

Introduction:

This experiment will introduce the concept and operation of a reduced-voltage motor starter and then will add the ability for directional control (forward-reverse) into the motor controller.

WARNING – Switch OFF the power supply before constructing and/or modifying any circuit or if the system appears to be operating in an uncontrolled/unsafe manner.

Procedure:

1. Construct the following manually-controlled, series-resistance motor-starter:
(Do NOT energize the system until instructed)

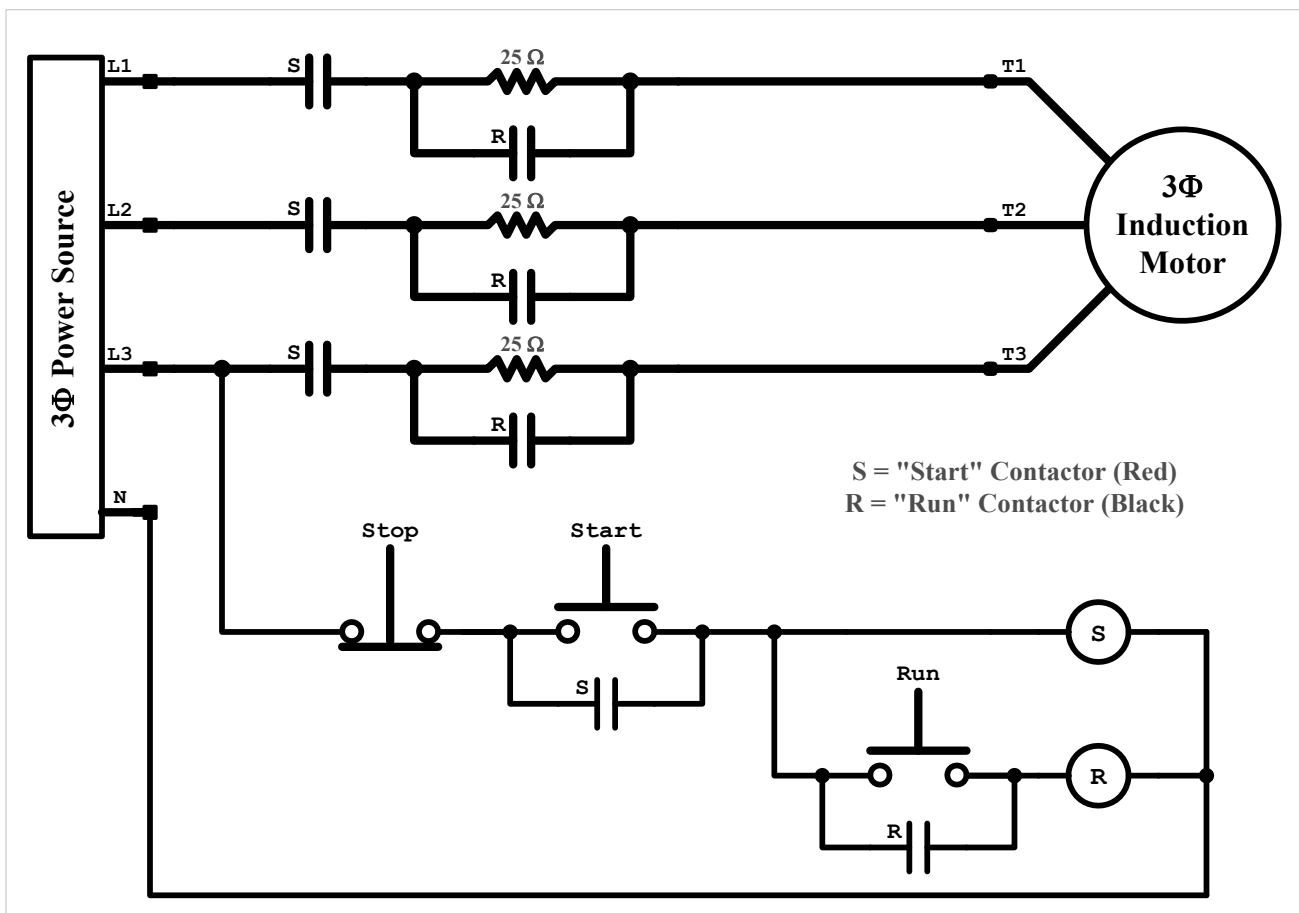


Figure 4.1 – Schematic Diagram of a Series-Resistance Motor-Starter

The resistance value shown, **25Ω**, is the value that should limit the starting current of the LabVolt, ¼-hp, 208V, Squirrel-Cage, Induction Motor to roughly 200% of its rated current. (The theory/calculations used to determine the resistance value are shown in the associated PowerPoint presentation.)

