

2013

Pneumatic Systems

Order of Construction of Pneumatic System

New York City College Of Technology
EMT 2320 Lab

Group #1

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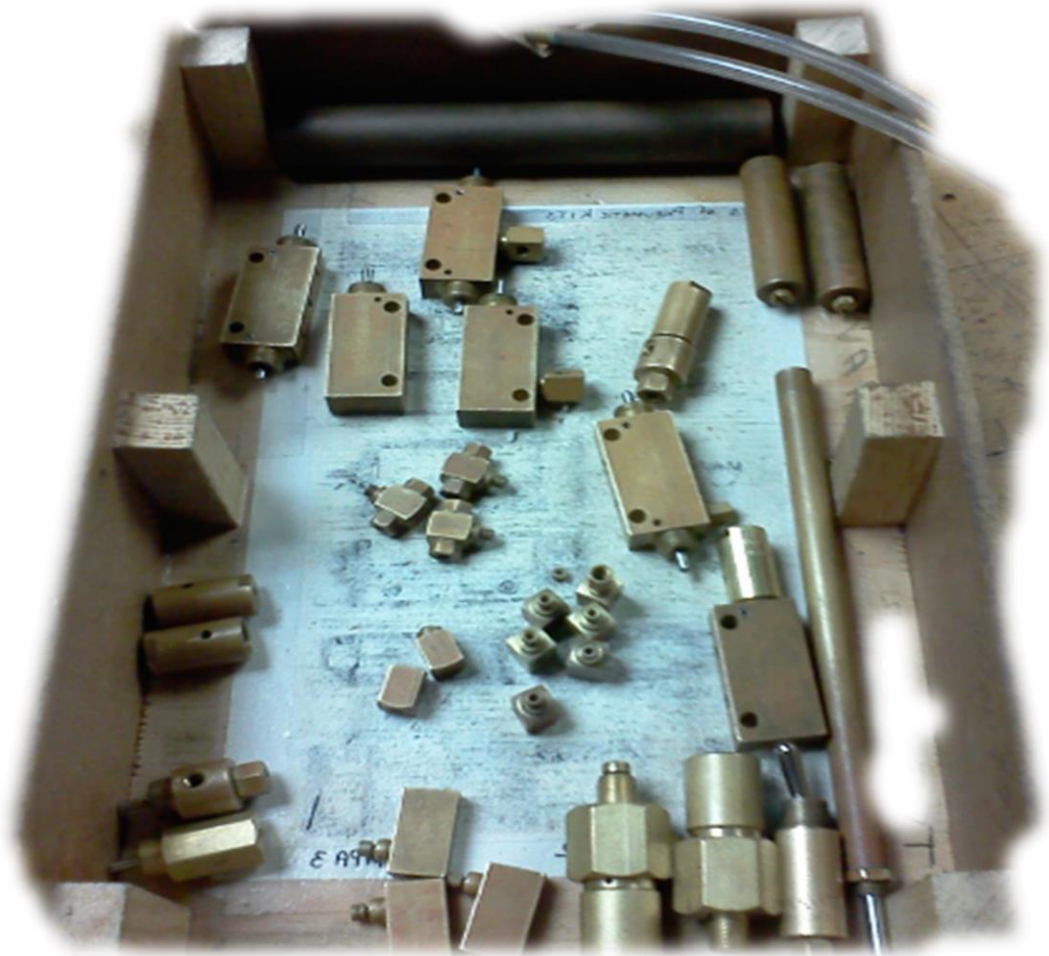
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Objective:

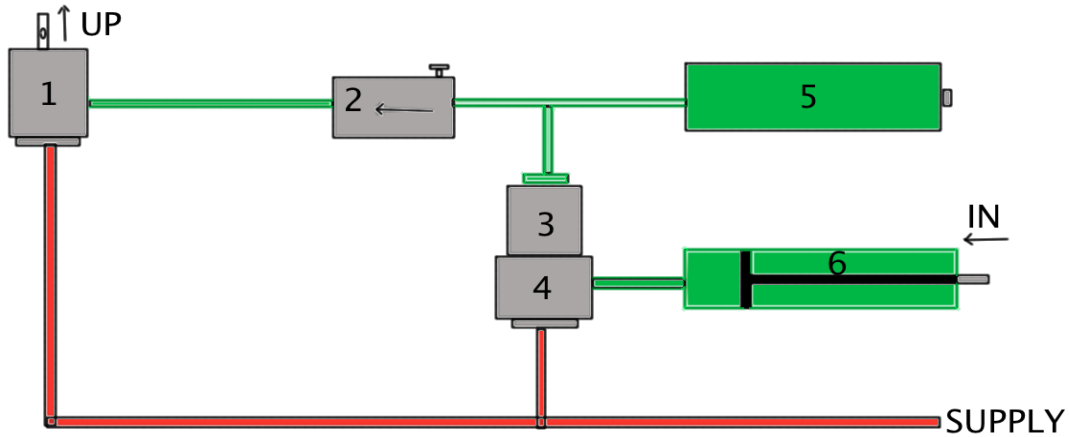
The objective of this laboratory experiment is to understand basic concepts of pneumatic system and to explore the function of pneumatic instruments such as; valves, air tank, double acting cylinder, flow control, actuators, etc.

PNEUMATICS EQUIPMENT'S



LIMITED MEMORY

PART 1



PRESSURE █
VENTING █
NEUTRAL █

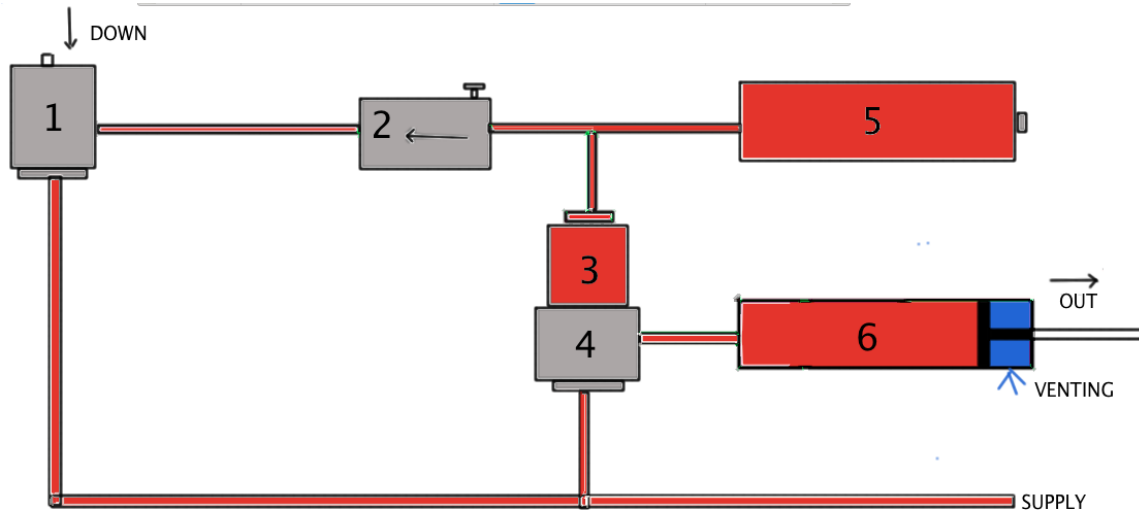
Part No.	Model No.	Type
1,4	MAV-3	3-Way Valve
2	MFC - 2	Flow Control
3	MPA - 3	Actuator
5	MAT - 50	Air Tank
6	Spring Return Cylinder	

ANALYSIS:

At the beginning pressure is supplied into the system, as part 1's stem is up the pressure stays in 1 and doesn't go through the system. Everything is neutral in the system.

LIMITED MEMORY

PART 2



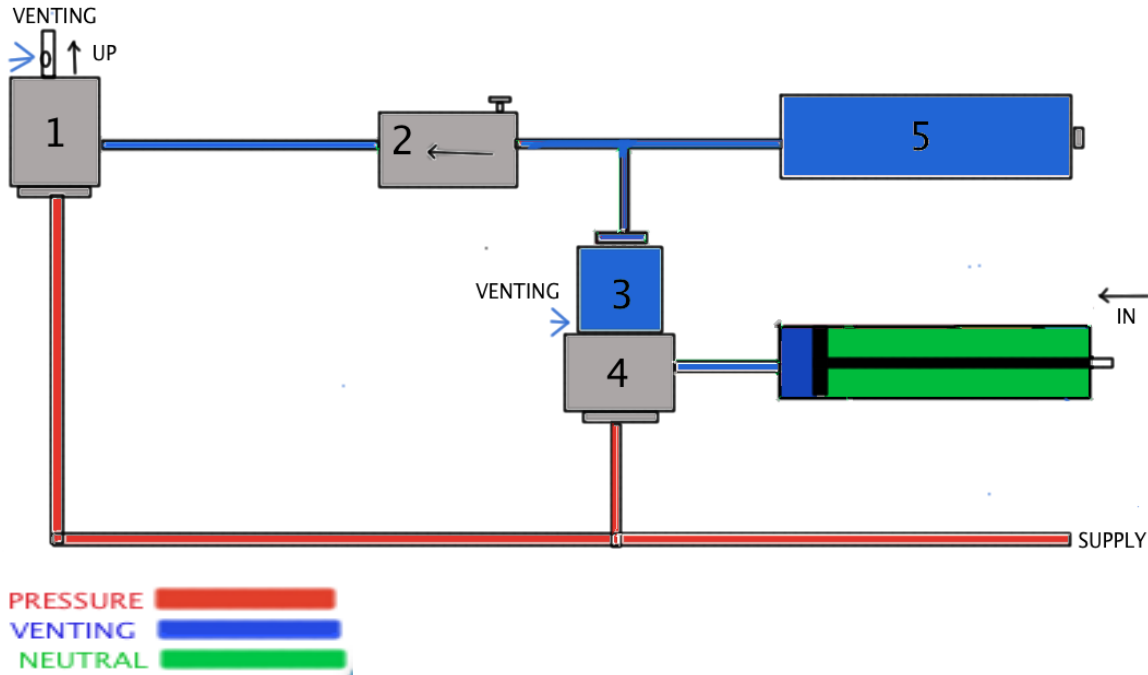
Part No.	Model No.	Type
1,4	MAV-3	3-Way Valve
2	MFC - 2	Flow Control
3	MPA - 3	Actuator
5	MAT - 50	Air Tank
6	Spring Return Cylinder	

ANALYSIS:

When MAV-3 (Part 1) is pressed down the pressure is flown through 1 and 2 completely. Then the pressure goes to 3 and 5, when 5 is filled fully the pressure starts 3 and pushes the stem on 4 downward. When the stem on 4 is pushed down the pressure is flown into 6, which causes the piston on 6 to extend out.

