TDI FAQ

8) Troubleshooting

Disclaimer: While considerable effort has been made to make the information provided in this section as complete and accurate as possible, it does not and cannot cover all possible situations. The authors cannot accept any responsibility for any damages which may occur from the use or mis-use of these procedures, nor can the authors accept any responsibility for any damages which may result from personal injury or property damage which allegedly may be caused by the use or mis-use of these procedures. No responsibility is accepted for missing or incorrect information. Those who use these procedures shall accept all responsibility for performing the work which may be described below. If you have any comments or suggestions for additions or revisions, please contact the site administrator.

The following sections are grouped based upon the "major symptom". Within each section, subsections describe possible causes that could cause the major symptom. These symptoms are approximately listed in descending order of probability based on the experience of forum members (in other words, the most likely causes are listed first). In many cases, the subsection will be preceded by one or more questions or test procedures. It is crucial to find out the answers to each of these questions and test procedures so that you do not get led astray!

Troubleshooting is like detective work. It will frequently be necessary to list a number of possible causes, then systematically go through these possible causes while ruling them out one by one, until the actual problem area is located.

Finally, within each subsection, a description of how to repair the problem is either provided, or referenced elsewhere. Where applicable, advice is given on how to prevent the problem from happening again.

References within this document to "left" or "right" always refer to the orientation viewed from the driver's normal seating position.

Throughout this document, you will see references to VAG-COM. Many diagnostic and calibration procedures cannot be performed without a VW specific diagnostic scan tool. VAG-COM is a reasonably priced software and cable that allow any Windows based computer to be used to communicate with the vehicle's on-board diagnostic system. Generic OBD-II code scanners (such as those which may be found at independent garages that do not specialize in VW/Audi) will normally NOT be sufficient - you need a VW specific scan tool. For more information about VAG-COM and to purchase a copy for yourself, see www.ross-tech.com - highly recommended.

This thread identifies VAG-COM users who may be willlling to help:
http://forums.tdiclub.com/showflat.php?Board=UBB17&Number=309894

Here's a database of VAG-COM users in North America who might be able to help you:
http://www20.brinkster.com/beowulf9/tdi/vagcom/

Know which model you have. If you have a '96 or '97 Passat TDI in North America, you have a B4 chassis with what is known in this document as an A3-style engine, and you have a Garrett GT15 turbocharger. If you have a '97 through early '99 Jetta TDI in North America, you have an A3-style engine and you may have the Garrett GT15 turbocharger but more likely you have a KKK K03-006 turbocharger. If you have a New Beetle TDI, or a '99.5 or later Jetta or Golf TDI in North America, you have an A4-chassis vehicle, and you have a Garrett VNT-15 turbocharger.

The engine code number can be found on the build sheet which is typically near the spare tire on the floor of the trunk. In North America, engine code 1Z means 90hp A3-style engine with Garrett GT15 turbocharger and Pierburg MAF (mass air flow sensor). Engine code AHU means 90hp A3-style engine with KKK K03-006 turbocharger and Pierburg MAF. ALH means 90hp A4-style engine with Garrett VNT-15 turbocharger and Bosch MAF. European models don't necessarily correspond in specifications, engine codes, and model years (you're on your own, as far as figuring out what type of turbo and MAF sensor you have).

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8) Trouble Shooting

a. **Preventing Future Problems (to the extent possible) :**
This section documents procedures and operating practices that will hopefully prevent many of the problems described later on from ever happening.

Perform the scheduled maintenance on schedule! The required schedule is in your owner's manual. Don't assume that particular driving habits will allow any service interval to be extended beyond what the owner's manual recommends. Consider doing *more* maintenance than officially scheduled. Particular attention needs to be paid to all fluid levels, fuel / air / oil filters, and timing belt replacement. Timing belt replacement interval is 96,000 km for all manual transmission models of 2001 and previous model years, 64,000 km for all automatic transmission models of 2001 and previous model years unless the 2002 model belt and tensioner have been installed, and 128,000 km for 2002 models and beyond. The 2002 model timing belt and tensioner can be retrofitted to A4-chassis vehicles (manual or automatic) provide that both the belt and tensioner are replaced with the new designs. They cannot be retrofitted to earlier A3-type engines because the belt is a different length.

Use the fluid types recommended in the owner's manual and in the factory service manual. The "G12" VW coolant is specially designed to be compatible with the seals, hoses, and cooling jacket materials used in VW vehicles - don't assume that other pink or reddish fluids are the same. Likewise for the power steering fluid, the brake fluid, and the special automatic transmission fluid (do NOT ever use a Dexron-type fluid in later model VW automatic transmissions!). The best bet is to buy these fluids at a VW dealer. Yes, the VW power steering fluid is 10 times more expensive than generic power steering fluid. Why should you use it? Price out a new rack and pinion mechanism ...

Regarding engine oil ... your owner's manual recommends 5w40 oil which conforms to one of several specifications, all of which are specific to diesel engines.

There have been issues with intake manifolds clogging due to the combination of oily fumes (originating from the CCV or crankcase ventilation system) with soot from the EGR (exhaust gas recirculation) system. These problems can be virtually eliminated by ensuring that the EGR system is operating at the minimum allowable level. The adjustment procedure is in section 7.h of this FAQ. The only side effect of this alteration will be somewhat increased NOx emissions under certain operating conditions but the change will not affect the ability of the vehicle to pass emission tests (#1, the adjustment remains within factory specifications, #2, most emission test procedures for diesel vehicles do not measure NOx). DO NOT change any of the other adaptation values unless their effects are precisely known and considered. Specifically, changing the adaptation

value for injection timing in group 4 to other than factory default may cause severe engine damage so DON'T TOUCH adaptation group 4! (Every 2 degrees of timing advance raises peak cylinder pressure approximately 15 bar (about 10%) and raises piston temperature by an unknown amount, so it's best to leave this alone.)

