Experiment # 4

Using Switch-relays in Control Circuits

➢ Objectives:

1. To familiarize students with the basic elements of control circuits such as contactors, relays, overloads and timers.
2. To install simple control circuits.

➢ Equipment:

Three phase Induction motor, Relays, Timers, Wires and DC contactors.

➢ Introduction:

Contactor is a magnetically operated switch. It consists of one set of stationary contacts and one set of movable contacts which are brought together by means of the magnetic force of an electromagnet.

The vast majority of contactors use an electromagnet and contact arrangement that falls into one of two general types, the clapper type and solenoid-type contactor. What is needed electrically to operate the contactor is to provide a voltage of the proper value to the core of the electromagnet. When the voltage is switched on, the previous states of the contacts are changed, the opened contacts become close and the closed contacts become open. Whether the contactor is of the clapper or the solenoid type, the contacts are broken by the pull of gravity or the force of a spring when the electromagnet is de-energized.

Relay is by design an electromechanical amplifier. Automatic control circuits almost contain one or more relays, primarily because relay lends flexibility to the control circuit. When the coil of the relay is energized with 24V and the contacts are controlling a circuit of 380V or more, we are amplifying the voltage through the use of relay. Relay coils require only very low currents in their operation and are used to control circuits of large currents, so they amplify the current. The relay

is a single-input device in that it requires only a single voltage or current to activate its coil.

Through the use of multiple outputs, the relay can be a multiple-output device which amplifies the number of operation controlled by the single input. Relay falls into many types according to their use, there are voltage relay, current relay, frequency relay, overload relay, time-delay relay.

A timer is a device which allows a delay between pairs of events. Upon activation, a timer counts off a preset number of time units before powering the devices it controls. A traffic light is a good example of a timer application. As the light cycles from green to yellow to red, there is a delay between each change. The lengths of these delays are controlled by timers.

Timers have two measures of time. The preset value is the length of the delay between activation of the timer and activation of the output. The accumulated value is the number of time units counted by the timer at any given point.

➢ Procedure:

➢ Part A: Switch Relays:

1. Connect the control circuit of Figure (4.1).

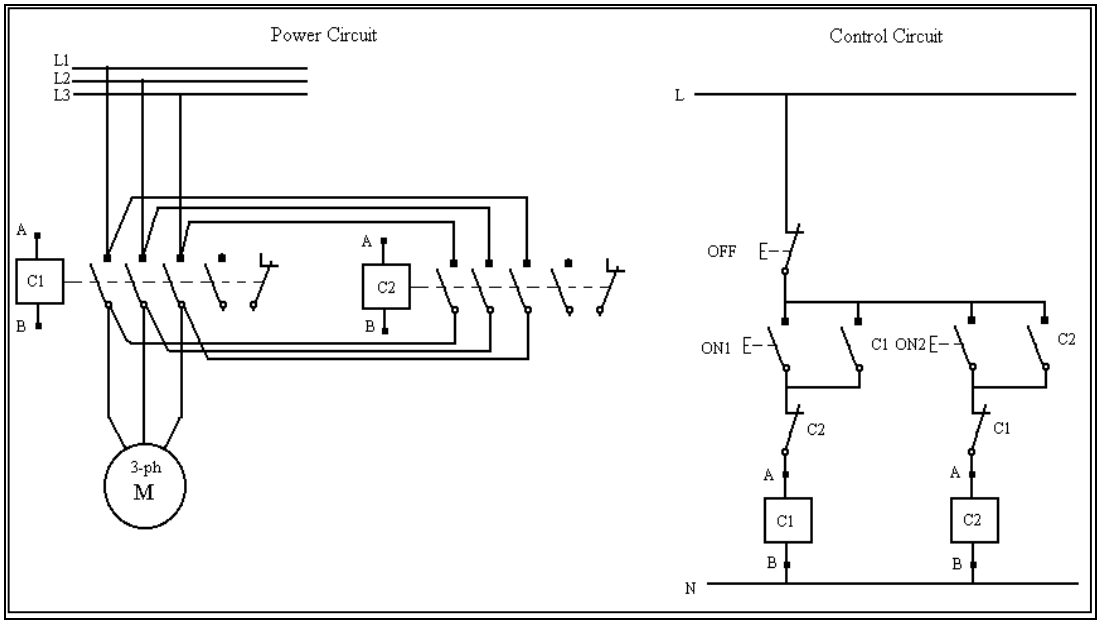
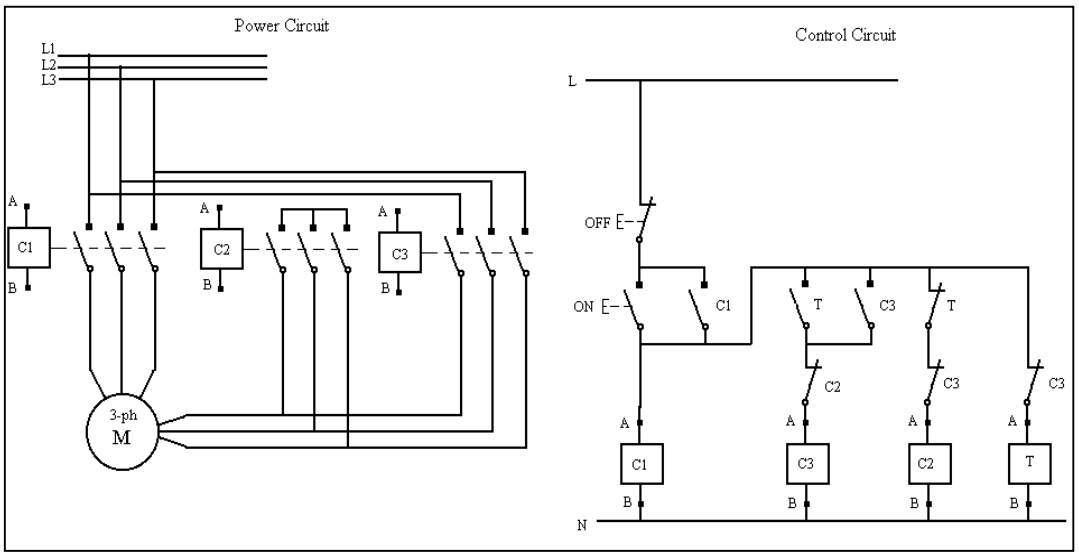