LIMITED MEMORY

PART 3



Part No.	Model No.	Type
1,4	MAV-3	3-Way Valve
2	MFC - 2	Flow Control
3	MPA - 3	Actuator
5	MAT - 50	Air Tank
6	Spring Return Cylinder	

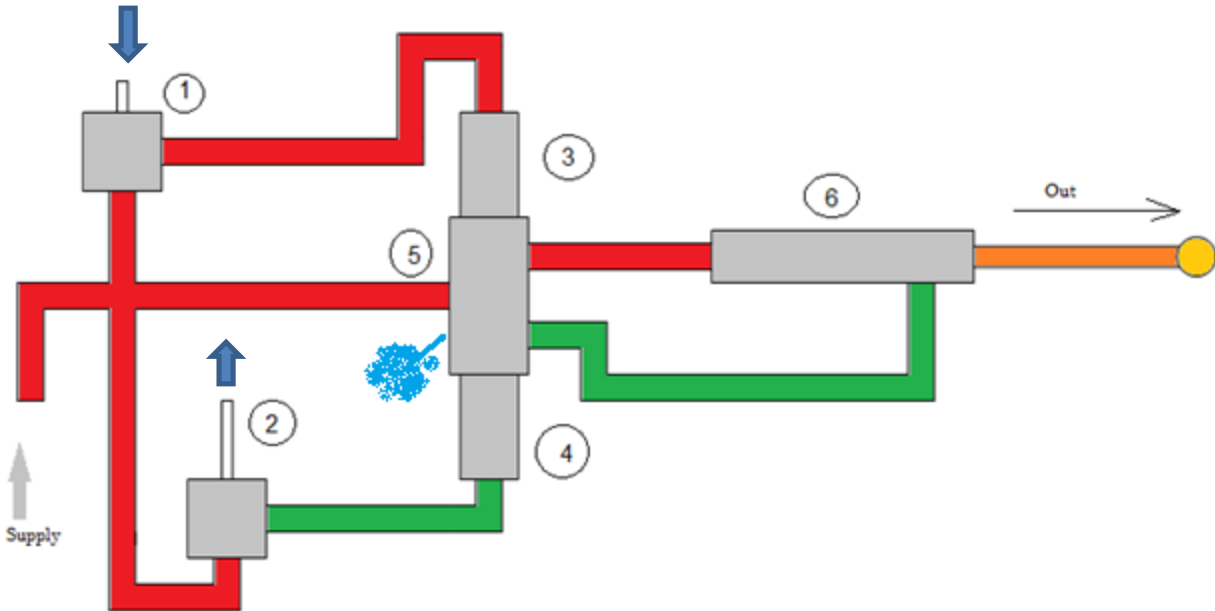
ANALYSIS:

When the stem on 1 is released, the pressure would stop at the end of 3. The pressure that is leftover on 5 will flow through 2 and vent from 1. When this happens, the stem on 4 is released because of pressure leaving which will stop at the bottom of 4. The piston in 6 will begin to return, and the pressure that was left in 6 vents from 3. The knob on part 2 controls the speed of the piston returning.

This system is called Limited Memory because as the stem in 1 has to remain pressed for the piston in 6 to extend out, and when the stem is released the piston will return back to its original position.

FULL MEMORY

PART 1



Part No.	Model No.	Type
1,2	MAV-3	3-Way Valve
3,4	MPA - 3	Actuator
5	MAV - 4D	4 Way Valve
6	Spring Return Cylinder	

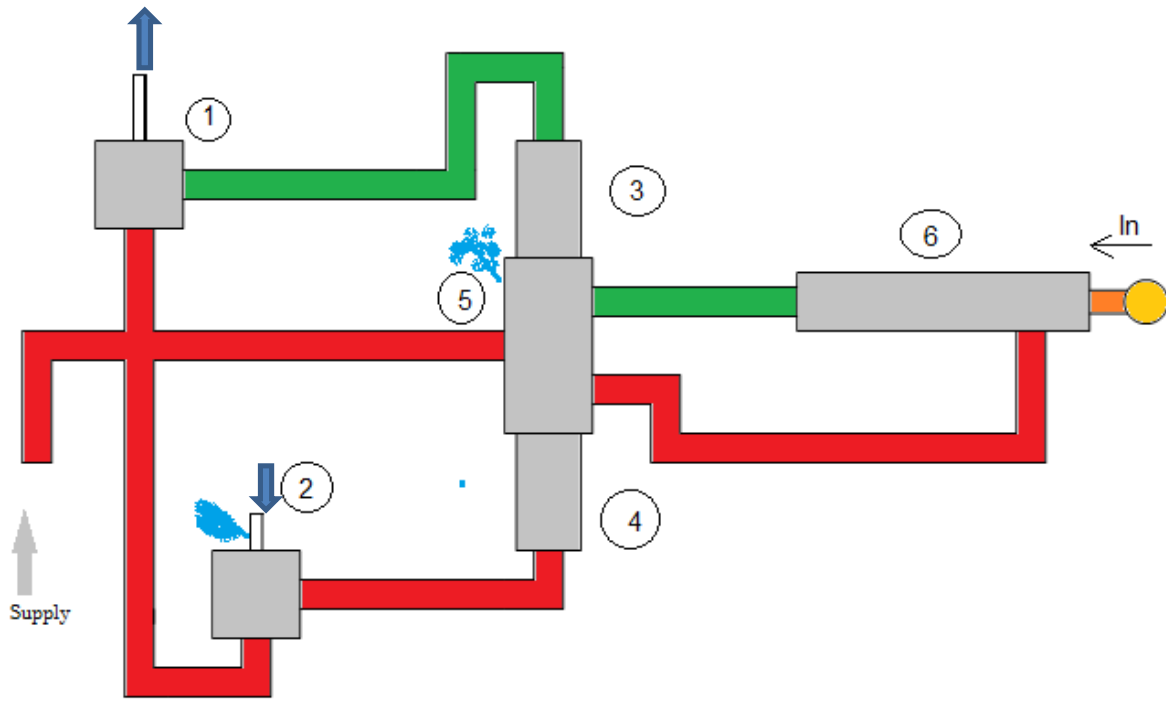
PRESSURE 
VENTING 
NEUTRAL 

Analysis:

When the Three way valve #1 is push down, pressure flow to actuator #3 and activate the upper sector of #5. Then pressure flows to the left chamber of the spring return cylinder and causes the piston to shoot out.

FULL MEMORY

PART 2



Part No.	Model No.	Type
1,2	MAV-3	3-Way Valve
3,4	MPA - 3	Actuator
5	MAV - 4D	4 Way Valve
6	Spring Return Cylinder	

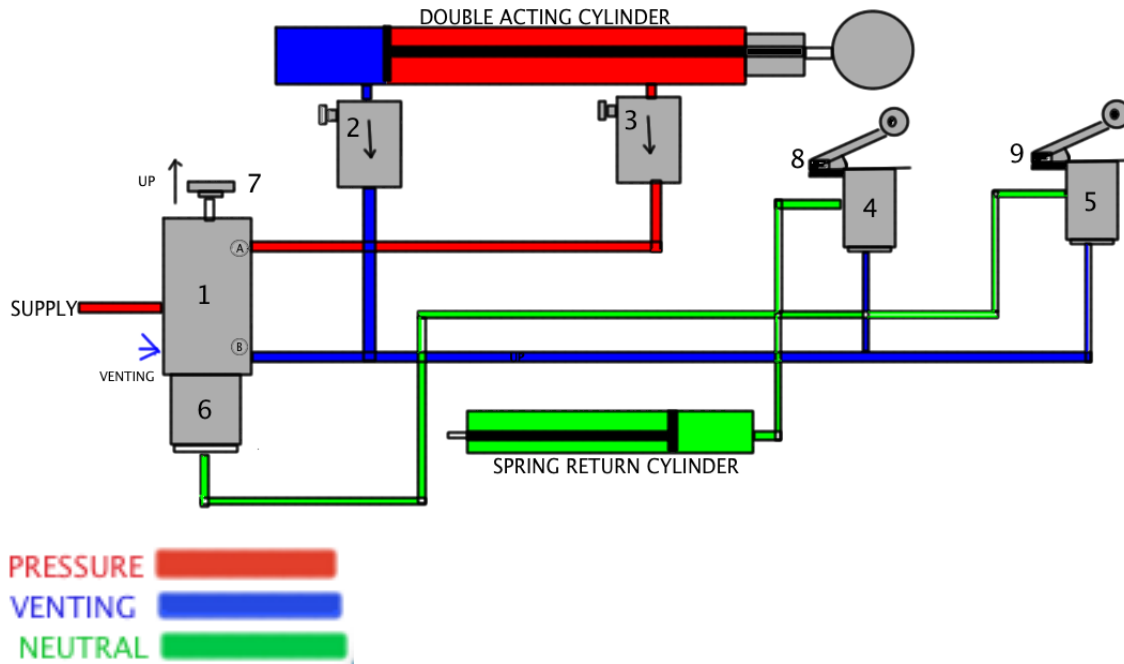
PRESSURE █
VENTING █
NEUTRAL █

Analysis:

When the 3 way valve #2 is press, pressure flows towards the right pressing the actuator #4. Then the actuator pushes up and cause pressure to flow through the bottom sector of #5 and so, pressure continue to flow to the right chamber of the spring return cylinder and causes the piston to go in.

