

# PROCEDURE NOTES

## SUZUKI DL650

### THROTTLE-BODY SYNCHRONISATION

#### 1. INTRODUCTION

The DL650 has two throttle bodies, one for each cylinder. These throttle bodies meter the air that is delivered to each cylinder for fuel combustion. To ensure smooth operation of the bike's engine, these throttle bodies must be synchronised so that each cylinder receives the same amount of combustion air for each power stroke.

This document provides notes on the procedure for synchronising the throttle bodies on the K4 to K6 DL650. These notes may also be suitable for later models. Synchronising the throttle bodies requires the use of a manometer (vacuum pressure measuring device). There are many different types of manometers available for this procedure and each have their own way of being used. This file does not cover "how to use your manometer". To perform this procedure properly, you must thoroughly understand how to use your manometer.

- Note:**
1. This procedure is not for those who are "mechanically challenged". If you are, please have this work done by a suitably experienced person. Fully read these instructions before you start and make sure you understand everything.
  2. It is recommended that you read the Tips & Suggestions at the end of these notes.

#### 2. TIME & PERSONS

The procedure normally requires only one person and should take 0.5 (if extension tubes have been fitted) to 2.5 hours. Depending on the manometer you use, you may require an additional person to read the manometer while the other person makes the necessary adjustments.

#### 3. TOOLS

The tools and equipment you will need to perform this modification are-

ITEM	REMARKS
Suzuki "Precision" Took Kit	This should have come with your bike. You will find it under the bike's seat.
Manometer, suitable for balancing carburettors/throttle bodies (the DL650 throttle body vacuum pressure is between 14cm and 18cm of Hg)	Available from most good auto shops or you can make your own- <a href="http://www.powerchutes.com/manometer.asp">http://www.powerchutes.com/manometer.asp</a>
Offset (bent) needle-nose pliers	At lease 200mm (8")
Short (stubby) No. 2 crosshead (Phillips) screwdriver	As short as possible.
DL650 Owners Manual	This should have come with your bike.

#### 4. MATERIALS

The following materials are optional for performing this procedure.

ITEM	REMARKS
2 x 150mm (6") automotive vacuum tube	Between 3mm to 5mm internal diameter (4mm preferred). Available from most good auto shops
2 x connector pieces for 4mm diameter vacuum tube	Available from most good auto shops
1 x small tube blue Loctite 243 (or similar)	A must for all bolted connections on the bike

