Fakulti:	**SEKOLAH KEJURUTERAAN ELEKTRIK**
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SKEM 3742

SEKOLAH KEJURUTERAAN ELEKTRIK
UNIVERSITI TEKNOLOGI MALAYSIA
KAMPUS SKUDAI
JOHOR MECHATRONICS

LABORATORY

ELECTRO-PNEUMATIC (TASK and PROBLEMS)

Disediakan oleh		Disahkan oleh	: Ketua Jabatan
Nama	: En. Shukri Bin Abd Manaf : Dr. Salinda Binti Buyamin	Nama	: Assoc Prof. Ir. Dr. Norhaliza Abdul Wahab
Tandatangan	:	Tandatangan	:
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Tarikh	:	Tarikh	:

Electro-Pneumatic

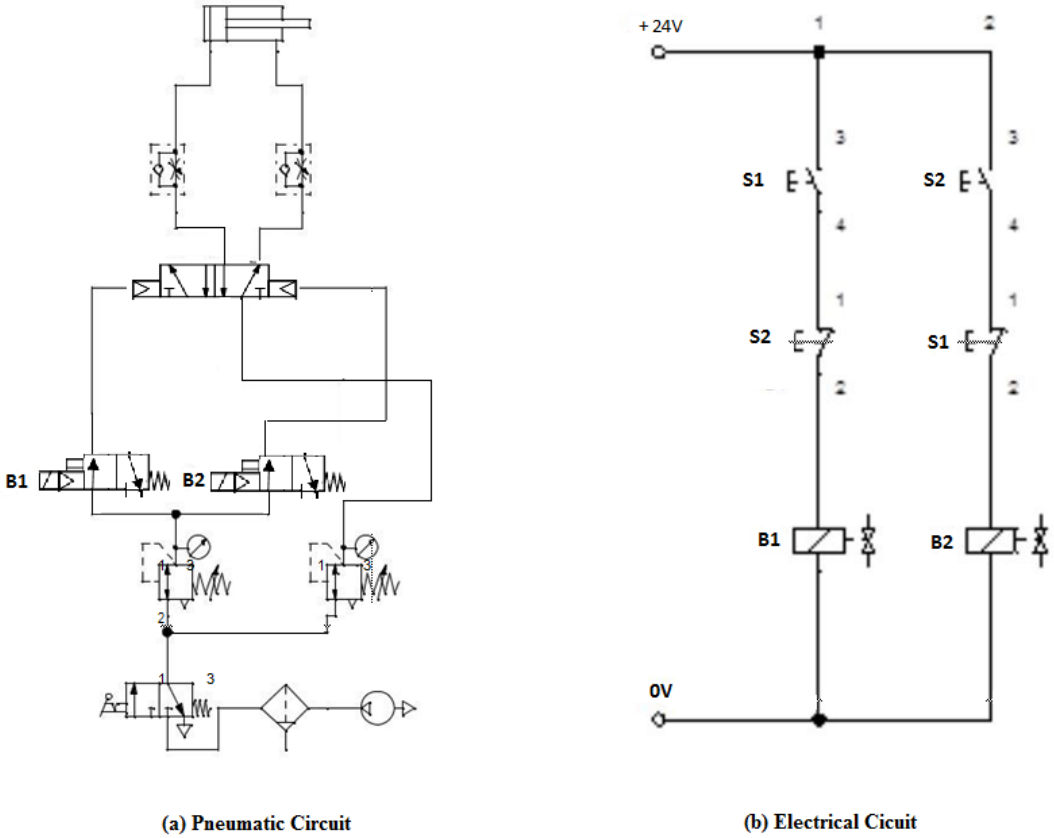
Task 1: Actuation of the 5/2 Way Directional Control Valve (DCV).

Practice Objective

After working through this practice, students are expected to understand the basic operation of the electro-pneumatic control circuit using a double-acting cylinder.

Procedure

1. Connect the pneumatic circuit as shown in **Figure 2.3(a)**.
2. Connect the electric circuit as shown in **Figure 2.3(b)**.
3. Validate the pneumatic circuit and electric circuit for any misconnection.
4. Turn the pneumatic power unit ON. Adjust the pressure to 2 to 5 bars at the pressure-limiting valve.
5. Turn the electrical power unit ON.
6. Press S1 and verify if the piston rod of the pneumatic cylinder extends.
7. Press S2 and verify if the piston rod of the pneumatic cylinder retracts.
8. After you complete the experiment, turn OFF of the pneumatic power unit and electric power unit.



(a) Pneumatic Circuit (b) Electrical Cicuit

Figure 2.3: Circuit drawing of pneumatic and electrical circuits for Task 1

~End~

Assignment

Based on your observation, fill **Table 2.2**.