ONE CYCLE - THEN RESET

PART 1



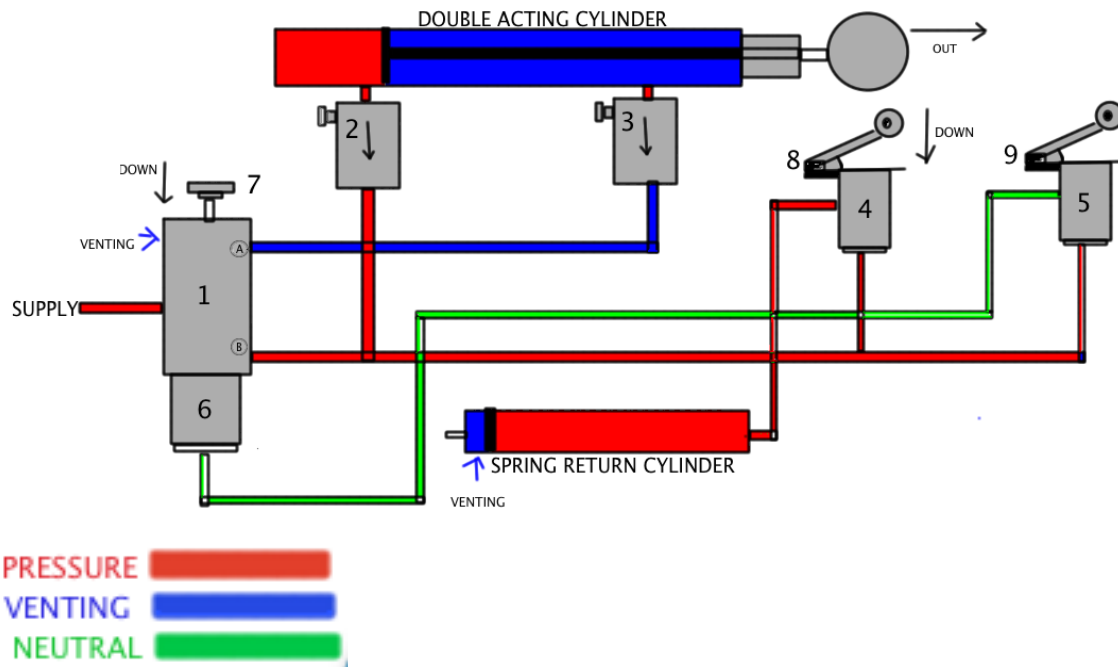
Part No.	Model No.	Type
1	MAV-4D	4-WAY VALVE
2,3	MFC-2	FLOW CONTROL
4,5	MAV-3	3-WAY VALVE
6	MPA-3	ACTUATOR
7	PUSH BUTTON	
8,9	CAM FOLLOWER	

ANALYSIS:

At the beginning of this system, the stem in 1 is up. The pressure goes through part 1A, and then the pressure flows through 3 into the right side of the Double Acting Cylinder and keeps the piston inside. If there were any pressure on the left side of the Double Acting Cylinder, it would vent through 1B.

ONE CYCLE THEN RESET

PART 2



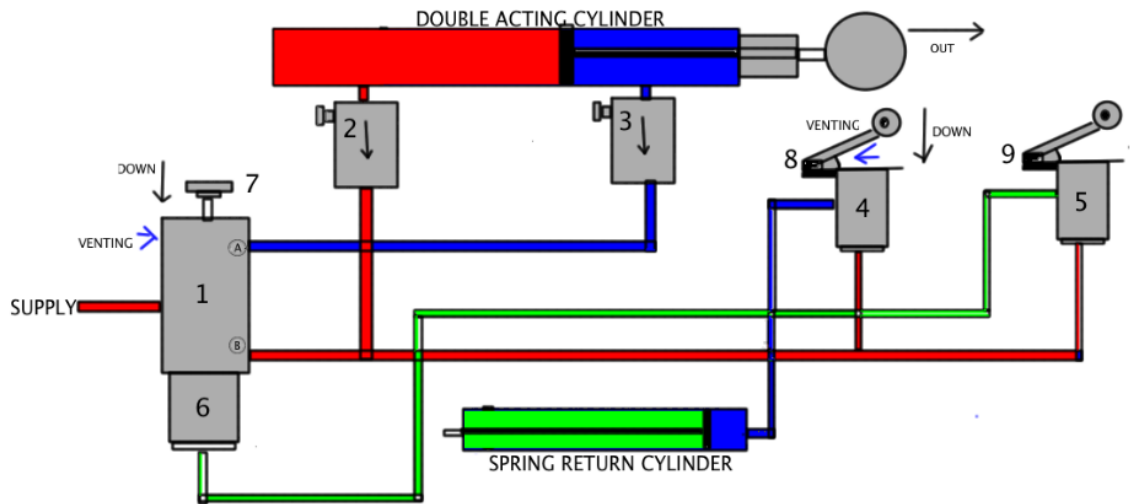
Part No.	Model No.	Type
1	MAV-4D	4-WAY VALVE
2,3	MFC-2	FLOW CONTROL
4,5	MAV-3	3-WAY VALVE
6	MPA-3	ACTUATOR
7	PUSH BUTTON	
8,9	CAM FOLLOWER	

ANAYLSIS:

When stem 1 is pressed down, the pressure goes from 1A to 1B. The pressure then goes through 2, 4, and 5. In 2 and 5 the pressure remains at the bottom. While the piston in 2 starts to move outward because of the pressure, the pressure on the right side of the Double Acting Cylinder would pass through 3, the pressure will vent from the upper left side of 1. When the piston reaches 8, it'll push 8 down, the pressure at the bottom of 4 will pass through 4 and it'll push the Single Return Cylinder out.

ONE CYCLE THEN RESET

PART 3



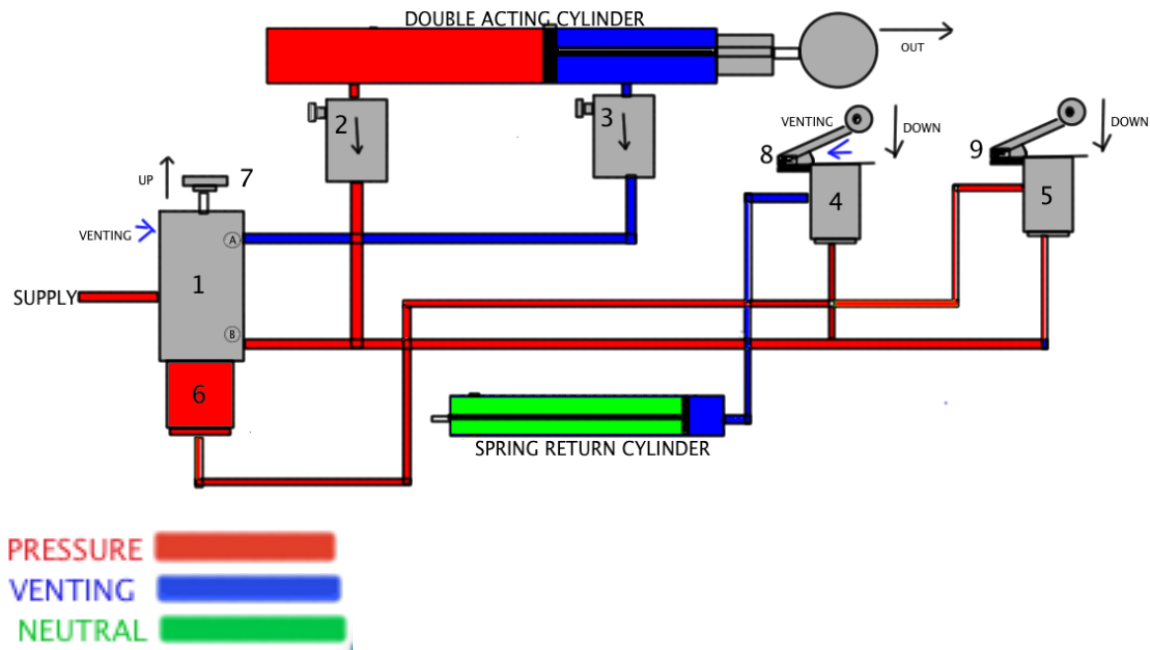
Part No.	Model No.	Type
1	MAV-4D	4-WAY VALVE
2,3	MFC-2	FLOW CONTROL
4,5	MAV-3	3-WAY VALVE
6	MPA-3	ACTUATOR
7	PUSH BUTTON	
8,9	CAM FOLLOWER	

ANALYSIS:

When the piston passes 8, it'll go up. This will result with the Spring Return Cylinder to return and the pressure from the Single Return Cylinder to vent from part 4. Part 4 vents whenever the piston is being pushed outward.

ONE CYCLE THEN RESET

PART 4



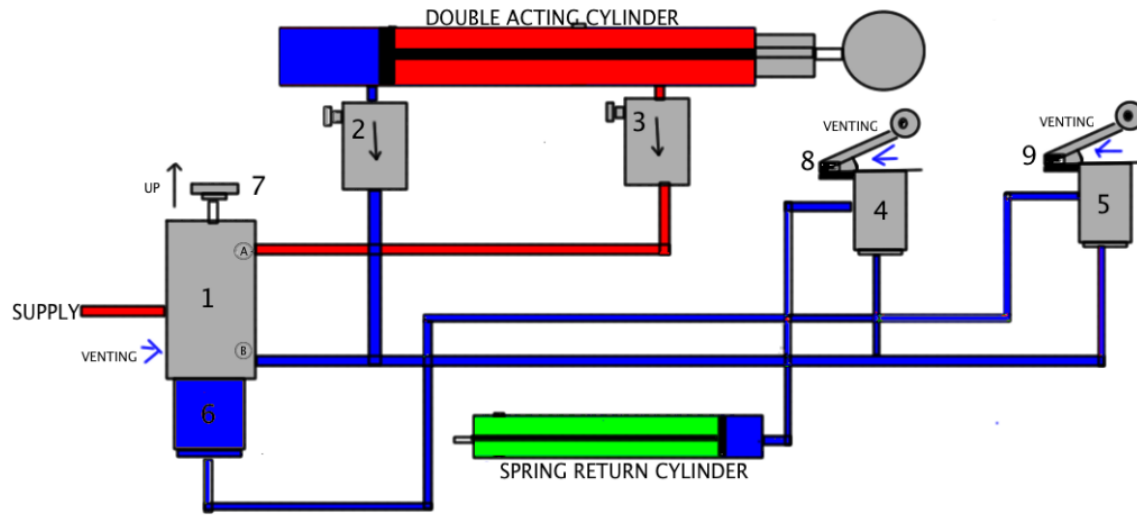
Part No.	Model No.	Type
1	MAV-4D	4-WAY VALVE
2,3	MFC-2	FLOW CONTROL
4,5	MAV-3	3-WAY VALVE
6	MPA-3	ACTUATOR
7	PUSH BUTTON	
8,9	CAM FOLLOWER	

ANALYSIS:

When the piston is pushed to part 9, it'll push part 9 down. The pressure at the bottom of 5 flows to 6, part 6 will push the stem in part 1 up.

