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MiniSimulProbe™

Illustrated SOPs

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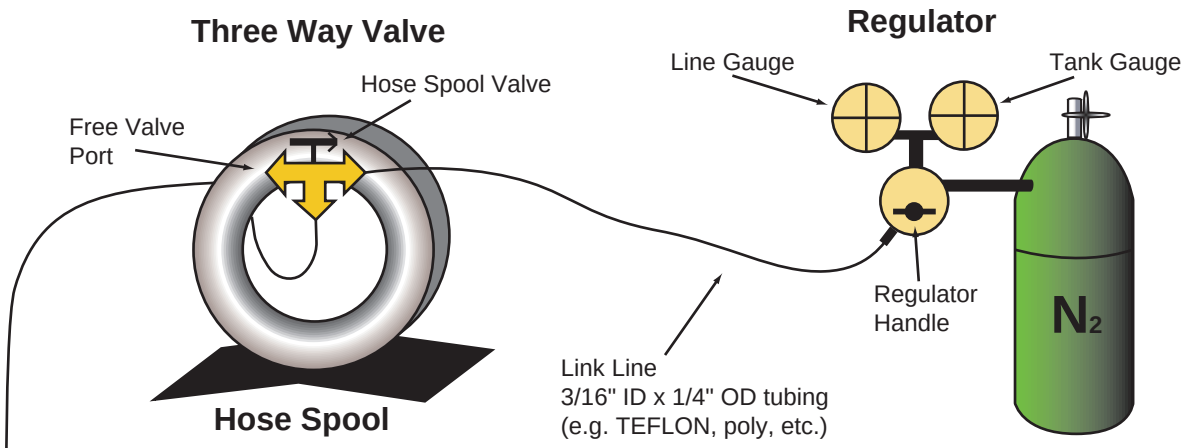
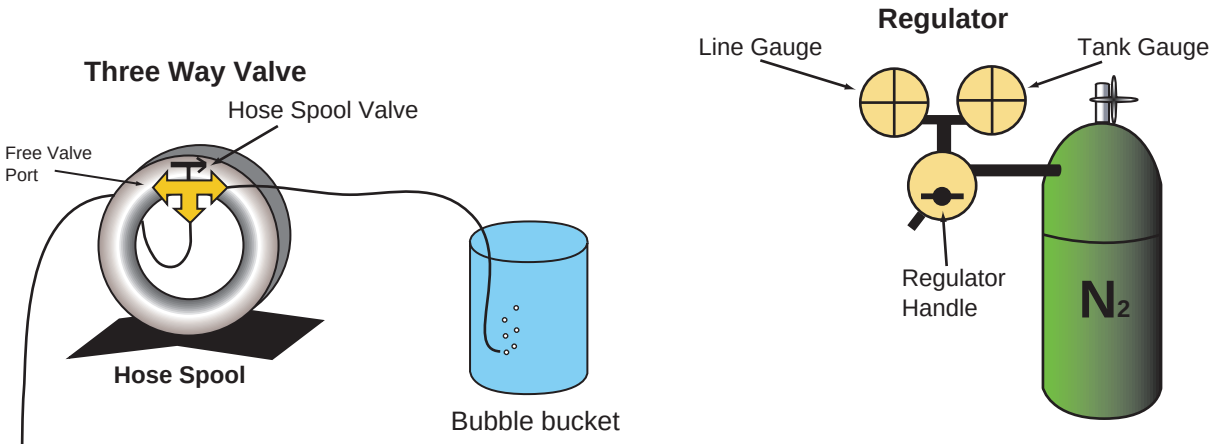
Deployment of SimulProbe into Bore Hole (Coring and Groundwater Mode)



