

JUARA

Micro Electro-pneumatic

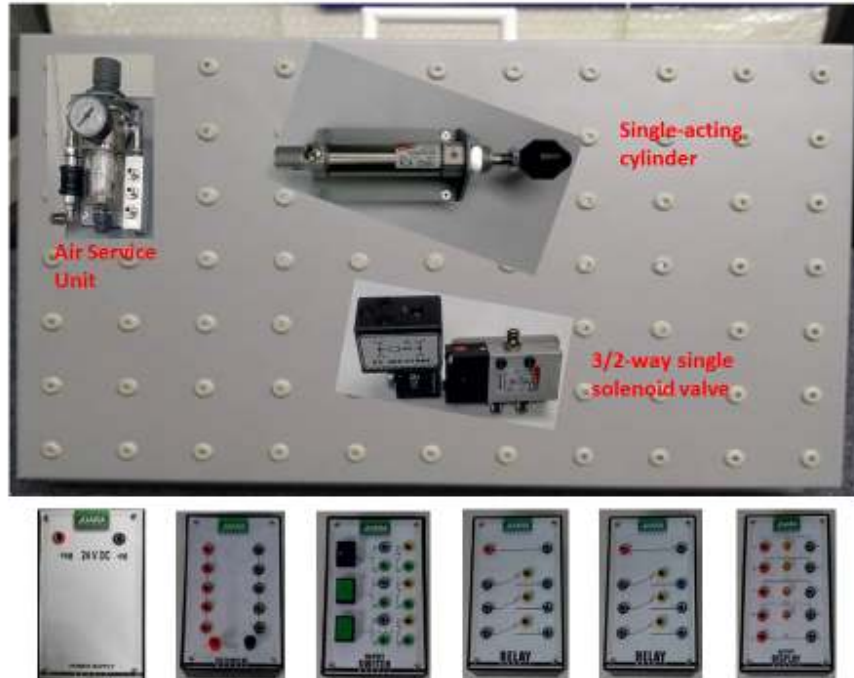


Practical Exercises

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Exercise 1 Unistable control of a single-acting cylinder with 3/2 valve using a N.O. switch



In this experiment, there are two circuits; one for fluid circuit and the other, electrical circuit.

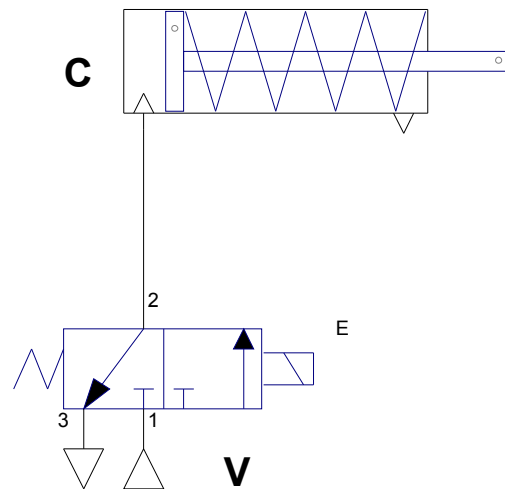
For the electrical circuit, connect the power supply positive output (24V) to one of the Push Button switch normally open contact and then to the coil of the 3/2 solenoid valve as shown.

For the fluid circuit, connect air supply from one of the outlet manifold of the Air Service unit to the inlet port 1 of the solenoid valve. Connect another tube from the outlet port 2 of the solenoid valve to the single-acting cylinder.

When the Electrical push button switch is actuated, the coil is energized and the cylinder will extend. When the push button is released, the coil de-energize, and the cylinder retract.

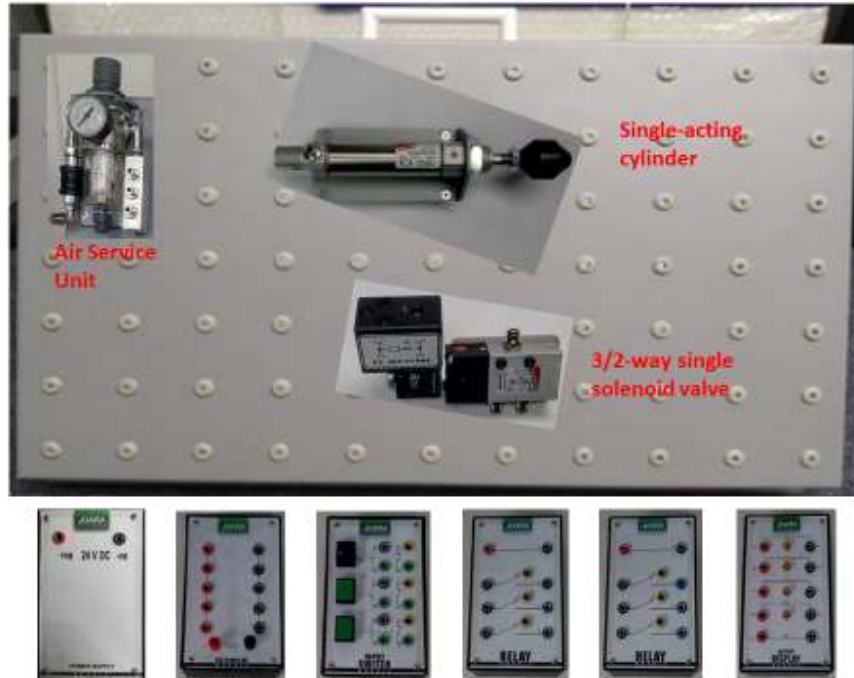


Electrical circuit diagram



Fluid circuit diagram

Exercise 2 Unistable control of a single-acting cylinder with 3/2 valve using a N.C. switch

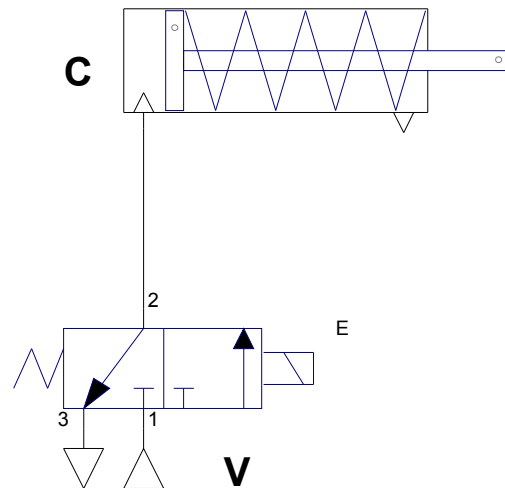


This experiment is similar to the previous one except the electrical circuit, we connect using the normally closed contacts of the Push button switch instead. Upon turning on the supply of both the air service unit and the electrical power supply unit, the coil will be energized and the cylinder will extend.

