

# Throttle Body Instruction Sheet

Thank you for purchasing our modified O.E.M. or new Billet throttle body. They have proven to give considerable power increases when properly adjusted and used alone on stock engines and even larger power increases when used with our cams, heads and intake manifolds.

Installing the throttle body is a simple bolt-on procedure. A Mopar Performance computer or modified computer is not required for proper operation. Your computer will have to "adjust" to the increased airflow. This adjustment period may take up to 500 miles of driving. You will feel the power increase as the computer becomes familiar with the new throttle body. Unplugging the computer or disconnecting the battery for 20 minutes to clear the memory and then reconnecting it can eliminate this adjustment period.

Prior to installation, make sure the throttle body gasket does not overhang the throttle bores, especially on the Stage III, V8 throttle body. Trim as required. The Stage III Billet throttle body will require larger manifold bores for maximum flow. Also ensure the gasket surface on the intake manifold is clean and flat before installing the throttle body. Make sure the throttle body boltholes in the intake manifold are deep enough for the Allen head cap screws. Clean out the boltholes or run a tap (5/16" - 18) through them if you are unsure of the thread conditions. Install the supplied, low profile, Allen head cap screws and torque to 200 in-lbs. Make sure that the throttle body is correctly centered over the manifold bores and that it will open fully without the plates touching the manifold. Start with 50 in-lbs. and work up in a criss-cross pattern in 50 in-lb. increments until they are all torqued to 200 in-lbs. Failure to do this properly can cause the throttle body to distort and possibly cause the throttle to stick

Adjusting & Tuning for extra power:

For those customers who want even better performance the throttle body the throttle position sensor (TPS) can be adjusted. The stock TPS is not adjustable. By following these simple instructions you can make it adjustable. The TPS retaining *Torx* screws pass through metal sleeves in the TPS body. The sleeves must be removed. Mount the TPS in a drill press vice as shown in figure 1. Using a  $\frac{1}{4}$ " drill bit attempt to drill through the sleeve. The drill bit will "stick" in the sleeve and the sleeve will begin to spin. Keep moderate pressure on the drill bit.

The heat generated by the pressure and the spinning will cause the plastic to soften and the spinning sleeve will cleanly push out of the plastic housing as shown in figure 2. The hole can be reamed by hand with a 5/16" drill bit (figure 3) to clean up any burrs. Install the TPS using 2 small washers to do the clamping.

The TPS can now be adjusted by rotating it. The TPS sends a small amount of voltage to the powertrain control module (PCM) and controls, to some extent, the richness, or pulse width, of the injectors. The amount of this voltage is controlled by the relationship of the throttle shaft to the TPS. Rotating the TPS allows the custom calibration of the unit. The voltage through the TPS can be as low as .26 volts at idle on stock setting. Our modified throttle bodies performance can be improved by altering this voltage up to a higher voltage. The exact voltage that you set your T.P.S. will depend on pump pressure, injector size and your personal driving preferences; one setting is not correct for all applications. Notice that in figure #4 the TPS has been rotated slightly to the left (counter-clockwise) from the stock straight up position. Determine the correct position by voltage and performance. Usually poor idle quality or a hesitation or flat spot demonstrates the need for calibration. Fuel mileage generally increases when the TPS is properly adjusted. In some cases the 5/16" holes in the TPS do not allow enough rotation for best performance. The 5/16" holes can be slightly elongated using a 3/16" rat-tail file (see figure #5).

### How to adjust the T.P.S.

*Wire color codes: Purple/White = Power (5 volts)*

*Orange/Dark Blue = Signal (Center Pin)*

*Black = Ground*

1. Turn the key to the "OFF" position and disconnect the connector from the T.P.S.
2. Switch the key to the "ON" position. Using a DVM (digital voltmeter), check the voltage at the harness plug. This may require some type of an extension for the DVM probes to be able to touch the connectors.
3. Read the voltage from the purple wire to the black wire (these should be the two outside pins). The key will need to be in the "ON" position. The voltage should read a maximum of 5 volts.
4. Turn the key off and plug the connector back into the T.P.S.

5. Using probes connect the DVM into the back of the TPS connector. The negative (-) probe to the black wire and the positive (+) probe to the Orange/Dark Blue signal wire.

