Hydraulics Technology 3: Advanced Hydraulics and Electro-Hydraulics

SKILL 7A: COMPARING 4/3 VALVES

Name	Class/Period	Date

1. Overview

In this Skill Drill, you will observe and compare the hydraulic behavior of three 4/3 valves: the closed center, open center, and spring-centered tandem valves. The integration of two pressure gauges and a flow meter will help you do this.

2. Performance Objectives

- Identify causes of pressure and flow rate drops in a circuit.
- Understand efficient versus inefficient systems.
- Compare different 4/3 valves.

3. Required Materials

- JMTS panel
- Oil tray
- Hydraulic power pack
- Hoses of different lengths
- 4/3 hand-operated closed-center valve
- 4/3 hand-operated open-center valve
- 4/3 sol-sol tandem valve
- Double-acting cylinder
- Two pressure gauges
- Flow meter
- Power supply module
- Operational module
- Electrical cables of different lengths
- Rags or paper towels
- Hex driver
- Safety glasses

4. Panel Setup

Secure the components to the panel as shown:

5. Inventory and Safety

Before beginning the Skill Drill, review this checklist and mark off each item as you complete it.

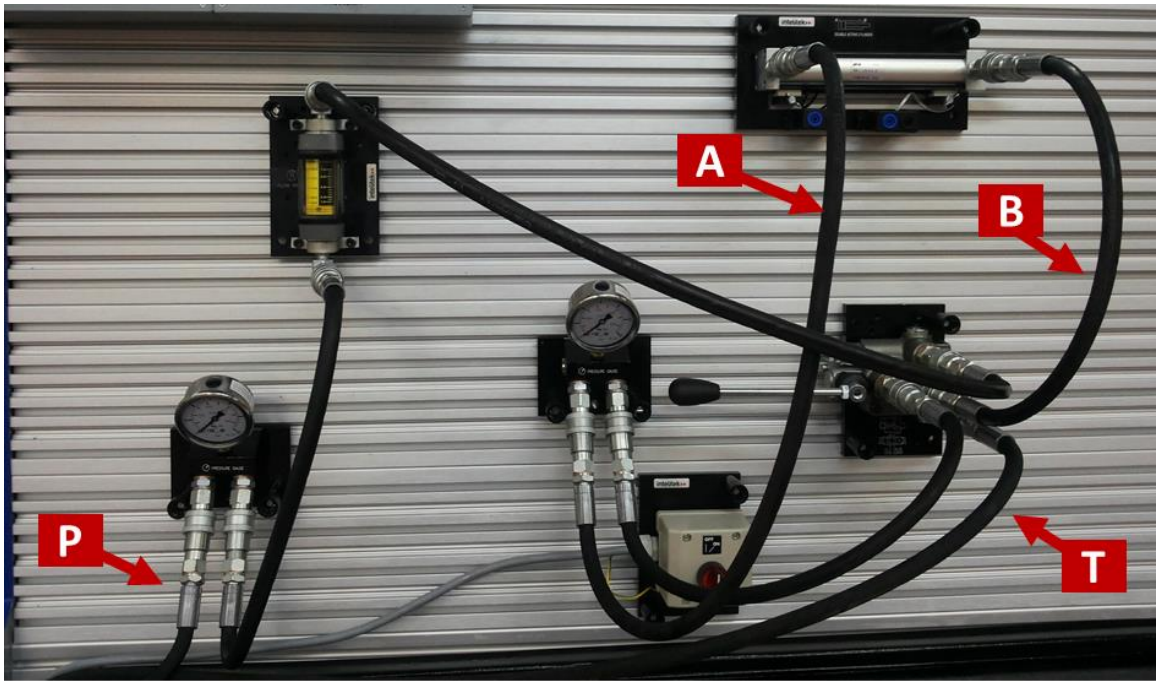
- ☐ All hardware components required for this Skill Drill are mounted on the panel.
- ☐ The hardware is mounted securely to the panel.
- ☐ The power pack is off, and the pressure gauge reads zero.
- ☐ The power supply module is off.
- ☐ You are wearing safety glasses.
- ☐ Hands, hair, and clothing are securely away from the work area of any moving parts.
- ☐ You are standing an arm's length away from the panel.
- ☐ The work area is clean and devoid of food or drink.

