TTweaker's Guide

v0.6

1. INTRODUCTION

1.1 About the Guide

This guide is about tweaking and troubleshooting the original Audi TT, also known as mk.I. The information is snatched from various sources, mostly from Audi related forums on the Internet. Even tough the information is believed to be correct, *it is provided with no warranty of any kind*.

The guide is divided into three parts. First part, Chapter 2, contains information how to troubleshoot common problems, and some general information. Second part, Chapter 3, contains instructions for tweaking various features. Third part, Chapter 4, is a collection of lists and tables, in an easily printable form.

As most things in a car are nowadays controlled with diagnostics software and a computer, this guide is mostly about the tricks and tweaks that can be done purely with software. At the moment, no hardware mods are included, though some general information is provided.

This guide is not supposed to replace the workshop repair manual, but rather provide some often used information in easily accessible form. If you ever have read the repair manual, you probably appreciate it…

1.2 About VAG-COM

VAG-COM is *the diagnostics software* for the Volkswagen-Audi Group cars. It is a semi-free product from Ross-Tech, http://www.ross-tech.com/. All you need is a VAG-COM compatible OBD-II cable, and the free software from Ross-Tech web site.

The *official* VAG diagnostics software is called VAS 5051, but only a few people have access to it. Fortunately, VAG-COM can do all the tricks the official software can do, and even more. Further, all the instructions for VAS 5051 in the workshop repair manual can be directly applied to VAG-COM.

There are two versions of VAG-COM available on the Ross-Tech site. The latest version requires a dongled cable from Ross-Tech. It is pricey, but you will get a great piece of software bloaded with features, plus full support from Ross-Tech.

The cheapest option is the get a VAG-COM compatible cable from a third party, and to download an older version 409.1 of the software from Ross-Tech. Even tough some people have had luck with USB cables*, it is strongly adviced to stick with a serial cable*. The USB cables are known to have very tricky timing issues.

The free software version 409.1 will work in shareware mode, which gives you fault codes without explanations, and very limited data logging features. The license for the full version is available from Ross-Tech, costing $99, but it's still only for the version 409.1.

More information about what third party cables are known to work with TT can be obtained from the TT forum http://www.tt-forum.co.uk.

2. TROUBLESHOOTING

2.1 Diagnostics Trouble Codes

Courtesy of factory repair manual

A Diagnostic Trouble Code (DTC) is a fault code stored in the car's computer system.

DTCs can be retrieved with VW/Audi Factory Scan Tools such as the VAG 1551 or VAG 1552 through a diagnostics connector (OBD-II). Several aftermarket scan tools and computer programs, like VAG-COM, are also capable of retrieving this information in this *factory mode*. The factory mode also allows the scan tool to be used for system diagnostic functions and also parameter tweaking.

Some DTC information can also be retrieved in a *generic mode*. The generic mode is not as complete as the factory mode, but allows commercially available scan tools to be used simply to read DTCs. For example, MOT stations can use the generic mode to retrieve some basic information about the engine's fundamental functions.

A DTC consists of five digits, having the following structure.

First digit structure is:

- Pxxxx for powertrain
- Bxxxx for body
- Cxxxx for chassis
- Uxxxx for future systems

Second digit structure is:

- P0xxx Government required codes
- P1xxx Manufacturer codes for additional emission system function; not required but reported to the government

Third digit structure is:

- Px1xx measurement of air and fuel
- Px2xx measurement of air and fuel
- Px3xx ignition system
- Px4xx additional emission control
- Px5xx speed and idle regulation
- Px6xx computer and output signals
- Px7xx transmission
- Px8xx transmission
- Px9xx control modules, input and output signals

The fourth and fifth digits designate the individual components and systems.

The full DTC list can be found in section 4.13, starting at page 65. For details, visit the Ross-Tech site http://wiki.ross-tech.com/index.php/Category:Fault_Codes.

2.2 Climate Control Diagnosis Codes

Courtesy of Waks Wide Web

There are a great number of sensor values that can be displayed on the Climate Control display. These are especially useful if you don't have VAG-COM (available).

To activate the display, press and hold the recirculation button. Then press the manual flow control *up arrow*. You should see 1C:

Twist the temperature dial to cycle trough the codes. Then press the recirculation button again to enter the code. The value should display:

To select another code, twist the temperature dial again, followed by the recirculation button.

Note! Some of the codes - like 12,14,16,19 - allow you to actually *change the value* by twisting the air blower speed knob!

To go back to normal CC mode, press the recirculation and the up buttons together. Alternatively, just press Auto.

All the known codes are listed in section 4.2.

2.3 Common Problems

Courtesy of enginerd on elitedubs forum

We have all seen the common problems that these cars develop, and often know right away what symptom = what problem.

2.3.1 Symptoms – Possible Problems

Rough Running At Idle - MAF, Ignition Coil, Spark Plug, VAC Leak, O2 Sensor, TB, CTS
Missfires under Boost, Flashing CEL – Ignition Coils, Spark Plugs
Running Rich – Boost Leak, MAF, O2 Sensor, Coolant Temp Sensor
Running Lean – VAC Leak, MAF, O2 Sensor, Fuel Filter, Coolant Temp Sensor
Low Boost – Limp Mode, MBC, BOV, DV, Boost Leak, N75,
High Boost – MBC Setting, N75, Spark Plugs, Ignition Coils
Cold Start Problems – MAF, Spark Plugs, Fuel Pump Relay, CTS
Poor MPG – MAF, CTS, O2 Sensor, AIT Sensor
Cat Efficiency Below Threshold – Down pipe, CAT, Rear O2, RACE FUEL
No Start – Battery - ECU, Fuel Pump Relay, Ground
Start For 1 Second - Stall – Immobilizer
Overheating - Waterpump, Thermostat, Head Gasket
Oil in coolant - Oil Cooler, head Gasket, Water Wetter
Dies While Driving - Timing belt, Boost Leak, MISC
Shorts To Ground CEL - Fuel Pump Relay, Bad Grounds

2.3.2 Troubleshooting

Most of these procedures require a VAG-COM to scan the car for DTCs. While you can fix things without a VAG-COM you will most likely be replacing parts that really are not bad just to rule them out. A VAG-COM is a must have for any 1.8T mechanic.

AIT – Sensor – This is a small sensor located in the intake manifold just after the throttle body. It is responsible for monitoring the intake temperature. It can get coated with oil, and can affect gas mileage, and a loss of power. It is common to remove it and clean it with alcohol, or electronics cleaner.

Boost Leak – View Block 032 with VAG-COM. If Fuel Trims are Negative more than 5% in the load range there is a very good chance that there is a leak after the turbo. Visual inspection of clamps, hoses for a loose connection is the best way to look for leaks. A common place for leaks is at the entrance to the pancake pipe located in the passenger side fender. Also the small line on the DV can rip. See also section 2.4.

BOV – Blow off Valve's vent off air metered by the MAF, and can cause many problems, and make it more difficult to troubleshoot a car. Best way to troubleshoot a BOV is to replace it with a DV and see if the problems continue.

CAT – Aftermarket high Flow Cats often sacrifice emissions for power. It is not uncommon for aftermarket cats to give codes for "efficiency below threshold" right away. Some people have had success using O2 adapters to move the rear O2 sensor away from the exhaust gas and eliminating this code. O2 simulators do not work on the 1.8T. Sometimes cats can melt or clog up. Running hig exhaust gas temps for extended periods of time can cause this. Usually you will get the cat code, and see that the max boost and sustained boost levels drop off. After checking everything else on the list, remove the down pipe/cat and check to see that light shines through brightly. If there is very little light passing through it is clogged and requires replacement.

Coilpacks – See Ignition Coils.

CTS – Coolant Temp Sensor – This part is prone to failure. 2002 and older vehicles had a

bad coolant temp sensor from the factory that VW updated. It was a black sensor, and now the good one is referred to as a green top coolant temp sensor. Block 011 in the VAG-COM can monitor coolant temp for erratic readings. This is a £15 part. Do not change while engine is hot.

Down-Pipe – See CAT

DV – Diverter Valve – When the throttle is closed on a turbo car, the turbo is spinning rapidly, and trying to push air into the engine. By closing the throttle the air has nowhere to go, and will cause a large pressure spike. The diverter valve is actuated by a vacuum line, and when the throttle closes creating vacuum behind it, the diverter valve will open and provide a path for the air. The air is returned back to the intake of the car after the MAF. When A DV fails it leaks air in this circular pattern causing boost problems.
2001 and older cars have a weak DV that is prone to failure. 2002 and newer cars have an improved design. It is durable, inexpensive (£20) and it responds very quickly. The part number for the good valve ends in 710 N. The DV is located at the back right side of the engine, it has 1 large hose, and 1 small line connected to it, and the other end is connected to your intake hose running to the airbox. To test if your DV has failed remove the DV, press the diaphragm up, put your thumb on the top nipple, and then release the diaphragm. There should be suction created on the top of the DV that prevents the diaphragm from returning. If there is no suction then the diaphragm is leaking and the valve should be replaced. IF the valve is good, check the VAC line leading up to the valve for any cut's/ tears.
A good alternative to the standard valve is the Forge 007P.

ECU – Engine Control Unit - The ECU is responsible for nearly all functions on the car. If the ECU is suspected as a bad part, you need to use a scan tool such as a VAG com to attempt to communicate with the ECU. If you can't communicate with the ECU, then the ECU needs replacement. Check all electrical connections. Check your Fuses for blown fuses. Whatever killed the ECU might kill the new one.
ECU removal procedure: http://www.goapr.com/VW/support/ecu_tt_golf_gti_jetta.pdf

Fuel pump Relay – The fuel pump relay is located under the driver's side kick panel. Remove the lower panels to gain access to the relay box. When the fuel pump relay goes bad it will trigger many fault codes with electrical shorts to ground. The fuel pump relay is also used to turn on the injectors, and will show injector short to ground failures. If you open your door you hear the pump kick on, if the pump no longer kicks on, and you experience these codes repeatedly, replace the fuel pump relay.

Fuel Filter – The fuel filter on these cars is rated as a lifetime filter by VW. What the aftermarket has found is that high HP applications can run into fuel delivery problems with dirty fuel filters. 30K miles is a more realistic interval for replacement when pushing the system. The fuel filter is located under the car near the gas tank. It has small clip on hoses. To remove the hoses press in on the clip on the end of the hose and it will come off easily. You may need a small screwdriver for this, and be prepared to have fuel leaking out.

Head Gasket Head gaskets can be a cause of overheating, oil consumption or coolant in the oil. I have only heard of one case of a head gasket failure on a 1.8T and it was on a car running 30 lbs of boost and used head bolts. This is a repair better left to an experienced mechanic and is generally a last item to do after all other possibilites have been evaluated. Oerheating is usually the water pump, and coolant in the oil is usually the oil cooler failing internally.

Immobilizer – These cars are equipped with immobilizers to prevent theft. If you swap an ECU without matching up the ECU and the cluster, it will start briefly and then die repeatedly. There are 2 kinds of immobilizer. Immo II used on pre 2002, and Immo III used on 2002+. Immobilizer and ECU info can be found on the VAG-COM Site.
http://www.ross-tech.com/vag-com/cars/immobilizer2.html
http://www.ross-tech.com/vag-com/cars/Immo3-ecu-swapping.html
If swapping an engine into a car without an immobilizer/cluster, you can get software for

swaps from REVO, and Dahlback that remove the immobilizer.

Ignition Coils – These are famous parts for the 1.8T they are very prone to failure. The 1.8t motor has a slightly different ignition system than most of us are used to, replacing the more traditional distributor and ignition wires are coilpacks. Coilpacks sit directly ontop of your spark plugs, and are located directly underneath your engine cover. You need to remove your coilpacks in order to change your sparkplugs. Coilpacks work in much the same way as a traditional ignition system in that they power up the sparkplug to create a spark and transfer potential energy in the head into kinetic energy through combustion. In general many people have had certain problems with their coilpacks, chalk it down to improper sparkplug gapping, faulty modules or a host of other conditions. There was a running change in late 2000 where the coilpacks were redesigned and the manufacturer changed. The original coilpacks were produced by Hitachi and used allen keys and clips to hold them in place. Very few of these failed.
The later coilpacks are produced by Bosch, with many revisions. VAG has had a recall on these because they were failing rapidly on 2001+ cars. To check for bad coils the best way is with a VAG-COM. Log Blocks 014, 015 and 016. This will be a misfire counter. Drive the car or let it run, and look for misfires. If you have a bad coil you will see the counter increase on a cylinder. If you have one counting up then it's probably a bad coil. Turn off engine and take that coil out and swap it with another coil. The cylinders read left to right 1,2,3,4 when looking at the engine from the front. Use the VAG-COM again to see if the misfires have also swapped to another cylinder. If it moved, then you have a bad coil. Replace it. If they do not move, then you likely have a plug problem. On some cars the ignition coils have problems and they will pop up out of the cylinder head and lose contact with the plug. Plugs should be torqued to 22 ft-lbs when changed. If the coils still pop up, they can be fixed with simple brackets.

Limp Mode – These cars are designed to protect themselves from engine damage. If the engine boosts too much, or the engine does not get enough fuel it will go into a limp mode where boost is limited to protect the engine. It limits boost by controlling a solenoid on the wastegate line (N75), by closing the electronic throttle or by opening the DV valve. If you are experiencing a limp mode the best thing to do is get the car scanned for codes and to see what is wrong. Look at fuel trims for signs of running lean, and to look for MAF problems, or O2 sensor problems. To look for potential boost problems log Block 115 and you can see the specified Vs actual boost. If you exceed the specified then there is a good chance that you will go into this limp mode. Stock specified is a max of **?**psi for a 2002+ car.

MAF – Mass air flow meter is used to measure the air going into the engine. It is located on the outlet of the airbox, and housed in a cylindrical tube. The ECU reads the MAF signal, and injects fuel in proportion to the airflow. There are a few different ways the MAF can fail. The MAF can get coated with oil, and will not read properly. This is common if it happens right after installing a CAI, or a K&N filter. It can be cleaned out with 99% isopropyl alcohol (IPA). Remove the sensor from the housing and clean the sensor element.
MAF sensors also go bad due to too much airflow. On a car with a larger turbo the airflow is so high that the MAF element will get burned out from the excess air flow. It is common to increase the size of the housing to prevent this (other modifications required).
To check for a BAD MAF the best way is with a VAG-COM. Block 002 show air mass from the sensor. At idle the airflow should be no less than 2g/s. With a wide open throttle run to redline the reading should show up to 190-220g/s on a chipped car. Look for jumpy readings in the MAF, which can indicate a problem. If you suspect your MAF is bad, one way to test it is to unplug the MAF, often if the MAF is giving false readings and upsets the fueling. If you unplug it, the ECU will ignore the MAF and run off of baseline tables. Be careful, as a boost leak or a vacuum leak can be miss-diagnosed as a bad MAF, because they will throw off the readings on the MAF. (Air sneaks around the MAF).

MBC – Manual Boost Controller **–** Often people want more boost from their car, and use a MBC. While MBCs can get you more boost they will cause a jerky part throttle driving, and can cause over boost, often put the car into a limp mode. The way a MBC works is by bleeding off air from the wastegate control line. A wastegate is a mechanical flapper valve in

the turbocharger that opens to allow exhaust gas to sneak around the turbo. By bleeding off air from the line, the wastegate opens less, more exhaust goes through the turbo, and you get more boost.

N75 – The N75 is an electronic solenoid valve that the ECU uses to control boost. It is located in the intake hose near the back right side of the engine. It has 3 connections.

1. Connects to charge pipe = pressure source
2. Connects to wastegate actuator
3. Connects to intake hose – bleed line.

The ECU will pulse this valve at a high frequency to bleed air off from the wastegate line. It does this based on throttle position and engine load. If the valve, or any of the liens connected to it have leaks then there can be severe boost regulation problems. Its function is similar to the MBC above. To get more boost people often swap in different N75 valves. These different valves simply have a different response characteristic, and will act different when given the same signal by the ecu. They can get more boost, less boost, or even a big boost spike by swapping N75's.

O2 Sensor – Because of strict emissions these 1.8T's are very sensitive to readings from the O2 sensors. Most 2001+ TTs have a wideband front O2 sensor with high accuracy and a linear response. The car will adjust the fueling based on the readings from the sensor. If the sensor is overheated, exposed to lead (race gas), flooded with soot (too rich) or is just old, it can provide the car with false readings and the car will not provide the proper fueling. When the O2 sensors go bad and the ECU detects this the car will run on reserve fueling maps and will not be able to adjust for boost leaks, fuel pressure, MAF readings or any other parameter that affects fueling. To check for a bad sensor the first thing to do is run block 032 on the VAG com. If the sensors are bad, the readings will both be 0%, replace the front O2 sensor. If the sensor is bad, it will also respond slowly, or reach a peak. Logging block 031 will show the lambda reading from the O2 sensor as well as the requested lambda from the ECU. To get air fuel ratio multiply lambda by 14.7. If the log shows the lambda jumping wildly when running through a gear, or perhaps it flat lines at an unreasonable level, then the O2 sensor should be replaced. If the O2 sensors get shorted out or the wires get pulled, they will damage the ECU, be careful with the wiring on these sensors. 2000 and older cars do not have a wideband sensor, however they will still perform some adjustment of fueling based on the sensor.

Oil Cooler The Oild cooler on these cars uses a plate and plate heat exchanger. Often the brazing on the cooler can fail and oil and coolant mix together. This is often misdiagnosed as a bad head gasket. To test this remove the coolant hoses, and apply air pressure to the oil cooler and watch for leaks. Oil cooler is located above the oil filter.

Spark plugs – With the weak coil packs that these cars have, and the high boost pressures that they run, the spark plugs are very important. Spark plugs on turbo cars need a nice tight gap 0.028" is recommended. Spark plugs may come "pre-gapped" however you should always check the gap, as the variation can be severe and will cause problems. Plugs are cheap, so the best way to troubleshoot is to replace them or pull them and check the gap. The standard OEM plugs are NGK-PFR6Q. If you are running serious power, a good alternative is the cooler type NGK-PFR7E.

Thermostat - Thermostats can be a source of overheating. Most common is the waterpump. Thermostats are relatively inexpensive, and can be change din a half hour. If your car overheats, or has a tendency to spike up in temp and then drop down to normal temp, it may be a thermostat. It can fail after only 30k.

Timing Belt If you are driving along and your 60k+ car runs great and all of a sudden dies, there is a good chance that your timing belt has broken, or stripped some teeth. This is a very costly repair and could have been prevented had the factory recommended a better service interval for the belt. Damage estimates are anywhere from £500 - £3000 to repair this kind of failure. 60k miles is a good time to change the timing belt, some belts have lasted 90k, but it's not worth the risk. To test for this failure, pull off the timing belt cover and crank the

engine by hand. If the cam gear doesn't turn you have a bad timing belt. Repair is best left to a good mechanic.

TB – Throttle Body **–** The throttle on these cars is drive by wire, it is an electronic throttle with a wire attached. Most common TB problem just requires adaptation, or cleaning out with carb cleaner. This procedure shows how to do a TBA. TBA can improve idle and part throttle operation. To clean the TB, remove it, and spray inside with carb cleaner. Wipe out the residue that gets built up in there. NEVER port a TB on a 1.8T it won't idle properly. See also section 2.5.

Race Fuel – 1.8T engines love high octane fuel, however they can have cold startup problems, and if you run leaded race fuel you will ruin your CAT and your O2 sensors. Always run unleaded fuel in a 1.8T unless you are catless, and you have extra O2 sensors. In the UK, the TT just loves Shell V-Power 99RON, but BP's Ultima is also fine.

VAC Leak – A VAC leak will cause un-metered air to enter the engine and it will run lean. If the air is not measured by the MAF then the fuel will not be injected. The O2 sensor will compensate for much of this, however it has limits. To check for a VAC leak, log block 032 and check the idle fuel trims. If it's more than +2% you probably have a VAC leak somewhere. Check hoses and connections for loose clamps of cut hoses here are come common areas for VAC leaks.
Turbo inlet pipe not secured, DV line leaking, Crank case breather Y pipe split, Line on Fuel pressure regulator gets worn and leaks, intake manifold gasket can leak, and PCV line under intake manifold leaks. To find leaks some people spray ether or starter spray around in the engine bay and listen for changes in idle speed. If you get a change from spraying in a certain area look for leaks there.

Waterpump – Nearly all overheating problems I have seen on these engines has been from the water pump. VW uses a plastic impellar that is splined/molded onto the shaft. These splines strip, or the pump cracks and the impellar slips on the shaft at high speeds. If your car is overheating best bet is to change the waterpump. You can do the T-stat first to see if you are lucky, but every time I have seen people try this it's the water pump anyways. This happens as early as 35k miles. While you are in there doing the water pump, change the timing belt. Timing belts on these can go as early as 60k miles. There are several companies that make kits to do the timing belt and water pump.

Water wetter – Water wetter is an additive used to remove surface tension from water. It improves waters cooling ability in a cooling system as it prevents beading of the water, and raises the boiling point. Water wetter should not be used with G12 coolant. It is best for race cars running only water. If you add this to the coolant reservoir you get a nasty oily sludg in the reservoir. Flush coolant system and remove this.