ONE CYCLE THEN RESET

PART 5



Part No.	Model No.	Type
1	MAV-4D	4-WAY VALVE
2,3	MFC-2	FLOW CONTROL
4,5	MAV-3	3-WAY VALVE
6	MPA-3	ACTUATOR
7	PUSH BUTTON	
8,9	CAM FOLLOWER	

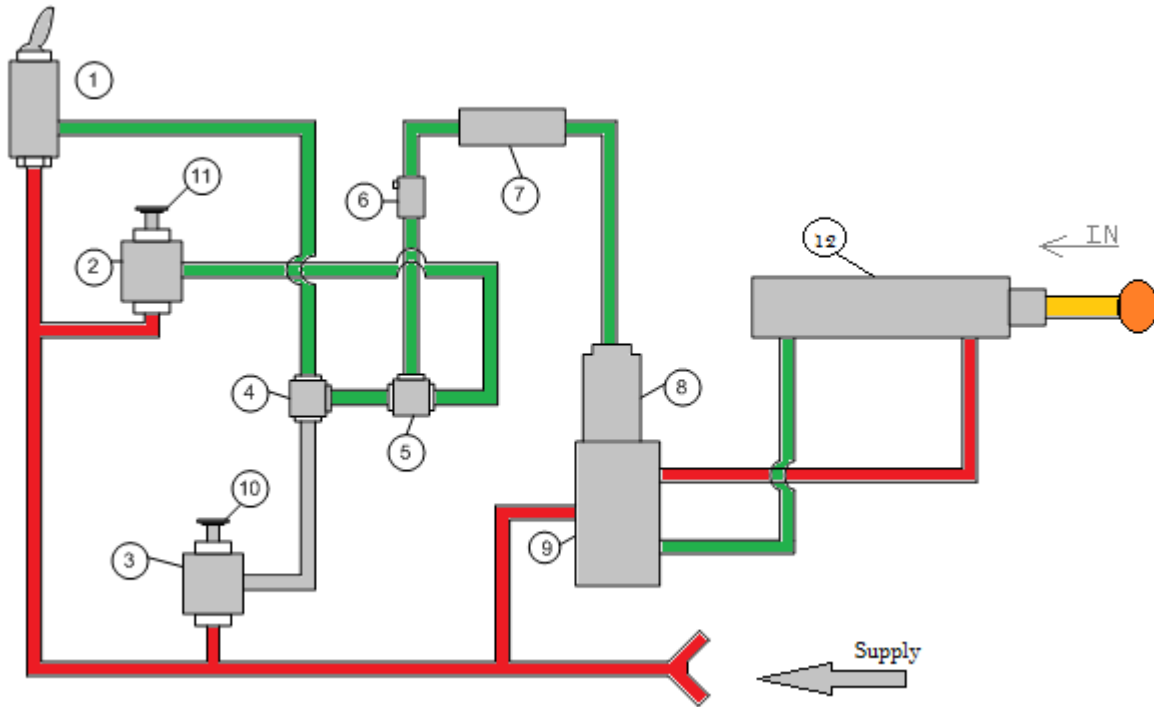
ANAYLSIS:

When the stem on part 1 goes up, the pressure will go from 1B to 1A. When this occurs the pressure will flow through 3 and causes the piston to return. The pressure in the left side of the Double Acting Cylinder will pass through 2 and will vent from 1B. Part 2 will control venting when the piston is returning. We can control how fast the piston of the Double Acting Cylinder will return by adjusting the knob at part 2.

This system acts by the Double Acting Cylinder making on cycle and the Single Return Cylinder making one cycle as well automatically.

DOOR OPENER - DELAY SHUT

PART 1



Part No.	Model No.	Type
1	MTV-3	Toggle
2,3	MAV-3	3-Way Valve
4,5	MSV-1	Shuttle
6	MFC-2	Flow Control
7	MAR-50	Air Tank
8	MPA-3	Actuator
9	MAV-4	4-Way Valve
10,11	Push Button	Push Button
12	Double Acting Cylinder	Double Acting Cylinder

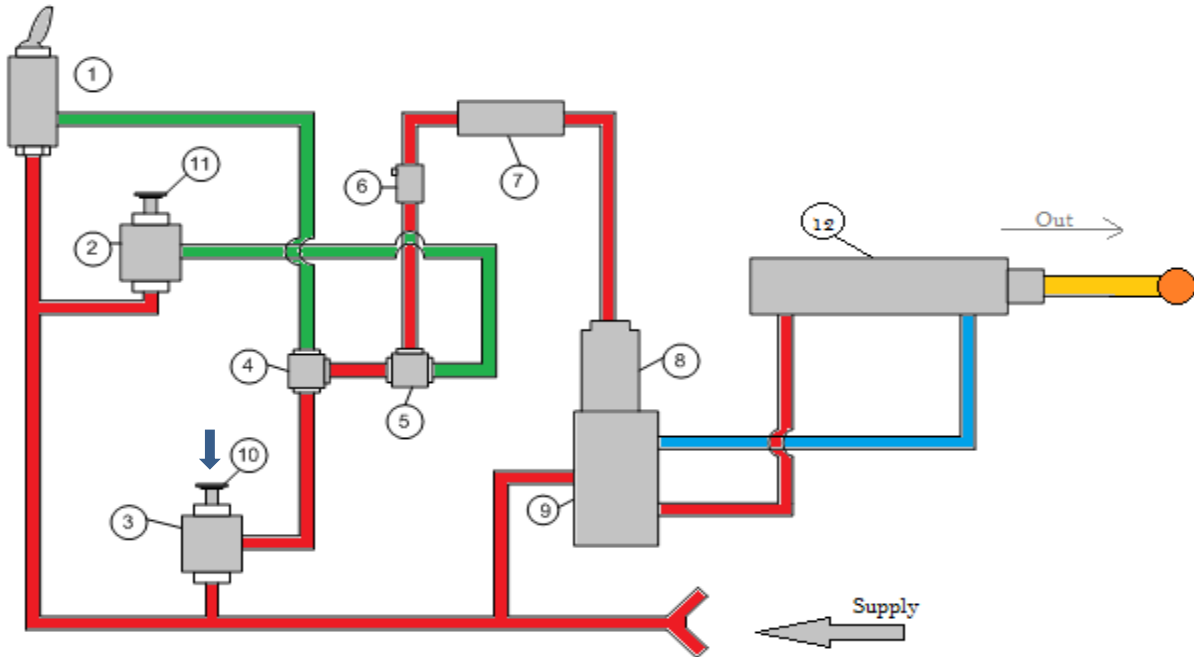
PRESSURE
VENTING
NEUTRAL

Analysis:

In the first stage of this circuit, when the pressure is apply, nothing will happen because the pressure will fill the right side of the double acting cylinder and so the piston will be in.

DOOR OPENER - DELAY SHUT

PART 2



Part No.	Model No.	Type
1	MTV-3	Toggle
2,3	MAV-3	3-Way Valve
4,5	MSV-1	Shuttle
6	MFC-2	Flow Control
7	MAR-50	Air Tank
8	MPA-3	Actuator
9	MAV-4	4-Way Valve
10,11	Push Button	Push Button
12	Double Acting Cylinder	Double Acting Cylinder

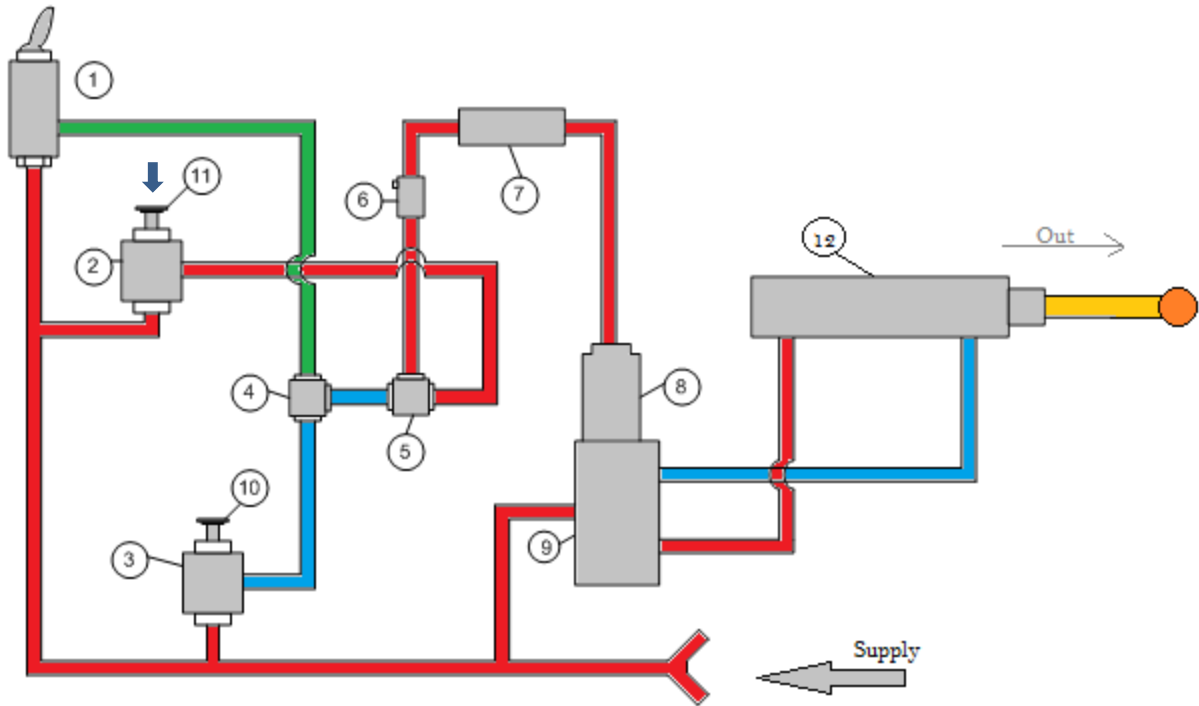


Analysis:

When stem is pushed down on #3 and up on #2, the pressure will go through #3 to #4 causing the ball at #4 to move up and let pressure vent through the right, the pressure then travel to #5 causing the ball to move to the left and letting the air vent through the top leading to #6 which control the pressure and then #7 and #8. Once the pressure goes through #8 it will push the stem down on #9 allowing the pressure to go through the bottom sector of #9 and straight to #13 causing #13 to shoot out.