⃠ *Warning: Oil may leak from components and hoses. Be aware of oil leaking after disconnecting hoses from components. Do not get oil on your clothing!*

6. Skill Drill

Perform this procedure:

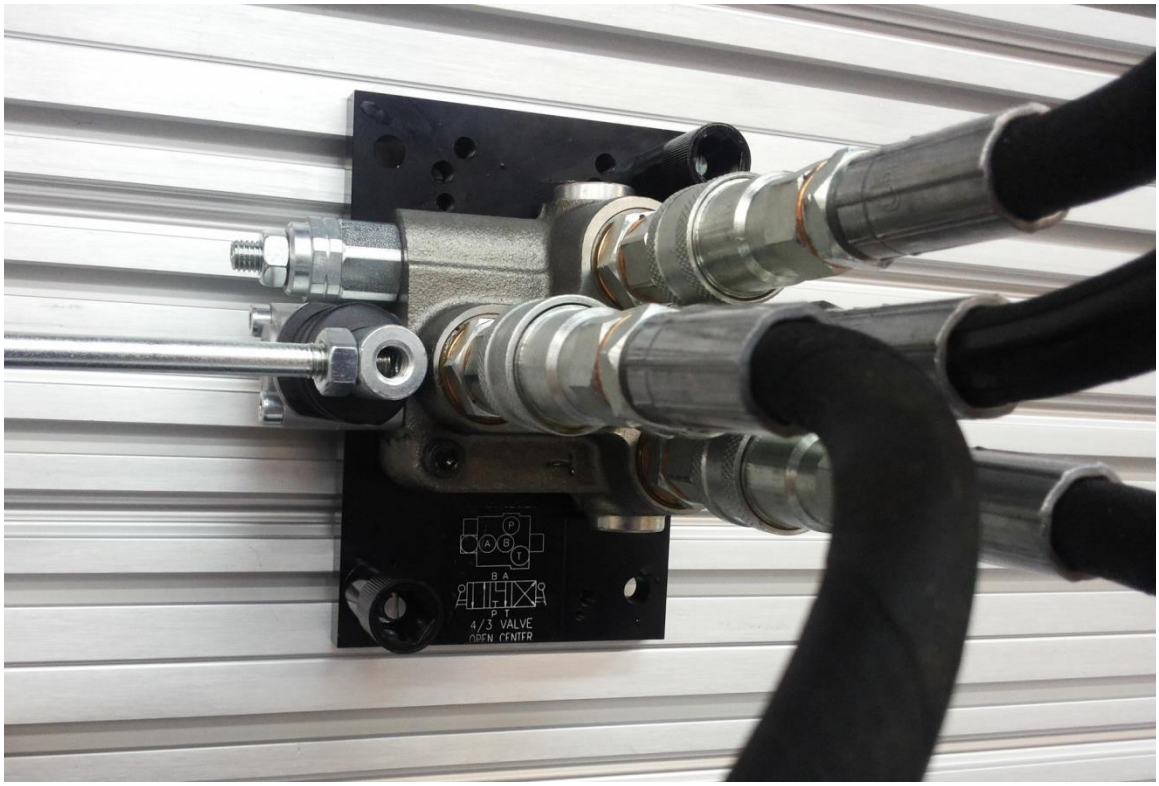
1. Make the following hydraulic connections. The order of connection is irrelevant.
    - Connect the power pack's pressure-out port to the left-side port of the left pressure gauge.
    - Connect the right side port of the left pressure gauge to the lower port of the flow meter.
    - Connect the upper port of the flow meter to port P of the 4/3 closed-center valve.
    - Connect port B of the 4/3 valve to the forward port of the cylinder.
    - Connect port A of the 4/3 valve to either port of the right pressure gauge.
    - Connect the gauge's other port to the rear port of the cylinder.
    - Connect port T of the 4/3 valve to the power pack's return line port.



