

## **Audi, Seat, Skoda and Volkswagen**

### **Engine Codes**

#### **Engine Code: ADX, AEA, ABD, ABU and AEV**

<b>Display Group</b>	<b>Description</b>
1	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Coolant temperature.</li><li>3. Lambda value.</li><li>4. Operating condition (see Table 1 for the relevance of these figures).</li></ol>
2	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Injection period.</li><li>3. Battery voltage.</li><li>4. Intake air temperature.</li></ol>
3	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load signal.</li><li>3. Throttle valve angle. Calculated figure, dependent on throttle valve potentiometer.</li><li>4. Ignition timing value. Calculated figure, dependent on the ignition timing adjustment (this value must not be used to check or adjust ignition timing).</li></ol>
4	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load signal.</li><li>3. Road speed (for engine code ABD &gt; 9.94, the speed will not be shown).</li><li>4. Operating condition (see Table 1 for the relevance of these figures).</li></ol>
5	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Duty cycle (of activated charcoal filter solenoid valve 1).</li><li>3. Lambda correction factor.</li><li>4. Mixture correction factor.</li></ol>
6	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Duty cycle (of activated charcoal filter solenoid valve 1).</li><li>3. Lambda correction factor.</li><li>4. Mixture correction factor.</li></ol>

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7	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Lambda probe voltage.</li> <li>3. Lambda correction factor.</li> <li>4. Operating condition (see Table 1 for the relevance of the figures).</li> </ol>
8	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Load.</li> <li>3. Knock control number 1 cylinder (ignition retardation).</li> <li>4. Knock control number 2 cylinder (ignition retardation).</li> </ol>
9	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Load.</li> <li>3. Knock control number 3 cylinder.</li> <li>4. Knock control number 4 cylinder.</li> </ol>
10	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Load.</li> <li>3. Integral knock number 1 cylinder.</li> <li>4. Integral knock number 2 cylinder.</li> </ol>
11	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Load.</li> <li>3. Integral knock number 3 cylinder.</li> <li>4. Integral knock number 4 cylinder.</li> </ol>

**Table 1 - Operating Conditions (AEA only)**

Relevant when '1' is displayed in the 8-digit block										Display Group 1	Display Group 4	Display Group 7
X	X	X	X	X	X	X	X	X				
1									No. 1 cylinder recognised	-	-	
	1								Idling switch closed	-		Activated charcoal filter system solenoid valve 1 active
		1							AT recognised	-		Lambda control active
			1						A/C compressor switched on ('1' must not be displayed)	Acceleration or full load enrichment		Acceleration or full load enrichment
				1					A/C switched on ('1' must not be displayed)	Full load recognised		Full load recognised
					1				Speed boost gear engaged	Part load recognised		Part load recognised

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						1		Torque reduction (display must always show '1')	Idling switch closed	Idling switch closed
							1	Gear engaged (if '1' is displayed)	Overrun cut-off active	Overrun cut-off active

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## Engine Code: AAM, ABS and ADZ

Display Group	Description
1	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Coolant temperature.</li> <li>3. Lambda correction factor.</li> <li>4. Operating condition (see Table 2 for the relevance of these figures).</li> </ol>
2	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injection period.</li> <li>3. Battery voltage.</li> <li>4. Intake air temperature.</li> </ol>
3	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load signal.</li> <li>3. Throttle valve angle. Calculated figure, dependent on throttle valve potentiometer.</li> <li>4. Ignition timing value. Calculated figure, dependent on the ignition timing adjustment (this value must not be used to check or adjust ignition timing).</li> </ol>
4	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load signal.</li> <li>3. Road speed (0 to 7, with 4 as a centred value).</li> <li>4. Operating condition (see Table 1 for the relevance of these figures).</li> </ol>
5	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Duty cycle (of activated charcoal filter solenoid valve 1).</li> <li>3. Lambda correction factor.</li> <li>4. Mixture correction factor.</li> </ol>

**Table 2 - Operating Conditions**

Relevant when '1' is displayed in the 8-digit block									Display Group 1	Display Group 4
X	X	X	X	X	X	X	X	X		
1									-	-
	1								Idling switch closed	-
		1							-	-
			1						A/C compressor switched on	Acceleration or full load enrichment
				1					A/C switched on	Full load recognised
					1				-	Part load recognised
						1			Torque reduction (display must always show '1')	Idling switch closed
							1		Driving stage engaged	Overrun cut-off active

## Engine Code: AEK

Display Group	Description
1	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Coolant temperature.</li> <li>3. Lambda value.</li> <li>4. Ignition timing.</li> </ol>
2	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injection period.</li> <li>3. Battery voltage.</li> <li>4. Not relevant.</li> </ol>
3	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load signal.</li> <li>3. Throttle valve angle.</li> <li>4. Intake manifold temperature.</li> </ol>
4	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load signal.</li> <li>3. Road speed signal.</li> <li>4. Operating condition (see Table 3 for the relevance of these figures).</li> </ol>
5	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Learned idling stabilisation value.</li> <li>3. Idling stabilisation valve duty cycle.</li> <li>4. Adjustment requirements (see Table 3 for the relevance of these figures).</li> </ol>
6	<ol style="list-style-type: none"> <li>1. Lambda factor.</li> <li>2. Learned idling adaption value (specification range not currently available).</li> <li>3. Learned part load adaption value (specification range not currently available).</li> <li>4. Learned full load adaption value (specification range not currently available).</li> </ol>

**Table 3 - Engine Code AEK**

Relevant when '1' is displayed in the 5-digit block						
X	X	X	X	X	Display Group 4	Display Group 5
				1	Overrun	Not relevant
			1		Idling	Signal from AT
		1			Part load	N/A
	1				Full load	A/C stand-by
1					Acceleration	A/C compressor switched on

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## Engine Code: ABF (Digifant 3.0)

Display Group	Description
1	<ol style="list-style-type: none"><li>1. Coolant temperature.</li><li>2. Engine speed.</li><li>3. Lambda probe voltage.</li><li>4. Injection period</li></ol>
2	<ol style="list-style-type: none"><li>1. Coolant temperature.</li><li>2. Engine speed.</li><li>3. Throttle valve angle. Calculated figure, (dependent on throttle valve potentiometer).</li><li>4. Injection period.</li></ol>
3	<ol style="list-style-type: none"><li>1. Coolant temperature.</li><li>2. Engine speed.</li><li>3. Intake air temperature.</li><li>4. Battery voltage.</li></ol>
4	<ol style="list-style-type: none"><li>1. Coolant temperature.</li><li>2. Engine speed.</li><li>3. Ignition timing. Calculated figure (this value must not be used to check or adjust ignition timing).</li><li>4. Engine load.</li></ol>
5	<ol style="list-style-type: none"><li>1. Coolant temperature.</li><li>2. Engine speed.</li><li>3. Throttle valve angle. Calculated figure, (dependent on throttle valve potentiometer).</li><li>4. Battery voltage.</li></ol>

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## Engine Code: ABF (Digifant 3.2)

Display Group	Description
1	1. Engine speed 2. Coolant temperature. 3. Lambda probe voltage. 4. Adjustment conditions (see Table 4 for the relevance of these figures).
2	1. Engine speed. 2. Injection period. 3. Battery voltage. 4. Intake air temperature.
3	1. Engine speed. 2. Engine load. 3. Throttle valve angle. Calculated figure, (dependent on throttle valve potentiometer). 4. Intake air temperature.
4	1. Engine speed. 2. Engine load. 3. Not relevant. 4. Operating condition (see Table 4 for the relevance of these figures).
5	1. Engine speed. 2. Engine load. 3. N/A 4. Operating condition (see Table 4 for the relevance of these figures).
6	1. Lambda integration value (see note below). 2. Lambda integration value (see note below). 3. Learning value for idling stabilisation. 4. Intake air temperature.

*NOTE: Always observe the values in lines 1 and 2 of this display group together.*

*If a 0 is displayed in line 1, line 2 must show a value between 0 and 70.*

*If 225 is displayed in line 1, line 2 must show a value between 144 and 255.*

### Table 4 - Operating Conditions

X	X	X	X	X	X	X	X	Display groups 1, 4 & 5 line 4
1								Fault stored in memory
	1							Not assigned
		1						A/C compressor switched on
			1					Idling switch open
				1				Fault in lambda control
					1			Throttle valve closed
						1		Engine speed above 2500 rpm
							1	Coolant temperature below 80°C

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## Engine Code: 2E

Display Group	Description
1	1. Coolant temperature. 2. Engine speed. 3. Lambda probe voltage. 4. Injection time.
2	1. Coolant temperature. 2. Engine speed. 3. Throttle angle. 4. Engine load signal.
3	1. Coolant temperature. 2. Engine speed. 3. Air intake temperature. 4. Battery voltage.
4	1. Coolant temperature. 2. Engine speed. 3. Calculated ignition point. 4. Engine load signal.
5	1. Coolant temperature. 2. Engine speed. 3. Throttle angle. 4. Battery voltage.

## Engine Code: 1Z

Display Group	Description
1	1. Engine speed. 2. Quantity injected. 3. Voltage supplied (specified). 4. Coolant temperature
2	1. Engine speed 2. Accelerator pedal position 3. Operating condition (see Table 5 for the relevance of the figures in line 3). 4. Coolant temperature
3	1. Engine speed. 2. Mass of air drawn in (specified). 3. Mass of air drawn in (Actual. The measurement requires that the EGR system be switched off after a period of approximately 10 minutes at idle speed, requiring a burst of throttle or an engine restart to switch it back on). 4. EGR valve duty cycle (specified).



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4	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Commencement of injection (specified).</li> <li>3. Commencement of injection (actual).</li> <li>4. Duty cycle commencement of injection valve.</li> </ol>
5	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Start quantity</li> <li>3. Commencement of injection (specified).</li> <li>4. Coolant temperature</li> </ol>
6	<ol style="list-style-type: none"> <li>1. Vehicle speed.</li> <li>2. Brake pedal monitor (see Table 5 for the relevance of the figures in line 2).</li> <li>3. Cruise control system (see separate cruise control table F for the relevance of the figures in line 3).</li> <li>4. Cruise control system (vehicles fitted with cruise control system display 0, vehicles without cruise control system display 255).</li> </ol>
7	<ol style="list-style-type: none"> <li>1. Fuel temperature.</li> <li>2. No display.</li> <li>3. Intake manifold temperature.</li> <li>4. Coolant temperature.</li> </ol>
8	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Quantity injected (driver's requirement - pedal position)</li> <li>3. Injection quantity limitation value (from torque map).</li> <li>4. Injection quantity limitation value (from opacity map).</li> </ol>
9	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Quantity injected (cruise control system active).</li> <li>3. Injection quantity limitation (Cruise control active).</li> <li>4. Voltage supplied (from opacity map).</li> </ol>
10	<ol style="list-style-type: none"> <li>1. Mass of air drawn in (actual).</li> <li>2. Atmospheric pressure (ambient)</li> <li>3. Intake manifold pressure (charge pressure).</li> <li>4. Accelerator pedal position.</li> </ol>
11	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Charge pressure (specified).</li> <li>3. Charge pressure (actual).</li> <li>4. Duty cycle from charge pressure limitation valve.</li> </ol>
12	<ol style="list-style-type: none"> <li>1. Not relevant.</li> <li>2. Glow period.</li> <li>3. Voltage supply from control unit.</li> <li>4. Coolant temperature.</li> </ol>
13	<ol style="list-style-type: none"> <li>1. Quantity injected (deviation - No. 4 cylinder to No. 3 cylinder).</li> <li>2. Quantity injected (deviation - No. 2 cylinder to No. 3 cylinder).</li> <li>3. Quantity injected (deviation - No. 1 cylinder to No. 3 cylinder).</li> <li>4. No display.</li> </ol>

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**Table 5**

Relevance when '1' is displayed in the three digit block				
X	X	X	Display Group 2 - Line 3	Display Group 6 - Line 2
1			Idling speed boost when air conditioning system is switched on	Clutch pedal switch open (brake pedal open)
	1		Idling speed switch closed (accelerator pedal position below 17%)	Brake pedal switch open (brake pedal operated)
		1	Conditioner compressor on	Brake pedal switch open (brake pedal operated)

**Table 6**

Relevance when '1' is displayed in the 5 digit block					
X	X	X	X	X	Display Group 6 - Line 3
1					Clutch pedal switch open (clutch pedal operated)
	1				Brake light switch closed (brake pedal operated)
		1			Speed accepted
			1		Speed accepted
				1	Cruise control system on

## Engine Code: ABV

Display Group	Description
1	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine temperature.</li> <li>3. Lambda factor.</li> <li>4. Ignition angle.</li> </ol>
2	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injection time.</li> <li>3. System voltage.</li> <li>4. EGR temperature (if acceptable).</li> </ol>
3	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Throttle valve angle.</li> <li>4. Intake manifold temperature.</li> </ol>
4	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Road speed.</li> <li>4. Operating status (see Table 7 for the relevance of the figures in line 4).</li> </ol>

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5	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Idling speed stabilisation valve.</li> <li>3. Duty cycle.</li> <li>4. Operating status (see Table 7 for the relevance of the figures in line 4).</li> </ol>
6	<ol style="list-style-type: none"> <li>1. Lambda factor.</li> <li>2. Lambda adaption (Idle).</li> <li>3. Lambda adaption (part load).</li> <li>4. Lambda adaption (full throttle).</li> </ol>

**Table 7**

Relevance when '1' is displayed in the 5 digit block						
X	X	X	X	X	Operating status Display group 4 (5 block numeric group - Operating status may also be shown, for example acceleration from part load, as 10100).	Operating status. Display group 5 (4 block numeric group - Operating status may be also shown, for example Air con. compressor and air con. on, as 11 Display Group 1).
1					Acceleration enrichment	Not relevant
	1				Full throttle	Air conditioning compressor on
		1			Part load	Air conditioning on
			1		Idling speed	Gearbox intervention (auto gearbox)
				1	Overrun cut-off	Driving position (auto gearbox only)
					Operating statuses not OK, interrogate fault memory again	Not relevant

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## Engine Code: ADY and AGG

Display Group	Description
1	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Coolant temperature.</li><li>3. Lambda probe voltage.</li><li>4. Adjustment condition (see Table 8 for the relevance of the figures in line 4).</li></ol>
2	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Injection period.</li><li>3. Battery voltage.</li><li>4. Intake air temperature.</li></ol>
3	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Throttle valve angle.</li><li>4. Duty cycle (off throttle valve positioner).</li></ol>
4	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Road speed.</li><li>4. Engine operating condition (see Table 8 for the relevance of the figures in line 4).</li></ol>
5	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Duty cycle (for activated charcoal filter).</li><li>3. Consumption signal.</li><li>4. Operating condition (of Lambda control (see Table 9 for the relevance of the figures in line 4).</li></ol>
6	<ol style="list-style-type: none"><li>1. Additive learning value (for Lambda control at idling).</li><li>2. Multiplicative learning value (for Lambda control at part/full load range).</li><li>3. Multiplicative learning value (for throttle valve positioner duty cycle).</li><li>4. Multiplicative learning value (for throttle valve positioner duty cycle with auto gearbox).</li></ol>
7	<ol style="list-style-type: none"><li>1. Co-ordination (of Hall sender to engine speed sensor).</li><li>2. Co-ordination (of Hall sender to engine speed sensor).</li><li>3. Altitude correction value</li><li>4. Operating condition (of throttle valve positioner. Refer to Table 8 for the relevance of the figures in line 4).</li></ol>

**Table 8**

Relevance when '1' is displayed in the 8 digit block									
X	X	X	X	X	X	X	X	Adjustment Conditions Display Group 1	Engine Operating Conditions Display Group 4
1								Not relevant	Overrun
	1							Signal from automatic gearbox	Idling
		1						Air conditioner compressor switched on	Part load
			1					Idling switch on	Full load
				1				Fault in the Lambda control	Not relevant
					1			Throttle valve open	Not relevant
						1		Engine running	Not relevant
							1	Coolant temperature below 80°C	Not relevant

**Table 9**

Relevance when 1 is displayed in the 8 digit block									
X	X	X	X	X	X	X	X	Lambda Control Operating condition - Display Group 5	Throttle Valve Control Operating Condition - Display Group 7
1								Coding for synchro	Mechanical emergency running
	1							Not relevant	Not relevant
		1						Not relevant	Adaption necessary
			1					Lambda control at limit	Adaption necessary
				1				Diagnostic fault	Not relevant
					1			Lambda probe operationally ready	Adaption terminated (battery voltage too low)
						1		Rich mixture (0= lean mixture)	Idle switch open

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## Engine Code: ABK

Display Group	Description
1	<ol style="list-style-type: none"><li>1. Engine speed (idling).</li><li>2. Coolant temperature.</li><li>3. Lambda probe voltage (fluctuates).</li><li>4. Setting condition (see Table 10 for the relevance of the figures in line 4).</li></ol>
2	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Injection time (computed value between 1.5 and 3.5 ms at idle speed).</li><li>3. Digifant control unit voltage supply.</li><li>4. Intake air temperature</li></ol>
3	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine loading (idling).</li><li>3. Throttle valve angle (0 to 2.0% full load greater than 75%).</li><li>4. Duty cycle (off idling speed stabilisation valve (idling)).</li></ol>
4	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Road speed signal (stationary = 255, driving = 0).</li><li>4. Engine load operating state (see Table 11 for the relevance of the figures in line 4).</li></ol>
5	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Duty cycle - Of activated charcoal filter solenoid valve -N80 (Valve fully open = 100% valve closed =0%). This is closed when engine is idling and so long as Lambda control is not active.</li><li>3. Consumption signal - On board computer calculation. The signal can be checked by observing it with the engine idling, then 'blipping' the throttle to raise the engine speed and releasing immediately to bring the overrun fuel cut-off function in. At idle the reading should indicate 1, should then increase, drop to 0 then return to 1 again.</li><li>4. Operating condition (of Lambda control (see Table 9 for the relevance of the figures in line 4)</li></ol>