DOOR OPENER - DELAY SHUT

PART 3



Part No.	Model No.	Type
1	MTV-3	Toggle
2,3	MAV-3	3-Way Valve
4,5	MSV-1	Shuttle
6	MFC-2	Flow Control
7	MAR-50	Air Tank
8	MPA-3	Actuator
9	MAV-4	4-Way Valve
10,11	Push Button	Push Button
12	Double Acting Cylinder	Double Acting Cylinder

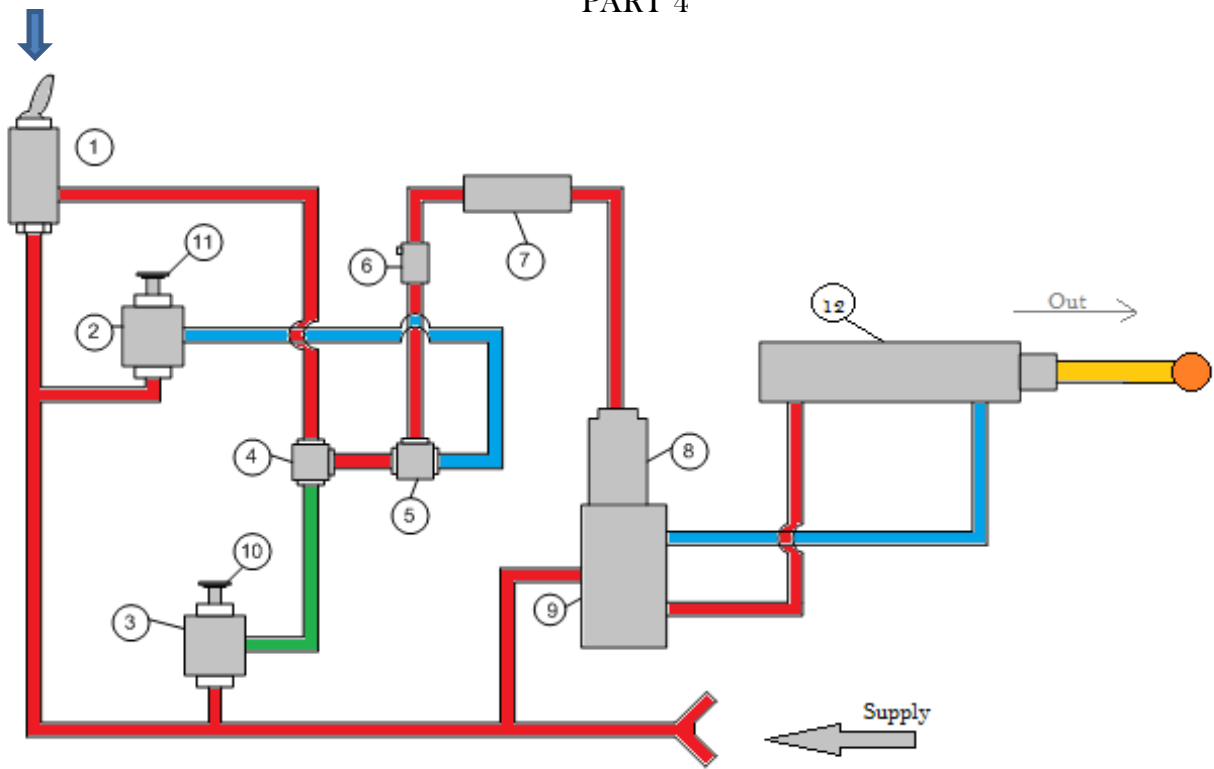
PRESSURE █
 VENTING █
 NEUTRAL █

Analysis:

When stem is push down on #2 the pressure will go through #2, next to #5 causing the ball to move to the left and letting the air vent through the top leading to #6 which control the pressure and then #7 and #8. Once the pressure goes through #8 it will push the stem down on #9 allowing the pressure to go through the bottom sector of #9 and straight to #12 causing #12 to shoot out.

DOOR OPENER - DELAY SHUT

PART 4



Part No.	Model No.	Type
1	MTV-3	Toggle
2,3	MAV-3	3-Way Valve
4,5	MSV-1	Shuttle
6	MFC-2	Flow Control
7	MAR-50	Air Tank
8	MPA-3	Actuator
9	MAV-4	4-Way Valve
10,11	Push Button	Push Button
12	Double Acting Cylinder	Double Acting Cylinder

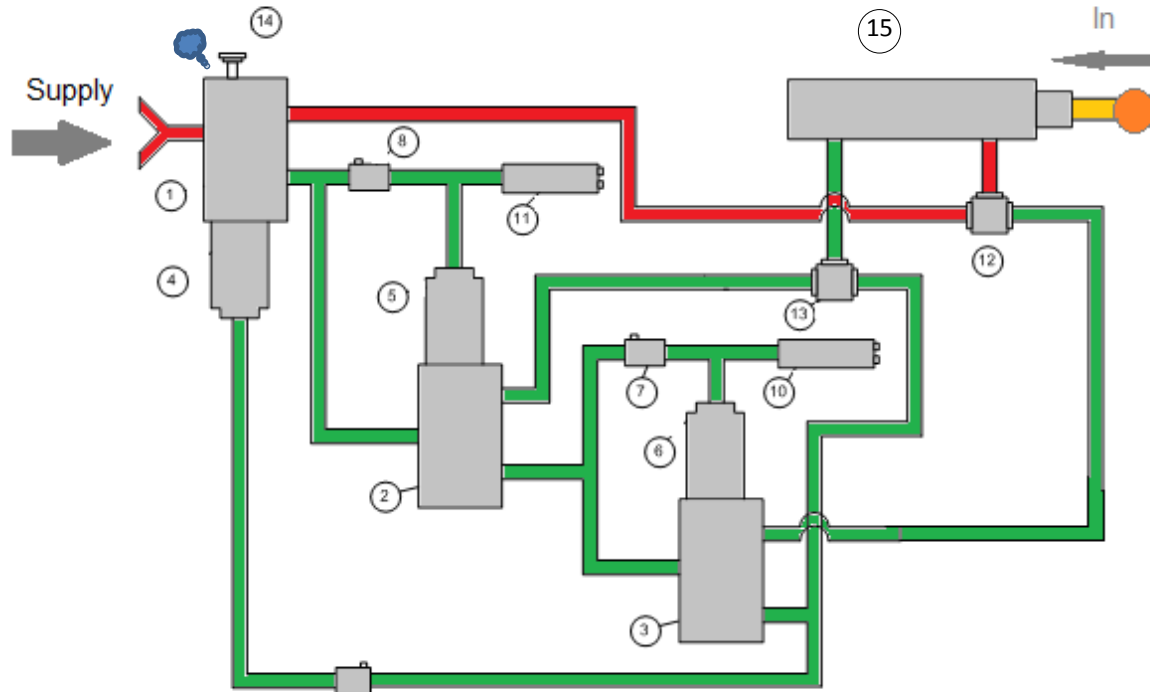


Analysis:

When you activate #1, pressure go through #4, #5, #6 and #7 and activate #8 which causes pressure to flow through the bottom sector of #9 and so the piston shoot out.

Momentary Valve Activation - 2 Cycles of Cylinder

PART 1



Part Number	Model Name	Type
1,2,3	MAV-4	4-Way Valve
4,5,6	MPA-3	Actuator
7,8,9	MFC-2	Flow Control
10,11	MAT-50	Air Tank
12,13	MSV-1	Shuttle
14	Push Button	Push Button
15	Double Acting	Cylinder

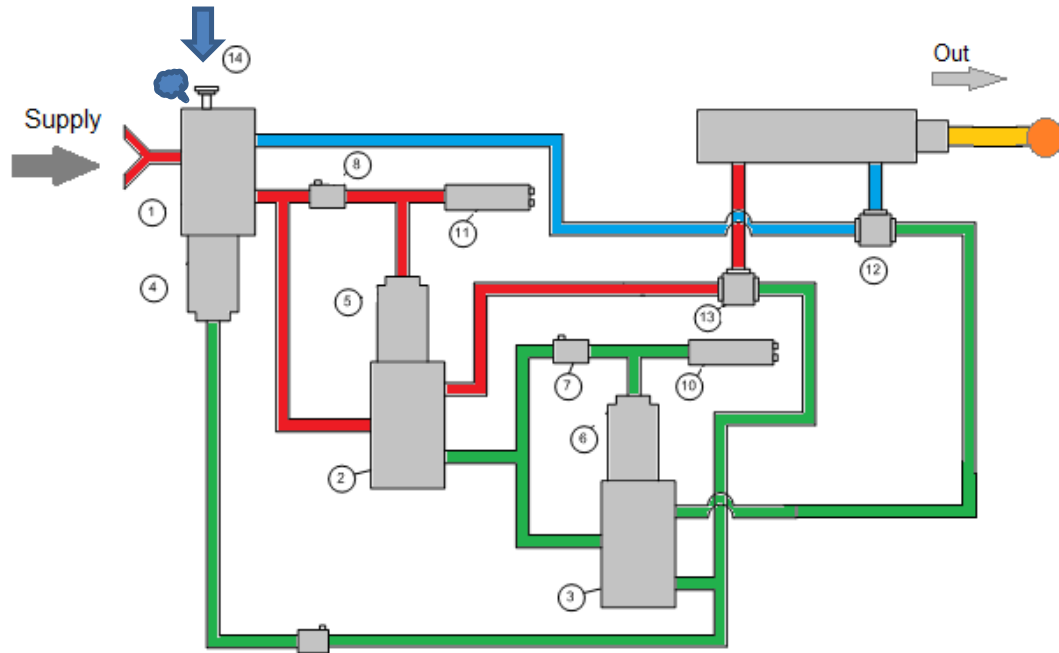
PRESSURE █
 VENTING █
 NEUTRAL █

Analysis:

When the pressure is apply, it will flow through the actuator #1 and fill the right chamber of the double acting cylinder. The pressure entering the right chamber of the double acting cylinder causes the piston not to shoot out.