Pressing the push button switch will de-energize the coil of the valve and the cylinder will retract to its normal position by the spring inside the chamber.

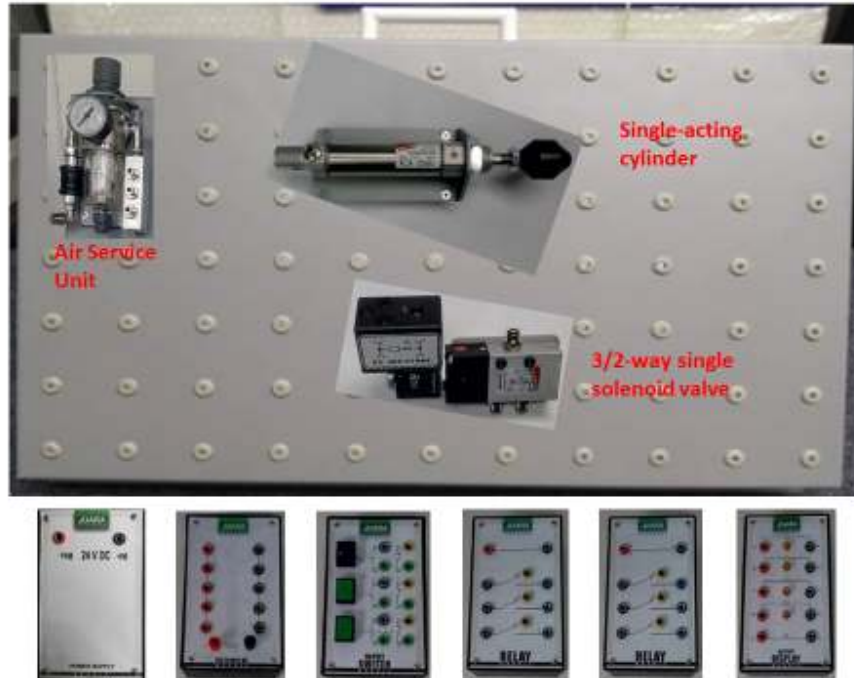


Electrical circuit diagram



Fluid circuit diagram

Exercise 3 Bistable control of a single-acting cylinder with 3/2 valve, with latching circuit

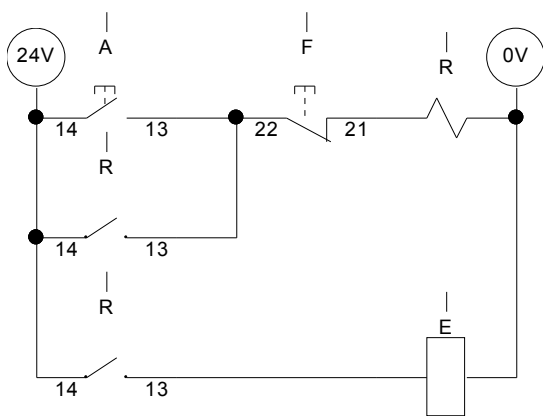


This experiment requires additional normally closed push button switch and a relay with two normally open contacts.

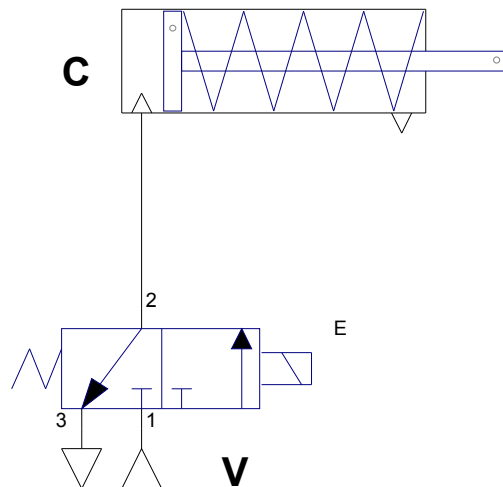
Connect the electrical circuit shown below to build a latching or holding circuit.

When push button A is pressed momentarily, the relay coil (R) is energized and all the relay contacts will be closed. One of the relay contact (parallel to the push button A) will continue to energize the relay coil even when the PB A is released. The other relay contact, will provide supply to energize the coil of the valve to make the cylinder extend.

To retract the cylinder, just need to press the normally closed PB "F" to de-energize the relay coil.

