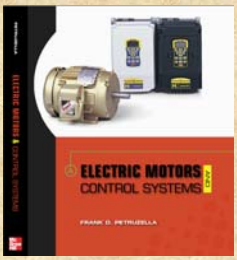


Chapter 2

Understanding Electrical Drawings

PART 5 Manual and Magnetic Motor Starters

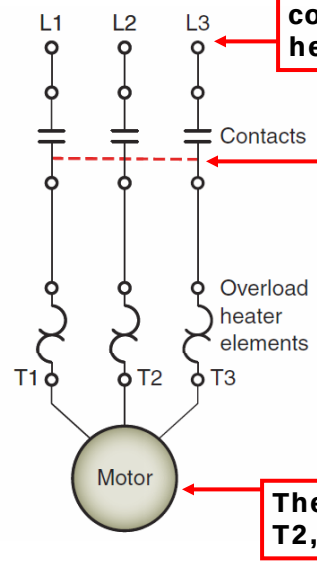
MANUAL MOTOR STARTER

Manual motor starters are a very basic way to supply power to a motor. A manual control circuit is a circuit that requires the operator to control the motor directly at the location of the starter.

Manual starters are operated by the manual start/stop mechanism located on the front of the starter enclosure. The start/stop mechanism moves all three contacts at once to close (start) or open (stop) the circuit to the motor.

Manual three-phase starters are used in low horsepower applications such as drill presses and table saws where remote push button control is not required.

3ϕ Manual Starter



Incoming power supply wires (L1, L2, and L3) connect to the top of the contacts, and the opposite sides of the contacts are connected to the overload heater elements.

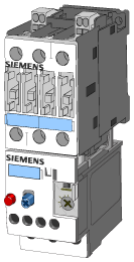
The dotted line across the contacts designates a manual starter (as opposed to a magnetic starter).

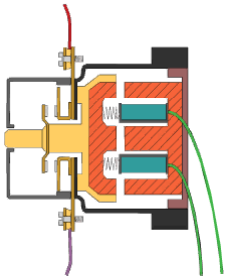
The three thermal overload protective devices are installed to mechanically trip open the starter contacts when an overload condition is sensed.

The motor terminal connections (T1, T2, and T3) connect to the 3ϕ motor.

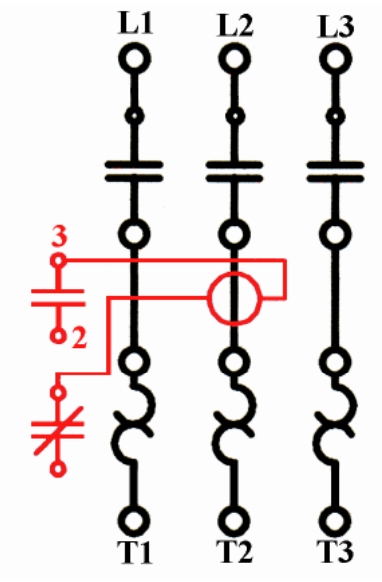
MAGNETIC MOTOR STARTER

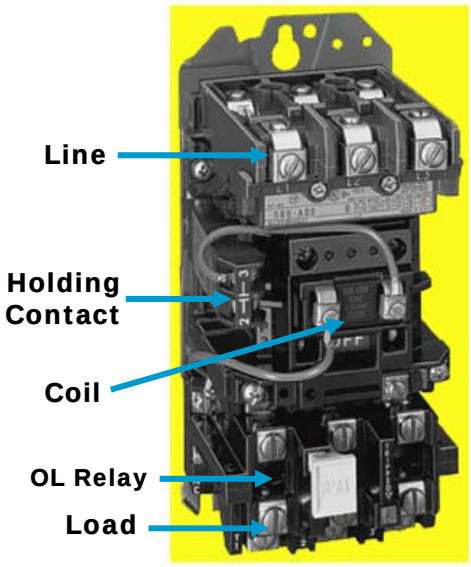
Magnetic motor starters allow a motor a motor to be controlled from any location.



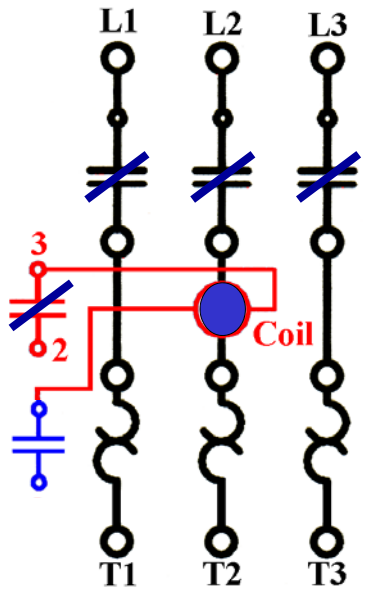


3ϕ Across-The-Line Magnetic Starter





When the starter coil is energized, the three main contacts as well as the holding contact close.



