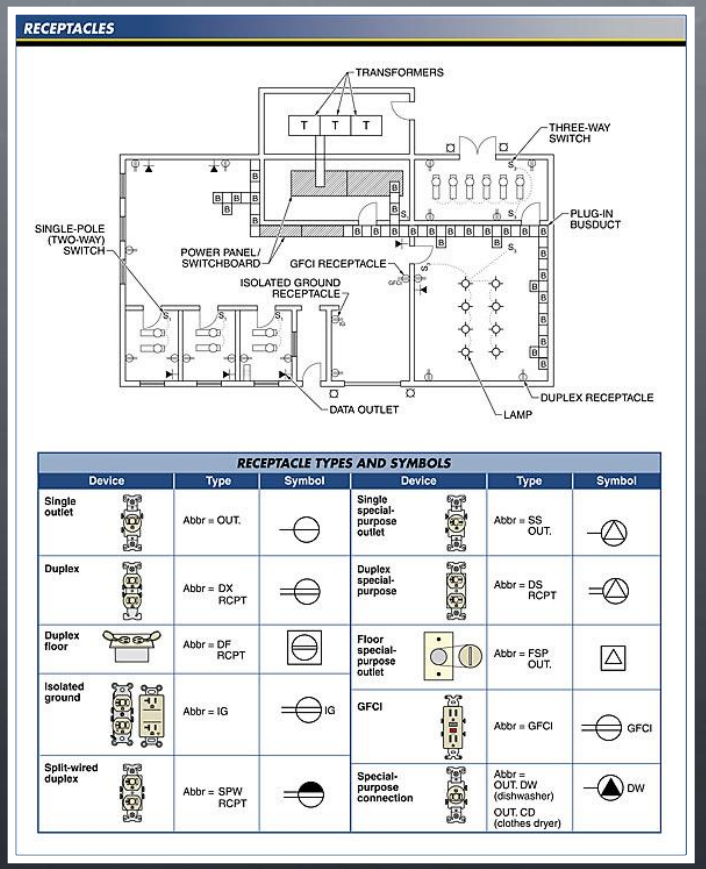
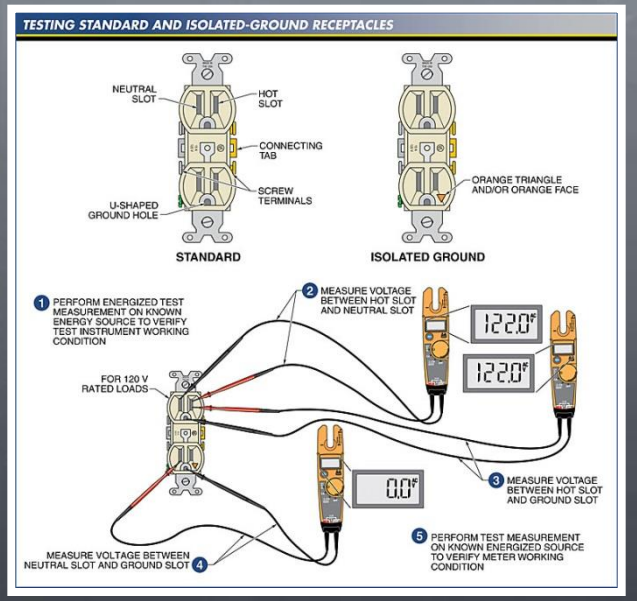
# Electrical Distribution Systems

By
Mr P Kiran Kumar

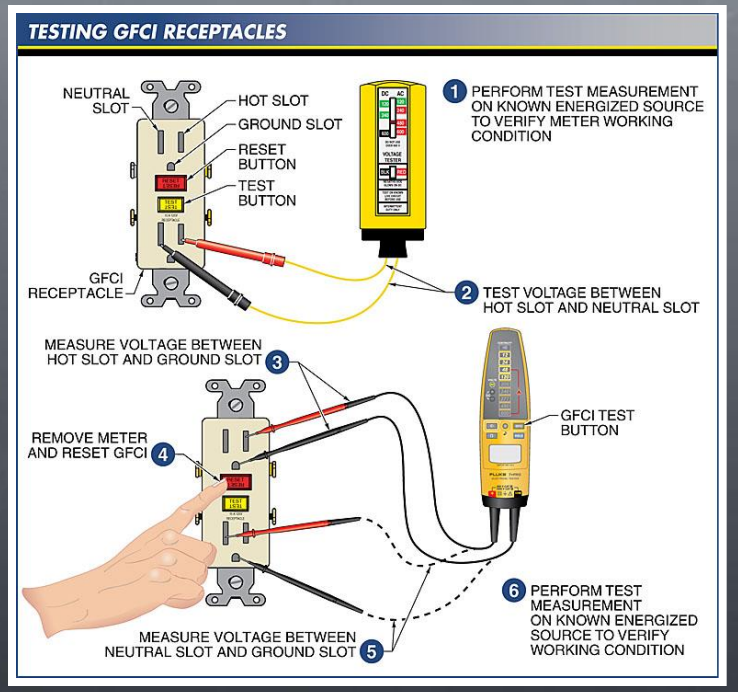
The type, location, and usage of receptacles are identified by a schematic symbol on a schematic drawing or electrical print.



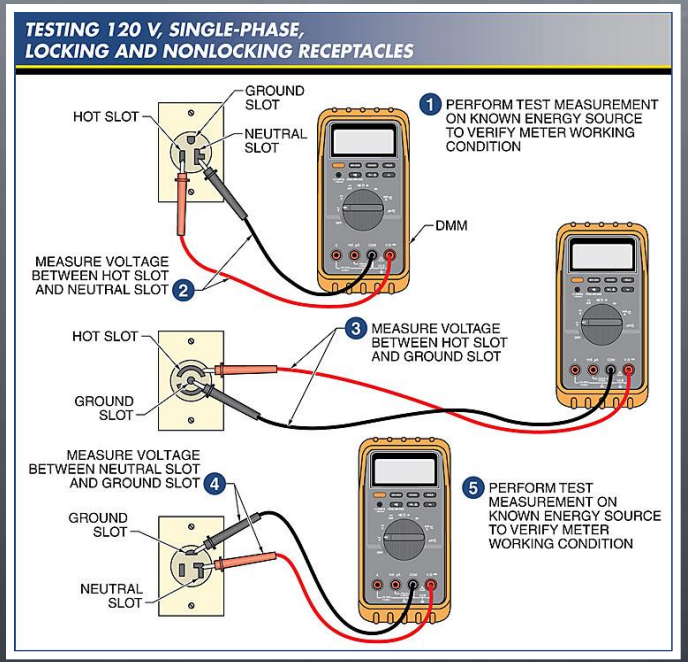
Standard and isolated-ground receptacles can be tested for proper wiring connections using a DMM or voltage tester.