Some manual transmission vehicles exhibit a slight "shudder" upon returning to idle speed after coasting down from higher speed. An adjustment procedure is in section 7.i of this FAQ. Deviation towards a smaller reported injection quantity has been associated with this "slow-down shudder". Deviations towards a higher reported injection quantity have been associated with lack of power. It can be adjusted to some extent by adjusting adaptation channel 1 using VAG-COM so that the reported injection quantity is as close to within the 3.0 to 4.0 range as can be achieved.

Finally, DON'T BABY IT. Don't drive around with the pedal right on the floor all the time, either. But don't baby it and don't lug it. Give it some load once in a while. Give it some revs. This seems to "exercise" the VNT mechanism and help in keeping the exhaust system from getting clogged up with carbon.

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b. **Engine will not start, or engine is difficult to start:**
Question: Will the engine start at all? If the engine will start occasionally, or after an extended period of cranking, go to section 8.b.2 - Difficult starting. If the engine cannot be started at all, go to section 8.b.1 - Engine will not start.
b.1 Engine will not start.

Test procedure, step 1: Have the transmission in neutral (or park, if automatic transmission). Have the clutch pedal pressed completely to the floor throughout this procedure (if manual transmission). Watch the instrument cluster at the location of the "glow plug" and/or "check engine" lights. Insert the ignition key into the ignition switch, and turn it to "run" (not start). Do the "check engine" and "glow plug" indicator lights come on? If they do not, go to section 8.b.1(a) - No electrical power to engine electronics. If the indicator lights come on as they do normally, continue to the next step in the test procedure, below.

Test procedure, step 2: Wait for the "glow plug" indicator to turn off, then turn the key to "start". Does the engine rotate ("crank", "try to start", "make noise")? If it does, go to section 8.b.1(b) - Engine cranks but does not start. If the starter motor does not operate, go to section 8.b.1(c) - Starter motor does not operate.

b.1(a) - No electrical power to engine electronics.

PRECAUTION: Problems listed in this section can NOT be identified by the vehicle's "on board diagnostics" system. They will typically NOT set any "trouble codes" in the ECU.

- Are all other electrical systems (such as lighting systems) "dead", in addition to the electronics? If so, the battery may be completely discharged. It will be necessary to remove the battery from the vehicle and have it recharged out of the vehicle, and replaced with a new one if the battery is found to be faulty. AVOID "BOOSTER / JUMPER STARTING" ANY LATE MODEL VEHICLE (not just this one). THE ELECTRONICS ARE VERY, VERY EXPENSIVE TO REPLACE IF YOU "FRY" SOMETHING.

- If all other electrical systems are also weak or dead but the battery is good, the problem may involve a corroded or loose battery cable connection. Check the connections at the battery terminals as well as at the ground straps and chassis ground connections (these are located near or under the battery on most models). It will be necessary to make the connection good (e.g. by sanding the contact surfaces) and re-install the connection, coating it with a suitable dielectric grease to prevent further corrosion. HINT: At the battery cables, before securing the clamp nut, place a socket centered over the battery terminal and large enough to fit around the outside of the battery post but securely flat on the terminal, then tap the socket lightly with a hammer to "seat" the terminal before securing the clamp nut.

- "Relay 109" failure - this is the relay which provides power to all of the engine electronics. Failure of this relay will NOT typically set any "trouble codes" in the ECU. The only method of isolating the problem is to replace the relay. Refer to Section 7.j of this FAQ for replacement procedure.

- Ignition switch fault. If replacing the relay doesn't solve the problem, this is the next most likely problem.

- Security system fault (if so equipped).

b.1(b) - Engine cranks but does not start.

- Electrical problem. Perform the test procedure at section 8.b.1 to determine whether the engine electronics are receiving power. Refer to section 8.b.1(a) if there is no power to the engine electronics.

- Weak or partially discharged battery. The starter motor must crank the engine at about 300 RPM for the engine to start. If cranking speed is low, have the battery load tested out of the vehicle, and serviced / recharged / replaced as required.

- Corroded electrical connections at the battery terminals, starter motor power wire, ground strap (located near or under the battery on most cars), ground strap at engine block side. See similar symptom under 8.b.1(a).

- Weak starter motor. The starter motor must crank the engine at about 300 RPM for the engine to start. If the cranking speed is low, but the battery checks out OK and all battery post and cable terminals are OK (see 8.b.1(a)), then the starter motor needs to be removed from the vehicle and serviced. The starter motor can be serviced by any reputable auto electric shop; look in your local phone book.

- Incorrect or insufficient fuel in the fuel tank. Diesel engines will not operate on gasoline, water, or air.

- Incorrect fuel injection timing. See inspection and repair procedure at section 7.k.

- Anti-shudder valve not opening. See description of this same symptom under section 8.b.2 - Difficult starting.

- All of the potential causes of difficult starting can also cause complete failure to start, if the condition is sufficiently severe. See section 8.b.2 - Difficult starting.

- Air in the fuel system - especially if maintenance has just been performed. Check the clear plastic lines for air bubbles, and see if the bubbles move when you crank the engine. If air bubbles are found, check all fuel hose connections and ensure that the white plastic "T" that fits into the top of the fuel filter is properly seated with the O-rings securely in place. Refer to section 7.b.

- Fuel filter clogged or filled with water. Refer to section 7.b.

- Poor compression due to worn-out engine.

- Major mechanical failure. Remove the timing belt cover and check whether the timing belt is still there and properly tensioned, and still has teeth on it all the way around ...

- Fuel injection pump problem - inoperative or worn out. See description at section 8.b.2 - Difficult starting.

- (Only applies if the ambient temperature is below freezing and the engine has been outside in below-freezing conditions for several hours.) Improper starting procedure. Drivers accustomed to gasoline engines might be turning the key all the way to "Start" without waiting for the glow plugs. Proper starting procedure is to turn the key to "ON", wait for the glow plug light to go off "for good" (some models have a brief flash before the "real" glow plug delay), and then turn the key to "START" to crank the engine.

