

Valve Drills

Aim:

To familiarize students with the:

- Operation
- Failure modes
- Emergency procedures involved in the use of a manifold

Mechanical Aspects:

- Activating either valve knob only removes the valve outlet from the system
- The isolator separates the tanks into two independent entities. Interrupts air flow from one cylinder to the other.

Failures

Discuss the likelihood of failures from the standpoint of failure points. For example, a post is unlikely to fail in comparison to a first stage due to the numerous failure points on a first stage compared to a post.

Nine types of valve drills:

1. Right regulator repairable
 - a. Unseated first stage o-ring
2. Right regulator not repairable
 - a. Hose
 - b. Swage
 - c. Extruded o-ring
3. Right post not repairable
 - a. Burst disk
 - b. Tank o-ring
 - c. Barrel o-ring
4. Left regulator repairable:
 - a. Unseated first stage o-ring
5. Left regulator not repairable
 - a. Hose
 - b. Swage
 - c. Extruded o-ring
6. Left post not repairable
 - a. Burst disk
 - b. Tank o-ring
 - c. Barrel o-ring
7. Erroneous Right post either repairable or not
 - a. Failure actually on the left
8. Erroneous left post either repairable or not
 - a. Failure actually on the right
9. No clue where the air is from

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1. Right regulator repairable

Likely problem:

Unseated first stage o-ring

Action:

- Signal buddy and start shutting down the valve.
- Breathe the long hose dry and go on the necklace. Listen for the bubbles to stop. If the bubbles stop, you have isolated the right post first stage as the problem.
- Have buddy check the valve. Buddy comes over and turns air on slowly while observing the regulator and valve. If he sees it is an unseated first stage o-ring, he turns off post, purges the regulator, reseats and turns the valve on and the problem will be solved. The buddy will purge the long hose so the diver can see it, signals that it is okay, and signals to switch back to the long hose.

Decision:

- Check air supply
- Continue with original dive plan if air supply allows.
- Else terminate the dive

Lost resources:

None

2. Right regulator not repairable:

Likely problem:

- Hose
- Swage
- Blown o-ring

Action:

- Signal buddy and start shutting down the valve.
- Breathe the long hose dry and go on the necklace. Listen for the bubbles to stop. If they do, you have isolated the right post first stage as the problem.
- Have buddy check the valve. Buddy comes over and turns on air slowly while observing the regulator and valve. If he sees it is a hose, swage or blown o-ring he turns off the post, taps his buddy on the right shoulder and indicates to the diver that there is a "not repairable" failure on the right regulator.

Decision:

- Diver with failure moves to secure position in team.
- Terminate the dive and return to exit or surface immediately.

Lost resources:

- Primary regulator
- Primary inflation

3. Right post not repairable:

Likely problem:

- Burst disk
- Extruded tank o-ring
- Barrel o-ring

Action:

- Signal buddy and start shutting down the right valve.
- Breathe the long hose dry and go on the necklace. Listen for the bubbles to stop.
- The bubbles don't stop. This would indicate that it is not a first stage failure. Close isolator. Bubbles continue.
- Have buddy check your valves. Buddy confirms that it is a burst disk, tank o-ring, or barrel o-ring. He would tap you on the right shoulder and indicate that there is a "not repairable" failure on the right side of your manifold. Bubbles will continue until right tank has drained.

Decision:

- Diver with failure moves to secure position in team.
- Terminate the dive and return to exit or surface.

Lost resources:

- Primary regulator
- Primary inflation

4. Left regulator repairable:

Likely Problem:

Unseated first stage o-ring

Action:

- Switch light to right hand.
- Signal buddy and start shutting down the valve.
- Purge the necklace dry. Listen for the bubbles to stop. If they do you have isolated the left post first stage as the problem.
- Have buddy check the valve. Buddy comes over and turns on air slowly while observing the regulator and valve. If he sees it is an unseated first stage o-ring, turn off post, purge regulator, reseal and turn valve on to see if it solves the problem, if it does, purge the necklace so the buddy can see it and signal that it is okay.

Decision:

- Check air supply
- Continue with original dive plan if air supply allows.

