Install a Lighting Contactor Circuit Using a Three-Wire Control System

Program: Electrician Technician

Course: EL170 – Motor and Industrial Motor Controls

Objectives: Under the supervision of your instructor, you should be able to do the following:

- Describe the operating principles of contactors and relays.
- Select contactors and relays for use in specific electrical systems.
- Install contactors and relays according to the *NEC®* requirements.
- Select and install contactors and relays for lighting control.
- Read wiring diagrams involving contactors and relays.
- Connect a simple control circuit.
- Test control circuits
- Mount and connect a 120V lighting contactor with a three-wire pushbutton control

Lab Equipment:

- 1 – 120V/24V control transformer
- 1 – 120V pigtail with cap (plug)
- 1 – Lighting contactor, minimum four poles (two sets of NO contacts) and a 24V coil
- 1 – Stop/start station equipped with one momentary-contact NO and one momentary-contact NC pushbutton switch
- 1 – Metal ceiling box (to mount keyless)
- 1 – Keyless fixture
- 1 – 120V incandescent light bulb

Required Tools:

- 1 – Screwdriver set
- 1 – Pair of Wire cutters
- 1 – Pair of Wire strippers
- 1 – Cordless screw gun

Consumables:

- 10’ - Red or black 14 AWG THHN stranded wire
- 5’ - White 14 AWG THHN stranded copper wire
- 1 - Book of wire numbering tags
- 6 - Sheet metal or wood screw for mounting components to board
- 4 - Yellow wire nuts
- 1 - Roll of black vinyl electrical tape

Safety (PPE):

- Safety glasses

Resources: N/A

Instructor Notes:

- You may substitute the 24-volt coil with a 120-volt coil and omit the 120V/24V transformer if you feel your trainees can safely perform all tasks under your direct supervision.

Time Required: 180 Minutes

Shop Maintenance:

- All work will cease 20 minutes prior to the end of class.
- All work areas must be cleaned.
- Tools and equipment must be cleaned and returned to the designated areas (cage, tool room, cabinets etc.)
- Any broken or missing tools must be reported immediately.
- Tools and equipment are student's responsibility

Procedures: (Eye protection must always be worn)

This performance project requires the trainee to interpret a wiring drawing and install and wire a lighting control circuit controlled by a three-wire control station.

1. Refer to *Figure 1* for the physical layout of the project.
2. Mount the Stop/Start station, lighting contactor, and ceiling box to the board.
3. Refer to *Figure 2* for the wiring schematic.
4. Cut and install three equal lengths of red or black 14 AWG THHN wire between the stop/start station and the lighting contactor.
5. Separately number each wire in step 4 on both ends as 1, 2, and 3.
6. Cut and install a length of white 14 AWG THHN wire from the power supply neutral to either terminal on the contactor coil.
7. Cut and install a length of white 14 AWG THHN wire from the power supply neutral to the ceiling box.
8. Cut and install a length of red or black 14 AWG THHN wire between the contactor and the ceiling box.
9. Connect the keyless fixture to the two wires in the ceiling box and secure the fixture to the ceiling box.
10. Wire the stop/start station, as shown in *Figure 2* (don't forget the jumper) and install the cover.
11. Wire the contactor as shown in *Figure 2*.
12. Energize the circuit and test it. Push and let go of the start button. The contactor should energize, and the light should glow. Push and let go of the stop button. The contactor should de-energize and the light should go out.
13. De-energize the circuit and troubleshoot, if needed. ***This Lab will be continued to the next lab!***

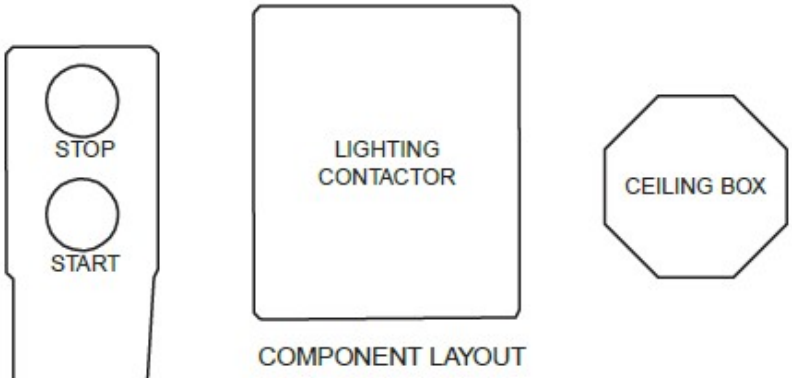

Figure 1 ■ Component Layout

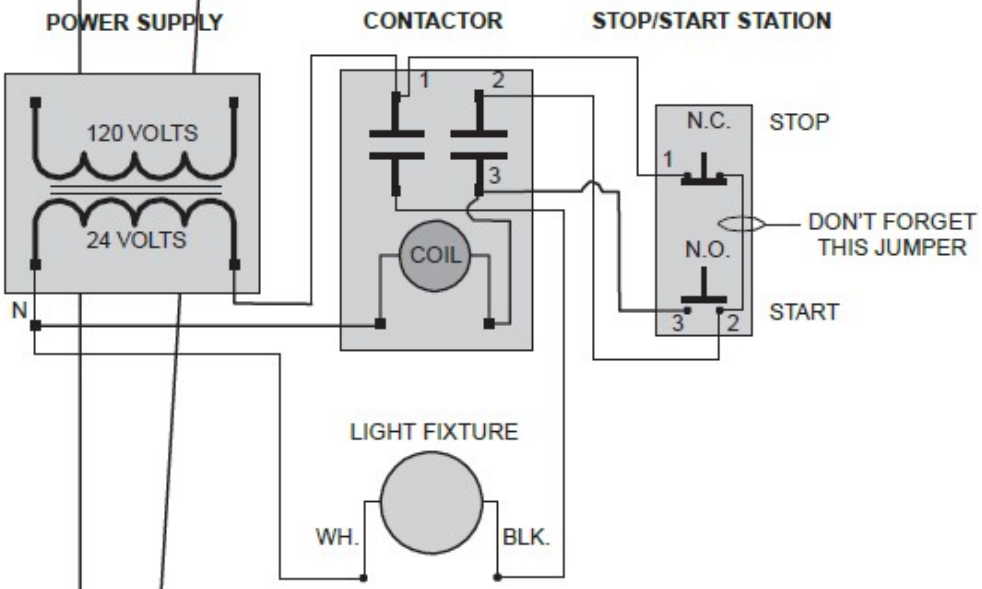

Figure 2 ■ Wiring Schematic