- (Only applies if the ambient temperature is below approximately -10 C.) Fuel not sufficiently "winterized". There are some additives which claim to de-gel a fuel system which is already gelled up, but they won't solve the problem of thawing out the injection pump and the fuel filter. The only way you're going to get started is to get some heat into the injection pump and the fuel filter by some suitable means - hair dryer, or whatever. To prevent this from happening again, fill up with fuel which is either known to be winterized, or use an anti-gelling additive which is available at truck stops to prevent precisely this problem.

- (Only applies if the ambient temperature is below approximately -10 C.) Wrong oil viscosity, too heavy for ambient temperature, causing cranking too slow to allow the engine to start. Use the oil viscosity recommended in your owner's manual, which is 5w40 (this viscosity is only available as a synthetic engine oil).

- (Only applies if the ambient temperature is below freezing and the engine has been outside in below-freezing conditions for several hours.) Glow plugs or glow plug system inoperative. If the temperature is above freezing, this is not the problem - the glow plug system is not required for starting the engine with the coolant temperature above approximately 5 degrees C. If the temperature is below freezing and the engine has been outside for several hours, but the glow plug delay period is abnormally short, the coolant temperature sensor may be faulty. This fault will NOT cause a MIL or "check engine" light and will NOT set any ECU trouble codes. Checking the calibration of the coolant temperature sensor requires that the vehicle be left outside for several hours and then connected to VAG-COM. Confirm that the temperature displays in VAG-COM "measuring blocks" are approximately outside temperature before starting the engine. If they are not, replace the faulty temperature sensor. The coolant temperature sensor can also be resistance checked out of the vehicle, per the procedure in the factory shop manual, but given the hassle of removing the sensor from the vehicle and checking it, it may make more sense to simply replace the sensor with a new one (it's not expensive). Troubleshooting a faulty coolant temperature sensor without either VAG-COM or information from the factory service manual is not possible.

To get the vehicle going with a bad coolant temperature sensor, unplug the electrical connection to the coolant temperature sensor (which will force the glow plugs to operate for the maximum period) until the engine is running. The coolant temperature sensor is located on a coolant pipe towards the left side of the cylinder head and the wiring connection is on a bracket nearby.

This vehicle is equipped with a monitoring system for the glow plugs. If problems develop with a glow plug, the power supply wiring to the glow plug, or the activation relay for the glow plugs, the MIL or "check engine" light will come on and a "glow plug monitoring" code will be set in the ECU. If problems develop with the coolant temperature sensor, the MIL will probably NOT come on (see above).

b.1(c) - Starter motor does not operate.

- Are all other electrical systems "dead" in addition to the electronics? If so, see similar, under section 8.b.1(a).

- Corroded or loose battery cable connection. See similar, under section 8.b.1(a).

Optional test procedure which will make subsequent troubleshooting much easier: Obtain a DC voltmeter, or a 12-volt test light with suitable probes. At the starter motor, note that there are 2 cable connections, one small, one big. There should be 12 volts between the big cable connection and the engine block at all times. (If not, there is a problem with the battery itself, or the wiring between the battery and this terminal.) Have an assistant switch the key to "start" while pressing the clutch all the way to the floor (manual) or with the selector in "Park" or "Neutral" (automatic). There should be no voltage between the small terminal and the engine block normally, but this should go to 12 volts when the key is in the "start" position with the clutch pedal pressed to the floor (manual) or selector in "Park" or "Neutral" (automatic). If there is power to both large and small terminals, and yet the starter motor does not operate, the starter is faulty, and requires a rebuild which can be done by any automotive starter/alternator shop in your local area.

- Clutch interlock switch fault (manual transmission - if so equipped). On most models, the clutch pedal must be depressed all the way to the floor before the engine can be started. If this is being done, and the starter still will not operate, the switch may be faulty. Check switch and wiring for proper operation and good connections and repair/replace as necessary.

- Gear position interlock switch fault (automatic transmission - if so equipped). The starter motor will not operate unless the selector is in "P" or "N". If this is the case, and yet the starter still will not operate, the switch may be faulty. Check switch and wiring for proper operation and good connections and repair/replace as necessary.

- Faulty starter motor. Refer to the test procedure described above. If the starter does not operate, but the battery checks out OK and all battery post and cable terminals are OK (see 8.b.1(a)), then the starter motor needs to be removed from the vehicle and serviced. The starter motor can be serviced by any reputable auto electric shop; look in your local phone book.

- Ignition switch fault.

- Security system fault (if so equipped).

b.2 Engine is difficult to start, requires a long period of cranking before starting, etc.

- Weak or partially discharged battery. The starter motor must crank the engine at about 300 RPM for the engine to start. If cranking speed is low, have the battery load tested out of the vehicle, and serviced / recharged / replaced as required.

- Corroded electrical connections at the battery terminals, starter motor power wire, ground strap (located near or under the battery on most cars), ground strap at engine block side. See similar symptom under 8.b.1(a).

- Weak starter motor. The starter motor must crank the engine at about 300 RPM for the engine to start. If the cranking speed is low, but the battery checks out OK and all battery post and cable terminals are OK (see 8.b.1(a)), then the starter motor needs to be removed from the vehicle and serviced. The starter motor can be serviced by any reputable auto electric shop; look in your local phone book.

- Air in the fuel system - especially if maintenance has just been performed. Check the clear plastic lines for air bubbles, and see if the bubbles move when you crank the engine. If air bubbles are found, check all fuel hose connections and ensure that the white plastic "T" that fits into the top of the fuel filter is properly seated with the O-rings securely in place. Refer to section 7.b.

- Fuel filter clogged or filled with water. Refer to section 7.b.

- Incorrect fuel injection timing. Further evidence of incorrect timing include excessive smoke from the exhaust once the engine eventually starts, and reduced power, and higher than normal fuel consumption. See inspection and repair procedure at section 7.k.