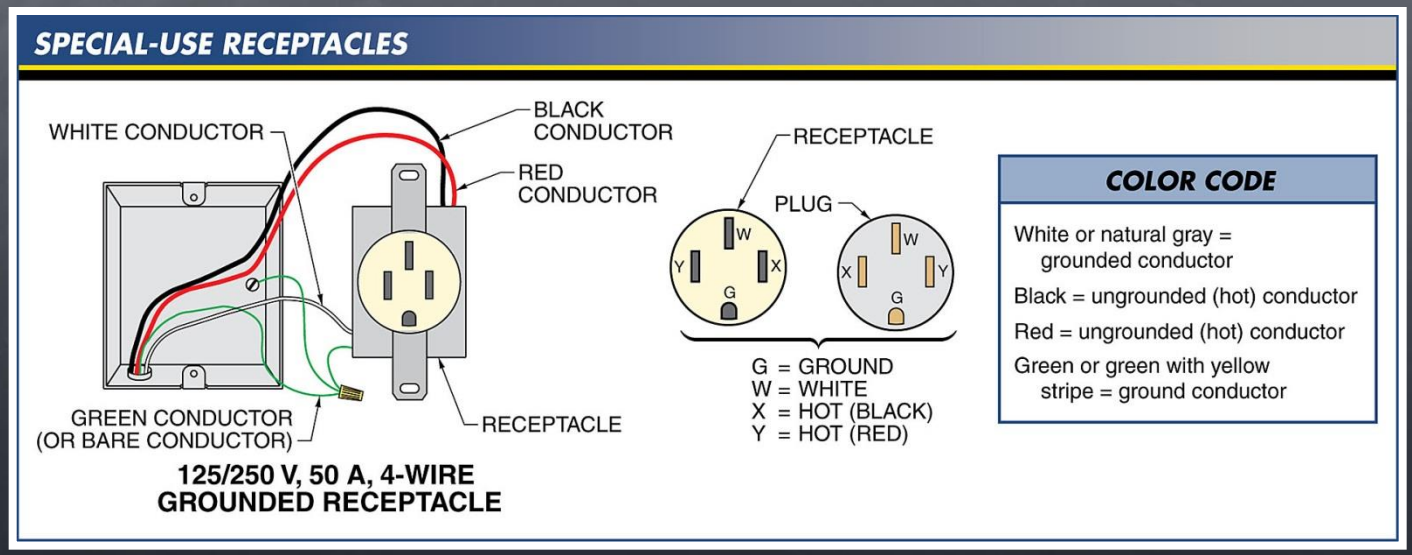
GFCI receptacles are tested to verify that the hot, neutral, and ground slots are properly wired and to verify that the electronic fault detection and trip circuit is functioning properly.



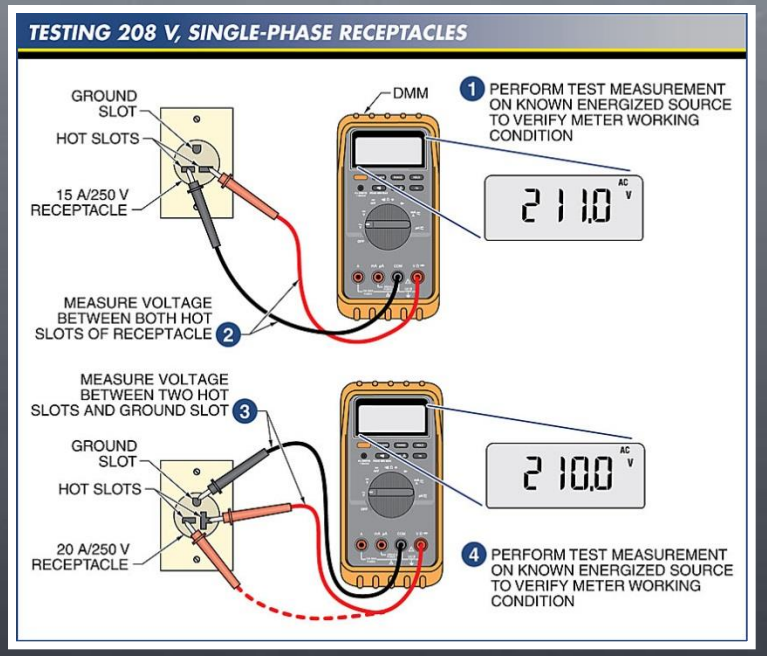
When testing a 120 V, single-phase receptacle, the receptacle is tested to verify that the voltage level is within an acceptable range for the equipment and circuit and that the receptacle is wired properly.



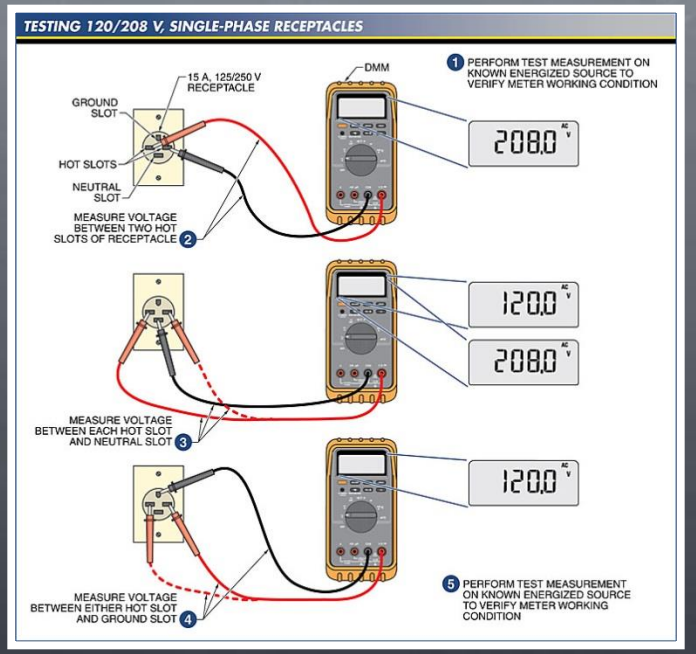
Single-phase high-power loads are designed to operate on 208 V, while some loads can operate on either 208 V or 120 V.