The starter is designed such that the operator must first press the “Start” button to energize the motor through the series resistors and then press the “Run” button in order to bypass the resistors once the motor has sufficiently accelerated.

Note that, due to the limited availability of equipment in the lab, a similar circuit may also be constructed using a set of series-connected inductors having the same impedance magnitude.

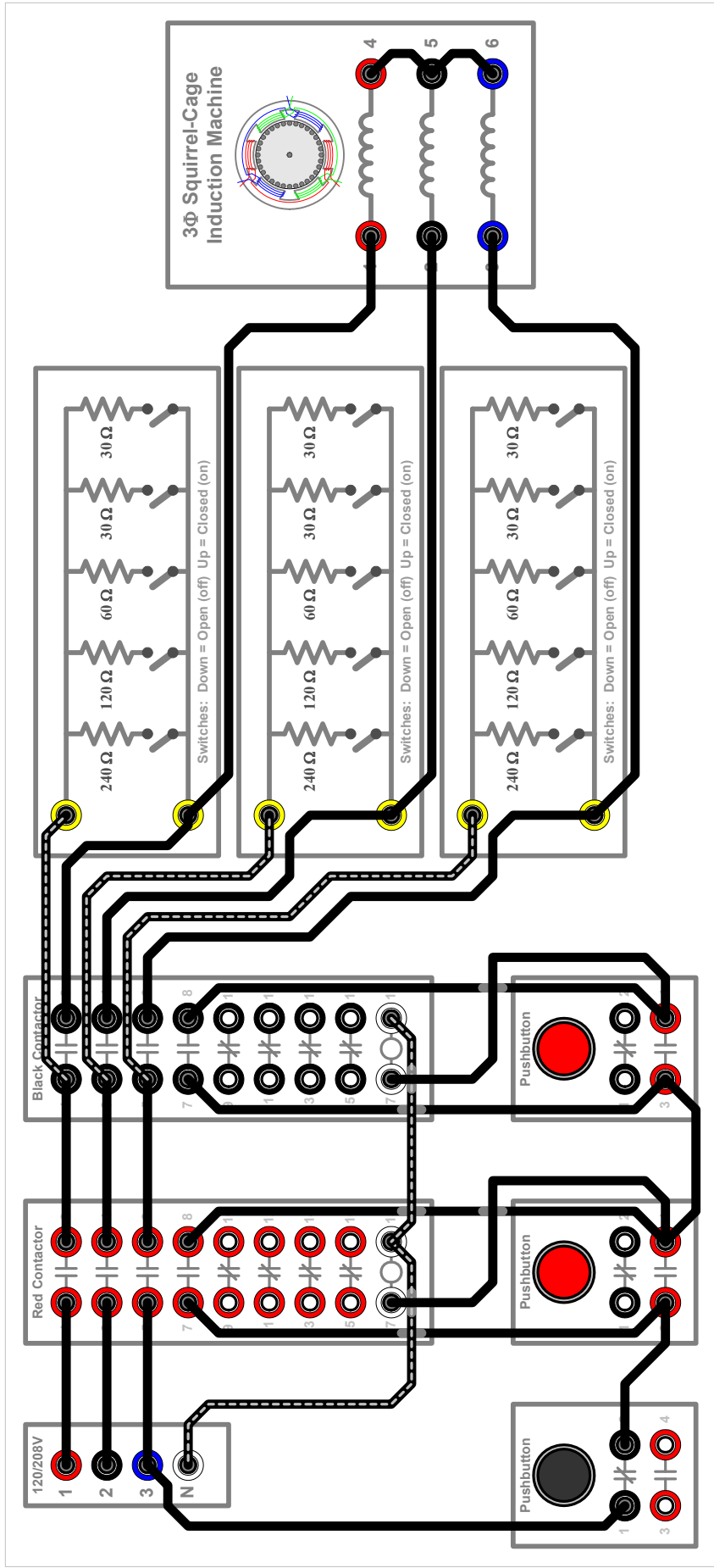


Figure 4.2 – Wiring Diagram for the Series-Resistance Motor-Starter

- Verify the proper operation of the series-resistance motor-starter. Utilizing a pair of digital multimeters, determine the motor's starting line-voltage and line-current.