- Faulty or poorly calibrated fuel injectors or injector pump. IF you have VAG-COM, get the engine going, and confirm that the amount of fuel delivery at idle is within specifications. Refer to section 7.i of this document for adaptation procedure.

- Anti-shudder valve problems. If you have an A3 or B4, this isn't the problem, because you don't have one. The anti-shudder valve is located at the entrance to the intake manifold right next to the silver round EGR diaphragm at the right rear of the engine compartment (attached to the engine). To the right of this is a device operated by a linkage facing the rear - this is the anti-shudder valve. Operate the mechanism by hand and make sure it moves freely and is spring-loaded to the open position. If you unclamp and remove the flexible air intake hose located right next to this, you can look inside and readily see whether the "throttle butterfly" is operating as it should.

- Poor quality fuel.

- (Only applies if the ambient temperature is below freezing and the engine has been outside in below-freezing conditions for several hours.) Improper starting procedure. See 8.b.1(b).

- (Only applies if the ambient temperature is below approximately -10 C.) Fuel not sufficiently "winterized". See 8.b.1(b).

- (Only applies if the ambient temperature is below approximately -10 C.) Wrong oil viscosity, too heavy for ambient temperature, causing cranking too slow to allow the engine to start. Use the oil viscosity recommended in your owner's manual, which is 5w40 (this viscosity is only available as a synthetic engine oil).

- (Only applies if the ambient temperature is below freezing and the engine has been outside in below-freezing conditions for several hours.) Glow plugs or glow plug system weak or inoperative. See 8.b.1(b).

- (Only applies if the ambient temperature is below freezing and the engine has been outside in below-freezing conditions for several hours.) Faulty coolant temperature sensor causing non-operation of glow plugs. See 8.b.1(b).

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c. **Engine stalls randomly without warning and may or may not restart :**
- See "Relay 109" at section 8.b.1(a).

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d. **MIL ("Check Engine") light is on while driving, or "glow plug" light is flashing while driving:**

- In ALL cases, if a MIL is on or flashing, a trouble code will be set in the ECU which can be read by a VAG-COM or other scan tool connected to the on-board diagnostic system. The knowledge of this trouble code will greatly assist in narrowing down the problem area.

- Do the engine "check" light and "glow plug" light intermittently come on for brief periods while driving? If so, see "Relay 109" at section 8.b.1(a). The relay may be losing electrical power for fractions of a second, which are enough for the engine electronics to think that you switched the key off then on.

- If the "glow plug" light is flashing while driving, check your brake lights! The brake light circuit is monitored by the engine electronics and this is the warning signal used in this case (among others). Burned out brake light bulbs will cause this symptom, as will a faulty or improperly adjusted brake light switch or a blown fuse for the brake lights.

- If the MIL is accompanied by a reduction in engine power, proceed to section 8.e below, with particular attention paid to the sections concerning the MAF sensor and wiring (most likely cause).

- MIL accompanied by difficult starting and/or smoke from the exhaust and/or a reduction in power and/or an increase in fuel consumption, especially after work has been done involving the timing belt or the injector pump, may indicate fuel injection timing grossly out of adjustment. Resetting the injection timing requires the use of a VW specific scan tool, there is NO alternative procedure. Refer to section 7.k of this document.

- MIL which may or may not be accompanied by a reduction in power may indicate a malfuctioning EGR system (e.g. sticking EGR valve, sticking EGR solenoid valve, disconnected or improperly routed vacuum hose related to EGR system, clogged intake manifold, MAF sensor problems - all of these components are involved with the EGR system). These problems will set a trouble code that can be read by a VAG-COM, with the trouble code indicating an EGR control system deviation (or similar). Note: see section 7.g for intake manifold cleaning procedure, see section 7.h for EGR adaptation procedure to prevent a recurrence. If despite cleaning the intake manifold and confirming that the EGR valve is operating smoothly, the problems likely involve the EGR solenoid valve or the MAF sensor.

- MIL which comes on after approximately 30 seconds of starting the engine, but which is not associated with any apparent driveability problems but which MAY be associated with difficult cold starting, may indicate a problem related to the glow plug or the glow plug circuit. If you get a "glow plug monitoring" fault upon investigation with VAG-COM, remove the wiring harness from the glow plugs and measure the resistance between each glow plug terminal and the engine block. All four should be the SAME and in the 0.5 to 1.0 ohm range. If you find that one or more glow plugs are either outside this range or are different from the others, consider replacing ALL FOUR glow plugs with new ones. The resistance of the glow plugs must match very closely and since it changes as the plugs get older, one must change all four to ensure that they start out with the same resistance and will all have the same pattern of aging. Also check the main glow plug fuse (it's visible under a small clear plastic cover somewhere in the engine compartment - typically either near the battery or on the firewall). If there are no apparent faults with the fuse or the glow plugs, the most likely problem involves poor electrical connection between the harness and the glow plugs - try sanding / cleaning these contacts or replacing the harness (not expensive). The official service procedure calls for replacing the glow plug relay but it has been found that an exceedingly large majority of the time, the relay is not at fault.

- There are many other potential causes for a MIL, but rest assured that a loose fuel cap is not one of them! Gasoline engine vehicles have a monitoring system

for the fuel tank venting arrangement but diesel engine vehicles DO NOT HAVE this system.

- If a MIL is on, and there are no readily apparent other symptoms of malfunction, the ONLY method of finding the cause involves connecting the vehicle to a suitable scan tool. IT IS NOT POSSIBLE TO OBTAIN ECU CODES WITHOUT A SUITABLE DIAGNOSTIC SCAN TOOL. Nor is it possible to reset fault codes without first fixing the underlying cause and then resetting the code using a suitable diagnostic scan tool. Get VAG-COM, it's well worth the small investment.