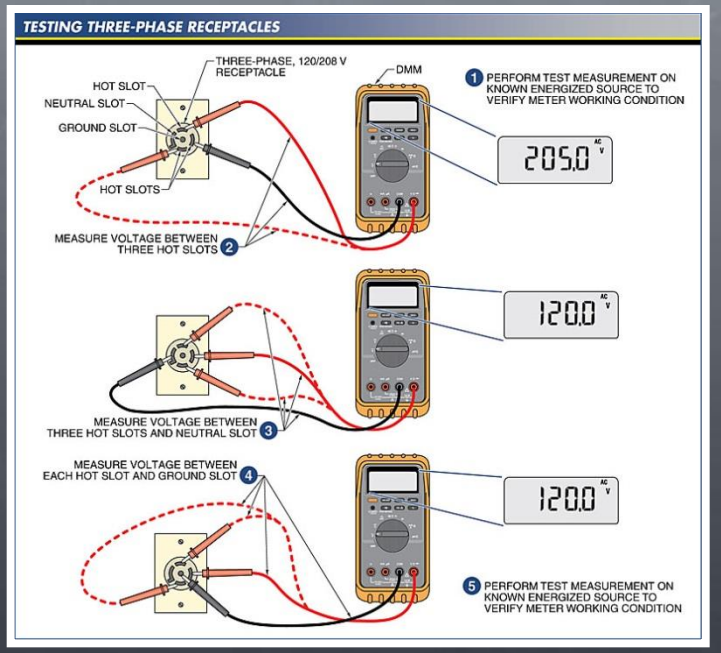
A 208 V, single-phase receptacle is tested to ensure that the voltage level is within an acceptable range for the equipment and circuit and that the receptacle is properly grounded.



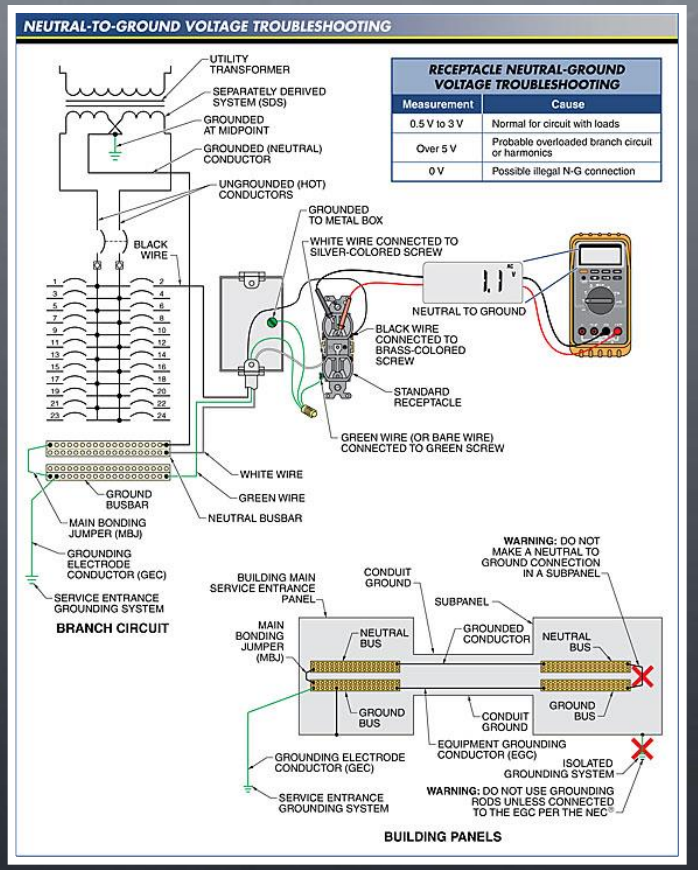
When testing a 120/208 V, single-phase receptacle, the receptacle is tested to verify that both voltage levels are within an acceptable range for the equipment and circuit and that the receptacle is wired properly.



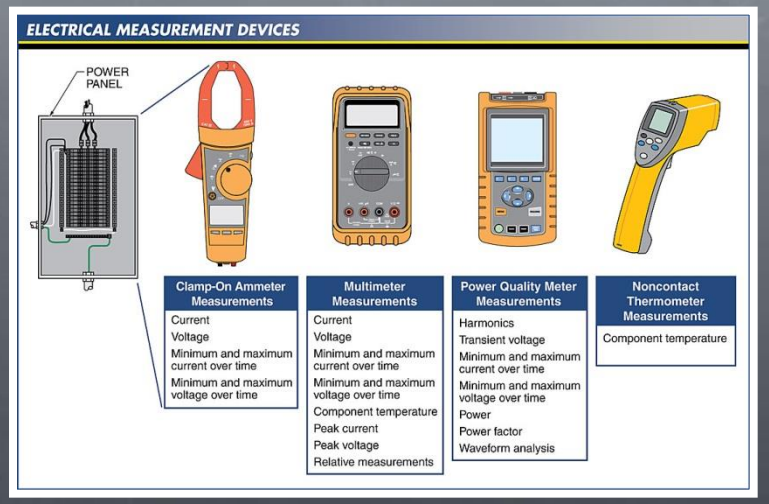
Three-phase receptacles require that the voltage between every slot on the receptacle be tested because they can be powered by different voltages.



