

TuneECU TPS and ISC Stepper Adjustment

On the “**Tests**” page of TuneECU there is a menu option labeled “**Adjust ISCV**”. It provides a means to check and adjust the TPS (Throttle Position Sensor) and ISC (Idle Speed Control) Stepper Motor. This file provides a description based on my 2006 Triumph Sprint ST 1050 with Keihin ECU. I’ve made no attempt to highlight differences for other models. At the end there is additional information for about the secondary throttle used on the Triumph Daytona 600, Daytona 650 and Rocket III.

TuneECU can be used to check and adjust TPS and ISC in three basic steps each accessed by double-clicking “**Adjust ISCV**” in turn:

1. Move the throttles to a fully closed position and check TPS voltage. Adjust TPS position if necessary.
2. Drive the stepper motor to fully opened and check TPS voltage. Adjust stepper arm/lever if necessary.
3. Reset adaption. This resets adaption values to their start point. The engine must be run to “learn” new adaption values.

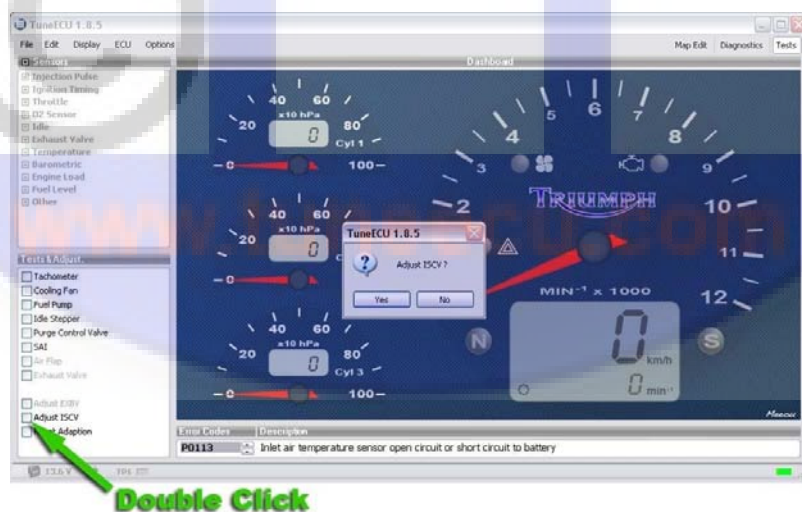
Update: from Version 1.9.10 of TuneECU resetting adaption values is separated from the “**Adjust ISCV**” process. It no longer occurs automatically so resetting adaption must be initiated separately using the “**Reset Adaption**” command (or from the menu bar select “**ECU> Reset Adaption**”). With this change it is now possible to check the voltage without initiating adaption reset.

OK, that’s a basic description. For those who want to know more read on and I’ll describe at length with photos and other information.

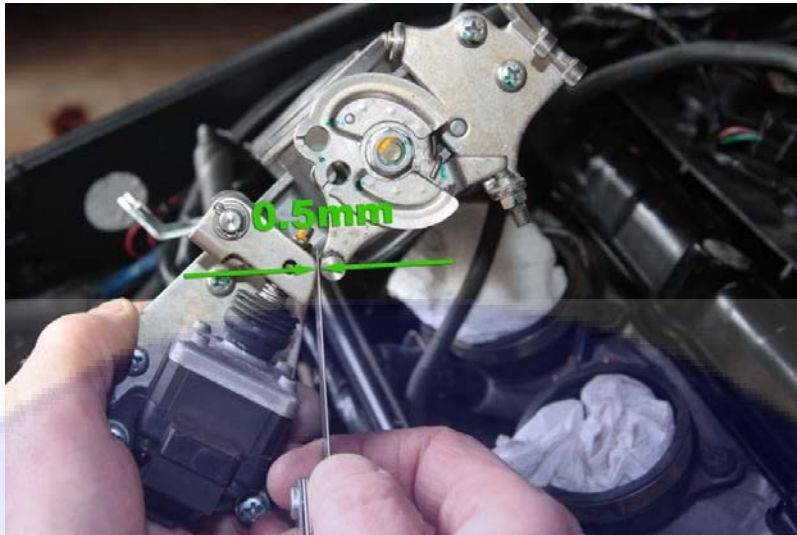
TPS and ISC adjustments are not regular maintenance items and should only be necessary if those components are replaced or found to be operating out of range (that might be sign of imminent failure). If you’re like me you’ll fiddle anyway out of curiosity and a desire to get the settings bang-on.