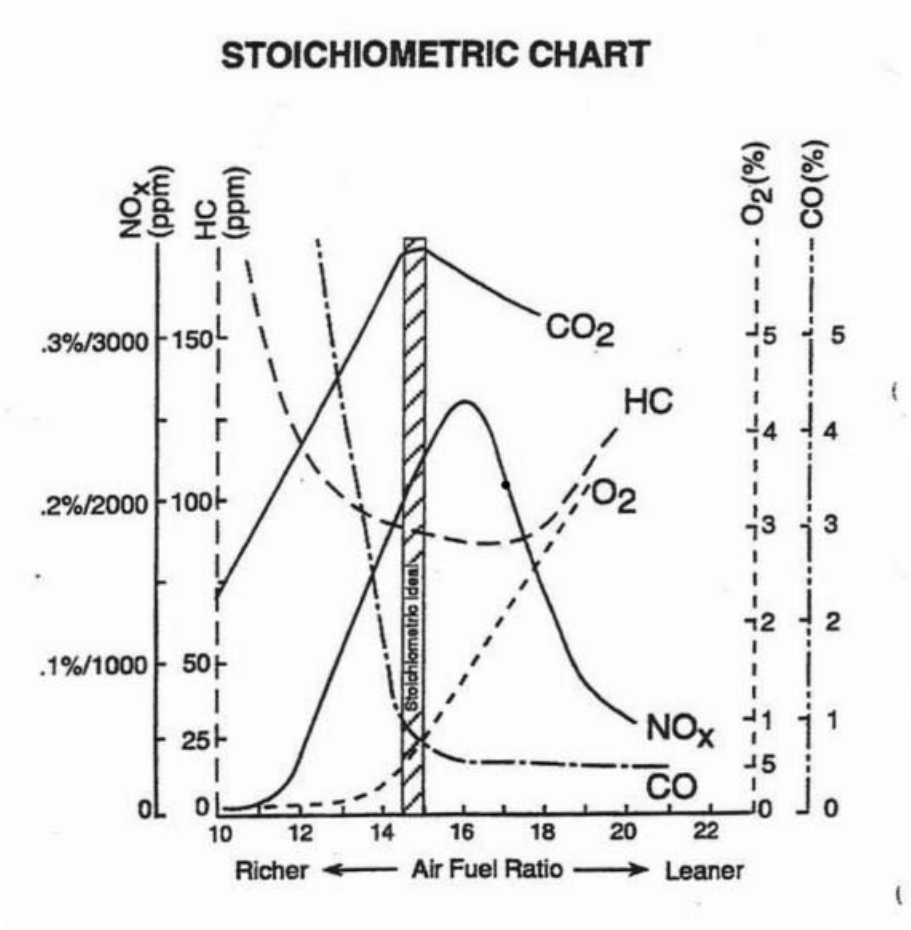
2.4 Lambda Adaptation

Courtesy of Andy@Ross-Tech

Some of the most common Fault Codes (DTC's) pertain to fuel trim (rich mixture, lean mixture, etc.) Here is an explanation of fuel trim and what it does for us.

The ECU controls Air/Fuel mixture in order to maintain power, efficiency, and emissions. A/F is expressed as either a ratio (14.7:1 for example) or as a Lambda value. With iso-octane ("ideal" gasoline), Lambda of 1.0 is equal to 14.7:1 A/F. This is known as *stoichiometric*, a condition where there is a perfect balance between oxygen molecules and the various hydrogen and carbon based molecules in petroleum. With the oxygenated gasoline that most of us use, actual A/F ratio of 15:1 is closer to stoichiometric.

If Lambda is greater than 1.0, then there is a surplus of air and the engine is running lean. If Lambda is less than 1.0, then there is a surplus of fuel and the engine is running rich. It should be noted that the ratios are mass-based, not volume-based.



So, why don't we always run at 1.0 all the time? Well, we do *most* of the time. At cruise and idle, mixture is held tightly to 1.0 to keep the catalytic convertor at optimal efficiency, so the emissions are minimized. However, when we need acceleration, the mixture gets richer. Why? Maximum power is made between 0.85 and 0.95 Lambda (12.5 to 14.0 A/F with iso-octane). So, under acceleration, mixtures get richer. Sometimes you want to get even richer under acceleration to keep detonation (pre-ignition of the mixture from excess cylinder temperatures) away. The 1.8T, for example, has a relatively high compression ratio for a turbocharged engine, which especially under lots of boost, is very succeptible to detonation.

So, now that we know that the ECU wants to be able to control the A/F ratio. It has a prescribed set of values (maps) for a given RPM, Load, etc. So, the ECU tells the injectors to pulse for exactly *x* milliseconds and that *should* get us the proper A/F ratio that we want.

Well, if you tell an employee to go do something, you want to make sure they actually did it, right? The ECU has some snitches (the front O2 sensor and the MAF, for the most part) that will report back whether or not the desired mixture has been attained. The rear O2 sensor is used mostly to monitor the condition of the catalytic convertor, although in some applications it also contributes to trim information.

Based on feedback from the snitches, the ECU learns to apply a correction factor to its commands to the fuel injectors. If you know that your employees take longer than the standard allotted time to do a specified job, you will need to adjust for that in your planning (injectors are in a union, so it is tough to fire them). The learned values go between the maps in the ECU's Flash ROM (the "chip") and the signal to the fuel injectors. These learned compensations are known as "trim". So, when you see "trim", it means "compensation".

"Add" means additive trim, which is addressing an imbalance at idle. When the ECU is using additive trim, it is telling the injectors to stay open a fixed amount longer or shorter. The malfunction (e.g. vacuum leak) becomes less significant as RPM increase. For additive adaptation values, the injection timing is changed by a fixed amount. This value is not dependent on the basic injection timing.

"Mult" means multiplicative trim, which is addressing an imbalance at all engine speeds. The malfunction (e.g. clogged injector) becomes more severe at increased RPM. For multiplicative adaptation values, there is a percentage change in injection timing. This change is dependent on the basic injection timing.

You can check your current state of trim by using VAG-COM or equivalent to look in Group 032 in your engine measuring blocks. The first two fields will have percentages. The first field tells the fuel trim at idle (Additive). The second field tells the fuel trim at elevated engine speeds (Multiplicative). Negative values indicate that the engine is running too rich and oxygen sensor control is therefore making it leaner by reducing the amount of time that the injectors are open. Positive values indicate that the engine is running too lean and oxygen sensor control is therefore making it richer by increasing the amount of time that the injectors are open.

It is totally normal for both the first and second fields to be something other than zero. In fact, zeros indicate either you just cleared codes (which will reset fuel trim values) or something isn't working properly. If values get too far away from zero, it will cause a DTC (fault code) and can set off the MIL (commonly referred to as the Check Engine Light, or CEL).

Specifications for normal operation are usually somewhere near +/- 10%. In general, an out-of-spec value in the first field (Additive) indicates a vacuum leak, since it is mostly present at idle, when vacuum is highest. An out-of-spec value in the second field (Multiplicative) indicates a fault at higher RPM, and may point to a faulty MAF.

Other causes for the trims staying *below* specifications:

- High oil consumption
- Oil dilution
- Boost leak after turbo
- MAF defective
- Fuel pressure too high
- Injector(s) not closing properly
- Charcoal filter system valve N80 stuck open
- Lambda probe defective

Other causes for the trims staying *above* specifications:

- Unmetered air in the intake
- MAF defective
- Fuel pressure too low
- Injector(s) not opening properly
- Charcoal filter system valve N80 sticking
- Lambda probe defective

Here's a good sanity check for the status of your MAF. Do a full-throttle run all the way to redline in a single gear (second works fine). Group 002 shows air mass in g/s. Your peak airflow should be roughly 0.80 times your horsepower. So, if you have a stock 150hp 1.8T, expect around 120g/s. If you have a 225hp 1.8T remapped to 265hp, expect around 200g/s. If you see significantly less than that, you MAF may be on the way out. This also works if you are chipped, but "race" programs may make more power through timing, rather than airflow. Therefore, take all readings with a grain of salt. Also remember that the MAF can be knackered even if all values look reasonable!

2.5 Throttle Body Adaptation without VAG-COM

More info on Ross-Tech wiki

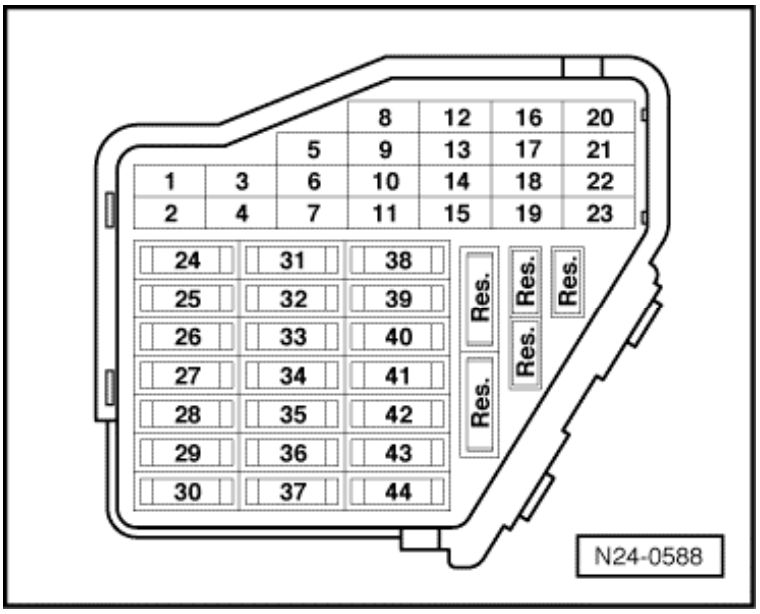
Throttle body adaptation (TBA) is a procedure used to calibrate the throttle body flap sensors. Sometimes it is confused with clearing the ECU adaptation tables. The only procedure to ensure the real throttle body adaptation is to enter VAG-COM basic settings block 060. However, the ECU usually does TBR after its power supply is cycled, i.e. the fuse has been pulled or the battery has been disconnected.

The reason for doing TBA is that some people have reported power loss after a long period of unspirited driving, as if the ECU were adapting to the driving style. Presumably the ECU has just lost the flap sensor calibration. However, if hesitation is caused by misguided (ignition or fueling) adaptation, full reset may be needed instead of TBA.

If you don't have VAG-COM, or you actually want to reset the ECU for clearing all adaptation tables, you can just pull the ECU fuse, or disconnect the battery. Leave the power out for 5min to ensure all the power has been drained. Then reconnect, and turn on ignition, but DO NOT start the engine. Listen out for the clicking under the bonnet, which is usually over after a minute. Turn off ignition.

Warning! If you disconnect the battery, be prepared to enter the radio safety code.

Note. The ECU fuse is #10 for models before 10/2000, or #37 for models after 10/2000.



2.6 Basic VAG-COM Logging Tests

Courtesy of MJB Motorsport, jonas@TT-forum

2.6.1 **Block 032** – Fuel Trims

Refer to section 2.4 for complete description.

In measuring block 032, field 1 represents the fuel trim at idle (additive), and field 2 represents the fuel trim at part throttle (multiplicative). Always check these two figures first, before doing any futher analysis.

The idle trim should generally stay between -9% and +9%, and the partial throttle trim should stay within -25% ... 25%. A negative value indicates the ECU is leaning fueling (engine running rich), and positive indicates the ECU is enriching (engine running lean). A value outside -25% ... 25% hints that there is certainly something wrong with the engine - the ECU will throw a DTC.

2.6.2 **Block 002** – Mass Air Flow Sensor / MAF

This field 4 in block 002 indicates the airflow in grams per second, measured by the MAF sensor. That is the amount (mass) of air the engine is sucking in. The ECU calculates the fueling parameters based on this figure.

Check the MAF reading at idle. Make sure the car is running and warmed up and the A/C is off. The value at idle should be between 2 and 4 g/s. If it's lower than 2 g/s, then the MAF is presumably faulty, or there is a leak in the intake tubing between the MAF and the turbo.

On a chipped car one would expect MAF numbers to increase linearly as the car approaches redline under WOT. The highest numbers will be seen at or near redline and are likely to be in the neighborhood of 190-220g/s for a chipped TT225. Low numbers at redline, such as 160g/s, are a good indicator your MAF is on the way out.

If you suspect your MAF is bad, one way to test it is to unplug the connector. With the MAF unplugged, the ECU will run on the baseline tables. If the engine runs smoother without the MAF, the chances are the MAF is knackered.

2.6.3 **Block 031** – Lambda (A/F)

Refer to section 2.4 for complete description.

This value is particularly important to be viewed and interpreted only when the car is under full throttle (WOT). Take your logs in third gear (or higher if your local authorities will allow) from 2500rpm till redline.

Usually you will see values like: 1.0 ~ 14.7:1 stoich a/f ratio; 0.85 ~ 12.5:1 “high power ratio”; 0.75 ~ 11:1 “redline ratio”. To convert between lambda and A/F, simply multiply by 14.7.

Remember that lean is your ultimate enemy. Running too lean for too long will spell disaster for the motor. Ideally you would like to see the A/F passes linearly from the stoich 14.7:1 at idle, towards 13:1 in the mid rpms, to at least 12:1 at redline. This would show a car that is getting good fuel mileage under easy driving, but richens up nicely as you wind it out under full throttle to redline. This would make you feel at ease driving the car under high load conditions at high speeds or using the car for frequent track days.

2.6.4 **Block 004** – Intake Air Temperatures

This block displays the coolant temperature and the intake air temperature. The intake air temperature probe is located in the intake manifold just after the throttle body. This sensor measures the temperature of the air after it has passed through the intercoolers and is entering the engine to mix with the fuel. Ideally the intake air should be as cool as possible, perhaps remaining at ambient temps.

The intercoolers are designed to make use of the air flowing over the car to cool the intake air. It is common to see temps begin to rise after a spirited driving regimen while the car is stationary. Watching those temps rise while idling and then observing how quickly they once again reduce as the car goes underway gives some insight into the recovery rates of the intercoolers.

You may also want to observe the temps througout a 3rd gear wide open throttle (WOT) run, to see if the temps remain cool and stable. If the temps start to raise too high (near 100°C), this may be an indicator that the boost pressure is too high, or an intercooler upgrade would be of benefit.

2.6.5 **Block 020** – Timing Retard

This block shows the timing retard for each cylinder. You should see a field of zeros everywhere, with a few possible spikes up to 9°KW. The number 0 in each of the cylinder boxes indicates no timing retard is taking place. Non-zero numbers indicate the timing advance is reduced.

Now, what if you see some random numbers like "1.5" and "3" every once in awhile? This should be fine. If you were a tweaker, ideally you would want to find that point where you are able to use the most timing without triggering problems. Since most people do not mess with timing adjustments, we want to see as close to zero as possible thoughout.

Warning! The ECU can retard timing no more than 12°KW. Timing retard greater than 10°KW should make you worried, and is a major player in engine destruction.

Example: An engine running very safe timing (standard map)

	Group B:	'020				Group C:	
		Cyl #1	Cyl #2	Cyl #3	Cyl #4	RPM	
	TIME						
	STAMP	CF	CF	CF	CF	/min	
	160.63	0	0	0	0	2760	
	161.84	0	0	0	0	2720	
	163.04	0	0	0	0	2800	
	164.25	0	0	0	0	2760	
	165.46	0	0	0	0	3000	
	166.66	0	0	0	0	3440	
	167.87	0	0	0	0.8	3800	
	169.08	0	0	0	0	4240	
	170.28	0	0	0	0	4440	
	171.49	0	0	0	0	4760	
	172.7	0	0	0	0	5080	
	173.9	0.8	0	0	1.5	5400	
	175.11	0	0	0	1.5	5960	
	176.32	0	0	0	0.8	6200	
	177.52	0	0	0	0	5840	

Example: An engine running *too much* timing advance

Group B:	'020				Group C:
	Cyl #1	Cyl #2	Cyl #3	Cyl #4	RPM
TIME					
STAMP	CF	CF	CF	CF	/min
160.63	0	0	0	0	2760
161.84	0	0	0	0	2720
163.04	0.8	0	0	0.8	2800
164.25	0	1.5	1.5	1.5	2760
165.46	1.5	1.5	1.5	3	3000
166.66	4.5	4.5	4.5	4.5	3440
167.87	6.8	4.5	4.5	6.8	3800
169.08	8.3	6.8	6.8	8.3	4240
170.28	6.8	4.5	4.5	6.8	4440
171.49	8.3	4.5	4.5	9.8	4760
172.7	9.8	6.8	6.8	11.3	5080
173.9	11.3	9.8	9.8	11.3	5400
175.11	4.5	3	3	4.5	5960
176.32	0	0	1.5	1.5	6200
177.52	0	0	0	0	5840

Example: An engine running aggressive timing (remap)

Group B:	'020				Group C:
	Cyl #1	Cyl #2	Cyl #3	Cyl #4	RPM
TIME					
STAMP	CF	CF	CF	CF	/min
160.63	0	0	0	0	2760
161.84	0	0	0	0	2720
163.04	0	0	0	0	2800
164.25	0	0	0	0	2760
165.46	0	0	0	0	3000
166.66	0	0	0	1.5	3440
167.87	0	0	0	1.5	3800
169.08	0.8	1.5	1.5	3.8	4240
170.28	2.3	1.5	1.5	2.3	4440
171.49	4.5	2.3	2.3	4.5	4760
172.7	6.8	1.5	1.5	6.8	5080
173.9	6.8	2.3	2.3	6.8	5400
175.11	3	0.8	0	3	5960
176.32	0	0	0	0.8	6200
177.52	0.8	0	0	0	5840

2.6.6 **Block 112** – Exhaust Gas Temperatures (EGT)

This monitors the exhaust gas temperatures in the exhaust manifold. To find out the full temperature range, take your car out for some spirited full boost runs, then start logging in the normal 3rd gear WOT manner. If you want to see what the limits are here, it will take some beating on the car to find it. When the car is still warming up, your readings may not accurately reflect just how high these temps can get.

Exhaust gas temperatures up to 900°C are common to the 1.8T engines, especially when heavily boosted. The sensor appears to be only accurate to 999°C. If you see readings creeping up this high, you have a great indicator that something is not right on your car and your engine is not happy with you.

Warning! *Running too high of temps for too long will spell disaster.*

2.6.7 **Block 115** – Requested Boost and Actual Boost

This block displays the boost requested by ECU (command pressure) in the first column, and the boost actually made by the turbo (boost pressure) in the second column. This is a very helpful channel for diagnosing boost leaks, limp mode problems, and general hardware issues.

The numbers here are absolute pressures, without atmosphere pressure correction (1013mbar at sea level). Usually it's good enough to subtract 1000mbar from the numbers, though the real *barometric* pressure is available in block 113. Further, if you need the numbers in psi, just multiply by 0.0145.

So why are the above numbers important to us, other than acting as a boost guage to entertain us? Well, as you can imagine, if you had a boost leak you would have a car that is requesting the correct boost but you would see very little in the actual boost column. In the case that you had just installed your new boost controller or N75 valve, you may find that your actual boost is far exceeding the requested boost. The ECU will sense this as "overboost condition", and go into limp more.

For those of us who dare to run a turbo that was not designed specifically for the software they are using, this is a great way to see why it is not working out for you. For example, the boost maps on a K03 will show the ECU requesting max boost at around 3000rpms (this is a small turbo that makes its boost low in the rpm range). Now if you were to throw on a Garrett gt28r or T28 turbo, you would see that the computer will still request the max boost at 3000rpm, but the turbo is not capable of making it until closer to 3800rpm, leaving you with an "underboost" condition.

Note. The sensor will only measure up to 2540mbar, including atmospheric pressure. This means that if you are running more than 1.54bar or 21.75psi of boost, this sensor will not measure beyond it. Both values will max out at 2540mbar.

2.7 Testing Sensors and Switches

Courtesy of jonas@TT-forum

The six simple tests in this section check the proper function of various sensors and switches. Also, basic connectivity is tested.

Before starting, the following conditions must be met:

- No DTCs
- Battery voltage at least 11.5V
- All electrical instruments switched off
- Air conditioner switched off
- Engine stopped, ignition on
- Vehicle stationary*; don't do it while driving!*

WARNING! *All ABS/EPS functions are deactivated while accessing the ABS/EPS measuring blocks!*

Note. If any of the checks fails, *please refer to the service manual*.

2.7.1 **ECU Block 062** – Accelerator Pedal

The DBW accerelator pedal has two position senders, G79 and G185, in a joint housing. The sender potentiometers are connected so that the voltage from G79 is twice the voltage from G185. The ECU converts the voltage values to percentage values, 5V corresponding to 100%.

Enter the ECU Measuring Block 062.

Press the accelator pedal slowly. The values in fields 3 and 4 should increase steadily. The tolerance ranges are 12% … 97% and 4% … 49%, respectively. Check that the value in field 4 is about half of the value in field 3.

2.7.2 **ECU Block 066** – Clutch and Brake Pedal Switches

The clutch pedal position is sensed by the switch F36. It provides the position information to the ECU for avoiding speed overshoot and load change jolting on disengaging the clutch.

The brake pedal is equipped with two switches. The first switch controls the brake lights. The second switch provides the brake pedal position to the ECU.

Enter the ECU Measuring Block 066.