SimulProbe

1. Open Hose Spool Three Way Valve - Arrow Points Parallel to Link Line.
2. Open Tank Valve - Rotate Counter Clockwise.
3. Open Regulator Valve to Back Pressurize Water Canister -Rotating Clockwise.
4. Back-Pressurize Water Canister with Nitrogen or Helium Before Lowering SimulProbe into Bore Hole.
5. Back Pressure should be equal to or greater than anticipated bore hole fluid pressure. For pure water, bore hole fluid pressure is roughly equal to ½ Lb. PSI for each foot of bore hole fluid. For muddy bore hole water assume roughly ¾ Lb. PSI for each foot of bore hole fluid (assume this case for conservative measure in almost any condition). As an example, 100 feet of bore hole fluid requires 75 PSI - as indicated on line gauge.
6. Close Hose Spool Valve - Arrow Perpendicular to Link Line
7. Close Regulator Valve - Rotate Counter Clockwise.
8. Close N2 Tank Valve - Rotate Clockwise.
9. Disconnect Link Line from N2 Tank and connect Open end of Link Line to Free Port on Hose Spool three Way Valve.
10. Lower SimulProbe to bore hole bottom - Using Rod or Wire-Line.
11. Drive SimulProbe into sediment with Up-Hole or Down Hole Hammer.
12. Pull Maxi or Mini SimulProbe back 4-inches when using 3-inch drive shoe assembly, and only 2-inches when using ½-inch (Maxi) or 1-inch (Mini) drive shoe assembly. If using FloCore Assembly with Mini, then pull back 15-inches. The pull-back exposes the screen.
13. Bleed off the N2 by opening Hose Spool Gauge - Arrow Point Parallel to Link Line. How do you know when N2 is bled off??? Hold link line in air. You will hear hissing from the line as N2 is bleeding from the line. When you can't hear hissing, place the open end of the link line close to the surface of water in your bubble bucket. If you see a vortex on the water surface, then last of N2 is bleeding off. When you can't see the vortex, then N2 is completely bled off.
14. Place open end of the link line into the bubble bucket - and refer to Diagram 2

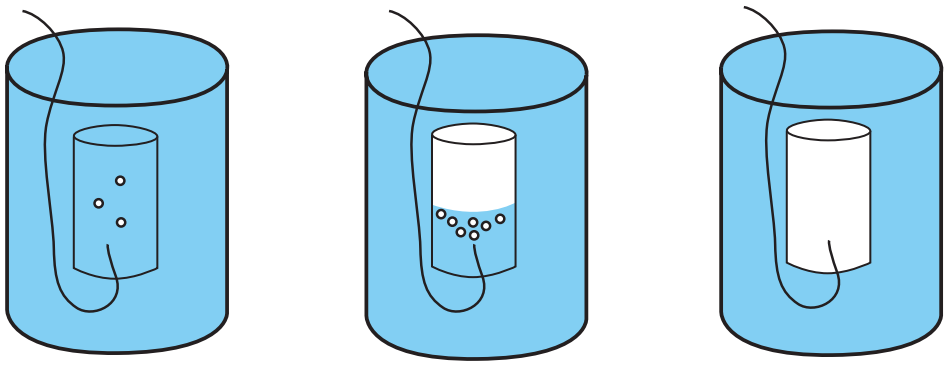
Fill Detection and Monitoring with the SimulProbe (Coring and Groundwater Mode)