Momentary Valve Activation - 2 Cycles of Cylinder

PART 2



Part Number	Model Name	Type
1,2,3	MAV-4	4-Way Valve
4,5,6	MPA-3	Actuator
7,8,9	MFC-2	Flow Control
10,11	MAT-50	Air Tank
12,13	MSV-1	Shuttle
14	Push Button	Push Button
15	Double Acting	Cylinder

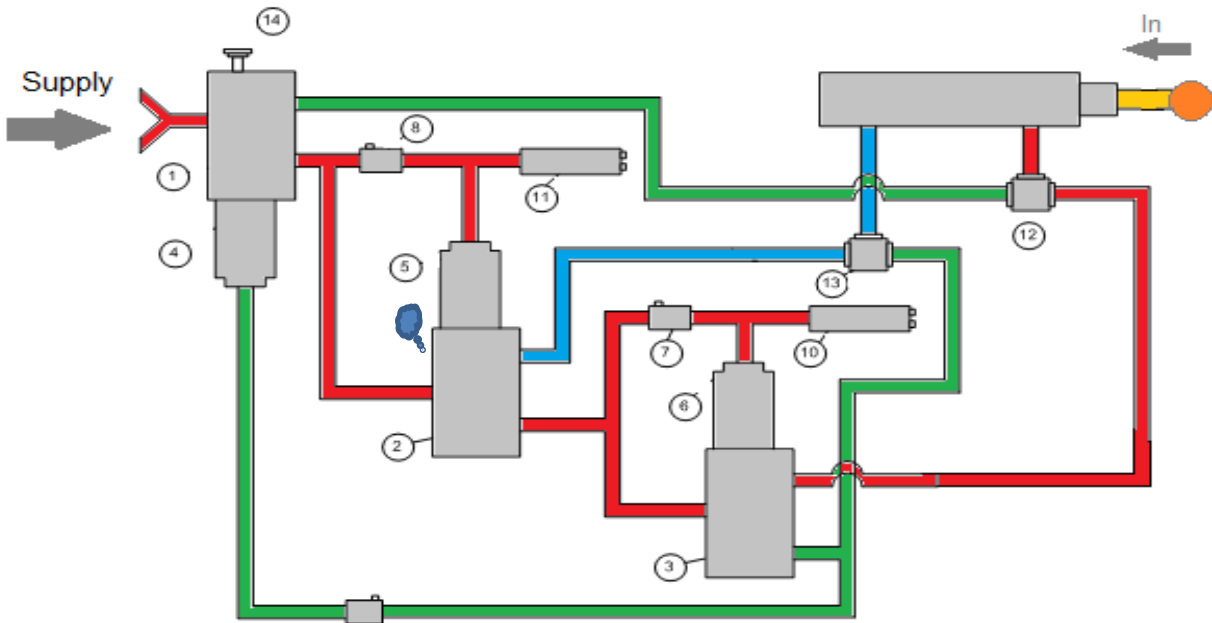


Analysis:

When the push bottom #14 is pushed down, the pressure will pass through #1 (4-way valve). Then the pressure will go through #8 and #2 (4 way valve). When the #11 fills up the pressure will move to #5 through #13, which will result of moving the ball to the right.

Momentary Valve Activation - 2 Cycles of Cylinder

PART 3



Part Number	Model Name	Type
1,2,3	MAV-4	4-Way Valve
4,5,6	MPA-3	Actuator
7,8,9	MFC-2	Flow Control
10,11	MAT-50	Air Tank
12,13	MSV-1	Shuttle
14	Push Button	Push Button
15	Double Acting	Cylinder

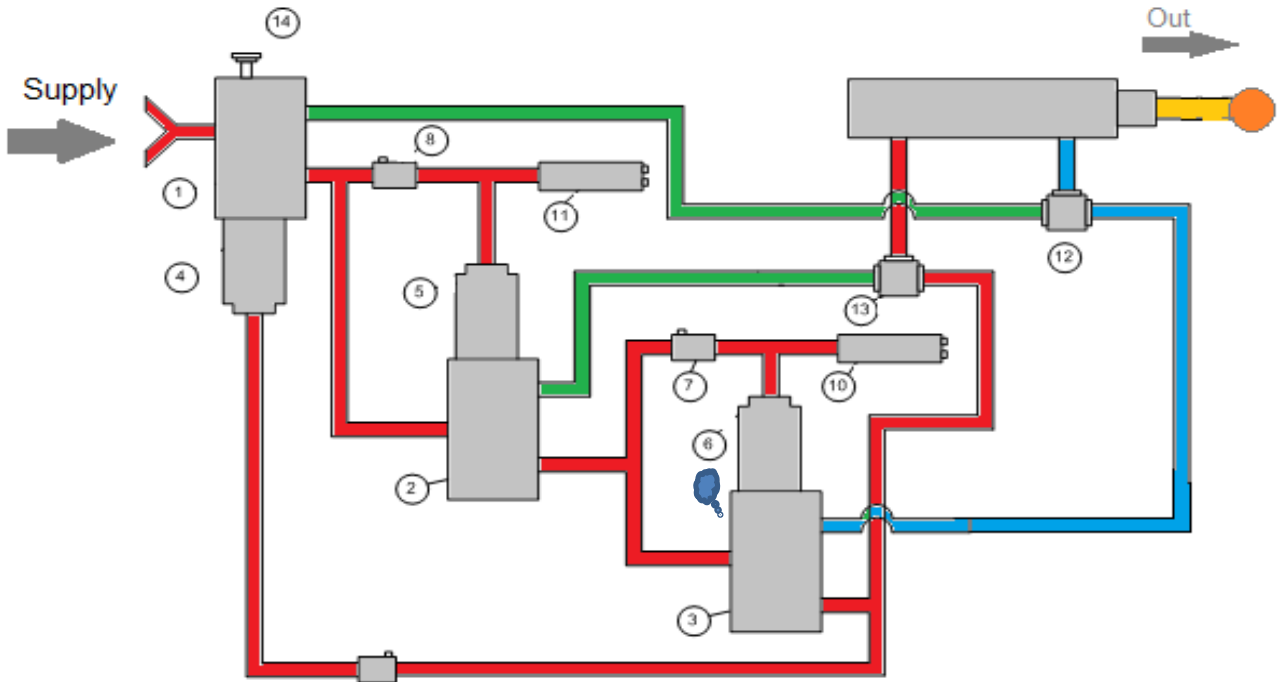
PRESSURE █
 VENTING █
 NEUTRAL █

Analysis:

When the tank fill up, pressure go to the 4 way valve #2 and since the actuator #5 is activated, pressure will flow through the bottom sector of #2 and flow to #7 fill up the tank and move to actuator #6 and then continue flowing to the right chamber of the double acting cylinder and causing the piston to return.

Momentary Valve Activation - 2 Cycles of Cylinder

PART 4



Part Number	Model Name	Type
1,2,3	MAV-4	4-Way Valve
4,5,6	MPA-3	Actuator
7,8,9	MFC-2	Flow Control
10,11	MAT-50	Air Tank
12,13	MSV-1	Shuttle
14	Push Button	Push Button
15	Double Acting	Cylinder

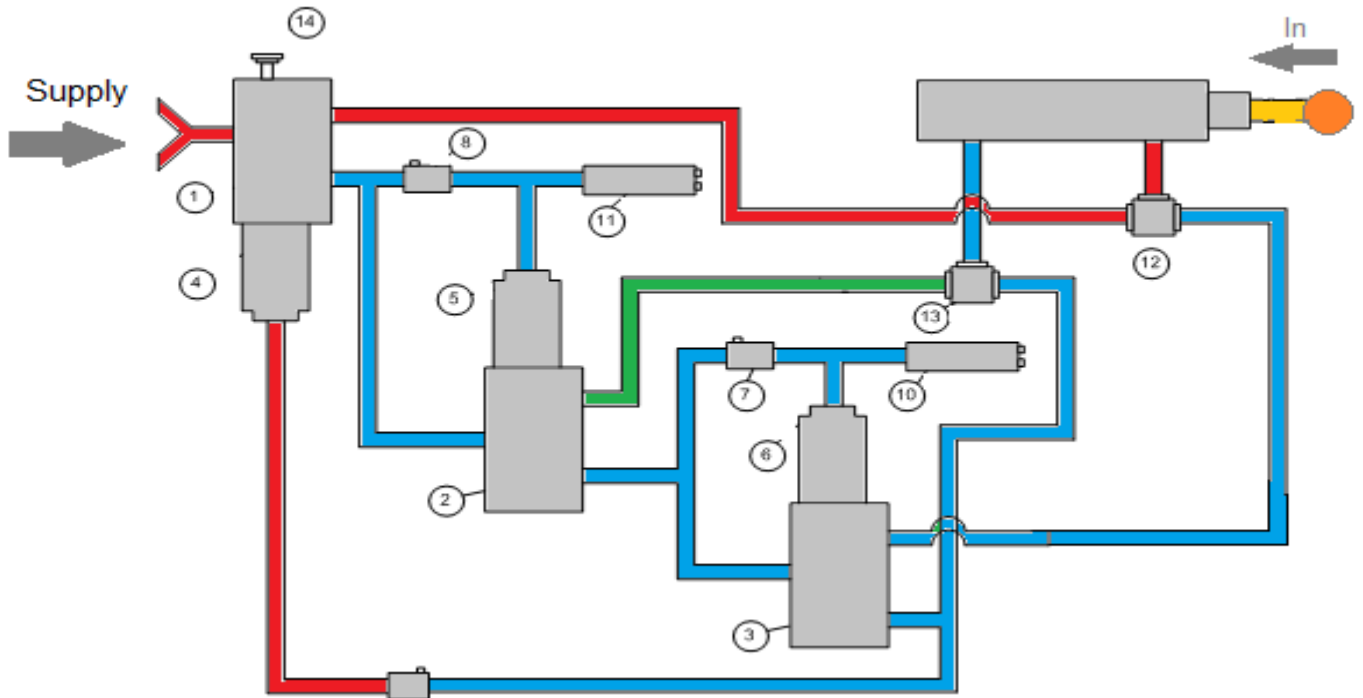
PRESSURE █
 VENTING █
 NEUTRAL █

Analysis:

When the tank #10 fill up, pressure go to the 4 way valve #3 and since the actuator #6 is activated, pressure will flow through the bottom sector of #3 and flow to #9 and #13 and then flow to the left chamber of the double acting cylinder causing the piston to shoot out.