- Finally, do not interpret MIL codes as "gospel" indicating that the sensor pointed to by the code is at fault. The trouble code only indicates the general problem area. Before condemning a particular sensor, check the wiring and electrical connections.

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e. **Engine lacks power - "No Boost" - "No Turbo" - "Can't hear turbo":**
Precaution: DO NOT jump to conclusions when attempting to identify the cause of having no power. Don't automatically assume that your turbocharger is broken!

Question: Is the power loss intermittent (OK some of the time, weak at other times) or is it weak all the time? If it is intermittent, see 8.e.1 - Intermittent power loss. If it is weak all the time compared to a similar vehicle which is known to be in a similar state of tune but operating properly, see 8.e.2 - Constant power loss.

e.1 Intermittent power loss - Low engine power under some conditions, but runs well at other times

Note: Getting any codes that may be set your ECU (using VAG-COM) will be a major help in isolating the problem. Codes may be set without necessarily illuminating the MIL ("check engine") light.

- Manifold pressure sensor problems. This only applies to A3 and B4 models (i.e. older models - if you have a New Beetle or a '99.5 or later Golf/Jetta, don't even bother reading this section, you have a completely different setup). There is a black hose which connects at one end to the intake manifold and at the other end to the MAP (manifold air pressure) sensor at the ECU. (The ECU is located underneath a black plastic trim panel that also covers the windshield wiper linkage.) The rubber hardens up and leaks at both end connections, resulting in the ECU not seeing a proper pressure signal and causing "limp mode". Replace the hose with a 5 foot length of 5/64" windshield washer hose (about $4 at an auto parts store). It is not even worth investigating whether the hose is at fault, just replace it.

- MAF (Mass Air Flow) wiring harness problems. Did you change the air filter and forget to plug in the sensor? Some vehicles may have aftermarket modifications which involve the wiring harness leading to the MAF sensor ... are these aftermarket devices operating properly with electrical connections all good? Diagnosis of any problems that may exist with such aftermarket modifications is beyond the scope of this document and troubleshooting may be best performed by removing the device in question from the system.

- MAF (Mass Air Flow) electrical plug problems. If your vehicle has a Bosch MAF (see below) there is a technical service bulletin for replacement of earlier-style wiring connectors with a new design having larger electrical contacts.

- MAF (Mass Air Flow) sensor problems. The MAF sensor is located immediately adjacent to the air filter housing. Question: Look at the nameplate on the sensor. Is your MAF sensor manufactured by Pierburg (all A3's and B4's, some European A4's, i.e. all earlier models) or Bosch (most A4's i.e. all later models)? The Pierburg MAF is extremely reliable and is unlikely to be the source of the problem. The Bosch MAF prior to model year 2002 has a poor reliability history. Many owners have had to replace this sensor multiple times (and this is regardless of the type of air filter used). Refer to section 7.l of this document.

- Turbo control system not operating properly. Clogged, leaking, disconnected, or improperly connected hoses that are involved with controlling the turbo boost pressure will create havoc. Check condition and routing, and replace if necessary.

- Turbo VNT mechanism sticking. This only applies to vehicles with a VNT-15 turbocharger ... most A4-chassis models including all A4-chassis models sold in North America, and all 110hp models (A3 or A4 chassis) sold elsewhere. (DON'T READ THIS if your car has a GT15 or K03 turbocharger because they operate in a COMPLETELY different manner.) Locate the diaphragm housing which operates the VNT mechanism (has a single hose going to it, extreme rear of engine compartment, buried down near the bottom right rear of the engine, hose connection faces STRAIGHT DOWN). Locate (by feel with a finger) the linkage rod which points straight up out the center of that diaphragm housing. While feeling this rod, have someone start the engine, and note whether the linkage rod moves - it should. Upon stopping the engine, the linkage rod should move back after a few seconds. If the linkage rod does not operate as described, get a vacuum tester (any auto parts store) and apply vacuum to the VNT diaphragm to see if you can get it to move. If it's seized up, there's your problem. NOTE: To prevent this from happening, DON'T BABY THE VEHICLE when you are driving it, and consider recalibrating the EGR system to reduce the amount of soot build-up in the exhaust.

- Turbo wastegate mechanism sticking. This only applies for those with a GT15 or K03 turbo. If you have a later model, you have a VNT mechanism rather than a wastegate, so see above. The wastegate opens under pressure rather than vacuum.

Using a pressure gauge which reads to 30 psi, verify that when you floor it at 2500 rpm, the turbo boost pressure rises to a peak and then drops to about 0.8 - 0.9 bar (12 - 14 psi). Sometimes the wastegate diaphragm gets clogged up with oil from the crankcase ventilation system, and some owners have had success by replacing the red and blue hoses with new clean hoses and cleaning gunk out of the diaphragm housing as best as possible. You're on your own for doing this procedure. To prevent it from ever happening, arrange for the crankcase fumes to not get into the engine air intake ...

- Turbo boost control solenoid valve problems - this is also known as the N75 valve. If you have VAG-COM, and a trouble code of "intake manifold pressure control" is being set, and the problem is NOT a sticky VNT mechanism (see above), the N75 valve may be sticking, clogged with debris, or faulty. It can be removed from the vehicle and the paths through the valve checked by blowing through the various connections with the valve first de-energized, and then energized with 12 volts. Alternatively, obtain a vacuum gauge and "T" it into the hose that goes from the N75 valve to the VNT vacuum diaphragm, and confirm that the vacuum varies under different load conditions while driving. If found to be faulty, some have had success by blowing solvent through the valve to remove any deposits, but replacement with a new one may be the best option.

- Fuel cut-off valve O-ring unseated - especially if the idle speed is intermittently higher than normal. With the engine cover removed, the fuel cut-off valve is located on top of the injection pump just above where the four steel lines go into the end, and has a single wire going to it. Remove this valve (disconnect the wire first!) and make sure the black O-ring is all the way against the body of the valve, then re-assemble.