Depress the clutch pedal. Check the sixth digit in field 2. The value should change from 0 to 1. Pump the pedal a couple of times to see that the value follows the pedal position.

Depress the brake pedal. The seventh and eighth digits in field 2 should change from 0 to 1. Pump the pedal a couple of times to check that the values correspond to the pedal position.

2.7.3 **ECU Block 056** – Steering Pressure Switch

The power steering pressure switch F88 is used for idling speed stabilization during pressure peaks. The switch is activated when the steering is fully left or right locked, and during rapid movements.

Enter the ECU Measuring Block 056.

Check the third digit in field 4. It should change from 0 to 1 when the steering is locked.

2.7.4 **AWD Block 001** – Brake Switches

The brake pedal sender information is transferred from the ECU to the Halder controller via a CAN bus. The information available in the Haldex measuring blocks should coincide with the switch positions.

Enter the AWD Measuring Block 001.

Field 1 and 2 indicate the brake light switch and handbrake switch positions, respectively. Check that the value in field 1 changes when the brake pedal is depressed. Check that the value in field 2 changes when the handbrake in engaged.

2.7.5 **ABS/ESP Block 003** – Brake Switches

The brake pedal sender information is transferred from the ECU to the ABS controller via a CAN bus.

Enter the ABS Measuring Block 003.

Field 1 indicates the brake light switch position. Check that the status changes when the brake pedal is depressed.

2.7.6 **ABS/ESP Block 004** – Movement sensors

Enter the ABS Measuring Block 004.

Field 1 indicates the steering angle sender G85 position. With the vehicle moving in straight line, the value should be within ±4.5°.

Field 2 is lateral acceleration, measured by sender G200. When the vehicle is not moving, the value should be within ±0.5m/s².

Field 3 is yaw rate, measured by sender G202. The value should be within ±2.5°/s when the vehicle is stationary. Negative value indicates turning right – positive turning left.

2.8 Testing Lambda Control and CATs

The sequence of 10 tests in this section checks the proper function of the air mass sensor, the catalyst, the lambda sensors, and the fuel tank breather. Running the tests regenerates the *readiness information* that can be accessed in the VAG-COM function “Readiness”.

Before starting, the following conditions must be met:

- No DTCs
- Battery voltage at least 11.5V
- Coolant temperature at least 80°C
- All electrical instruments switched off
- Air conditioner switched off
- Engine stopped, ignition on
- Vehicle stationary*; don’t do it while driving!*

A tool for fixing the accelerator pedal position could be handy. A steady leg is also fine.

Note. According to the service manual, the following tests *should* be run in the specified order.

Note. If any of the tests fails, please refer to the service manual.

2.8.1 **Block 060** – Throttle Body Adaptation

Note! Be sure NOT to touch the accelerator and make sure the engine is NOT running!

Enter the Basic Settings block 060.

Once started, you will see the rightmost field saying “ADP RUN”. The adaptation step counter in the third field represents the adaptation status. Following adaption, the step counter reaches the number 8, but some numbers may also be skipped.

The crucial factor is not the behaviour of the step counter (field 3) during adaption, but rather that the specification “ADP OK” is displayed in field 4 afterwards.

2.8.2 **Block 002** – Air Flow and Fuel Injection

Note! Before continuing:

- Start the engine, leave it idling

Enter the Basic Settings block 002.

Check field 3, the average injection period. The value should stay within 1.0ms … 4.0ms.

Check field 4, the air mass flow. The value should generally stay in range 2.0 … 4.5g/s. Usually, when all electric equipment is turned off, the value should be around 3g/s.

2.8.3 **Block 030** – Lambda Control Operating Status

Note! Before continuing:

- Adjust the engine RPM to 2000 using the handy tool, or your steady leg

Enter the Basic Settings block 030.

In block 030, the fields 1 and 2 are three-digit binary codes that give the status of the oxygen sensors. The first digit indicates the probe heating status, the second digit indicates the probe condition, and the third digit indicates lambda control status. The value should fluctuate between 111 (heater on) and 011 (heater off). The last two digits can also fluctuate between 1 and 0, but should be predominantly 11.

Do not continue with testing until the displays have reached 111 in field 1 and 110 in field 2, at least once.

2.8.4 **Block 034** - Ageing of Pre-Cat Oxygen Sensor

Enter the Basic Settings block 034.

Field 2 shows the Exhaus Gas Temperature, measured by the oxygen sensor. It must be above 350°C for the test to succeed.

The value in field 3 is called “dynamic factor”. It is an indicator for lambda probe ageing. The value should be above 0.5; the value for a new sensor is ~2.0. It will decrease as the sensor ages.

The field 4 will say either 'TEST OFF/ON' before/while the test is running, and either 'B1-S1 OK' or 'B1-S1 NOT OK' afterwards. It may take several minutes to obtain result of diagnosis.

Do not continue with testing unless the field 4 is indicating “B1-S1 OK”.

2.8.5 **Block 036** - Post-Cat Oxygen Sensor Diagnosis

Enter the Basic Settings block 036.

The field 2 will say either 'TEST OFF/ON' before/while the test is running, and either 'B1-S2 OK' or 'B1-S2 NOT OK' afterwards. It may take several minutes to obtain result of diagnosis.

Do not continue with testing unless the field 2 is indicating “B1-S2 OK”.

2.8.6 **Block 037** – Lambda System Diagnosis

Enter the Basic Settings block 037.

The value in field 2 is the post-cat lambda probe output voltage, with range of 0.10 … 0.95V. It should remain as constant as possible. Considerable voltage fluctuations are an indication of catalytic converter damage. A constant voltage of 0.450V is an indication of damaged wiring.

The third field is lambda correction value between the pre and post-cat sensors. It should stay below 0.02.

Note. *If the lambda probe voltage is OK and the lambda correction value is still greater than 0.02, even after a test drive, this is an indication of ageing of the lambda probe upstream of the catalytic converter.*

The field 4 will say either 'TEST OFF/ON' before/while the test is running, and either 'System OK' or 'System NOT OK' afterwards. It may take several minutes to obtain result of diagnosis.

Do not continue with testing unless the field 4 is indicating “System OK”.

2.8.7 **Block 043** – Ageing of Post-Cat Oxygen Sensor

Enter the Basic Settings block 043.

The field 4 will say either 'TEST OFF/ON' before/while the test is running, and either 'B1-S2 OK' or 'B1-S2 NOT OK' afterwards. It may take several minutes to obtain result of diagnosis.

Do not continue with testing unless the field 4 is indicating “B1-S2 OK”.

2.8.8 **Block 046** - Catalytic Converter Diagnosis

Enter the Basic Settings block 046.

Field 2 indicates the *CAT Temperature (EGT)*, which must be more than 320°C for the test to start. Increase engine speed if necessary.

Field 3 is the *CAT Conversion Efficiency*. If the cat is good, the value should be below 0.50 at the end of the test.

The field 4 will say either 'TEST OFF/ON' before/while the test is running, and either 'CAT B1 OK' or 'CAT B1 NOT OK' afterwards.

Do not continue with testing unless the field 4 is indicating “CAT B1 OK”.

2.8.9 **Block 070** – Fuel Tank Breather Valve Diagnosis

Note! Before continuing:

- Remove the accelerator tool / leg – let the engine idle

Enter the Basic Settings block 070.

Note. If the test does not start or if the display switches from “Test ON” to “Test OFF” instantly, give a brief burst of throttle and the test will be repeated.

The field 4 will say either 'TEST OFF/ON' before/while the test is running, and either 'TBV OK' or 'TBV NOT OK' afterwards.

Do not continue with testing unless the field 4 is indicating “TBV OK”.

2.8.10 **Block 056** – Idling Speed Diagnosis

Enter the Basic Settings block 056.

Field 1 indicates the actual engine speed. Field 2 indicates the requested speed, which is usually 760rpm, unless changed in the engine adaptation. The value can be higher also during warmup.

Verify that the actual speed coincides with the requested speed. *Turn on Air Conditioning.* After short fluctuation, the values should coincide again.

Exit the Basic Settings screen.

2.8.11 **Readiness**

Enter the Readiness function “15”.

All the fields should indicate “PASSED”.

2.9 Testing the Dashpod

Courtesy of jonas@TT-forum

A failing dashpod is one of the most common problems with TTs. The actual problem is with the fuel and temperature gauges, which can get jammed due to a design flaw. Usually the needles are showing incorrect readings, or not moving at all.

Thanks to the brave people on the TT-forum, Audi UK is now recognising the problem:

> *Audi Recognises that a number of fuel and temperature gauges haven't been working correctly, mainly on cars built up to mid-2004, when an improved instrument panel was introduced. It has now agreed to replace units that are out of warranty on cars up to five years old, completely free, on what it calls a 'case-by-case' basis. Better still, anyone who has already paid for a new dashpod will also be 'treated sympathetically on a case-by-case basis'.*

To verify that the problem is actually with the dashpod, and not with any of the senders, there are a couple of easy checks to perform.

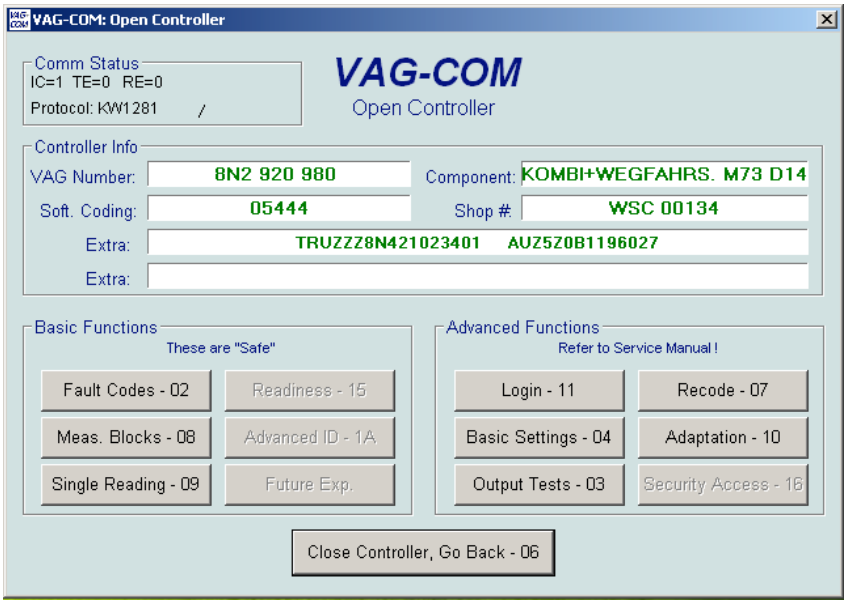
2.9.1 Coolant Temp on the CC Display

The temperature gauge can be checked against the actual coolant temperature reading on the CC display, using the *code 49*. To access the CC codes, see section 2.2, Climate Control Diagnosis Codes.

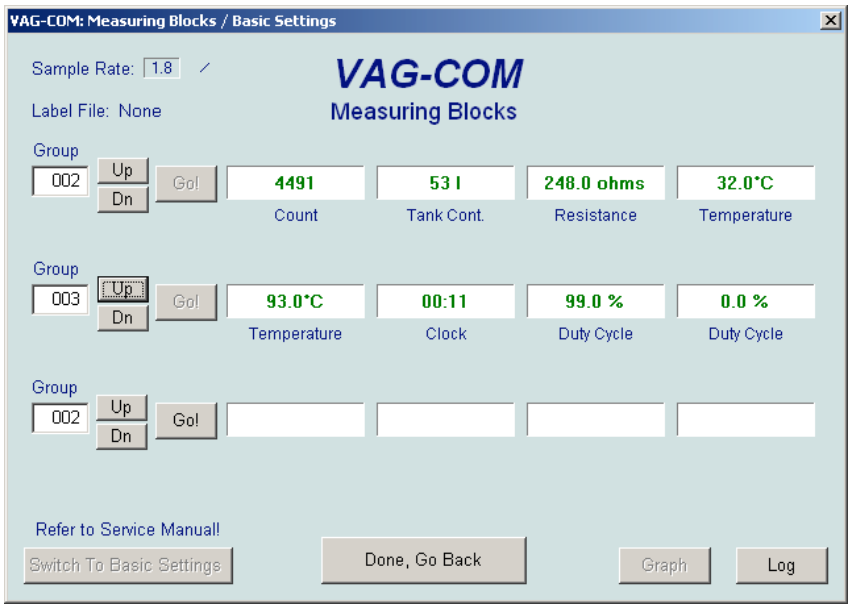
The temp gauge should be indicating the exact temperature, when the coolant temperature is within 50…80°C or 110…130°C. *When the temperature is in the normal operating range of 80…110°C, the needle should be sticking to 90°C*.

2.9.2 Fuel Level and Coolant Temp in VAG-COM

The fuel and temp gauge readings can be also checked against the fuel level and the coolant temperature values in VAG-COM. To enter the measuring block, select *Instruments,* then hit *Meas. Blocks – 08:*



Too see the fuel level, enter *002* in the Group box and hit *Go!*. For the temperature, enter *003* in another group box.

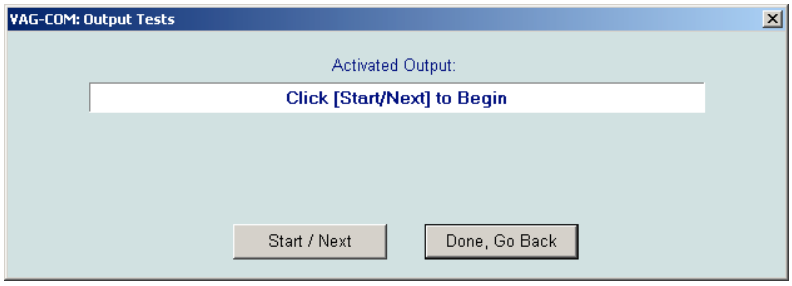


If the values do not match with the gauge readings, the gauges are faulty.

2.9.3 Dashpod Self-Diagnosis

It is also possible to run a self-diagnostic check with the dashpod. The diagnosis function will actuate five control elements in the dashpod in sequence.

To start the sequence, enter *Instruments*, then select *Output Tests – 03*, and finally press *Start / Next*.



1. **Analog gauge sweep**. The full range of the analog gauges is tested. Then the following fixed values will be displayed: 90°C, ½ fuel, 3000rpm, 62mph. *Now, check that the fuel and temp gauges are showing these values!*

2. **Warning lamp test.** Lamps are lid (not all, though).

3. **Gong sound test**.

4. **Display segment test**. All segments on all displays are lid.

5. **Illumination test.** The illumination switches to dark, brightens, then dims down again, and finally switches back to the original brightness.

Obviously, all the tests should perform the described functionality; especially the gauges should be moving freely and showing correct values.

3. TWEAKING

3.1 Changing Temperature Display – Celcius / Fahrenheit

Courtesy of Waks Wide Web

The temperature on the climate control and on the dash computer can be easily changed between Celcius and Fahrenheit:

1. Press and hold the recirculation button
2. Twist the temperature up to switch between degrees Celsius / Fahrenheit
3. When satisfied, let go the recirculation button

Enjoy the more familiar readings!

3.2 Xenon Adjustment

Courtesy of TTinTO on AudiWorld and Ross-Tech wiki

When I recently took delivery of my '03 A4 Avant 1.8T, I noticed that the headlights were aimed too low. Foreground illumination was excellent; however I was having difficulty picking out signs further down the road. They were certainly not aimed as optimally as the Xenons on my TT (after several trips to the dealer to get it right).

When I parked the A4 alongside the wall of an industrial building at night, a sharp downwards slope was evident. The lights were aimed approximately 20-30 degrees from horizontal, too low for my taste.

Here is the procedure to adjust the vertical aim of OEM Xenons:

1. Park the car on a level surface, 10 to 20 feet from a wall if possible. Connect the VAG-COM as usual, with both ignition and xenons on.
2. Select control module “55” Light Range. This is somewhat hidden under "Less Common Modules"
3. Take note of the value in the Soft Coding cell. This is the headlight level as set by the dealer when they performed the PDI. If you manage to muck things up you can always go back to this default value
4. Click on "07 Recode" and you will be able to modify this soft coding value. A smaller value aims the ights higher, and lower value aims the lights lower. Click on "Do it!" to see the lights move up or down.
5. Don't over do it. I suggest that you choose a value that still has a gentle downwards slope to avoid blinding other people on the road. I changed my original value from 00060 to 00020 and it's perfect.
6. Now you need to recalibrate the self-leveling reference point, or else you will throw a code the next time you start the car.
7. To do this, select "04 Basic Settings" and scroll up to "Group 001". In a few seconds the first cell will change from "wait" to "set". Now scroll to "Group 002" and wait until the controller says "Learned"

I can confirm that this tweak works on a '01 TT 225 and '03 A4 Avant 1.8T. Although I have not tested it, this should work on all current Audi cars with OEM self-levelling Xenon lights.

Enjoy your improved visibility!

3.3 Dashpod Illumination

Courtesy of Waks Wide Web

Previous discussions have mentioned how some dash pods had different illuminations and consensus was that Audi changed pod models. The pod illumination is in fact customisable; you can set it to a number of settings when the ignition is on and the lights off:

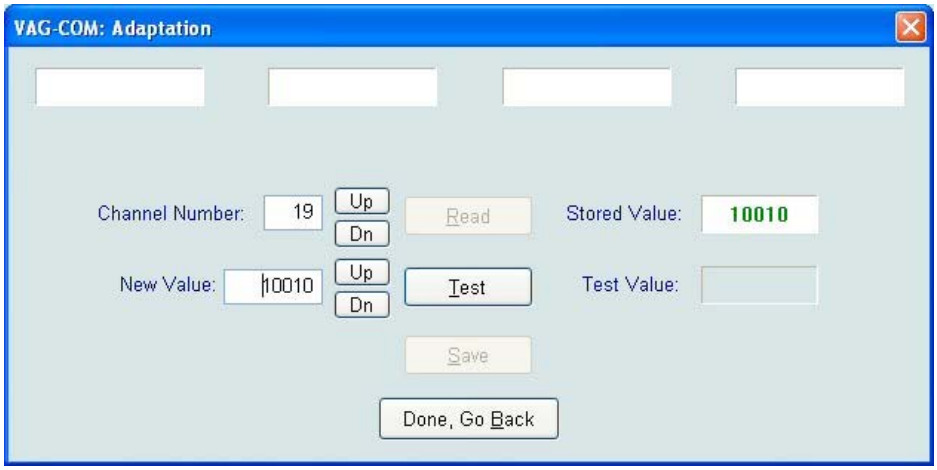
1. All off
2. Pointers Lit all the time
3. Scales Lit all the time
4. Pointers & Scales Lit all the time

By default my pointers were lit all the time, but recently I found that when wearing sun glasses or going through a tunnel having the scales lit as well makes them much easier to read and being able to set this is very useful.

Always note down the original setting of anything you do and if you are not confident with what you are doing then just don't do it. YOU HAVE BEEN WARNED.

1. In "17" for the Instruments, select “10" Adaptation

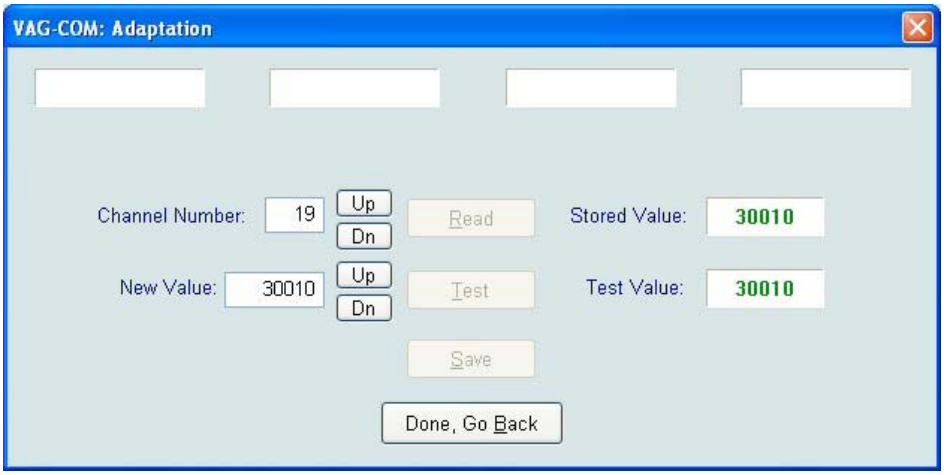
2. Read channel “19”



3. Change the first digit (fifth counting from right) of the value in that channel to correspond to the mode you desire. There are four lighting modes:

Mode 0: Nothing lit until ext. light on
Mode 1: Pointers lit all the time
Mode 2: Scales lit all the time
Mode 3: Pointers and Scales lit all the time

4. TEST the new value, 30010 in this case:



5. If you're satisfied with the results, hit Save.

3.4 Fuel Gauge Calibration

Courtesy of jonas@TT-forum

If your fuel gauge is not exactly spot on, here are the instructions to fix it.

The fuel level sender in the fuel tank is directly connected to the dashpod that measures the resistance of the sender. The resistance value is then converted to the estimated fuel level, which is finally indicated on the fuel gauge. If the gauge does not correspond to the actual fuel level, it is possible to adjust the resistance conversion curve.