**Table 10 - Setting Conditions Table**

Relevance when '1' is displayed in the 8 digit block. These setting conditions are met only when 8 zeros are indicated.								
X	X	X	X	X	X	X	X	Display Group 1 - Line 4
1								Not relevant
	1							Ignition angle retardation during gearshift active (auto only)
		1						AC compressor not switched off (switched automatically)
			1					Idling switch not closed
				1				Lambda control switched off
					1			Throttle valve open
						1		Engine speed within valid range
							1	Engine temperature less than 80°C

**Table 11 - Engine Load Operating State Table**

Relevance when '1' is displayed in the 8 digit block. Read-out = 0, operating state not achieved. Read-out = 1, operating state achieved								
X	X	X	X	X	X	X	X	Display Group 4 - line 4
1								Overrun fuel cut-off (10000000)
	1							Idling (01000000)
		1						Part load (00100000)
			1					Full Load (00010000)
				1				Not relevant
					1			Not relevant
						1		Not relevant

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## Engine Code: AAE

Display Group	Description
1	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Coolant temperature.</li> <li>3. Lambda control value.</li> <li>4. Operating state (see Table 12 for the relevance of the figures in line 4).</li> </ol>
2	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injection time (computed value between 1.5 and 3.5 ms at idle speed).</li> <li>3. Battery voltage</li> <li>4. Intake air temperature</li> </ol>
3	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Throttle valve angle (idling 0 to 2.0%, full load greater than 75%).</li> <li>4. ignition angle.</li> </ol>
4	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Road speed signal (Stationary = 255, driving = 0).</li> <li>4. Operating state (see Table 12 for the relevance of the figures in line 4).</li> </ol>
5	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Duty cycle - Operating states may be combined on the display, dependent on the status of the vehicle equipment active at that particular time.</li> <li>3. Lambda control valve.</li> <li>4. Mixture correction factor.</li> </ol>

**Table 12 - Setting Conditions Table**

Relevance when '1' or '0' is displayed in the 8 digit block										
X	X	X	X	X	X	X	X	X	Operating State - Display Group 1	Operating state Display 4
	1								Idling contact closed	-
			1						AC compressor on	Acceleration enrichment/lean mixture on deceleration
				1					Air conditioner on	Full load
							0		Torque reduction (gearshift intervention in auto gearbox)	-
							1		-	Idling contact closed
								1	Driving stage (automatic gearbox)	Overrun cut-off



## Engine Code: ABC

Display Group	Description
1	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Intake manifold pressure (100% = 1022 hPa, 32% = 327 hPa).</li><li>3. Not relevant</li><li>4. Idling stabilisation position (18 to 75 steps at idle).</li></ol>
2	<ol style="list-style-type: none"><li>1. Throttle valve angle.</li><li>2. Not relevant.</li><li>3. Coolant temperature.</li><li>4. Intake air temperature.</li></ol>
3	<ol style="list-style-type: none"><li>1. Lambda learning factor (cylinders 1 to 3, 0.84 to 1.12).</li><li>2. Not relevant.</li><li>3. Lambda control factor (cylinders 1 to 3, 0.84 to 1.2).</li><li>4. Not relevant.</li></ol>
4	<ol style="list-style-type: none"><li>1. Not relevant.</li><li>2. Not relevant.</li><li>3. Lambda control factor (cylinders 1 to 3).</li><li>4. Not relevant.</li></ol>
5	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Knock control depth (base read-out = 60°).</li><li>3. Not relevant.</li><li>4. Coolant temperature.</li></ol>
6	<ol style="list-style-type: none"><li>1. Idling stabilisation position.</li><li>2. Idling stabilisation learning value.</li><li>3. Idling stabilisation disturbance influence.</li><li>4. Not relevant.</li></ol>
7	<ol style="list-style-type: none"><li>1. Idling stabilisation position.</li><li>2. Coolant temperature.</li><li>3. Lambda learning factor (cylinders 1 to 3).</li><li>4. Not relevant.</li></ol>
8	<ol style="list-style-type: none"><li>1. Idling stabilisation position.</li><li>2. Coolant temperature.</li><li>3. Lambda learning factor (cylinders 1 to 3).</li><li>4. Not relevant.</li></ol>
9	<ol style="list-style-type: none"><li>1. Coolant temperature.</li><li>2. Idling switch position (0 = open, 1 = closed).</li><li>3. Not relevant.</li><li>4. Engine speed.</li></ol>
10	<ol style="list-style-type: none"><li>1. Coolant temperature.</li><li>2. Idling switch position (0= open, 1 = closed).</li><li>3. Lambda learning factor (cylinders 1 to 3).</li><li>4. Not relevant.</li></ol>

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## Engine Code: AAH (and ABC for A4 models '95 on)

Display Group	Description
1	<ol style="list-style-type: none"><li>1. Coolant temperature (85 to 105°C up to 05/94, 85 to 110°C 06/94 on).</li><li>2. Air mass meter output voltage (1.45 to 1.58V, or 1.47 to 1.62V, dependent on valve-gear type).</li><li>3. Altitude read-out (0 to 0.025V up to 05/94, or 0 to 255).</li><li>4. Voltage supply to ECU (battery voltage) - 12.0 to 14.0V.</li></ol>
2	<ol style="list-style-type: none"><li>1. Throttle valve potentiometer voltage (voltage 0.25 to 4.75V - idle speed through to full load).</li><li>2. Throttle valve potentiometer voltage (voltage 0.25 to 1.275V - idle speed at lower part of load range).</li><li>3. Throttle valve potentiometer voltage (programmed value (0.25 to 0.50V).</li><li>4. Mechanical idle switch. (0 = open, 1 = closed).</li></ol>
3	<ol style="list-style-type: none"><li>1. Engine speed - Idle speed 700 to 800 rpm up to 05/94 then 650 to 750 or 700 to 800 rpm from 06/94 on dependent upon valve-gear type fitted.</li><li>2. Engine load - 15 to 32% up to 05/94, then 15 to 32% or 15 to 35% from 06/94 on dependent upon valve-gear type fitted</li><li>3. Throttle valve angle - With ignition on only 0% (idle) or greater than 95% (full load).</li><li>4. Vehicle speed.</li></ol>
4	<ol style="list-style-type: none"><li>1. Idling speed controller - At idle. Range between -2 and 2.</li><li>2. Idling speed stabilisation value - Automatic gearbox with 'N' or 'P' selected, manual gearbox in neutral. Manual = -16 to 14, auto = -20 to 10</li><li>3. Idling speed stabilisation value - Automatic gearbox in 'D', 1, 2, 3, or 'R', Manual always = 0, auto. = -20 to 10.</li><li>4. Gearbox input when engine idling 0 = off, and 1 = on. Refer to Table 13.</li></ol>
5	<ol style="list-style-type: none"><li>1. Lambda programmed value - -25 to 25% at idling speed (bank 1).</li><li>2. Lambda programmed value - -19 to 19% (vehicles to 05/94), -25 to 25% (vehicles 06/94 on), at part load 1 (bank 1).</li><li>3. Lambda programmed value - -19 to 19% (vehicles to 05/94), -25 to 25% (vehicles 06/94 on), at part load 2 (bank 1).</li><li>4. Lambda programmed value - -19 to 19% (vehicles to 05/94), -25 to 25% (vehicles 06/94 on), at part load 3 (bank 1).</li></ol>
6	<ol style="list-style-type: none"><li>1. Lambda programmed value - -25 to 25% at idling speed (bank 2).</li><li>2. Lambda programmed value - -19 to 19% (vehicles to 05/94), -25 to 25% (vehicles 06/94 on), at part load 1 (bank 2).</li><li>3. Lambda programmed value - -19 to 19% (vehicles to 05/94), -25 to 25% (vehicles 06/94 on), at part load 2 (bank 2).</li><li>4. Lambda programmed value - -19 to 19% (vehicles to 05/94), -25 to 25% (vehicles 06/94 on), at part load 3 (bank 2).</li></ol>

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7	<ol style="list-style-type: none"> <li>1. Lambda control (bank 1) - -6.0 to 6.0%.</li> <li>2. Lambda programme range display (see Table 14 for the relevance of the figures in line 2).</li> <li>3. Lambda programme demand diagnosis (see Table 15 for the relevance of the figures in line 3).</li> <li>4. Lambda programme demand display (see Table 15 for the relevance of the figures in line 4). Not relevant.</li> </ol>
8	<ol style="list-style-type: none"> <li>1. Lambda control (bank 2) - -6.0 to 6.0%.</li> <li>2. Lambda programme range display (see Table 14 for the relevance of the figures in line 2).</li> <li>3. Lambda programme demand diagnosis (see Table 15 for the relevance of the figures in line 3).</li> <li>4. Lambda programme demand display (see Table 15 for the relevance of the figures in line 4). Not relevant.</li> </ol>
9	<ol style="list-style-type: none"> <li>1. Lambda control (bank 1).</li> <li>2. Lambda control (bank 2).</li> <li>3. Charcoal filter valve duty cycle.</li> <li>4. Throttle valve angle (at idling speed = 0, at full load = greater than 95%).</li> </ol>
10	<ol style="list-style-type: none"> <li>1. Assigned Lambda value (the difference between this reading and the field 2 below must always be &lt; 8%).</li> <li>2. Assigned Lambda value (the difference between this reading and the field 1 above must always be &lt; 8%).</li> <li>3. Lambda probe 1 voltage (bank 1) - Reading must fluctuate, occasionally going beyond 0.3 to 0.6V range.</li> <li>4. Lambda probe 1 voltage (bank 2) - Reading must fluctuate, occasionally going beyond 0.3 to 0.6V range.</li> </ol>
11	<ol style="list-style-type: none"> <li>1. Ignition timing - without knock control and without digital idling speed stabilisation. - (with idling switch open - engine speed raised).</li> <li>2. Ignition timing - with knock control and with digital idling speed stabilisation. - (average of all four cylinders).</li> <li>3. Ignition timing intervention (for digital idling speed stabilisation).</li> <li>4. Idling switch function (0 = open, 1 = closed).</li> </ol>
12	<ol style="list-style-type: none"> <li>1. Momentary engine speed.</li> <li>2. Engine load.</li> <li>3. Ignition timing map switch-over - selected by the knock control function under a variety of conditions including poor fuel quality or abnormal engine noises (loose ancillaries or other engine damage).</li> <li>4. Ignition timing retardation of knock control - active from a engine load of greater than 40% - average of all cylinders.</li> </ol>
13	<ol style="list-style-type: none"> <li>1. Ignition timing map switch-over - selected by the knock control function under a variety of conditions including poor fuel quality or abnormal engine noises (loose ancillaries or other engine damage).</li> <li>2. Ignition timing retard of knock control (cylinder 1).</li> <li>3. Ignition timing retard of knock control (cylinder 2).</li> <li>4. Ignition timing retard of knock control (cylinder 3).</li> </ol>

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14	<ol style="list-style-type: none"> <li>1. Ignition timing map switch-over - selected by the knock control function under a variety of conditions including poor fuel quality or abnormal engine noises (loose ancillaries or other engine damage).</li> <li>2. Ignition timing retard of knock control (cylinder 4).</li> <li>3. Ignition timing retard of knock control (cylinder 5).</li> <li>4. Ignition timing retard of knock control (cylinder 6).</li> </ol>
15	<ol style="list-style-type: none"> <li>1. Engine speed (momentary).</li> <li>2. Knock sensor signal for cylinder 1.</li> <li>3. Knock sensor signal for cylinder 2.</li> <li>4. Knock sensor signal for cylinder 3.</li> </ol>
16	<ol style="list-style-type: none"> <li>1. Engine speed (momentary).</li> <li>2. Knock sensor signal for cylinder 4.</li> <li>3. Knock sensor signal for cylinder 5.</li> <li>4. Knock sensor signal for cylinder 6.</li> </ol>
17	<ol style="list-style-type: none"> <li>1. Timer 1 (see note below).</li> <li>2. Timer 2 (see note below).</li> <li>3. For vehicles up to 05/94 the display indicates EGR valve duty cycle between 0 and 100%. For vehicles 06/94 on the display indicates momentary engine load (33 to 60% for ECU suffix 'C', and 30 to 60% for ECU suffix 'E').</li> <li>4. EGR temperature. Diagnosis recognised as OK only if EGR temperature is in excess of 65°C at the end of the diagnosis.</li> </ol>
<p><b>NOTE:</b> Timer 1 end value = 2 for ECU with suffix 'C', end value = 1 for ECU with suffix 'E'.</p> <p>Timer 2 end value = 0 for ECU with suffix 'C', end value = 160 for ECU with suffix 'E'.</p> <p>If diagnostic conditions are met, the timers are incremented (count up); if these conditions are not met, the timers are decremented (count down). The timer functions operate in a different manner for the differing ECU suffix letter types, and are explained individually below.</p> <p><b>Suffix 'C' ECU</b></p> <p>For Suffix 'C' ECUs, Timer 1 is incremented by 1 as soon as Timer 2 has reached the value of 255. If the value of 255 is reached, Timer 2 jumps to 0 and begins counting up again to 255. Once the value 255 is reached, Timer 2 jumps to its end value 0 and Timer 1 to its end value of 2.</p> <p><b>Suffix 'E' ECU</b></p> <p>Timer 1 is incremented by 1 as soon as Timer 2 has reached the value 255. If the value 255 is reached, Timer 2 jumps to 0 and begins to count up to 160.</p>	
18	<ol style="list-style-type: none"> <li>1. Idle speed stabilisation valve on/off ratio.</li> <li>2. Idle speed stabilisation valve (current consumption of).</li> <li>3. Idle speed stabilisation valve (current control of).</li> <li>4. Voltage supply to ECU.</li> </ol>

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19	<ol style="list-style-type: none"> <li>1. Engine output (computed value) - momentary.</li> <li>2. Inducted air mass.</li> <li>3. Road speed - momentary.</li> <li>4. Injection time (average of all cylinders).</li> </ol>
20	<ol style="list-style-type: none"> <li>1. Display group 20 not currently assigned.</li> </ol>
21	<ol style="list-style-type: none"> <li>1. Display group 21 not currently assigned.</li> </ol>
22	<ol style="list-style-type: none"> <li>1. Torque reduction stages (see note below).</li> <li>2. Ignition timing retardation - because of ASR (only if engine cold - coolant temp. less than 20°C).</li> <li>3. Reduced engine torque.</li> <li>4. Non-reduced engine torque.</li> </ol>
<p><i>NOTE: Traction control (ASR) information, computed from data supplied on wheel slip through the ABS ECU. As required of the system, the engine torque is reduced via the engine management ECU; this is achieved in differing manners according to the temperature of the engine and the degree of torque reduction required - with engine cold (coolant temperature less than 20°C) small reduction (stages 1 to 5) by ignition timing retardation, large reduction (stages 6 to 12) by briefly switching off individual injectors; with a warm engine (coolant temperature in excess of 40°C), all reductions are achieved by briefly switching off individual injectors.</i></p>	
23	<ol style="list-style-type: none"> <li>1. Gearbox signal shift signal (see Note 1 below).</li> <li>2. Gear recognition signal and gearshift signal (see Note 2 below).</li> <li>3. Aircon compressor and HRW signal - 1st digit indicates the Aircon compressor, 2nd digit indicates the heated rear window, 0 = off, 1 = on.</li> <li>4. Aircon compressor cut-out - 0 = compressor has not been switched off by the engine ECU, 1 = compressor has been switched off by the engine ECU.</li> </ol>
<p><i>NOTE 1: '01V' automatic gearboxes only - all others will always show 0. Upshift or downshift signal. With vehicle stationary, selector lever in position R = 0, selector lever in positions 2, 3, 4, D, P, or N = 1. With vehicle moving above 14 km/h, read-out of 0 indicates ignition retardation selected for downshift whilst a read-out of 1 indicates ignition retardation selected for upshift.</i></p> <p><i>NOTE 2: First digit indicates gear recognition signal: a read-out of 0 = selector lever in R, D, 4, 3 or 2, whilst a read-out of 1 = P or N selected. Second digit indicates ignition timing retardation status: a read-out of 0 = ignition timing retardation not active, whilst a read-out of 1 = ignition timing retardation active (these signals are very brief). '00' will always be shown for vehicles without the '01V' automatic gearbox.</i></p>	
99	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Coolant temperature.</li> <li>4. OFF or ON Lambda control.</li> </ol>

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**Table 13 - Gearshift Inputs**

Display Group 4 - Gearshift Input State - Line 4						
X	X	X	X	X	4 - Digit Code (ECM Suffix C)	5 - Digit Code (ECM Suffix E)
0					Always = 0	Always = 0
	0				Aircon compressor (0 = off, 1 = on).	Aircon compressor (0 = off, 1 = on).
		1			Mechanical Idling switch (1 = closed, 0 = open).	Mechanical Idling switch (1 = closed, 0 = open).
			1		Always = 1 (except for auto gearbox with gear engaged which = 0).	Always = 1 (except for auto gearbox with gear engaged which = 0).
				0	-	Auto gearbox engine intervention (0 = not active, 1 = active).

**Table 14 - Lambda Programming Range**

X	X	X	X	Display Groups 7 & 8 - Line 2
0				Part load 3
	0			Part load 2
		0		Part load 1
			1	Idling speed

**NOTE:** Read-out 0 = engine speed or speed and load for this particular learning range not yet reached.

Read-out 1 = engine speed or speed and load for this particular learning range has been reached.

For Idling speed state, engine is to idle between 650 and 900 rpm.

For part-load programming ranges, a second person will be needed to perform a road test whilst the operator observes the display. During the road test, raise the engine speed to between 1500 and 3000 rpm and produce a load by slightly depressing the brake.

