

Basics of pressurized CO2

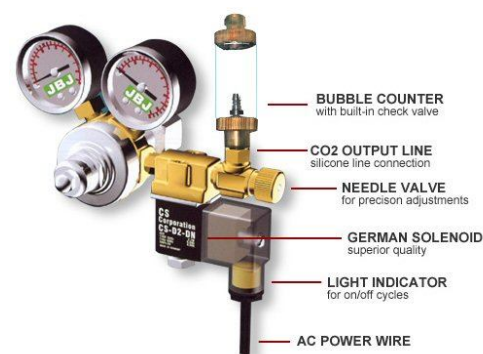
Components:

- Bottle: Contains the CO2. 5lb-20lb sizes are typical. This is the weight of the liquid CO2 in the bottle. Has an on/off valve.
 - The CO2 in the tank is a liquid and cold, so it's important to keep the tank standing upright.
- Pressure regulator: Can just be a simple knob. Can also have one or two pressure gauges.
 - One dial will indicate bottle pressure.
 - This will stay at 900psi until the liquid CO2 is all gone.
 - Then it will slowly drop off as the remaining gas is used.
- The second dial will typically either show PSI or flow rate
- Needle valve: Like the regulator, it also controls gas flow. It provides the very fine control we need.
- Bubble counter: a common way of measuring the very low flow rate after the needle valve.
- A method for mixing the CO2 into the water. Common methods are:
 - Diffuser: As simple as a piece of chopstick stuck in an airline, to an air stone, to a hand-blown glass device with a ceramic disc.
 - Reactor: Mixes CO2 in a chamber, can be external and plumbed in line with the filter, or can be internal using a power head.
 - Powerhead: Just bubble the CO2 into the powerhead, one of the most effective methods.
 - Filter: CO2 can be bubbled into the filter inlet.



Other Items:

- Solenoid: An automatic on/off valve.
- Ph controller: Used to turn off the CO2 when desired levels are reached.
- Ph/Kh test kits
- Paintball: Any items used for paintball CO2, from tanks to regulators, can be used. Although, they are better suited to advanced or specialized applications.
- Flourish Excel: Helps manage algae, and supplements the CO2.

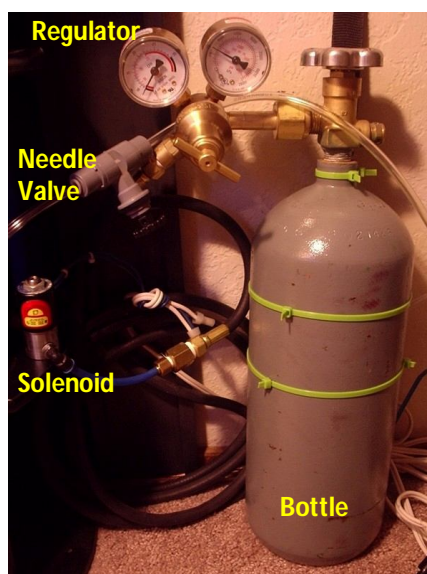


Setting it up:

Bottle>>Regulator>>Solenoid>>Needle valve>>Bubble counter>>Diffuser

- Best done early in the day/light cycle. Gives you more time to get things adjusted.
- Test Ph and Kh, write down the results. Before the CO2 is on, the Ph/Kh relationship should indicate 0-7 ppm of CO2 max. If you get a result that indicates higher CO2 levels, then retest. Do not proceed to turning on the CO2 without these tests.
- Make sure all the valves are closed. Attach all the bits, use Teflon tape on threaded connections.
- First open the valve on the bottle. Then open the valve on the regulator to about 10-15 psi. Open needle valve slightly.
- Wait a few minutes. This is a good time to check for leaks by carefully squirting some water on each connection.
- Check bubble rate, adjust to about 3 bubbles per second as a starting point.
- In an hour test the Kh and Ph, CO2 should have risen as compared to the previous test.
- Re-adjust bubble rate if needed. Check Ph/Kh every hour for the first day.
- Make small adjustments, and wait a few minutes to see the effect on bubble count each time.

The pH/KH/CO2 Relationship												
pH	6.0	6.2	6.4	6.6	6.8	7.0	7.2	7.4	7.6	7.8	8.0	
KH°												
0.5	15.0	9.3	5.9	3.7	2.4	1.5	0.9	0.6	0.4	0.2	0.1	
1.0	30.0	18.6	11.8	7.4	4.7	3.0	1.9	1.2	0.7	0.5	0.3	
1.5	44.0	28.0	17.6	11.1	7.0	4.4	2.8	1.8	1.1	0.7	0.4	
2.0	59.0	37.0	24.0	14.8	9.4	5.9	3.7	2.4	1.5	0.9	0.6	
2.5	73.0	46.0	30.0	18.5	11.8	7.3	4.6	3.0	1.9	1.2	0.7	
3.0	87.0	56.0	35.0	22.0	14.0	8.7	5.6	3.5	2.2	1.4	0.9	
3.5	103	65.0	41.0	26.0	16.4	10.3	6.5	4.1	2.6	1.6	1.0	
4.0	118	75.0	47.0	30.0	18.7	11.8	7.5	4.7	3.0	1.9	1.2	
5.0	147	93.0	59.0	37.0	23.0	14.7	9.3	5.9	3.7	2.3	1.5	
6.0	177	112	71.0	45.0	28.0	17.7	11.2	7.1	4.5	2.8	1.8	
8.0	240	149	94.0	59.0	37.0	24.0	14.9	9.4	5.9	3.7	2.3	
10.0	300	186	118	74.0	47.0	30.0	18.6	11.8	7.4	4.7	3.0	
15.0	440	280	176	111	70.0	44.0	28.0	17.6	11.1	7.0	4.4	
20.0	590	370	240	148	94.0	59.0	37.0	24.0	14.8	9.4	5.9	
CO2 mg/liter												



Target levels of 25-45 are ideal, beyond 70 and some fish can suffer, beyond 100 and fish may begin to die.

Resources:

<http://www.csd.net/~cgadd/aqua/articles.htm> From Chuck Gadd, a collection of articles covering CO2 and other aquarium topics. Good DIY resource.

<http://sfbaaps.org/ref.html> Includes lists of local CO2 suppliers.

<http://www.aquariumadvice.com/forums/t24/need-to-know-about-co2-heres-the-info-41278.html> Aquarium advice has a lot of good info to search.