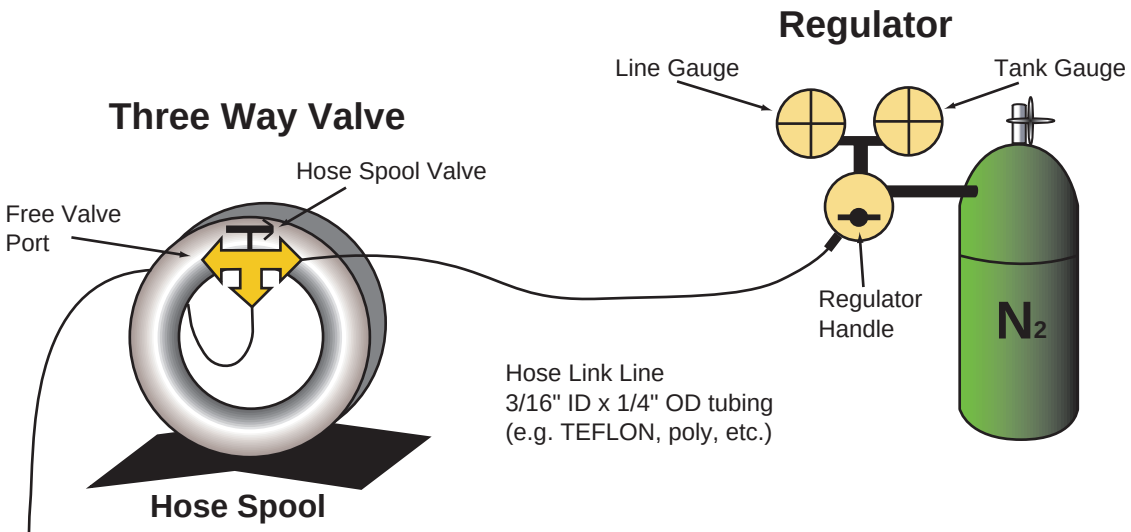
15. Water from formation passes through mesh screen, and rises hydrostatically through longitudinal pathway around core chamber. Water passes through one way reed-valve at bottom of water canister and fills water canister.
16. As water enters canister, residual canister atmosphere (a canister volume of 1/3 litre or 1-litre for the Mini SimulProbe and 2-litres for the Maxi SimulProbe) is displaced upwards through the back-pressurization line.
17. The residual atmosphere exits as a bubble stream into the Bubble Bucket - Canister is filling with fluid.
18. How do you measure how much water has filled the water canister. We use the Soda Pop Bottle Trick - See Below:

Soda Pop Trick

A 1-liter soda pop bottle is filled with bucket water. Air displaced from the water canister enters the soda pop bottle through the link line. The air displaces the water in the soda pop bottle. When 1-liter of water is displaced from the bottle, then there is approximately 1-liter of water in the H2-Vape water canister. The bottle is now filled with 1-liter of air displaced from the water canister.



Retrieval of SimulProbe from the Bore Hole (Coring and Groundwater Mode)



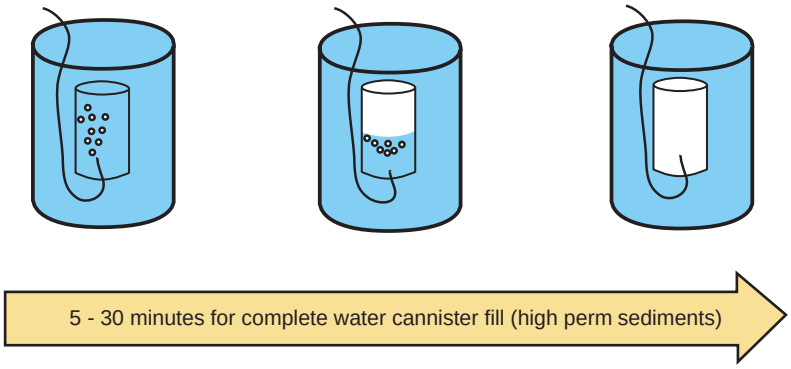
19. Open Hose Spool Three Way Valve - Arrow Points Parallel to Link Line.
20. Open Tank Valve - Rotate Counter Clockwise.
21. Open Regulator Valve to Back Pressurize Water Canister- Rotating Clockwise.
22. Back-Pressurize Water Canister (including water inside canister) with Nitrogen or Helium Before Retrieving SimulProbe from the Bore Hole.
23. Back Pressure should be equal to or greater than anticipated bore hole fluid pressure. For pure water, bore hole fluid pressure is roughly equal to ½ Lb. PSI for each foot of bore hole fluid. For muddy bore hole water assume roughly ¾ Lb. PSI for each foot of bore hole fluid (assume this case for conservative measure in almost any condition). As an example, 100 feet of bore hole fluid requires 75 PSI - as indicated on line gauge.
24. Close Hose Spool Valve - Arrow Perpendicular to Link Line.
25. Close Regulator Valve - Rotate Counter Clockwise.
26. Close N2 Tank Valve - Rotate Clockwise.
27. Disconnect Link Line from N2 Tank and connect Open end of Link Line to Free Port on Hose Spool three Way Valve.
28. Retrieve SimulProbe from bore hole - Using Rod or Wire-Line.
29. Bleed off the N2 from line and canister by opening Hose Spool Valve - Arrow Points Parallel to Link Line.
30. Disconnect SimulProbe water canister base and water canister from core barrel section of tool.
31. Insert drain tube through one way reed valve at the bottom of the water canister and fill bottles and VOAs.
32. Disassemble SimulProbe core barrel section and observe core.