Note that you may want to utilize a dynamometer to add a load-torque onto the shaft of the Induction Motor in order to decrease the rate at which the motor is able to accelerate at startup.

Be prepared to discuss the operation of the motor-starter.

- If a separate, pre-wired, time-delayed, series-resistance motor-starter is not already available, re-wire the previously constructed **control circuit** to include a time-delay relay as shown below:

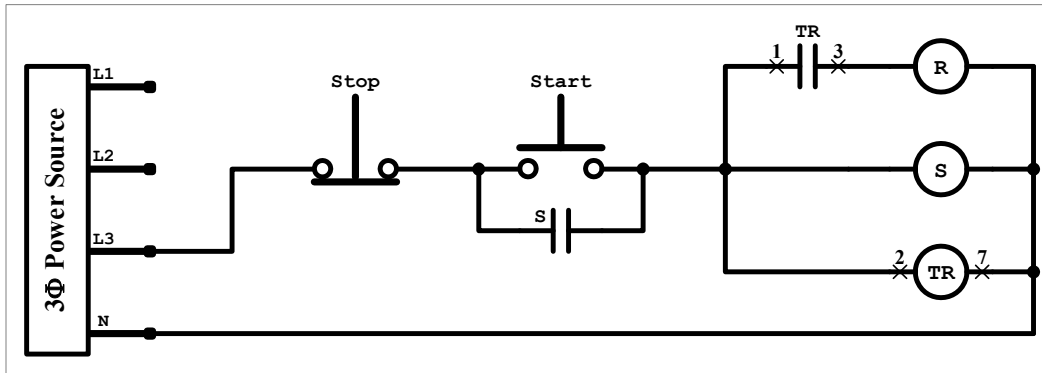


Figure 4.3 – Schematic Diagram of the Time-Delayed, Series-Resistance Control Circuit

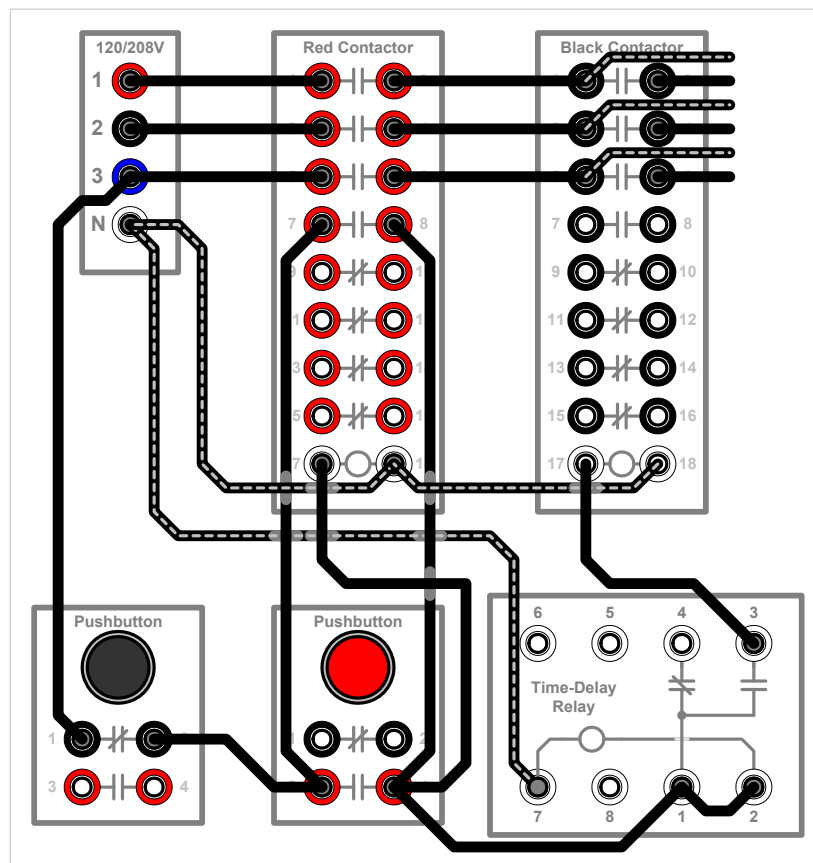


Figure 4.4 – Wiring Diagram for the Time-Delayed, Series-Resistance Control Circuit

- Adjust the time-delay relay such that it has a time delay of roughly **2 seconds** and verify the proper operation of the time-delayed, series-resistance motor-starter.

Be prepared to discuss the operation of the time-delayed, series-resistance motor-starter.