**Table 15 - Lambda programming demand display (and diagnosis on vehicles 06/94 on)**

Relevant when '1' is displayed in the 8 digit block								
X	X	X	X	X	X	X	X	Display Groups 7 & 8
0								Part load 3 (cylinders 4 to 6)
	1							Part load 3 (cylinders 1 to 3)
		0						Part load 2 (cylinders 4 to 6)
			1					Part load 2 (cylinders 1 to 3)
				1				Part load 1 (cylinders 4 to 6)
					1			Part load 1 (cylinders 1 to 3)
						1		Idling speed (cylinders 4 to 6)
							0	Idling speed (cylinders 1 to 3)

*NOTE: Read-out 0 = request for renewed learning.*

*Read-out 1 = learning process ended for the time being.*

*NOTE: On models 06/94 onwards, the Display Groups 7 and 8 may be structured differently to that for earlier models. Models up to 05/94 may indicate a Lambda learning value in line 2, followed by the range display (Table 14) as line 3 and the demand display as line 4: models from 06/94 have the programming range display (Table 14) as line 2, a programming demand diagnosis as line 3 followed by demand display as line 4.*

*Demand diagnosis illustrates which programmed value was checked. If diagnosis has been performed the corresponding read-out is set to 1 regardless of whether or not the diagnosis was recognised as being OK or not, e.g. if a value of the Lambda programming diagnosis in display line 3 is set to 1, but the corresponding value of the Lambda programming demand display in display line 4 is not set to 1, this indicates that diagnosis was performed but was not recognised as being satisfactory.*

*The Lambda programming diagnosis will reset to 0 each time the engine is started at a coolant temperature of less than 40°C.*

*Demand display illustrates which portion of the engine's operating range the programming demand is required in. The format for demand diagnosis and demand display is the same.*

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## Engine Code: AAT and ABP

Display Group	Description
1	<ol style="list-style-type: none"><li>1. Engine speed - 750 to 800 rpm for manual gearbox equipped vehicles, and 690 to 750 rpm for automatic gearbox equipped vehicles.</li><li>2. Fuel quantity injected.</li><li>3. Piston movement sensor voltage.</li><li>4. Coolant temperature.</li></ol>
2	<ol style="list-style-type: none"><li>1. Engine speed - 750 to 800 rpm for manual gearbox equipped vehicles, and 690 to 750 rpm for automatic gearbox equipped vehicles.</li><li>2. Accelerator pedal position (0% at idle).</li><li>3. Operating state (Refer to Table 16 for the relevant figures in line 3).</li><li>4. Intake air temperature.</li></ol>
3	<ol style="list-style-type: none"><li>1. Engine speed - 750 to 800 rpm for manual gearbox equipped vehicles, and 690 to 750 rpm for automatic gearbox equipped vehicles.</li><li>2. Quality of air inducted (specified).</li><li>3. Quantity of air inducted (actual).</li><li>4. ERG valve duty cycle.</li></ol>
4	<ol style="list-style-type: none"><li>1. Engine speed - 750 to 800 rpm for manual gearbox equipped vehicles, and 690 to 750 rpm for automatic gearbox equipped vehicles.</li><li>2. Start of injection (specified).</li><li>3. Start of injection period (actual).</li><li>4. Duty cycle of start of injection valve - N108</li></ol>
5	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Starting quantity injected (stored from last start).</li><li>3. Start of injection.</li><li>4. Coolant temperature.</li></ol>
6	<ol style="list-style-type: none"><li>1. Road speed.</li><li>2. Brake pedal status monitoring (refer to Table 17 for the relevance of the figures in line 2).</li><li>3. Cruise control system status switch (refer to Table 18 for the relevance of the figures in line 3).</li><li>4. Cruise control operating state.</li></ol>
7	<ol style="list-style-type: none"><li>1. Fuel temperature.</li><li>2. Intake air temperature.</li><li>3. Not relevant.</li><li>4. Coolant temperature.</li></ol>
8	<ol style="list-style-type: none"><li>1. Engine speed (full throttle test in 3rd or 4th gear, engine coolant temp min. 80°C).</li><li>2. Desired fuel quantity injected (full throttle test in 3rd or 4th gear, engine coolant temp min. 80°C, must indicate quantity limitation above 42mg/h).</li><li>3. Fuel quantity limitation (speed) - See Note 1 below.</li><li>4. Fuel quantity limitation (induced air) - See Note 2 below.</li></ol>



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*NOTE 1: Limitation of engine output - read-out to indicate between 37 and 42mg/h for a full throttle test in 3rd or 4th gear with an engine coolant min. temp of 80°C. This is limitation based upon engine speed.*

*NOTE 2: Limitation of engine output - read-out to indicate between 35 and 45mg/h for a full throttle test in 3rd or 4th gear with an engine coolant min. temp of 80°C. This is limitation based upon measured inducted air quantity.*

9	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Fuel quantity injected (with cruise control system active).</li> <li>3. Fuel quantity limitation (with automatic gearbox, during gearshift).</li> <li>4. Emergency fuel quantity injected (based on voltage signal from modulating piston movement sender).</li> </ol>
10	<ol style="list-style-type: none"> <li>1. Quantity of air inducted.</li> <li>2. Atmospheric (ambient) pressure.</li> <li>3. Intake manifold (boost) pressure.</li> <li>4. Accelerator pedal position.</li> </ol>
11	<ol style="list-style-type: none"> <li>1. Quantity of air inducted.</li> <li>2. Atmospheric (ambient) pressure.</li> <li>3. Intake manifold (boost) pressure.</li> <li>4. Accelerator pedal position.</li> </ol>
12	<ol style="list-style-type: none"> <li>1. Not relevant.</li> <li>2. Glow period (in seconds).</li> <li>3. ECU supply voltage.</li> <li>4. Coolant temperature.</li> </ol>
13	<ol style="list-style-type: none"> <li>1. Quantity injected - fuel variance (between cylinder 5 and cylinder 4, for idle speed control).</li> <li>2. Quantity injected - fuel variance (between cylinder 3 and cylinder 4, for idle speed control).</li> <li>3. Quantity injected - fuel variance (between cylinder 1 and cylinder 4, for idle speed control).</li> <li>4. Quantity injected - fuel variance (between cylinder 2 and cylinder 4, for idle speed control).</li> </ol>
14	<ol style="list-style-type: none"> <li>1. Display Group 14 not been assigned.</li> </ol>
15	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Quantity injected (actual).</li> <li>3. Fuel consumption.</li> <li>4. Desired quantity injected (controlled by driver depressing throttle).</li> </ol>

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**Table 16 - Operating State**

Relevant when '1' is displayed in the 3 - digit block			
X	X	X	Display Group 2
1			Air conditioner demands higher capacity - switch off air conditioner.
	1		Idling speed switch closed.
		1	Air conditioner compressor switched on.

**Table 17 - Brake Pedal Status Monitoring**

Relevant when '1' is displayed in the 3 - digit block			
X	X	X	Display Group 6
1			Clutch pedal switch (F36) - open
	1		Brake pedal switch (F47) - open
		1	Brake light switch - closed

**Table 18 - Cruise Control System (CCS) Switch Status**

Relevant when '1' is displayed in the 6 - digit block						
X	X	X	X	X	X	Display Group 6 - line 3
1						Clutch pedal switch (F36) - open
	1					Brake light switch - closed
		1				Speed resumption/ acceleration
			1			Speed reduction
				1		CSS off, with speed stored
					1	CSS switched on

## Engine Codes: ADP, ADR and AEB

Display Group	Description
1	<ol style="list-style-type: none"> <li>1. Engine speed (read-out in steps).</li> <li>2. Engine load - injection time per revolution - 1.6 to 2.4 ms (ADP engine code), 1.0 to 2.5 ms (ADR engine code), 0.5 to 1.5 ms (AEB engine code).</li> <li>3. Throttle valve angle.</li> <li>4. Ignition angle.</li> </ol>
2	<ol style="list-style-type: none"> <li>1. Engine speed (read-out in steps of 40rpm).</li> <li>2. Engine load - Injection time per revolution - 1.6 to 2.4 ms (ADP engine code), 1.0 to 2.5 ms (ADR engine code), 0.5 to 1.5 ms (AEB engine code).</li> <li>3. Injection time - 2.0 to 3.5 ms (ADP engine code), 2.0 to 5.0 ms (ADR engine code), 1.5 to 3.0 ms (AEB engine code).</li> <li>4. Air mass - 2.5 to 4.5 g/s (ADP engine code), 2.0 to 4.0 g/s (ADR engine code), 1.8 to 4.0 g/s (AEB engine code).</li> </ol>
3	<ol style="list-style-type: none"> <li>1. Engine speed (read-out in steps of 40rpm).</li> <li>2. Battery voltage.</li> <li>3. Coolant temperature.</li> <li>4. Intake air temperature.</li> </ol>
4	<ol style="list-style-type: none"> <li>1. Throttle valve angle.</li> <li>2. Idle air mass learned (without drive position of automatic gearbox selected. 0 is indicated for manual gear box equipped vehicles).</li> <li>3. Idle air mass learned (with drive position of automatic gearbox selected. 0 is indicated for manual gearbox equipped vehicles).</li> <li>4. Idling speed operating state (Refer to Table 19 for the relevance of the information in line 4).</li> </ol>
5	<ol style="list-style-type: none"> <li>1. Road speed (read-out in steps of 10 rpm. Actual measured value).</li> <li>2. Road speed (specified).</li> <li>3. Idling speed controller.</li> <li>4. Air mass - 2.5 to 4.5 g/s (ADP engine code), 2.0 to 4.0 g/s (ADR engine code), 1.8 to 4.0 g/s (AEB engine code).</li> </ol>
6	<ol style="list-style-type: none"> <li>1. Engine speed - (read-out in steps of 10 rpm). - Maximum 2550 rpm.</li> <li>2. Idling speed controller.</li> <li>3. Lambda controller - -5 to 5% (ADP engine code), -10 to 10% (ADR and AEB engine codes).</li> <li>4. Ignition angle.</li> </ol>
7	<ol style="list-style-type: none"> <li>1. Lambda controller.</li> <li>2. Lambda probe voltage.</li> <li>3. Charcoal filter valve on/off ratio (Ratio indicated at 0 means activated charcoal filter solenoid valve 1 is closed).</li> <li>4. Lambda correction factor (see note below).</li> </ol>

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**NOTE:** With active fuel tank breather system (ACF). Read-out of 0.3 indicates very rich mixture supplied from the ACF system thus the Lambda control will reduce the quantity of fuel injected to compensate, and vice-versa for a high reading.

8	<ol style="list-style-type: none"> <li>1. Injection time - 2.0 to 3.5 ms (ADP engine code), 2.0 to 5.0 ms (ADR engine code), 1.5 to 3.0 ms (AEB engine code).</li> <li>2. Lambda learning value for idling - -10 to 10% (ADP and ADR engine codes), -12 to 12% (AEB engine code).</li> <li>3. Lambda learning value for part throttle - -8 to 8% (ADP and ADR engine codes), -12 to 12% (AEB engine code).</li> <li>4. TE active or Lambda adaption (TE active indicates that the activated charcoal filter valve is pulsed, whilst Lambda adaption means that it is constantly closed).</li> </ol>
9	<ol style="list-style-type: none"> <li>1. Engine speed (read-out in steps of 10rpm). - max. 2550 rpm.</li> <li>2. Lambda controller - -5 to 5% (ADP engine code), -10 to 10% (ADR and AEB engine codes).</li> <li>3. Lambda probe voltage</li> <li>4. Lambda learning value for idling - Adaptive. -10 to 10% (ADP and ADR engine codes), -12 to 12% (AEB engine code).</li> </ol>
10	<ol style="list-style-type: none"> <li>1. Charcoal filter solenoid valve (on/off ratio).</li> <li>2. Lambda correction factor (see Note 1 below)</li> <li>3. Charcoal filter charge level (see Note 2 below).</li> <li>4. Charcoal filter purging rate (see Note 3 below).</li> </ol>
<p><b>NOTE 1:</b> With active fuel tank breather system (ACF). Read-out of 0.3 indicates very rich mixture supplied from the ACF system thus the Lambda control will reduce the quantity of fuel injected to compensate, and vice-versa for a high reading.</p> <p><b>NOTE 2:</b> If -3 is displayed, Activated Charcoal Filter (ACF) contains no petrol vapour. If 30 is displayed, ACF is completely filled with petrol vapour.</p> <p><b>NOTE 3:</b> 0 indicates that the ACF solenoid valve is closed (no supply is drawn):0.3 Indicates that 30% of inducted air comes from the ACF system.</p>	
11	<ol style="list-style-type: none"> <li>1. Engine speed (read-out in steps of 40 rpm).</li> <li>2. Engine load (see Note 1 below).</li> <li>3. Road speed.</li> <li>4. Fuel consumption (see Note 2 below).</li> </ol>
<p><b>NOTE 1:</b> Injection time per revolution. 1.6 to 2.4 ms (ADP engine code), 1.0 to 2.5 ms (ADR and AEB engine codes). Maximum engine load decreases by approximately 10% for every 1000 m above sea level; extremely hot outside temperatures likewise affect maximum engine load by up to 10%.</p> <p><b>NOTE 2:</b> Read-out applies at idle, without ancillary loads. ADP engine code = 0.5 to 1.1 l/h, ADR and AEB engine codes = 0.5 to 1.5 l/h. When driving at full throttle, the following minimum figures must be reached:- ADP engine code at 4000 rpm = 7.0ms, at 6000 rpm = 6.1ms. ADR engine code at 4000 rpm = 7.5ms, at 6000 rpm = 6.5ms. AEB engine code at 4000 rpm = 6.5ms, at 6000 rpm = 6.0ms.</p>	

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12	<ol style="list-style-type: none"> <li>1. Engine speed (Read-out in steps of 10 rpm - Max 2550 rpm).</li> <li>2. Battery voltage.</li> <li>3. Fuel consumption (see note below).</li> <li>4. Ignition angle.</li> </ol>
<p><i>NOTE: Read-out applies at idle, without ancillary loads. ADP engine code = 0.5 to 1.1 l/h, ADR and AEB engine codes = 0.5 to 1.5 l/h. When driving at full throttle, the following minimum figures must be reached:- ADP engine code at 4000 rpm = 7.0 ms, at 6000 rpm = 6.1 ms. ADR engine code at 4000 rpm = 7.5 ms, at 6000 rpm = 6.5 ms. AEB engine code at 4000 rpm = 6.5 ms, at 6000 rpm = 6.0 ms</i></p>	
13	<ol style="list-style-type: none"> <li>1. Ignition angle retardation - cylinder 1 (retardation by knock control, active across complete engine speed range from a minimum engine load of 3 ms).</li> <li>2. Ignition angle retardation - cylinder 2 (retardation by knock control, active across complete engine speed range from a minimum engine load of 3 ms).</li> <li>3. Ignition angle retardation - cylinder 3 (retardation by knock control, active across complete engine speed range from a minimum engine load of 3 ms).</li> <li>4. Ignition angle retardation - cylinder 4 (retardation by knock control, active across complete engine speed range from a minimum engine load of 3 ms).</li> </ol>
14	<ol style="list-style-type: none"> <li>1. Engine speed (Read-out in steps of 40 rpm).</li> <li>2. Engine load (injection time per revolution).</li> <li>3. Ignition angle retardation - cylinder1 (retardation by knock control, active across complete engine speed range from a minimum engine load of 3 ms).</li> <li>4. Ignition angle retardation - cylinder2 (retardation by knock control, active across complete engine speed range from a minimum engine load of 3 ms).</li> </ol>
15	<ol style="list-style-type: none"> <li>1. Engine speed (read-out in steps of 40 rpm).</li> <li>2. Engine load (injection time per revolution).</li> <li>3. Ignition angle retardation - cylinder 3 (retardation by knock control, active across complete engine speed range from a minimum engine load of 3 ms).</li> <li>4. Ignition angle retardation - cylinder 4 (retardation by knock control, active across complete engine speed range from a minimum engine load of 3 ms).</li> </ol>
16	<ol style="list-style-type: none"> <li>1. Knock sensor signal - cylinder 1 (at idle; at high engine speeds, the signal voltage may achieve values up to 5.1 V).</li> <li>2. Knock sensor signal - cylinder 2 (at idle; at high engine speeds, the signal voltage may achieve values up to 5.1 V).</li> <li>3. Knock sensor signal - cylinder 3 (at idle; at high engine speeds, the signal voltage may achieve values up to 5.1 V).</li> <li>4. Knock sensor signal - cylinder 4 (at idle; at high engine speeds, the signal voltage may achieve values up to 5.1 V).</li> </ol>

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17	<ol style="list-style-type: none"> <li>1. Engine speed (read-out in steps of 40 rpm. Specified as 820 to 900 rpm for ADP engine code).</li> <li>2. Engine load (injection time per revolution. Specified as 1.0 to 2.5 ms for ADP engine code).</li> <li>3. Read out dependent of engine code (see note below).</li> <li>4. Ignition angle (specified at 12° CA for ADP engine).</li> </ol>
<p><i>NOTE: Distributor basic setting, for engine code ADP only:- the Hall sender signal position is set by turning the distributor, whilst the Modernity unit can process the signal within the range specified - maintain a range of -3 to 3° CA when setting. Energy balance for Cat heating, for engine code ADR only:- for rapid heating of the catalytic converter (when operating temp. is reached the energy balance will read 1 or above).</i></p>	
18	<ol style="list-style-type: none"> <li>1. Engine speed (read-out in steps of 40 rpm).</li> <li>2. Engine load (injection time per revolution - engine load without altitude correction).</li> <li>3. Engine load (Ignition time per revolution - engine load with altitude correction).</li> <li>4. Altitude correction factor (see note below).</li> </ol>
<p><i>NOTE: For engine code AEB only, this field will always indicate 0 as the system altitude correction is taken directly from the altitude sender, however, meteorological conditions may alter results significantly.</i></p>	
19	<ol style="list-style-type: none"> <li>1. Engine speed (read-out in steps of 40 rpm).</li> <li>2. Engine load (injection time per revolution).</li> <li>3. Ignition angle retardation (retardation signal may not always be recognised because it is so brief).</li> <li>4. Ignition angle.</li> </ol>
20	<ol style="list-style-type: none"> <li>1. Engine speed. Read-out in steps of 10 rpm (max 2550 rpm).</li> <li>2. Selector level position (Automatic gearbox equipped vehicles, with Neutral or Drive selected. Manual gearbox equipped vehicles always display Drive position ON).</li> <li>3. Air conditioner type. - High or low heating/cooling capacity - on models without aircon, A/C High is always displayed when the heated rear screen is on.</li> <li>4. Air conditioner compressor status (compressor OFF is always displayed on vehicles fitted with aircon).</li> </ol>
21	<ol style="list-style-type: none"> <li>1. Engine speed (read-out in steps of 40 rpm).</li> <li>2. Engine load (injection time per revolution).</li> <li>3. Coolant temperature (see note below).</li> <li>4. Lambda control status (when Lambda control is switched OFF, the engine runs under map control).</li> </ol>
<p><i>NOTE: At a starting temperature below 5°C, the Lambda control is not activated until coolant temperature reaches 5°C; above 5°C Lambda control is not activated until signal voltage is recognised.</i></p>	
22	<ol style="list-style-type: none"> <li>1. This display group is not relevant.</li> </ol>