Fill Detection and Monitoring with the Simulprobe - Bubble Scenarios (Groundwater Mode)

High flow scenario

Observation - Nitrogen gas is fully bled off. Bubbles stream into the bucket quickly as you move the discharge tube (link line) into the mouth of an upside down bottle.

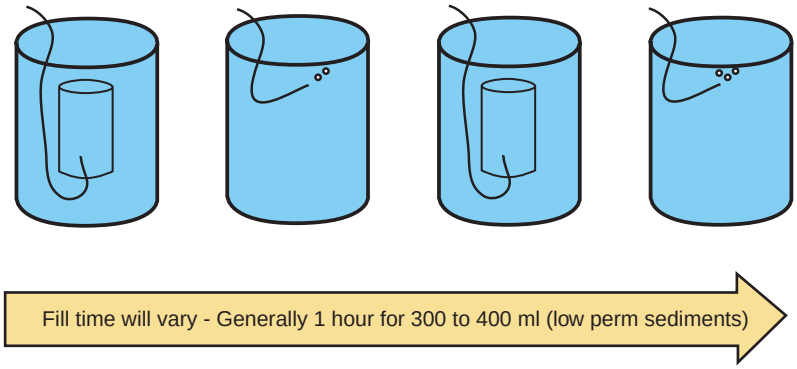
Explanation - Fill of the H2-Vape water cannister will take between 5 to 30 minutes.



Low flow scenario

Observations - Nitrogen gas is completely bled off. Initially, it appearsthat the cannister is not filling because bubbles do not appear when the link line is moved into the mouth of an upside down bottle. Then you experiment with the link line by removing the end of the line from the fill bottle and bringing the end of the line just beneath the water surface in the bubble bucket. You suddenly see bubbles streaming from the line and then slowing. Thinking you now have flow,you re-submerge the end of the line and insert it again into the mouth of the fill bottle - but again you don't see any bubble. You remove the end of the line from the mouth of the bottle and bring it to just beneath the water surface one more time. Again, you see bubbles as before.

Explanation - Water fill pressure inside the water cannister is very low. the remaining water cannister atmosphere (which has re-equilibrated to ambient atmospheric pressure after the N2 bleed off) cannot be displaced with enough force (pressure) by the incoming formation water to overcome the hydrostatic pressure of the water column at the bottom of the bubble bucket (about 0.5 to 1 PSI). Raising the link line to just below the water surface inside the bucket allows the water pressure inside the cannister to exceed the water pressure close to the water surface inside the water bucket. therefore allowing air to escape from the Link Line into the bucket water.

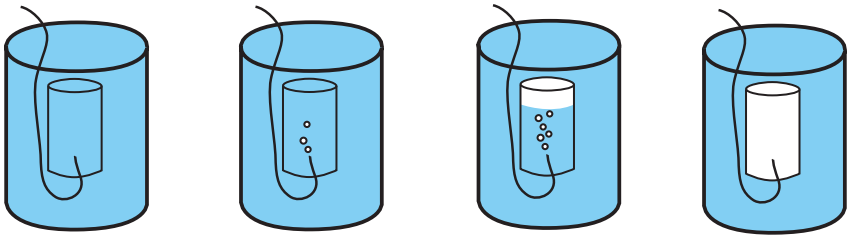


Fill Detection and Monitoring with the Simulprobe - Bubble Scenarios (cont.) (Groundwater Mode)

Delayed flow scenario

Observation - Nitrogen gas is fully bled off. No bubbles stream out of link line into upside down bottle. Slow stream of bubbles appears from link line 5 to 10 minutes later. Stream of bubles becomes rapid and steady.