Checks can be carried out by simply hooking up TuneECU and reading the output voltages without removing the tank, airbox, etc. Just be sure that the throttle cables have sufficient slack so they don’t interfere with the throttles moving to the fully-closed position. I checked mine when the whole area was open and throttle cables disconnected for other maintenance.

The first step is to get a baseline TPS voltage by driving the throttles to the fully-closed position. With TuneECU connected to the bike and ignition on (but engine not running) go to the “**Tests**” page and double click “**Adjust ISCV**”.



Confirm the “**Adjust ISCV?**” request. The Cyl 3 MP dial will change to a TPS Voltage indicator. TuneECU will send a command to move the throttles to the fully-closed position. If these checks are being performed because a new stepper motor has been fitted check the clearance between the idle speed control lever and the roller on the throttle cam. Clearance should be 0.5mm.



With the throttles still in the fully-closed position the TPS voltage should be 0.60V (+/- 0.02V). If the voltage is outside the range 0.58V – 0.62V adjustment is made by rotating the TPS, located on the left side of the throttle bodies.



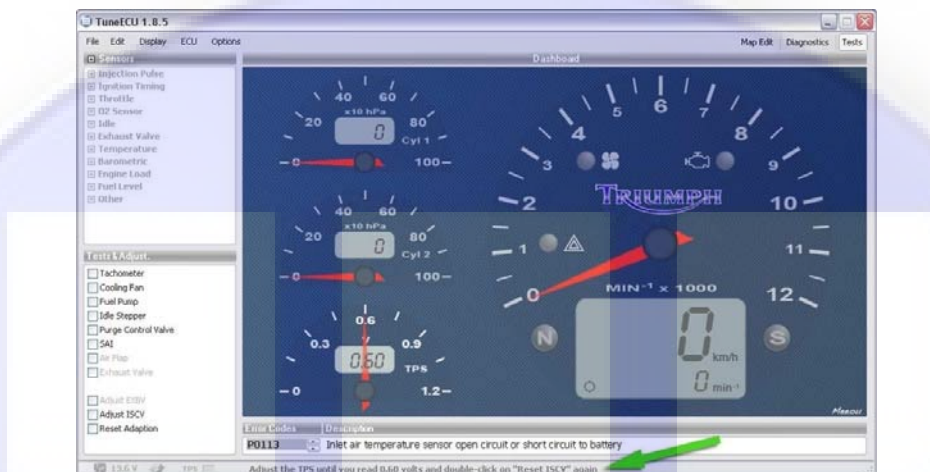
On my Sprint access to the TPS holding screws is blocked by the frame. If adjustment is required the easiest way (for me) to do it is to simply remove the throttle body assembly. The TPS holding screws are a Tamper Resistant Torx screw – a T20H Security Torx bit is required. You might consider replacing them with Allen head screws (M4x10) so that a shortened Allen wrench can be used for future adjustments with throttle bodies in place. I didn't because I don't expect to adjust my TPS again.

With the screws slackened off slightly the TPS is moved until the required 0.60V is shown on the TuneECU display. The TPS is very sensitive to movement so check the voltage again after re-tightening the screws. Avoid over-tightening the screws – the specified torque is only 3.5Nm so be careful.

