

# Regulator Inspection Checklist

With a little practice, these checks can be performed by anyone. They should be done well prior to any dive trip, not to mention with a regulator new out of the box or after shop service.

**Check early, check often!**

Here are a few quick checks that everyone is capable of doing.

Items 1, 2, 3 and 4 should be performed in the field **before every dive**.

Items 5 through 11 should only take a few minutes at home once you establish a routine, and should be performed before you pack your gear even for a local trip.

The entire checklist should be run at home a couple of times per year, and any time your gear is taken out of long-term storage. Items 12.-14. require obtaining an Intermediate Pressure Gauge (\$20-\$90).

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|---|---|
| <b>1. Visual Check for Corrosion/Damage</b> | <b>9. Late Leak</b>                                   |
| <b>2. Inlet Filter</b>                      | <b>10. Cracking Pressure</b>                          |
| <b>3. Hose Connections</b>                  | <b>11. Venturi Performance</b>                        |
| <b>4. Watertight Integrity Check</b>        | <b>12. Static Intermediate Pressure</b>               |
| <b>5. Lever Height</b>                      | <b>13. Dynamic Intermediate Pressure</b>              |
| <b>6. Air Leaks</b>                         | <b>14. Intermediate Pressure Stability</b>            |
| <b>7. Locate Any Audible Leak</b>           | <b>15. Advanced: Internal Second Stage Inspection</b> |
| <b>8. Intermittent Leak</b>                 |   |

**1. Visual Check for Corrosion.** Inspect for external corrosion or physical damage to any parts including hoses. Pay particular attention to the hose to fitting interface for any signs of damage.

**2. Inlet Filter.** Inspect the sintered metal first stage inlet filter for discoloration, corrosion, particulate matter, mold or other signs of water intrusion.

**3. Hose Connections.** Check each hose connection to see that it is at least hand tight. This is an *essential* check after service or reassembly.

**4. Watertight Integrity.** Connect the regulator to a tank (or place the dust cap tightly in place if off a tank) and without turning on the air gently attempt to draw a breath on the second stage. See if air leaks into the regulator and into your mouth (do not draw in too hard as it may collapse the exhaust valve and allow a leak). Does the regulator hold vacuum? If so, then it is probably watertight. If there is a perceptible leak, you may have sand or a leak in the exhaust valve, a small hole in the diaphragm or even a crack in the case itself. See Step #15.

**5. Lever Height.** Shake the second stage. Does it rattle? If so, the lever may be too low to permit maximum valve opening and air flow. (*Note: this is not true for all second stages. Some have a significant distance between the lever and the diaphragm and rattling is normal.*) Pressurize the regulator. Perform the shake test again. Some regulators with "seat saver" features will rattle when unpressurized, but not when pressurized. This is normal.

Depress the purge very slightly. If you have to depress it more than a very slight amount before air flow starts, the lever may be improperly adjusted, reducing the working range of the valve and the flow rate of the reg. Using a flashlight, it may even be possible to see the lever position against the diaphragm. If you can see the lever and diaphragm through the mouthpiece, hold the reg over your head, and look up at the diaphragm from below. There should be less than 1/16" gap between the diaphragm and lever.

**6. Air Leaks.** Put the regulator on a tank and carefully pressurize. First, listen for any leaks, then turn the tank valve off but do not purge the reg. Note the tank pressure on the SPG and leave it undisturbed for 5 minutes. The SPG pressure should be within 400 psi of the original value. A larger drop in pressure indicates an inaudible slow leak that may be serious. If the leak is so fast you can see the needle drop while just looking at it, the leak is large enough to abort the dive.

Note: This step is not applicable to certain Sherwood regulators with a dry bleed valve. These regs "bleed" 15-25 cc/min deliberately, to keep the first stage dry. This is not a leak.