- Vehicles which have modified engine control systems, especially if a chip and a tuning-box are used together, may experience a phenomenon which has been called "warp field collapse": at full load and generally higher engine speeds, the engine will abruptly go into a reduced-power mode. Investigation of trouble codes with a VAG-COM will generally find a code set which is related to the quantity adjuster upper limit. The problem is that too much fuel is being requested! The solution is to back off the requested amount of fuel, generally through de-tuning the tuning box which hopefully has some manual adjustments that can be made.

e.2 Constant power loss - Vehicle is always sluggish compared to another similar vehicle in a similar state of tune

- If power loss happens below operating temperature and it's OK warmed up, this behavior is normal to some extent.

- If the power loss is accompanied by an excessive amount of exhaust smoke, check all the pipes involved with the air intake system for leaks! A leak on the high-pressure side of the turbo compressor will cause this problem. On later

models, the pipe from the turbo compressor outlet (bottom of turbo) to the intercooler is particularly vulnerable because the clamp is awkward to reach and difficult to install properly, so it's prone to blowing the pipe off the turbo. You'll have to remove some lower engine covers to see this pipe properly.

- Dragging brakes, underinflated tires, excessive weight carried in vehicle, slipping (worn-out) clutch, transmission problems which are beyond the scope of this document, etc.

- Incorrect injection timing. See inspection and repair procedure at section 7.k.

- MAF sensor or wiring problems. See procedures described under section 8.e.1.

- Intake manifold clogged. See repair procedure at section 7.g, and see section 7.h for recalibration procedure to prevent this from ever happening.

- Air intake clogged. Inspect air filter and airbox intake screen as described in section 7.c of this document.

- Air entering fuel system. Check the clear plastic lines for air bubbles, and see if the bubbles move when you crank the engine. If air bubbles are found, check all fuel hose connections and ensure that the white plastic "T" that fits into the top of the fuel filter is properly seated with the O-rings securely in place. Refer to section 7.b.

- Intercooler blocked externally. Inspect intercooler for external blockage by leaves or other debris - visible by looking at the intercooler, under the bumper on the left side (A3 cars) / right side (A4 cars), and clean as necessary.

- Intercooler clogged internally. Follow the intercooler cleaning procedure in section 7.f of this document.

- Fuel filter clogged. Replace with a new one per section 7.b of this document. If desired, inspect the old one by cutting it open. If failure was premature, find cause of debris entering fuel system. Your VW has a plastic fuel tank, the debris cannot be from corrosion of your car's fuel tank.

- Poor quality fuel. Fill up at a different station next time.

- Fuel cut-off valve O-ring trouble. See repair procedure described under section 8.e.1.

- Accelerator pedal position sensor malfunction. Check for fault codes with VAG-COM.

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f. **Fuel consumption seems high:**

- Consumption normally increases noticeably in cold weather, both due to efficiency loss in cold weather, and due to lower energy content of winterized fuel.

- Incorrect use of manual transmission - unnecessary high engine revs, jack-rabbit starts, and so forth affect fuel consumption of any vehicle.

- High proportion of city driving or short trips affect fuel consumption adversely in any vehicle.

- New engine not broken in. The TDI engine seems to take longer to break in than gasoline engines.

- Automatic transmission models have about 20% to 25% higher fuel consumption than those with manual transmission.

- Brakes dragging.

- Low tire pressure.

- Clogged injectors, if older vehicle.

- General lack of maintenance. Dirty air filters, clogged exhaust system, etc.

- Improper modifications to the turbo and/or boost control system in an attempt to get more performance, which result in excessively high boost pressure under light load conditions (and thus, excessively high exhaust back-pressure, and hence the drag on the engine).

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g. **Oil consumption seems high:**

- Engine not broken in. Oil consumption is normally higher during the break-in period.

- Most owners report normal oil consumption of one litre over several thousand km.

- CCV (crank case vent) trouble. Check for restriction in the air filter or intake system which could be causing abnormal amounts of oil to be sucked in through the CCV system, or pressurized out of other openings due to restriction in the CCV system.

- It is NORMAL for a small amount of oil to get into the air intake system through the CCV (crankcase vent) hose, which then contaminates the turbo compressor and all intercooler pipes including the intercooler itself, and continues on to contaminate the intake manifold. Refer to sections 7.f (intercooler cleaning), 7.g (intake manifold and EGR cleaning). CONSIDER THE POSSIBILITY THAT OIL FOUND IN THE INTAKE SYSTEM IS *ALL* COMING FROM THE CRANKCASE VENT BEFORE CONDEMNING THE TURBOCHARGER!!!!

- Oil leaks. See next section.

- Turbocharger seal problems. This failure is extremely rare on vehicles that have seen their proper oil changes using the proper type (synthetic oil rated CG-4 minimum!) and viscosity of oil.

- Internal engine problems, due to leaking rings or valve stem seals.

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h. **Oil leaks onto ground :**

- On A3 cars, it's impossible to change the oil filter without spilling a bit of oil, and if the old filter happens to drop before it comes out of the car due to the difficulty of getting the filter out, the oil in the filter will make a much bigger mess. If the oil filter is changed without removing the lower pan, this oil will gradually work its way to the back of the pan and may drip off from there.

- Oil may be leaking from the drain plug, especially if the gasket on the drain plug wasn't replaced.

- Oil which is sitting on the outside of the turbocharger is NOT coming from the INSIDE of the turbocharger, so don't panic! Oil on the outside of the turbo is either coming from a leak at the oil feed fitting on top of the turbo, or it's coming from a leak at the valve cover gasket and running down the manifolds to end up at the "low spot" which of course is the turbocharger, or it's coming from a leak elsewhere in the engine compartment and landing on the turbocharger. Oil is NOT getting to the outside of the turbo from the inside, because seal failures result in oil either getting inside the intake system (but see notes on crankcase ventilation system in section 8.g), or down the exhaust pipe.