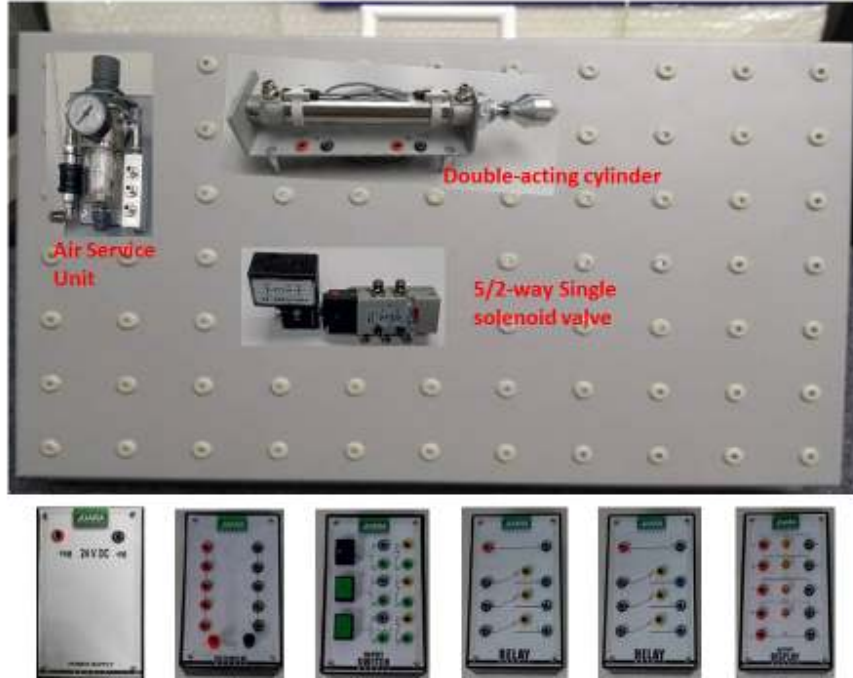


Electrical circuit diagram



Fluid circuit diagram

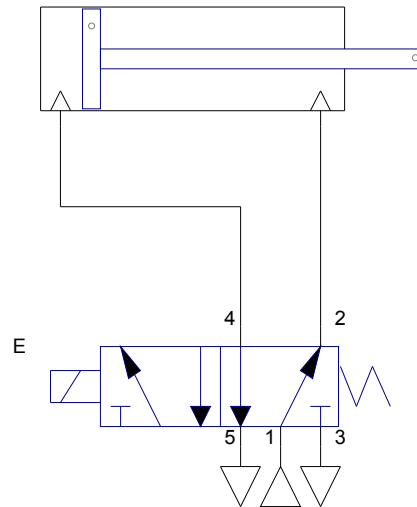
Exercise 4 Unistable control of double-acting cylinder using 5/2 unistable valve



To control a double acting cylinder, it is recommended to use a 5/2 valve instead. Connect the electrical and fluid circuit diagram shown below for this experiment.

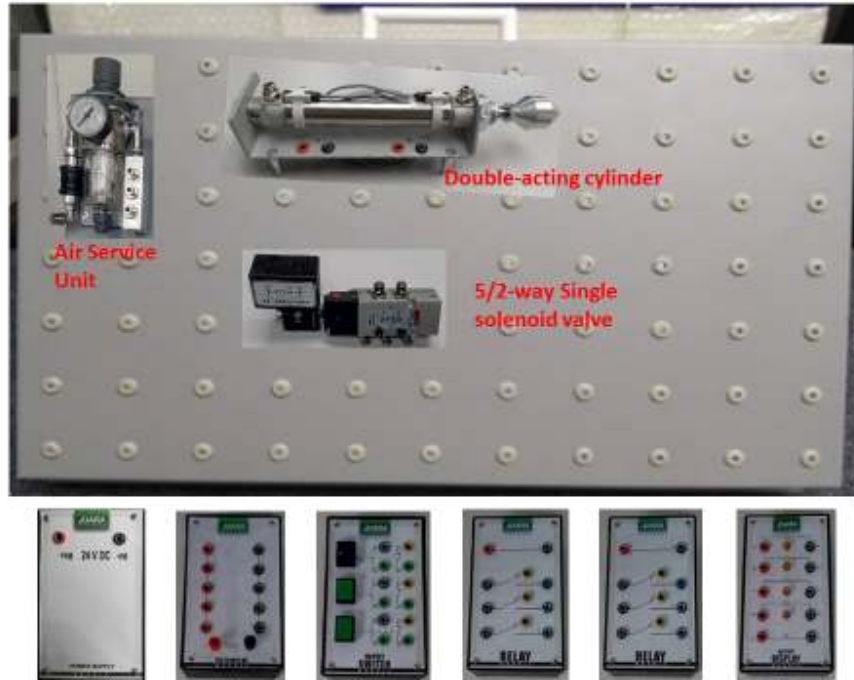


Electrical circuit diagram

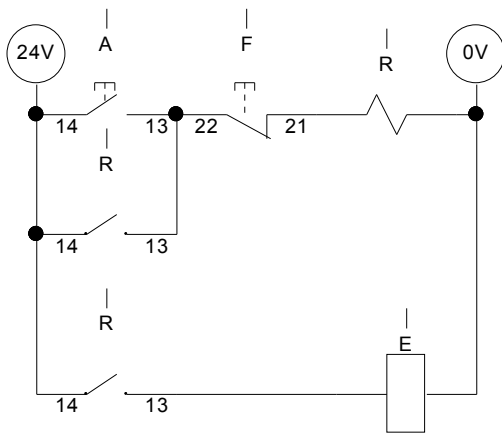


Fluid circuit diagram

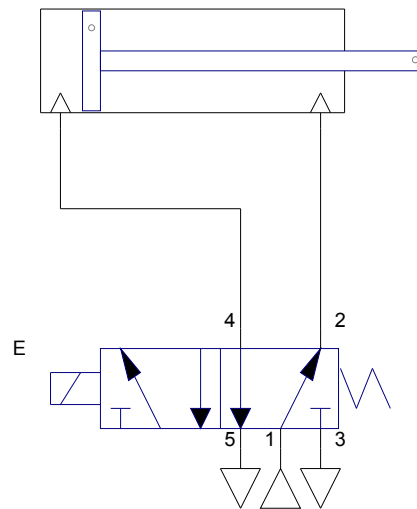
Exercise 5 Bistable control of double-acting cylinder using 5/2 unstable valve



This experiment is similar to the above experiment 3 except that it is now using 5/2 solenoid valve to control a double-acting cylinder.