*For Sherwood 1st stages with a bleed air valve, omit Step 6. In Step 7, immerse the pressurized first stage in the bathtub and place a shot glass upside down over the bleed air valve. The shot glass should fill between 1/3 and 3/4 full of air in 60 seconds, as bubbles escape from the bleed air valve."*

**7. Locate Any Audible Leak.** The preliminary answer to leaks comes with submerging the entire regulator set in a water tub or similar container. Check the first stage, the second stages, the pressure gauge, and all the hoses with special attention to hose connections. Second stage leaks may not be apparent until enough air accumulates in the regulator to leak out of its case. Turn a second stage underwater so that it is mouthpiece up, and watch for tiny leaks. If your second stage is adjustable, see if any leak stops by turning the breathing adjustment knob inward (clockwise). A slightly leaking second stage that stops as breathing resistance is increased is likely still safe to dive, but may need service at the next opportunity. A few manufacturers actually specify a tiny freeflow with the adjustment knob fully out, in order to lengthen the lifetime of the low pressure seat.

**8. Intermittent Leak.** Leave the regulator sit in a pressurized condition for a few minutes. If the second stage intermittently starts free flowing slightly, immediately after you stop inhaling from it, it may have dust or sand caught in the valve seat. Bang it against your leg while purging it several times. If this does not cure the problem, with the first stage unpressurized and disconnected from the tank, and with the first stage held higher than the second stage, submerge the second stage only into water and press the purge button. This will allow the reg to fill and a little water to ascend inside the low pressure hose. Now pressurize the reg and purge several times. The jet of water may dislodge any particles caught in the valve. If the leak still does not stop, it is most likely in need of adjustment or annual service due to improper second stage orifice adjustment or excessive LP seat wear.

**9. Late Leak.** Leave the set pressurized for a half hour or more. If the primary second stage regulator or your octopus begins free flowing slightly anywhere from a minute to an hour after you last breathed off it, it may indicate "IP creep" - most commonly caused by a leaking HP seat or damaged first stage orifice. This is a serious issue and warrants canceling a dive if you do not have an IP gauge to assess the problem directly. See step 11. below.

**10. "Cracking Effort".** This test checks how easily your reg will allow you to initiate a breath. Your primary second stage valve should open before you suck in harder than 1.5" of water pressure (<0.05 PSI!!). Estimate the position of the diaphragm in the case. Screw any adjustment knob out (counterclockwise) to the "easiest" breathing position. Partially fill your sink and immerse a pressurized second stage regulator with the diaphragm parallel to the water's surface and the mouthpiece up. Air should begin to flow before the mouthpiece goes below the water's surface and before the diaphragm's position in the case is submerged more than 1 1/2 inches below the water's surface. If the mouthpiece is submerged before the regulator starts to flow, the cracking pressure is probably set too high. Once the reg begins to freeflow, just put your thumb over the mouthpiece to stop the flow of air. (*Note: This test may only be possible for your main second stage. Many octopus or BCD-integrated second stages have a cracking effort set as high as 2.1" water. You may not have that much distance between the diaphragm and the mouthpiece, and the reg will submerge and fill before the valve "cracks"*).

**11. Venturi Performance.** Except for very marginal or old equipment, or for special reasons which you have requested, every modern primary second stage regulator should freeflow when purged, although this may only be noted with the mouthpiece removed. If your venturi setting is adjustable, place it on maximum (or Dive). With the regulator pressurized, briskly hit the purge button. The reg

should freeflow with a loud rush of air from the mouthpiece. Some regs may stop on their own in a couple of seconds, but all others will stop freeflowing when you cover the mouthpiece with your thumb. With the regulator's venturi set on minimum, or Pre-Dive, hitting the purge button should not initiate a freeflow.

If your regulator does not have an adjustable venturi, or if it does and will not freeflow upon purging, you may need to have the vane adjusted. Many Scubapro regulators have a "cutout" in the vane. If the vane is installed with the cutout facing the mouthpiece (rental configuration), the reg will not freeflow despite being placed in the Dive position. If desired, this can be changed by your service technician.

**12. Static Intermediate Pressure.** Find out what the IP should be for your regulator **at your current tank pressure.** Connect the IP gauge to the BCD inflator hose. Connect your regulators to a tank and open the tank valve. Inhale/exhale several times to "cycle" the regulator, then watch the IP as you breathe. Most first stages have an IP of 125-145 psi at all tank pressures from 300 to 3000 psi. One exception is Poseidon regs with the "hockey puck" style Cyklon second stage. These first stages are set to around 160 psi at 300 psi tank pressure.