- Else terminate the dive

Lost resources:

None

5. Left regulator not repairable:

Likely problem:

- Hose
- Swage
- Extruded o-ring

Action:

- Switch light to right hand.
- Signal buddy and start shutting down the left valve.
- Purge the necklace dry. Listen for the bubbles to stop. If they do you have isolated the left post first stage as the problem.
- Have buddy check the valve. Buddy comes over and turns on air slowly while observing the regulator and valve. If he sees it is a hose, swage or blow o-ring, he turns off the post, taps his buddy on the left shoulder and indicates to the divers that the left regulator is not repairable.

Decision:

- Diver with failure moves to secure position in team.
- Terminate the dive and return to exit or surface.

Lost resources:

- Secondary regulator
- Drysuit inflation
- SPG

6. Left post not repairable:

Likely problem:

- a. Burst disk
- b. Extruded tank o-ring
- c. Barrel o-ring

Action:

- Switch light to right hand.
- Signal buddy and start shutting down the left valve.
- Purge the necklace dry. Listen for the bubbles to stop.
- The bubbles don't stop. This would indicate that it is not a first stage failure. Close isolator. Bubbles continue.
- Have buddy check your valves. Buddy confirms that it is a burst disk, tank o-ring or barrel o-ring. He would tap you on the left shoulder and indicate that there is a "not repairable" failure on the left side of your manifold. Bubbles will continue until left tank has drained.

Decision:

- Diver with failure moves to secure position in team.
- Terminate the dive and return to exit or surface.

Lost resources:

- Secondary regulator
- Drysuit inflation
- SPG

7. Erroneous right post either repairable or not:

Likely Problem:

Failure actually on the left

Action:

- Signal buddy and start shutting down the right valve.
- Breathe the long hose dry and go on the necklace. Listen for the bubbles to stop.
- The bubbles don't stop. This would indicate that it is not a first stage failure. Close isolator. Bubbles continue.
- Have buddy check your valves. Buddy confirms that it is a left side failure. It could be either a regulator failure or valve failure. Buddy would turn on the right post and indicate to you that it is working and signal you to switch back to the primary regulator. If it is a first stage failure he would shut down the left post. Bubbles will stop. You know at this point it is a regulator failure. He would then turn your isolator back on and would tap you on the left shoulder and indicate that there is a "not repairable" regulator failure.
- If it is a left post failure, buddy would turn on the right post and indicate to you that it is working and signal you to switch back to the primary regulator. The buddy would then ensure that the isolator is indeed closed, tap you on the left shoulder and indicate that you have a failure on the left side that is not repairable. Bubbles will continue until the left tank is drained.

Decision:

- Diver with failure moves to secure position in team.
- Terminate the dive and return to exit or surface.

Lost resources:

- Secondary regulator
- Drysuit inflation
- SPG

8. Erroneous left post either reparable or not:

Likely problem:

Failure actually on the right

Action:

- Switch light to right hand.
- Signal buddy and start shutting down the left valve.
- Purge the necklace dry. Listen for the bubbles to stop.
- The bubbles don't stop. This would indicate that it is not a first stage failure. Close the isolator. Bubbles continue.
- Have buddy check your valves. Buddy confirms that it is actually a right side failure. It could be either a regulator failure or valve failure.
- For a regulator failure: Buddy would turn on the left post and indicate to you that it is working and signal you to switch regulators. He would then shut down the right post. Bubbles will stop. You know at this point it is a regulator failure. He would then turn your isolator back on and would tap you on the right shoulder and indicate that there is a "not repairable" regulator failure.
- If it is a right post failure, buddy would turn on the left post and indicate to you that it is working and signal you to switch regulators. The buddy would then ensure that the isolator is indeed closed, tap you on the right shoulder and indicate you have a failure on the right side that is not repairable. Bubbles will continue until the left tank is drained.

Decision:

- Diver with failure moves to secure position in team.
- Terminate the dive and return to exit or surface.

Lost resources:

- Primary regulator
- Primary inflation

9. No clue where the air is from

- Same drill as the right side failures until problem is solved.