



# HVLP Gun Basics

By Brian Martin

Painting your own vehicle can be fun, rewarding and cheaper than having the goons down at Fast Buck Freddie's do it. But not if you suffer from runs, drips, spatter or overspray! -- Here's [The Stovebolt Page's](#) resident body work Guru, Brian Martin, with a few tips on setting up that gun.

## But first, a Glossary...

- **CFM** -- Cubic Feet per Minute. A measure of air flow.
- **HVLP** -- High Volume, Low Pressure. The way of the future that a lot of guys have already gone to.
- **PSI** -- Pounds per Square Inch. The unit of measure for air pressure.
- **PSPC** -- Primer/Sealer/Paint/Clear. A shorthand way to refer to the primary products you will be shooting out of your gun
- **VOC** -- Volatile Organic Compound. You know, the bad stuff that goes up into the air we breathe

## Intro

HVLP and low-VOC products are the way the industry is going so I will be referring to them in this discussion on painting and paint guns. Also, some areas of the country are "VOC Regulated" and **require** the use of HVLP for automotive painting. So if you aren't HVLP yet, you will be sooner or later. The good news in this article, though, is most basic issues dealing with HVLP can be applied to conventional guns -- atomization is atomization. The HVLP just arrives at it differently.



The object of the spray gun is to break up the primer/sealer/paint/clear (I will call this ?PSPC? from here out) into small particles and lay them in neat little rows on the panel being PSPCed. So the whole outcome rests on how well the gun is doing this. Picture the droplets of PSPC coming out of the fluid tip of the gun and then the air ?slapping? them into smaller droplets.

You have two things that help you with this process: air and solvent. Solvent can mean something that is already in the PSPC from the manufacturer or something the manufacturer has told you to add to it. By the way, you should always mix in proper ratios as instructed in the tech sheet. The thinner (less viscosity) you get the PSPC or the more air you have at the fluid tip of the gun the more it will break up the PSPC. The target for you is getting the perfect balance needed. Too much solvent and the PSPC will have no body, fill, durability, etc. Too much air and you blow the PSPC everywhere but the car, poor adhesion, excessive texture, etc.

So, the answer is **proper air supply** and **gun** (and fluid tip) **choice**, and how you **adjust** it.

With today?s high-solids, low-VOC products there is less solvent. And with HVLP guns there is less air at the cap to break up the PSPC. Thus, proper air supply and gun setup is more important than ever.

## First things first -- Air Supply

Air supply, aside from being a popular Top 40 group from the '70's (*Editor's note: now heard in nursing homes and elevators all over America ;)*) is a complete subject by itself. Let's assume you have a **sufficient supply of dry air** and move on. What's sufficient? Check your gun -- If you have a gun that requires 15 CFM you will need a compressor and plumbing that will produce that at a very minimum. There are HVLP guns that need as little as 7.5 CFM so you can get good results even from a smaller compressor. Remember, that's 15 CFM at the **GUN**. If your compressor puts out 15 CFM, but then you use a lot of narrow pipe to get to the gun, you may be choking off some of the CFM. So check your gun and make sure your compressor and set up can supply it properly. Or check your compressor and get a gun that will work with it. How do you dry the air? Again, there are many ways to get there from here and we'd best leave that to a Tech Tip just on air system set up.

## Gun Set Up

An HVLP gun requires more VOLUME of air to operate (the V in HVLP) than older gun types. Perhaps you notice your HVLP gun is adjusted at the same PSI as an old conventional gun -- around 50 PSI at the gun (many HVLP guns are set at much lower though) so where is the ?Low? in PSI they are talking about? It is at the actual air cap where the air and paint come out. An HVLP gun has only 10 PSI at the cap while a conventional has upwards of 50! This 10 PSI at the cap is something you have no way to measure. ?AT THE CAP? means at the fluid/air cap where the paint sprays out. It takes a special air cap with a gauge on it. This ?test cap? is used by paint reps, air quality control agents but only a few painters. I have never seen one in a body shop. I say this because the instructions that come with many HVLP guns tell you to ?adjust to 10 PSI at the cap? all the while they give you no way of measuring the cap pressure. There is usually a ?MAX PRESSURE? stamped on the gun or in the instructions. This ?max pressure? is the maximum pressure you can set the gun pressure and still keep the cap pressure at the 10 lbs max at the cap the law allows (in most VOC regulated areas where HVLP is required). So the VOLUME of air (CFM, Cubic Feet per Minute) is the key to proper atomization with an HVLP.

So atomization is the key, but why? Why can't you just lay it out wet and let it ?flow," as an old painter will say. Picture a jar full of bb?s that represent small, atomized droplets of PSPC. The gaps in between the bb?s is solvent. Now picture a jar filled with marbles representing large, poorly atomized droplets of PSPC. The gaps in between are, you guessed it, **solvent**.

If you apply your PSPC in large, poorly atomized droplets, what you will have is a film full of solvent. This can and will cause slow curing, shrinkage and dieback (the loss of gloss in the hours and days after application).

So, now that we have learned the need for gun set up, how do we do it? Lets start with the fluid tip choice.

### Fluid Tip Choice

The newer high solids low VOC PSPC products need to be broken up more, so a smaller fluid tip is needed.