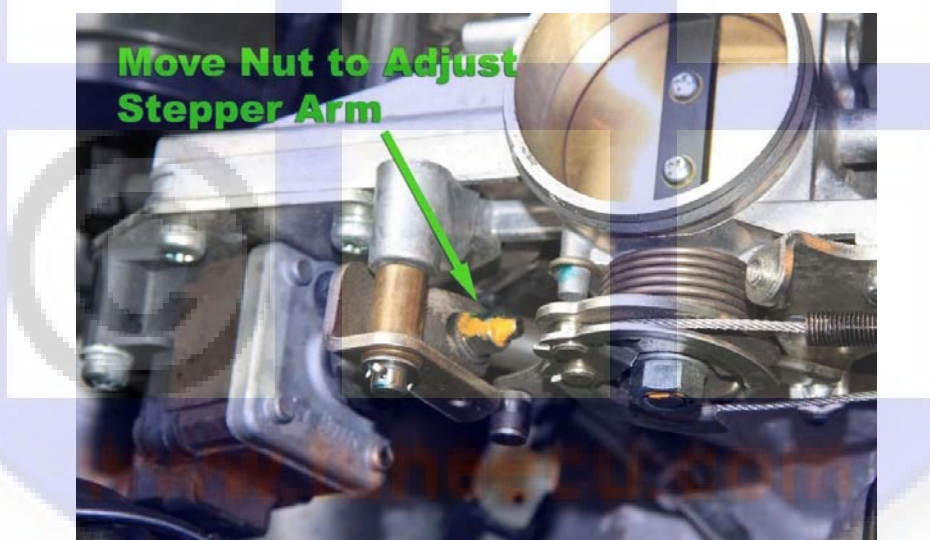


If all is OK double-click on **"Adjust ISCV"** again. TuneECU will send a command to drive the stepper motor to the fully open position. The TPS voltage should now be the previous reading plus 0.15V. In my screenshot the previous reading was 0.60V so now I was now looking for a reading of 0.75V. A tolerance of +/- 0.05V is allowed so a voltage range of 0.70V – 0.80V is acceptable.

Note: the factory manual for my Sprint 1050 (Keihin ECU) says "On pressing the validation key, the diagnostic tool will send a command that drives the throttles to the fully open position". That is incorrect; only the stepper motor is driven to the fully-open position (thanks to surya for clarifying that in an earlier thread).



If adjustment is required move the adjuster nut to set the position of the stepper arm/idle speed control lever. Be aware that this will change the clearance between the idle speed control lever and the roller on the throttle cam that was measured earlier. The 0.5mm clearance should correspond with 0.75V TPS reading. If they do not correspond then a decision must be made to set one or the other. This setting will affect the throttle position for engine starts so if you experience starting issues with 0.75V set then I'd suggest going back and adjusting the stepper arm to the correct clearance.



When all the correct numbers are achieved double click **"Adjust ISCV"** again. This will automatically start the **"Reset Adaption"** sequence – the same process required after a new tune is loaded to the ECU. This does not apply new adaption values; it simply resets them to their start point. To "learn" new adaption values the engine must be run to establish settings for throttle position and fuel trims to achieve correct idle speed control.

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The throttle bodies should be in balance before adaption takes place. TPS adjustment should not affect TB balance and a quick check of manifold pressures confirmed that all 3 cylinders were in balance. After refitting the tank, clear the error codes that were raised because the ignition was turned on with the tank and airbox removed. Adaption cannot begin until the engine reaches normal operating temperature of 90°C. The whole process can take 10 - 15 minutes during which time the idle speed may be erratic. When adaption is complete the “TPS” indicator at the bottom of the TuneECU screen will turn green. The factory manual says “Several forced adaptations may be necessary to fully adapt an individual motorcycle”.

More Information

The TPS (Throttle Position Sensor) is located on left end of throttle body assembly and does exactly what the name implies – it senses throttle position. The ECU provides a 5V feed to the TPS and the voltage returned by the TPS signals throttle opening angle to the ECU. The 0.6V that we set is a throttle closed reference voltage only – you may not see this reading during normal operation. Do not confuse the term “throttle closed” with our normal understanding of throttle grip closed. When the throttle grip is closed the throttles are still open slightly to maintain idle. On my 1050 Sprint TPS voltage ranged from the baseline 0.60V to 4.11V with the throttle wide open.

At small throttle openings fuelling is determined by rpm and MAP (Manifold Absolute Pressure). Above 6% throttle the system delivers fuel based on engine load (measured by rpm and throttle position) so obviously it's important that the TPS readings are correct. Proper TPS adjustment is a physical process - if the TPS voltage reading is wrong the TPS must be moved. There is obviously some latitude in the system because at higher throttle openings (over 40%) the maps for my Sprint are defined in steps of 10% throttle opening.