Table 2.2: Truth table for Task 1.

S1	S2	Double-Acting Cylinder (Extend/Retract/No change)
Not pressed	Not pressed	
Not pressed	Pressed	
Pressed	Not pressed	
Pressed	Pressed	

Based on your understanding, describes the expected result if both solenoids (B1 and B2) in **Figure 2.3(b)** are swapped.

~End~

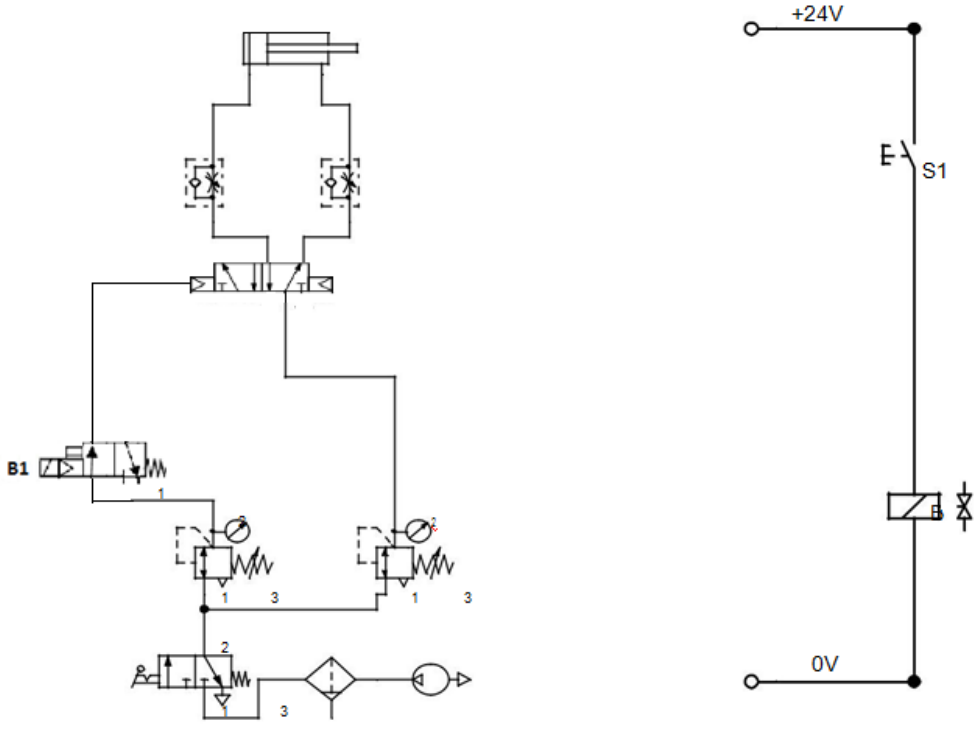
Task 2: Self-holding (Memory) Electro-Pneumatic Circuit Using Relay.

Practice Objective

After working through this practice, students are expected to understand the self-holding concept in the electro-pneumatic control system.

Procedure

1. Connect the pneumatic circuit and electric circuit as shown in **Figure 2.4(a)** and **(b)**.
2. Validate the pneumatic circuit and electric circuit for any misconnection.
3. Turn the pneumatic power unit ON. Adjust the pressure to 2 to 5 bars at the pressure-limiting valve.
4. Turn the electrical power unit ON.
5. Press and hold S1. Verify if the piston rod of the pneumatic cylinder extends.
6. Release S1. Verify if the piston rod of the pneumatic cylinder extends.
7. Record your observation.
8. Press the switch S2 and verify if the piston rod of the pneumatic cylinder retracts.
9. Replace the current electric circuit to the electrical circuit shown in **Figure 2.5**. Repeat procedure #3 to #7. Based on your observation, explain the differences observed between these two electrical circuits.
10. After you complete the experiment, turn OFF of the pneumatic power unit and electrical power unit.