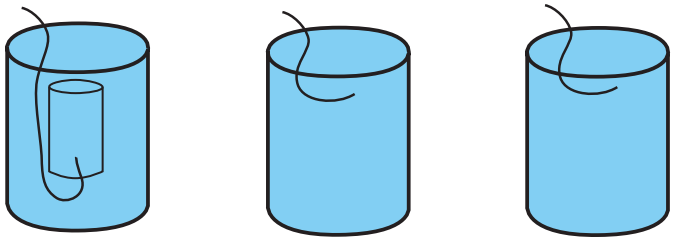
Explanation - Sometimes the H2-Vape screen becomes temporarily compacted with sedimentt at the start of the fill period or the formation is over compacted by displacement with the H2-Vape. In the delayed flow scenario, there is enough water pressure and permeability from the formation to overcome compaction. Flow usually begins within the first 5 to 10 minutes (as either high or low flow scenarios).



No flow scenario

Observation - Nitrogen gas is fully bled off. No bubbles stream out of link line into upside down bottle. Experimentation to determine the low flow scenario by raising linkline near the surface of the water buckets still yields no bubbles. Still after 10 minutes there is no bubbles.

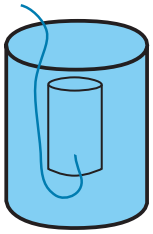
Explanation - The H2-Vape is in tight sediment and no groundwater can be retrieved. Tool should be retrieved to the ground surface.



Reverse flow scenario

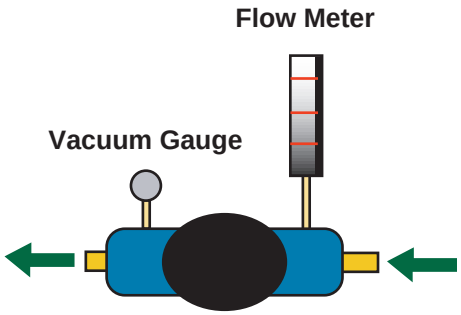
Observation - Water from the bottle or bucket moves upward into the Link Line after the N2 is bled off.

Explanation - The H2-Vape is in extremely tight sediment. When the toolis pulled back to expose the screen, the sediment was so tight and expansive around the tool that a partial vacuum was created in the vvoid space created by the pull back (analogous to pulling back the plunger on a syringe). The slightly lower atmosphere now insde the water cannister (as a result of vacuum) cause the bucket water to move up the link line. Reverse flow is an immediate indication that the formation is extremely tight and will not yield water over any length of time. The H2-Vape should be immediately retrieved from teh bore-hole. Try to find a more permeable zone.