- Check the valve cover gasket for leaks, especially if the car just came out of a timing belt job.

- If it is found that the front crankshaft seal leaks, it is very important that the timing belt be replaced besides the obvious replacement of the leaking seal. A

thorough cleaning of that area of the engine should be done, so that no oil gets on the new timing belt. Oil causes the belt material to deteriorate.
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i. **Smokes on cold start-up:**
- It's normal for diesel engines to smoke a little bit after start-up in very cold conditions. The smoke goes away as the engine warms up. This is mentioned in the owner's manual.

- Coolant temperature sensor problems. Using VAG-COM, leave the car sit for several hours and confirm that all of the temperature sensors read approximately ambient temperature after turning on the key but before starting the engine.

- Excessive smoking accompanied by rough running after a cold start may indicate problems with the glow plug system. See 8.b.2 and glow plug system at 8.d.

- Incorrect fuel injection timing. See section 7.k.

- Poor quality fuel. Use the best stuff you can find, in cold weather.

- Worn or clogged injectors. Using VAG-COM, check that the injectors are balanced to each other in measuring blocks.

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j. **Smokes under full acceleration:**
- For the older models, and for engines which have been "hot-rodded" by various means, some smoke under full acceleration may be normal. To minimize or eliminate it, check the following items.

- Check the air filter and intake system as described elsewhere.

- Incorrect fuel injection timing. See section 7.k.

- Injectors may be clogged. Try using a good-quality diesel fuel injector cleaner at the next fill-up.

- Poor quality fuel. Try filling up at a different station to see if that has any effect. Biodiesel has been reported to reduce the amount of exhaust smoke.

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k. **Smokes from exhaust under other conditions:**
If you have a 1996 Passat TDI, and you are experiencing bluish or greyish smoke

from the exhaust after decelerating from extended periods of highway driving, disable the supplementary injector system per section 7.e of this document.

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l. **Bucks and snatches slightly at low speed when cold :**
- Many owners of earlier models report a slight stumbling at 1200 to 1500 rpm in the higher gears, when the engine is cold. The problem goes away when the engine warms up. It seems to be normal, but verifying that the reported fuel injection quantity at idle is within the specified range (2.2 to 9.0 mg/stroke) or ideal range if possible (3.0 to 5.0 mg/stroke) and adjusting it as close as possible to the ideal range helps. Refer to adaptation discussion in section 7.i of this document.
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m. **Rattles, buzzes, and resonances from the exhaust system:**
- Many B4 (1995 to 1997) Passat models have a resonance in the exhaust system at 1200 rpm, and a lesser one at 2400 rpm. Several possible causes have been described but the problem appears to be inherent in the design.

- Some owners have reported that the downpipe (flex pipe) has become clogged with carbon build-up, thus causing noise to be transmitted through the rest of the exhaust system. In some cases this component has been replaced under warranty. In other cases, the problem was addressed by removing the flex pipe from the car and working it back and forth to loosen up the deposits.

- Some have had one of the mufflers (there are two) come apart internally, thus requiring replacement.

- Exhaust hangers can harden up and/or work loose over time, thus transmitting much more noise to the passenger compartment. These components are easily replaced.

- If this happens out of warranty, some owners may consider this to be an excuse to buy a performance aftermarket "cat-back" exhaust system. This might be the only way to eliminate the flaws in the standard system. The TDI engine is not loud even when operating with no muffler at all.

- Several owners have had success with getting a muffler shop to install an additional flex pipe downstream of the catalyst.

- Deteriorated engine mounts can increase the amount of noise and vibration transmitted into the vehicle.

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n. **Accidentally filled tank with gasoline - now what?**
- If the tank was mostly filled with diesel, and the gasoline is a smaller proportion so that the engine still runs, the best remedy appears to be to buy a container of injector lubricant additive and cetane boost additive, and "overdose" it to protect the injection pump. Fill the tank completely with diesel to dilute the gasoline as much as possible, and keep driving. In the interest of protecting the engine, it would be prudent to avoid high engine speeds or high engine loads until the gasoline is sufficiently diluted.

If the tank has more gasoline than diesel fuel in it, the engine won't run on that mixture. It will be necessary to drain the tank and re-fill it with diesel. If the car was driven to the point of stalling, it will also be necessary to drain the injection pump housing and replace the fuel filter, and re-prime both of these with diesel fuel.

The expense and aggravation caused by all this should be a sufficient reminder to not do it again.
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o. **"Shuddering", "misfiring", "stumbling" at highway cruising conditions:**
- Fuel pump delivered quantity may be out of specification (or if your vehicle is modified, it may require a different setting than standard which will have to be determined by experiment). Refer to section 7.i of this document.

- Some vehicles may have had a device fitted in the electrical circuit from the MAF sensor to the ECU, which tricks the computer into thinking that the EGR system is operating when in fact, it is disconnected in order to avoid intake clogging, thus avoiding a MIL or "check engine" light. Malfunction of this device can cause shuddering under certain speed and load conditions. Check security of electrical connections associated with this device, if the vehicle is so equipped. Calibration of the vacuum switch may have some effect. Rather than installation of this device (which is not legal for on-road use), it is recommended that the EGR system be recalibrated according to section 7.g of this document such that the EGR is operating at the minimum level that the original specifications will allow - i.e. that the amount of intake air is at the maximum that the original specifications will allow, which is 370 mg/stroke at warm idle in neutral with all major accessories off.

- EGR valve, or EGR solenoid valve, may be sticking. See sections 7.h (recalibration), 7.g (cleaning).

- If the vehicle is modified beyond stock, the modifications may be such that the ECU in the vehicle is not compatible with the modifications. In some cases, modifications to greatly increase the amount of fuel delivery have resulted in shuddering. Some compensation may be possible by recalibrating the fuel pump per section 7.i of this document. You want a larger reported amount of fuel

delivery at idle than standard in this case - this is actually a "leaner" pump, because the actual amount of fuel required to keep the engine going is not changing but you are telling it that it is delivering more (bigger number) than it really is ... i.e. it is actually delivering less than it is telling the ECU. But in extreme cases, the only solution to the shuddering may involve un-doing some of the modifications so that the ECU is capable of dealing with the situation.