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23	<ol style="list-style-type: none"> <li>1. Throttle operating conditions - when the first figure in the display is 1, this indicates engine speed in steps of 40 rpm. Refer to Table 20 for the relevance of the figures in line 1.</li> <li>2. Throttle valve positioner min. stop.</li> <li>3. Emergency throttle valve positioner stop.</li> <li>4. Throttle valve positioner max. stop.</li> </ol>
24	<ol style="list-style-type: none"> <li>1. Engine speed (read-out in steps of 40 rpm).</li> <li>2. Engine load (injection time per revolution).</li> <li>3. Ignition angle.</li> <li>4. Ignition angle retardation (see note below).</li> </ol>
<p><i>NOTE: Total of ignition angle retardation under knock control, cylinders 1 to 4. On engines with the code AEB, the turbo boost pressure is also reduced from a position of total ignition angle retardation of approx. 24° CA but retarding the ignition angle by 3° across all four cylinders has the same effect as retarding the ignition angle by 12° at only one cylinder.</i></p>	
25 (This engine group should be disregarded for engine code AEB)	<ol style="list-style-type: none"> <li>1. Specified load without correction - this Display Group only relevant to engine code AEB.</li> <li>2. Specified load after correction (see Note 1 below).</li> <li>3. Actual load - if the actual load differs from the specified load after correction by more than 0.5 ms, there is a fault in the boost pressure control.</li> <li>4. Boost pressure control (see Note 2 below).</li> </ol>
<p><i>NOTE 1: Injection time per revolution. Specified load reduced by conditional correction factors - total ignition retardation by knock control from 24° CA, altitude adaption (dependent on ignition map), and coolant temperature below 105°C.</i></p> <p><i>NOTE 2: Solenoid valve on/off ratio. If the difference between actual load and specified load after correction is greater than 1ms, the boost pressure control solenoid valve is actuated with a fixed on/off ratio of 5%.</i></p>	
26 (This engine group should be disregarded for engine code AEB)	<ol style="list-style-type: none"> <li>1. Idling speed controller - compensation for change of air mass percentage due to varying load at idling speed.</li> <li>2. Idling speed air mass learned - without Drive position engaged (automatic gearbox).</li> <li>3. Coolant temperature.</li> <li>4. Engine speed (read-out in steps of 40 rpm).</li> </ol>
27 (This engine group should be disregarded for engine code AEB)	<ol style="list-style-type: none"> <li>1. Load reduction by knock control.</li> <li>2. Engine load after reduction.</li> <li>3. Engine speed (read-out in steps of 40 rpm).</li> <li>4. Boost pressure control - solenoid valve on/off ratio. If the total from engine load plus load reduction is equal to or &gt; 8, this would indicate a fault in the air mass meter.</li> </ol>
28	<ol style="list-style-type: none"> <li>1. Throttle pot. voltage</li> <li>2. Idling speed adjuster pot. voltage).</li> <li>3. Throttle valve control operating state.</li> <li>4. Throttle valve control adaption state - ADP running, ADP OK, or ADP error (ADP being the abbreviated form of adaption).</li> </ol>

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**Table 19 - Idle Speed Operating State**

Relevant when '1' is displayed in the 5 - digit block					
X	X	X	X	X	Display Group 4- line 4
1					Idling speed
	1				Part throttle
		1			Full throttle
			1		Overrun
				1	Enrichment (full throttle enrichment)

**Table 20 - Throttle Operating Conditions - Adaption of Throttle Valve Control**

Relevant when '1' is displayed in the 6 - digit block						
X	X	X	X	X	X	Display Group 23- line 1
1						Engine speed (read-out in steps of 40)
0						Adjustment of throttle valve potentiometer with potentiometer for idling speed positioner not OK
	1					Reading not relevant - ignore
		1				Learning of max. stop of throttle valve potentiometer no OK
			1			Learning of min. stop of throttle valve potentiometer not OK
				1		Learning of max. stop of potentiometer for idling speed positioner not OK
					1	Learning of min. stop of potentiometer for idling speed positioner not OK



## Engine Codes: ABT and ABM

Display Group	Description
1	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Coolant temperature.</li> <li>3. Lambda control value.</li> <li>4. Operating status (refer to Table 2 for the relevance of the figures in line 4).</li> </ol>
2	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injection time.</li> <li>3. Battery voltage.</li> <li>4. Intake air temperature.</li> </ol>
3	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Throttle valve angle.</li> <li>4. Ignition angle.</li> </ol>
4	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Vehicle speed.</li> <li>4. Fuelling requirements operating status (refer to Table 21 for the relevance of the figures in line 4).</li> </ol>
5	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Activated charcoal valve duty cycle.</li> <li>3. Lambda control value.</li> <li>4. Mixture correction.</li> </ol>

**Table 21 - Fuelling Requirements Operating Status**

Relevant when '1' is displayed in the 5-digit block					
X	X	X	X	X	Display Group 4 - Line 4
1					Acceleration enrichment
	1				Full load
		1			Part load
			1		Idling
				1	Fuel cut-off on overrun
					Re-test the system

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## Engine Codes: ABY

Display Group	Description
1	<ol style="list-style-type: none"><li>1. Engine speed (with all electrical loads switched off).</li><li>2. Coolant temperature.</li><li>3. Lambda control (after approximately one and a half minutes).</li><li>4. Ignition angle (calculated by - J220).</li></ol>
2	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Injection time.</li><li>3. Battery voltage.</li><li>4. Altitude compensation signal.</li></ol>
3	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Throttle valve angle.</li><li>4. Intake manifold temperature.</li></ol>
4	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Vehicle speed.</li><li>4. Switch positions - indicated as OK if 00010 is displayed (only in idle condition). Idle switch - F60 defective if 00000 indicated.</li></ol>
5	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Idling speed stabilisation (zero point of the characteristic curve).</li><li>3. Idling speed stabilisation (duty cycle).</li><li>4. Switch positions - switch OK when 0000 is displayed (only with air conditioner switched off and no gear selected - automatics).</li></ol>
6	<ol style="list-style-type: none"><li>1. This Display Group is not relevant.</li></ol>
7	<ol style="list-style-type: none"><li>1. Idling speed stabilisation (working range).</li><li>2. Idling speed stabilisation (characteristic curve zero point).</li><li>3. Idling speed stabilisation (characteristic curve control).</li><li>4. Idling speed stabilisation (load adaption).</li></ol>
8 & 9	<ol style="list-style-type: none"><li>1. These display groups are not relevant</li></ol>

## Engine Codes: ACU

Display Group	Description
1	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Coolant temperature.</li><li>3. Lambda probe voltage.</li><li>4. Adjustment conditions (see Table 22 for the relevance of the figures in line 4).</li></ol>
2	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Injection time.</li><li>3. Battery voltage.</li><li>4. Intake air temperature.</li></ol>
3	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Throttle valve angle (calculated figure, dependent on throttle valve potentiometer).</li><li>4. Idling stabilisation valve opening.</li></ol>
4	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load signal.</li><li>3. Not relevant.</li><li>4. Operating condition (see Table 22 for the relevance of the figures in line 4).</li></ol>
5	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Duty cycle (of activated charcoal filter solenoid valve).</li><li>3. Consumption signal.</li><li>4. Not relevant.</li></ol>
6	<ol style="list-style-type: none"><li>1. Learned mixture adaption value (awaiting specification).</li><li>2. Mixture adaption constant (awaiting specification).</li><li>3. Learned idling stabilisation value (awaiting specification).</li><li>4. Stored value for throttle pot. during basic setting.</li></ol>
7	<ol style="list-style-type: none"><li>1. This display group is not relevant.</li></ol>

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**Table 22 - Adjustment/Operating Conditions**

Relevant when '1' is displayed in the 8-digit block									Display Group 1 - Line 4	Display Group 4 - Line 4
X	X	X	X	X	X	X	X	X	Not relevant	Overrun
1									Signal from auto. gearbox	Idling
	1								Aircon compressor on	Part load
		1							Idling switch open	Full load
			1						Lambda control fault	Not relevant
				1					Throttle valve opened	Not relevant
					1				Speed over 2300 rpm	Not relevant
							1		Coolant temp. below 80°C	Not relevant

## Engine Codes: AAC for vehicles up to 02.92

Display Group	Description
1	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load signal.</li> <li>3. Coolant temperature.</li> <li>4. Injection period.</li> </ol>
2	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Intake air temperature.</li> <li>3. Not relevant.</li> <li>4. Injection period.</li> </ol>
3	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Coolant temperature.</li> <li>3. Not relevant.</li> <li>4. Injection period.</li> </ol>
4	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load signal.</li> <li>3. Not relevant.</li> <li>4. Injection period.</li> </ol>
5	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Throttle valve angle.</li> <li>3. Not relevant.</li> <li>4. Injection period.</li> </ol>

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## Engine Codes: AAC for vehicles 03.92 on

Display Group	Description
1	1. Coolant temperature. 2. Engine speed. 3. Lambda probe voltage. 4. Injection period.
2	1. Coolant temperature. 2. Engine speed. 3. Throttle valve angle. 4. Engine load signal.
3	1. Coolant temperature. 2. Engine speed. 3. Intake air temperature. 4. Battery voltage.
4	1. Coolant temperature. 2. Engine speed. 3. Ignition timing. 4. Engine load signal.
5	1. Coolant temperature. 2. Engine speed. 3. Throttle valve angle. 4. Battery voltage.

## Engine Codes: AAF for vehicles up to 09.91

Display Group	Description
1	1. Engine speed. 2. Intake manifold pressure. 3. Coolant temperature. 4. Injection time.
2	1. Engine speed. 2. Intake air temperature. 3. Not relevant. 4. Injection time.
3	1. Engine speed. 2. Coolant temperature. 3. Not relevant. 4. Injection time.
4	1. Engine speed. 2. Intake manifold pressure. 3. Not relevant. 4. Injection time.

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5	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Throttle valve potentiometer (G68).</li><li>3. Not relevant.</li><li>4. Injection time.</li></ol>
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### Engine Codes: AAF for vehicles 10.91on

Display Group	Description
1	<ol style="list-style-type: none"><li>1. Coolant temperature</li><li>2. Engine speed.</li><li>3. Lambda probe voltage.</li><li>4. Injection time.</li></ol>
2	<ol style="list-style-type: none"><li>1. Coolant temperature.</li><li>2. Engine speed.</li><li>3. Throttle valve angle.</li><li>4. engine load signal.</li></ol>
3	<ol style="list-style-type: none"><li>1. Coolant temperature.</li><li>2. Engine speed.</li><li>3. Intake air temperature.</li><li>4. Battery voltage.</li></ol>
4	<ol style="list-style-type: none"><li>1. Coolant temperature.</li><li>2. Engine speed.</li><li>3. Ignition timing.</li><li>4. Engine load signal.</li></ol>
5	<ol style="list-style-type: none"><li>1. Coolant temperature.</li><li>2. Engine speed.</li><li>3. Throttle valve angle.</li><li>4. Battery voltage.</li></ol>

## Engine Codes: 1E

Display Group	Description
1	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Coolant temperature.</li> <li>3. Lambda probe voltage (fluctuating).</li> <li>4. Adjustment conditions (see Table 23 for the relevance of the figures in line 4).</li> </ol>
2	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injection period.</li> <li>3. Battery voltage.</li> <li>4. Intake air temperature.</li> </ol>
3	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load (25 to 38% at idling speed, with coolant temp. a minimum of 80°C).</li> <li>3. Throttle valve angle (with ignition on, range 0 to 86°C).</li> <li>4. Idling stabilisation valve opening (3 to 25% at idling, with coolant temp. a minimum of 80°C)</li> </ol>
4	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load (25 to 38% at idling speed, with coolant temp. a minimum of 80°C).</li> <li>3. Not relevant.</li> <li>4. Opening condition (see Table 23 for the relevance of the figures in line 4).</li> </ol>

**Table 23 - Adjustment/Operating Conditions**

Relevant when '1' is displayed in the 8-digit block									Display Group 1 - Line 4	Display Group 4 - Line 4
X	X	X	X	X	X	X	X			
1									Not relevant	Overrun
	1								Not relevant	Idling
		1							Aircon compressor on	Part load
			1						Not relevant	Full load
				1					Lambda control fault	Not relevant
					1				Lambda control fault	Not relevant
						1			Speed over 2500 rpm	Not relevant
							1		Coolant temp. below 80°C	Not relevant

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## Engine Codes: PY

Display Group	Description
1	1. Coolant temperature. 2. Engine speed. 3. Lambda probe signal. 4. Injection period.
2	1. Coolant temperature. 2. Engine speed. 3. Not relevant. 4. Engine load signal.
3	1. Coolant temperature. 2. Engine speed. 3. Not relevant. 4. CO potentiometer voltage.
4	1. Coolant temperature. 2. Engine speed. 3. Not relevant. 4. Engine load signal.
5	1. Coolant temperature. 2. Not relevant. 3. Not relevant. 4. Battery voltage

## Engine Codes: 3F

Display Group	Description
1	1. Coolant temperature. 2. Engine speed. 3. Lambda probe signal. 4. Injection period.
2	1. Coolant temperature. 2. Engine speed. 3. Not relevant. 4. Engine load signal.
3	1. Coolant temperature. 2. Engine speed. 3. Intake air temperature. 4. Not relevant.
4	1. Coolant temperature. 2. Engine speed. 3. Calculated ignition timing. 4. Injection period.



5	<ol style="list-style-type: none"> <li>1. Coolant temperature.</li> <li>2. Intake air temperature.</li> <li>3. Not relevant.</li> <li>4. Battery voltage.</li> </ol>
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## Engine Codes: ABZ

Display Group	Description
1	<ol style="list-style-type: none"> <li>1. Engine speed (read-out in steps of 40 rpm).</li> <li>2. Engine load.</li> <li>3. Throttle valve angle.</li> <li>4. Injection angle.</li> </ol>
2	<ol style="list-style-type: none"> <li>1. Engine speed (read-out in steps of 40 rpm).</li> <li>2. Engine speed.</li> <li>3. Air mass throughput.</li> <li>4. Ignition angle.</li> </ol>
3	<ol style="list-style-type: none"> <li>1. Engine speed (read-out in steps of 40 rpm).</li> <li>2. Battery voltage.</li> <li>3. Coolant temperature.</li> <li>4. Intake air temperature.</li> </ol>
4	<ol style="list-style-type: none"> <li>1. Throttle valve angle (absolute).</li> <li>2. Throttle valve angle (learned value).</li> <li>3. Injection time.</li> <li>4. Operating state.</li> </ol>
5	<ol style="list-style-type: none"> <li>1. Engine speed (actual - max. 2250 rpm).</li> <li>2. Engine speed (see note below).</li> <li>3. Air mass idling speed controller.</li> <li>4. Switch positions.</li> </ol>

*NOTE: Specified. The basic 760 rpm speed specified is reduced to 600 rpm when a Drive position is engaged in an automatic gearbox, to prevent vehicle-creep. This reduction is partially cancelled if the rear screen heater or air conditioner is operating and idling speed is raised to 700 rpm. If no Drive position is engaged, the idling speed is raised to 800 rpm as a result of the air conditioner demanding a high cooling or heating capacity. Refer to Table 24 for the specified idling speed for the loading applied.*

6	<ol style="list-style-type: none"> <li>1. Engine speed (actual - max. 2250 rpm).</li> <li>2. Air mass idle speed controller (see Note 1 below).</li> <li>3. Learning value of idling speed stabilisation (see Note 2 below).</li> <li>4. Switch position.</li> </ol>
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*NOTE 1: Learning process occurs in small steps each time the idling speed switch closes - blip the throttle approx. once every 10 seconds to open and close the switch.*

*NOTE 2: Indicates the drift away from the designed average value (a new engine should have a positive value).*

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7	<ol style="list-style-type: none"> <li>1. Air mass inducted - specified air mass calculated by the control unit - engine idling.</li> <li>2. Air mass inducted - actual measured air mass - engine idling. Deviations of up to 0.3 g/s that last only a short time may be ignored.</li> <li>3. Current control factor - of idling speed stabilisation valve. Values above 1.2 indicate a contact resistance between the control unit and the idling speed stabilisation valve. Values which greatly differ indicate fouling or jamming of the idling speed.</li> <li>4. Learning value of idling speed stabilisation.</li> </ol>
8	<ol style="list-style-type: none"> <li>1. Engine speed (displayed in steps of 40 rpm).</li> <li>2. Engine load (see Note 1 below).</li> <li>3. Fuel consumption (see Note 2 below).</li> <li>4. Vehicle speed.</li> </ol>
<p><i>NOTE 1: Read-outs of 80 to 100% are reached when driving at full throttle. Note that the maximum engine load decreases by approximately 10% for each 1000 m above sea level.</i></p> <p><i>NOTE 2: Read-out applies to engine idling without ancillary loads (i.e. auto gearbox, aircon/heating system, alternator, power steering pump).</i></p>	
9	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine specified torque</li> <li>3. Engine actual torque.</li> <li>4. Ignition angle retardation - retardation occurs to smooth the gearshift jolt by reducing the torque output. No ignition angle retardation occurs below 2000 rpm.</li> </ol>
10	<ol style="list-style-type: none"> <li>1. Lambda learning value - bank 1 (engine idling).</li> <li>2. Lambda learning value - bank 2 (engine idling).</li> <li>3. Lambda learning value - bank 1 (at part load).</li> <li>4. Lambda learning value - bank 2 (at part load).</li> </ol>
11	<ol style="list-style-type: none"> <li>1. Lambda control value - bank 1 (engine idling).</li> <li>2. Lambda control value - bank 2 (engine idling).</li> <li>3. Lambda control value - bank 1 (see note below).</li> <li>4. Lambda control value - bank 1 (see note below).</li> </ol>
<p><i>NOTE: Because of the steep voltage jump between rich and lean, the control constantly fluctuates between the states 'slightly too rich' and 'slightly too lean'. 'Mixture rich' and 'mixture lean' states exist at approximately 0.2V inside the maximum and minimum limits.</i></p>	
12	<ol style="list-style-type: none"> <li>1. Pulse duty cycle (see Note 1 below).</li> <li>2. Filling level (of activated charcoal filter).</li> <li>3. Lambda correction (see Note 2 below).</li> <li>4. Activated charcoal filter solenoid status (see Note 3 below).</li> </ol>