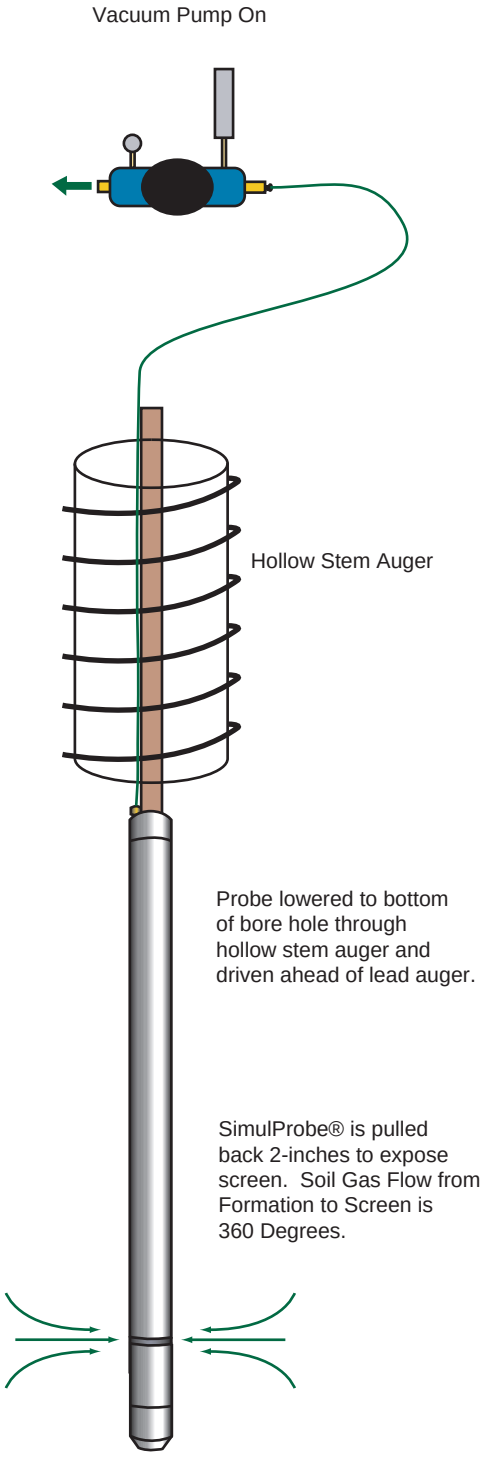


Deploying, Sampling and Retrieval of the SimulProbe for Cased Bore Hole Soil Gas Sampling

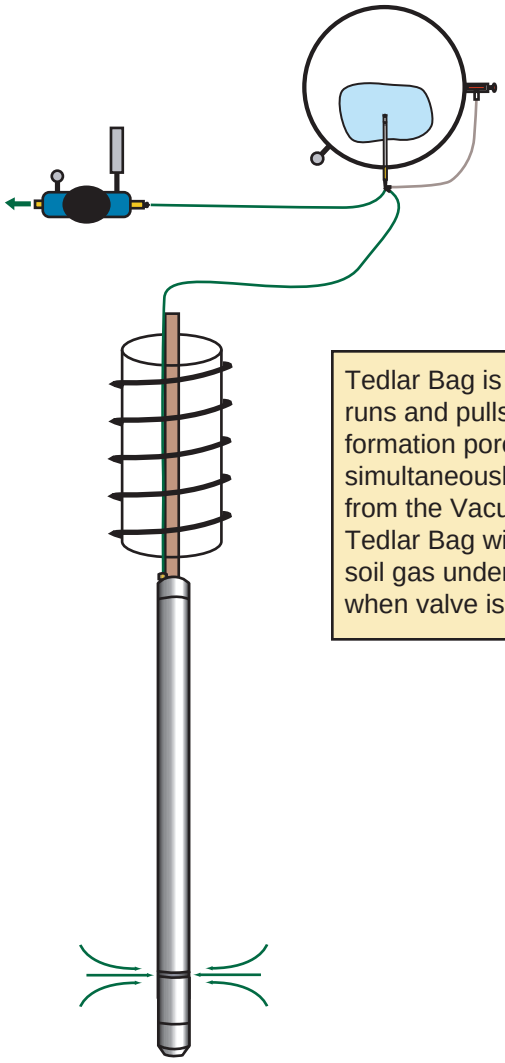
(No SPLAT Attachment)