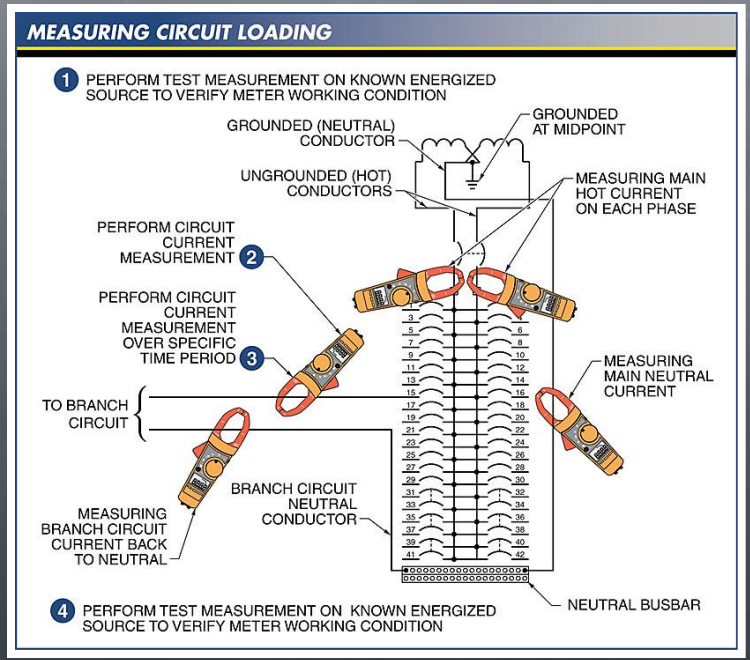
Measuring the voltage between the neutral and ground can help determine if there are any illegal neutral-to-ground connections.



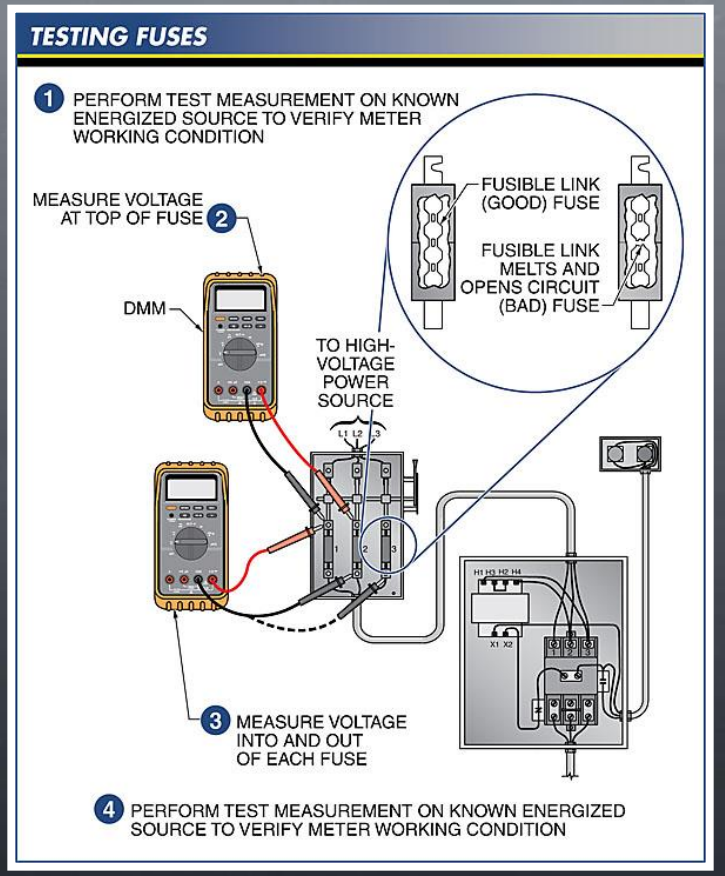
In addition to clamp-on ammeters and DMMs, electrical measurements can be taken at a power panel with power quality meters and noncontact thermometers.



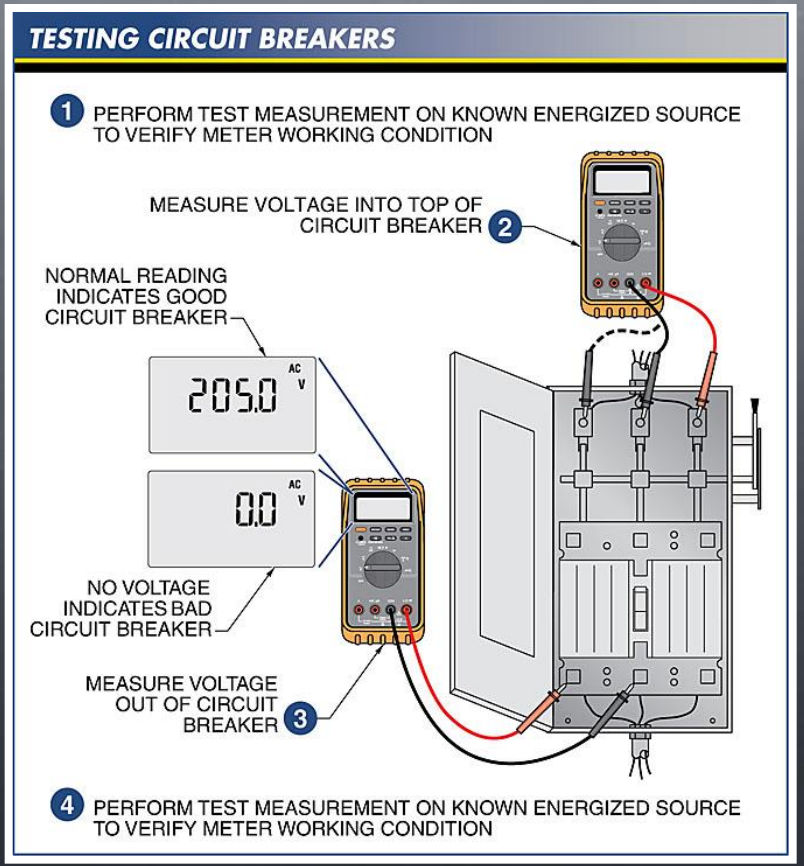
Measuring the current at fuses and circuit breakers indicates the amount of load on a circuit (current draw).