*NOTE 1: Of activated charcoal filter solenoid valve 1 at idling speed. Above Idling speed the engine can process a higher quantity of fuel vapour from the ACF system, rising up to 100% under part load and full load conditions.*

*NOTE 2: If fuel tank vent active. Once the flow of fuel vapour slows as the ACF system empties, the Lambda control enriches the mixture - by up to 18% for an empty system; Lambda control also leans off the mixture when the system initially has high fuel vapour concentrations.*

*NOTE 3: Status of the valve. 'Active' indicates that the valve is pulsed for 6 minutes, 'adaption' indicates that the valve is constantly closed for 1 minute.*

13	<ol style="list-style-type: none"> <li>1. Ignition retardation by knock control (cylinder 1 - active from engine load greater than 40%).</li> <li>2. Ignition retardation by knock control (cylinder 2 - active from engine load greater than 40%).</li> <li>3. Ignition retardation by knock control (cylinder 3 - active from engine load greater than 40%).</li> <li>4. Ignition retardation by knock control (cylinder 4 - active from engine load greater than 40%).</li> </ol>
14	<ol style="list-style-type: none"> <li>1. Ignition retardation by knock control (cylinder 5 - active from engine load greater than 40%).</li> <li>2. Ignition retardation by knock control (cylinder 6 - active from engine load greater than 40%).</li> <li>3. Ignition retardation by knock control (cylinder 7 - active from engine load greater than 40%).</li> <li>4. Ignition retardation by knock control (cylinder 8 - active from engine load greater than 40%).</li> </ol>
15	<ol style="list-style-type: none"> <li>1. Knock sensor signal - cylinder 1 (at high engine speeds, the knock sensor signal voltage may achieve values of up to approximately 10V).</li> <li>2. Knock sensor signal - cylinder 2 (at high engine speeds, the knock sensor signal voltage may achieve values of up to approximately 10V).</li> <li>3. Knock sensor signal - cylinder 3 (at high engine speeds, the knock sensor signal voltage may achieve values of up to approximately 10V).</li> <li>4. Knock sensor signal - cylinder 4 (at high engine speeds, the knock sensor signal voltage may achieve values of up to approximately 10V).</li> </ol>
16	<ol style="list-style-type: none"> <li>1. Knock sensor signal - cylinder 5 (at high engine speeds, the knock sensor signal voltage may achieve values of up to approximately 10V).</li> <li>2. Knock sensor signal - cylinder 6 (at high engine speeds, the knock sensor signal voltage may achieve values of up to approximately 10V).</li> <li>3. Knock sensor signal - cylinder 7 (at high engine speeds, the knock sensor signal voltage may achieve values of up to approximately 10V).</li> <li>4. Knock sensor signal - cylinder 8 (at high engine speeds, the knock sensor signal voltage may achieve values of up to approximately 10V).</li> </ol>
17	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Combustion misfire total (see note below).</li> <li>4. Flywheel ring gear-check</li> </ol>

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<i>NOTE: Misfiring recognition occurs across the entire speed range from an engine load of 15%. The display indicates the total number of combustion misfirings that occurred in the preceding 200 crankshaft revolutions - ideal read-out = 0.</i>	
18	<ol style="list-style-type: none"><li>1. Flywheel ring gear check.</li><li>2. Correction value - ring gear segment 2</li><li>3. Correction value - ring gear segment 3</li><li>4. Correction value - ring gear segment 4</li></ol>
19	<ol style="list-style-type: none"><li>1. Combustion misfiring - cylinder 1 (see note below).</li><li>2. Combustion misfiring - cylinder 2 (see note below).</li><li>3. Combustion misfiring - cylinder 3 (see note below).</li><li>4. Combustion misfiring - cylinder 4 (see note below).</li></ol>
<i>NOTE: Misfiring recognition occurs across the entire speed range from an engine load of 15%. The display indicates the number of combustion misfirings that occurred in the preceding 200 crankshaft revolutions for each cylinder individually. Ideal read-out = 0.</i>	
20	<ol style="list-style-type: none"><li>1. Combustion misfiring - cylinder 5 (see note below).</li><li>2. Combustion misfiring - cylinder 6 (see note below).</li><li>3. Combustion misfiring - cylinder 7 (see note below).</li><li>4. Combustion misfiring - cylinder 8 (see note below).</li></ol>
<i>NOTE: Misfiring recognition occurs across the entire speed range from an engine load of 15%. The display indicates the number of combustion misfirings that occurred in the preceding 200 crankshaft revolutions for each cylinder individually. Ideal read-out = 0.</i>	
21	<ol style="list-style-type: none"><li>1. Selector lever position.</li><li>2. Aircon. status.</li><li>3. Aircon. compressor status.</li><li>4. Torque reduction during gearshift.</li></ol>
22	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Coolant temperature.</li><li>4. Intake manifold change over (change over occurs at approximately 4000 rpm if engine speed is rising, and at approximately 3700 rpm if speed is falling).</li></ol>

**Table 24 - Applied Loading/Idle Speed**

Drive position engaged	Rear screen-heater on	Air conditioner on	Specified idling speed
No	No	No	760 rpm
No	Yes	No	760 rpm
No	No	Yes	800 rpm
No	Yes	Yes	800 rpm
Yes	No	No	600 rpm
Yes	Yes	No	700 rpm
Yes	No	Yes	700 rpm
Yes	Yes	Yes	700 rpm

**Engine Codes: AAA for vehicles 92 on**

Display Group	Description
1	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Coolant temperature.</li> <li>3. Lambda factor.</li> <li>4. Injection timing.</li> </ol>
2	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injection period.</li> <li>3. Battery voltage.</li> <li>4. EGR temperature (if applicable).</li> </ol>
3	<ol style="list-style-type: none"> <li>1. Engine speed</li> <li>2. Engine load.</li> <li>3. Throttle valve angle.</li> <li>4. Intake manifold temperature.</li> </ol>
4	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Vehicle speed.</li> <li>4. Operating state (see the Table 25 for the relevance of the figures in line 4).</li> </ol>
5	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Idling stabilisation valve.</li> <li>3. Idling stabilisation valve duty cycle.</li> <li>4. Operating state (see the Table 25 for the relevance of the figures in line 4).</li> </ol>
6	<ol style="list-style-type: none"> <li>1. Lambda factor</li> <li>2. Lambda adaption (idling).</li> <li>3. Lambda adaption (part load).</li> <li>4. Lambda adaption (full load).</li> </ol>

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**Table 25 - Adjustment/Operating Conditions**

Relevant when '1' is displayed in the 5-digit block						
X	X	X	X	X	Display Group 4 - Line 4	Display Group 5 - Line 4
1					Acceleration enrichment	Air conditioning compressor on
	1				Full load	Air conditioning on
		1			Part load	Gearbox intervention - auto. only
			1		Idling	Drive range
				1	Fuel cut-off on overrun	Not relevant
					Re-test the system	Not relevant

## Engine Codes: AAA for vehicles 96 on

Display Group	Description
1	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Coolant temperature.</li> <li>3. Lambda control.</li> <li>4. Ignition timing.</li> </ol>
2	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injection period.</li> <li>3. Battery voltage.</li> <li>4. EGR status.</li> </ol>
3	<ol style="list-style-type: none"> <li>1. Engine speed</li> <li>2. Engine load signal.</li> <li>3. Throttle valve angle.</li> <li>4. Intake air temperature.</li> </ol>
4	<ol style="list-style-type: none"> <li>1. Lambda control.</li> <li>2. Multiplicative Lambda adaption value.</li> <li>3. Additive Lambda adaption value.</li> <li>4. Tank venting adaption factor.</li> </ol>
5	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Relative engine load.</li> <li>3. Vehicle speed.</li> <li>4. Not relevant.</li> </ol>
6	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Idling control adaption requirement.</li> <li>3. Multiplicative learning value.</li> <li>4. Signal from aircon compressor (see Table 26 for the relevance of the figures in line 4).</li> </ol>

**Table 26- Compressor State**

Relevant when '1' is displayed in the 7-digit block							
X	X	X	X	X	X	X	Display Group 6 - Aircon compressor signal
1							Air-conditioning readiness
	1						Air conditioning compressor has cut in

**Engine Codes: AEE for vehicles 96 on**

Display Group	Description
1	<ol style="list-style-type: none"> <li>1. Engine speed (see note below).</li> <li>2. Coolant temperature.</li> <li>3. Lambda probe voltage (fluctuating).</li> <li>4. Adjustment conditions (see the Table 27 for the relevance of the figures in line 4).</li> </ol>
<p><i>NOTE: The specification must be attained with the coolant temperature at a minimum of 80°C, with all electrical ancillaries switched off. Specified for manual gearbox as 640 to 740 rpm (or 830 to 930 rpm for vehicles with control unit 032 906 030D), and for auto. gearbox as 750 to 850 rpm. On both auto. and manual (without control unit 032 906 030D), the idle speed is increased by the control unit if the battery voltage is too low or the air conditioner is switched on (up to 900 rpm), and after a long full throttle drive and higher temperatures (up to 960 rpm).</i></p>	
2	<ol style="list-style-type: none"> <li>1. Engine speed (see note below).</li> <li>2. Injection period.</li> <li>3. Battery voltage.</li> <li>4. Intake air temperature.</li> </ol>
<p><i>NOTE: The specification must be attained with the coolant temperature at a minimum of 80°C, with all electrical ancillaries switched off. Specified for manual gearbox as 640 to 740 rpm (or 830 to 930 rpm for vehicles with control unit 032 906 030D), and for auto. gearbox as 750 to 850 rpm. On both auto. and manual (without control unit 032 906 030D), the idle speed is increased by the control unit if the battery voltage is too low or the air conditioner is switched on (up to 900 rpm), and after a long full throttle drive and higher temperatures (up to 960 rpm).</i></p>	
3	<ol style="list-style-type: none"> <li>1. Engine speed (see note below).</li> <li>2. Engine load (18 to 28% for manual gearbox, 18 to 29% for auto. gearbox).</li> <li>3. Throttle valve angle.</li> <li>4. Throttle valve position - 17 to 27% for manual gearbox (17 to 33% for vehicles with control unit 032 906 030D), or 17 to 34% for automatic gearbox.</li> </ol>

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*NOTE: The specification must be attained with the coolant temperature at a minimum of 80°C, with all electrical ancillaries switched off. Specified for manual gearbox as 640 to 740 rpm (or 830 to 930 rpm for vehicles with control unit 032 906 030D), and for auto. gearbox as 750 to 850 rpm. On both auto. and manual (without control unit 032 906 030D), the idle speed is increased by the control unit if the battery voltage is too low or the air conditioner is switched on (up to 900 rpm), and after a long full throttle drive and higher temperatures (up to 960 rpm).*

4	<ol style="list-style-type: none"><li>1. Engine speed (see note below).</li><li>2. Engine load (18 to 28% for manual gearbox, 18 to 29% for auto. gearbox).</li><li>3. Speed signal.</li><li>4. Operating condition (see Table 27 for the relevance of the figures in line 4).</li></ol>
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*NOTE: The specification must be attained with the coolant temperature at a minimum of 80°C, with all electrical ancillaries switched off. Specified for manual gearbox as 640 to 740 rpm (or 830 to 930 rpm for vehicles with control unit 032 906 030D), and for auto. gearbox as 750 to 850 rpm. On both auto. and manual (without control unit 032 906 030D), the idle speed is increased by the control unit if the battery voltage is too low or the air conditioner is switched on (up to 900 rpm), and after a long full throttle drive and higher temperatures (up to 960 rpm).*

5	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Duty cycle (of activated Charcoal Filter solenoid valve 1, with coolant temperature at a minimum of 80°C).</li><li>3. Not relevant.</li><li>4. Not relevant.</li></ol>
6	<ol style="list-style-type: none"><li>1. Mixture correction value (fluctuating around 128, in a limitation range of 80 to 150).</li><li>2. Not relevant.</li><li>3. Not relevant.</li><li>4. Throttle valve potentiometer (stored value of basic setting; throttle valve closed).</li></ol>



**Table 27- Adjustment/Operating Conditions (automatic gearbox retards ignition for gear change)**

Relevant when '1' or '0' is displayed in the 8-digit block								Display Group 1 - Line 4	Display Group 4 - Line 4
X	X	X	X	X	X	X	X	Idling contact closed	-
	1							AC compressor on	Acceleration enrichment/lean mixture on deceleration
			1					Air conditioner on	Full load
				1				Torque reduction (gearshift intervention in auto gearbox)	-
						0		-	Idling contact closed
							1	Driving stage (automatic gearbox)	Overrun cut-off

## Engine Codes: ACK, ALG

Display Group	Description
1	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Throttle valve angle.</li> <li>4. Ignition angle.</li> </ol>
2	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Ignition duration.</li> <li>4. Intake air mass.</li> </ol>
3	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. ECU supply voltage.</li> <li>3. Engine coolant temperature.</li> <li>4. Intake air temperature.</li> </ol>
4 Idling Stabilisation	<ol style="list-style-type: none"> <li>1. Throttle valve angle.</li> <li>2. Idling intake mass learning valve (automatic gearbox with drive selected).</li> <li>3. Idling intake mass learning valve (manual gearbox in neutral - automatic gearbox in P or N).</li> <li>4. Operating mode (idle, part load, etc.).</li> </ol>
5 Idling Stabilisation	<ol style="list-style-type: none"> <li>1. Actual engine speed.</li> <li>2. Specified engine speed.</li> <li>3. Idle air mass regulating valve.</li> <li>4. Intake air mass.</li> </ol>

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6 Idling Stabilisation	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injection duration.</li> <li>3. Bank 1 at idle - lambda learnt valve (additive) (see note below).</li> <li>4. Bank 2 at idle - lambda learnt valve (additive) (see note below).</li> </ol>
<p><i>NOTE: A negative value indicates a rich mixture, whilst a positive value indicates a lean mixture</i></p>	
7 Lambda Learnt Value	<ol style="list-style-type: none"> <li>1. Bank 1 at part throttle - lambda learnt value (multiplicative) (see note below).</li> <li>2. Bank 2 at part throttle - lambda learnt value (multiplicative) (see note below).</li> <li>3. Bank 1 at idle - lambda learnt value (additive) (see note below).</li> <li>4. Bank 2 at idle - lambda learnt value (additive) (see note below).</li> </ol>
<p><i>NOTE: A low value indicates that the engine is running too rich and therefore the ECU is weakening the mixture.</i></p> <p><i>A high value indicates that the engine is running too weak and therefore the ECU is enriching the mixture.</i></p> <p><i>Additive: The effects of a fault (e.g. Intake air leak), will reduce as the engine speed increases, so the injection period will be modified by a fixed amount. This amount is not dependent on the basic injection duration period.</i></p> <p><i>Multiplicative: The effects of a fault (e.g. Injector fault) will increase as engine speed increases, so a multiplicative learnt value is a proportional change to the injection duration. The change is dependent on the basic injection duration period.</i></p>	
8 Lambda Learnt Value	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injection duration.</li> <li>3. Bank 1 at idle - lambda learnt value (additive) (see note below).</li> <li>4. Bank 2 at idle - lambda learnt value (additive) (see note below).</li> </ol>
<p><i>NOTE: Additive: The effects of a fault (e.g. Intake air leak), will reduce as the engine speed increases, so the injection period will be modified by a fixed amount. This amount is not dependent on the basic injection duration period.</i></p>	
9 Oxygen Sensor	<ol style="list-style-type: none"> <li>1. Oxygen sensor voltage - bank 1.</li> <li>2. Oxygen sensor voltage - bank 2.</li> <li>3. EVAP canister purge valve duty cycle.</li> <li>4. Lambda correction factor while fuel tank venting is active.</li> </ol>
10 Fuel Tank Breather	<ol style="list-style-type: none"> <li>1. EVAP canister purge valve duty cycle.</li> <li>2. Lambda correction factor with tank breather active.</li> <li>3. EVAP canister charge level (see Note 1 below).</li> <li>4. Fuel tank venting system purge rate (see Note 2 below).</li> </ol>
<p><i>NOTE 1: Display = - 5: canister empty Display = 95: canister full</i></p> <p><i>NOTE 2: Display = 0.5: no canister vapours ingested Display = 1.5: 30% of the intake air mass drawn from the canister</i></p>	

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11 Fuel Consumption	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Vehicle speed.</li><li>4. Fuel consumption.</li></ol>
12 Knock Control	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Retardation of ignition timing by knock control - cylinder 1.</li><li>3. Retardation of ignition timing by knock control - cylinder 2.</li><li>4. Retardation of ignition timing by knock control - cylinder 3.</li></ol>
13 Knock Control	<ol style="list-style-type: none"><li>1. Engine load.</li><li>2. Retardation of ignition timing by knock control - cylinder 1.</li><li>3. Retardation of ignition timing by knock control - cylinder 2.</li><li>4. Retardation of ignition timing by knock control - cylinder 3.</li></ol>
14 Knock Control	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Retardation of ignition timing by knock control - cylinder 4.</li><li>3. Retardation of ignition timing by knock control - cylinder 5.</li><li>4. Retardation of ignition timing by knock control - cylinder 6.</li></ol>
15 Knock Control	<ol style="list-style-type: none"><li>1. Engine load.</li><li>2. Retardation of ignition timing by knock control - cylinder 4.</li><li>3. Retardation of ignition timing by knock control - cylinder 5.</li><li>4. Retardation of ignition timing by knock control - cylinder 6.</li></ol>
16 Knock Control	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Ignition timing.</li><li>4. Total sum of ignition retardation cylinders 1 to 6.</li></ol>
17 Knock Sensors	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Knock sensor voltage - cylinder 1.</li><li>3. Knock sensor voltage - cylinder 2.</li><li>4. Knock sensor voltage - cylinder 3.</li></ol>
18 Knock Sensors	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Knock sensor voltage - cylinder 4.</li><li>3. Knock sensor voltage - cylinder 5.</li><li>4. Knock sensor voltage - cylinder 6.</li></ol>
19 Torque Reduction (automatic gearbox)	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Required engine torque.</li><li>4. Actual engine torque.</li></ol>
20 Operating Modes	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Automatic gearbox operating mode.</li><li>3. A/C operating modes.</li><li>4. A/C compressor status.</li></ol>