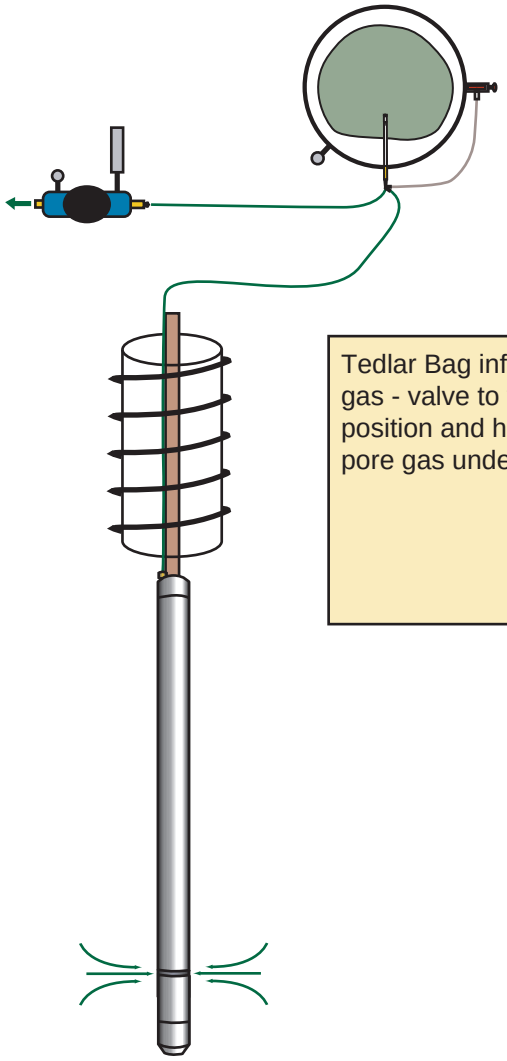
1. SimulProbe® lowered inside of bore hole.
2. Use down-hole wire line hammer or up-hole hammer with rods.
3. Drive SimulProbe® into undisturbed material immediately below bore hole.
4. Drive distance for Mini SimulProbe® (without SPLAT Drive Cone) is 18 inches and 20 inches for the Maxi SimulProbe®.
5. When drive distance is reached, pull Probe back one to two inches to open sliding drive shoe - to expose screened entry port.
6. Turn on vacuum pump and purge line before sampling. Line volume is calculated by r2 x L where, r, is the radius of the inside diameter of the line between the pump and the SimulProbe®. In addition to the line volume, the Mini SimulProbe® has a purge volume of 50ml and the Maxi SimulProbe® has a purge volume of 200ml.
7. If the flow meter shows that the flow rate is 1-llitre per minute, and there is a 1-litre volume in the line between the SimulProbe® and pump, then one purge volume for both the line and the Mini SimulProbe will take about 1 minute and 4 seconds. For the Maxi, about 1 minute and 15 seconds.
8. After line is purged, collect soil gas sample in syringe, Tedlar bag, or canister. One could also simply monitor PID or FID readings with a Tedlar bag or at the discharge end of the pump.



Using Vacuum Box (Lung) system with the SimulProbe (Soil Gas Mode)



Tedlar Bag is not inflated. As pump runs and pulls soil vapor from formation pore spaces, the pump simultaneously evacuates atmosphere from the Vacuum Box. Therefore the Tedlar Bag will inflate and fill up with soil gas under negative pressure when valve is opened.

