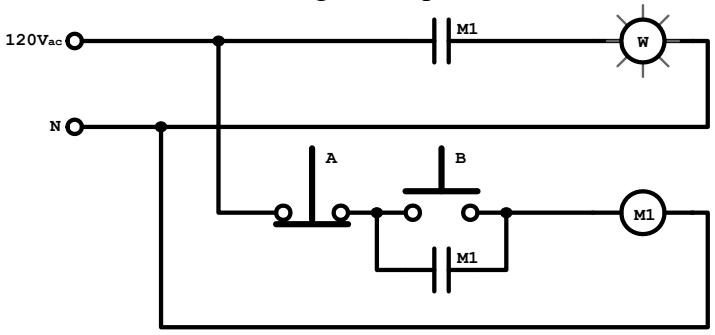
Introduction:

This experiment will introduce the concepts and the devices used to construct simple motor-control circuits. The investigation will primarily focus on the construction and operation of a basic "start-stop" controller which will then be modified in a step-by-step manner to change its operational characteristics. During each step, the students will be expected to analyze the controller's operation by applying relay-logic theory and/or experimentally verify the operation of the controller.

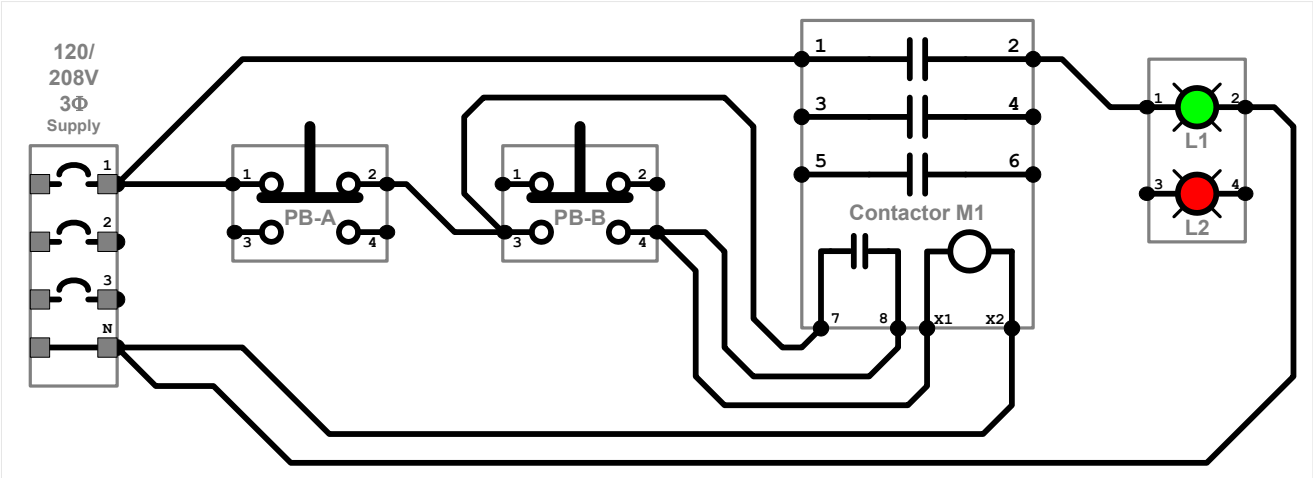
Procedure:

WARNING – Switch OFF the power supply before making modifications to any circuit or if the controller appears to be operating in an uncontrolled/unsafe manner.

1. Construct the Basic "Start-Stop" Controller shown in **Figure 2.1**. Note that an indicator lamp will be used in place of an actual motor during this experiment.



Schematic Diagram



Wiring Diagram

Figure 2.1 – Basic "Start-Stop" Controller

2. Experimentally verify the theoretical operation of the controller. If necessary, troubleshoot the circuit to achieve proper operation.

3. Demonstrate the proper operation of Basic "Start-Stop" Controller to the instructor and then **WAIT for the instructor's approval before proceeding to the next step**.