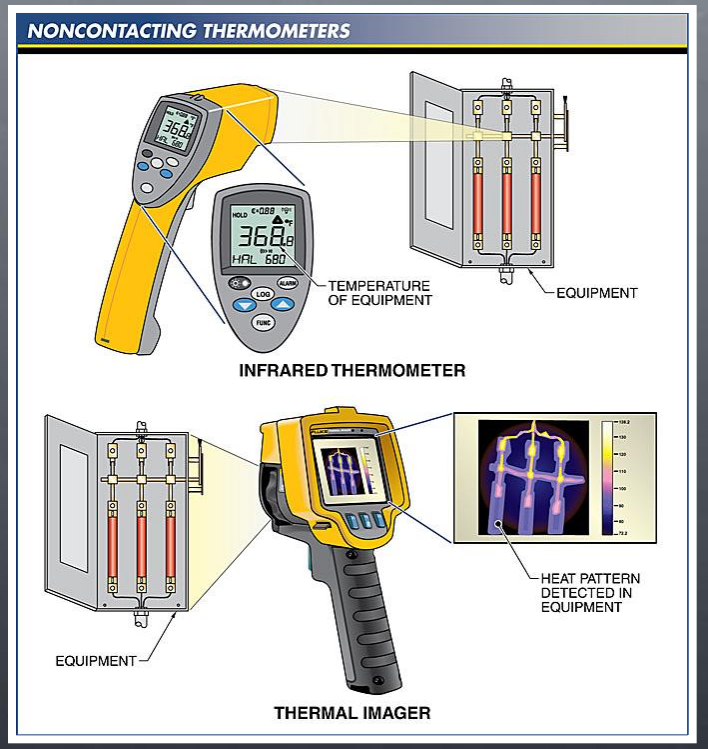
Fuses are tested with an ohmmeter or DMM with a continuity function.



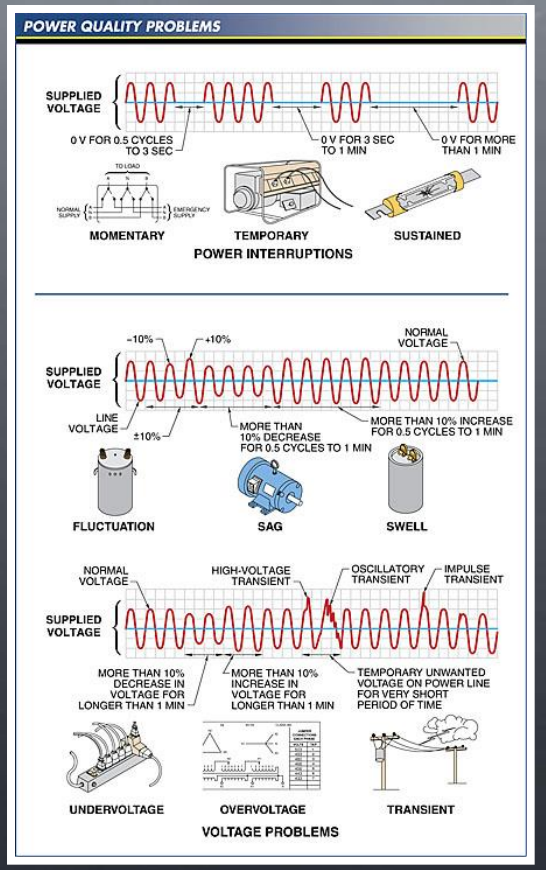
Circuit breakers that are suspected of having a problem can be tested using a DMM or voltage tester.



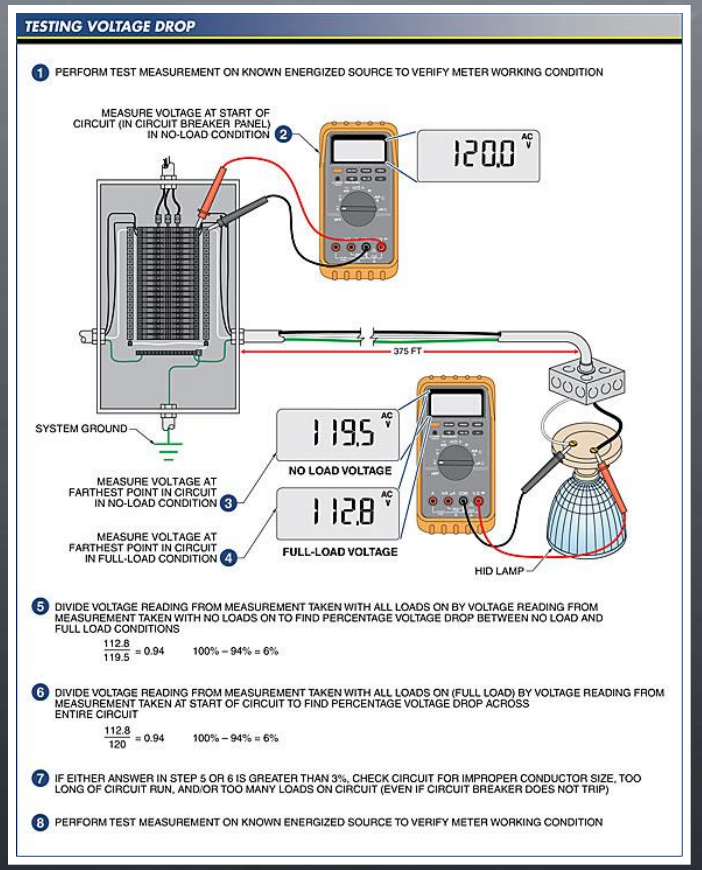
Infrared (IR) thermometers and thermal imagers can be used to identify problems in building power distribution systems without making physical contact with the equipment to be tested.