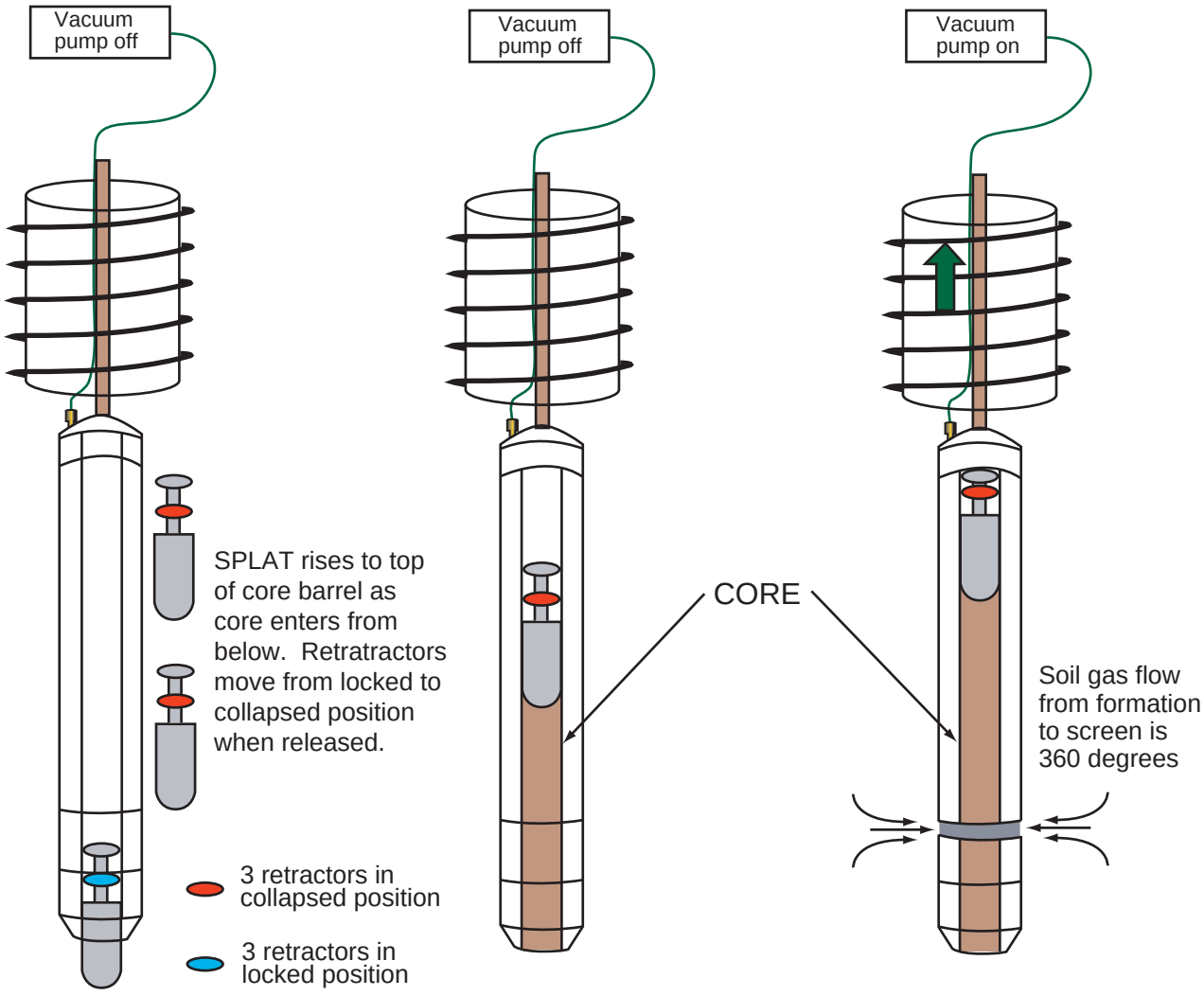


Tedlar Bag inflated with formation soil gas - valve to vacuum box in open position and has inflated with pure pore gas under negative pressure

Sampling of the SimulProbe for Cased Bore Hole Soil Gas Sampling

(With SPLAT Attachment)

SPLAT Explanation: The SPLAT (SimulProbe Latck Activated Tip) is a remote release drive cone mechanism. There are 3 retractors that are in a locked position in the SimulProbe sliding drive shoe mechanism. When the SimulProbe has been driven to the targeted sampling horizon with the locked SPLAT, the SimulProbe is pulled back 2-inches to release (or unlatch) the SPLAT retractors - which collapse to a relaxed position. The SimulProbe is then driven forward to collect the core sample. As the core enters the core chamber, it pushes the SPLAT to the top of the core barrel. Since the SPLAT is 3-inches long, the SimulProbe core drive is shortened by 3-inches. Do not over pack the core barrel. The SimulProbe is once again pulled back 2-inches to expose the screened port for soil-gas sampling.



Schematic for Vacuum Box for Tedlar Bag Soil Gas Sampling (Soil Gas Mode)