Mapping is based on standard atmospheric conditions. The ECU will adjust for changes in air density based on barometric pressure and intake air temp. That relationship is determined by laws of nature so it is not necessary to make changes (although I'm sure we'll have a few forum members who think they can make improvement there!). Also, in closed loop operation the system can apply short term and long term fuel trims based on readings from the O2 sensor. '05 and '06 model Sprints go out of closed-loop operation immediately above idle but I'm informed that later model Sprints ('07+) remain in closed-loop operation until 25% throttle opening.

The ISC (Idle Speed Control) Stepper Motor, located on right end of throttle body assembly, will adjust throttle position to maintain target idle speed and increase throttle opening when the engine is cold.

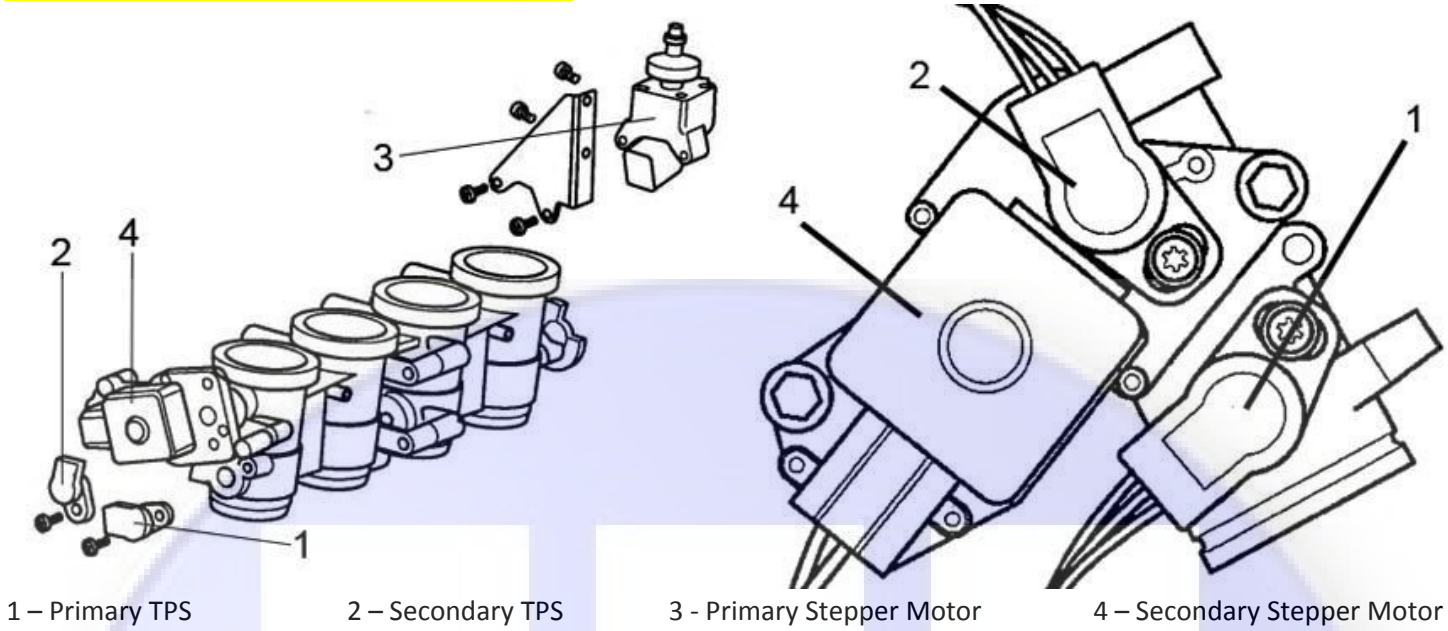
As mentioned at the beginning, this information is based on my 2006 Sprint ST 1050 with Keihin ECU. It does not have a “control valve” as such. Idle speed is controlled by a stepper motor that adjusts throttle position while mixture is determined by fuel maps and trims. Other models, particularly those that use an IACV, will require a different technique.

Additional Information for Models with a Secondary Throttle

The following applies to Triumph Daytona 600, Daytona 650 and Rocket III. Those models have a second throttle to optimize torque by maintaining intake airflow speed. Like the primary system the Secondary Throttle has a sensor (Secondary TPS) and an actuator (Secondary Stepper). The Secondary TPS can be checked using TuneECU and, if necessary, adjusted in a similar way to the previous description. There are some important differences so the following notes have been added to assist those who want to carry out TPS checks or adjustment on bikes equipped with a Secondary Throttle.