The dashpod Adaptation Channel 30 accepts values 120 … 136, corresponding to -2l … +2l adjustment range to the fuel level. An adjustment of 4 equals 1l. Value 128 corresponds to no adjustment, which is the default.

It is strongly adviced to only adjust the empty tank range of the gauge. It should not really matter whether your gauge is showing *exactly* full tank after fillup, but it is essential the gauge is indicating *empty* when you are running on vapours!

To perform the adjustment:

1. In "17" for the Instruments, select “10" Adaptation
2. Read channel 30
3. Enter the new value, always 5 digits, prefixed with zeros. For example, enter 00124 to do -1l adjustment.
4. Test the new value
5. If you're satisfied with the results, hit “Save”

3.5 Key Fob Recoding

Courtesy of Waks Wide Web, Chip_iTT & jonas on TT-forum

These instructions allow you to reprogram the remote locking function on your "switchblade" key fob. This does NOT reprogram the immobiliser or anything related to the ECU/Dashpod or the key blade itself - only VAG can do that. This only relates to the remote locking system.

The remote uses a rotating pseudo-random code security system, which relies on both the car and the key fob knowing the next few numbers in the sequence of just over 16000 numbers. If you press the key out of range too often they get out of step. This process gets them back in step again by resetting the sequence. It relies on you being able to open the car with the key in order to prove that the keyblade and the car are related.

The Central Locking controller unit has four “memory slots” for storing the key security codes. When recoding a new key, you need to know which slot is empty. When recoding an existing key, you need to know the exact slot the key is occupying. This information is available in the Central Locking measuring blocks.

Fortunately, it is possible to recode the keys without VAG-COM, if you recode them all at the same time. You will need all your "switchblade" keys, and the plastic master key (can do without, but requires more work).

1. Number the keys; which one is first, second, third, and fouth.
2. Put the plastic master key in the ignition. Turn it one click forward.
3. Open the window (precaution)
4. Close and lock the driver’s door with the key to program (by twisting the key). Leave the key in the lock.
5. On the key to program, press the 'UNLOCK' button - for the first key press *once*, for the second key press *twice* within less than 5 seconds, etc. The lights will flash on the car, but the doors will remain locked.
6. With the key still in the drivers door - unlock then lock the door again (by twisting the key)
7. Pull the key from the lock and test remote functions
8. Repeat from 4 with the other keys
9. Open drivers door, remove the master key from ignition

3.6 Central Locking

Courtesy of Waks Wide Web

A number of features of the central locking are not promoted by the dealers but are very useful to have and make ownership more pleasurable and safer.

The features control these four main functions:

1. Windows open/close - The comfort feature allowing windows to be opened or closed by holding the lock/unlock on the key fob.
2. Autolock - The car will lock when you reach 15km/h and unlock when you pull the key from the ignition
3. Alarm confirmation beep - a very subtle beep when the alarm is correctly armed, a small honk if you have a euro/US spec alarm
4. Double press unlock - the drivers door only will unlock on the first press of the remote, 2nd press will unlock both doors.

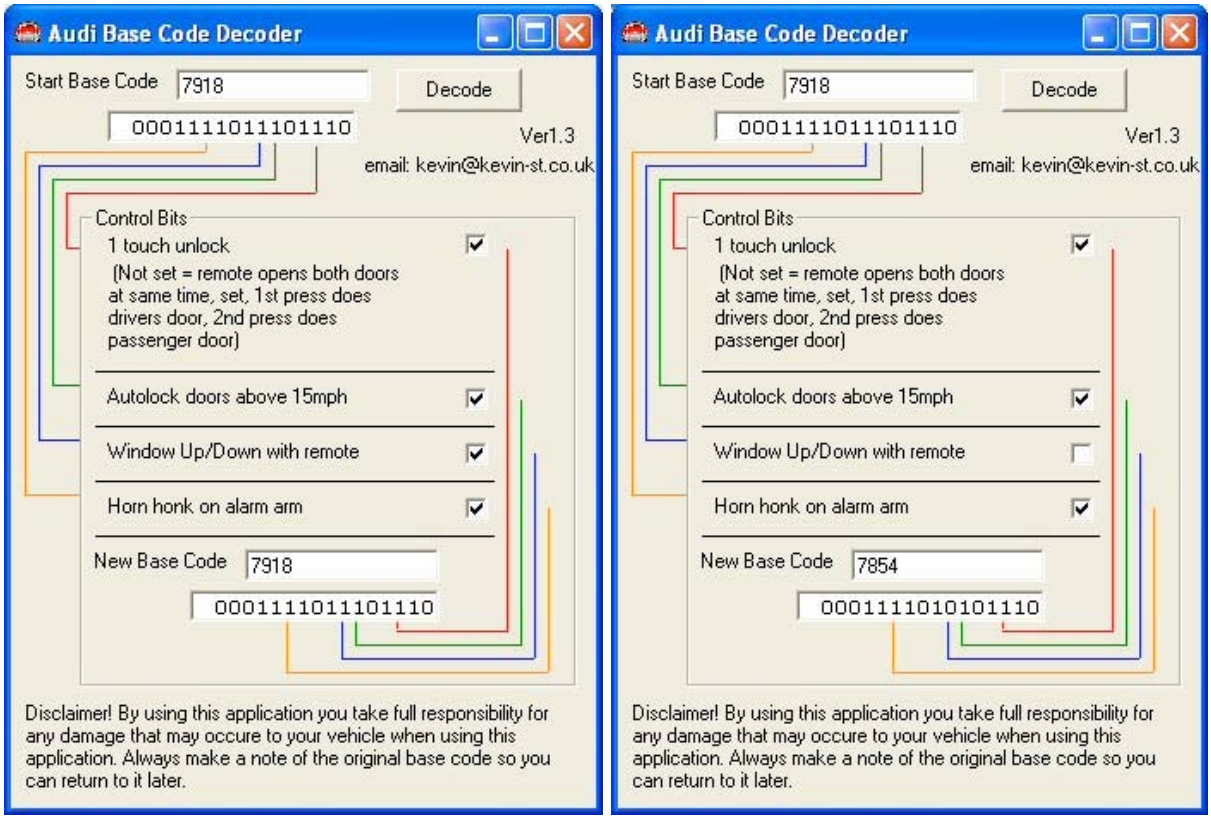
Why would you want these features:

- Opening the Windows when you have squeezed the remote in your pocket and are out of sight of the car can be avoided
- An anti car jacking feature to help ensure your door cant be opened at junctions and traffic lights
- The alarm may not arm depending on certain conditions, when you are used to the beep, this is more apparent usually a repeat unlocking and locking will arm the car properly and the beep is an additional confirmation for you.
- Another anti car jacking feature to only unlock the driver's door and avoid anyone jumping into the passenger seat whilst you are getting into the car.

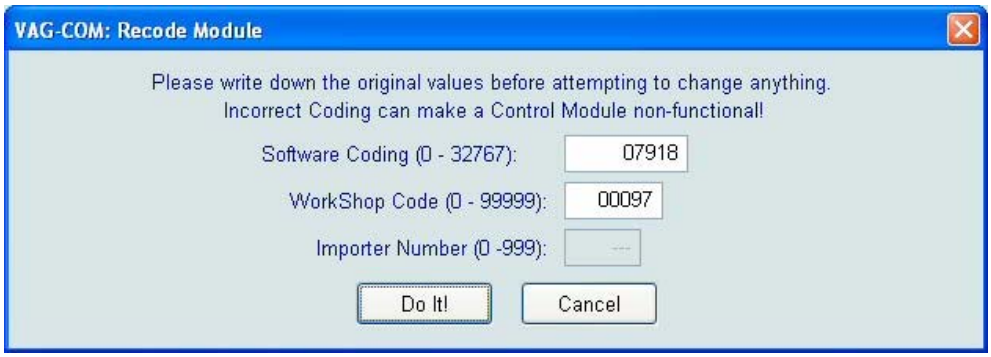
In "35" Central locking, the "Soft. Coding" field contains the information, 07918 in this case:

The software coding can simply be entered and decoded visually with a clever program called BaseCode, available on Kev's site.

To display the currently selected options, simply select or deselect the required settings and the New Base Code window will show the new value.



Select "07" Recode on Vagcom and the following window will be displayed



Replace the 07918 software coding with the new value (7854 example), leave the workshop code alone and click "Do It!".

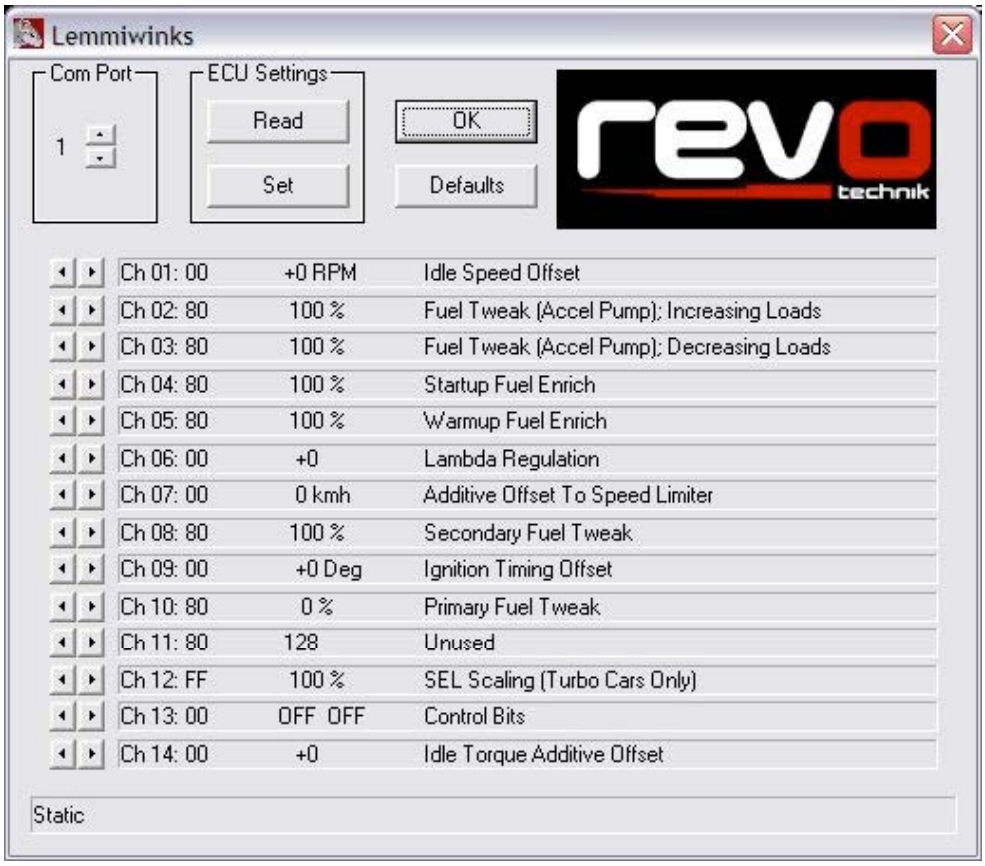
Exit VAG-COM, switch the ignition off and test the selected features.

For complete list of the encoding values, see section 4.12.

3.7 Lemmiwinks

The TT ECU has 14 adaptation channels - engine parameters - that can be tuned with VAG-COM. However, some of the channels are read-only, and for the rest the accepted value range is very limited. *Lemmiwinks* is a program that can tweak the channels without limitations.

WARNING! *You should not even consider using this software if you are not familiar with the engine management and VAG-COM data logging. Without verifying the results in VAG-COM you are most likely going to destroy your engine!*



Courtesy of 27psiBoom on VWvortex forum

3.7.1 How it works

Adaptation channels making minor tweaks to engine operating parameters (e.g. engine idle speed adjustment). These settings can be modified using the dealer's diagnostic equipment or VAG-COM.

These settings are stored in a serial eeprom which means the settings will not be lost if the ECU loses power. This is the same eeprom that stores data that can change from time to time like diagnostic trouble codes. This serial eeprom is different from the flash memory chip that stores the main engine control program, and therefore changes made to adaptation channels will not affect code checksums.

As an example, let us take a TT owner who is happy with the performance of his engine but would like to have his speed limiter raised. There is an adaptation channel that can be used to raise or lower the speed limiter setting, and if there were a way to change this adaptation channel then there would be no need for this owner to even buy a chip. He would be able to continue running with bone stock ECU programming with no worries about a dealership

detecting a chip (since there is no chip), and if he were particularly worried he would simply restore the default factory setting before bringing the car in for service.

So, he connects to his ECU with VAG-COM, goes to adaptation channel 7, and tries raising the speed limiter. But it doesn't work: the commands that request the setting of new adaptation channel values have built in limit checks and reject the new values. In this particular case, the speed limiter related adaptation channel is effectively disabled since the stock ECU programming limits the control range so that the only valid value is zero (i.e. no change).

So the issue boils down to this: is it possible to change these adaptation channels in such a manner that the original factory limits are bypassed? There are two possible approaches. First, one can make a chip with the preset adaptation channel limits extended to allow a larger adjustment range. Second, one can bypass the VAG adaptation channel routines and directly place the new adaptation channel settings into the ECU.

Changing the preset adaptation channel limits in a chip is the only option for VAG group diesel ECUs, Magneti Marelli ECUs, and older Bosch ECUs. These codes check the adaptation channel limits after the values have been read out of the serial eeprom. Motronic 7 ECUs do not do this check which opens up the second method.

Directly transferring the new adaptation channel values into the ECU works by finding the RAM memory location where the ECU stores the adaptation channel data and directly writing the changes to those RAM memory locations. When the ignition key is turned off the ECU enters a housekeeping mode where among other tasks the modified adaptation channel data is written into the serial eeprom. This roundabout method is required because memory writes directly to the serial eeprom are blocked.

Interestingly, this method will not work using the VAG mode protocol. Write access is allowed to any ECU RAM location except those locations that store the serial eeprom data. Someone at Bosch clearly knew about this vulnerability and took measures to close this loophole. But for some reason this loophole was left in the KWP2000 routines.

Each ECU code stores this adaptation channel data in different RAM locations. To make this method work with any ECU one runs through the following steps:

1) Establish communications with the ECU using KWP2000 mode;
2) Read data directly from serial eeprom (since read access is allowed);
3) Search for this data in the ECU's RAM;
4) Write the new adaptation channel settings to the RAM location;
5) Cycle ECU power (turn off ignition) to have ECU transfer the new settings into the serial eeprom.

The KWP2000 protocol is not as reliable as the VAG protocol. Some cars will have communications problems, which often can be worked around by pulling the instrument cluster fuse (make sure VAG-COM will be able to clear you air bag DTC light before doing this!).

Using the KWP2000 protocol gives one the ability to change settings in any VAG Motronic 7 ECU regardless of whether the ECU is stock or chipped.

3.7.2 How to use

1. Attach VAG-COM cable
2. Turn on ignition
3. Bring up Lemmiwinks software
4. To read the current settings from the ECU, click "Read"
5. Adjust settings at will
6. Click 'SET' to connect to the ECU and apply new settings
7. When asked to cycle ECU, simply turn off ignition, later turn on
8. To close the software, click ‘OK’
9. Enjoy

If you can't establish communication with the ECU, take off your Instrument Cluster fuse 11.

3.7.3 ECU Adaptation Channels

This lists all Bosch Motronic 7 adaptation channels with a typical factory VAG control range and the maximum possible control range if one were to directly write changes to the serial eeprom.

3.7.3.1 **Channel 1:** Additive Engine Idle Speed Offset

This channel adjusts the engine idle speed in steps of 10 rpm.

Base value:	760 rpm
VAG control range:	-50 rpm ... +50 rpm
Lemmiwinks control range:	-1280 rpm ... +1270 rpm

3.7.3.2 **Channel 2:** Fuel Enrichment on Increasing Loads

This channel adjusts a fuel enrichment term that is proportional to load rate of change. It acts to enrich fuel when the engine load is increasing. This is equivalent to an accelerator pump function.

VAG control range:	100% ... 110%
Lemmiwinks control range:	0% ... 200%

3.7.3.3 **Channel 3:** Fuel enrichment on Decreasing Loads

This is very similar in function to channel 2, but adjusts a term that works to increase fuel when engine load is decreasing. This is also equivalent to an accelerator pump function.

VAG control range:	90% ... 100%
Lemmiwinks control range:	0% ... 200%

3.7.3.4 **Channel 4:** Startup Fuel Enrichment

This adjusts the startup fuel enrichment term.

VAG control range:	100% ... 110%
Lemmiwinks control range:	0% ... 200%

3.7.3.5 **Channel 5:** Warmup Fuel Enrichment

This adjusts the warmup fuel enrichment term.

Presumably the ECU uses this setting when the temperature needle is showing below 90C, which roughly equals coolant temperatures below 82C.

VAG control range:	90% ... 100%
Lemmiwinks control range:	0% ... 200%

3.7.3.6 **Channel 6:** Lambda Regulation Cycle

This tweaks a lambda regulation system's oxygen sensor cycle time in steps of 10 milliseconds.

VAG control range:	-100ms ... +100ms
Lemmiwinks control range:	-1280ms ... +1270ms

3.7.3.7 **Channel 7:** Additive Offset on Speed Limiter

This adjusts the speed limiter in steps of 1 km/h.

Base balue:	250km/h or 155MPH
VAG control range:	none
Lemmiwinks control range:	-128km/h ... +127km/h

3.7.3.8 **Channel 8:** Secondary Fuel Tweak

This adjusts the fueling; *presumably* how fast the injectors react, by changing the pulse-width as a function of gross changes in the airflow. Higher values smooth out boost onset during part throttle. This parameter is useful if you are running uprated injectors.

This parameter does not have much effect on the fuel trims, at least in range 100%-120%. However, some people are reporting lower mpg with values over 130%.

VAG control range:	100% ... 110%
Lemmiwinks control range:	0% ... 200%

3.7.3.9 **Channel 9:** Ignition Timing Angle Offset

This allows shifting the ignition timing angle up or down in steps of 0.75 degrees. Negative values retard ignition, positive values advance.

Warning! This is the most dangerous parameter in Lemmiwinks. If adjusting at all, start carefully. Proceed with 0.75 steps, checking all relevant engine parameters with VAG-COM after every change.

VAG control range:	none
Lemmiwinks control range:	-96 deg ... +95.25 deg

3.7.3.10 **Channel 10:** Primary Fuel Term

This parameter adjusts the *multiplicative fuel trim*. Note that the ECU will compensate idle and part throttle for stoich, so this parameter only sets the starting point - the offset - for the trim (second field in Block 032). It is useful if the trim would otherwise be out of scale, causing CEL.

Note that this parameter allows tuning the fueling in steps of 0.125%. The ECU, on the other hand, can only adjust fueling in steps of 0.8%

VAG control range:	none
Lemmiwinks control range:	-25.0% ... +24.8%

3.7.3.11 **Channel 11:** Unused

Unused in the TT ECU.

VAG control range:	none
Lemmiwinks control range:	-128 ... +127

3.7.3.12 **Channel 12:** Specified Engine Load Scaling Factor

This factor allows one to scale the specified engine load.

The default value comes set at the maximum value, so specified engine loads can only be reduced with this adaptation channel.

VAG control range:	always 100% (no adjustment)
Lemmiwinks control range:	0% ... 100%

3.7.3.13 **Channel 13:** Control Bits

These control bits affect engine idle control. So far, no specific information is available.

VAG control range:	Limited to 2 control bits
Lemmiwinks control range:	All 8 control bits can be set or cleared

3.7.3.14 **Channel 14:** Additive Offset to Idle Torque

This channel allows one to raise the minimum torque maintained at idle.

VAG control range:	0 ... 31 (unknown units)
Lemmiwinks control range:	0 ... 255

4. LISTS AND TABLES

4.1 Codes for Common Parts

4.1.1 Fluids

Description	Option	Part.No.
Oil VW 503.01 (TT 225 variable service)	Motul	8100 X-lite 0W-30
	Motul	8100 E-tech 0W-40
	Castrol	Edge 0W-30
	Mobil	0W-40
Coolant anti-freeze	OE	G12
Brake fluid	OE	DOT 4
Haldex oil	OE	G052175A1
Washer fluid (for headlight aliens)	OE	D00510010

4.1.2 Body and Interior Parts

Description	Option	Part.No.
CC knob “Off’	OE	8N0 819 681C B98
CC knob “Fan”	OE	8N0 819 682C B98
Mirror switch	OE	8N0 959 565 01C
License plate light (left)	OE	8N0 943 021A
License plate light (right)	OE	8N0 943 022A
Mirror glass / left blind spot	OE	8NO 857 535 A
Mirror glass / right blind spot	OE	8NO 857 536 A
Honeycomb rear valance, Twin-tailpipe	OE	8N0 807 421F 3FZ
3 bar grill	OE	8N0 853 651 E
Battery cover bolt	OE	8N0 103 531

4.1.3 Electrics

Description	Option	Part.No.
Alarm siren	OE	8L0 951 605 A
Hazard switch / relay	OE	8N0 941 509 A
Cruise Control stalk	OE	1J0 953 513 01C

4.1.4 Running Gear

Description	Option	Part.No.
RSTT wheel	OE	8NO 601 025 S
RSTT wheel cap	OE	8NO 601 165 K1H7
ARB rear 16mm	OE	1J0 511 409J
ARB rear 19mm	OE	1J0 511 409K

4.1.5 BAM Engine

Description	Option	Part.No.
MAF (air mass meter)	OE	06A 906 461 M(X)
	Bosch	0 280 218 065
Coilpack (ignition coil)	OE / Latest	06B 905 115R
	OE / Reliable	J, L, M, R
Diverter valve	OE	06A 145 710 N
	Forge	DV007P
N75 valve	OE	058 906 283 F
MAP sensor	OE	038 906 051 (D)
IAT sensor	OE	058 905 379
Lambda sensor (pre-cat,rhd)	OE	06A 906 262 BE
Lambda sensor (post-cat)	OE	06A 906 262 BA / BB
Coolant temp sender (green)	OE	059 919 501 A
Engine speed sender	OE	078 906 433 B
Spark Plugs	OE	101 000 063 AA
	NGK	PFR6Q
Thermostat	OE / 87 - 102C	050 121 113 C
	OE / 82 – 102C	050 121 113 B
Thermostat seal	OE	038 121 119 B
Waterpump	OE	06A 121 012
Air filter	OE	1J0 129 620

4.2 Climate Control codes

Courtesy of Audiworld, jonas@TT-forum

The available CC codes are listed in the table below. The codes in grey are not verified; the information may not be correct for the TT.