Figure (4.1).

2. Check the operation of the control circuit.
3. After that connect power circuit of Figure (4.1).

4. Discuss the operation of total circuit.
5. Connect the control circuit of Figure (4.2) .



Figure(4.2)

6. Check the operation of the control circuit.
7. After that connect power circuit of Figure (4.2).
8. Discuss the operation of total circuit.

➢ Part B: Timers:

1. Connect the circuit as shown in Figure (4.3).

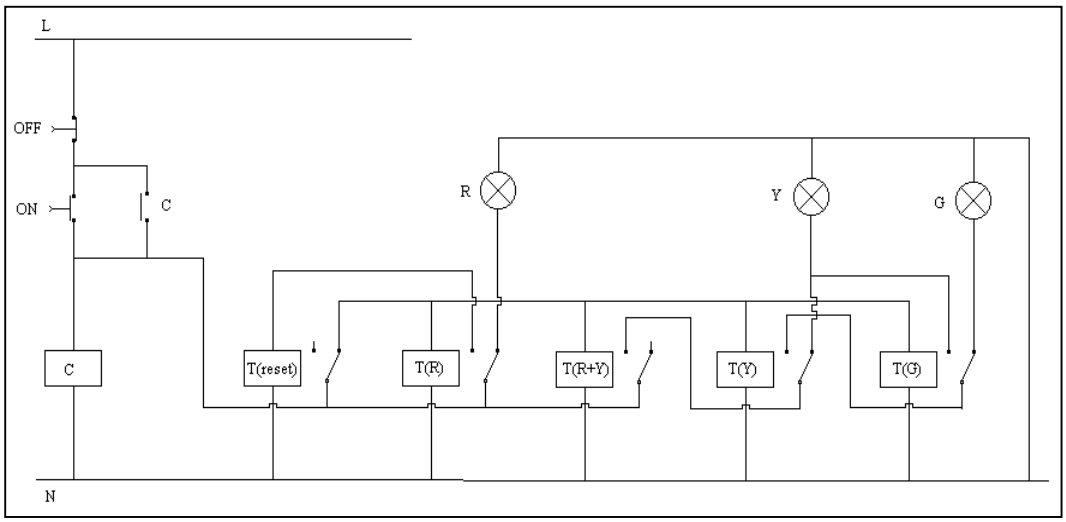


Figure (4.3).

2. Choose the time sitting for every timer so the traffic light works in the following sequence:

- The red light is on for a specific time.
- Both the red and yellow lights are on for specific time.
- Both the red and yellow lights turn off and the green light turns on.
- The green light is on for a specific time.
- The green light turns off and the yellow light is turned on for a specific time.
- The yellow light turns off and the red light turns on again.

3. Check the operation of the circuit.

- **EXERCISE:**

1. Suggest another circuit of the traffic light, and show its operation using the timing diagram.