(a) Pneumatic Circuit

(b) Electrical Circuit

Figure 2.4: Circuit drawing of pneumatic and electrical circuits for Task 2

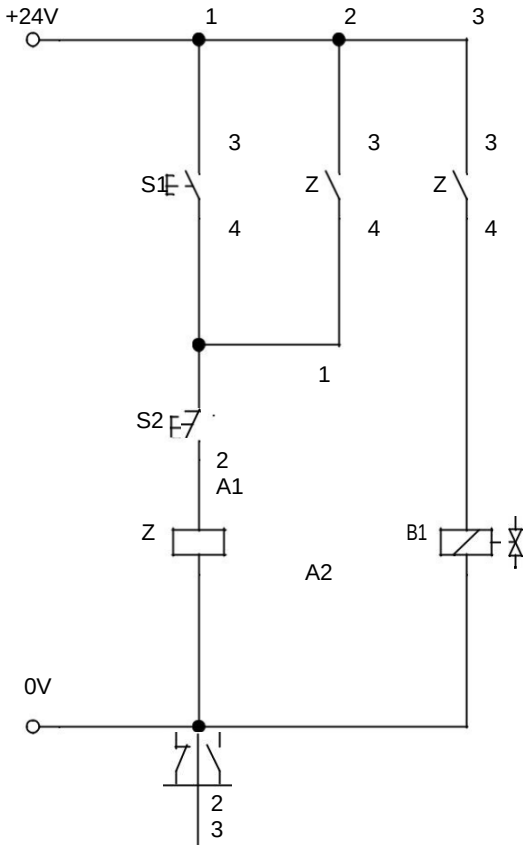


Figure 2.5: Self-holding electrical circuit

Task 3: Implementing Basic Logic Functions in Electro-pneumatic Circuit.

Practice Objective

After working through this practice, students are expected to be able to relate the installation of parallel and serial electric circuit with the basic logic functions (OR/AND/NOT).

Assignment

By using the pneumatic circuit as shown in **Figure 2.6**, try out different electrical circuits as shown in **Figure 2.7(a)** to **Figure 2.7(c)**.