2. Turn the power pack on.
3. Shift the lever of the 4/3 closed-center valve back and forth through all three positions to extend and retract the cylinder. Observe and record (in the appendix) the pressure gauge and flow meter levels during and after retraction/extension, as well as when the 4/3 valve is in the center position (position #1).
4. Turn the power pack off.

5. Disconnect the closed-center valve and replace it with the 4/3 hand-operated, open-center valve. Use the hex wrench to tighten the bolts of the valve's plate and ensure that it is mounted securely.

6. Re-connect the hoses to the valve as you did for the closed-center valve.



7. Turn the power pack on.

8. Shift the lever of the 4/3 open-center valve back and forth through all three positions to extend and retract the cylinder. Observe and record (in the appendix) the pressure gauge and flow meter levels during and after retraction/extension, as well as when the 4/3 valve is in the center position (position #1).

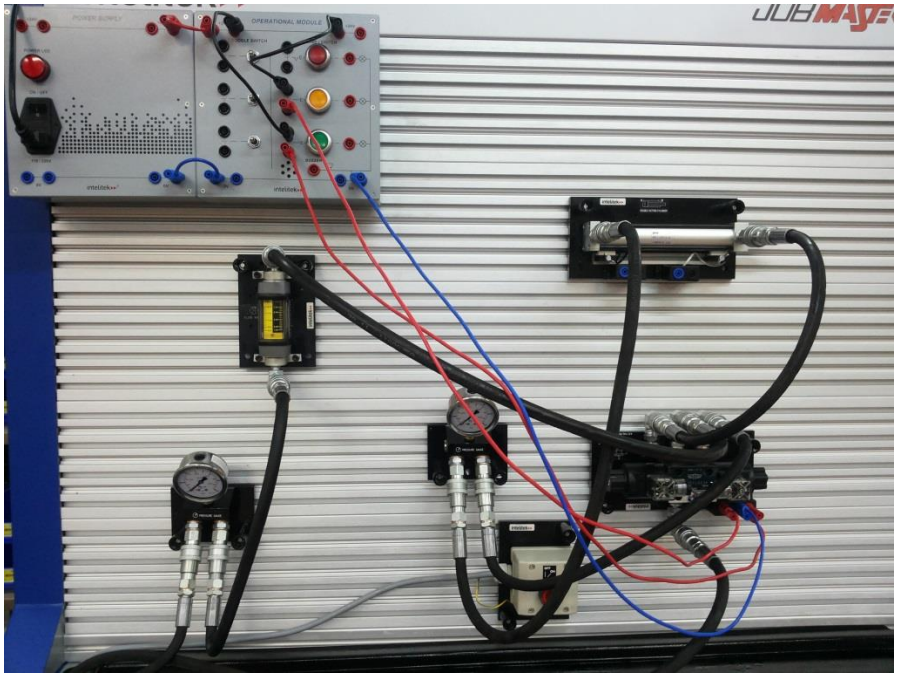
9. Turn the power pack off.