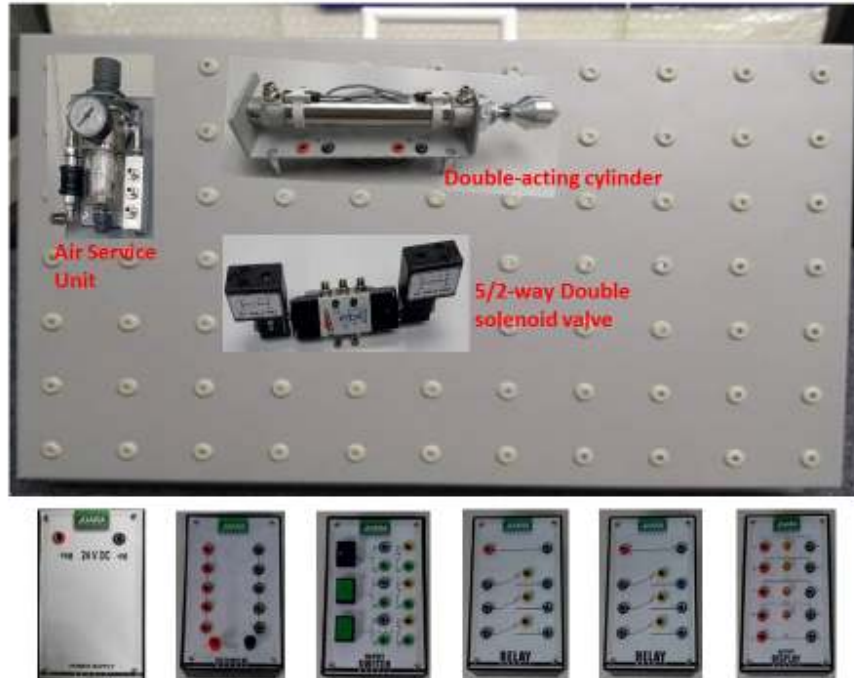


Electrical circuit diagram



Fluid circuit diagram

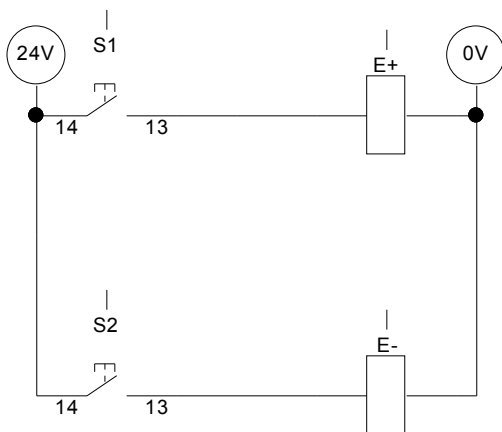
Exercise 6 Bistable control of double-acting cylinder using 5/2 bistable valve



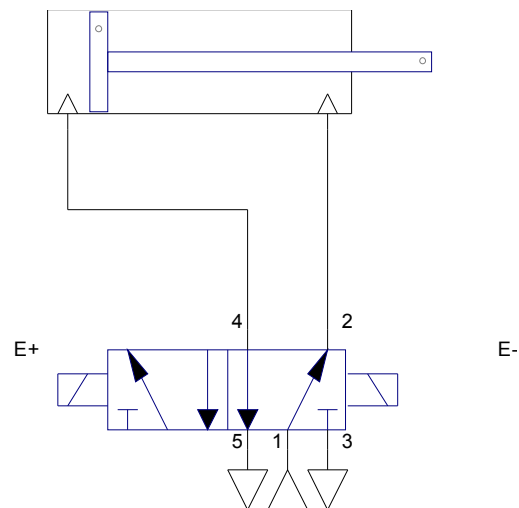
In this experiment, two push button switches are used to control the movement of the cylinder.

When PB "S1" is pressed momentarily, E+ coil of the 5/2 solenoid valve will be energized, and the cylinder will move to the extended position. It will stay in this position.

When PB "S2" is pressed momentarily, E- coil of the 5/2 solenoid valve will be energized, and the cylinder will retract to its original position.

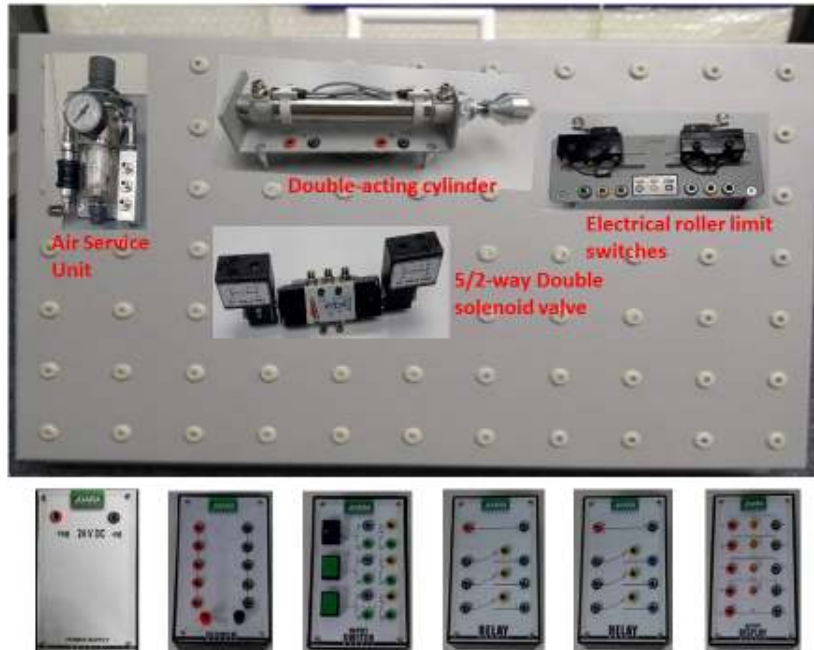


Electrical circuit diagram



Fluid circuit diagram

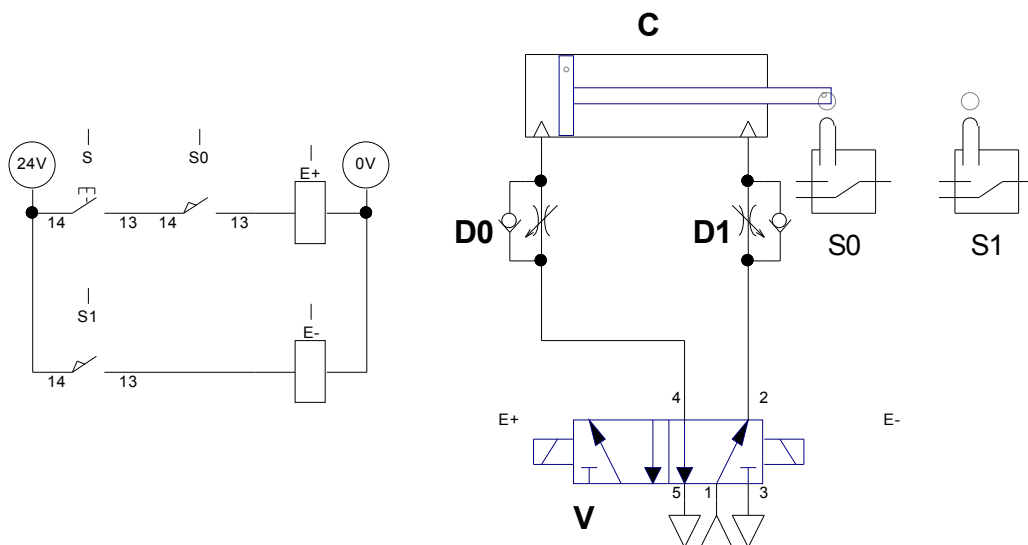
Exercise 7 Automatic control of double-acting cylinder using 5/2 bistable valve



In this experiment, we need to add a selector (start/stop) switch in series with “S0” electrical limit switch.