Some of the code values can be adjusted by twisting the air blower speed knob. They are marked in the second column.

1		System malfunction - displayed as a Diagnostic Trouble Code (DTC), see section 4.2.1
2		Digital value of Interior Temperature Sensor G86, in Headliner
3		Digital value of Interior Temperature Sensor G56, in Instrument Panel
4		Digital value of Fresh Air Intake Duct Temperature Sensor G89
5		Digital value of Outside Air (Ambient) Temperature Sensor G17, front
6		Digital value of Outside Air (Ambient) Temperature Sensor
7		Digital value of Ambient Temperature Sensor At Fresh Air Blower G109
8		Delta value of Temperature Regulator Flap G92
9		Position of the Temperature Regulator Flap Motor Potentiometer G92
10	√	Requested position of the Temperature Regulator Flap G92 [0-255]
11		Position of the Central Flap Motor Potentiometer G112 [0-255]
12	√	Requested position of the Central Flap [0-255]
13		Position of the Footwell/Defroster Flap Motor Potentiometer G114 [0-255]
14	√	Requested position of the Footwell/Defroster Flap [0-255]
15		Position of the Air Flow Flap Motor Potentiometer G113 [0-255]
16	√	Requested position of the Air Flow Flap [0-255]
17		Vehicle Speed [km/h]
18		Actual Air Blower voltage [Volts]
19	√	Requested Fresh Air Blower voltage [Volts]
20		Termial 15 (system) voltage [Volts]
21		Number of low voltage occurrences, non-transient
22		Cycle condition of A/C Refrigerant High Pressure Switch F118
23		Cyclings of the A/C Refrigerant High Pressure Switch F118
24		Cyclings of the switches, absolute non-fluctuating
25		?
26		Analog/Digital value, Engine Coolant Temperature (ECT) Warning Light
27		Engine Speed [x10 RPM]
28		?
29		?
30		?
31		?
32		Feedback value, flap position, Temperature Regulator Flap G92
33		Feedback value, flap position, Central Flap G112
34		Feedback value, flap position, Footwell/Defroster Flap G114
35		Feedback value, flap position, Air Flow Map G113
36		Feedback value, cold end-stop, Temperature Regulator Flap G92
37		Feedback value, hot end-stop, Temperature Regulator Flap G92
38		Feedback value, cold end-stop, Central Flap G112
39		Feedback value, hot end-stop, Central Flap G112
40		Feedback value, cold end-stop, Footwell/Defroster Flap G114
41		Feedback value, hot end-stop, Footwell/Defroster Flap G114
42		Feedback value, cold end-stop, Air Flow Map G113
43		Feedback value, hot end-stop, Air Flow Map G113

44		Vehicle operation cycle counter
45		Calculated interior temperature (internal software, in digits)
46		Outside (ambient) temperature, filtered, for regulation (internal software)
47		Outside (ambient) temperature, unfiltered, (internal software, in deg C)
48		Display check (all segments of A/C Control Head display light up)
49		Engine Coolant Temperature (ECT) in deg C
50		Standing time (in minutes)
51		Engine Coolant Temperature (ECT), Smoothed in deg C
52		?
53		?
54	√	?
55		Outside (ambient) temperature, in deg C or deg F
56		Temperature in deg C, from Interior Temperature Sensor, in Headliner (G 86)
57		Temperature in deg C, from Interior Temperature Sensor, in Instrument Panel (G 56)
58		Temperature in deg C, from Fresh Air Intake Duct Temperature Sensor (G 89)
59		Temperature in deg C, from Outside Air (Ambient) Temperature Sensor (G 17)
60		Temperature in deg C, from Ambient Temperature Sensor At Fresh Air Blower (G 109)
61		?
62		?
63	√	?
64		?
65		?
66		?
67		?
68		?
69		?
70		?
71		?
72		?
73	√	?
74	√	?
75	√	?
76	√	?
77		?
78		?
79		?
80		?

4.2.1 1C - Diagnostic Trouble Codes

The trouble codes reported on Climate Control channel 1 (1C) are listed in the table below.

00.0	**No malfunction present**
02.1 (G86)	Interior Temperature Sensor, in Headliner, static open, digital default value of 128 is programmed if sensor fails
02.2	Interior Temperature Sensor, in Headliner, static short, see 02.1
02.3	Interior Temperature Sensor, in Headliner, sporadic open
02.4	Interior Temperature Sensor, in Headliner, sporadic short
03.1 (G56)	Interior Temperature Sensor, in Instrument Panel, static open, see 02.1
03.2	Interior Temperature Sensor, in Instrument Panel, static short, see 02.1
03.3	Interior Temperature Sensor, in Instrument Panel, sporadic open
03.4	Interior Temperature Sensor, in Instrument Panel, sporadic short
04.1 (G89)	Fresh Air Intake Duct Temperature Sensor, static open, value supplied by Temp. Sensor is used if sensor fails
04.2	Fresh Air Intake Duct Temperature Sensor, static short, see 04.1
04.3	Fresh Air Intake Duct Temperature Sensor, sporadic open
04.4	Fresh Air Intake Duct Temperature Sensor, sporadic short
05.1 (G17)	Outside Air (Ambient) Temperature Sensor, front, static open, value supplied by Temp. Sensor is used if sensor fails
05.2	Outside Air (Ambient) Temperature Sensor, front, static short, see 05.1; Digital default value of 128 is programmed if sensors G89 & G17 both fail
05.3	Outside Air (Ambient) Temperature Sensor, front, sporadic open
05.4	Outside Air (Ambient) Temperature Sensor, front, sporadic short
06.1 (G110)	Engine Coolant Temperature (ECT), A/C static open. Engine Coolant Temperature is calculated is sensor should fail or is not installed; diagnosis occurs only above 0 degrees Celsius
06.2	Engine Coolant Temperature (ECT), A/C static short, see 06.1
06.3	Engine Coolant Temperature (ECT), A/C sporadic open
06.4	Engine Coolant Temperature (ECT), A/C sporadic short
07.1 (G109)	Ambient Temperature Sensor at Fresh Air Blower, static open, Programmed corrective value = 0
07.2	Ambient Temperature Sensor at Fresh Air Blower, static short, see 07.1
07.3	Ambient Temperature Sensor at Fresh Air Blower, sporadic open
07.4	Ambient Temperature Sensor at Fresh Air Blower, sporadic short
08.1 (G92)	Temperature Regulator Flap Motor Potentiometer, static open, Temperature Regulator Flap Motor will no longer be controlled automatically; manual adjustment only
08.2	Temperature Regulator Flap Motor Potentiometer, static short, see 08.1
08.3	Temperature Regulator Flap Motor Potentiometer, sporadic open
08.4	Temperature Regulator Flap Motor Potentiometer, sporadic short
08.5	Temperature Regulator Flap, static block, Motor is cycled; software attempts to eliminate block
08.6	Temperature Regulator Flap Motor Potentiometer, malfunction
08.7	Temperature Regulator Flap, sporadic block
11.1 (G112)	Central Flap Motor Potentiometer, static open, Central Flap Motor will no longer be controlled automatically; manual adjustment only
11.2	Central Flap Motor Potentiometer, static short, see 11.1
11.3	Central Flap Motor Potentiometer, sporadic open
11.4	Central Flap Motor Potentiometer, sporadic short
11.5	Central Flap, static block; Motor is cycled; software attempts to eliminate block
11.6	Central Flap Motor Potentiometer, malfunction

11.7	Central Flap, sporadic block
13.1 (G114)	Footwell/Defroster Flap Motor Potentiometer, static open; Footwell/Defroster Flap Motor will no longer be controlled automatically; manual adjustment only
13.2	Footwell/Defroster Flap Motor Potentiometer, static short, see 13.1
13.3	Footwell/Defroster Flap Motor Potentiometer, sporadic open
13.4	Footwell/Defroster Flap Motor Potentiometer, sporadic short
13.5	Footwell/Defroster Flap, static block; Motor is cycled; software attempts to eliminate block
13.6	Footwell/Defroster Flap Motor Potentiometer, malfunction
13.7	Footwell/Defroster Flap, sporadic block
15.1 (G113)	Air Flow Flap Motor Potentiometer, static open; Digital value is internally programmed for limp-home mode
15.2	Air Flow Flap Motor Potentiometer, static short, see 15.1
15.3	Air Flow Flap Motor Potentiometer, sporadic open
15.4	Air Flow Flap Motor Potentiometer, sporadic short
15.5	Air Flow Flap, static block; Motor is cycled; software attempts to eliminate block
15.6	Air Flow Flap Motor Potentiometer, malfunction
15.7	Air Flow Flap, sporadic block
17	Vehicle Speed Signal faulty
18.1	Fresh air blower voltage, static
18.3	Fresh air blower voltage, sporadic
20.1	A/C compressor voltage not OK – static; Compressor remains off until voltage is greater than 10.8V for at least 25 seconds
20.3	A/C compressor voltage not OK – sporadic
22.1 (F118)	A/C Refrigerant High Pressure Switch, static open; Compressor remains off until switch closes
22.3	A/C Refrigerant High Pressure Switch, sporadic open
22.5	A/C Refrigerant High Pressure Switch, 120X open; Compressor re-engagement circuit, VAG 1551 Scan Tool function
29.1	Belt slip detection "soft", static
29.2	Belt slip detection "hard", static
29.3	Belt slip detection "soft", sporadic
29.4	Belt slip detection "hard", sporadic
49.3	?

4.3 Engine / ECU Measuring Blocks

4.3.1 Measuring Block 000

The measuring block 000 is different from the others in two ways. First, it contains ten fields instead of four. Second, the ecu does not provide any encoding information; all the values are pure decimal numbers without units. However, newer VAG-COM versions provide hints about the content of the fields.

Note. The conversion equations in the table are estimates.

Field	Description	Unit	Conversion
1	Coolant temperature	°C	x - 100
2	Engine load	%	3x / 4
3	Engine speed	RPM	10x
4	System voltage	V	18x / 255
5	Throttle opening	%	100x / 255
6	Idle torque	%	25x / 128 – 25
7	Torque loss adaptation	%	25x / 128 – 25
8	Mixture formation control value	%	25x / 32 – 100
9	Mixture adaptation; idle	%	25x / 128 – 25
10	Mixture adaptation; part load	%	25x / 64 – 50

4.3.2 General Information Blocks

001	RPM	Engine coolant temp	Lambda control value	Adjusting condition
	1/min	°C	%	

002	RPM	Load	Mean injection time	Air Mass Flow
	1/min	%	ms	g/s

003	RPM	Air Mass Flow	Throttle valve opening	Ignition timing (actual)
	1/min	g/s	%	°KW

004	RPM	Voltage	Coolant temperature	Intake air temperature
	1/min	V	°C	°C

005	RPM	Load	Speed	Operating condition
	1/min	%	km/h	Text
				Idle, partial load, full load, SA, BA

006	RPM	Load	Intake air temperature	Altitude correction
	1/min	%	°C	%

4.3.3 Ignition & Knock Control Blocks

003	RPM	Air Mass Flow	Throttle valve opening	Ignition timing (actual)
	1/min	g/s	%	°KW

010	RPM	Load	Throttle valve opening	Ignition timing (actual)
	1/min	%	%	°KW

011	RPM	Coolant temperature	Intake air temperature	Ignition timing (actual)
	1/min	°C	°C	°KW

020	Ignition angle retard Cyl#1	Ignition angle retard Cyl#2	Ignition angle retard Cyl#3	Ignition angle retard Cyl#4
	°KW	°KW	°KW	°KW

021	Ignition angle retard Cyl#5	Ignition angle retard Cyl#6	Ignition angle retard Cyl#7	Ignition angle retard Cyl#8
	°KW	°KW	°KW	°KW

022	RPM	Load	Ignition angle retard Cyl#1	Ignition angle retard Cyl#2
	1/min	%	°KW	°KW

023	RPM	Load	Ignition angle retard Cyl#3	Ignition angle retard Cyl#4
	1/min	%	°KW	°KW

024	RPM	Load	Ignition angle retard Cyl#5	Ignition angle retard Cyl#6
	1/min	%	°KW	°KW

026	Knock sensor volt Cyl#1	Knock sensor volt Cyl#2	Knock sensor volt Cyl#3	Knock sensor volt Cyl#4
	V	V	V	V

027	Knock sensor volt Cyl#5	Knock sensor volt Cyl#6	Knock sensor volt Cyl#7	Knock sensor volt Cyl#8
	V	V	V	V

4.3.4 Misfire Recognition Blocks

014	RPM	Last	Misfire counter	Misfire recognition
	1/min	%	N	Text
				Activated / locked

015	Counter Cyl#1	Counter Cyl#2	Counter Cyl#3	Misfire recognition
	N	N	N	Text
				Activated / locked

016	Counter Cyl#4	Counter Cyl#5	Counter Cyl#6	Misfire recognition
	N	N	N	Text
				Activated / locked

018	Lowest RPM limit misfire count	Highest RPM limit misfire count	Lowest Load	Highest Load
	N	N	%	%

4.3.5 EGT / Engine Cooling Blocks

004	RPM	Voltage	Coolant temperature	Intake air temperature
	1/min	V	°C	°C

011	RPM	Coolant temperature	Intake air temperature	Ignition timing (actual)
	1/min	°C	°C	°KW

034	RPM	EGT; CAT	Length period	Result
	1/min	°C	sec	

112	EGT; G235	Load	EGT Bank 2	?
	°C	%	°C	

4.3.6 Oxygen Sensor Blocks

001	RPM	Engine coolant temp	Lambda control value	Adjusting condition
	1/min	°C	%	

030	Lambda Sensor 1 Status	Lambda Sensor 2 Status	Bank 2, Sensor 1	Bank 2, Sensor 2
	XYZ	XYZ	XYZ	XYZ
	X = Sensor heater Y = Sensor ready Z = Control active			

031	Lambda; Actual value	Lambda; Requested		
	lambda	lambda		
	1.0 ~ 14.7 A/F	1.0 ~ 14.7 A/F		

032	Lambda Additive Learning Value	Lambda Multiplicative Learning Value	Bank 2, Additive Learning Value	Bank 2 Multiplicative Learning Value
	%	%	%	%
	-10% … 10%	-25% … 25%		

033	Lambda Control Value	Lambda Sensor 1 Voltage	Bank 2, Sensor 1 Lambda Control Value	Bank 2, Sensor 1 Voltage
	%	V	%	V
		1.5V ~ 1.0		

034	RPM	EGT; pre-CAT	Length period	Result
	1/min	°C	sec	

043	RPM	EGT; post-CAT	Sensor 2 voltage	Result
	1/min	°C	V	

4.3.7 Fuel Injection Blocks

101	RPM	Load	Average Injection Time	Air Mass Flow
	1/min	%	Ms	g/s

102	RPM	Coolant temperature	Intake air temperature	Average Injection time
	1/min	°C	°C	ms

110	RPM	Coolant temperature	Average Injection Time	Throttle valve opening
	1/min	°C	ms	%

4.3.8 Load Registration Blocks

101	RPM	Load	Average Injection Time	Air Mass Flow
	1/min	%	ms	g/s

113	RPM	Load	Throttle valve opening	Barometric pressure
	1/min	%	%	mbar

114	Specified Load	Specified Load	Actual Load	Wastegate N75 duty cycle
	%	%	%	%
	No correction	With correction		

120	RPM	Specified moment; ASR/FDR	Engine moment	Status; ASR
	1/min	Nm	Nm	Text
				ASR active / not

122	RPM	Specified moment; Transmission	Engine moment	Timing retard status
	1/min	Nm	Nm	Text
				ON/OFF

4.3.9 Boost Pressure Control Blocks

113	RPM	Load	Throttle valve angle	Barometric pressure
	1/min	%	%	mbar

114	Specified Load	Specified Load	Actual Load	Wastegate N75 duty cycle
	%	%	%	%
	No correction	With correction		

115	RPM	Load	Specified Boost pressure	Actual Boost pressure
	1/min	%	mbar	mbar

116	RPM	Correction factor; fuel	Correction factor; coolant temp	Correction factor; intake air temp
	1/min	%	%	%

117	RPM	Accelerator position	Throttle valve opening	Specified Boost pressure
	1/min	%	%	mbar

118	RPM	Intake air temp	Wastegate N75 duty cycle	Boost Pressure
	1/min	°C	%	mbar

119	RPM	Charge limit	Wastegate N75 duty cycle	Boost Pressure
	1/min	%	%	mbar

111	Boost pressure adaptation; RPM range 1	Boost pressure adaptation; RPM range 2	Boost pressure adaptation; RPM range 3	Boost pressure adaptation; RPM range 4

204	RPM	Manifold pressure	Specified Boost pressure	Actual Boost pressure
	1/min	mbar	mbar	mbar

4.3.10 Miscellaneous Blocks

204	RPM	Manifold Pressure	Specified Boost Pressure	Boost Pressure
	1/min	mbar	mbar	mbar

208	RPM	Throttle valve opening	Drive2 Opening	Boost Pressure
	1/min	%	%	mbar

209	RPM	Load	Ignition timing angle	
	1/min	%	°KW	

210	RPM	Load	Boost Pressure	Ignition Retard (CF)
	1/min	%	mbar	°KW

221	Throttle opening	Ignition timing angle	Coolant temperature	Intake temperature
	%	°KW	°C	°C

4.3.11 Quick Reference

Blocks / Functions	RPM	Load	Speed	Air flow	Injection time	Ignition timing	Coolant temp	Intake temp	EGT @manifold	EGT @O2-S1	EGT @O2-S2	Throttle opening	Barometric press.	Specified press.	Boost pressure	Manifold press.	N75 duty cycle	Lambda (A/F)	Lambda control	Voltage
001	X						X												X	
002	X	X		X	X															
003	X			X		X						X								
004	X						X	X												X
005	X	X	X																	
006	X	X						X												
008													X							
010	X	X				X						X								
011	X					X	X	X												
031																		X		
033																			X	
034	X									X										
043	X										X									
099	X																			
101	X	X		X	X															
102	X				X		X	X												
110	X				X		X					X								
112									X											
113	X	X											X							
114		X															X			
115	X	X												X	X					
116	X																			
117	X											X		X						
118	X							X							X		X			
119	X														X		X			
204	X													X	X	X				
209	X	X				X														
210	X	X													X					

4.4 Engine / ECU Adaptation Channels

Ch	Description	VAG range	Lemmiwinks range
1	Additive Engine Idle Speed (offset)	-50 … +50 RPM	-1280 … +1270 RPM
2	Fuel enrichment - Increasing loads	100 … 110%	0 ... 200 %
3	Fuel enrichment - Decreasing loads	90 … 100%	0 … 200 %
4	Startup Fuel Enrichment	100 … 110%	0 … 200 %
5	Warmup Fuel Enrichment	90 … 100%	0 … 200 %
6	Lambda Regulation	-100 … +100ms	-1280 … +1270 ms
7	Additive Offset on Speed Limiter	-	-128 … +127 km/h
8	Secondary Fuel Term	100 … 110%	0 … 200%
9	Additive Offset on Ignition Timing angle	-	-96 … 95.25°
10	Primary Fuel Term	-	-25.0 … 24.8%
11	Unused	-	-128 … 127
12	Specified Engine Load Scaling Factor	-	0% … 100%
13	Control Bits	2x ON/OFF	8x ON/OFF
14	Additive Offset To Idle Torque	0 … 31	0 … 255