## 5. PREPARATION

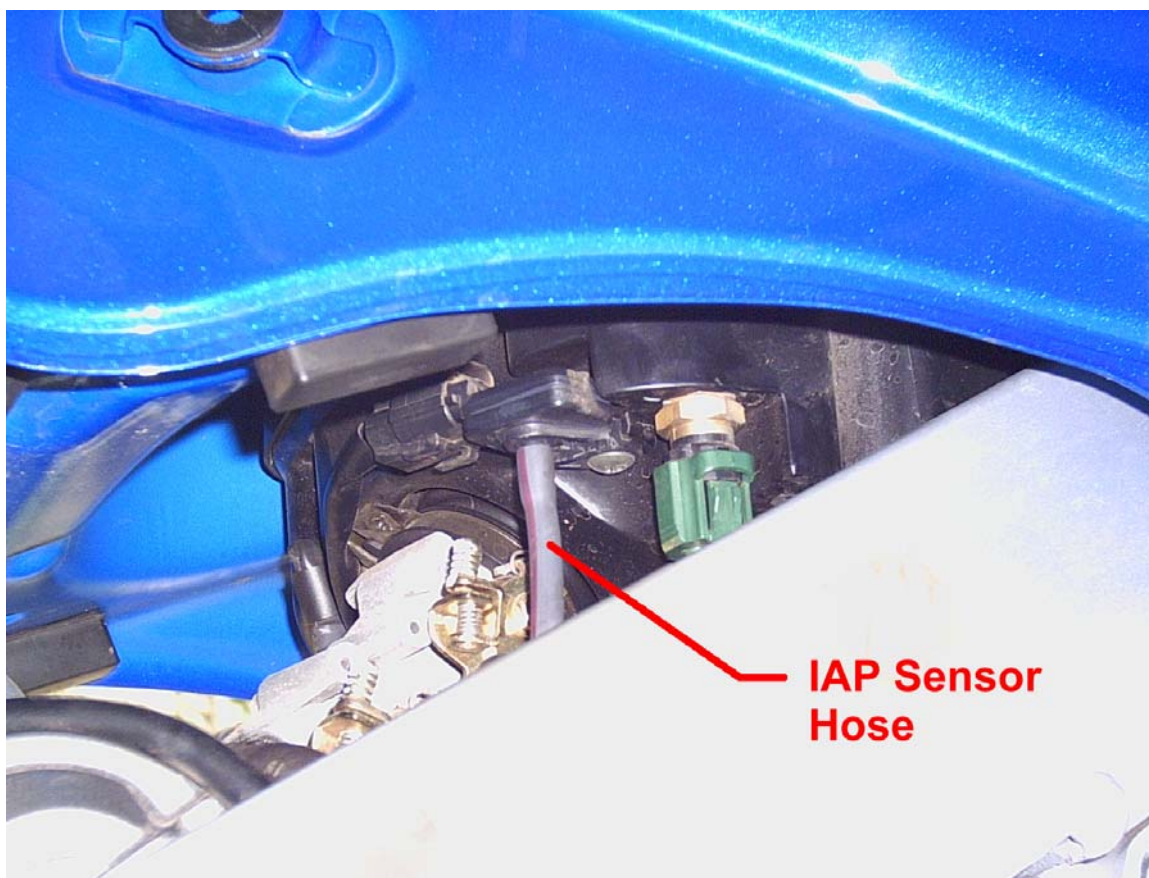
The bike's Suzuki service manual calls for the bike's air box to be removed before synchronising the throttle bodies. From experience, this has not been found necessary, although it does give easier access to the throttle body take-off pipes for the manometer. Many believe the effort is not worth it. For these notes, the air box is not removed.

It is recommend (but not mandatory) that you fit new spark plugs and a clean air filter (if air box is left in place) to the bike before proceeding with the throttle body synchronisation. See the Owners Manual for fitting these items.

- Remove the bike's seat (see Owners Manual).
- Remove the left-hand and right-hand black plastic side covers (see Owners Manual).
- Raise the fuel tank (see Owners Manual) and support on its prop.

**Note:** To remove the black plastic "press studs" use the smallest hex key in the tool kit to press in the centre pin of the stud one click (about 2mm). You should then be able to pull the stud (with pin) straight out. Be careful not to loose the pin.

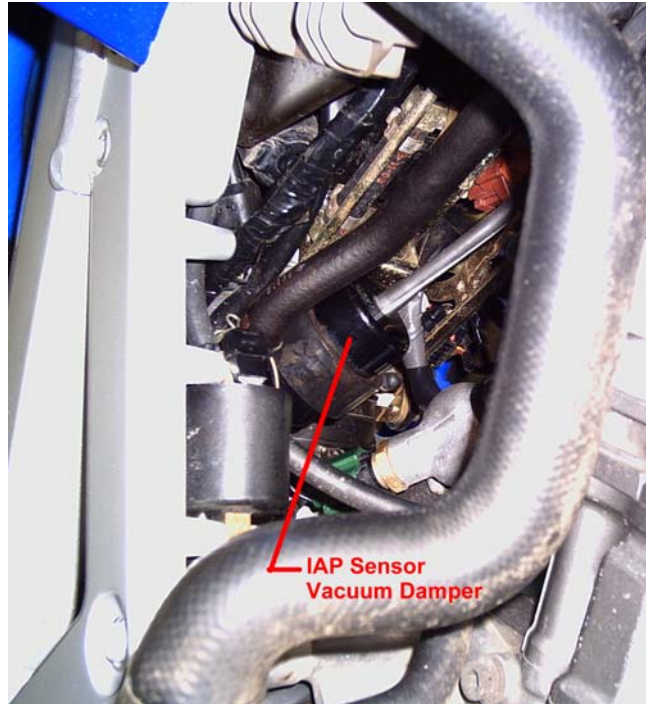
- Disconnect the IAP sensor hose from its connection on the air box (see fig. 1).