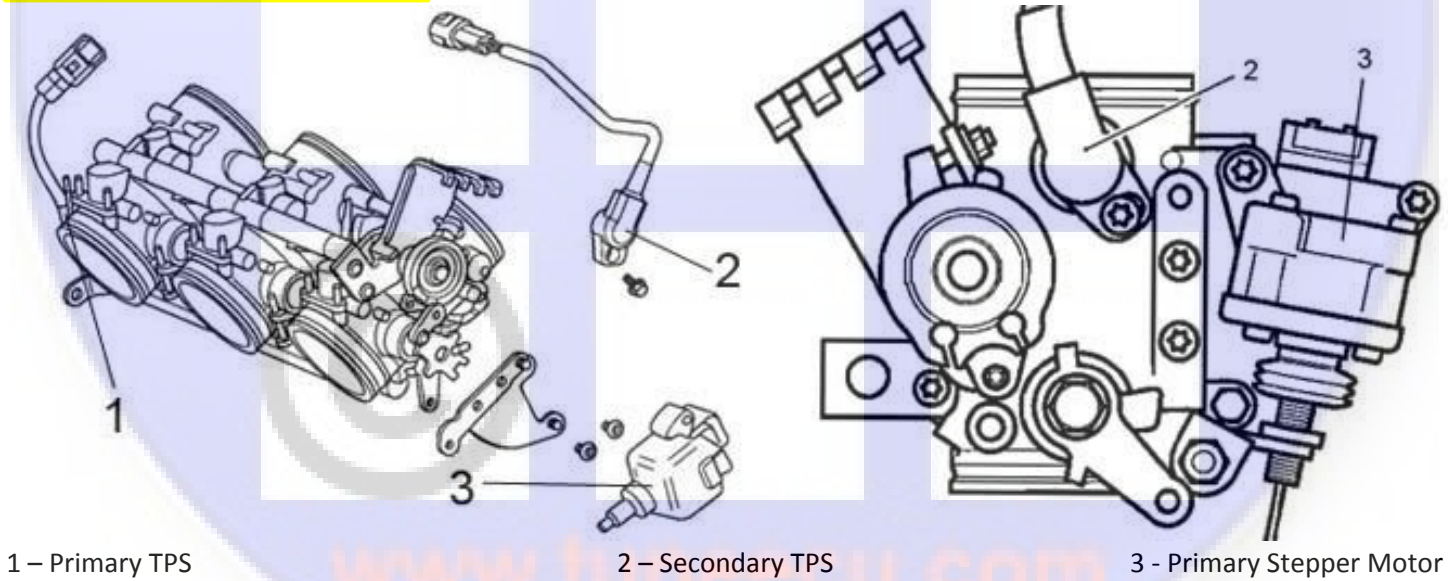
As mentioned before TPS and ISC adjustments are not regular maintenance items and should only be necessary if those components are replaced or found to be operating out of range. I have not carried out this procedure so these notes are based on information contained in the service manuals for the Daytona 600 and Rocket III with practical input from Dazz84. Thanks go to him for doing the legwork running back and forth to his D600 to answer my questions.

Location of Components - Daytona 600 and 650



On the Daytona 600 and 650 the Secondary TPS and Secondary Stepper Motor are located together at the right hand end of the throttle body assembly. The Primary TPS is also located at the right hand end of the throttle body assembly – just below the secondary sensor. The second throttle is the upper one so the Secondary TPS will be on the end of the upper throttle spindle while the Primary TPS aligns with the lower throttle spindle. To aid identification Triumph fitted a white connector to the Secondary TPS whereas the wires for the Primary TPS have a black connector. The Primary Stepper Motor is on left end of throttle bodies.

Location of Components - Rocket III



On the Rocket III the Secondary TPS is at the front end of the throttle body assembly while the Secondary Stepper Motor is located between throttle bodies for No. 1 & No. 2 Cylinders. The Primary TPS is mounted on the rear end of the throttle body assembly aligned with the lower throttle spindle. The Primary Stepper Motor is located at the front end of throttle bodies alongside the Secondary TPS. The Primary TPS can also be identified by its shorter cable.