- "Relay 109" may be in the early stages of failure. See section 8.b.1(a).

- MAF sensor may be dirty. Check calibration per section 7.l of this document. If the sensor is indicating proper readings, do not do anything further with it! On A4 cars, this sensor is very prone to failure. On A3/B4 cars, obtain some non-residue electronics cleaner and spray it at the sensor element WITHOUT EVER TOUCHING THE SENSOR ELEMENT. Check the security of the intake system. Make sure there are no leaks past the air filter element, and if an aftermarket air filter element is used, ensure that it is properly oiled with a very sparse but evenly-distributed coating of high-tack "sticky" air filter oil. Over-oiling may be a contributing factor to dirty MAF sensor elements.

- Problems may involve the wiring harness to the fuel pump, especially if non-OEM accessories such as tuning boxes or other wiring harness modifications are found. Check security of electrical connections.
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p. **"Surging" during acceleration; fluctuation of turbo boost pressure:**
- The standard control system for the turbo boost pressure may be electronic with high-tech sensors, and it may depend on a sophisticated map inside the ECU, but fast response to changes in load conditions is not one of its strong points. It is normal upon sudden application of load at higher engine speeds for the boost pressure to "spike" beyond its eventual setpoint, then drop down below the ECU-requested boost pressure, then settle to a stable value after more fluctuations. This behaviour may be more pronounced on vehicles that have been modified beyond stock form. The standard "mapping" in the ECU is very conservative, partially in order to mask this behaviour, but those insisting upon better performance than stock will want to fully utilize the turbocharger's capacity while not overstressing it.

- In some cases, turbo boost fluctuation problems have been traced to problems with the N75 valve (see 8.e.1), or contamination in the hose from N75 to the turbo wastegate diaphragm (GT15 / K03 turbo only - does not apply to VNT15). If oily residue is found in the hose from N75 to wastegate diaphragm, removing and cleaning out these components may help. This oily residue is coming from the crankcase vent (CCV).

- In other cases, generally on modified vehicles, it may be necessary to use an aftermarket mechanical boost controller in addition to the standard electronic

system in order to obtain a satisfactory solution. www.dawesdevices.com has a nice simple adjustable mechanical boost pressure regulator.

- If you have a GT15 or K03 turbo, install a "T" fitting into both the blue and red hoses at any convenient location (the Passat has existing hose connectors near the upper right corner of the firewall that can easily be replaced with T fittings without cutting any stock hoses). Solder the small vent hole in the mechanical boost controller closed. Connect the boost controller so that the inlet connects to the T fitting that you spliced into the red hose, and the outlet (90-degree hose connection in this case) connects to the T fitting that you spliced into the blue hose. Temporarily "T" a boost gauge into the hose connection at the intake manifold so that you can perform calibration. Then adjust the boost controller so that the peak boost pressure is no more than the electronically-controlled steady boost pressure, and your boost control problems will be solved. Don't run the GT15 or K03 turbochargers at higher than 18 psi boost pressure at sea level, and this should be reduced in proportion to barometric pressure at higher altitudes.

- If you have a VNT15 turbo, it will be necessary to use the "higher pressure" version of the boost controller (different spring). Remove the lower intercooler pipe from the vehicle, and install a suitable fitting to supply boost pressure to your boost gauge and boost controller. Solder the small vent hole in the mechanical boost controller closed. The inlet of the boost controller connects to the fitting that you just installed. Connect the outlet to a "T" that you need to install on the hose that connects to the VNT vacuum diaphragm. Temporarily connect a pressure gauge into the supply hose to the boost controller so that you can perform calibration. Then adjust the boost controller so that the peak boost pressure is no more than the electronically-controlled steady boost pressure. Don't run the VNT15 turbocharger at higher than 18 psi boost pressure at sea level.

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q. **Hesitation upon moving away from a standstill or upon sudden application of accelerator pedal:**
- Improper use of manual transmission - engine speed too low. The turbocharger is not operating near its best efficiency until the engine speed is above 2000 rpm, and below 1500 engine rpm, not much boost pressure is available. If you are going to require fast acceleration, downshift so that the engine speed is above 2000 rpm before giving it full load. Do not be tempted to make modifications that result in increased boost pressure at engine speeds below 2000 rpm - it's bad for the turbocharger. (Search forums for "compressor surge".)

- EGR valve, or EGR solenoid valve, may be sticking. See sections 7.h (recalibration), 7.g (cleaning).

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r. **Miscellaneous Strange Noises and Odd Behaviour**:
- A "swish" or "whoosh" that happens about 2 seconds after switching the engine off, is the anti-shudder valve operating normally. Don't worry about it. Worry when it STOPS making that noise. A3's and B4's don't have this valve, so they don't make this noise ... in those cases, the engine makes a mighty shiver that can be felt throughout the car when you switch off the key. That's NORMAL in those models, it's what happens with 19.5:1 compression ratio and it's why the later models have that anti-shudder valve!

- A clicking noise within the engine compartment, which may be present even if the engine is not running but the key is in the "run" position, is the EGR solenoid valve and boost pressure control solenoid valve (a.k.a. N75 valve) clicking away merrily. Both of these devices continuously switch from "on" to "off" all the time the key is on, and they make a clicking noise. Worry when they STOP clicking.

- During engine warm-up, occasional clicking noises coming from the vicinity of the relay panel near the base of the steering column are normal. These noises come from the glow plug control relay switching on and off in response to various conditions. The clicks may be associated with a brief change in the brightness of lights throughout the vehicle, which are caused by switching the very high current load of the glow plugs on and off. This is all normal.

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