In addition to the power circuit some of the control circuit is pre-wired. This consists of two connections to the starter coil.

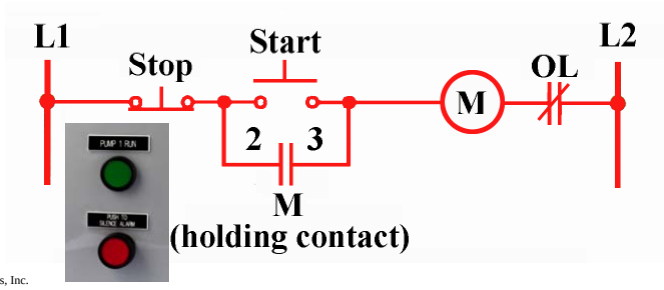
Should an overload condition occur the normally closed OL relay contact would open.

TWO-WIRE CONTROL CIRCUIT

Magnetic motor control circuits are divided into two basic types: the two-wire control circuit, and the three-wire control circuit

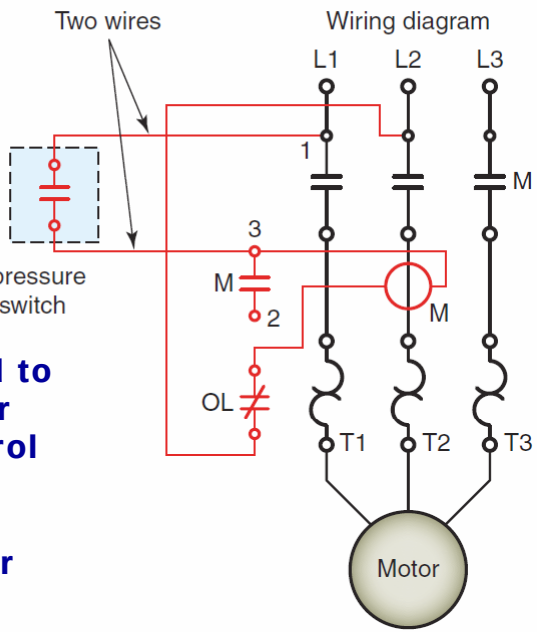
Two-wire control

Three-wire control



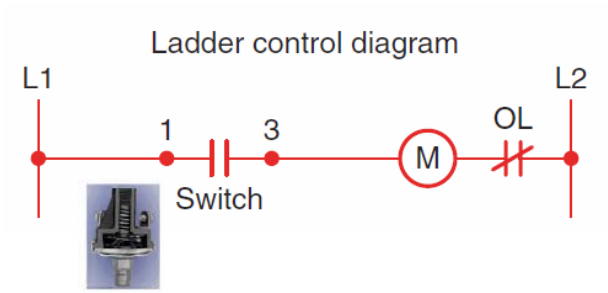
Two-Wire Control Circuit

Remote pressure control switch



Two-wire control circuits are designed to start on stop a motor when a remote control device such as a thermostat or level switch is activated or deactivated.

The starter operates automatically in response to the state of the control device without the assistance of an operator.

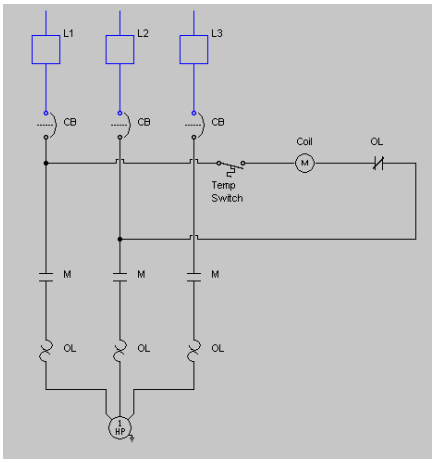


The two-wire circuit provide *low-voltage release but not low-voltage protection*. If the motor is stopped by a power interruption, the starter deenergizes (low-voltage release), but also reenergizes if the control device remains closed when the circuit has power restored.

Two-wire control circuits are used to automatically operate machinery where the automatic restarting characteristic is desirable and there is no danger of persons being injured if the equipment should suddenly restart after a power failure.