4. Modify the original control circuit by wiring in the additional **NO Pushbutton** and **Field Coil** that appear **black** in Figure 2.2a. Note that the original components appear grey in the figure.

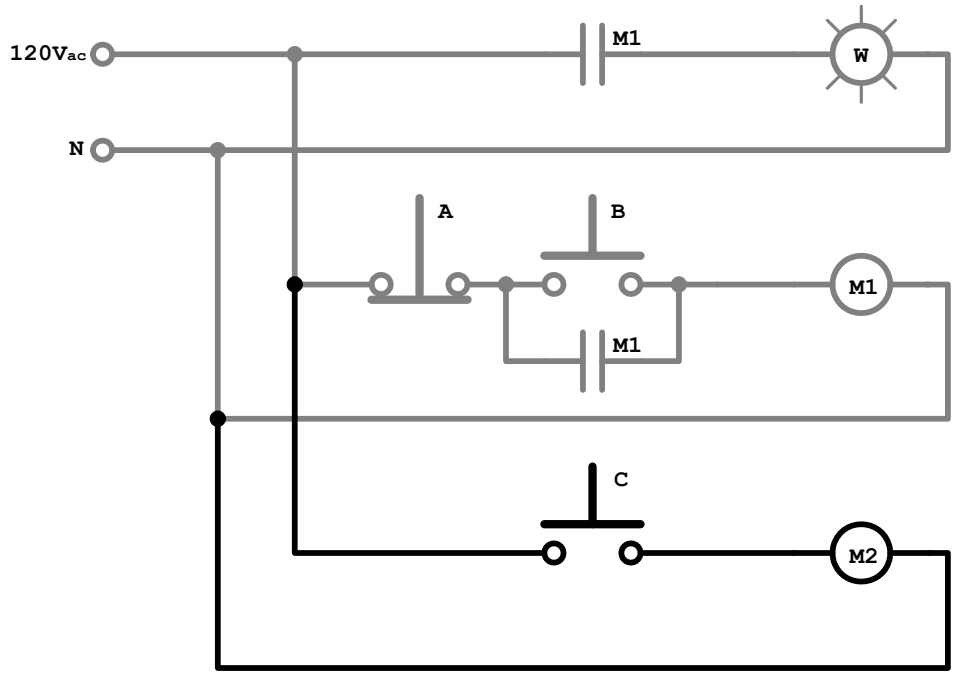


Figure 2.2a – Modified Controller #2a

5. <u>WAIT</u> **for the instructor's approval**, and then further modify the original control circuit by wiring in the **NO Contact** that appears **black** in Figure 2.2b.