4.5 Dashpod Measuring Blocks

001	Speed	RPM	Oil press. status	Time / Clock
		1/min		hh:mm

002	Mileage counter	Fuel Gauge	Fuel Tank Sender	Ambient Temp
		litres	ohms	°C

003	Coolant Temperature	Standing time	Dimmer; display	Dimmer; instruments
	°C	h	%	%

010	Adaptation Channel Nr	Adaptation; tank sender	Adaptation Channel Nr	Adaptation; mileage counter reset
	30	96 … 160	9	

011	Adaptation Channel Nr	Adaptation; language	Adaptation Channel Nr	Adaptation; econometer
				%
	4		3	85% … 115%

012	Adaptation Channel Nr	Mileage since service	Adaptation Channel Nr	Time since service
	40		41	

013	Adaptation Channel Nr	Minimum Mileage	Adaptation Channel Nr	Maximum Mileage
	42		43	

014	Adaptation Channel Nr	Max service time interval		
	44			

015	Adaptation Channel Nr	Adaptation; Oil grade	Adaptation Channel Nr	Total consumption
	45		46	

019			Adaptation Channel Nr	Radio/clock/lighting
			19	

050	Mileage counter	RPM	Oil temp	Coolant temp
	x10 miles	1/min	°C	°C

4.6 Dashpod Adaptation Channels

Channel	Description	Values
02	Reset “service due”	00000
03	Adjust mpg display	85% … 115%
04	Dash language	1 … 6
09	Enter mileage into *new dash*	Refer to service manual
19	Radio/clock/lighting configuration	See section 3.3
30	Adjust fuel gauge range	96 … 160 (-8.0l … +8.0l)
35	Engine speed threshold for oil press warning	Refer to service manual
40	Mileage since service	Refer to service manual
41	Days since service	Refer to service manual
42	Min mileage prior to service	Refer to service manual
43	Max mileage prior to service	Refer to service manual
44	Max time prior to service	Refer to service manual
45	Oil grade	Refer to service manual
46	Total consumption	Refer to service manual

4.7 HVAC Measuring Blocks

001	Compresor cutoff criteria	Clutch N25 voltage	Terminal 15 voltage	Standing time
		V	V	min
				(Ignition off time)

002	Temp flap; actual position	Temp flap; specified	Temp flap; heating stop	Temp flap; cooling pos
	0 … 255	0 … 255	0 … 255	0 … 255

003	Cantral flap; actual postion	Cantral flap; specified	Cantral flap; lower stop	Cantral flap; upper stop
	0 … 255	0 … 255	0 … 255	0 … 255

004	Footwell flap; actual position	Footwell flap; specified	Footwell flap; defroster stop	Footwell flap; footwell stop
	0 … 255	0 … 255	0 … 255	0 … 255

005	Recirc flap; actual postion	Recirc flap; specified	Recirc flap; recirc stop	Recirc flap; fresh air stop
	0 … 255	0 … 255	0 … 255	0 … 255

006	Ambient temp; calculated	Air intake duct temp G89	Ambient temp sensor G17	Sunlight penetration G107
	°C	°C	°C	%

007	?	Footwell vent temp G192	Dash panel temp G56	?
		°C	°C	°C

008	Air blower; specified volt	Air blower; actual volt	Display illumination	Switch illumination
	V	V	%	%

009	RPM	Speed	?	?
	1/min	km/h		

010	Coolan temp too high	AC compressor cut-in	AC pressure sender G65	Convertible roof status
	1 = “too high”	1 = “Closed”	0 = “pos signal”	1 = “roof open”

011	Fourth cutoff criterion	Third cutoff criterion	Second cutoff criterion	Latest cutoff criterion
	The latest 4 A/C compressor cutoff criteria			

4.8 Xenon Measuring Blocks

001	Supply voltage; terminal 15	Dipped beam; terminal 56b	Speed	
	V	V	km/h	

002	Front leveling sender	Rear leveling sender	Adaptation of servo motors	
	V	V		
	0.5 … 4.5V	0.5 … 4.5V	ADP OK / nOK	

4.9 Haldex Measuring Blocks

001	Brake light switch	Handbrake switch		

002	Power Supply	Clutch Oil temperature		
	V	°C		

125	ECU communication	ABS communication		
	0 = No communication; 1 = Communication OK			

4.10 ABS/ESP Measuring Blocks

001	Wheel speed; front left	Wheel speed; front right	Wheel speed; rear left	Wheel speed; rear right
	km/h	km/h	km/h	km/h

002	Starting speed; front left	Starting speed; front right	Starting speed; rear left	Starting speed; rear right

003	Brake light switch	Brake pressure switch F84		

004	Steering angle sender G85	Lateral accel sender G200	Yaw rate sender G202	
	°	m/s²	°/s	

005	Brake pressure switch G201	Brake pressure switch G214		
	bar	bar		

006	Longitudinal accel sender G251			
	m/s²			

125	ECU communication	Steering angle sender G85 communication	Haldex communication	
	0 = No communication; 1 = Communication OK			

4.11 Central Locking Measuring Blocks

001	Key switch; right	Locking switch; interior	Lock switch; right	Safety switch; right
	open / closed / not actuated	lock / unlock / not actuated	locked / unlocked	safe / not safe

002	Key switch; Left		Lock switch; left	Safety switch; left
	open / closed / not actuated		locked / unlocked	safe / not safe

003	Door switch; right	Door switch; left	Interior monitor switch	
	open / closed	open / closed	actuated / not actuated	

004	Fuel flap; release switch	Tailgate contact switch	Tailgate; release switch	
	actuated / not actuated	open /closed	actuated / not actuated	

005	Interior Light	Switch-off delay	Automatic open/close	Boot light
	on / off	on / off	open / closed / not actuated	on / off

006	Matched key slot	Remote command	Key slots	

007	Vehicle speed	Immobiliser	Ignition	S-contact
	km/h			
		on / off	on / off	actuated / not actuated

008	Encoding; Bits 13-15	Encoding; Bits 9-12	Encoding; Bits 5-8	Encoding; Bits 1-4
	See Central Locking Encoding in section 4.12			

009	Hood; release switch		Tonneau cover	Hardtop
	open /close / not actuated		recognised / not	recognised / not

010	Hood lock	Vacant switch	Stowed switch	Front switch
	locked / unlocked	vacant / engaged	rear / not actuated	front / not actuated

4.12 Central Locking Encoding Values

Bit	Value	Description
1	1	ATW LED 1Hz
2	2	Confirming ATW flashes
3	4	Security Central Locking (SCL); Unlock driver's door first
4	8	Anti-theft alarm (ATW) is activated
5	16	Semi-automatic convertible top control (roadster only)
6	32	Automatic locking above 20 km/h (15 mph)
7	64	Convenience function; Windows opening/closing via remote control
8	128	RHD
9	256	Alarm cycle sounder for ROW
10	512	Confirming remote locking (flashes 1x); Hazard warning lights flash once on locking via remote control
11	1024	Confirming ATW (remote locking) with horn honk
12	2048	Window lifter logic for USA
13	4096	Confirming remote opening (flashes 2x); Hazard warning lights flash twice on opening via remote control
14	8192	Not used; always 0
15	16384	Remote CL, mech. Security Cenral Locking (SCL)

4.13 Diagnostics Trouble Codes

DTC	P-code	Description
16394	P0010	-A- Camshaft Pos. Actuator Circ. Bank 1 Malfunction
16395	P0020	-A- Camshaft Pos. Actuator Circ. Bank 2 Malfunction
16449	P0065	Air Assisted Injector Control Range/Performance
16450	P0066	Air Assisted Injector Control Low Input/Short to ground
16451	P0067	Air Assisted Injector Control Input/Short to B+
16485	P0101	Mass or Volume Air Flow Circ Range/Performance
16486	P0102	Mass or Volume Air Flow Circ Low Input
16487	P0103	Mass or Volume Air Flow Circ High Input
16489	P0105	Manifold Abs.Pressure or Bar.Pressure Voltage supply
16490	P0106	Manifold Abs.Pressure or Bar.Pressure Range/Performance
16491	P0107	Manifold Abs.Pressure or Bar.Pressure Low Input
16492	P0108	Manifold Abs.Pressure or Bar.Pressure High Input
16496	P0112	Intake Air Temp.Circ Low Input
16497	P0113	Intake Air Temp.Circ High Input
16500	P0116	Engine Coolant Temp.Circ Range/Performance
16501	P0117	Engine Coolant Temp.Circ Low Input
16502	P0118	Engine Coolant Temp.Circ High Input
16504	P0120	Throttle/Pedal Pos.Sensor A Circ Malfunction
16505	P0121	Throttle/Pedal Pos.Sensor A Circ Range/Performance
16506	P0122	Throttle/Pedal Pos.Sensor A Circ Low Input
16507	P0123	Throttle/Pedal Pos.Sensor A Circ High Input
16509	P0125	Insufficient Coolant Temp.for Closed Loop Fuel Control
16512	P0128	Coolant Thermostat/Valve Temperature below control range
16514	P0130	O2 Sensor Circ.,Bank1-Sensor1 Malfunction
16515	P0131	O2 Sensor Circ.,Bank1-Sensor1 Low Voltage
16516	P0132	O2 Sensor Circ.,Bank1-Sensor1 High Voltage
16517	P0133	O2 Sensor Circ.,Bank1-Sensor1 Slow Response
16518	P0134	O2 Sensor Circ.,Bank1-Sensor1 No Activity Detected
16519	P0135	O2 Sensor Heater Circ.,Bank1-Sensor1 Malfunction
16520	P0136	O2 Sensor Circ.,Bank1-Sensor2 Malfunction
16521	P0137	O2 Sensor Circ.,Bank1-Sensor2 Low Voltage
16522	P0138	O2 Sensor Circ.,Bank1-Sensor2 High Voltage
16523	P0139	O2 Sensor Circ.,Bank1-Sensor2 Slow Response
16524	P0140	O2 Sensor Circ.,Bank1-Sensor2 No Activity Detected
16525	P0141	O2 Sensor Heater Circ.,Bank1-Sensor2 Malfunction
16534	P0150	O2 Sensor Circ.,Bank2-Sensor1 Malfunction
16535	P0151	O2 Sensor Circ.,Bank2-Sensor1 Low Voltage
16536	P0152	O2 Sensor Circ.,Bank2-Sensor1 High Voltage
16537	P0153	O2 Sensor Circ.,Bank2-Sensor1 Slow Response
16538	P0154	O2 Sensor Circ.,Bank2-Sensor1 No Activity Detected
16539	P0155	O2 Sensor Heater Circ.,Bank2-Sensor1 Malfunction
16540	P0156	O2 Sensor Circ.,Bank2-Sensor2 Malfunction

16541	P0157	O2 Sensor Circ.,Bank2-Sensor2 Low Voltage
16542	P0158	O2 Sensor Circ.,Bank2-Sensor2 High Voltage
16543	P0159	O2 Sensor Circ.,Bank2-Sensor2 Slow Response
16544	P0160	O2 Sensor Circ.,Bank2-Sensor2 No Activity Detected
16545	P0161	O2 Sensor Heater Circ.,Bank2-Sensor2 Malfunction
16554	P0170	Fuel Trim,Bank1 Malfunction
16555	P0171	Fuel Trim,Bank1 System too Lean
16556	P0172	Fuel Trim,Bank1 System too Rich
16557	P0173	Fuel Trim,Bank2 Malfunction
16558	P0174	Fuel Trim,Bank2 System too Lean
16559	P0175	Fuel Trim,Bank2 System too Rich
16566	P0182	Fuel temperature sender-G81 Short to ground
16567	P0183	Fuel temperature sender-G81 Interruption/Short to B+
16581	P0197	Engine Oil Temperature Circuit Low Input
16582	P0198	Engine Oil Temperature Circuit High Input
16585	P0201	Cyl.1, Injector Circuit Fault in electrical circuit
16586	P0202	Cyl.2, Injector Circuit Fault in electrical circuit
16587	P0203	Cyl.3, Injector Circuit Fault in electrical circuit
16588	P0204	Cyl.4, Injector Circuit Fault in electrical circuit
16589	P0205	Cyl.5 Injector Circuit Fault in electrical circuit
16590	P0206	Cyl.6 Injector Circuit Fault in electrical circuit
16591	P0207	Cyl.7 Injector Circuit Fault in electrical circuit
16592	P0208	Cyl.8 Injector Circuit Fault in electrical circuit
16599	P0215	Engine Shut-Off Solenoid Malfunction
16600	P0216	Injector/Injection Timing Control Malfunction
16603	P0219	Engine Overspeed Condition
16605	P0221	Throttle Pos. Sensor -B- Circuit Range/Performance
16606	P0222	Throttle Pos. Sensor -B- Circuit Low Input
16607	P0223	Throttle Pos. Sensor -B- Circuit High Input
16609	P0225	Throttle Pos. Sensor -C- Circuit Voltage supply
16610	P0226	Throttle Pos. Sensor -C- Circuit Range/Performance
16611	P0227	Throttle Pos. Sensor -C- Circuit Low Input
16612	P0228	Throttle Pos. Sensor -C- Circuit Hight Input
16614	P0230	Fuel Pump Primary Circuit Fault in electrical circuit
16618	P0234	Turbocharger Overboost Condition Control limit exceeded
16619	P0235	Turbocharger Boost Sensor (A) Circ Control limit not reached
16620	P0236	Turbocharger Boost Sensor (A) Circ Range/Performance
16621	P0237	Turbocharger Boost Sensor (A) Circ Low Input
16622	P0238	Turbocharger Boost Sensor (A) Circ High Input
16627	P0243	Turbocharger Wastegate Solenoid (A) Open/Short Circuit to Ground
16629	P0245	Turbocharger Wastegate Solenoid (A) Low Input/Short to ground
16630	P0246	Turbocharger Wastegate Solenoid (A) High Input/Short to B+
16636	P0252	Injection Pump Metering Control (A) Range/Performance
16645	P0261	Cyl.1 Injector Circuit Low Input/Short to ground
16646	P0262	Cyl.1 Injector Circuit High Input/Short to B+
16648	P0264	Cyl.2 Injector Circuit Low Input/Short to ground

16649	P0265	Cyl.2 Injector Circuit High Input/Short to B+
16651	P0267	Cyl.3 Injector Circuit Low Input/Short to ground
16652	P0268	Cyl.3 Injector Circuit High Input/Short to B+
16654	P0270	Cyl.4 Injector Circuit Low Input/Short to ground
16655	P0271	Cyl.4 Injector Circuit High Input/Short to B+
16657	P0273	Cyl.5 Injector Circuit Low Input/Short to ground
16658	P0274	Cyl.5 Injector Circuit High Input/Short to B+
16660	P0276	Cyl.6 Injector Circuit Low Input/Short to ground
16661	P0277	Cyl.6 Injector Circuit High Input/Short to B+
16663	P0279	Cyl.7 Injector Circuit Low Input/Short to ground
16664	P0280	Cyl.7 Injector Circuit High Input/Short to B+
16666	P0282	Cyl.8 Injector Circuit Low Input/Short to ground
16667	P0283	Cyl.8 Injector Circuit High Input/Short to B+
16684	P0300	Random/Multiple Cylinder Misfire Detected
16685	P0301	Cyl.1 Misfire Detected
16686	P0302	Cyl.2 Misfire Detected
16687	P0303	Cyl.3 Misfire Detected
16688	P0304	Cyl.4 Misfire Detected
16689	P0305	Cyl.5 Misfire Detected
16690	P0306	Cyl.6 Misfire Detected
16691	P0307	Cyl.7 Misfire Detected
16692	P0308	Cyl.8 Misfire Detected
16697	P0313	Misfire Detected Low Fuel Level
16698	P0314	Single Cylinder Misfire
16705	P0321	Ign./Distributor Eng.Speed Inp.Circ Range/Performance
16706	P0322	Ign./Distributor Eng.Speed Inp.Circ No Signal
16709	P0325	Knock Sensor 1 Circuit Electrical Fault in Circuit
16710	P0326	Knock Sensor 1 Circuit Range/Performance
16711	P0327	Knock Sensor 1 Circ Low Input
16712	P0328	Knock Sensor 1 Circ High Input
16716	P0332	Knock Sensor 2 Circ Low Input
16717	P0333	Knock Sensor 2 Circ High Input
16719	P0335	Crankshaft Pos. Sensor (A) Circ Malfunction
16720	P0336	Crankshaft Pos. Sensor (A) Circ Range/Performance/Missing tooth
16721	P0337	Crankshaft Pos.Sensor (A) Circ Low Input
16724	P0340	Camshaft Pos. Sensor (A) Circ Incorrect allocation
16725	P0341	Camshaft Pos.Sensor Circ Range/Performance
16726	P0342	Camshaft Pos.Sensor Circ Low Input
16727	P0343	Camshaft Pos.Sensor Circ High Input
16735	P0351	Ignition Coil (A) Cyl.1 Prim./Sec. Circ Malfunction
16736	P0352	Ignition Coil (B) Cyl.2 Prim./Sec. Circ Malfunction
16737	P0353	Ignition Coil (C) Cyl.3 Prim./Sec. Circ Malfunction
16738	P0354	Ignition Coil (D) Cyl.4 Prim./Sec. Circ Malfunction
16739	P0355	Ignition Coil (E) Cyl.5 Prim./Sec. Circ Malfunction
16740	P0356	Ignition Coil (F) Cyl.6 Prim./Sec. Circ Malfunction
16741	P0357	Ignition Coil (G) Cyl.7 Prim./Sec. Circ Malfunction

16742	P0358	Ignition Coil (H) Cyl.8 Prim./Sec. Circ Malfunction
16764	P0380	Glow Plug/Heater Circuit (A) Electrical Fault in Circuit
16784	P0400	Exhaust Gas Recirc.Flow Malfunction
16785	P0401	Exhaust Gas Recirc.Flow Insufficient Detected
16786	P0402	Exhaust Gas Recirc.Flow Excessive Detected
16787	P0403	Exhaust Gas Recirc. Contr. Circ Malfunction
16788	P0404	Exhaust Gas Recirc. Contr. Circ Range/Performance
16789	P0405	Exhaust Gas Recirc. Sensor (A) Circ Low Input
16790	P0406	Exhaust Gas Recirc. Sensor (A) Circ High Input
16791	P0407	Exhaust Gas Recirc. Sensor (B) Circ Low Input
16792	P0408	Exhaust Gas Recirc. Sensor (B) Circ High Input
16794	P0410	Sec.Air Inj.Sys Malfunction
16795	P0411	Sec.Air Inj.Sys. Incorrect Flow Detected
16796	P0412	Sec.Air Inj.Sys.Switching Valve A Circ Malfunction
16802	P0418	Sec. Air Inj. Sys. Relay (A) Contr. Circ Malfunction
16804	P0420	Catalyst System,Bank1 Efficiency Below Threshold
16806	P0422	Main Catalyst,Bank1 Below Threshold
16811	P0427	Catalyst Temperature Sensor, Bank 1 Low Input/Short to ground
16812	P0428	Catalyst Temperature Sensor, Bank 1 High Input/Open/Short Circuit to B+
16816	P0432	Main Catalyst,Bank2 Efficiency Below Threshold
16820	P0436	Catalyst Temperature Sensor, Bank 2 Range/Performance
16821	P0437	Catalyst Temperature Sensor, Bank 2 Low Input/Short to ground
16822	P0438	Catalyst Temperature Sensor, Bank 2 High Input/Open/Short Circuit to B+
16824	P0440	EVAP Emission Contr.Sys. Malfunction
16825	P0441	EVAP Emission Contr.Sys.Incorrect Purge Flow
16826	P0442	EVAP Emission Contr.Sys.(Small Leak) Leak Detected
16827	P0443	EVAP Emiss. Contr. Sys. Purge Valve Circ Electrical Fault in Circuit
16836	P0452	EVAP Emission Contr.Sys.Press.Sensor Low Input
16837	P0453	EVAP Emission Contr.Sys.Press.Sensor High Input
16839	P0455	EVAP Emission Contr.Sys.(Gross Leak) Leak Detected
16845	P0461	Fuel Level Sensor Circ Range/Performance
16846	P0462	Fuel Level Sensor Circuit Low Input
16847	P0463	Fuel Level Sensor Circuit High Input
16885	P0501	Vehicle Speed Sensor Range/Performance
16887	P0503	Vehicle Speed Sensor Intermittent/Erratic/High Input
16889	P0505	Idle Control System Malfunction
16890	P0506	Idle Control System RPM Lower than Expected
16891	P0507	Idle Control System Higher than Expected
16894	P0510	Closed Throttle Pos.Switch Malfunction
16915	P0531	A/C Refrigerant Pressure Sensor Circuit Range/Performance
16916	P0532	A/C Refrigerant Pressure Sensor Circuit Low Input
16917	P0533	A/C Refrigerant Pressure Sensor Circuit High Input
16935	P0551	Power Steering Pressure Sensor Circuit Range/Performance
16944	P0560	System Voltage Malfunction
16946	P0562	System Voltage Low Voltage
16947	P0563	System Voltage High Voltage

