From the old FIM website

How does the CO trimmer work and how do I set it?

Every model of Weber injected bike has a CO trimming function which allows the idle mixture to be set. In fact the trimmer affects fuel delivery over the entire RPM range, but with a lesser effect at higher RPM. The amount of fuel added or subtracted from the base fuel duration varies from model to model, as it's programmed differently for different models and ECUs. However it is necessary to adjust the CO Trim to obtain optimum performance.

P7 or P8 ECUs (851/888/916SP)

On these ECUs there is an external screw adjuster located next to the 35 pin harness connector. This is usually under a grey plastic cap which can be removed for access. The screw adjuster has a range of four turns, or plus/minus two turns. The default position is in the middle of the range. When you screw the adjuster clockwise the mixture is richened. The adjuster has no end stop, so if you over-adjust the screw the trimmer just rolls over at the maximum or minimum setting, without damaging the trimmer. Each time the trimmer rolls over a tiny click is just audible.

So to set the default position, all you need to do is turn the screw clockwise five times, and listen for the tiny click when the trimmer rolls over. Note the position of the screwdriver blade, and then turn counterclockwise for two turns. The trimmer is now in the default position.

Since the trimmer is simply a potentiometer which puts out a signal from 0 to 5 volts, you can also set your default position using a voltmeter placed on the centre terminal of the trim pot, inside the ECU. You should set the default position to 2.5 volts.

16M computers (748/916 Biposto/ST2)

On these ECUs the trimmer is located inside the ECU and the rubber bung must be removed for access.**NOTE - Always re-seal the rubber bung with waterproof tape (ie Gaffer tape or Duct tape) after you have finished adjusting CO.**

Next to the chip socket there's a very small (1/4" square) trimmer potentiometer. This has the same function as the external trimmer screw on P7 and P8 ECUs. The Trimmer on the 16M ECU has a range of about 3/4 turn, or 270 degrees. When you hit the end stop, STOP !!! There is no roll-over on these trimmers and they will break if you try to force them.

When you screw the adjuster clockwise the mixture is leaned. To set the default position, simply set the trimmer in it's mid-rotation point. You can also use a voltmeter to set the 2.5 volt point.

1.5M ECUs (900ss, 750ss)

On these ECUs the CO trim function is achieved via software. There is no CO trim potentiometer. To get access you need either the factory Mathesis tester, or the UltiMap Diagnostic software for Win95.

The CO is adjusted with the software using an Up/Down system, and when the correct CO is obtained the value is locked into the ECU using EEPROM memory.

What is the adjustment range of the Trimmer?

This depends on the particular EPROM settings for each model. Bear in mind that this function is deigned for idle mixture adjustment, not overall engine tuning! Typical examples are shown in the table:

Ducati 996 Biposto

RPM	Idle Throttle	Idle Throttle range mS	Idle Throttle range %	Mid Throttle	Mid Throttle range mS	Mid Throttle range %	Full Throttle	Full Throttle range mS	Full Throttle range %
1100	1.17 mS	+/-0.24 mS	+/-20%	2.31 mS	+/-0.24 mS	+/-10%	3.44 mS	+/-0.24 mS	+/-7%
4500	0.96 mS	+/-0.15 mS	+/-15%	1.48 mS	+/-0.14 mS	+/-10%	2.78 mS	+/-0.14 mS	+/-5%
9100	0.95 mS	+/-0.07 mS	+/-8%	1.11 mS	+/-0.07 mS	+/-6%	2.20 mS	+/-0.07 mS	+/-3%

Note that a mixture change of 1.5% is required to move the exhaust Lambda by one point (ie from 0.90 to 0.91) so the available range is pretty massive, and will still have some effect at high rpm.

How do I set the trimmer correctly?

Firstly let's look at the factors involved in the mixture system:

The fuel entering the engine is controlled by the injectors, principally by how long they are open for each engine cycle. Typically at idle they are open from about 1mS to about 2mS. The CO trimmer affects this duration as shown in the table above. This change is the same for both cylinders, and cannot affect the CO cylinder balance.

The computer measures the butterfly position using the Throttle Position Sensor (TPS). This sensor is precisely aligned on the butterfly shaft and afftects not only fuel delivery but ignition advance as well. Many owners are tempted to move this sensor on the shaft, as you can get more fuel delivery from the ECU in this way. But there are several goods reasons not to do this:

- The Weber TPS sensors are **NOT LINEAR**. If you change the position from the factory setting, not only do you change the fuel delivery but you change the ignition advance. This means that the bike will have too much advance at partial throttle, leading to detonation (pinging) problems which were not there before.
- The factory used a specific setting for it's mapping, and we use the same setting for our mapping. So if you want to achieve optimum results with our

chips, then you should set the TPS to the factory settings. Then your engine will operate as close as possible to the engine we used for testing.

The air entering the engine is controlled by two things, the throttle butterfly and the air-bleed channel. These two factors are inter-dependant, ie you can get the same amount of air with a shut throttle and open airbleed as with an open throttle and shut air-bleed. The difference is that the ECU does not know how the air-bleeds are set, whereas it does know the throttle position. So you can change the air entering the engine either by opening the throttles (which the ECU knows about and makes an adjustment for) or by opening the airbleed. The salient point here is that the butterfly and the airbleed are designed for two different functions.