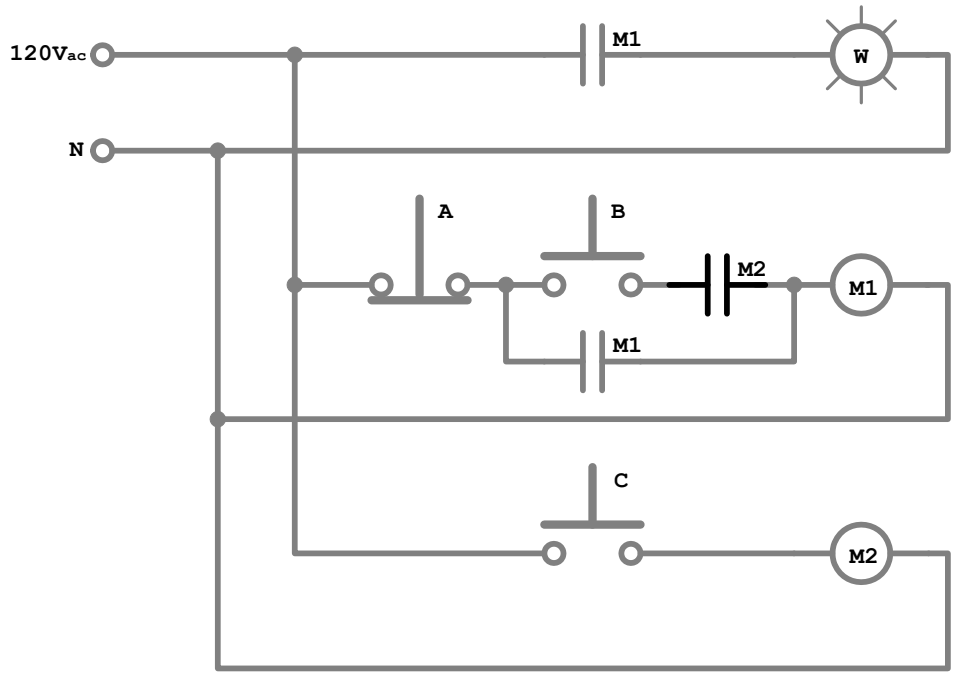
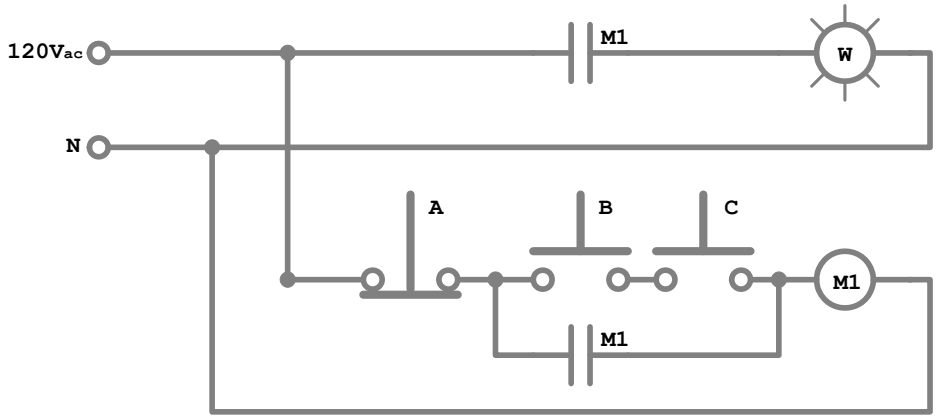


Figure 2.2b – Modified Controller #2b

6. Experimentally **verify** the procedure required to **START** and **STOP** the "motor" using the modified controller. If you were writing a simple "Operators Manual" for the system, determine the wording of the steps that you would write in the manual for Starting and Stopping the "motor".

7. Could the additional function provided by pushbutton "C" have been accomplished using a simpler circuit? Be prepared to state and justify your answer.

8. Consider the following circuit shown below. Would this circuit perform in the same manner as that currently-constructed in terms of starting the "motor" and pushbuttons B and C?



9. **WAIT for the instructor's approval**, and then modify the currently-constructed control circuit by wiring in the new **NC Contact** that appears black in **Figure 2.3**.

****** Do NOT re-energize the main supply until instructed. ******

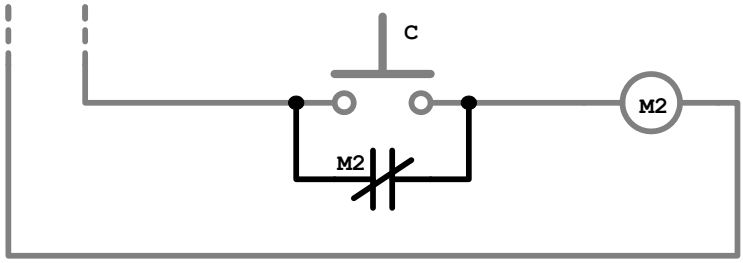


Figure 2.3 – Modified Controller #2

10. **WAIT for the instructor's approval**, and then energize the system in order to determine the motor controller's operational characteristics. Be prepared to provide a theoretical statement as to why the controller functioned in the observed manner.