

Richard's **DUCATI** ST2 pages - TPS and throttle adjustment

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First off, if you are reading this you will likely also love to read the writeup on how the fuel injection system works at [Sigma Performance](#). Well worth a read so you understand the design of the system before you jump in to adjust it.

Throttle Position Sensor (TPS) adjustment

Below is some info gathered from the mailing lists, the shop manual, and personal experience. Note that these instructions are for the ST2 with the 16M computer, not sure all of the procedures will apply to the ST4.

1. Remove the cover on the big connector going into the computer. This is done by removing the zip-tie on the rubber boot, removing the small screw on the end, and then sliding the cover off. The connector must remain attached to the computer. Make sure the fuel pump, etc. are still connected as these loads may affect the readings.
2. Hook a voltmeter up between pins 16 and 30, set to measure DC voltage.
3. Turn ignition on, but no need to start engine. Voltage should be in the 500-560mv range according to the shop manual. I have also receive via email a suggestion that US bikes may work better with a reading of 462mv and European bikes may work better with a reading of 404mv, each +/- 5mv. The same source gave values of 404mv and 345mv for the US and Euro model ST4.
4. If adjustment is needed, back the throttle stop screws all the way out and check voltage again. Should be 150mv with throttles completely closed. If not, loosen the TPS screws, rotate it to get the desired reading, and re-tighten.
5. Now turn the stop screw on the throttle body attached to the TPS to open the throttles enough to get the readings specified in step 3 above.

You are now done with the TPS so can remove the voltmeter. Basically the above procedure calibrates the TPS to output a 2.5-3 degree value to the computer at idle. The map on the computer chip is set up to assume the throttles are open 3 degrees at idle and uses the value from the TPS as one of the parameters to decide how much fuel to inject when you open the throttle. From here you need to balance the vacuum on the two intakes via the linkage between the throttles and then fine tune the idle speed with the air bleed screws.

Throttle Balancing and Idle Adjustment

The throttle bodies need to be balanced to ensure smooth running. I'm sure the factory tries to get this close but I checked mine at 1000 miles and the balance was off a bit at both idle and higher RPMs. Adjusting the balance resulted in noticeably smoother running.

If you are going to check the TPS then you should do that first as any adjustment to it will affect balancing and idle. You will need some type of vacuum gauges, I have both the mercury column type and the dial type. The former seem to work a bit better with big twins, but both are acceptable. On each intake manifold there is a vacuum port plugged by a small screw. To check the balance you remove these screws, connect the vacuum gauges, and observe the differences in vacuum between the two with the engine running. Make sure you tighten those vacuum port screws well when you are done. I had one vibrate out and this resulted in some interesting backfires and a rough idle due to the resulting vacuum leak.

A CO meter is nice to have but not absolutely necessary. It will allow you to balance the CO between the cylinders at idle. I have one but found that balancing the vacuum carefully resulted in balanced CO as well. So if you are careful with the vacuum balance the CO check is likely not absolutely necessary. See my [fuel injection](#) page for info on my CO meter.

The CO can be measured from the silencer outlet and this will yield a value representing some average of the two cylinders. The exhaust system has a collector that allows the gasses from both cylinders to mix before being split up again on the way to the individual silencers. Therefore measuring at the silencers is not going to allow you to balance the CO value between the two cylinders. To measure this properly you must hook up the CO meter at the port provided on the header pipe for each cylinder. I was not able to find adapters that matched the thread in these ports exactly, but found at the local hardware store a brass fitting with 1/8 NPT on one end and a compression fitting on the other end. The 1/8 NPT does not match exactly but will be close enough as the brass will deform a bit when threaded into the stainless fitting on the header. I really doubt that brass fitting could mess up the stainless threads so this is pretty safe. The brass fitting may get messed up after a few uses but they are really cheap to replace. Then you will need some metal tubing - aluminum, copper, steel will all do - whatever is available. Use a foot or two of this from the

fitting to the vinyl hose on the CO meter. The reason for the metal tubing is to disperse some heat - the vinyl hose will melt if placed directly on the fitting.

When replacing the plugs in the headers I suggest safety wiring them. I've heard of quite a few folks having problems with them falling out.

Try to do this procedure in a well ventilated place as the meter is comparing the exhaust to the ambient air. If done in a relatively confined space with little airflow then the exhaust will start altering the ambient CO percentage after a while and cause the readings to drift. Mine seems relatively stable, at least for the 5 or 10 minutes required to balance between the two cylinders.

The factory shop manual has a long write-up of the procedure and references a special meter to check some of the adjustments. I used a slightly different procedure without the special meter and had good results. I will describe that procedure here.

To access the adjustment screws you will need to prop up the tank and remove the airbox. The main idle adjustment screw is on the left (vertical cylinder) throttle body. Look at the left throttle body where the shaft goes in and you will see a small screw that limits the throttle travel and thus adjusts the idle. This screw will move both of the throttle plates. Adjusting this is the quick way to get a little more or less RPM at idle. The main balancing adjustment screw is in the linkage between the throttle bodies and adjusts the relative angle between the two throttle plates. On each throttle body there is an air bypass screw which allows air past the throttle plate. These are used to fine-tune the balance and the CO percentage between the two cylinders.

The goal is to try to balance between equal vacuum on both, equal CO percentage on both, the proper voltage from the throttle position sensor, and the correct idle speed. It is an iterative proces and I went about it in the following sequence:

- 1. Adjust TPS to proper voltage.**
- 2. Start engine.**
- 3. Adjust main balancing screw for equal vacuum at idle and 5000RPM.**
- 4. If you cannot balance both at idle and 5000RPM values then use the air bypass screws to alter the idle balance.**
- 5. Set the idle speed.**
- 6. If the idle was changed much then you have altered the base throttle position and you need to return to step 1, adjust the TPS, then check everything again.**
- 7. If you have a CO meter then check the CO at idle on each cylinder, adjusting the air bypass screws to balance.**
- 8. If you made adjustments for CO then return to step 2 and check everything again.**

The idle spec in the workshop manual is 1000-1100 RPM. I actually run mine at 1200-1300 on purpose as the idle is a bit smoother there. This is likely related to my lighter flywheel/clutch and the high-compression pistons conspiring to make the engine a bit harder to keep spinning at low speeds.

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