The intermediate pressure should dip whenever the air is flowing, and immediately return to the acceptable range and remain steady. Stop breathing from the second stage and watch the IP gauge over 1-5 minutes. If the IP climbs **at all** after 1 minute (IP creep), there is an internal leak in the first stage that should probably be corrected. Creep (for most regulators) above 145 psi is cause to abort a planned dive. If no creep is noticed over 5 minutes, leave the regulator pressurized with the IP gauge connected for a half hour or longer to check for slow IP creep. You may see a 1-3 psi **drop** in the IP during this time. This usually occurs in heavily lubricated piston first stages. Sluggish piston movement may have allowed a higher pressurization in the intermediate chamber before the high pressure seat sealed. A tiny leak from the second stage over 30 minutes may allow the IP to drop before the valve opens again to restore intermediate pressure. This is not a problem, as long as check #7 above did not show a perceptible leak in the second stage.

*It should be noted that the IP of balanced and unbalanced first stages reacts differently to changing tank pressures. Balanced first stages should keep a relatively constant IP (+/- 5 psi) over the entire range of tank pressure. Any significant changes in the IP indicate a first stage problem. The IP of unbalanced regs will vary by as much as 20 PSI as tank pressure drops, with piston IP's falling and diaphragm IP's rising as the tank empties. Additionally, some newer "overbalanced" piston regs will deliberately demonstrate an inversion, with a slight rise in IP as the tank empties, much like an unbalanced diaphragm first stage.*

**13. Dynamic Intermediate Pressure.** Next, purge the second stage while watching the IP gauge. The drop in IP should be no more than 25 psi. Any greater drop indicates an impaired high pressure air supply. Either you didn't open your tank valve fully, or (more likely) the metal filter at the tank connection is clogged with corrosion, tank dust or other debris. Regulator service is indicated, to check for other first stage problems downstream from the filter.

**14. Intermediate Pressure Stability.** Once a year, if all checks have been successful, leave the entire rig pressurized on the IP gauge overnight. A stable IP with no drop in tank pressure confirms that all components are sealing properly. Together with the checks above, we know that unless required by warranty, service is not yet indicated.

**15. Advanced: Internal Second Stage Inspection.** If the second stage cover is not pinned in place, you may be able to remove it to inspect for corrosion, damage, retained sand or other contaminants (bugs in the tropics!). Ask a trained technician to teach you how to inspect your second stage. Clean/rinse as necessary. *Replace the diaphragm with special care to ensure a seal. Do not lubricate the diaphragm edges to "improve the seal."* The antifriction washer always goes in between the moving cover and the next part below it (spacer or diaphragm). Replace the cover and repeat step 4. above to ensure that you have not created a new leak.

**(16. Go diving!)**

Good sources of additional information:

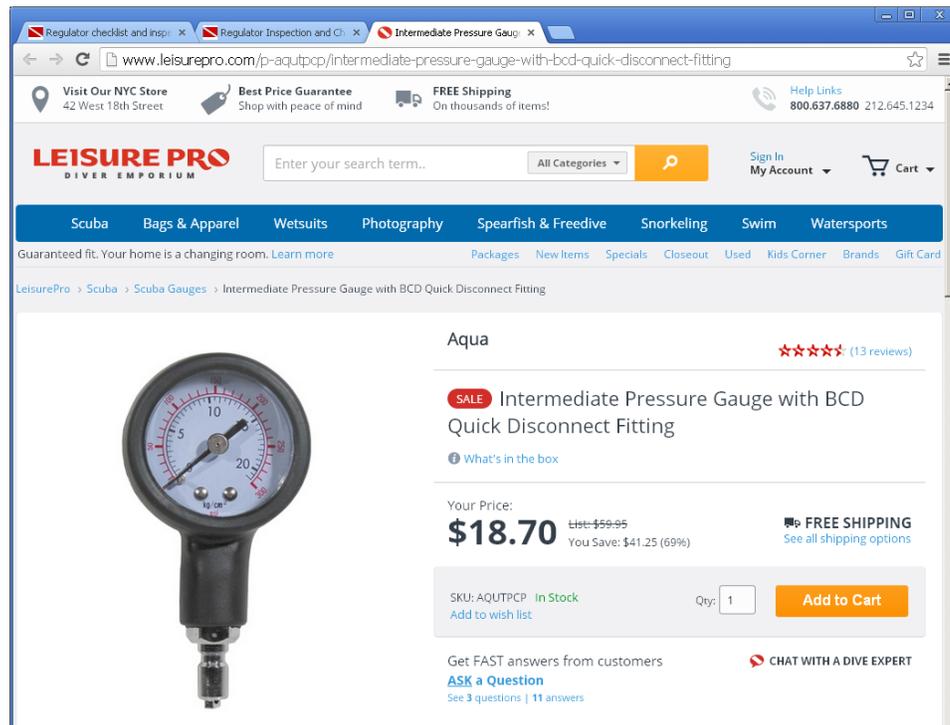
Vance Harlow's "SCUBA Regulator Maintenance and Repair."  
The ScubaTools book, "Regulator Savvy"