The butterflies are designed to deliver the same amount of air to each cylinder under load conditions. This is achieved by synchronising the butterflies using a vacuum guage or 2-channel CO meter.

Because the butterflies are not perfect, the airflow will vary between the two, especially at low throttle settings. It is impossible to maintain exact synchronisation through the throttle range, so the butterflies are synched where they are most critical, ie in the range one-third to one-half throttle. This can be easily achieved on a brake dyno.

The designed purpose of the air-bleeds is to achieve cylinder balance at low, or idle, throttle settings, where the butterflies are effectively closed on the stop screw. The bleeds are adjusted to give either matching vacuum or CO for both cylinders.

Clearly the idle can be set in a number of ways, since the mixture and balance are interdependant, along with the butterfly synchronisation.

So unless you are familiar with idle setting then we suggest you leave this to a dealer with the right equipment. **To properly set the CO you need a CO meter !!** If you don't have one it is very hard to pin down the relationship between the CO trim, the air bleeds, and the butterfly position.

So to re-iterate the variables:

- Throttle Position Sensor adjustment.
- Butterfly synchronisation.
- CO Trimmer setting.
- Air Bleeds.

We use the following sequence to correctly align all parts of the induction system. This sequence is essentially the same as the factory recommended sequence:

- **Set the Throttle Position Sensor on the throttle shaft.** To correctly do this you must:
    - Completely back off the idle stop screws on both throttle bodies.
    - Use the Mathesis tester or a Digital MilliVoltMeter to read the throttle sensor voltage. To do this you should tap the butterfly with your finger to ensure that the butterfly is completely closed against the body. Then you turn on the ignition and measure the voltage on the throttle sensor:

        - P7 or P8 ECU: Pins 11 and 17.
        - 1.6M ECU: Pins 16 and 30.
        - 1.5M ECU: Pins 22 and 11.
    - If the sensor does not read 150mV Plus or Minus 2mV then you need to adjust it:
        - Slacken the lock screws on the throttle sensor using a screwdriver or 7mm socket.
        - Carefully move the sensor whilst reading the voltage.
        - Retighten the lock screws a little at a time, each time reading the voltage and adjusting the sensor.
        - Note that you should probaly overshoot the reading by about 5mV on slack screws, because when you tighten them the reading will change by about 5mV.
        - Repeat until perfect. This takes a lot of practice.
    - The factory manuals specify +/- 5mV but we feel that this is not accurate enough. many owners will attest to the difference in performance when the sensor is set perfectly.
    - Re-set the throttle stop screw (or screws) so that the engine idles at around 1200 rpm. This is not a final setting for the stop screws, merely a step in the procedure. Typically this will produce a voltage of around 300mV on the TPS. **This value is completely arbitrary and is not important**. Many people misunderstand the factory manual in this regard and will try resetting the TPS until they get 1200 rpm idle and exactly 300mV on the sensor. **THIS IS WRONG !!!.** The actual voltage on the sensor at idle is irrelevant to correct sensor positioning on the throttle shaft. Trust Me !!
- **Synchronise the Butterflies:**
    - Close the airbleed screws completely by adjusting **CLOCKWISE.** If you don't do this then the throttle vacuum will still reflect any air passing through the bleed channels and the butterflies will not be perfectly synched.
    - Attach vacuum guages to the manifold port on each cylinder and run the engine.
    - Adjust the throttle butterfly link shaft until vacuum is identical.
    - Rev the engine and confirm that vacuum tracks on both cylinders throughout the throttle and RPM range.
    - Re-adjust the link shaft until satisfactory results are obtained.
    - **Do Not** adjust the throttle link shaft after this point.!!
- **Set the IDLE Balance** by adjusting the airbleed screws counterclockwise and confirming that the vacuum is identical for both cylinders at idle. You can rev the engine and observe vacuum tracking through the rev range, and then observe idle vacuum restabilising. **NOTE** Since the airbleeds are designed to iron out any irregularities in the throttle's function, by their nature there is no default setting, unlike the idle screws on a carburettor. If anything the default setting is fully closed. Airbleeds can also be balanced using a 2 channel CO meter. In this case, just adjust the bleeds until both cylinders have the same CO.
- **Adjust the IDLE Mixture**. Finally you get to set the CO Trimmer ! This will affect both cylinders by the same amount, so you need to set the airbleeds first. A typical CO figure for idle is 4% to 6%, but automotive regulations usually specify a CO of under 1% to meet emmissions standards. A V-twin will

idle very poorly if the CO is set below 1%, so if you are really bothered try a setting of about 3%. Note that you may need to finesse the airbleeds at this stage.

- **Adjust the IDLE RPM**. Set the idle rpm at the manufacturer's figure (usually 1100 - 1200 rpm) by adjusting the throttle butterfly stop screw (or screws). We recommend 1200 rpm for Ducatis and Guzzis, possibly 1500 rpm for Ducati 996SPS models.
- Finally, note that the last three steps are usually repeated until an acceptable balance of Idle Balance, Idle Mixture, and Idle RPM are obtained. This is normal. **Do Not** adjust the throttle synchronisation link shaft once it is set in the early stages. If you do this now, you will need to go through the entire sequence again.

So hopefully you will have an engine which now idles, accelerates, and delivers full power faultlessly. Again, if you are not confident about all of these steps, then we suggest you use a dealer who has the skills and equipment. **It is not worth adjusting the CO trimmer unless the entire sequence is followed without skipping any steps.**