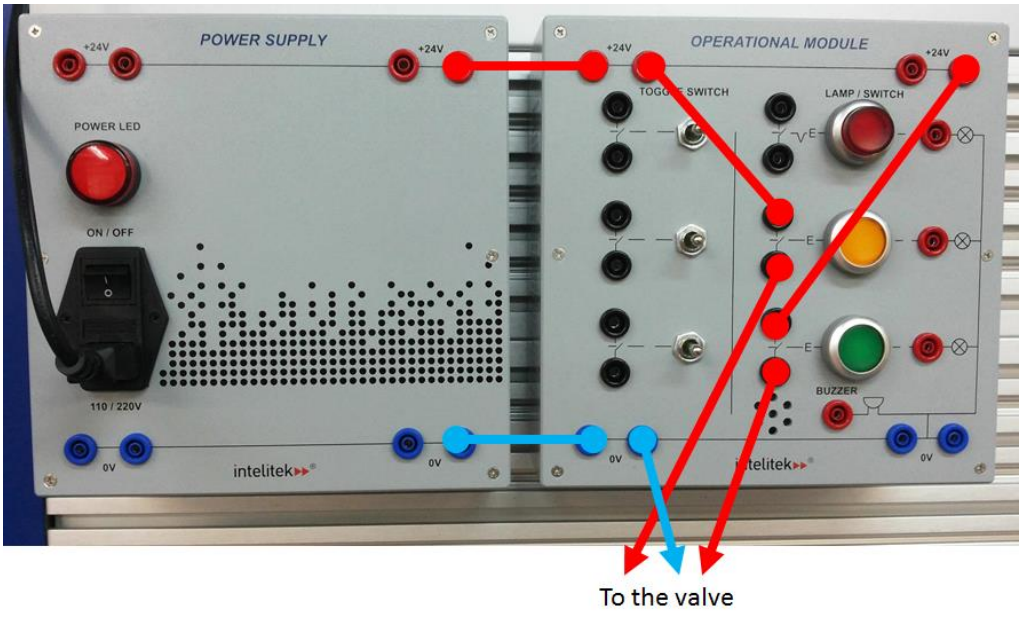
10. Disconnect the open-center valve and replace it with the 4/3 sol-sol, spring-centered tandem valve. Use the hex wrench to tighten the bolts of the valve's plate and ensure that it is mounted securely.

11. Re-connect the hoses to the valve as you did for the first two valves.

12. Make electrical connections between the power supply, operational module, and 4/3 valve so that the circuit behaves in the following manner. (See the connection schematic below for more connection help.)

    - A sustained pressing of the operational panel's middle button (PB1) extends the cylinder.
    - A sustained pressing of the operational panel's lower button (PB2) retracts the cylinder.
    - When neither button is pressed, the valve is the center position.





13. Turn the power supply module on.
14. Turn the power pack on.
15. Press the push buttons to extend and retract the cylinder. Observe and record (in the appendix) the pressure gauge and flow meter levels during and after retraction/extension, as well as when the 4/3 valve is in the center position.
16. Turn the power pack off.
17. Turn the power supply module off.
18. Discuss your observations with your classmates and your instructor. Be prepared to demonstrate this Skill Drill to your instructor.

7. Authentic Skill Assessment

Have your instructor verify that your work meets the requirements in the Performance Objectives and sign below. Place this Skill Drill Sheet in your Skills binder.

Instructor Signature	Date

8. Shutdown

Unless instructed otherwise by your teacher, review and complete each of the items of the checklist below.

- ☐ Switch off the power pump.
- ☐ Switch off the power supply module.
- ☐ Clean any oil spills using rags or paper towels.
- ☐ Disconnect all hoses and put them away.
- ☐ Remove the components mounted on the JMTS panel and store them securely unless instructed otherwise by your teacher.
- ☐ Check whether all materials required for this activity have been returned to their proper place at your lab station.

9. Appendix: Recording Data

Enter your results in the tables below. Record any observations and write your conclusions in the lines below the tables.

4/3 Hand-Operated Closed-Center Valve

	Fully Retracted	Retracting	Center Position	Extending	Fully Extended
Left Pressure Gauge					
Right Pressure Gauge					
Flow Meter					

Observations and Conclusions:

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4/3 Hand-Operated Open-Center Valve

	Fully Retracted	Retracting	Center Position	Extending	Fully Extended
Left Pressure Gauge					
Right Pressure Gauge					
Flow Meter					

Observations and Conclusions:

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4/3 Sol-Sol Tandem-Center Valve

	Fully Retracted (PB2 still pressed)	Retracting	Center Position	Extending	Fully Extended (PB1 still pressed)
Left Pressure Gauge					
Right Pressure Gauge					
Flow Meter					

Observations and Conclusions:

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