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21 Lambda Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Engine coolant temperature.</li> <li>4. Lambda control operating mode.</li> </ol>
22	<ol style="list-style-type: none"> <li>1. This group is not relevant.</li> </ol>
23 Throttle Control part adaption	<ol style="list-style-type: none"> <li>1. Learning requirement (for relevance of the figures in line 1 see Table 28).</li> <li>2. Throttle valve positioner minimum stop.</li> <li>3. Throttle valve positioner 'limp home' stop.</li> <li>4. Throttle valve positioner maximum stop.</li> </ol>
24 Traction Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Reduction stages.</li> <li>3. Specified engine torque.</li> <li>4. Actual engine torque.</li> </ol>
25 System Status	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. System status (for relevance of the figures in line 1 see Table 29).</li> <li>4.</li> </ol>
26 Camshaft Timing Adjustment	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Camshaft position - bank 1.</li> <li>4. Camshaft position - bank 2.</li> </ol>
27 System Status and Camshaft Timing Adjustments	<ol style="list-style-type: none"> <li>1. System status (for relevance of the figures in line 1 see Table 30).</li> <li>2.</li> <li>3. Camshaft position - bank 1.</li> <li>4. Camshaft position - bank 2.</li> </ol>
95	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Ignition timing.</li> <li>4. Engine coolant temperature.</li> </ol>
98 Throttle Control part-matching	<ol style="list-style-type: none"> <li>1. Throttle valve potentiometer voltage.</li> <li>2. Throttle valve positioner sensor voltage.</li> <li>3. Operating mode.</li> <li>4. Adaption status.</li> </ol>
99 Lambda Regulation	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine coolant temperature.</li> <li>3. Lambda regulation.</li> <li>4. Lambda regulation operating mode.</li> </ol>

**Table 28 - Throttle Control Learning Requirement**

Relevant when '1' or '0' is displayed in the 8-digit block								
X	X	X	X	X	X	X	X	Display group 23 - Line 1
							0	Not assigned
						1		Throttle valve positioner min. stop - learning process not carried out
					1			Throttle valve positioner max stop - learning process not carried out
				1				Throttle valve potentiometer min. stop - learning process not carried out
			1					Throttle valve potentiometer max stop - learning process not carried out
		0						Not assigned
	1							Throttle valve positioner to throttle valve potentiometer - balance not carried out
0								Not assigned

**Table 29 - Display group 25 System Status**

Relevant when '1' is displayed in the 8-digit block			
X	X	X	Display group 25 - Line 3
		1	Camshaft timing adjustment active.
	1		Intake manifold change-over active.
1			See WSM.

**Table 30 - Display Group 27 System Status**

Relevant when '1' is displayed in the 8-digit block			
X	X	X	Display group 27 - Line 1
		1	Camshaft timing adjustment active.
	1		Intake manifold change-over active.
1			See WSM.

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## Engine Codes: ADR, AEB, AJL, AJP

Display Group	Description
1	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Throttle valve angle.</li><li>4. Ignition angle.</li></ol>
2	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Ignition duration.</li><li>4. Intake air mass.</li></ol>
3	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. ECU supply voltage.</li><li>3. Engine coolant temperature.</li><li>4. Intake air temperature.</li></ol>
4	<ol style="list-style-type: none"><li>1. Throttle valve angle.</li><li>2. Idling air mass learnt valve (automatic transmission in P or N).</li><li>3. Idling air mass learnt valve (manual transmission in neutral or automatic in drive).</li><li>4. Operating mode (idle, part load, etc.).</li></ol>
5 Idling Stabilisation	<ol style="list-style-type: none"><li>1. Actual engine speed.</li><li>2. Specified engine speed.</li><li>3. Idle air mass regulating valve.</li><li>4. Intake air mass.</li></ol>
6 Idling Stabilisation	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Idle air mass regulating valve.</li><li>3. Lambda regulator.</li><li>4. Ignition angle.</li></ol>
7 Lambda Leant Values	<ol style="list-style-type: none"><li>1. Lambda regulator control value.</li><li>2. Oxygen sensor voltage.</li><li>3. EVAP canister purge valve duty cycle.</li><li>4. Lambda correction factor whilst tank venting is active.</li></ol>
8 Lambda Leant Values	<ol style="list-style-type: none"><li>1. Injection duration.</li><li>2. Lambda learnt value at idle (additive) (see note below).</li><li>3. Lambda learnt value at part load (multiplicative) (see note below).</li><li>4. Fuel tank venting operating mode.</li></ol>

*NOTE: A low value indicates that the engine is running too rich and therefore the ECU is weakening the mixture.*

*A high value indicates that the engine is running too weak and therefore the ECU is enriching the mixture.*

*Additive: The effects of a fault (e.g. Intake air leak), will reduce as the engine speed increases, so the injection period will be modified by a fixed amount. This amount is not dependent on the basic injection duration period.*

*Multiplicative: The effects of a fault (e.g. Injector fault) will increase as engine speed increases, so a multiplicative learnt value is a proportional change to the injection duration. The change is dependent on the basic injection duration period.*

9 Lambda Learnt Values	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Lambda regulator control value.</li> <li>3. Oxygen sensor voltage.</li> <li>4. Lambda learnt value at idle (additive).</li> </ol>
10 Fuel Tank Venting	<ol style="list-style-type: none"> <li>1. EVAP canister purge valve duty cycle.</li> <li>2. Lambda correction factor during active fuel tank venting.</li> <li>3. Charge level of EVAP canister (see Note 1 below).</li> <li>4. Fuel tank venting system purge rate (see Note 2 below).</li> </ol>
<p><i>NOTE 1: Value of -3 indicates that the canister is empty, 32 indicates it is full of vapours.</i></p> <p><i>NOTE 2: Value of 0.0 indicates that the purge valve is closed, 0.3 indicates that 30% of the intake air mass is from the EVAP canister.</i></p>	
11 Fuel Consumption	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Vehicle speed.</li> <li>4. Fuel consumption.</li> </ol>
12 Fuel Consumption (code AJP)	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Battery voltage.</li> <li>3. Fuel consumption.</li> <li>4. Ignition timing.</li> </ol>
13 Knock Control (code AJP)	<ol style="list-style-type: none"> <li>1. Retardation of ignition timing by knock control - cylinder 1.</li> <li>2. Retardation of ignition timing by knock control - cylinder 2.</li> <li>3. Retardation of ignition timing by knock control - cylinder 3.</li> <li>4. Retardation of ignition timing by knock control - cylinder 4.</li> </ol>
14 Knock Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Retardation of ignition timing by knock control - cylinder 1.</li> <li>4. Retardation of ignition timing by knock control - cylinder 2.</li> </ol>
15 Knock Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Retardation of ignition timing by knock control - cylinder 3.</li> <li>4. Retardation of ignition timing by knock control - cylinder 4.</li> </ol>

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16 Knock Control	<ol style="list-style-type: none"> <li>1. Cylinder 1 knock sensor voltage.</li> <li>2. Cylinder 2 knock sensor voltage.</li> <li>3. Cylinder 3 knock sensor voltage.</li> <li>4. Cylinder 4 knock sensor voltage.</li> </ol>
18 Altitude adaption	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Throttle valve angle (engine load).</li> <li>4. Altitude correction factor.</li> </ol>
19 Torque Reduction (automatic gearbox)	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Ignition angle retardation.</li> <li>4. Ignition timing.</li> </ol>
20O perasting Modes	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Automatic gearbox operating mode.</li> <li>3. A/C operating mode.</li> <li>4. A/C compressor operating mode.</li> </ol>
21 Lambda Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Engine coolant temperature.</li> <li>4. Lambda control operating mode.</li> </ol>
23 Adaption of throttle Valve Control part	<ol style="list-style-type: none"> <li>1. Learning requirement (for the relevance of this data see Table 31).</li> <li>2. Throttle valve minimum position.</li> <li>3. Throttle valve 'limp home' running position.</li> <li>4. Throttle valve maximum position.</li> </ol>
24 Knock Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Ignition timing.</li> <li>4. Sum of the cylinders 1 to 4 ignition retardation angles.</li> </ol>
25 Intake change-over/ camshaft adjustment (code ADR/ AJP)	<ol style="list-style-type: none"> <li>1. Engine operating mode.</li> <li>2. Hall sensor adjustment deviation.</li> <li>3. Intake manifold/camshaft adjustment operating mode (for the relevance of this data see Table 32).</li> <li>4. Active camshaft adjustment angle.</li> </ol>
25 Charge Pressure Control (AEB only)	<ol style="list-style-type: none"> <li>1. Specified engine load (from accelerator pedal).</li> <li>2. Specified engine load after correction by knock control etc.</li> <li>3. Actual engine load.</li> <li>4. Charge pressure limitation valve duty cycle.</li> </ol>
26 Camshaft Adjustment	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Intake manifold/camshaft adjustment operating mode.</li> <li>4. Active camshaft adjustment angle.</li> </ol>



95	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Ignition timing.</li> <li>4. Engine coolant temperature.</li> </ol>
98 Matching Throttle Control part	<ol style="list-style-type: none"> <li>1. Throttle valve potentiometer voltage.</li> <li>2. Throttle valve positioner potentiometer voltage.</li> <li>3. Engine operating mode.</li> <li>4. Throttle control part matching mode.</li> </ol>
99 Lambda Regulation	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine coolant temperature.</li> <li>3. Lambda control.</li> <li>4. Operating condition.</li> </ol>

**Table 31 - Throttle Control Learning Requirements**

Relevant when '1' is displayed in the 6-digit block						
X	X	X	X	X	X	Display group 23 - Line 1
					1	Throttle valve positioner Min. stop signal - learning process (0=Learning process OK, 1=Learning process required)
				1		Throttle valve positioner Max. stop signal - learning process (0=Learning process OK, 1=Learning process required)
			1			Learning process throttle valve potentiometer Min. stop (0=Learning process OK, 1=Learning process required)
		1				Learning process throttle valve potentiometer Max. stop (0=Learning process OK, 1=Learning process required)
	1					Not assigned
1						Throttle valve potentiometer being balanced with throttle valve positioner (0=Balance required, 1=Balance OK)

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**Table 32 - Intake Manifold/Camshaft Adjustment Operating Mode**

Relevant when '1' is displayed in the 3-digit block			
X	X	X	Display group 25 - Line 3
		1	1= Camshaft advanced
	1		1= Long intake manifold track
0			Not assigned

## Engine Codes: 1Z (03.94-on), AEY, AFN, ALE, AVG

Display Group	Description
1 Injected Quantity	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injected quantity.</li> <li>3. Modulating piston movement sensor voltage.</li> <li>4. Engine coolant temperature.</li> </ol>
2 Idling Speed	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Accelerator pedal position.</li> <li>3. Operating condition (for the relevance of this data see Table 33).</li> <li>4. Engine coolant temperature.</li> </ol>
3 EGR System	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified intake air mass.</li> <li>3. Actual intake air mass.</li> <li>4. EGR valve duty cycle.</li> </ol>
4 Injection Commencement	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified injection commencement.</li> <li>3. Actual injection commencement.</li> <li>4. Commencement-of-injection valve duty cycle.</li> </ol>
4 Injection Commencement at Full Throttle (3d gear)	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified injection commencement.</li> <li>3. Actual injection commencement.</li> <li>4. Commencement-of-injection valve duty cycle.</li> </ol>
5 Starting Conditions	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Starting injection quantity.</li> <li>3. Actual commencement of injection.</li> <li>4. Engine coolant temperature.</li> </ol>
6 Switch Positions	<ol style="list-style-type: none"> <li>1. Vehicle speed.</li> <li>2. Brake pedal monitor (for the relevance of this data see Table 34).</li> <li>3. Cruise control system (CCS) (for the relevance of this data see Table 35).</li> <li>4. Cruise control system.</li> </ol>

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7 Temperatures	<ol style="list-style-type: none"> <li>1. Fuel temperature.</li> <li>2. Not allocated.</li> <li>3. Intake manifold temperature.</li> <li>4. Engine coolant temperature.</li> </ol>
8 Limitation of Injection Quantity at full throttle (3rd gear)	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injected quantity (from accelerator pedal position).</li> <li>3. Injection quantity limitation (torque limitation).</li> <li>4. Injection quantity limitation (smoke prevention).</li> </ol>
9 Limitation of Injection Quantity	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injection quantity (Cruise control system active).</li> <li>3. Injection limitation from automatic gearbox during gear change.</li> <li>4. Modulating piston movement sensor voltage.</li> </ol>
10 Air Quantities at full throttle (3rd gear)	<ol style="list-style-type: none"> <li>1. Intake air mass.</li> <li>2. Atmospheric pressure.</li> <li>3. Intake manifold pressure.</li> <li>4. Accelerator pedal position.</li> </ol>
11 Turbo Charge Pressure Control at full throttle (3rd gear)	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified turbo charge pressure.</li> <li>3. Actual turbo charge pressure.</li> <li>4. Charge pressure control valve solenoid duty cycle (see note below).</li> </ol>
<i>NOTE: Engine code AEY: Throttle valve positioner duty cycle.</i>	
12 Glow Plugs	<ol style="list-style-type: none"> <li>1. Not allocated</li> <li>2. Pre-glow period.</li> <li>3. Supply voltage from control unit.</li> <li>4. Engine coolant temperature.</li> </ol>
13 Idle speed smooth running control (see note below)	<ol style="list-style-type: none"> <li>1. Difference in injected quantity between cylinders 4 and 3.</li> <li>2. Difference in injected quantity between cylinders 2 and 3.</li> <li>3. Difference in injected quantity between cylinders 1 and 3.</li> <li>4.</li> </ol>
<i>NOTE: The injection system is equipped with an idle speed smooth running control. Any power differences between the cylinders is recognised and equalised via selective injected quantities.</i>	
16 Additional Heating (AFN >08.97)	<ol style="list-style-type: none"> <li>1. Alternator loading.</li> <li>2. Additional heater conditions (for the relevance of this data see Table 36).</li> <li>3. Heater element activation (for the relevance of this data see Table 37).</li> <li>4. Control unit voltage supply.</li> </ol>

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19 (code 1Z)	<ol style="list-style-type: none"> <li>1. Modulating piston voltage at minimum stop.</li> <li>2. Modulating piston voltage at maximum stop.</li> <li>3.</li> <li>4.</li> </ol>
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**Table 33 - Group 2 Operating Conditions**

Relevant when '1' is displayed in the 3-digit block			
X	X	X	Display group 2 - Line 3
		1	A/C compressor switched on
	1		Idling switch closed
1			Idle speed increased due to A/C

**Table 34 - Group 6 Brake Pedal Monitor**

Relevant when '1' is displayed in the 3-digit block			
X	X	X	Display group 6 - Line 2
		1	Brake light switch closed
	1		Brake pedal switch open
1			Clutch pedal switch open

**Table 35 - Group 6 Cruise Control Monitor**

Relevant when '1' is displayed in the 5 & 6-digit blocks						
All except code ALE						
X	X	X	X	X	Display group 6 - Line 3	
				1	CCS switched on	
			1		Speed accepted	
		1			Speed accepted again	
	1				Brake pedal depressed	
1					Clutch pedal depressed	
Code ALE only						
X	X	X	X	X	X	Display group 6 - Line 3
					1	CCS switched on
			1		1	Speed accepted
		1			1	Speed accepted again
	1				1	Brake pedal depressed
1					1	Clutch pedal depressed

**Table 36 - Additional Heater Conditions**

Relevant when '1' is displayed in the 8-digit blocks								
X	X	X	X	X	X	X	X	Display group 16 - Line 2
							1	Coolant temperature above 70 to 80°C, or intake air temperature above 5°C
						1		Alternator defective
					1			Battery voltage below 9V
				1				Engine speed below 760 rpm
			1					Engine start within the last 10 secs
		1						Coolant or Intake manifold temperature sensor defective
	1							Not assigned
1								Not assigned

**Table 37 - Group 16 Heater Element Activation**

Relevant when '1' is displayed in the 2-digit blocks		
X	X	Display group 16 - Line 3
	1	Low heat output relay on
1		High heat output relay on

## Engine Codes: AFB, AKE and AKN

Display Groups	Description
1 Injected Quantity	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injection quantity.</li> <li>3. Injection duration.</li> <li>4. Engine coolant temperature.</li> </ol>
2 Idle Speed	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Accelerator pedal position.</li> <li>3. Operating conditions (for the relevance of this display line, see Table 38).</li> <li>4. Engine coolant temperature.</li> </ol>
3 EGR System	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified intake air mass.</li> <li>3. Actual intake air mass.</li> <li>4. EGR valve duty cycle.</li> </ol>
4 Injection Commencement	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified injection commencement.</li> <li>3. Actual injection commencement.</li> <li>4. Injection commencement valve duty cycle.</li> </ol>