*Note: The probes must reach the metal connectors or your DVM won't register any voltage at all.*

6. Slightly loosen your "trick" adjustable T.P.S. mounting screws so the T.P.S can be rotated.
7. Turn the key to the "ON" position with the engine off and adjust the T.P.S. to .7 to .8 volts in the idle position. Operate the vehicle at various voltages, working up .05 volts at a time until the best position is achieved. Many customers claim they can see a difference in only .01 volts so don't rush your testing. Your final setting will vary depending on your preferences. The battery must be disconnected after each TPS adjustment or idle screw adjustment for approximately 8 minutes.

**NOTE:**

The T.P.S. voltage can be raised to over 1.5 volts at idle but you need to keep in mind that higher voltage increases the torque converter clutch pressure, increases the idle speed, and if it's too high it can set a fault code. The highest factory setting is 1.2 volts, so proceed cautiously near this point. Check for proper operation of the T.P.S. with the voltmeter connected. Open the throttle from idle to W.O.T. (Wide open throttle) slowly and then back to an idle. Factory voltage is at least 3.5 volts at W.O.T. 5 volts is the maximum available. The voltage should increase and decrease smoothly. If it doesn't, the T.P.S. is faulty.

8. Tighten the T.P.S. carefully! Don't crush it Bubba! Recheck the idle setting and correct as required. Check again for smooth voltage changes as throttle is opened and closed.
9. Start and warm the engine up and adjust your idle speed. The idle RPM is controlled by the throttle plate opening (idle speed screw) and the idle air control (IAC). If the throttle plates are closed too much, more air will be drawn through the IAC. If too much air is passed through the IAC it may create a whistle noise. In this case

- open the idle speed screw *slightly*. The goal is to have the throttle plate open only enough to keep the IAC from whistling.
10. Any adjustment of the idle speed screw will change the TPS voltage and therefore it will need to be readjusted. At this time the battery will again have to be disconnected.
  11. Shut the engine off and push the accelerator pedal fully open and let off. If it sticks or does not close completely be sure and correct this problem before driving.
  12. Test Driving: The test drive and personal preference will determine the TPS setting at this time.
  13. It is best to start at a low voltage and work up. If the engine is to lean it will be indicated by a hesitation or surging at lower throttle openings. Increase the voltage from the TPS. Do not change the voltage more than .1 volt at a time. For final fine adjustment make changes of .01 volts at a time. Remember the TPS adjustment may change the idle speed or quality and the idle speed screw may need readjusted. Once again, disconnect the battery after doing this.
  14. Go hunting!

### **Tuning Tips:**

***A throttle body is a "door," it opens and closes. It cannot cause erratic running, misfires, improper shifting, etc. These problems are caused by either improper adjustments of linkages, faulty operation or adjustment of sensors, or wiring problems. These situations can show up when changing the throttle body, leading to blaming it for the problem. Because a throttle body looks somewhat like a carburetor, it is many times blamed for 'carb-like' problems. Guilty by association, always a bad call!***

Make sure the "O" ring seals on the IAC and TPS are in good condition and properly located. If not, the idle will be erratic and it may create a loud whistle. The idle is best controlled by the IAC (idle air controller). Trying to adjust the idle speed with the throttle stop can hurt the mileage.

The quality control tolerances of IAC and TPS's seem to vary considerably. Therefore, do not expect to interchange them and get identical results.

Everything is a trade-off. Increasing the T.P.S. voltage to much will delay the disengagement of the torque converter clutch until the trucks road speed drops to a lower than normal speed or until you touch the brake pedal. Higher voltages can cause unnecessary fuel enrichment, which wastes fuel.

*Hughes Engines Inc. throttle bodies have not been tested for emissions compliance and are intended for off-highway use only.*



Figure #1



Figure #2

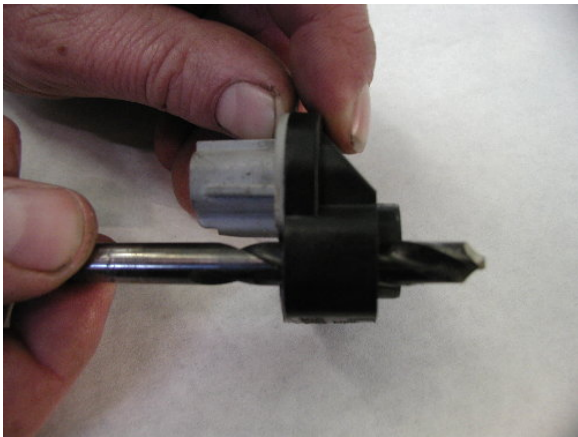


Figure #3



Figure #4



Figure #5



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