Typical application – well pump

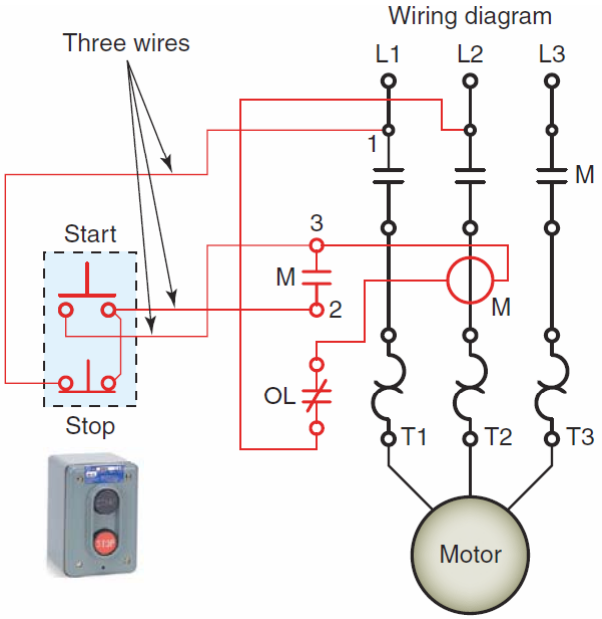
Simulated Two-Wire Control Circuit



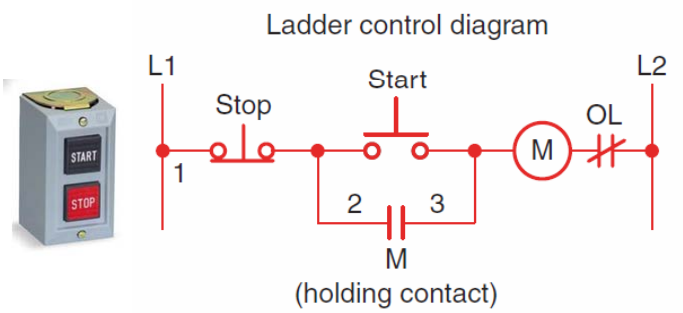
THREE-WIRE CONTROL CIRCUIT

Three-Wire Control Circuit

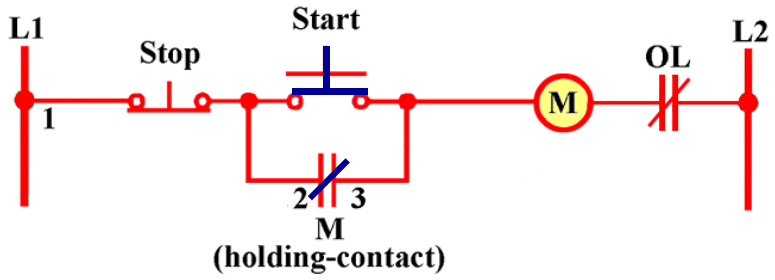
Three-wire control provides both *low-voltage release and low-voltage protection.* This means that the starter will drop out when there is a voltage failure, but it will not pick up automatically when voltage returns.



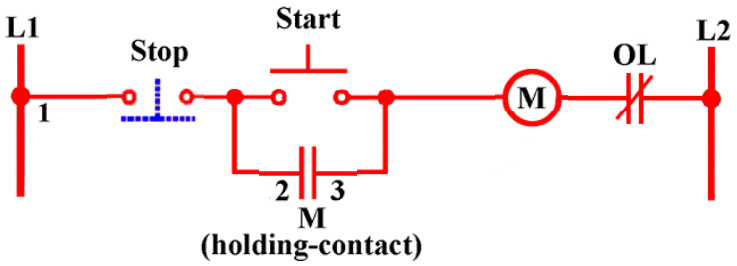
One of the most common examples of a three-wire control circuit is the start/stop, pushbutton control station.



The circuit uses a normally closed stop pushbutton wired in series with the parallel combination consisting of normally open start pushbutton and normally open holding contact (M).

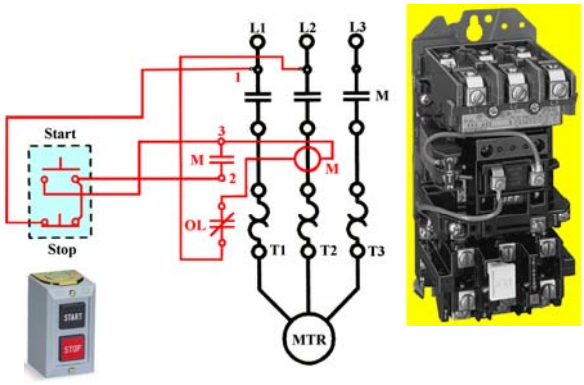


When start button is momentarily closed the starter coil energizes to closes the three main M contacts as well as the M auxiliary contact. The holding contact remains closed, or "held in", when the start button is released and the motor will continue to operate.



When stop button is momentarily opened the coil deenergizes. The main contacts are opened along with the holding contact. The coil drops out at low or no voltage and cannot be energized unless the voltage returns and the start button is closed

In the event of a power failure the maintaining circuit is designed to protect against automatic restarting when the power returns. This type of protection must be used where accidents or damage might result from unexpected starts.



Simulated Three-Wire Control Circuit