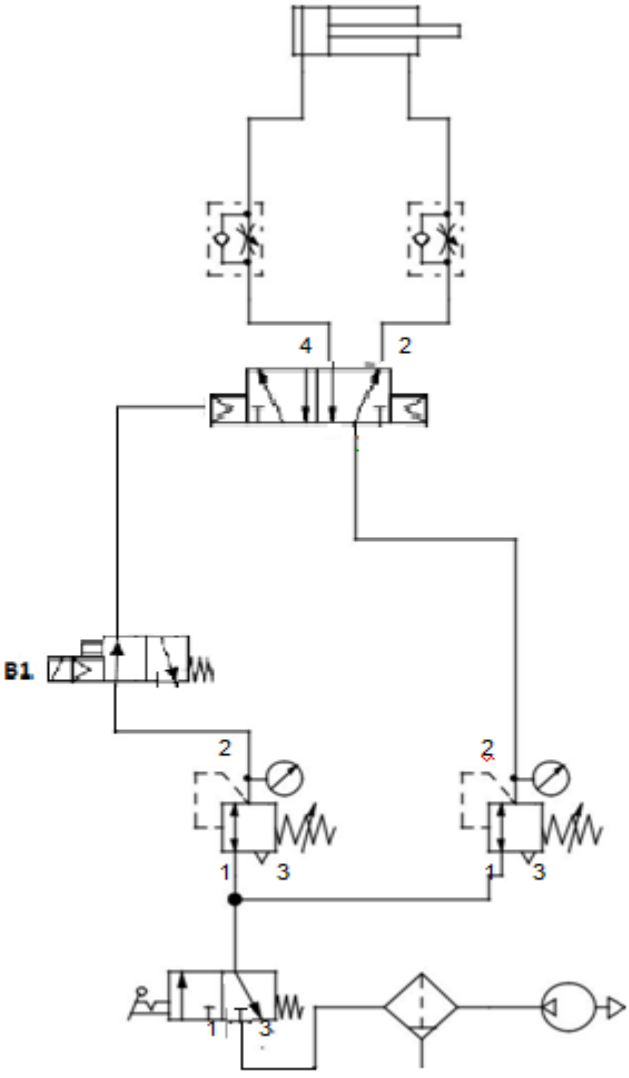


Figure 2.6: Pneumatic circuit for Task 3

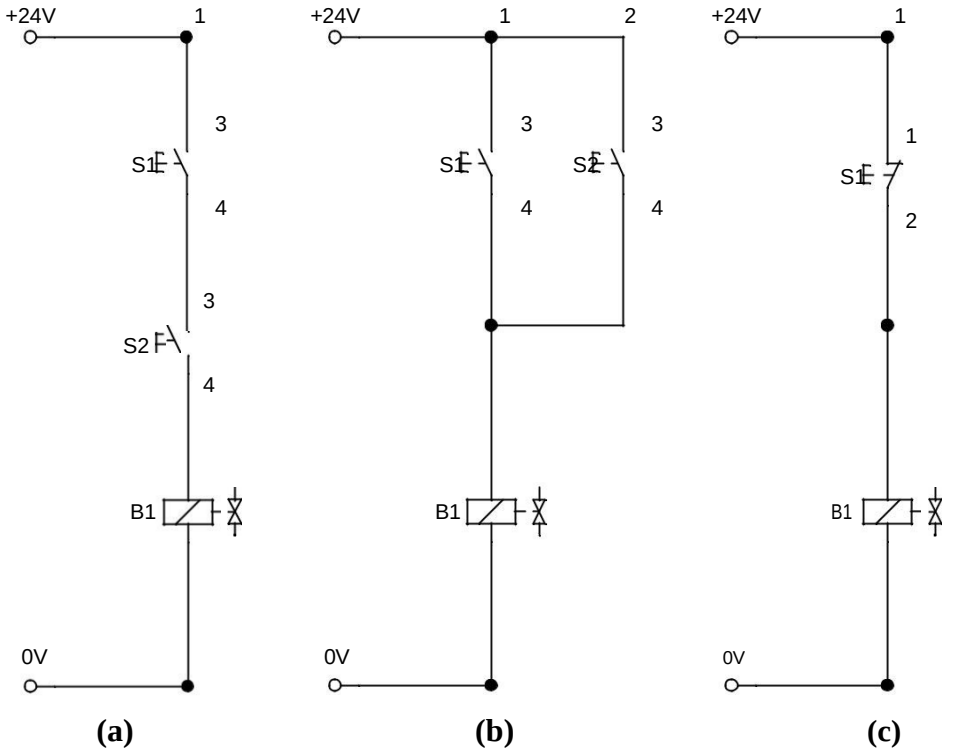


Figure 2.7: Electrical Circuits for Task 3

For each scenario (**Figure 2.7(a)** to **Figure 2.7(c)**), you are required to:

1. Write down the truth table of the observed result.
2. Formulate the logic equation based on the truth table.
3. Identify which logic function is used.

Based on what you have learned in the previous section, design an electro-pneumatic circuit that fulfill the following truth table (refer **Table 2.3**).

Table 2.3: Truth Table for Task 3

S1	S2	d
0	0	0
0	1	1
1	0	1
1	1	0
Note: For S1 & S2: 0 = Not press & 1 = Press For d: 0 = Retract & 1 = Extend		

You are required to:

1. Formulate the logic equations based on the truth table.
2. Design the electro-pneumatic circuit you had designed.
3. Validate the design with the experiment observation.
4. Identify which logic function that has the same truth table as **Table 2.3**.

~End~

Problems

Project 1

Electro Pneumaticcs – Application of Electro-Pneumatic in Transfer Station

Practice Objective
After working through this practice, students are expected to design and install an electro-pneumatic circuit using multiple cyclinders with sequence motion
Assignment
Consider a pneumatic transferring station shown in Figure , where two cylinders are used to transfer parts from lower deck to upper deck conveyors. The sequence of operation can be described by a statement list as follows:

Step 1: Cylinder A lifts the product from lower level conveyor to upper level conveyor
Step 2: Cylinder B pushes the product to upper level conveyor
Step 3: Cylinder A retracts only after cylinder B completely retracted
Step 4: When the object metal is not detected, reverse the conveyor to **X.** Refer to figure 1.0

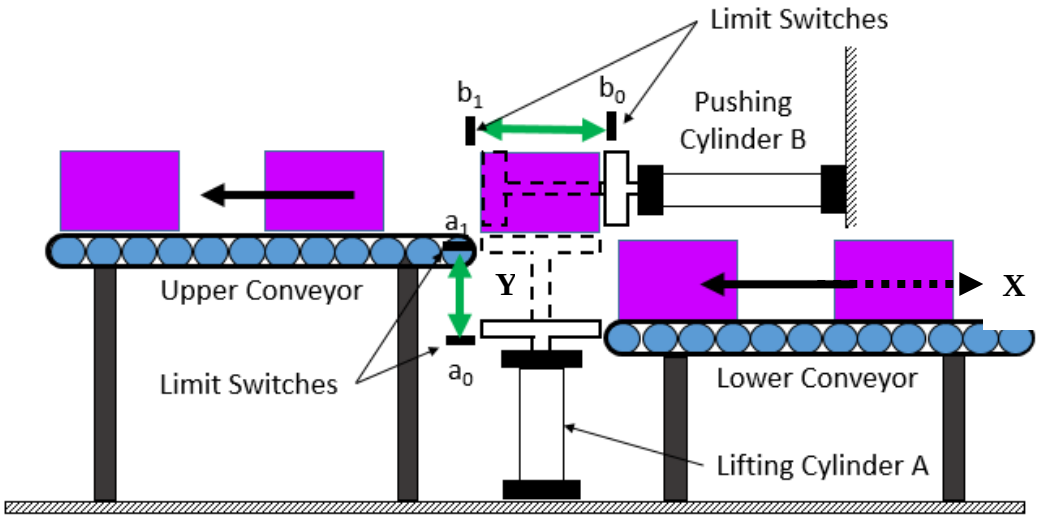


Figure 1.0