16952	P0568	Cruise Control Set Signal Incorrect Signal
16955	P0571	Cruise/Brake Switch (A) Circ Malfunction
16984	P0600	Serial Comm. Link (Data Bus) Message Missing
16985	P0601	Internal Contr.Module Memory Check Sum Error
16986	P0602	Control Module Programming Error/Malfunction
16987	P0603	Internal Contr.Module (KAM) Error
16988	P0604	Internal Contr.Module Random Access Memory (RAM) Error
16989	P0605	Internal Contr.Module ROM Test Error
16990	P0606	ECM/PCM Processor
17026	P0642	Knock Control Control Module Malfunction
17029	P0645	A/C Clutch Relay Control Circuit
17034	P0650	MIL Control Circuit Electrical Fault in Circuit
17038	P0654	Engine RPM Output Circuit Electrical Fault in Circuit
17040	P0656	Fuel Level Output Circuit Electrical Fault in Circuit
17084	P0700	Transm.Contr.System Malfunction
17086	P0702	Transm.Contr.System Electrical
17087	P0703	Torque Converter/Brake Switch B Circ Malfunction
17089	P0705	Transm.Range Sensor Circ.(PRNDL Inp.) Malfunction
17090	P0706	Transm.Range Sensor Circ Range/Performance
17091	P0707	Transm.Range Sensor Circ Low Input
17092	P0708	Transm.Range Sensor Circ High Input
17094	P0710	Transm.Fluid Temp.Sensor Circ. Malfunction
17095	P0711	Transm.Fluid Temp.Sensor Circ. Range/Performance
17096	P0712	Transm.Fluid Temp.Sensor Circ. Low Input
17097	P0713	Transm.Fluid Temp.Sensor Circ. High Input
17099	P0715	Input Turbine/Speed Sensor Circ. Malfunction
17100	P0716	Input Turbine/Speed Sensor Circ. Range/Performance
17101	P0717	Input Turbine/Speed Sensor Circ. No Signal
17105	P0721	Output Speed Sensor Circ Range/Performance
17106	P0722	Output Speed Sensor Circ No Signal
17109	P0725	Engine Speed Inp.Circ. Malfunction
17110	P0726	Engine Speed Inp.Circ. Range/Performance
17111	P0727	Engine Speed Inp.Circ. No Signal
17114	P0730	Gear Incorrect Ratio
17115	P0731	Gear 1 Incorrect Ratio
17116	P0732	Gear 2 Incorrect Ratio
17117	P0733	Gear 3 Incorrect Ratio
17118	P0734	Gear 4 Incorrect Ratio
17119	P0735	Gear 5 Incorrect Ratio
17124	P0740	Torque Converter Clutch Circ Malfunction
17125	P0741	Torque Converter Clutch Circ Performance or Stuck Off
17132	P0748	Pressure Contr.Solenoid Electrical
17134	P0750	Shift Solenoid A malfunction
17135	P0751	Shift Solenoid A Performance or Stuck Off
17136	P0752	Shift Solenoid A Stuck On
17137	P0753	Shift Solenoid A Electrical

17140	P0756	Shift Solenoid B Performance or Stuck Off
17141	P0757	Shift Solenoid B Stuck On
17142	P0758	Shift Solenoid B Electrical
17145	P0761	Shift Solenoid C Performance or Stuck Off
17146	P0762	Shift Solenoid C Stuck On
17147	P0763	Shift Solenoid C Electrical
17152	P0768	Shift Solenoid D Electrical
17157	P0773	Shift Solenoid E Electrical
17174	P0790	Normal/Performance Switch Circ Malfunction
17509	P1101	O2 Sensor Circ.,Bank1-Sensor1Voltage too Low/Air Leak
17510	P1102	O2 Sensor Heating Circ.,Bank1-Sensor1 Short to B+
17511	P1103	O2 Sensor Heating Circ.,Bank1-Sensor1 Output too Low
17512	P1104	Bank1-Sensor2 Voltage too Low/Air Leak
17513	P1105	O2 Sensor Heating Circ.,Bank1-Sensor2 Short to B+
17514	P1106	O2 Sensor Circ.,Bank2-Sensor1 Voltage too Low/Air Leak
17515	P1107	O2 Sensor Heating Circ.,Bank2-Sensor1 Short to B+
17516	P1108	O2 Sensor Heating Circ.,Bank2-Sensor1 Output too Low
17517	P1109	O2 Sensor Circ.,Bank2-Sensor2 Voltage too Low/Air Leak
17518	P1110	O2 Sensor Heating Circ.,Bank2-Sensor2 Short to B+
17519	P1111	O2 Control (Bank 1) System too lean
17520	P1112	O2 Control (Bank 1) System too rich
17521	P1113	Bank1-Sensor1 Internal Resistance too High
17522	P1114	Bank1-Sensor2 Internal Resistant too High
17523	P1115	O2 Sensor Heater Circ.,Bank1-Sensor1 Short to Ground
17524	P1116	O2 Sensor Heater Circ.,Bank1-Sensor1 Open
17525	P1117	O2 Sensor Heater Circ.,Bank1-Sensor2 Short to Ground
17526	P1118	O2 Sensor Heater Circ.,Bank1-Sensor2 Open
17527	P1119	O2 Sensor Heater Circ.,Bank2-Sensor1 Short to Ground
17528	P1120	O2 Sensor Heater Circ.,Bank2-Sensor1 Open
17529	P1121	O2 Sensor Heater Circ.,Bank2-Sensor2 Short to Ground
17530	P1122	O2 Sensor Heater Circ.,Bank2-Sensor2 Open
17531	P1123	Long Term Fuel Trim Add.Air.,Bank1 System too Rich
17532	P1124	Long Term Fuel Trim Add.Air.,Bank1 System too Lean
17533	P1125	Long Term Fuel Trim Add.Air.,Bank2 System too Rich
17534	P1126	Long Term Fuel Trim Add.Air.,Bank2 System too Lean
17535	P1127	Long Term Fuel Trim mult.,Bank1 System too Rich
17536	P1128	Long Term Fuel Trim mult.,Bank1 System too Lean
17537	P1129	Long Term Fuel Trim mult.,Bank2 System too Rich
17538	P1130	Long Term Fuel Trim mult.,Bank2 System too Lean
17539	P1131	Bank2-Sensor1 Internal Rsistance too High
17540	P1132	O2 Sensor Heating Circ.,Bank1+2-Sensor1 Short to B+
17541	P1133	O2 Sensor Heating Circ.,Bank1+2-Sensor1 Electrical Malfunction
17542	P1134	O2 Sensor Heating Circ.,Bank1+2-Sensor2 Short to B+
17543	P1135	O2 Sensor Heating Circ.,Bank1+2-Sensor2 Electrical Malfunction
17544	P1136	Long Term Fuel Trim Add.Fuel,Bank1 System too Lean
17545	P1137	Long Term Fuel Trim Add.Fuel,Bank1 System too Rich

17546	P1138	Long Term Fuel Trim Add.Fuel,Bank2 System too Lean
17547	P1139	Long Term Fuel Trim Add.Fuel,Bank2 System too Rich
17548	P1140	Bank2-Sensor2 Internal Resistance too High
17549	P1141	Load Calculation Cross Check Range/Performance
17550	P1142	Load Calculation Cross Check Lower Limit Exceeded
17551	P1143	Load Calculation Cross Check Upper Limit Exceeded
17552	P1144	Mass or Volume Air Flow Circ Open/Short to Ground
17553	P1145	Mass or Volume Air Flow Circ Short to B+
17554	P1146	Mass or Volume Air Flow Circ Supply Malfunction
17555	P1147	O2 Control (Bank 2) System too lean
17556	P1148	O2 Control (Bank 2) System too rich
17557	P1149	O2 Control (Bank 1) Out of range
17558	P1150	O2 Control (Bank 2) Out of range
17559	P1151	Bank1, Long Term Fuel Trim, Range 1 Leanness Lower Limit Exceeded
17560	P1152	Bank1, Long Term Fuel Trim, Range 2 Leanness Lower Limit Exceeded
17562	P1154	Manifold Switch Over Malfunction
17563	P1155	Manifold Abs.Pressure Sensor Circ. Short to B+
17564	P1156	Manifold Abs.Pressure Sensor Circ. Open/Short to Ground
17565	P1157	Manifold Abs.Pressure Sensor Circ. Power Supply Malfunction
17566	P1158	Manifold Abs.Pressure Sensor Circ. Range/Performance
17568	P1160	Manifold Temp.Sensor Circ. Short to Ground
17569	P1161	Manifold Temp.Sensor Circ. Open/Short to B+
17570	P1162	Fuel Temp.Sensor Circ. Short to Ground
17571	P1163	Fuel Temp.Sensor Circ. Open/Short to B+
17572	P1164	Fuel Temperature Sensor Range/Performance/Incorrect Signal
17573	P1165	Bank1, Long Term Fuel Trim, Range 1 Rich Limit Exceeded
17574	P1166	Bank1, Long Term Fuel Trim, Range 2 Rich Limit Exceeded
17579	P1171	Throttle Actuation Potentiometer Sign.2 Range/Performance
17580	P1172	Throttle Actuation Potentiometer Sign.2 Signal too Low
17581	P1173	Throttle Actuation Potentiometer Sign.2 Signal too High
17582	P1174	Fuel Trim, Bank 1 Different injection times
17584	P1176	O2 Correction Behind Catalyst,B1 Limit Attained
17585	P1177	O2 Correction Behind Catalyst,B2 Limit Attained
17586	P1178	Linear 02 Sensor / Pump Current Open Circuit
17587	P1179	Linear 02 Sensor / Pump Current Short to ground
17588	P1180	Linear 02 Sensor / Pump Current Short to B+
17589	P1181	Linear 02 Sensor / Reference Voltage Open Circuit
17590	P1182	Linear 02 Sensor / Reference Voltage Short to ground
17591	P1183	Linear 02 Sensor / Reference Voltage Short to B+
17592	P1184	Linear 02 Sensor / Common Ground Wire Open Circuit
17593	P1185	Linear 02 Sensor / Common Ground Wire Short to ground
17594	P1186	Linear 02 Sensor / Common Ground Wire Short to B+
17595	P1187	Linear 02 Sensor / Compens. Resistor Open Circuit
17596	P1188	Linear 02 Sensor / Compens. Resistor Short to ground
17597	P1189	Linear 02 Sensor / Compens. Resistor Short to B+
17598	P1190	Linear 02 Sensor / Reference Voltage Incorrect Signal

17604	P1196	O2 Sensor Heater Circ.,Bank1-Sensor1 Electrical Malfunction
17605	P1197	O2 Sensor Heater Circ.,Bank2-Sensor1 Electrical Malfunction
17606	P1198	O2 Sensor Heater Circ.,Bank1-Sensor2 Electrical Malfunction
17607	P1199	O2 Sensor Heater Circ.,Bank2-Sensor2 Electrical Malfunction
17609	P1201	Cyl.1-Fuel Inj.Circ. Electrical Malfunction
17610	P1202	Cyl.2-Fuel Inj.Circ. Electrical Malfunction
17611	P1203	Cyl.3-Fuel Inj.Circ. Electrical Malfunction
17612	P1204	Cyl.4-Fuel Inj.Circ. Electrical Malfunction
17613	P1205	Cyl.5-Fuel Inj.Circ. Electrical Malfunction
17614	P1206	Cyl.6-Fuel Inj.Circ. Electrical Malfunction
17615	P1207	Cyl.7-Fuel Inj.Circ. Electrical Malfunction
17616	P1208	Cyl.8-Fuel Inj.Circ. Electrical Malfunction
17617	P1209	Intake valves for cylinder shut-off Short circuit to ground
17618	P1210	Intake valves for cylinder shut-off Short to B+
17619	P1211	Intake valves for cylinder shut-off Open circuit
17621	P1213	Cyl.1-Fuel Inj.Circ. Short to B+
17622	P1214	Cyl.2-Fuel Inj.Circ. Short to B+
17623	P1215	Cyl.3-Fuel Inj.Circ. Short to B+
17624	P1216	Cyl.4-Fuel Inj.Circ. Short to B+
17625	P1217	Cyl.5-Fuel Inj.Circ. Short to B+
17626	P1218	Cyl.6-Fuel Inj.Circ. Short to B+
17627	P1219	Cyl.7-Fuel Inj.Circ. Short to B+
17628	P1220	Cyl.8-Fuel Inj.Circ. Short to B+
17629	P1221	Cylinder shut-off exhaust valves Short circuit to ground
17630	P1222	Cylinder shut-off exhaust valves Short to B+
17631	P1223	Cylinder shut-off exhaust valves Open circuit
17633	P1225	Cyl.1-Fuel Inj.Circ. Short to Ground
17634	P1226	Cyl.2-Fuel Inj.Circ. Short to Ground
17635	P1227	Cyl.3-Fuel Inj.Circ. Short to Ground
17636	P1228	Cyl.4-Fuel Inj.Circ. Short to Ground
17637	P1229	Cyl.5-Fuel Inj.Circ. Short to Ground
17638	P1230	Cyl.6-Fuel Inj.Circ. Short to Ground
17639	P1231	Cyl.7-Fuel Inj.Circ. Short to Ground
17640	P1232	Cyl.8-Fuel Inj.Circ. Short to Ground
17645	P1237	Cyl.1-Fuel Inj.Circ. Open Circ.
17646	P1238	Cyl.2-Fuel Inj.Circ. Open Circ.
17647	P1239	Cyl.3-Fuel Inj.Circ. Open Circ.
17648	P1240	Cyl.4-Fuel Inj.Circ. Open Circ.
17649	P1241	Cyl.5-Fuel Inj.Circ. Open Circ.
17650	P1242	Cyl.6-Fuel Inj.Circ. Open Circ.
17651	P1243	Cyl.7-Fuel Inj.Circ. Open Circ.
17652	P1244	Cyl.8-Fuel Inj.Circ. Open Circ.
17653	P1245	Needle Lift Sensor Circ. Short to Ground
17654	P1246	Needle Lift Sensor Circ. Range/Performance
17655	P1247	Needle Lift Sensor Circ. Open/Short to B+
17656	P1248	Injection Start Control Deviation

17657	P1249	Fuel consumption signal Electrical Fault in Circuit
17658	P1250	Fuel Level Too Low
17659	P1251	Start of Injection Solenoid Circ Short to B+
17660	P1252	Start of Injection Solenoid Circ Open/Short to Ground
17661	P1253	Fuel consumption signal Short to ground
17662	P1254	Fuel consumption signal Short to B+
17663	P1255	Engine Coolant Temp.Circ Short to Ground
17664	P1256	Engine Coolant Temp.Circ Open/Short to B+
17665	P1257	Engine Coolant System Valve Open
17666	P1258	Engine Coolant System Valve Short to B+
17667	P1259	Engine Coolant System Valve Short to Ground
17688	P1280	Fuel Inj.Air Contr.Valve Circ. Flow too Low
17691	P1283	Fuel Inj.Air Contr.Valve Circ. Electrical Malfunction
17692	P1284	Fuel Inj.Air Contr.Valve Circ. Open
17693	P1285	Fuel Inj.Air Contr.Valve Circ. Short to Ground
17694	P1286	Fuel Inj.Air Contr.Valve Circ. Short to B+
17695	P1287	Turbocharger bypass valve open
17696	P1288	Turbocharger bypass valve short to B+
17697	P1289	Turbocharger bypass valve short to ground
17704	P1296	Cooling system malfunction
17705	P1297	Connection turbocharger - throttle valve pressure hose
17708	P1300	Misfire detected Reason: Fuel level too low
17721	P1319	Knock Sensor 1 Circ. Short to Ground
17728	P1320	Knock Sensor 2 Circ. Short to Ground
17729	P1321	Knock Sensor 3 Circ. Low Input
17730	P1322	Knock Sensor 3 Circ. High Input
17731	P1323	Knock Sensor 4 Circ. Low Input
17732	P1324	Knock Sensor 4 Circ. High Input
17733	P1325	Cyl.1-Knock Contr. Limit Attained
17734	P1326	Cyl.2-Knock Contr. Limit Attained
17735	P1327	Cyl.3-Knock Contr. Limit Attained
17736	P1328	Cyl.4-Knock Contr. Limit Attained
17737	P1329	Cyl.5-Knock Contr. Limit Attained
17738	P1330	Cyl.6-Knock Contr. Limit Attained
17739	P1331	Cyl.7-Knock Contr. Limit Attained
17740	P1332	Cyl.8-Knock Contr. Limit Attained
17743	P1335	Engine Torque Monitoring 2 Control Limint Exceeded
17744	P1336	Engine Torque Monitoring Adaptation at limit
17745	P1337	Camshaft Pos.Sensor,Bank1 Short to Ground
17746	P1338	Camshaft Pos.Sensor,Bank1 Open Circ./Short to B+
17747	P1339	Crankshaft Pos./Engine Speed Sensor Cross Connected
17748	P1340	Crankshaft-/Camshaft Pos.Sens.Signals Out of Sequence
17749	P1341	Ignition Coil Power Output Stage 1 Short to Ground
17750	P1342	Ignition Coil Power Output Stage 1 Short to B+
17751	P1343	Ignition Coil Power Output Stage 2 Short to Ground
17752	P1344	Ignition Coil Power Output Stage 2 Short to B+

17753	P1345	Ignition Coil Power Output Stage 3 Short to Ground
17754	P1346	Ignition Coil Power Output Stage 3 Short to B+
17755	P1347	Bank2,Crankshaft-/Camshaft os.Sens.Sign. Out of Sequence
17756	P1348	Ignition Coil Power Output Stage 1 Open Circuit
17757	P1349	Ignition Coil Power Output Stage 2 Open Circuit
17758	P1350	Ignition Coil Power Output Stage 3 Open Circuit
17762	P1354	Modulation Piston Displ.Sensor Circ. Malfunction
17763	P1355	Cyl. 1, ignition circuit Open Circuit
17764	P1356	Cyl. 1, ignition circuit Short to B+
17765	P1357	Cyl. 1, ignition circuit Short to ground
17766	P1358	Cyl. 2, ignition circuit Open Circuit
17767	P1359	Cyl. 2, ignition circuit Short Circuit to B+
17768	P1360	Cyl. 2, ignition circuit Short Circuit to Ground
17769	P1361	Cyl. 3, ignition circuit Open Circuit
17770	P1362	Cyl. 3, ignition circuit Short Circuit to B+
17771	P1363	Cyl. 3, ignition circuit Short Circuit to ground
17772	P1364	Cyl. 4 ignition circuit Open Circuit
17773	P1365	Cyl. 4 ignition circuit Short circuit to B+
17774	P1366	Cyl. 4 ignition circuit Short circuit to ground
17775	P1367	Cyl. 5, ignition circuit Open Circuit
17776	P1368	Cyl. 5, ignition circuit Short Circuit to B+
17777	P1369	Cyl. 5, ignition circuit short to ground
17778	P1370	Cyl. 6, ignition circuit Open Circuit
17779	P1371	Cyl. 6, ignition circuit Short Circuit to B+
17780	P1372	Cyl. 6, ignition circuit short to ground
17781	P1373	Cyl. 7, ignition circuit Open Circuit
17782	P1374	Cyl. 7, ignition circuit Short Circuit to B+
17783	P1375	Cyl. 7, ignition circuit short to ground
17784	P1376	Cyl. 8, ignition circuit Open Circuit
17785	P1377	Cyl. 8, ignition circuit Short Circuit to B+
17786	P1378	Cyl. 8, ignition circuit short to ground
17794	P1386	Internal Control Module Knock Control Circ.Error
17795	P1387	Internal Contr. Module altitude sensor error
17796	P1388	Internal Contr. Module drive by wire error
17799	P1391	Camshaft Pos.Sensor,Bank2 Short to Ground
17800	P1392	Camshaft Pos.Sensor,Bank2 Open Circ./Short to B+
17801	P1393	Ignition Coil Power Output Stage 1 Electrical Malfunction
17802	P1394	Ignition Coil Power Output Stage 2 Electrical Malfunction
17803	P1395	Ignition Coil Power Output Stage 3 Electrical Malfunction
17804	P1396	Engine Speed Sensor Missing Tooth
17805	P1397	Engine speed wheel Adaptation limit reached
17806	P1398	Engine RPM signal, TD Short to ground
17807	P1399	Engine RPM signal, TD Short Circuit to B+
17808	P1400	EGR Valve Circ Electrical Malfunction
17809	P1401	EGR Valve Circ Short to Ground
17810	P1402	EGR Valve Circ Short to B+