This checklist is my personal adaptation of a checklist originally published by Robert Couvillon ("couv") on the Scubaboard Regulator Forum, with contributions by Scubaboard members. The changes represent my own personal opinion and have not been approved by any of the manufacturers for whom I repair equipment.

Robert Singler  
NapaScuba  
7/21/2017

## Finding an Intermediate Pressure Gauge:

For BCD's with a "standard" connection to the inflator:  
LeisurePro SKU: AQUTPCP \$18.70



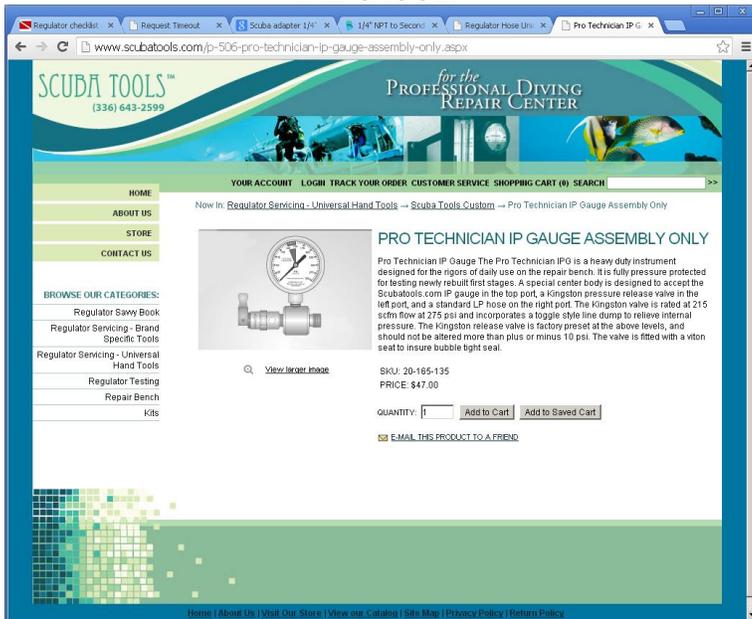
The screenshot shows a web browser window displaying the LeisurePro website. The URL is [www.leisurepro.com/p-aqutpcp/intermediate-pressure-gauge-with-bcd-quick-disconnect-fitting](http://www.leisurepro.com/p-aqutpcp/intermediate-pressure-gauge-with-bcd-quick-disconnect-fitting). The page features a navigation bar with categories like Scuba, Bags & Apparel, Wetsuits, Photography, Spearfish & Freedive, Snorkeling, Swim, and Watersports. The main content area displays a product titled "Aqua Intermediate Pressure Gauge with BCD Quick Disconnect Fitting" with a price of \$18.70, marked as a sale from \$59.95. The product image shows a black gauge with a white face and a black handle. The page also includes a "What's in the box" link, a "FREE SHIPPING" badge, and an "Add to Cart" button.

