

## Subject: Using a Air Density Gauge

Have you ever noticed how well your bike runs on a frosty morning? Well it's not you imagination, it's all about the Air Density.

### Question: What is Air Density Percentage?

*Answer: Air Density Percentage is a measurement that combines of Air Temperature and Barometric Pressure.*

### Question: Why is Air Density important?

*Answer: A motorcycle engine runs on a mixture of oxygen and gasoline, the engine gets it's oxygen from the air drawn in through the carburetor's choke or venturi, various orifices in the carb (holes) and the gasoline through the various jets. To get the best performance from an engine the fuel and air need to be in a precise mixture or ratio of air to fuel known as AFR. The reason you change jets to get the best performance is to get the optimum AFR and the when the Air Density goes up or down we need to adjust the fuel to bring the AFR back into line.*



Tech stuff for those who like it –

Density is based on atmospheric pressure 14.696 psia and molecular weight of air 28.97

- Density : 1 lb/ft<sup>3</sup> = 16.018 kg/m<sup>3</sup>
- Pressure: 1 psi (lb/in<sup>2</sup>) = 6,894.8 Pa (N/m<sup>2</sup>)
- Temperature: T(oC) = 5/9[T(oF) - 32]

Density of air can also be expressed as

$\rho = 1.325 \text{ pin Hg} / \text{TR} (1)$  Where

$\rho$  = density (lb/ft<sup>3</sup>)

pin Hg = pressure (inches Hg)

TR = absolute temperature (Rankine)

### Question: When I correct the jets to compensate for Air Density changes will bike run same as it did when I set it up?

*Answer: No, the carburetion will be optimized so it will run clean. However the horsepower the engine can produce is affected by the available air and fuel.*

*Here's why, the base setting that most of the automotive industry uses is 95% RAD. At 95% an engine is said to produce 100% of it power. So when you read the engine output in a brochure it's usually rated at 95% RAD, Let's say your engine makes 49 bhp, if the RAD increases from 95% to 104% the engine could produce 52.5 bhp, on the other hand if the RAD drops to 83% RAD (think Thunder Valley, CO) you are likely to see around 42 bhp. It would be much worse if you didn't correct the jetting.*

*Note: These numbers are based on the SAE calculations to correct dynos for atmospheric conditions.*

### Question: What is Air Density Gauge?

*Answer: an Air Density gauge simply provides you with reference number, a measurement of air temperature and barometric pressure; "Percentage of Relative Air Density or "RAD".*

### Question: How do I use the Air Density Gauge?

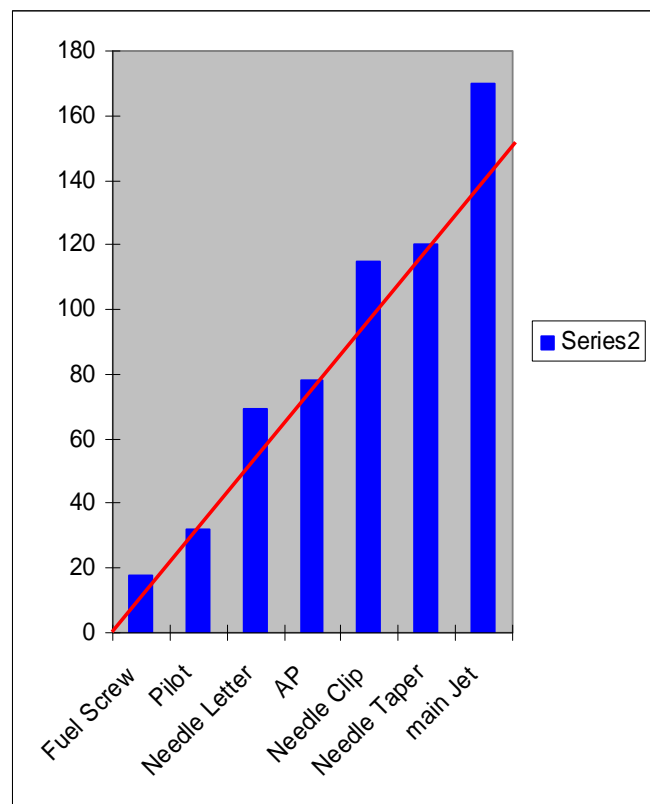
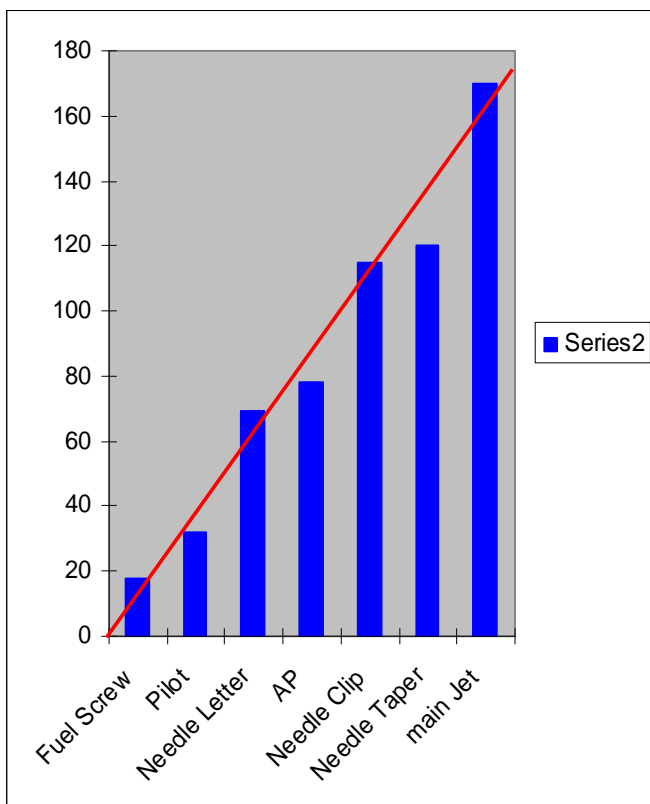
*Answer: Let's say you have your bike running how you like it, make a note of the current Air Density and the jets you have in the carb, when you see the air density change more then a few percent you change the jets to compensate. Below we have a link to a custom chart to assist you with jetting and also gives you an approximation of the horsepower loss or gains you can expect.*

**Question: Is it important to get all the carb settings correct and if so why?**

*Answer: Yes it's important to get all the various tuning parts correct especially if you ride in different conditions. The charts below will help explain. The blue columns represent how much fuel will flow through the jets and needle etc into the engine. The red line represents how much air is available.*

*On the left you can see a scenario where you have an "OK", average setting but notice how the pilot is supplying a little less than the available air (making it a little lean) but the straight diameter of the needle is a little rich. Overall when you opening the throttle the bike would run fairly well in those conditions.*

*Now, on the right you have the same jetting but a warm day and low air pressure. See how the pilot and needle taper are OK but the straight diameter of the needle, the needle clip and main jet are really rich, this gets confusing when you are trying to dial in for these new atmospheric conditions. If its correct to start with you know you have to bring everything down or up to correct the fuel for the new RAD.*



*Here is a link to a chart that will help you keep your FCR equipped motorcycle or ATV running at it's best.*

[Merge Jetting Chart](#)