Basically you want the smallest fluid tip that will still allow you to PSPC the particular part you are PSPCing, keeping the entire thing wet and in a fair amount of time. In other words, a 1.0 tip would be beautiful for clearing one fender, but would be lousy to paint a complete vehicle. The application would be way too slow and the first panel would be way too flashed by the time you got around back to it. So you need to compromise -- a 1.3 is a great all-around tip, while a 1.5 though getting a little big, can get you by. If you read the tech sheet on the particular product you are shooting, it will have a recommendation for fluid tip size. There are needs for other tips, for instance when shooting polyester primer you may need as big as a 2.3, but for many urethanes and epoxies, or base coats the 1.3 or 1.5 will work great. If you plan on using a pressure pot or paint a bus, all bets are off and we would need to study a little bit more.

As an example of the use of a 1.3 tip, I did a test once that proved the point well. I shot two panels of metal with a medium-solids urethane primer. One was shot with a 1.3 super high-atomizing top of the line topcoat gun. The other was shot with a 1.5 (or a 1.7 I can't remember) ?hoser? primer gun. Three coats were applied and after a full cure (the one shot with the larger gun took MUCH longer to flash and cure by the way) the film thickness was measured. The one shot with the 1.3 tip was 2 tenths of a MIL thicker! The larger gun laid out the marble sized droplets full of solvent and when the solvent flashed the film shrank.

This doesn?t mean I recommend a 1.3 tip for your primer gun, however. It is only meant to make the subject of atomization easier to understand. **Always refer to the tech sheets of the particular product you are shooting to see what tip you should be using.**

### Gun Tuning

You need to ?tune? your gun EVERY TIME you use it just as you would tune a guitar before you perform. This is done with a very basic spray-out pattern test. This very basic test tells you how your gun is atomizing and you adjust it to achieve the best atomization you can.

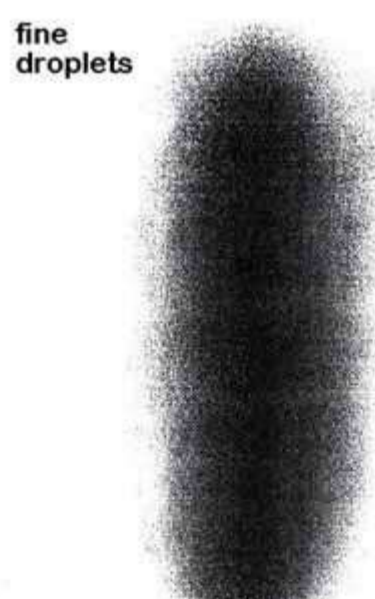


Coarse Spray Pattern

Set the fan width as need (you don?t want to change it after you have ?tuned? the gun). Turn the material knob "out" about 2 ½ turns. This is the ?mixture? adjustment, kind of like the idle screw on a carburetor. The farther in it is screwed, the lower the fluid to air ratio is and the smaller the droplets will be. The farther out it is, the higher the fluid to air ratio is and the larger the droplets. Set the air pressure at the inlet to the gun to the manufactures specs. On an HVLP gun this spec is usually found on the gun and is the maximum PSI it can have while still maintaining the maximum 10 lb at the cap for legal HVLP transfer efficiency (68 %). You are now ready to do a test spray out.

Tape a piece of masking paper on the wall for the test. Hold the gun at a right angle to the wall, just as if you were going to paint the wall. Hold the gun at a spread-out hand's distance (about 8? or 22cm). Pull the trigger to completely open for a split second and then close it. You want an ON-OFF wide-open to completely closed in **ONE** movement. You should have a cigar shaped pattern with complete coverage in the center with fading coverage going away from the full coverage cigar shape in the center. The center should be fully covered without any runs. If you have runs, either you are holding the trigger too long, you are too close or the gun is simply applying too much material. In which case you need to screw in the material knob or turn the air pressure down. But most likely if you have turned the material knob out the 2 ½ turns and the air is set at the factory specs, you are just too close or holding the trigger open too long.

The droplets you see trailing off the center are what you will use to ?tune? your gun.



Normal Spray Pattern

Turn in the material knob to make the droplets smaller (and or raise the air pressure). **The balance you need to attain is the smallest droplet size possible before you loose the coverage desired.** In other words if you turn in the material knob too far, not enough material will be coming out to cover the panel! That balance of atomization and enough material coming out is what you are after.

Now, you?ll notice I said, ?raise the pressure to the gun.? And earlier I said to set it to "manufactures specs." This can be 25-50 PSI and is measured AT THE GUN. This means at the INLET of the gun, NOT at the cap and NOT at the other end of the hose, but AT THE GUN. If your gun doesn?t have a regulator on it, then install one. This regulator will tell you at all times what the pressure is AT THE GUN, which is what you need to know. Be sure to buy a quality regulator from a paint gun manufacture. Some cheapie regulators are going to rob air volume from your gun because of restrictions within them. This is something most home hobbyist CAN NOT afford do to small compressors. If you don?t have the air volume to atomize your paint, you are NOT going to get satisfactory results.

We are talking a very small adjustment. It is a fine balance in material to air ratio and a little more air than specified is okay. Even if it is an HVLP gun the inlet pressure recommended is to maintain the 10 PSI limit at the cap. Well, about three quarters of the country has no regulations for HVLP use so if you go over the 10 PSI all it will do is atomize the material a little better. You may loose a little of the benefits of HVLP though. But remember you have a lot of control with the material adjustment knob.

After you are happy with the droplet size, **DON'T TOUCH THE FAN CONTROL**. It will change the PSI at the cap and will change the atomization you worked hard to get.

Do this spray out every time you spray and as material change, temp, and humidity change. Remember, every time is different and even environmental changes within the same paint session will necessitate a new spray-out droplet pattern test. Good luck!

Check for an enlarged image of the [normal spray pattern](#) and the [course spray pattern](#).

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