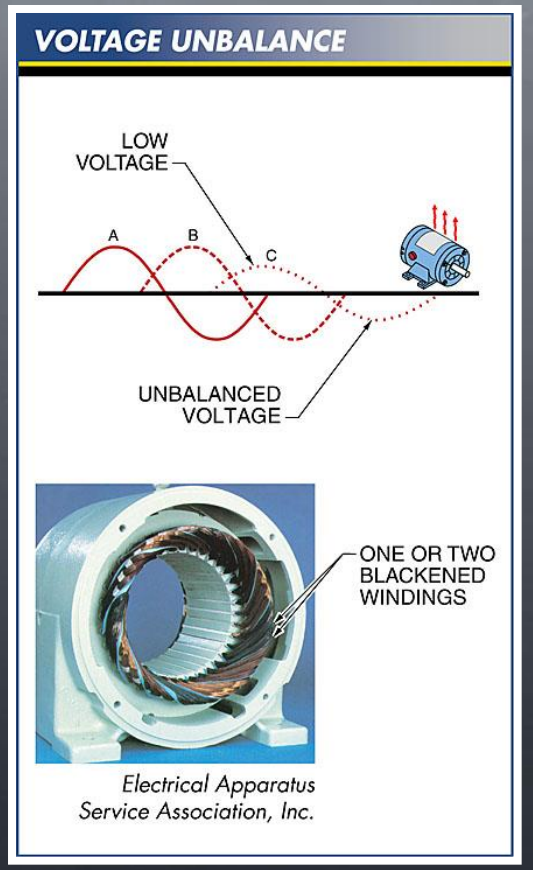
Power quality problems can damage electrical equipment and lead to unsafe operating conditions.



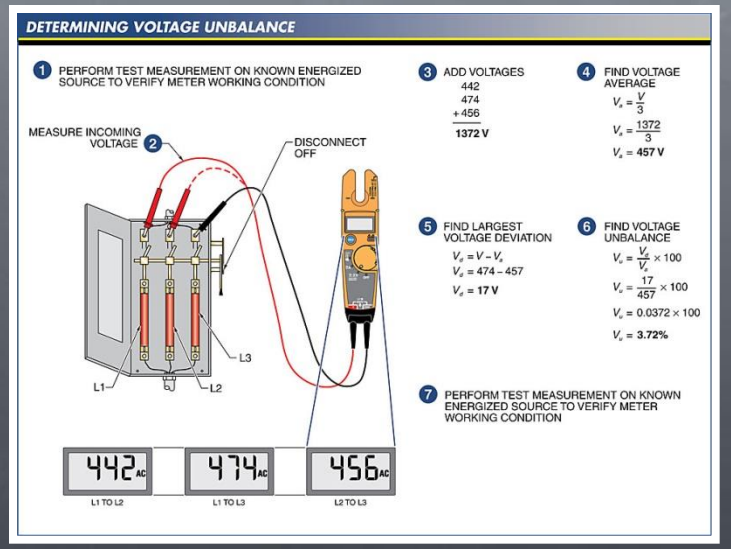
At no time should an electrical circuit have more than a 3% voltage drop from the start of the circuit (panel) to the farthest point.



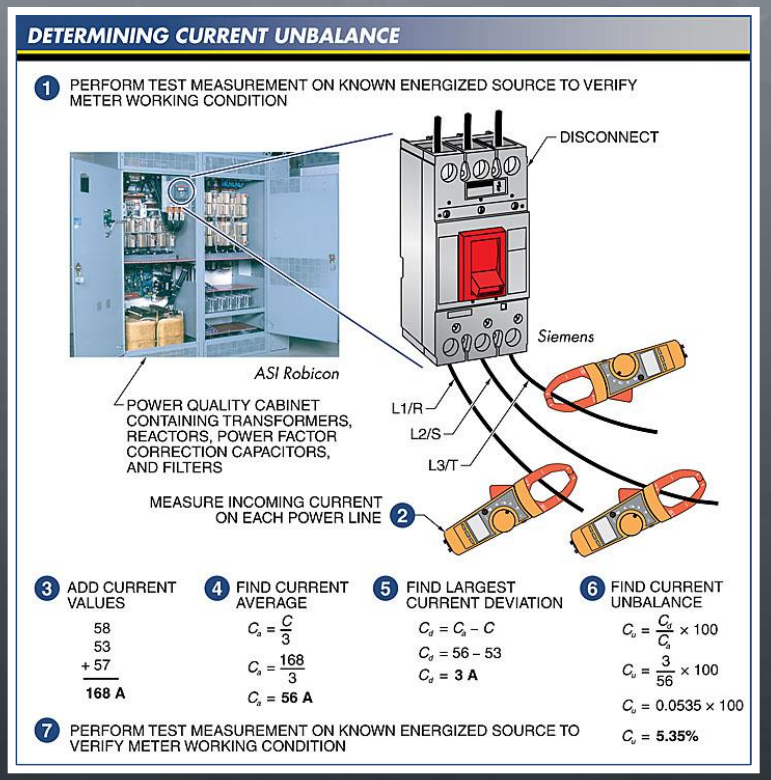
Voltage unbalance within a power distribution system can cause high current unbalance in loads such as electric motors.



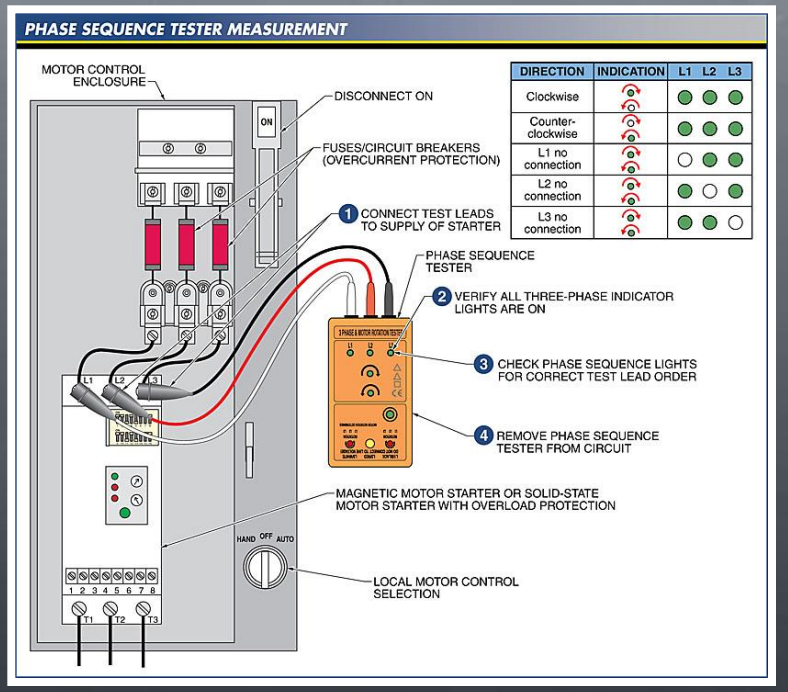
In general, voltage unbalance should not be more than 1%. Whenever there is a 2% or greater voltage unbalance, corrective action should be taken.