Keep in mind if you build one like this, there is no relief valve like on the Scubatools version. Therefore, you need to add your second stage attached on a hose while using your BCD hose to connect this gauge. That way, in the event of excess IP, your second stage can be used to vent the system.

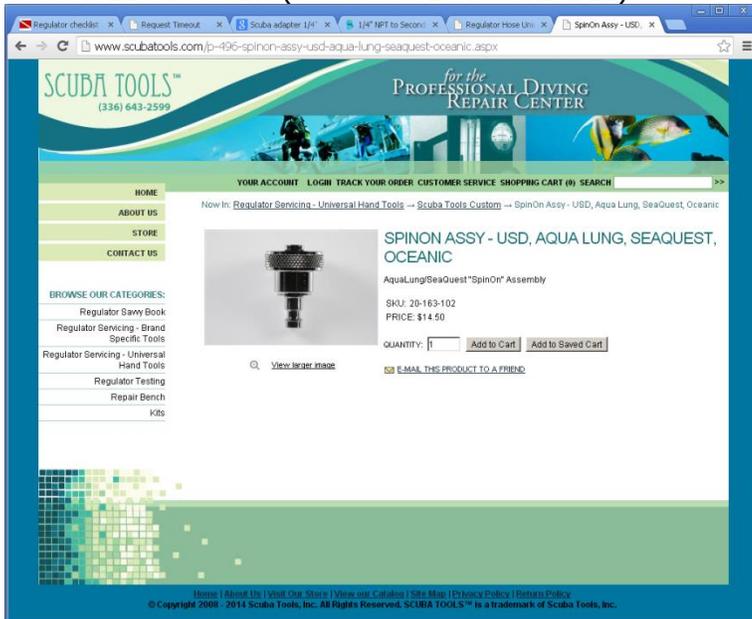
For BCD's with a manufacturer-specific connection (e.g., Scubapro, Oceanic, etc.), either buy a brand-specific gauge (\$50-80) or build one yourself (see following pages).

Here's the Pro version from [www.scubatools.com](http://www.scubatools.com):

### THE GAUGE:



### A SAMPLE ADAPTER (FOUR TYPES AVAILABLE):



Total Price \$62 plus tax and shipping.

ScubaTools SKU's: 20-165-135 and 20-163-100 for Scubapro, Atomic and TUSA

20-163-101 for Universal Inflator fitting

20-163-102 for US Divers, Aqualung, Seaquest and Oceanic

20-163-103 for Zeagle and Beuchat

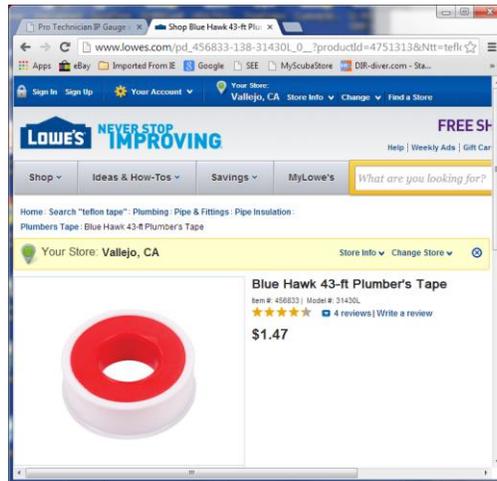
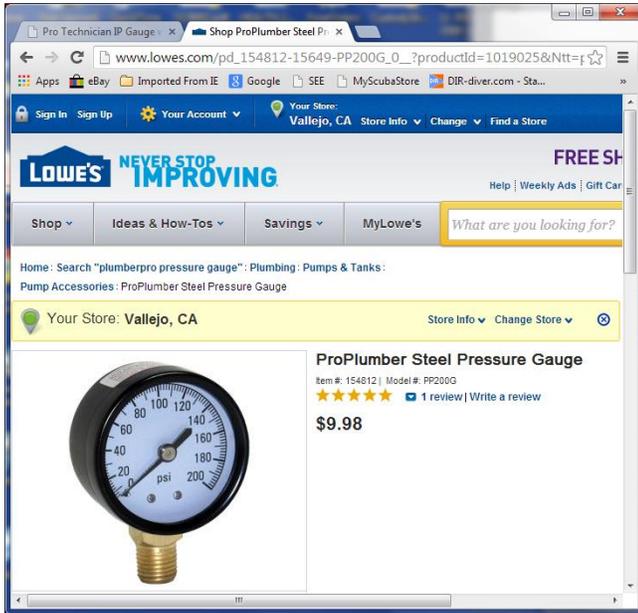
Or get all four spin-on connectors to check your buddies' regulators on a trip: SKU 20-165-130 \$93.00

To build one yourself (and save \$20-40) see the following pages.