Momentary Valve Activation - 2 Cycles of Cylinder

PART 5



Part Number	Model Name	Type
1,2,3	MAV-4	4-Way Valve
4,5,6	MPA-3	Actuator
7,8,9	MFC-2	Flow Control
10,11	MAT-50	Air Tank
12,13	MSV-1	Shuttle
14	Push Button	Push Button
15	Double Acting	Cylinder

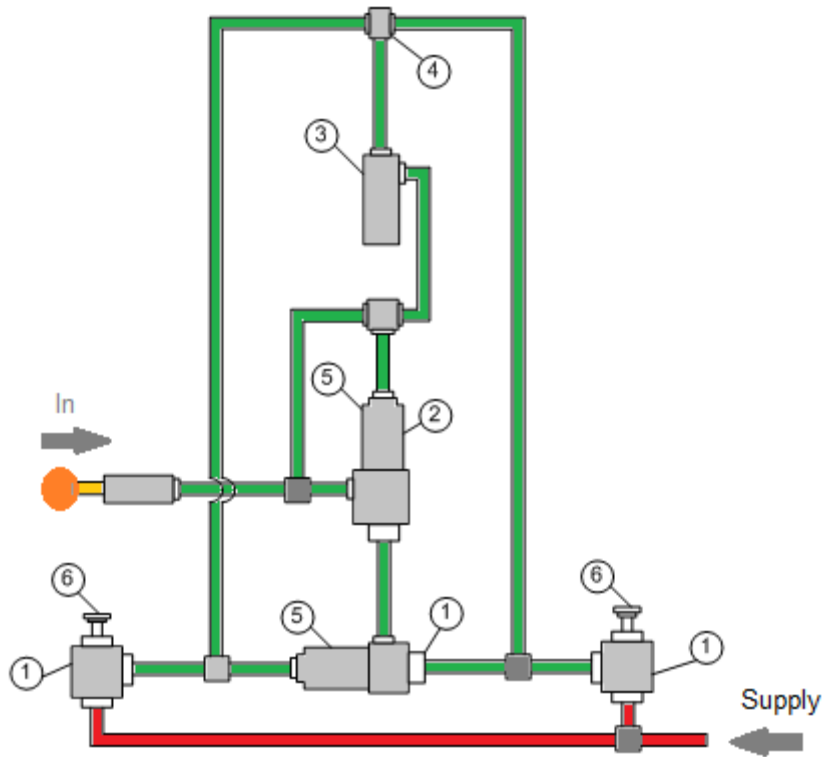
PRESSURE █
 VENTING █
 NEUTRAL █

Analysis:

When the pressure enter through #9 (flow control), it will cause bottom #14 to go down and so pressure will flow through the upper sector of the 4 way valve #1 and fill up the right chamber of the double acting cylinder causing the piston to return.

Two Hand No Tie-Down Circuit

PART 1



Part Number	Model Name	Type
1	MAV-3	3-Way Valve
2	MJV-3	3 Way Valve
3	MPV-3	Pulse Valve
4	MSV-1	Shuttle Valve
5	MPA-3	Actuator
6	Push Button	
7	Spring Return	Cylinder

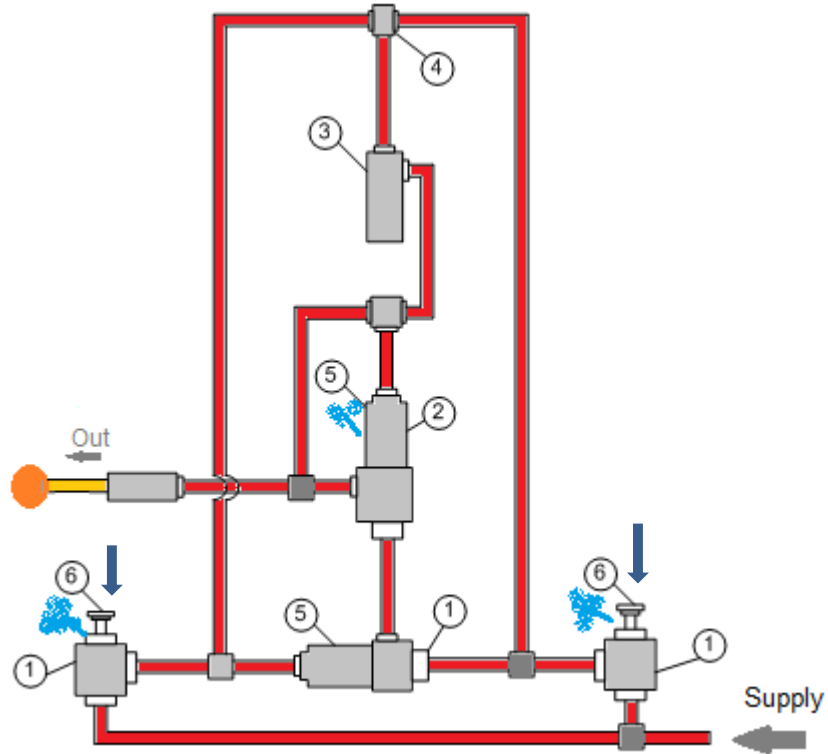
PRESSURE
VENTING
NEUTRAL

Analysis:

When the pressure goes in from the supply, nothing happened because the push buttons are not activated.

Two Hand No Tie-Down Circuit

PART 2



Part Number	Model Name	Type
1	MAV-3	3-Way Valve
2	MJV-3	3 Way Valve
3	MPV-3	Pulse Valve
4	MSV-1	Shuttle Valve
5	MPA-3	Actuator
6	Push Button	
7	Spring Return	Cylinder

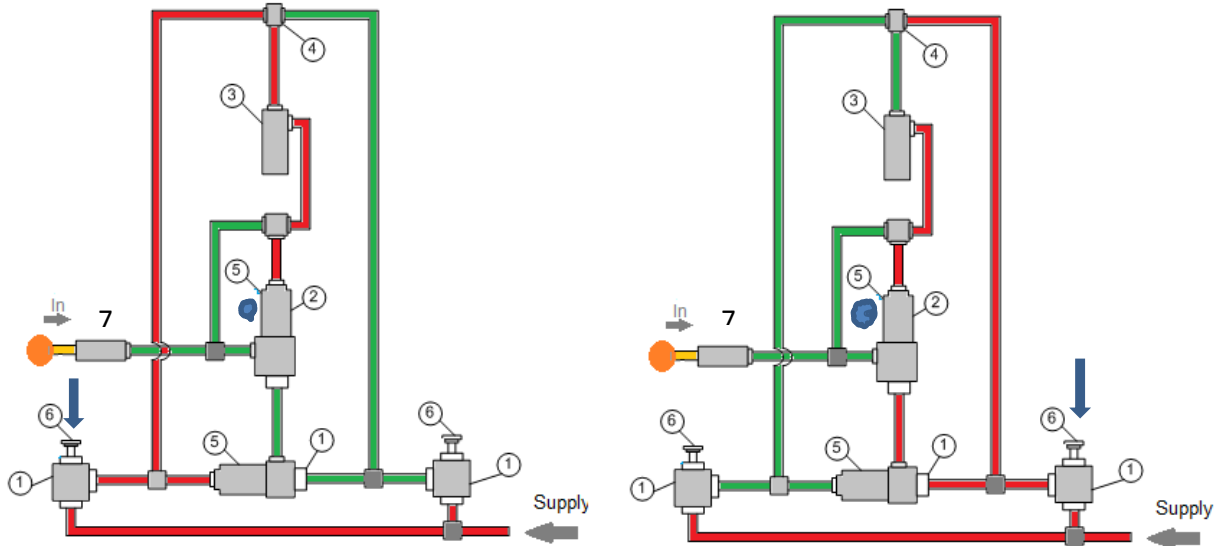
PRESSURE
VENTING
NEUTRAL

Analysis:

When both Push buttons are press at the same time, pressure will flow and cause the spring return cylinder to open.

Two Hand No Tie-Down Circuit

PART 3



Part Number	Model Name	Type
1	MAV-3	3-Way Valve
2	MJV-3	3 Way Valve
3	MPV-3	Pulse Valve
4	MSV-1	Shuttle Valve
5	MPA-3	Actuator
6	Push Button	
7	Spring Return	Cylinder

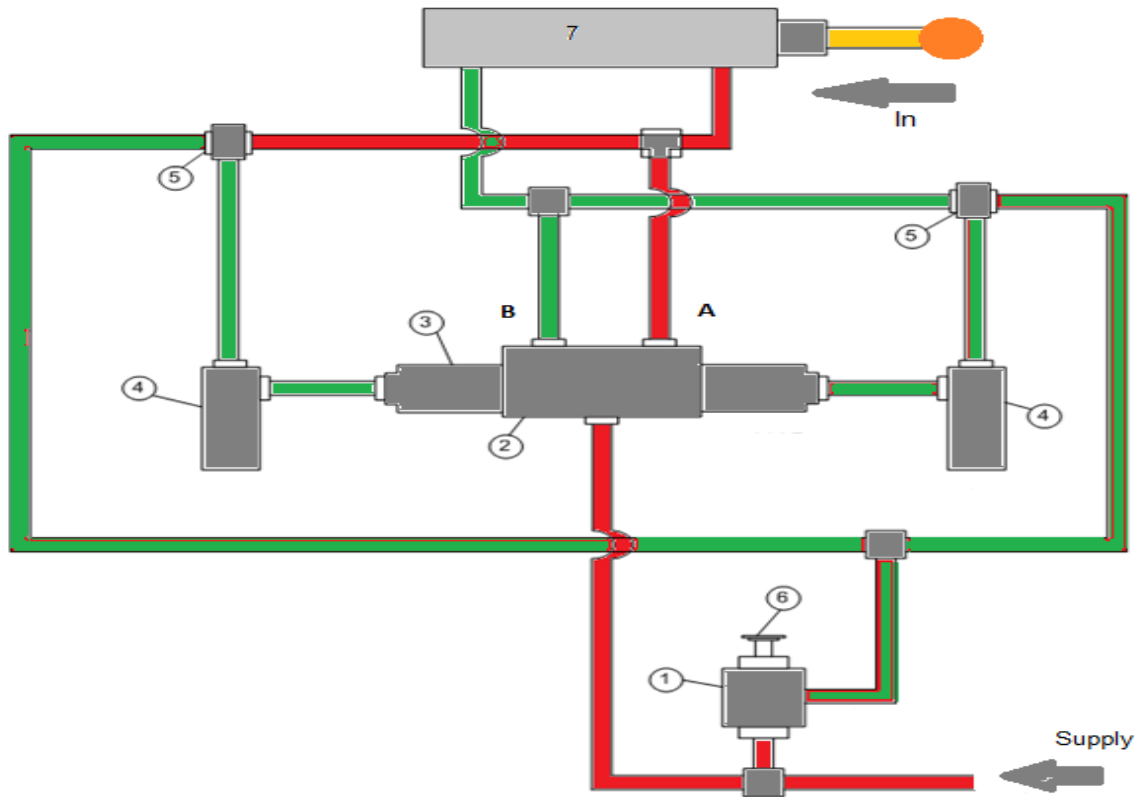


Analysis:

When only one push button is pressed at a time, the spring return cylinder will not shoot out the piston. Since there will be venting in #5, the pressure will never flow to the spring return cylinder.