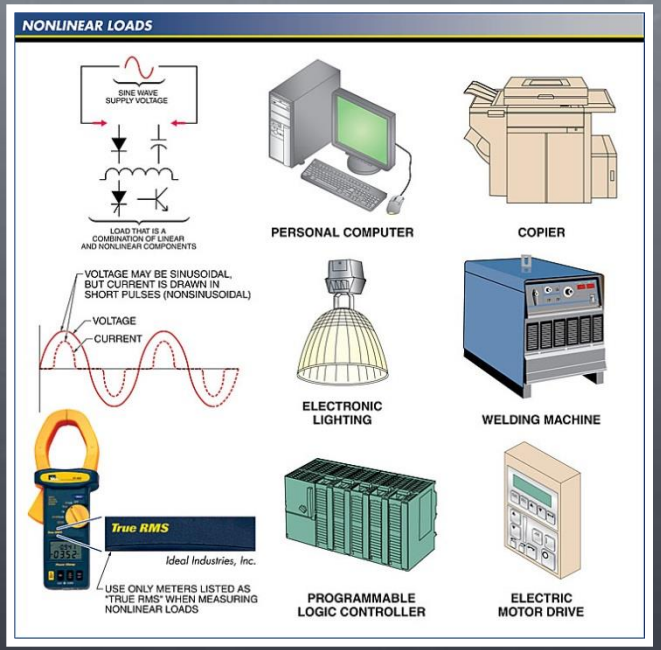
Current unbalance is determined in the same manner as voltage unbalance, except that current measurements are used.



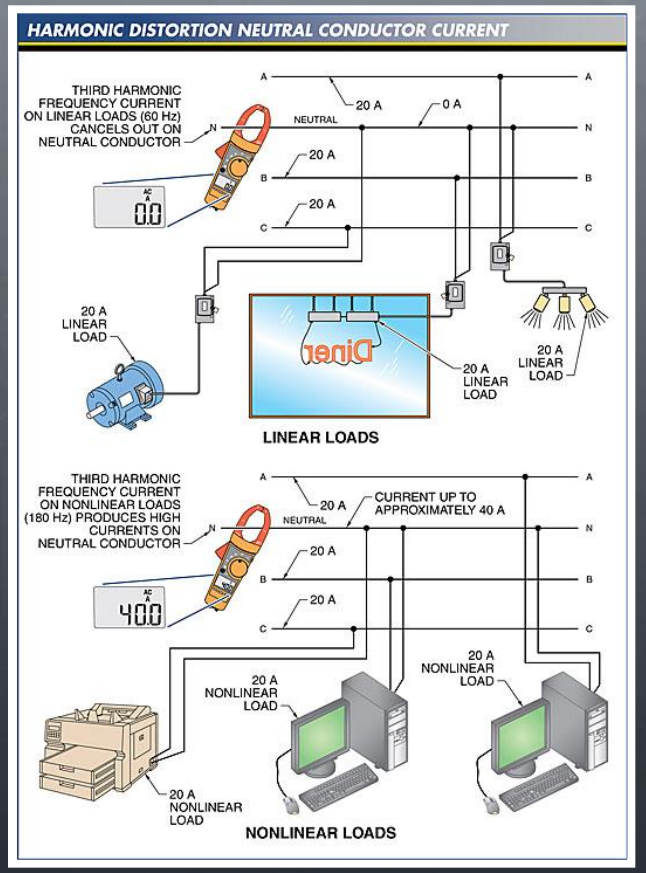
The phase sequence of power lines can be verified using a phase sequence tester.



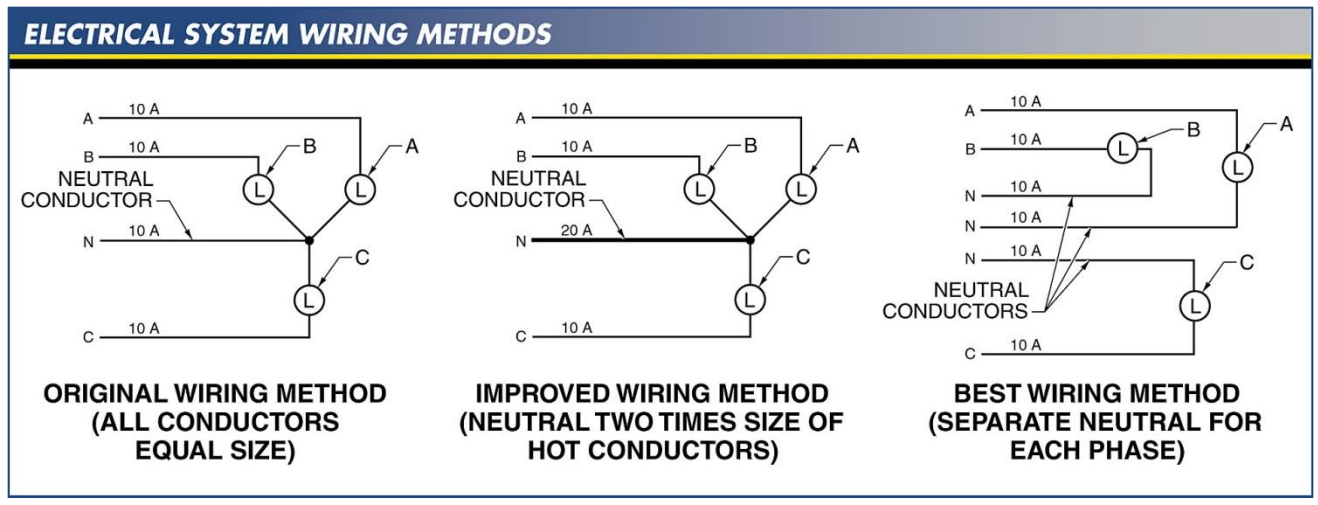
In nonlinear loads, current is not a pure proportional sine wave because current is drawn in short pulses.