17811	P1403	EGR Flow Deviation
17812	P1404	EGR Flow Basic Setting not carried out
17814	P1406	EGR Temp.Sensor Range/Performance
17815	P1407	EGR Temp.Sensor Signal too Low
17816	P1408	EGR Temp.Sensor Signal too High
17817	P1409	Tank Ventilation Valve Circ. Electrical Malfunction
17818	P1410	Tank Ventilation Valve Circ. Short to B+
17819	P1411	Sec.Air Inj.Sys.,Bank2 Flow too Flow
17820	P1412	EGR Different.Pressure Sensor Signal too Low
17821	P1413	EGR Different.Pressure Sensor Signal too High
17822	P1414	Sec.Air Inj.Sys.,Bank2 Leak Detected
17825	P1417	Fuel Level Sensor Circ Signal too Low
17826	P1418	Fuel Level Sensor Circ Signal too High
17828	P1420	Sec.Air Inj.Valve Circ Electrical Malfunction
17829	P1421	Sec.Air Inj.Valve Circ Short to Ground
17830	P1422	Sec.Air Inj.Sys.Contr.Valve Circ Short to B+
17831	P1423	Sec.Air Inj.Sys.,Bank1 Flow too Low
17832	P1424	Sec.Air Inj.Sys.,Bank1 Leak Detected
17833	P1425	Tank Vent.Valve Short to Ground
17834	P1426	Tank Vent.Valve Open
17840	P1432	Sec.Air Inj.Valve Open
17841	P1433	Sec.Air Inj.Sys.Pump Relay Circ. open
17842	P1434	Sec.Air Inj.Sys.Pump Relay Circ. Short to B+
17843	P1435	Sec.Air Inj.Sys.Pump Relay Circ. Short to ground
17844	P1436	Sec.Air Inj.Sys.Pump Relay Circ. Electrical Malfunction
17847	P1439	EGR Potentiometer Error in Basic Seting
17848	P1440	EGR Valve Power Stage Open
17849	P1441	EGR Valve Circ Open/Short to Ground
17850	P1442	EGR Valve Position Sensor Signal too high
17851	P1443	EGR Valve Position Sensor Signal too low
17852	P1444	EGR Valve Position Sensor range/performance
17853	P1445	Catalyst Temp.Sensor 2 Circ. Range/Performance
17854	P1446	Catalyst Temp.Circ Short to Ground
17855	P1447	Catalyst Temp.Circ Open/Short to B+
17856	P1448	Catalyst Temp.Sensor 2 Circ. Short to Ground
17857	P1449	Catalyst Temp.Sensor 2 Circ. Open/Short to B+
17858	P1450	Sec.Air Inj.Sys.Circ Short to B+
17859	P1451	Sec.Air Inj.Sys.Circ Short to Ground
17860	P1452	Sec.Air Inj.Sys. Open Circ.
17861	P1453	Exhaust gas temperature sensor 1 open/short to B+
17862	P1454	Exhaust gas temperature sensor short 1 to ground
17863	P1455	Exhaust gas temperature sensor 1 range/performance
17864	P1456	Exhaust gas temperature control bank 1 limit attained
17865	P1457	Exhaust gas temperature sensor 2 open/short to B+
17866	P1458	Exhaust gas temperature sensor 2 short to ground
17867	P1459	Exhaust gas temperature sensor 2 range/performance

17868	P1460	Exhaust gas temperature control bank 2 limit attained
17869	P1461	Exhaust gas temperature control bank 1 Range/Performance
17870	P1462	Exhaust gas temperature control bank 2 Range/Performance
17873	P1465	Additive Pump Short Circuit to B+
17874	P1466	Additive Pump Open/Short to Ground
17875	P1467	EVAP Canister Purge Solenoid Valve Short Circuit to B+
17876	P1468	EVAP Canister Purge Solenoid Valve Short Circuit to Ground
17877	P1469	EVAP Canister Purge Solenoid Valve Open Circuit
17878	P1470	EVAP Emission Contr.LDP Circ Electrical Malfunction
17879	P1471	EVAP Emission Contr.LDP Circ Short to B+
17880	P1472	EVAP Emission Contr.LDP Circ Short to Ground
17881	P1473	EVAP Emission Contr.LDP Circ Open Circ.
17882	P1474	EVAP Canister Purge Solenoid Valve electrical malfunction
17883	P1475	EVAP Emission Contr.LDP Circ Malfunction/Signal Circ.Open
17884	P1476	EVAP Emission Contr.LDP Circ Malfunction/Insufficient Vacuum
17885	P1477	EVAP Emission Contr.LDP Circ Malfunction
17886	P1478	EVAP Emission Contr.LDP Circ Clamped Tube Detected
17908	P1500	Fuel Pump Relay Circ. Electrical Malfunction
17909	P1501	Fuel Pump Relay Circ. Short to Ground
17910	P1502	Fuel Pump Relay Circ. Short to B+
17911	P1503	Load signal from Alternator Term. DF Range/performance/Incorrect Signal
17912	P1504	Intake Air Sys.Bypass Leak Detected
17913	P1505	Closed Throttle Pos. Does Not Close/Open Circ
17914	P1506	Closed Throttle Pos.Switch Does Not Open/Short to Ground
17915	P1507	Idle Sys.Learned Value Lower Limit Attained
17916	P1508	Idle Sys.Learned Value Upper Limit Attained
17917	P1509	Idle Air Control Circ. Electrical Malfunction
17918	P1510	Idle Air Control Circ. Short to B+
17919	P1511	Intake Manifold Changeover Valve circuit electrical malfunction
17920	P1512	Intake Manifold Changeover Valve circuit Short to B+
17921	P1513	Intake Manifold Changeover Valve2 circuit Short to B+
17922	P1514	Intake Manifold Changeover Valve2 circuit Short to ground
17923	P1515	Intake Manifold Changeover Valve circuit Short to Ground
17924	P1516	Intake Manifold Changeover Valve circuit Open
17925	P1517	Main Relay Circ. Electrical Malfunction
17926	P1518	Main Relay Circ. Short to B+
17927	P1519	Intake Camshaft Contr.,Bank1 Malfunction
17928	P1520	Intake Manifold Changeover Valve2 circuit Open
17929	P1521	Intake Manifold Changeover Valve2 circuit electrical malfunction
17930	P1522	Intake Camshaft Contr.,Bank2 Malfunction
17931	P1523	Crash Signal from Airbag Control Unit range/performance
17933	P1525	Intake Camshaft Contr.Circ.,Bank1 Electrical Malfunction
17934	P1526	Intake Camshaft Contr.Circ.,Bank1 Short to B+
17935	P1527	Intake Camshaft Contr.Circ.,Bank1 Short to Ground
17936	P1528	Intake Camshaft Contr.Circ.,Bank1 Open
17937	P1529	Camshaft Control Circuit Short to B+

17938	P1530	Camshaft Control Circuit Short to ground
17939	P1531	Camshaft Control Circuit open
17941	P1533	Intake Camshaft Contr.Circ.,Bank2 Electrical Malfunction
17942	P1534	Intake Camshaft Contr.Circ.,Bank2 Short to B+
17943	P1535	Intake Camshaft Contr.Circ.,Bank2 Short to Ground
17944	P1536	Intake Camshaft Contr.Circ.,Bank2 Open
17945	P1537	Engine Shutoff Solenoid Malfunction
17946	P1538	Engine Shutoff Solenoid Open/Short to Ground
17947	P1539	Clutch Vacuum Vent Valve Switch Incorrect signal
17948	P1540	Vehicle Speed Sensor High Input
17949	P1541	Fuel Pump Relay Circ Open
17950	P1542	Throttle Actuation Potentiometer Range/Performance
17951	P1543	Throttle Actuation Potentiometer Signal too Low
17952	P1544	Throttle Actuation Potentiometer Signal too High
17953	P1545	Throttle Pos.Contr Malfunction
17954	P1546	Boost Pressure Contr.Valve Short to B+
17955	P1547	Boost Pressure Contr.Valve Short to Ground
17956	P1548	Boost Pressure Contr.Valve Open
17957	P1549	Boost Pressure Contr.Valve Short to Ground
17958	P1550	Charge Pressure Deviation
17959	P1551	Barometric Pressure Sensor Circ. Short to B+
17960	P1552	Barometric Pressure Sensor Circ. Open/Short to Ground
17961	P1553	Barometric/manifold pressure signal ratio out of range
17962	P1554	Idle Speed Contr.Throttle Pos. Basic Setting Conditions not met
17963	P1555	Charge Pressure Upper Limit exceeded
17964	P1556	Charge Pressure Contr. Negative Deviation
17965	P1557	Charge Pressure Contr. Positive Deviation
17966	P1558	Throttle Actuator Electrical Malfunction
17967	P1559	Idle Speed Contr.Throttle Pos. Adaptation Malfunction
17968	P1560	Maximum Engine Speed Exceeded
17969	P1561	Quantity Adjuster Deviation
17970	P1562	Quantity Adjuster Upper Limit Attained
17971	P1563	Quantity Adjuster Lower Limit Attained
17972	P1564	Idle Speed Contr.Throttle Pos. Low Voltage During Adaptation
17973	P1565	Idle Speed Control Throttle Position lower limit not attained
17974	P1566	Load signal from A/C compressor range/performance
17975	P1567	Load signal from A/C compressor no signal
17976	P1568	Idle Speed Contr.Throttle Pos. mechanical Malfunction
17977	P1569	Cruise control switch Incorrect signal
17978	P1570	Contr.Module Locked
17979	P1571	Left Eng. Mount Solenoid Valve Short to B+
17980	P1572	Left Eng. Mount Solenoid Valve Short to ground
17981	P1573	Left Eng. Mount Solenoid Valve Open circuit
17982	P1574	Left Eng. Mount Solenoid Valve Electrical fault in circuit
17983	P1575	Right Eng. Mount Solenoid Valve Short to B+
17984	P1576	Right Eng. Mount Solenoid Valve Short to ground

17985	P1577	Right Eng. Mount Solenoid Valve Open circuit
17986	P1578	Right Eng. Mount Solenoid Valve Electrical fault in circuit
17987	P1579	Idle Speed Contr.Throttle Pos. Adaptation not started
17988	P1580	Throttle Actuator B1 Malfunction
17989	P1581	Idle Speed Contr.Throttle Pos. Basic Setting Not Carried Out
17990	P1582	Idle Adaptation at Limit
17991	P1583	Transmission mount valves Short to B+
17992	P1584	Transmission mount valves Short to ground
17993	P1585	Transmission mount valves Open circuit
17994	P1586	Engine mount solenoid valves Short to B+
17995	P1587	Engine mount solenoid valves Short to ground
17996	P1588	Engine mount solenoid valves Open circuit
18008	P1600	Power Supply (B+) Terminal 15 Low Voltage
18010	P1602	Power Supply (B+) Terminal 30 Low Voltage
18011	P1603	Internal Control Module Malfunction
18012	P1604	Internal Control Module Driver Error
18013	P1605	Rough Road/Acceleration Sensor Electrical Malfunction
18014	P1606	Rough Road Spec Engine Torque ABS-ECU Electrical Malfunction
18015	P1607	Vehicle speed signal Error message from instrument cluster
18016	P1608	Steering angle signal Error message from steering angle sensor
18017	P1609	Crash shut-down activated
18019	P1611	MIL Call-up Circ./Transm.Contr.Module Short to Ground
18020	P1612	Electronic Control Module Incorrect Coding
18021	P1613	MIL Call-up Circ Open/Short to B+
18022	P1614	MIL Call-up Circ./Transm.Contr.Module Range/Performance
18023	P1615	Engine Oil Temperature Sensor Circuit range/performance
18024	P1616	Glow Plug/Heater Indicator Circ. Short to B+
18025	P1617	Glow Plug/Heater Indicator Circ. Open/Short to Ground
18026	P1618	Glow Plug/Heater Relay Circ. Short to B+
18027	P1619	Glow Plug/Heater Relay Circ. Open/Short to Ground
18028	P1620	Engine coolant temperature signal open/short to B+
18029	P1621	Engine coolant temperature signal short to ground
18030	P1622	Engine coolant temperature signal range/performance
18031	P1623	Data Bus Powertrain No Communication
18032	P1624	MIL Request Sign.active
18033	P1625	Data-Bus Powertrain Unplausible Message from Transm.Contr.
18034	P1626	Data-Bus Powertrain Missing Message from Transm.Contr.
18035	P1627	Data-Bus Powertrain missing message from fuel injection pump
18036	P1628	Data-Bus Powertrain missing message from steering sensor
18037	P1629	Data-Bus Powertrain missing message from distance control
18038	P1630	Accelera.Pedal Pos.Sensor 1 Signal too Low
18039	P1631	Accelera.Pedal Pos.Sensor 1 Signal too High
18040	P1632	Accelera.Pedal Pos.Sensor 1 Power Supply Malfunction
18041	P1633	Accelera.Pedal Pos.Sensor 2 Signal too Low
18042	P1634	Accelera.Pedal Pos.Sensor 2 Signal too High
18043	P1635	Data Bus Powertrain missing message f.air condition control

18044	P1636	Data Bus Powertrain missing message from Airbag control
18045	P1637	Data Bus Powertrain missing message f.central electr.control
18046	P1638	Data Bus Powertrain missing message from clutch control
18047	P1639	Accelera.Pedal Pos.Sensor 1+2 Range/Performance
18048	P1640	Internal Contr.Module (EEPROM) Error
18049	P1641	Please check DTC Memory of Air Condition ECU
18050	P1642	Please check DTC Memory of Airbag ECU
18051	P1643	Please check DTC Memory of central electric ECU
18052	P1644	Please check DTC Memory of clutch ECU
18053	P1645	Data Bus Powertrain missing message f.all wheel drive contr.
18054	P1646	Please Check DTC Memory of all wheel drive ECU
18055	P1647	Please check coding of ECUs in Data Bus Powertrain
18056	P1648	Data Bus Powertrain Malfunction
18057	P1649	Data Bus Powertrain Missing message from ABS Control Module
18058	P1650	Data Bus Powertrain Missing message fr.instrument panel ECU
18059	P1651	Data Bus Powertrain missing messages
18060	P1652	Please check DTC Memory of transmission ECU
18061	P1653	Please check DTC Memory of ABS Control Module
18062	P1654	Please check DTC Memory of control panel ECU
18063	P1655	Please check DTC Memory of ADR Control Module
18064	P1656	A/C clutch relay circuit short to ground
18065	P1657	A/C clutch relay circuit short to B+
18066	P1658	Data Bus Powertrain Incorrect signal from ADR Control Module
18084	P1676	Drive by Wire-MIL Circ. Electrical Malfunction
18085	P1677	Drive by Wire-MIL Circ. Short to B+
18086	P1678	Drive by Wire-MIL Circ. Short to Ground
18087	P1679	Drive by Wire-MIL Circ. Open
18089	P1681	Contr.Unit Programming, Programming not Finished
18092	P1684	Contr.Unit Programming Communication Error
18094	P1686	Contr.Unit Error Programming Error
18098	P1690	Malfunction Indication Light Malfunction
18099	P1691	Malfunction Indication Light Open
18100	P1692	Malfunction Indication Light Short to Ground
18101	P1693	Malfunction Indication Light Short to B+
18102	P1694	Malfunction Indication Light Open/Short to Ground
18112	P1704	Kick Down Switch Malfunction
18113	P1705	Gear/Ratio Monitoring Adaptation limit reached
18119	P1711	Wheel Speed Signal 1 Range/Performance
18124	P1716	Wheel Speed Signal 2 Range/Performance
18129	P1721	Wheel Speed Signal 3 Range/Performance
18131	P1723	Starter Interlock Circ. Open
18132	P1724	Starter Interlock Circ. Short to Ground
18134	P1726	Wheel Speed Signal 4 Range/Performance
18136	P1728	Different Wheel Speed Signals Range/Performance
18137	P1729	Starter Interlock Circ. Short to B+
18141	P1733	Tiptronic Switch Down Circ. Short to Ground

18147	P1739	Tiptronic Switch up Circ. Short to Ground
18148	P1740	Clutch temperature control
18149	P1741	Clutch pressure adaptation at limit
18150	P1742	Clutch torque adaptation at limit
18151	P1743	Clutch slip control signal too high
18152	P1744	Tiptronic Switch Recognition Circ. Short to Ground
18153	P1745	Transm.Contr.Unit Relay Short to B+
18154	P1746	Transm.Contr.Unit Relay Malfunction
18155	P1747	Transm.Contr.Unit Relay Open/Short to Ground
18156	P1748	Transm.Contr.Unit Self-Check
18157	P1749	Transm.Contr.Unit Incorrect Coded
18158	P1750	Power Supply Voltage Low Voltage
18159	P1751	Power Supply Voltage High Voltage
18160	P1752	Power Supply Malfunction
18168	P1760	Shift Lock Malfunction
18169	P1761	Shift Lock Short to Ground
18170	P1762	Shift Lock Short to B+
18171	P1763	Shift Lock Open
18172	P1764	Transmission temperature control
18173	P1765	Hydraulic Pressure Sensor 2 adaptation at limit
18174	P1766	Throttle Angle Signal Stuck Off
18175	P1767	Throttle Angle Signal Stuck On
18176	P1768	Hydraulic Pressure Sensor 2 Too High
18177	P1769	Hydraulic Pressure Sensor 2 Too Low
18178	P1770	Load Signal Range/Performance
18179	P1771	Load Signal Stuck Off
18180	P1772	Load Signal Stuck On
18181	P1773	Hydraulic Pressure Sensor 1 Too High
18182	P1774	Hydraulic Pressure Sensor 1 Too Low
18183	P1775	Hydraulic Pressure Sensor 1 adaptation at limit
18184	P1776	Hydraulic Pressure Sensor 1 range/performance
18185	P1777	Hydraulic Pressure Sensor 2 range/performance
18186	P1778	Solenoid EV7 Electrical Malfunction
18189	P1781	Engine Torque Reduction Open/Short to Ground
18190	P1782	Engine Torque Reduction Short to B+
18192	P1784	Shift up/down Wire Open/Short to Ground
18193	P1785	Shift up/down Wire Short to B+
18194	P1786	Reversing Light Circ. Open
18195	P1787	Reversing Light Circ. Short to Ground
18196	P1788	Reversing Light Circ. Short to B+
18197	P1789	Idle Speed Intervention Circ. Error Message from Engine Contr.
18198	P1790	Transmission Range Display Circ. Open
18199	P1791	Transmission Range Display Circ. Short to Ground
18200	P1792	Transmission Range Display Circ. Short to B+
18201	P1793	Output Speed Sensor 2 Circ. No Signal
18203	P1795	Vehicle Speed Signal Circ. Open

18204	P1796	Vehicle Speed Signal Circ. Short to Ground
18205	P1797	Vehicle Speed Signal Circ. Short to B+
18206	P1798	Output Speed Sensor 2 Circ. Range/Performance
18207	P1799	Output Speed Sensor 2 Circ. Rpm too High
18221	P1813	Pressure Contr.Solenoid 1 Electrical
18222	P1814	Pressure Contr.Solenoid 1 Open/Short to Ground
18223	P1815	Pressure Contr.Solenoid 1 Short to B+
18226	P1818	Pressure Contr.Solenoid 2 Electrical
18227	P1819	Pressure Contr.Solenoid 2 Open/Short to Ground
18228	P1820	Pressure Contr.Solenoid 2 Short to B+
18231	P1823	Pressure Contr.Solenoid 3 Electrical
18232	P1824	Pressure Contr.Solenoid 3 Open/Short to Ground
18233	P1825	Pressure Contr.Solenoid 3 Short to B+
18236	P1828	Pressure Contr.Solenoid 4 Electrical
18237	P1829	Pressure Contr.Solenoid 4 Open/Short to Ground
18238	P1830	Pressure Contr.Solenoid 4 Short to B+
18242	P1834	Pressure Contr.Solenoid 5 Open/Short to Ground
18243	P1835	Pressure Contr.Solenoid 5 Short to B+
18249	P1841	Engine/Transmission Control Modules Versions do not match
18250	P1842	Please check DTC Memory of instrument panel ECU
18251	P1843	Please check DTC Memory of ADR Control Module
18252	P1844	Please check DTC Memory of central electric control ECU
18255	P1847	Please check DTC Memory of brake system ECU
18256	P1848	Please check DTC Memory of engine ECU
18257	P1849	Please check DTC Memory of transmission ECU
18258	P1850	Data-Bus Powertrain Missing Message from Engine Contr.
18259	P1851	Data-Bus Powertrain Missing Message from Brake Contr.
18260	P1852	Data-Bus Powertrain Unplausible Message from Engine Contr.
18261	P1853	Data-Bus Powertrain Unplausible Message from Brake Contr.
18262	P1854	Data-Bus Powertrain Hardware Defective
18263	P1855	Data-Bus Powertrain Software version Contr.
18264	P1856	Throttle/Pedal Pos.Sensor A Circ. Error Message from Engine Contr.
18265	P1857	Load Signal Error Message from Engine Contr.
18266	P1858	Engine Speed Input Circ. Error Message from Engine Contr.
18267	P1859	Brake Switch Circ. Error Message from Engine Contr.
18268	P1860	Kick Down Switch Error Message from Engine Contr.
18269	P1861	Throttle Position (TP) sensor Error Message from ECM
18270	P1862	Data Bus Powertrain Missing message from instr. panel ECU
18271	P1863	Data Bus Powertrain Missing Message from St. Angle Sensor
18272	P1864	Data Bus Powertrain Missing message from ADR control module
18273	P1865	Data Bus Powertrain Missing message from central electronics
18274	P1866	Data Bus Powertrain Missing messages

4.14 Useful Conversions

Unit	Equals to	Remarks
1 inch	25.4mm	
1 imperial gallon	4.546 l	
1l	0.22 gallon	
1 mph	1.609 km/h	
1km/h	0.621 mph	
1 lbs	0.454 kg	
1 kg	2.205 lbs	
1 lb-ft	1.356 Nm	
1Nm	0.737 lb-ft	
1bar	14.5 psi	
1psi	67 mbar	
1 A	14.7 psi	Standard atmosphere
1 A	1013 mbar	Standard atmosphere
1 cu-in	16.387cc	
1000 cc	61.02 cu-in	
1 bhp	745.7 W	
1 kW	1.341 bhp	
1 bhp	1.0139 PS	DIN bhp
1 PS	0.986 bph	
1 bhp	1lb-ft @5252rpm	bhp = torque (lb-ft) x RPM / 5252
10 mpg	28.25 l/100km	mpg = 282.5 / lpk
10 l/100km	28.25 mpg	lpk = 282.5 / mpg