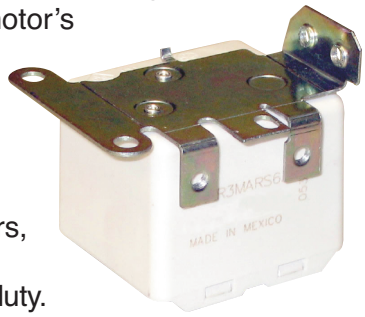
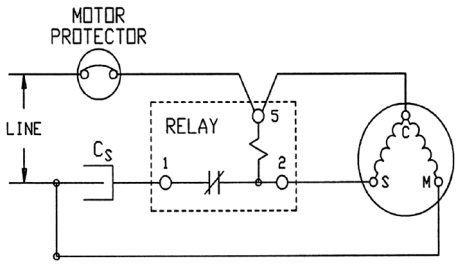
MARS Tech Potential Relays

Potential Relays

Typically, a refrigeration or air conditioning compressor needs high starting torque. A start capacitor, wired in series with the motor's start, or auxiliary, winding, provides additional current to give the motor more starting torque when the circuit is energized. Start capacitors, unlike run capacitors, are designed for intermittent duty.



Capacitor start motors require an electrical device to disconnect the start capacitor as soon as the motor attains the minimum speed needed. The most practical, reliable, accurate and economical device for this purpose is a potential relay. A potential relay senses voltage across the start winding. When this voltage reaches a sufficient level, the start capacitor, which is in series with the start winding, must be disconnected from the circuit.

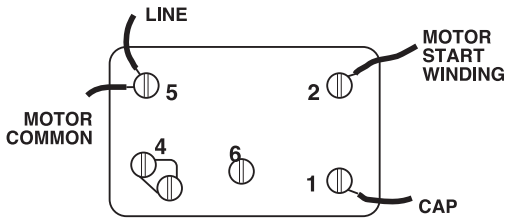


CAPACITOR START - INDUCTION RUN
FIG 1

When a capacitor start motor runs, a voltage is induced in the start winding. This voltage varies with the speed of the motor. Too much induced voltage can cause such a high current that it can destroy the start winding in seconds. For this reason, it is important to have a reliable device to disconnect the start capacitor before the induced voltage exceeds safety limits, but not before the motor has attained sufficient speed to continue to accelerate to its full load rated speed. Accuracy, repeatability, reliability and long life are attributes that ensure proper starting of compressors and pumps used in HVAC/R applications.

When a capacitor start, induction run (or capacitor start, capacitor run) motor runs, voltage is generated in the start winding. The generated voltage is the product of magnetic lines of flux, induced in the motor's rotor, cutting through the coils of the start winding. This voltage is a function of the speed of the motor and the number of turns in the start winding. Higher the speed of rotation, the greater the induced voltage.

When the motor is first energized, the voltage across the start winding is lower than the applied voltage. This is because the start circuit is composed of the start winding in series with the start capacitor. Each component takes a portion of the applied voltage. As the motor comes up to speed, the induced voltage plus the line voltage reaches a value called the "continuous coil voltage", which is an important rating for a potential relay. If a potential relay with a continuous coil rating that is too low is applied to a compressor's starting circuit, the relay will fail.



GENERAL ELECTRIC
TYPE 3ARR3 RELAY

Potential relays are normally closed devices. This means that the relay contacts between "1" and "2" are closed when a motor is first energized. The opening of these contacts is the primary function of a potential relay.

Operation

At the instant voltage is applied to a capacitor start, induction run motor with a potential relay, the relay contacts are closed, and the applied voltage is split between the start capacitor and the motor's start winding. As the motor quickly builds up speed, voltage is induced in the start winding. This voltage is sensed by the potential relay. As soon as the potential relay senses a pre-determined value, the relay's contacts open or "pick up". As soon as the relay contacts pick up, the start capacitor is disconnected from the motor's start circuit. Potential relays are designed or selected with specific motor speed and torque requirements as criteria. When a properly selected potential relay picks up, the motor to which it is applied no longer needs the extra torque provided by the start capacitor and has enough momentum to continue to accelerate to full rated speed at rated load conditions.