**Figure 1**

IAP Sensor Hose under Tank (lkg to left)

- Remove IAP sensor vacuum damper from its metal support bracket (see Fig. 2). This is done by pushing the vacuum damper and supporting rubber towards the rear.
- Move the IAP sensor vacuum damper and hose forward so that it does not interfere with access to the rear throttle body.

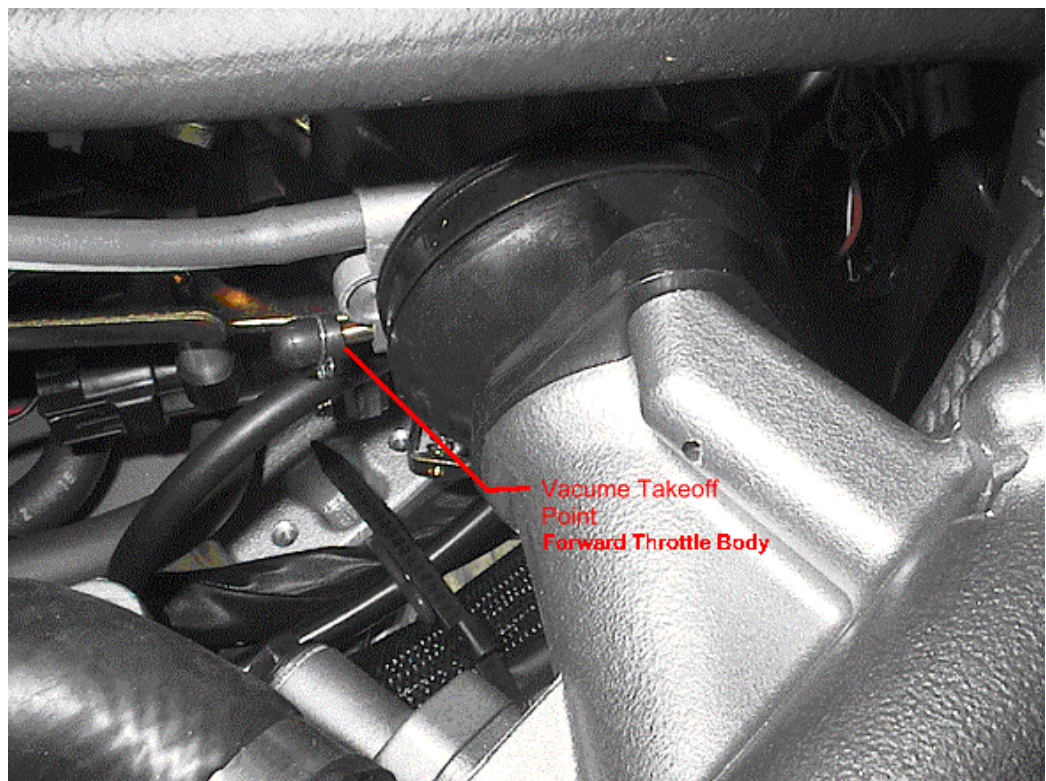


**Figure 2**

IAP Sensor Vacuum Damper (lkg to rear, up and to left)