Checking and Adjustment

Primary and Secondary TPS voltage checks can be carried out with the fuel tank and airbox in place. Any further checks to verify correct operation or make adjustment will require tank and airbox removal to gain access to the throttle bodies.

I recommend checking the secondary TPS first. In TuneECU the last step in the **"Adjust ISCV"** process will reset adaptations. We want that to happen after all adjustments have been made so it makes sense to check the Secondary TPS before reaching that stage.

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Secondary TPS

When the ignition is switched on the secondary throttle is moved to the closed position. With TuneECU connected select the **"2nd Throttle"** command on the **"Tests"** page. This will cycle the Secondary Stepper through its full range from closed to open and back to the closed position. This test is to verify correct operation of the Secondary TPS through its full range of operation.

With the Secondary TPS in the closed position we can check the voltage. Now here's an important difference from the information I gave earlier. The secondary TPS voltage is not displayed on the dashboard on the **"Tests"** page the way the Primary TPS voltage was (as illustrated earlier). To see Secondary TPS voltage we look in the **"Sensors"** column on the left of the **"Diagnostics"** page. Under the label **"Throttle"** values for throttle position % and voltage will be displayed with the 2nd line showing readings for the second throttle.

The factory manual includes a recommendation for checking secondary TPS voltage. A note says *"To ensure the second throttle is totally closed, have an assistant manually press the butterfly closed."* The secondary throttle is the upper one so it's easy to access the butterfly (throttle valve) with the airbox removed. If necessary adjust to 0.60V (+/- 0.02V) by rotating the Secondary Throttle Position Sensor. On the D600 & D650 it's the one with the white connector, on the Rocket III it's the one with the longer cable. Make sure you re-check the voltage after re-tightening the screws because it's very sensitive.

There is no adjustment for the Secondary Stepper Motor so if the Secondary TPS voltage is correct move on to adjustment of the Primary TPS.

Primary TPS

To check and, if necessary, adjust the Primary TPS and ISC Stepper follow the steps I described earlier for my Sprint. The process is the same although components will be in different locations depending on which model you're working on.

In TuneECU click **"Adjust ISCV"** on the **"Tests"** page to move the primary throttles to a fully closed position and check TPS voltage. If necessary adjust to 0.60V (+/- 0.02V) by rotating the Primary Throttle Position Sensor. On the D600 & D650 it's the one with the black connector, on the Rocket III it's the one with the shorter cable. The TPS is very sensitive to movement so check the voltage again after re-tightening the screws. Avoid over-tightening the screws – the specified torque is only 3.5Nm so be careful.

Click **"Adjust ISCV"** again to drive the Idle Speed Control Stepper Motor to the fully extended position. The primary throttle will now be partly open. Check the TPS voltage in this new position. It should be the previous reading + 0.12V. If our TPS was spot on we'd be looking for 0.60V + 0.12V = 0.72V (tolerance is +/- 0.05V). If necessary adjust using the nut on the stepper motor.

A final click on "Adjust ISCV" will initiate an adaption reset. This will return adaption values to the start point. You need to run the bike to establish new values. Bikes without O2 sensor do not learn new trim values but an adaption reset may still have some benefit by allowing the system to calibrate throttle closed position and idle speed control.

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Notes:

I've listed voltages for the TPS settings. The values given in the Daytona 600 and Rocket III maintenance manuals are the same as those for my Sprint. Before making any adjustment confirm that these voltages are correct for your bike.

Secondary Throttle - when the ignition is switched on the secondary throttle is moved to the closed position. Once the engine is started the ECM sends signals to the stepper motor to open or close the secondary throttle to maintain intake airflow speed. Since the Daytona and Rocket III do not have airflow sensors I assume the settings are derived from tables the same way as the fueling. The tables are not visible in TuneECU so, unlike fueling, we cannot customize the values and I don't know if there would be any benefit in doing so.

Finally - thanks to Alain for his fast response to my questions about the way TuneECU handles and displays secondary TPS information.

These notes were produced exclusively for [TuneECU](http://www.tuneecu.com) users by **Champ87**. For more information check out the forum posts at TriumphRAT.net

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