Initially, S0 contact is closed when the cylinder is in the retract position. Once we turn on the selector switch “S”, E+ coil of the solenoid valve will be energized to extend the cylinder movement.

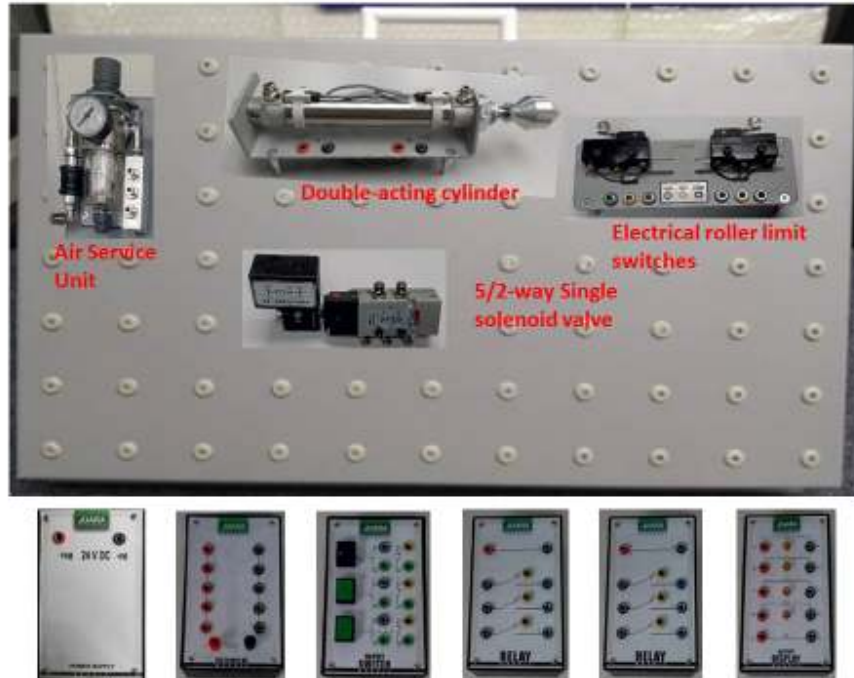
When the cylinder reaches the extended position and actuate the electrical limit switch (S1), it will then energized E- coil of the solenoid valve to make the cylinder retract. Again, when it touches the switch “S0” in the retract position, and if the selector switch “S” is still on, it will continue to extend and retract until the start/stop switch “S” is turned off.



Electrical circuit diagram

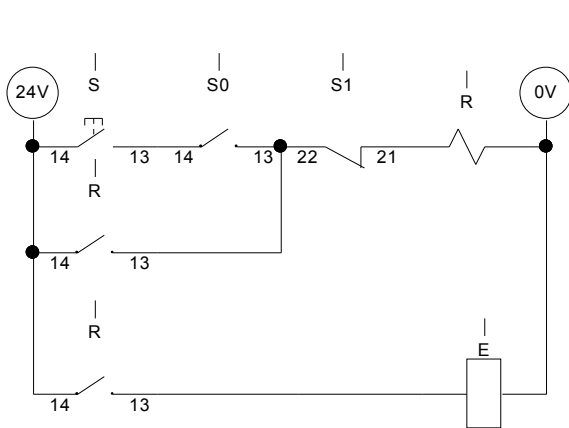
Fluid circuit diagram

Exercise 8 Automatic control of double-acting cylinder using 5/2 unstable valve

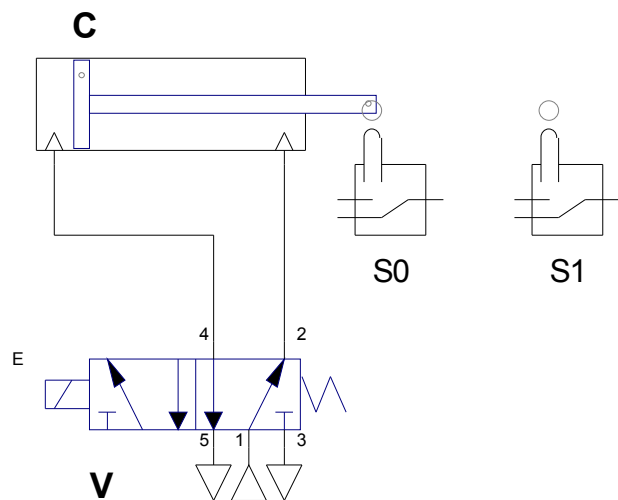


In this experiment, we replace the bistable, 5/2 double solenoid valve with a unistable, 5/2 single solenoid valve as shown.

In order to hold and energized the coil of the valve, a latching/holding circuit have to be build. Again, noticed that S & S0 is an AND logic function to control the movement cycle of the cylinder's automatic movement. A relay with two normally opened contacts is also use in order to hold the coil of the valve.