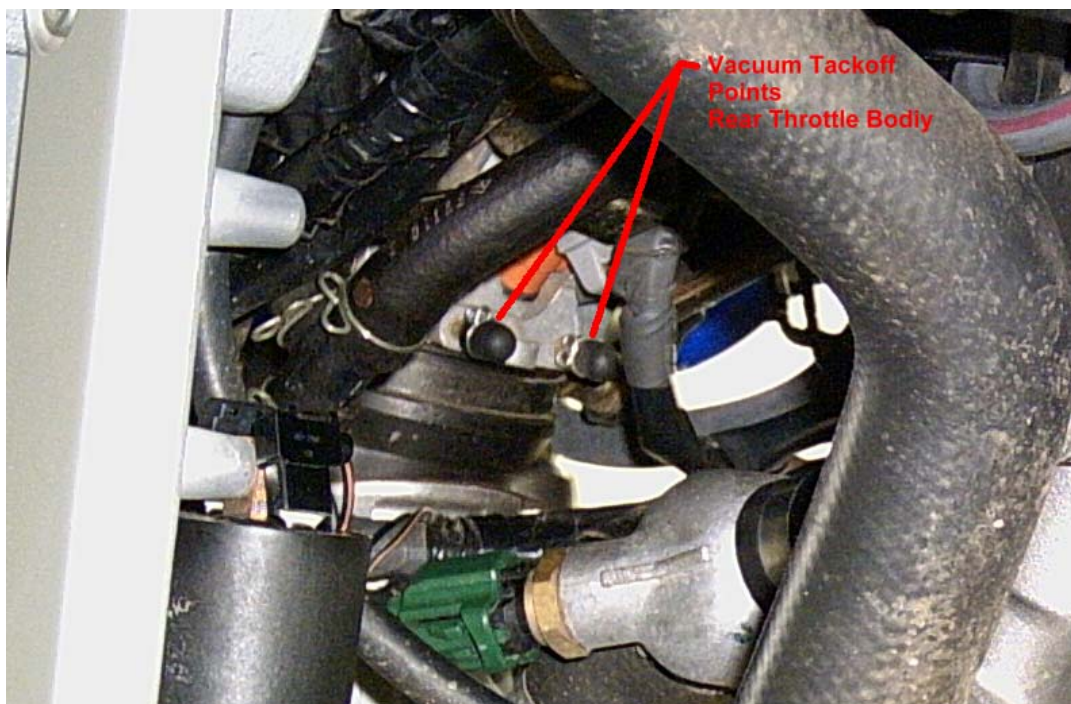
**6. CONNECTING THE MANOMETER**

The manometer is connected to the vacuum takeoff points on the forward and rear throttle bodies. There is one vacuum takeoff point on the forward throttle body (see Fig. 3) and two vacuum takeoff points on the rear throttle body (see Fig. 4).



**Figure 3**

Forward Throttle Body Vacuum Takeoff Point (lkg to left)



**Figure 4**

#### Rear Throttle Body Vacuum Takeoff Points (lkg to rear and left)

Two takeoff points on the rear throttle body are provided so that one can be used to power an accessory (automatic chain oiler, cruise control, etc.) and the other can be used to synchronise the throttle bodies. For throttle body synchronisation, either of the two rear throttle body vacuum takeoff points can be used.

To attach a manometer tube, remove the black rubber cap and retaining spring from the appropriate takeoff point. Then just push the manometer tube onto the takeoff point. You may find the bent needle-nose pliers handy in removing the retaining springs.

Be careful not to loose the black rubber caps and their retaining springs.

It is not easy to get access to the vacuum takeoff points, however it can be done. To make the job easier next (and this) time, see Tips & Suggestions at the end of this document.

- Note:**
1. The best fitting manometer tube has an internal diameter of 4mm, although 3mm or 5mm may be used.
  2. Always replace the black rubber cap and retaining spring onto the vacuum takeoff point whenever the manometer tube is removed. These throttle bodies should never be open to the atmosphere when the engine is running.

## 7. BALANCING THE THROTTLE BODIES

You are now ready to balance the throttle bodies.

**Note:** Reconnect the IAP sensor hose onto its connection on the air box. The bike's engine should not be run with this hose disconnected. For throttle body synchronisation it is not necessary to refit the IAP sensor vacuum damper back onto its support bracket.