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4 Injection Commencement at full load	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified injection commencement.</li> <li>3. Actual injection commencement.</li> <li>4. Injection commencement valve duty cycle.</li> </ol>
5 Starting Conditions	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Starting quantity.</li> <li>3. Actual commencement of injection.</li> <li>4. Engine coolant temperature.</li> </ol>
6 Switch Positions	<ol style="list-style-type: none"> <li>1. Vehicle speed.</li> <li>2. Brake pedal position (for the relevance of this display line, see Table 39).</li> <li>3. Cruise control system (for the relevance of this display line, see Table 40).</li> <li>4. Cruise control system status (see note below).</li> </ol>
<p><i>NOTE: Vehicles without cruise control = 255, Cruise control switched off = 0, Cruise control switched on = 1</i></p>	
7 Temperatures	<ol style="list-style-type: none"> <li>1. Fuel temperature.</li> <li>2. Oil temperature.</li> <li>3. Intake air temperature.</li> <li>4. Engine coolant temperature.</li> </ol>
8 Injection Limitation at full load	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injection requirement from accelerator pedal.</li> <li>3. Injected quantity limitation (torque reduction).</li> <li>4. Injected quantity limitation (smoke prevention).</li> </ol>
9 Injection Limitation at full load	<ol style="list-style-type: none"> <li>1. Injection requirement from accelerator pedal.</li> <li>2. Injection limitation during gear change (automatic transmission).</li> <li>3. Injected quantity due to engine braking effect.</li> <li>4. Injection quantity limitation due to traction control.</li> </ol>
10 Air Quantities at full load	<ol style="list-style-type: none"> <li>1. Intake air mass.</li> <li>2. Atmospheric pressure.</li> <li>3. Intake manifold pressure.</li> <li>4. Accelerator pedal position.</li> </ol>
11 Turbo Charge Pressure Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified turbo charge pressure.</li> <li>3. Actual turbo charge pressure.</li> <li>4. Charge pressure control valve duty cycle.</li> </ol>
12 Glow Plugs	<ol style="list-style-type: none"> <li>1.</li> <li>2. Pre-glow period.</li> <li>3. ECU supply voltage.</li> <li>4. Engine coolant temperature.</li> </ol>

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13 Idle Speed Smooth Running Control (see note below)	<ol style="list-style-type: none"> <li>1. Injection quantity variation between cylinders 3 and 2.</li> <li>2. Injection quantity variation between cylinders 1 and 2.</li> <li>3. Not allocated</li> <li>4. Not allocated</li> </ol>
<p><i>NOTE: The injection system is equipped with an idle speed smooth running control. Any power differences between the cylinders is recognised and equalised via selective injected quantities.</i></p>	
14 Idle Speed Smooth Running Control (see note below)	<ol style="list-style-type: none"> <li>1. Not allocated</li> <li>2. Injection quantity variation between cylinders 6 and 2.</li> <li>3. Injection quantity variation between cylinders 4 and 2.</li> <li>4. Injection quantity variation between cylinders 5 and 2.</li> </ol>
<p><i>NOTE: The injection system is equipped with an idle speed smooth running control. Any power differences between the cylinders is recognised and equalised via selective injected quantities.</i></p>	
15 Fuel Consumption	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Actual injection quantity.</li> <li>3. Fuel consumption</li> <li>4. Injection quantity requirement from accelerator pedal</li> </ol>
18 Fuel Injection Pump	<ol style="list-style-type: none"> <li>1. Injection pump voltage supply.</li> <li>2. Voltage supply from the ECU.</li> <li>3. Injection pump status (for the relevance of this display line, see Table 41).</li> <li>4.</li> </ol>
19 Starting	<ol style="list-style-type: none"> <li>1. Injection pump speed.</li> <li>2. Start of delivery.</li> <li>3. Metering solenoid valve activation period.</li> <li>4. Fuel temperature</li> </ol>
20 Idling	<ol style="list-style-type: none"> <li>1. Fuel quantity diagnosis operating conditions (for the relevance of this display line, see Table 42).</li> <li>2. Injection condition (for the relevance of this display line, see Table 43).</li> <li>3. Fuel pump status.</li> <li>4. Fault recognised (0 = no fault)</li> </ol>
125 Data Bus Communication	<ol style="list-style-type: none"> <li>1. Gearbox status (see note below).</li> <li>2. ABS status (see note below).</li> <li>3. Instrument cluster status (see note below).</li> <li>4. Air bag status (see note below).</li> </ol>
<p><i>NOTE: Display = 1 when control units with active data bus are fitted</i></p>	

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**Table 38 - Group 2 Idle Speed Operating Conditions**

Relevant when '1' is displayed in the 5-digit blocks					
X	X	X	X	X	Display group 2 - Line 3
				1	A/C compressor switch on
			1		Not assigned
		1			Idle switch closed
	1				Kick down switch closed
1					System fault recognised

**Table 39 - Group 6 Brake Pedal Position Monitor**

Relevant when '1' is displayed in the 3-digit block			
X	X	X	Display group 6 - Line 2
		1	Brake light switch closed
	1		Brake pedal switch open
1			Clutch pedal switch open

**Table 40 - Group 6 Cruise Control System Monitor**

Relevant when '1' and '0' are displayed in the 6-digit blocks						
All except code ALE						
X	X	X	X	X	X	Display group 6 - Line 3
0	0	0	0	0	0	CCS switched off
0	0	0	0	0	1	CCS and memory switched off
0	0	0	0	1	1	CCS switched on
0	0	1	0	1	1	Resume speed again
0	0	0	1	1	1	CCS button pressed
0	1	0	0	1	1	Brake pedal depressed
1	0	0	0	1	1	Clutch pedal depressed



**Table 41 - Fuel Injection Pump Status**

Relevant when '1' is displayed in the 8-digit blocks								
X	X	X	X	X	X	X	X	Display group 18 - Line 3
							1	Constant voltage supply to metering solenoid valve
						1		Metering solenoid valve defective
					1			Injection pump speed sensor defective
				1				Timing adjustment defective
			1					Commencement of injection not recognised
		1						See WSM
	1							Engine speed not recognised
1								Data wiring defective

**Table 42 - Fuel Quantity Diagnosis Operating Conditions**

Relevant when '1' is displayed in the 3-digit blocks				
X	X	X		Display group 20 - Line 1
		1		'Refuel' warning from instrument cluster
	1			'Tank almost empty' signal from sender
1				'Tank empty' signal from sender

**Table 43 - Group 20 Injection Conditions**

Relevant when '1' is displayed in the 5-digit blocks						
X	X	X	X	X		Display group 20 - Line 2
				1		'Switch off' being prepared
			1			Not assigned
		1				Engine start prevented due to low fuel level
	1					Engine stopped after starting due to low fuel level
1						Engine stopped - no fuel

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## Engine Codes: AFF, AHU and AHH

Display Group	Description
1 Injected Quantity	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injection quantity.</li> <li>3. Modulating piston movement sensor voltage.</li> <li>4. Engine coolant temperature.</li> </ol>
2 Idling Speed	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Accelerator pedal position.</li> <li>3. Operating condition (for the relevance of this display line, see Table 44).</li> <li>4. Engine coolant temperature.</li> </ol>
3 EGR System	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified intake air mass.</li> <li>3. Actual intake air mass.</li> <li>4. EGR valve duty cycle.</li> </ol>
4 Injection Commencement	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified injection commencement.</li> <li>3. Actual injection commencement.</li> <li>4. Commencement-of-injection valve duty cycle.</li> </ol>
4 Injection Commencement at full throttle (3rd gear)	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified injection commencement.</li> <li>3. Actual injection commencement.</li> <li>4. Commencement-of-injection valve duty cycle.</li> </ol>
5 Starting Conditions	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Starting injection quantity.</li> <li>3. Actual commencement of injection.</li> <li>4. Engine coolant temperature.</li> </ol>
6 Switch Positions	<ol style="list-style-type: none"> <li>1. Vehicle speed.</li> <li>2. Brake pedal monitor (for the relevance of this display line, see Table 45).</li> <li>3. Cruise control system (CCS) (for the relevance of this display line, see Table 46).</li> <li>4. Cruise control system (see note below).</li> </ol>
<b>NOTE: Vehicles with cruise control = 0/1, without cruise control = 255</b>	
7 Temperatures	<ol style="list-style-type: none"> <li>1. Fuel temperature.</li> <li>2.</li> <li>3. Intake manifold pressure.</li> <li>4. Engine coolant temperature.</li> </ol>
8 Limitation of Injection Quantity at full throttle (3rd gear)	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injected quantity (from accelerator pedal).</li> <li>3. Injected quantity limitation (torque limitation).</li> <li>4. Injected quantity limitation (smoke prevention).</li> </ol>

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9 Limitation of Injection Quantity	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injection quantity (Cruise control system active).</li> <li>3. Injection limitation from automatic gearbox during gear change.</li> <li>4. Modulating piston movement sensor voltage.</li> </ol>
10 Air Quantities at full throttle (3rd gear)	<ol style="list-style-type: none"> <li>1. Intake air mass.</li> <li>2. Atmospheric pressure.</li> <li>3. Intake manifold pressure.</li> <li>4. Accelerator pedal position.</li> </ol>
11 Turbo Charge Pressure Control at full throttle (3rd gear)	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified charge pressure.</li> <li>3. Actual charge pressure.</li> <li>4. Turbo charge pressure control valve duty cycle.</li> </ol>
12 Glow Plugs	<ol style="list-style-type: none"> <li>1.</li> <li>2. Pre-glow period.</li> <li>3. ECU supply voltage.</li> <li>4. Engine coolant temperature.</li> </ol>
13 Idle smooth running control (see note below)	<ol style="list-style-type: none"> <li>1. Difference in injected quantity between cylinders 4 and 3.</li> <li>2. Difference in injected quantity between cylinders 2 and 3.</li> <li>3. Difference in injected quantity between cylinders 1 and 3</li> <li>4. Difference between injection quantity between cylinders 1, 2, 4 and 3 (code AFF)</li> </ol>
<p><i>NOTE: The injection system is equipped with an idle speed smooth running control. Any power differences between the cylinders is recognised and equalised via selective injected quantities.</i></p>	
15 Fuel Consumption	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Actual injection quantity.</li> <li>3. Fuel consumption.</li> <li>4. Injection quantity requirement (from accelerator pedal sensor).</li> </ol>
16 Additional Heater	<ol style="list-style-type: none"> <li>1. Alternator loading.</li> <li>2. Additional heater condition (for the relevance of this display line, see Table 47).</li> <li>3. Activation of heater elements (for the relevance of this display line, see Table 48).</li> <li>4. Voltage supply from control unit.</li> </ol>
19 Quantity adjuster (AHH, AHU <08.97, AFF)	<ol style="list-style-type: none"> <li>1. Modulating piston movement sensor - stop position voltage.</li> <li>2. Modulating piston movement sensor - start position voltage.</li> <li>3. Not allocated</li> <li>4. Not allocated</li> </ol>

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**Table 44 - Idling Speed Operating Conditions**

Relevant when '1' is displayed in the 3-digit block			
X	X	X	Display group 2 - Line 3
		1	A/C compressor switched on
	1		Idling switch closed
1			Idle speed increased due to A/C

**Table 45 - Group 6 Brake Pedal Monitoring**

Relevant when '1' is displayed in the 3-digit block			
X	X	X	Display group 6 - Line 2
		1	Brake light switch closed
	1		Brake pedal switch open
1			Clutch pedal switch open

**Table 46 - Group 6 Cruise Control System Monitoring**

Relevant when '1' is displayed in the 5-digit blocks					
X	X	X	X	X	Display group 6 - Line 3
				1	CCS switched on
			1		Speed accepted
		1			Speed accepted again
	1				Brake pedal depressed
1					Clutch pedal depressed

**Table 47 - Group 16 Additional Heater Condition**

Relevant when '1' is displayed in the 8-digit blocks								
X	X	X	X	X	X	X	X	Display group 16 - Line 2
							1	Coolant temperature above 70 to 80°C, or intake air temperature above 5°C
							1	Alternator defective
					1			Battery voltage below 9V
				1				Engine speed below 760 rpm
			1					Engine start within the last 10 secs
		1						Coolant or Intake manifold temperature sensor defective
	1							Not assigned
1								Not assigned

**Table 48 - Group 16 Activation of Heater Elements**

Relevant when '1' is displayed in the 2-digit blocks		
X	X	Display group 16 - Line 3
	1	Low heat output relay on
1		High heat output relay on

**Engine Codes: AJM, ATD and ATJ**

Display Groups	Description
1 Injected Quantity	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injected quantity.</li> <li>3. Injection duration.</li> <li>4. Engine coolant temperature.</li> </ol>
2 Idle Speed	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Accelerator pedal position.</li> <li>3. Operating condition (for the relevance of this display line, see Table 49).</li> <li>4. Engine coolant temperature.</li> </ol>
3 EGR System	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified intake air mass.</li> <li>3. Actual intake air mass.</li> <li>4. EGR valve duty cycle.</li> </ol>
4 Unit Injector Valve activation	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified commencement of injection.</li> <li>3. Injection duration.</li> <li>4. Synchronisation angle.</li> </ol>
4 Unit Injector Valve activation at full load (3rd gear)	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified commencement of injection.</li> <li>3. Injection duration.</li> <li>4. Synchronisation angle.</li> </ol>
5 Starting Conditions	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Starting quantity</li> <li>3. Commencement of injection.</li> <li>4. Engine coolant temperature.</li> </ol>
6 Switch Position	<ol style="list-style-type: none"> <li>1. Vehicle speed.</li> <li>2. Brake/clutch pedal positions (for the relevance of this display line, see Table 50).</li> <li>3. Accelerator pedal position.</li> <li>4. Cruise control system (CCS) (see note below).</li> </ol>
<i>NOTE: Vehicles with cruise control = 0/1, without cruise control = 255</i>	

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7 Temperatures	<ol style="list-style-type: none"> <li>1. Fuel temperature.</li> <li>2. Fuel cooling status</li> <li>3. Intake manifold temperature.</li> <li>4. Engine coolant temperature.</li> </ol>
8 Injected Quantity Limitation at full load (3rd gear)	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injected quantity.</li> <li>3. Injected quantity limitation (torque limitation).</li> <li>4. Injected quantity limitation (smoke prevention).</li> </ol>
9 Injected Quantity Limitation	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Injected quantity (CCS active).</li> <li>3. Injected quantity limitation from AT gearbox during gear change.</li> <li>4. Quantity limitation.</li> </ol>
10 Air Quantities at full load (3rd gear)	<ol style="list-style-type: none"> <li>1. Intake air mass.</li> <li>2. Atmospheric pressure.</li> <li>3. Intake manifold pressure.</li> <li>4. Accelerator pedal position.</li> </ol>
11 Turbo Charge Pressure Control at full load (3rd gear)	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified turbo charge pressure.</li> <li>3. Actual turbo charge pressure.</li> <li>4. Charge pressure control valve duty cycle.</li> </ol>
12 Glow Plug System	<ol style="list-style-type: none"> <li>1. Glow status</li> <li>2. Pre-glow period.</li> <li>3. ECU supply voltage.</li> <li>4. Engine coolant temperature.</li> </ol>
13 Idle Smooth Running Control (see note below)	<ol style="list-style-type: none"> <li>1. Smooth running control injected quantity - cylinder 1.</li> <li>2. Smooth running control injected quantity - cylinder 2.</li> <li>3. Smooth running control injected quantity - cylinder 3.</li> <li>4. Smooth running control injected quantity - cylinder 4</li> </ol>
<p><i>NOTE: The injection system is equipped with an idle speed smooth running control. Any power differences between the cylinders is recognised and equalised via selective injected quantities.</i></p>	
15 Fuel Consumption	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Actual injected quantity.</li> <li>3. Fuel consumption.</li> <li>4. Injection quantity requirement.</li> </ol>
16 Additional Heater	<ol style="list-style-type: none"> <li>1. Alternator loading.</li> <li>2. Additional heater (for the relevance of this display line, see Table 51).</li> <li>3. Activation of heater elements (for the relevance of this display line, see Table 52).</li> <li>4. ECU supply voltage.</li> </ol>

18 Unit injector valve status (see note below)	<ol style="list-style-type: none"> <li>1. Cylinder 1 injector status.</li> <li>2. Cylinder 2 injector status.</li> <li>3. Cylinder 3 injector status</li> <li>4. Cylinder 4 injector status</li> </ol>
<i>NOTE: 0 = Unit injector OK 1 = Fault</i>	
125 Data Bus Messages	<ol style="list-style-type: none"> <li>1. Gearbox status.</li> <li>2. ABS status.</li> <li>3. Instrument cluster status.</li> <li>4. Airbag status.</li> </ol>

**Table 49 - Group 2 Idle Speed Operating Condition**

Relevant when '1' is displayed in the 3-digit block			
X	X	X	Display group 2 - Line 3
		1	A/C compressor switched on
	1		Idling switch closed
1			Idle speed increased due to A/C

**Table 50 - Group 6 Brake/Clutch Pedal Positions**

Relevant when '1' is displayed in the 3-digit block			
X	X	X	Display group 6 - Line 2
		1	Brake light switch closed
	1		Brake pedal switch open
1			Clutch pedal switch open

**Table 51 - Group 16 Additional Heater Condition**

Relevant when '1' is displayed in the 8-digit blocks								
X	X	X	X	X	X	X	X	Display group 16 - Line 2
							1	Coolant temperature above 70 to 80°C, or intake air temperature above 5°C
						1		Alternator defective
					1			Battery voltage below 9V
				1				Engine speed below 760 rpm
			1					Engine start within the last 10 secs
		1						Coolant or Intake manifold temperature sensor defective
	1							Not assigned
1								Not assigned

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**Table 52 - Group 16 Activation of Heater Elements**

Relevant when '1' is displayed in the 2-digit blocks		
X	X	Display group 16 - Line 3
	1	Low heat output relay on
1		High heat output relay on

## Engine Codes: ANA

Display Code	Description
1 Lambda Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine coolant temperature.</li> <li>3. Lambda control (see note below)</li> <li>4. Operating condition (for the relevance of this display line, see Table 53).</li> </ol>
<i>NOTE: Minus value indicates a weak mixture, positive value indicates a rich mixture</i>	
2 Injection Duration	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Injection duration.</li> <li>4. Intake air mass.</li> </ol>
3 Ignition Timing	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Intake air mass (engine load).</li> <li>3. Throttle valve angle sensor 1.</li> <li>4. Ignition timing.</li> </ol>
4 Temperature	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. ECU supply voltage.</li> <li>3. Engine coolant temperature.</li> <li>4. Intake air temperature.</li> </ol>
5 Operating Mode	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Vehicle speed.</li> <li>4. Operating mode (idle, part load, etc.).</li> </ol>
6 Altitude Correction	<ol style="list-style-type: none"> <li>1. Engine speed</li> <li>2. Engine load.</li> <li>3. Intake air temperature.</li> <li>4. Altitude correction factor (see note below).</li> </ol>
<i>NOTE: At sea level value should be +5 to -10</i> <i>1000m value should be -5 to -20</i> <i>2000m value should be -10 to -30</i>	
10 Ignition	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Throttle valve angle.</li> <li>4. Ignition timing.</li> </ol>