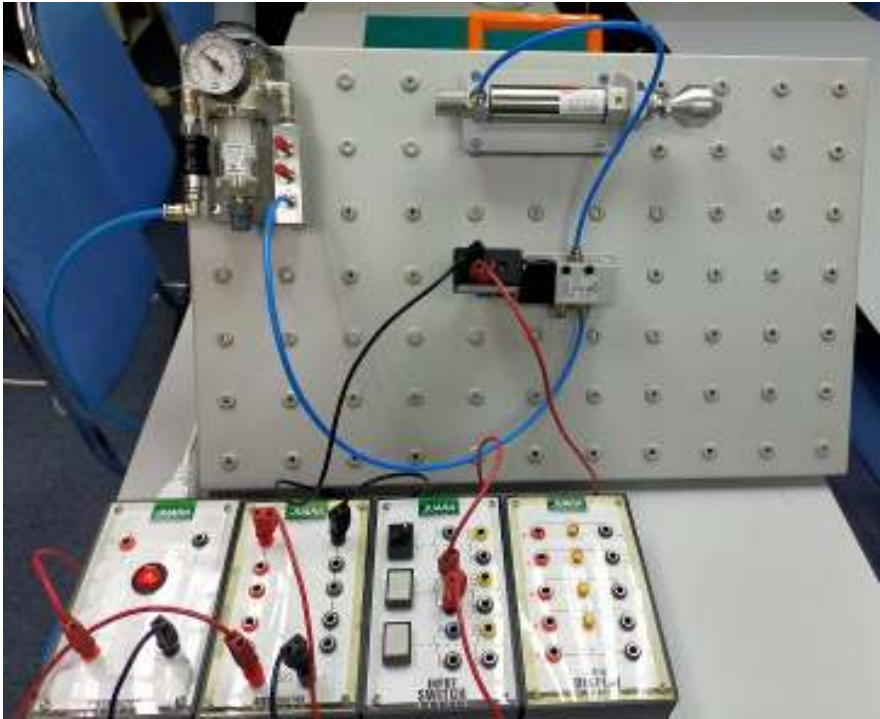


Electrical circuit diagram

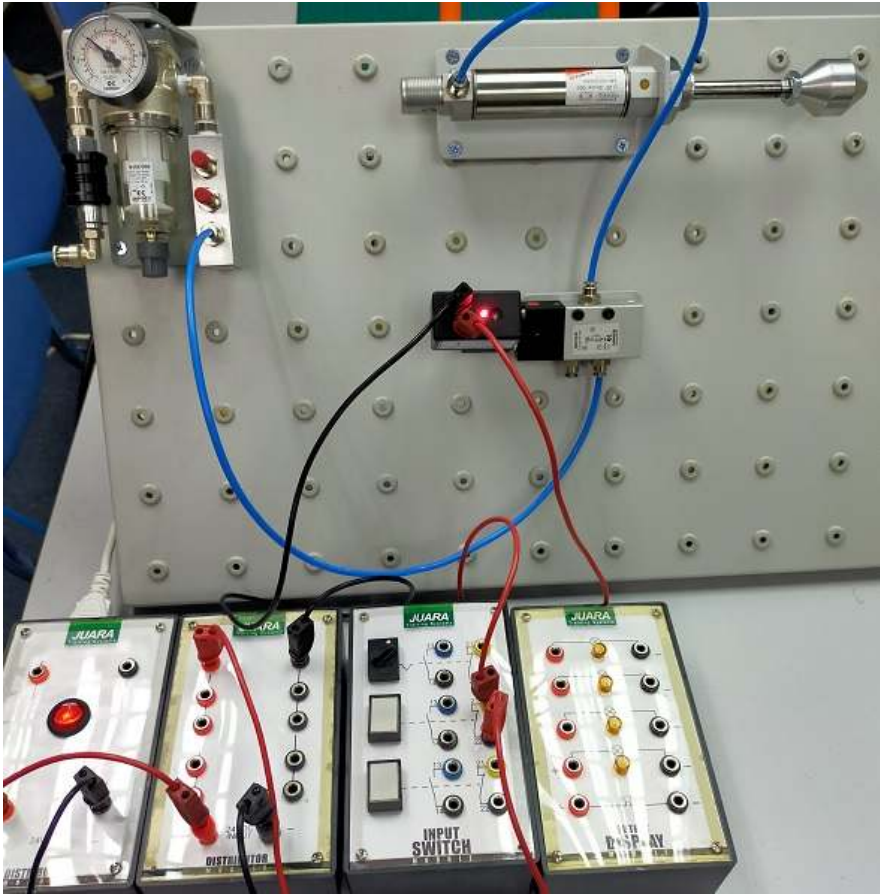


Fluid circuit diagram

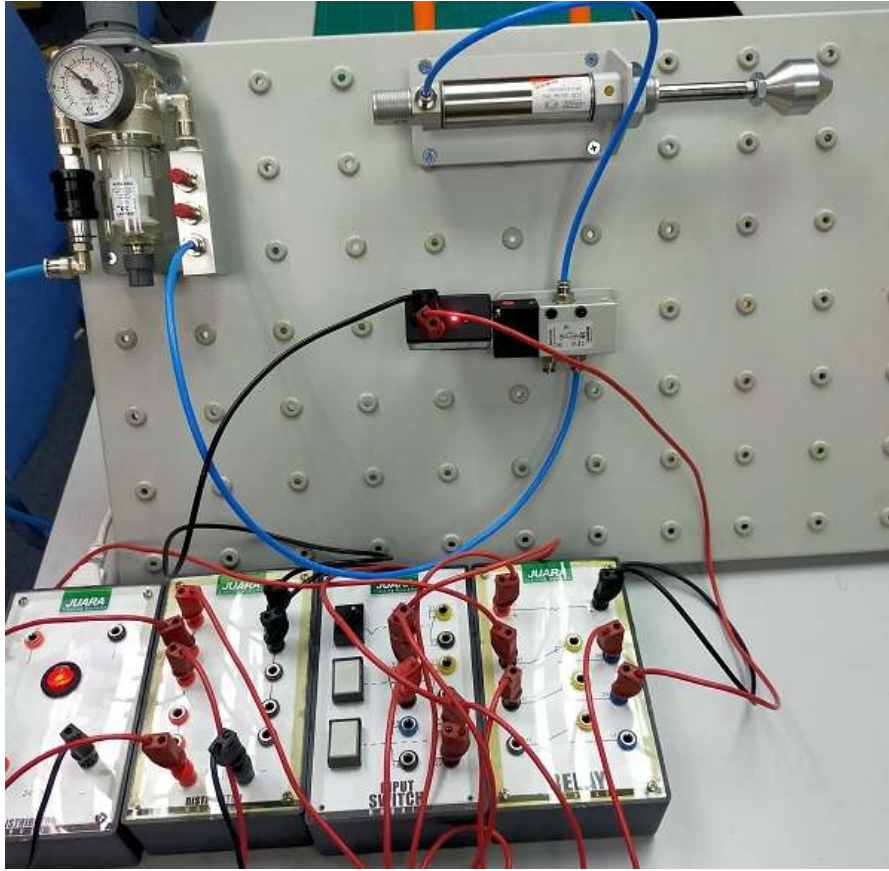
Photos of exercises



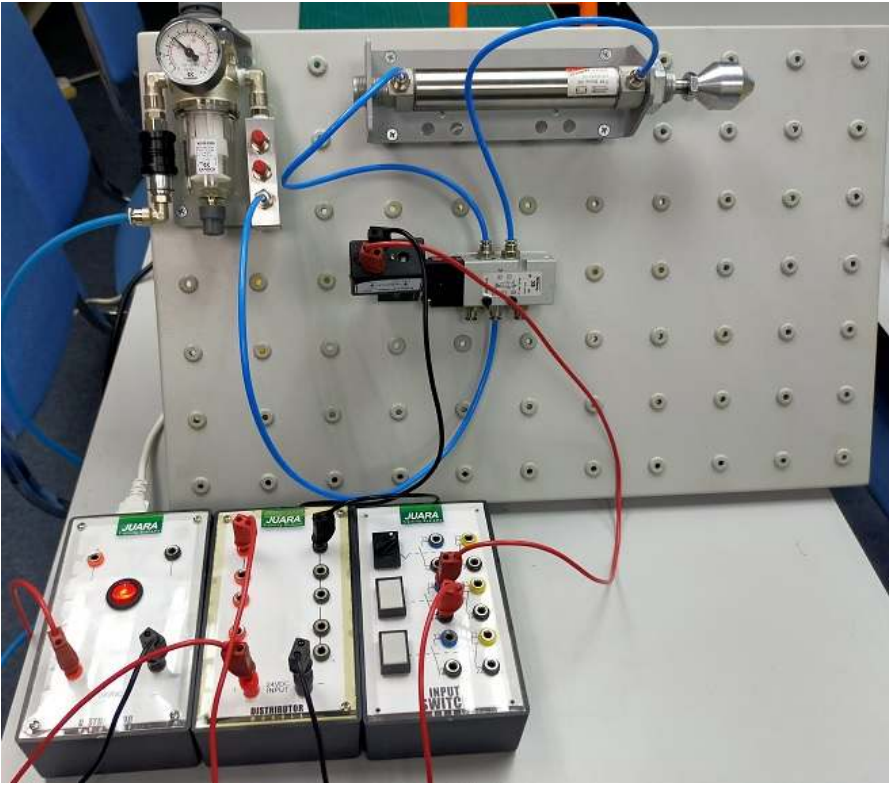
Exercise #1



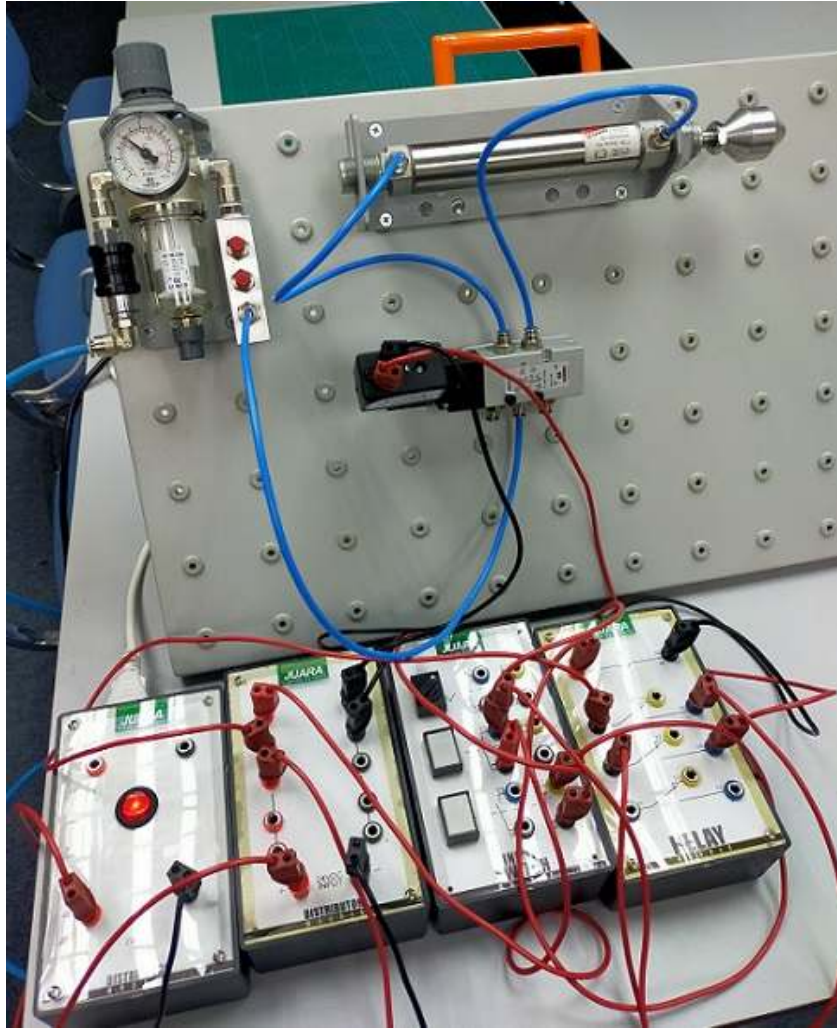
Exercise #2



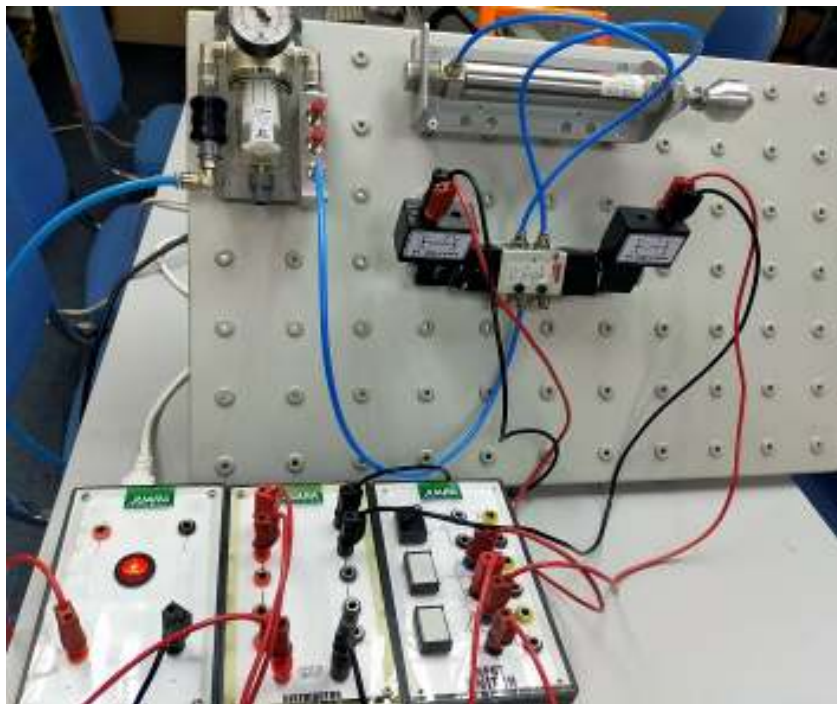
Exercise #3



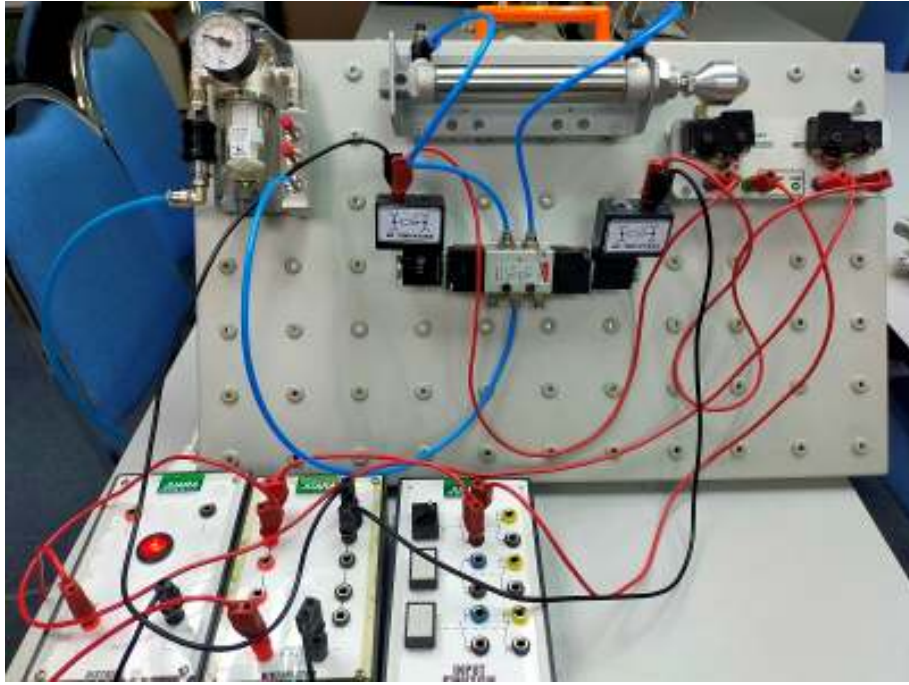
Exercise #4