- Start the bike's engine and allow it to idle until the temperature gauge shows three bars.
- With the engine idling (i.e. throttle fully closed) adjust the throttle stop screw (see Owners Manual – Idel Speed) until the engine speed is at "fast idle", about 1,300rpm to 1,400rpm.
- Note the reading(s) on your manometer.

- Using the short crosshead screwdriver, adjust the rear throttle body synchronisation screw. The screw is found under the fuel tank on the right-hand side of the rear throttle body (see Fig. 5). The screw may be very hard to turn. Just a little movement of this screw can greatly affect the manometer reading(s).



**Figure 5**

TB Synchronising Screw under Tank (lkg forward and to left)

*(Courtesy of an anonymous member of the Yahoo! DL560 group.)*

- After turning the screw a little, give the throttle a short “blip” and then allow everything to settle down again before checking your manometer reading(s).
- Keep on adjusting the synchronising screw (with throttle “blips”) until you have the throttle bodies balance as close as your manometer will allow. Balanced means that they both have equal vacuum pressure.

Your throttle bodies are now synchronised. You may like to dab a small amount of nail polish on the screw to help keep it from moving with vibration.

## **8. PUTTING IT ALL BACK TOGETHER**

You are now ready to refit all the parts your removed in the preparation. This is done in the reverse order by refitting -

- Of course, you have removed the manometer tube(s) and replaced the black rubber caps (including the retaining springs) onto the vacuum takeoff points.
- Refit the IAP sensor vacuum damper onto its metal support bracket. This is not easy, however with perseverance it will push back on.
- Reconnect the IAP sensor hose to its connection on the air box.
- Lower the fuel tank and secure it in place (see Owners Manual).

**Note:** To refit the black plastic “press studs”, press the pin from the pointed end through the “press stud” so that the pin’s head protrudes about 3mm past the head of the “press stud”. The “press stud”/pin assembly is then inserted into the hole in the fairing and the pin is pressed flush with the “press stud” head.

- Refit the left-hand and right-hand black plastic side covers (see Owners Manual).
- Refit the bike’s seat (see Owners Manual).

## 9. TIPS & SUGGESTIONS

Users of these procedure notes have provided the following tips and suggestions.

### 9.1 EXTENSION TUBES

The hardest part about this procedure is fitting the manometer tube to the throttle body vacuum takeoff points. To make this easier, vacuum hose extension pieces can be fitted to the relevant vacuum takeoff points. These hoses are then routed to the right-hand side of the bike for attaching the manometer tube. The procedure is-

- Remove the black rubber cap and retaining spring from the forward throttle body vacuum takeoff point.
- Fit a piece of 4mm internal diameter vacuum tube about 150mm long to the forward throttle body vacuum takeoff point, securing it with the retaining spring that was with the associated black rubber cap.
- Route the vacuum tube to the right-hand side of the bike taking care that it is isolated from any hot surface and will not chafe. Cut the tube to a suitable length if needed.
- Fit a suitable vacuum tube connector piece to the free end of the tube.
- Fit the associated black rubber cap to the open end of the connector piece.
- Tuck the extension tube arrangement out of the way, again ensuring that it is isolated from any hot surface and will not chafe.
- Repeat the above procedure with the rear throttle body vacuum takeoff point.

To connect the manometer with these extension pieces fitted, you only have to remove the black rubber cap from the end of the extension piece and attach the manometer tube.

### 9.2 MERCURY (Hg)

For those of you who are mathematically inclined and wish to convert mm of Hg to mm of another liquid, mercury (Hg) has the following densities:

Temperature (°C)	Mass (g/ml)
0	13.60
10	13.58
15	13.57
20	13.56
25	13.55
30	13.53
35	13.52

If you use a liquid manometer that has a liquid other than mercury (Hg) and you know the mass in g/ml of your manometer's liquid, you can convert your manometer's reading to mm of mercury by **DIVIDING** your manometer's reading in mm by-

$$\frac{\text{Mass of Hg}}{\text{Mass of Your Manometer's Liquid}}$$