Single Input Flip-Flop, Reverse Cycling

Part 1



Part Number	Model Name	Type
1	MAV-3	3-Way Valve
2	MAV-4D	4 Way Valve
3	MPA-3	Actuator
4	MPV-3	Pulse Valve
5	MSV-1	Shuttle Valve
6	Push Button	
7	Double Acting	Cylinder

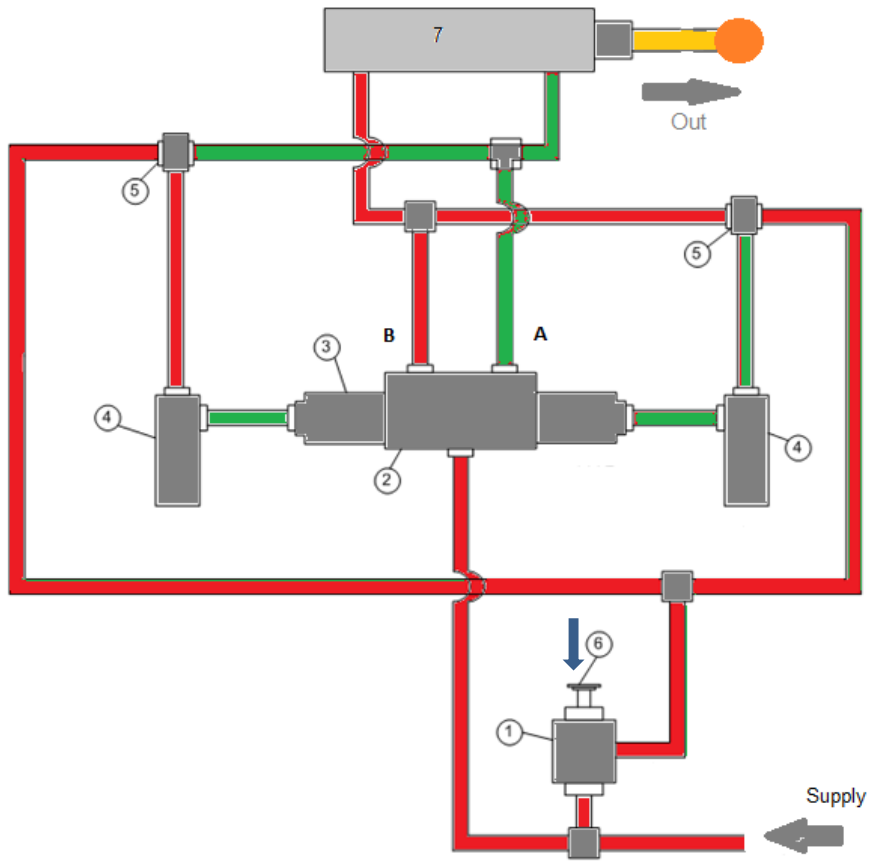
PRESSURE █
 VENTING █
 NEUTRAL █

Analysis:

In the first stage, if no action is taken then the pressure will fill the right sector of the double acting cylinder and so the piston will be inside the cylinder.

Single Input Flip-Flop, Reverse Cycling

Part 2



Part Number	Model Name	Type
1	MAV-3	3-Way Valve
2	MAV-4D	4 Way Valve
3	MPA-3	Actuator
4	MPV-3	Pulse Valve
5	MSV-1	Shuttle Valve
6	Push Button	
7	Double Acting	Cylinder

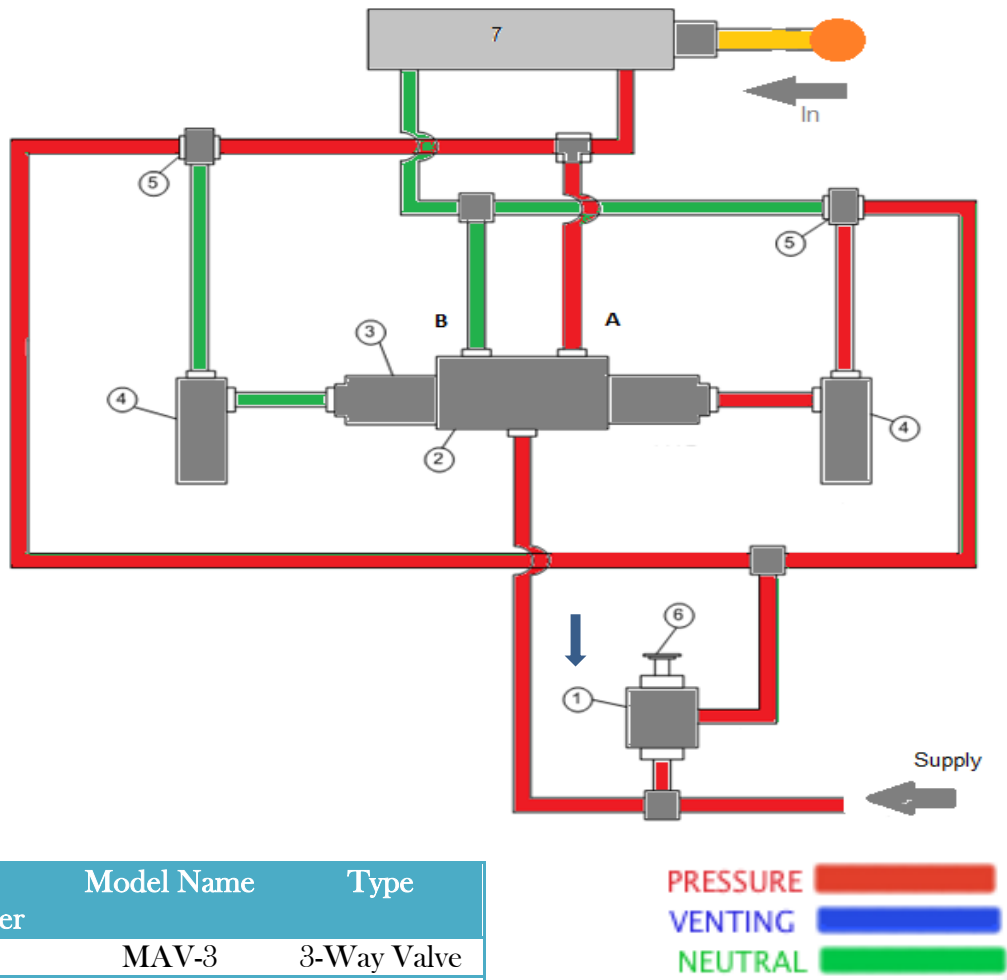
PRESSURE █
 VENTING █
 NEUTRAL █

Analysis:

When the push button #6 is press down, pressure flows through the left sector of the double acting cylinder and causes the piston to shoot out.

Single Input Flip-Flop, Reverse Cycling

Part 3



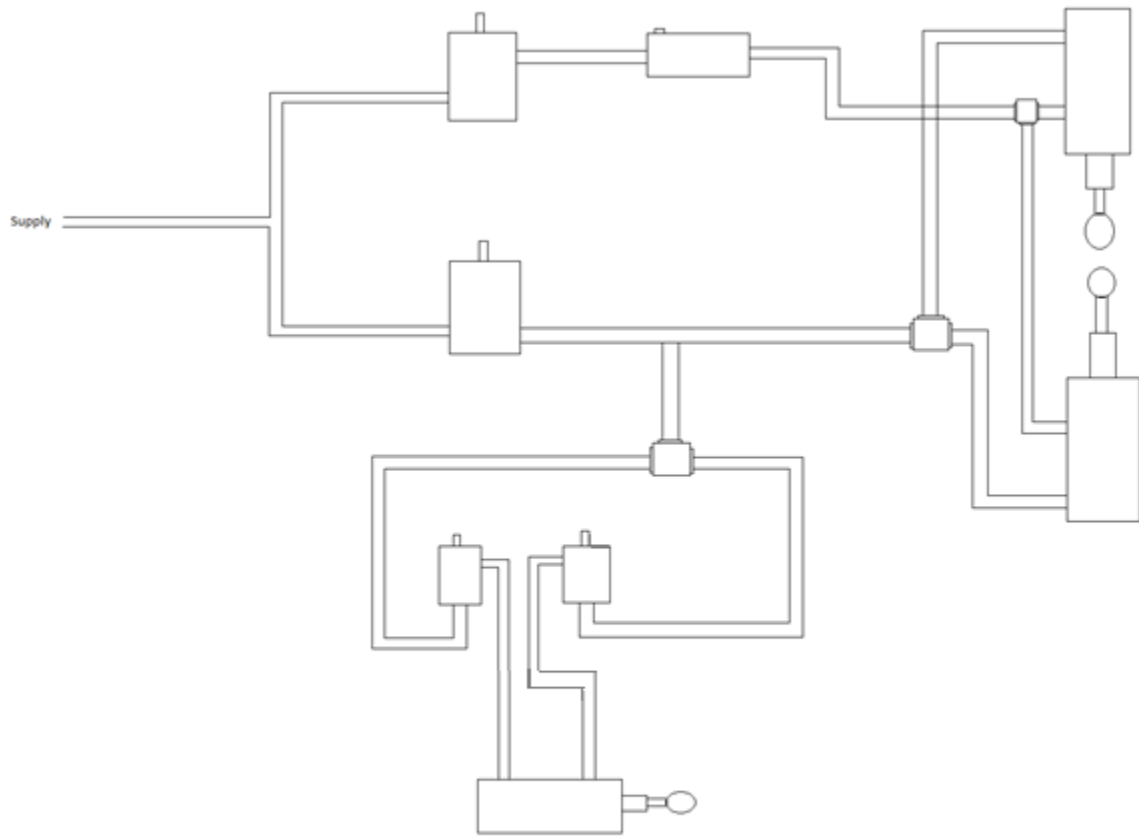
Part Number	Model Name	Type
1	MAV-3	3-Way Valve
2	MAV-4D	4 Way Valve
3	MPA-3	Actuator
4	MPV-3	Pulse Valve
5	MSV-1	Shuttle Valve
6	Push Button	
7	Double Acting	Cylinder

Analysis:

When the push button #6 is press down again, pressure will flow entering the 4 way valve and going through part causing the piston to return to its original position.

Simple Handicap Elevator

Our Own system



CONCLUSION

The objective of this experiment was to first identify each piece of inventory and determine how many we had. Then we had to construct each circuit and to identify the outcome. We learned that these are the concepts of further experiments that will be explained in greater details. These are the building blocks of advanced mechanism and these experiments showed us the horizons of pneumatic basics in circuits. Making the circuits was very easy but the lack or detrition of the equipment slowed us down. The application we used was paint and making the circuits was quiet easy.