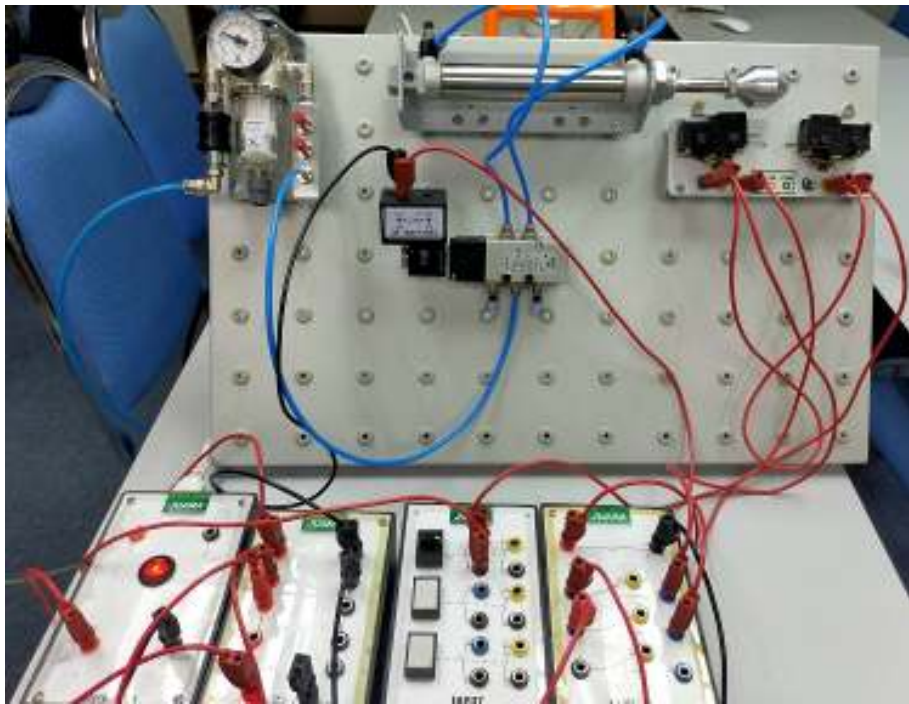
Exercise #5



Exercise #6



Exercise #7



Exercise #8

Components



Double acting cylinder c/w Banjo Flow Control valves



Single acting cylinder



Air Service Unit c/w shut-off valve



3/2 Single Solenoid valve



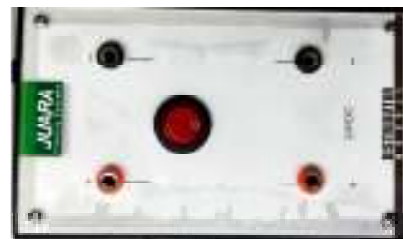
5/2 Double Solenoid valve



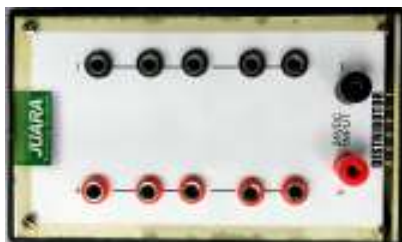
5/2 Single Solenoid valve



Electrical Roller Limit Switch



24Vdc Power Supply (1)



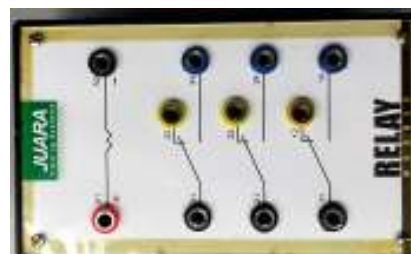
Electrical Distributor (1)



Input Switch Module (1)



Output Module (1)



Relay Module (2)

Accessories



4mm PU tube (10m)



6mm PU tube (5m)



Connection Cable (15 pcs)



Connection Cable (15 pcs)



Power Cable



Utility Box c/w:
4mm equal Tee, x 3
Tube cutter, x 1
Allan Key, x 1
Dismantling tool, x 1
Exhaust silencer, x 2
4mm blank plug, x 3