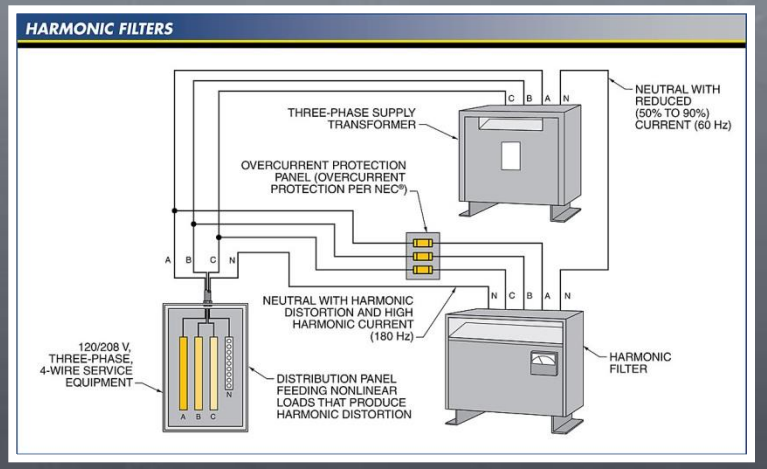
The third harmonic current frequency (180 Hz) on nonlinear loads produces high currents on the neutral conductor.



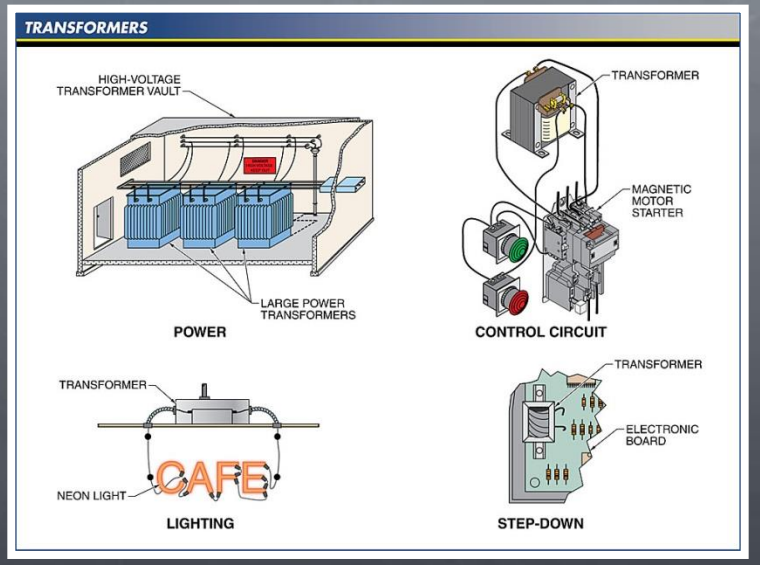
To reduce harmonic distortion and overheating problems, the best wiring method is one in which each circuit has its own neutral conductor (no shared neutrals).



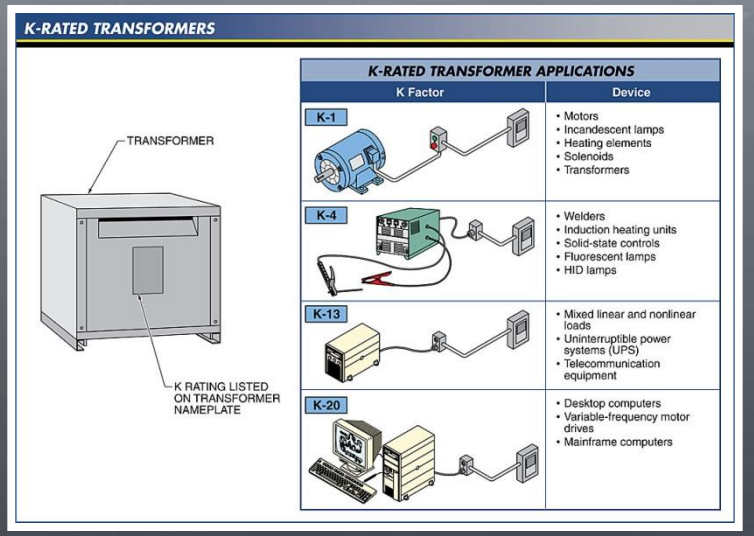
Three-phase harmonic filters are installed between the transformer and distribution panel to reduce harmonic frequencies and total harmonic distortion.



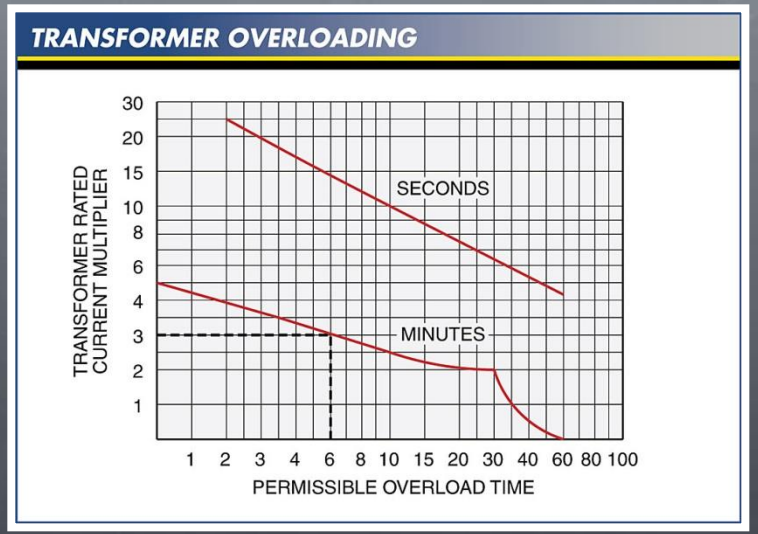
Common types of transformers used in commercial applications include power, control circuit, lighting, and step-down transformers.



A K-rated transformer is a transformer designed to handle the extra heating effects caused by harmonic distortion.



Because transformers can be overloaded for short periods, it is important when taking measurements to take them over incremental time periods.



Control-circuit transformers are tested by checking for open circuits in the coils, short circuits between the primary and secondary coils, and coils shorted to the core.