You can build an IP gauge yourself from these parts for under \$30:

Lowe's ProPlumber Pressure Gauge  
 Model PP200G (in Plumbing aisle)  
 SKU 154812 \$10

Teflon Tape \$2



The gauge is threaded directly into one of these four adapters from Scuba Tools:



QDC (Quick Disconnect Coupler) - 1/8" NPT (F) Adapter, Universal Inflator

SKU 20-161-103



QDC (Quick Disconnect Coupler) - 1/8" NPT (F) Adapter, Zeagle/Beuchat

SKU 20-161-109



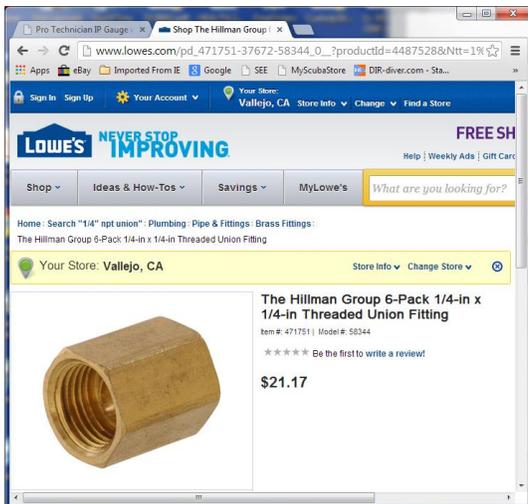
QDC (Quick Disconnect Coupler) - 1/8" NPTF Adapter, Aqua Lung, SeaQuest, Oceanic

SKU 20-161-107



QDC (Quick Disconnect Coupler) - 1/8" NPTF Adapter, Scubapro/Atomic/Tusa

SKU 20-161-101



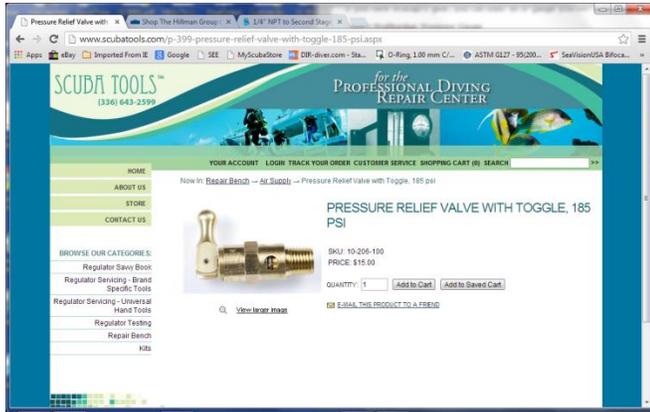
If you have Mares, Trident Diving item #A167 can be ordered by your dive shop, and mated to your gauge with a 1/4" threaded union from Lowe's or Home Depot (in the pneumatic tools section).



**A167**  
 1/4" NPT to  
 Mares type

Keep in mind again that if you build one like this, there is no relief valve like on the Scubatools version. Therefore, you need to add your second stage attached on a hose while using your BCD hose to connect this gauge. That way, in the event of excess IP, your second stage can be used to vent the system.

However, if you add a three way 1/4" female NPT block from Lowes or Home Depot, then just add a pressure relief valve like this: Scuba Tools SKU 10-206-100



<http://www.scubatools.com/p-399-pressure-relief-valve-with-toggle-185-psi.aspx>

you'll have one just like the pro version above with a cheap gauge.

If you really want a relief valve the pro version from Scuba Tools is the better deal, because the spin-on adapter can be changed as needed.