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12 Distributor Settings	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. No. of the teeth on the crank sender wheel when the Hall sensor signal changes from - to + (see note below).</li> <li>4. No. of teeth on the crank sender wheel when the Hall sensor signal changes from + to - (see note below).</li> </ol>
<p><i>NOTE: The engine speed sensor on the crankshaft transmits both the engine speed signal and a reference for crankshaft position. The reference signal is generated by a gap in the sender wheel. The Hall sensor rotor ring on the camshaft has a 180° division so that for half a camshaft revolution the window for the Hall sensor is covered, and for the other half revolution the window is exposed. To synchronise the components when starting, the ECU records the instant the Hall sensor rotor ring begins to cover the window (signal changes from - to +) and the instant the window begins to be exposed (signal changes from + to -). When the reference mark signal from the crank sensor is detected, the ECU counts the number of teeth on the crankshaft mounted sender wheel. As soon as it has counted between 26 and 30 teeth after the reference gap, the signal from the Hall sensor should change from - to +. After between 86 and 90 teeth, the Hall sensor signal should change from + to -.</i></p>	
14 Misfire Recognition	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Misfire total (see note below).</li> <li>4. Misfire recognition status.</li> </ol>
<p><i>NOTE: This specification is only valid for 5 mins after the engine has been started.</i></p>	
15 Misfire Recognition	<ol style="list-style-type: none"> <li>1. Cylinder 1 misfire.</li> <li>2. Cylinder 2 misfire.</li> <li>3. Cylinder 3 misfire.</li> <li>4. Misfire recognition status.</li> </ol>
16 Misfire Recognition	<ol style="list-style-type: none"> <li>1. Cylinder 4 misfire.</li> <li>2. Not allocated</li> <li>3. Not allocated</li> <li>4. Misfire recognition status.</li> </ol>
20 Knock Control	<ol style="list-style-type: none"> <li>1. Retardation of ignition timing by knock control - cylinder 1.</li> <li>2. Retardation of ignition timing by knock control - cylinder 2.</li> <li>3. Retardation of ignition timing by knock control - cylinder 3.</li> <li>4. Retardation of ignition timing by knock control - cylinder 4</li> </ol>
22 Knock Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Retardation of ignition timing by knock control - cylinder 1.</li> <li>4. Retardation of ignition timing by knock control - cylinder 2.</li> </ol>
23 Knock Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Retardation of ignition timing by knock control - cylinder 3.</li> <li>4. Retardation of ignition timing by knock control - cylinder 4.</li> </ol>

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30 Lambda Regulation	<ol style="list-style-type: none"> <li>1. Lambda status pre-catalyst (for the relevance of this display line, see Table 54).</li> <li>2. Lambda status post-catalyst (for the relevance of this display line, see Table 54).</li> <li>3.</li> <li>4.</li> </ol>
31 Oxygen Sensor	<ol style="list-style-type: none"> <li>1. Oxygen sensor actual voltage.</li> <li>2. Oxygen sensor specified voltage.</li> <li>3. Not allocated</li> <li>4. Not allocated</li> </ol>
32 Lambda Learnt Values	<ol style="list-style-type: none"> <li>1. Lambda learnt value at idling speed (additive) (see note below).</li> <li>2. Lambda learnt value at part load (multiplicative) (see note below).</li> <li>3. Not allocated</li> <li>4. Not allocated</li> </ol>
<p><i>NOTE: A low value indicates that the engine is running too rich and therefore the ECU is weakening the mixture.</i></p> <p><i>A high value indicates that the engine is running too weak and therefore the ECU is enriching the mixture.</i></p> <p><i>Additive: The effects of a fault (e.g. Intake air leak), will reduce as the engine speed increases, so the injection period will be modified by a fixed amount. This amount is not dependent on the basic injection duration period.</i></p> <p><i>Multiplicative: The effects of a fault (e.g. Injector fault) will increase as engine speed increases, so a multiplicative learnt value is a proportional change to the injection duration. The change is dependent on the basic injection duration period.</i></p>	
33 Lambda Regulation	<ol style="list-style-type: none"> <li>1. Pre-catalyst lambda regulation.</li> <li>2. Pre-catalyst oxygen sensor voltage.</li> <li>3. Not allocated</li> <li>4. Not allocated</li> </ol>
34 Lambda Regulation	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Catalyst temperature (see Note 1 below).</li> <li>3. Dynamic factor (see Note 2 below).</li> <li>4. Result of pre-catalyst oxygen sensor age test (see Note 2 below)</li> </ol>
<p><i>NOTE 1: Calculated value from engine speed and load.</i></p> <p><i>NOTE 2: The dynamic factor is an Oxygen sensor ageing measurement. The ECU compares the adjustment frequency of the sensors' evaluation circuitry with a stored specification. If the value is not reached, the text 'B1-P1 n/OK' is displayed in zone 4.</i></p>	
41 Lambda Regulation	<ol style="list-style-type: none"> <li>1. Pre-catalyst oxygen sensor internal resistance.</li> <li>2. Pre-catalyst oxygen sensor heating status.</li> <li>3. Post-catalyst oxygen sensor internal resistance.</li> <li>4. Post-catalyst oxygen sensor heating status.</li> </ol>
43 Post-catalyst Oxygen Sensor	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Catalyst temperature.</li> <li>3. Oxygen sensor voltage.</li> <li>4. Result of oxygen sensor test.</li> </ol>

46 Catalyst Diagnosis	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Catalyst temperature.</li> <li>3. Catalyst conversion measured value.</li> <li>4. Result of catalyst conversion test.</li> </ol>
50 Idle Speed Regulation	<ol style="list-style-type: none"> <li>1. Actual engine speed.</li> <li>2. Specified engine speed.</li> <li>3. A/C operating condition.</li> <li>4. A/C compressor operating condition.</li> </ol>
54 Idling Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Operating mode (idle, part load, etc.).</li> <li>3. Accelerator pedal position sensor 1.</li> <li>4. Throttle valve angle sensor 1.</li> </ol>
55 Idling Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Idle speed regulator.</li> <li>3. Idle speed stabilisation learning value.</li> <li>4. Operating condition (for the relevance of this display line, see Table 55).</li> </ol>
56 Idling Control	<ol style="list-style-type: none"> <li>1. Actual engine speed.</li> <li>2. Specified engine speed.</li> <li>3. Idle speed regulator.</li> <li>4. Operating mode (for the relevance of this display line, see Table 56).</li> </ol>
60 Electronic Throttle System	<ol style="list-style-type: none"> <li>1. Throttle valve angle (sensor 1).</li> <li>2. Throttle valve angle (sensor 2).</li> <li>3. Learning step counter (see WSM)</li> <li>4. Adaptation condition.</li> </ol>
62 Electronic Throttle System	<ol style="list-style-type: none"> <li>1. Throttle valve angle (sensor 1).</li> <li>2. Throttle valve angle (sensor 2).</li> <li>3. Accelerator pedal position (sensor 1)</li> <li>4. Accelerator pedal position (sensor 2).</li> </ol>
63 Kick-down Adaption	<ol style="list-style-type: none"> <li>1. Hold down the accelerator pedal.</li> <li>2. Not allocated</li> <li>3. Not allocated</li> <li>4. Not allocated</li> </ol>
66 Cruise Control System (CCS)	<ol style="list-style-type: none"> <li>1. Actual vehicle speed.</li> <li>2. Brake, clutch and CCS switch positions (for the relevance of this display line, see Table 57).</li> <li>3. Specified vehicle speed (last value stored by CCS).</li> <li>4. CCS switch position (for the relevance of this display line, see Table 58).</li> </ol>

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70 EVAP System Diagnosis	<ol style="list-style-type: none"><li>1. EVAP canister solenoid valve duty cycle.</li><li>2. Lambda regulation during TVV diagnosis (see note below).</li><li>3. Idle speed deviation during TVV diagnosis.</li><li>4. Result of diagnosis (see note below).</li></ol>
<i>NOTE: TVV = Fuel tank vent valve</i> <i>Negative valve = Canister full.</i> <i>Positive value = Canister empty.</i>	
77 Secondary Air Injection System	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine coolant temperature.</li><li>3. Not allocated</li><li>4. Result of test.</li></ol>
86 Readiness Code	<ol style="list-style-type: none"><li>1. Readiness code (for the relevance of this display line, see Table 59).</li><li>2. Not allocated</li><li>3. Not allocated</li><li>4. Not allocated</li></ol>
95 Variable Intake Manifold	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Engine coolant temperature.</li><li>4. Variable manifold status (see note below).</li></ol>
<i>NOTE: During rapid accelerator operation (up to 2000 rpm), the status must change from OFF to ON.</i>	
99 Lambda Regulation	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine coolant temperature.</li><li>3. Lambda regulator.</li><li>4. Lambda regulator operating condition.</li></ol>
120 Traction Control	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Specified engine load.</li><li>3. Actual engine load.</li><li>4. Status.</li></ol>
122 Automatic Transmission	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Specified engine load.</li><li>3. Actual engine load.</li><li>4. Status.</li></ol>

**Table 53 - Group 1 Operating Condition**

Relevant when '1' is displayed in the 8-digit blocks								
X	X	X	X	X	X	X	X	Display group 1 - Line 4
							1	Coolant temperature above 80°C
						1		Speed below 2000 rpm
					1			Throttle valve closed
				1				Lambda regulation OK
			1					Idle switch closed
		1						A/C compressor switch off
	1							Not assigned
1								No faults recognised

**Table 54 - Group 30 Lambda Regulation**

Relevant when '1' is displayed in the 3-digit blocks				
X		X	X	Display group 30 - Lines 1 & 2
			1	Lambda regulation active
		1		Oxygen sensor operationally ready
1				Oxygen sensor heating on

**Table 55 - Group 55 Operating Conditions**

Relevant when '1' is displayed in the 5-digit blocks					
X	X	X	X	X	Display group 55 - Line 4
				1	A/C compressor switch on
			1		Selected gear
		1			A/C system switched on
	X				Not relevant
1					PAS pressure switch on

**Table 56 - Group 56 Idle Control Operating Mode**

Relevant when '1' is displayed in the 5-digit blocks					
X	X	X	X	X	Display group 56 - Line 4
				1	A/C compressor switch on
			1		Selected gear
		1			A/C system switched on
	X				Not relevant
1					PAS pressure switch on

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**Table 57 - Group 66 Brake/Clutch Switch Monitor**

Relevant when '1' is displayed in the 4-digit blocks				
X	X	X	X	Display group 66 - Line 2
			1	Brake depressed (brake light switch)
		1		Brake depressed (brake pedal switch)
	1			Clutch depressed (AT: always 1)
1				Cruise control system operational (CCS)

**Table 58 - Group 66 Cruise Control Switch Monitor**

Relevant when '1' is displayed in the 4-digit blocks				
X	X	X	X	Display group 66 - Line 4
			1	CCS sliding switch at off (switch locked)
		1		CCS sliding switch at off (switch unlocked)
	1			'SET' button depressed
1				CCS sliding switch at 'RES'

**Table 59 - Group 86 Readiness Code**

Relevant when '1' is displayed in the 8-digit blocks								
X	X	X	X	X	X	X	X	Display group 86 - Line 1
							0	Catalyst
						0		Catalyst heating
					0			EVAP system
				0				Secondary air system
			0					Air conditioner
		0						Oxygen sensor
	0							Oxygen sensor heating
0								EGR system

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## Engine Codes: ANB, APT, APU and ARG

Display Group	Description
1	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine coolant temperature.</li><li>3. Lambda control (see note below).</li><li>4. Operating condition (for the relevance of this display line, see Table 60).</li></ol>
<i>NOTE: Minus value indicates a weak mixture, positive value indicates a rich mixture.</i>	
2	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Injection duration.</li><li>4. Intake air mass.</li></ol>
3	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Intake air mass.</li><li>3. Throttle valve angle.</li><li>4. Ignition timing.</li></ol>
4	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. ECU supply voltage.</li><li>3. Engine coolant temperature.</li><li>4. Intake air temperature.</li></ol>
5	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Vehicle speed.</li><li>4. Operating mode (idle, part load, etc.).</li></ol>
6	<ol style="list-style-type: none"><li>1. Engine speed</li><li>2. Engine load.</li><li>3. Intake air temperature.</li><li>4. Altitude correction factor.</li></ol>
10 Ignition	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Throttle valve angle.</li><li>4. Ignition timing.</li></ol>
14 Misfire Recognition (code: ANB)	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Misfire total.</li><li>4. Misfire recognition.</li></ol>
22 Knock Control	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Retardation of ignition timing by knock control - cylinder 1.</li><li>4. Retardation of ignition timing by knock control - cylinder 2.</li></ol>

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23 Knock Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Retardation of ignition timing by knock control cylinder 3.</li> <li>4. Retardation of ignition timing by knock control cylinder 4.</li> </ol>
30 Lambda Regulation	<ol style="list-style-type: none"> <li>1. Pre-catalyst lambda regulation status (for the relevance of this display line, see Table 61).</li> <li>2. Post-catalyst lambda regulation status (for the relevance of this display line, see Table 61).</li> <li>3. Not allocated</li> <li>4. Not allocated</li> </ol>
32 Lambda Regulation	<ol style="list-style-type: none"> <li>1. Lambda learnt value at idling speed (additive) (see note below).</li> <li>2. Lambda learnt value at part load (multiplicative) (see note below).</li> <li>3. Not allocated</li> <li>4. Not allocated</li> </ol>
<p><i>NOTE: A low value indicates that the engine is running too rich and therefore the ECU is weakening the mixture.</i></p> <p><i>A high value indicates that the engine is running too weak and therefore the ECU is enriching the mixture</i></p> <p><i>Additive: The effects of a fault (e.g. Intake air leak), will reduce as the engine speed increases, so the injection period will be modified by a fixed amount. This amount is not dependent on the basic injection duration period.</i></p> <p><i>Multiplicative: The effects of a fault (e.g. Injector fault) will increase as engine speed increases, so a multiplicative learnt value is a proportional change to the injection duration. The change is dependent on the basic injection duration period.</i></p>	
33 Lambda Regulation	<ol style="list-style-type: none"> <li>1. Pre-catalyst lambda regulator.</li> <li>2. Pre-catalyst oxygen sensor voltage.</li> <li>3. Not allocated</li> <li>4. Not allocated</li> </ol>
34 Lambda Regulation (code: ANB)	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Catalyst temperature (see Note 1 below).</li> <li>3. Pre-catalyst oxygen sensor cycle duration.</li> <li>4. Result of pre-catalyst oxygen sensor age test (see Note 2 below).</li> </ol>
<p><i>NOTE 1: Calculated value from engine speed and load</i></p> <p><i>NOTE 2: The ECU compares the adjustment frequency of the sensors' evaluation circuitry with a stored specification. If the value is not reached, the text 'B1-P1 n/OK' is displayed in line 4.</i></p>	
37 Lambda Regulation (code ANB)	<ol style="list-style-type: none"> <li>1. Engine load.</li> <li>2. Post-catalyst oxygen sensor voltage.</li> <li>3. Pre-catalyst lambda regulation dwell period.</li> <li>4. Test result.</li> </ol>
41 Oxygen sensor heating	<ol style="list-style-type: none"> <li>1. Pre-catalyst oxygen sensor heater resistance.</li> <li>2. Pre-catalyst oxygen sensor heater status.</li> <li>3. Post-catalyst oxygen sensor heater resistance.</li> <li>4. Post-catalyst oxygen sensor heater status.</li> </ol>



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46 Catalyst Diagnosis (code ANB)	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Catalyst temperature.</li> <li>3. Amplitude ratio.</li> <li>4. Test result.</li> </ol>
99 Lambda Regulation Operating Conditions	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine coolant temperature.</li> <li>3. Lambda regulator.</li> <li>4. Operating mode.</li> </ol>
50 Idle Speed Regulation	<ol style="list-style-type: none"> <li>1. Actual engine speed.</li> <li>2. Specified engine speed.</li> <li>3. A/C operating mode.</li> <li>4. A/C compressor status.</li> </ol>
54 Idling Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Operating mode (idle, part load, etc.).</li> <li>3. Accelerator pedal position (sensor 1).</li> <li>4. Throttle valve angle (sensor 1).</li> </ol>
55 Speed Regulation	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Idling regulator.</li> <li>3. Idling regulator learnt value.</li> <li>4. Operating condition (for the relevance of this display line, see Table 62).</li> </ol>
56 Speed Regulation	<ol style="list-style-type: none"> <li>1. Actual engine speed.</li> <li>2. Specified engine speed.</li> <li>3. Idling regulator.</li> <li>4. Operating mode (for the relevance of this display line, see Table 63).</li> </ol>
60 Electronic Throttle System	<ol style="list-style-type: none"> <li>1. Throttle valve angle (sensor 1).</li> <li>2. Throttle valve angle (sensor 2).</li> <li>3. Learning step counter.</li> <li>4. Adaptation condition.</li> </ol>
62 Electronic Throttle System	<ol style="list-style-type: none"> <li>1. Throttle valve angle (sensor 1).</li> <li>2. Throttle valve angle (sensor 2).</li> <li>3. Accelerator pedal position (sensor 1)</li> <li>4. Accelerator pedal position (sensor 2).</li> </ol>
62 Electronic Throttle System kick-down adaption	<ol style="list-style-type: none"> <li>1. Throttle valve angle (sensor 1).</li> <li>2. Throttle valve angle (sensor 2).</li> <li>3. Accelerator pedal position.</li> <li>4.</li> </ol>

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66 Cruise Control System (CCS)	<ol style="list-style-type: none"> <li>1. Actual vehicle speed.</li> <li>2. Brake, clutch and CCS switch positions (for the relevance of this display line, see Table 64).</li> <li>3. Specified vehicle speed (last value stored by CCS).</li> <li>4. Position of CCS controls switch (for the relevance of this display line, see Table 65).</li> </ol>
70 EVAP System (code ANB)	<ol style="list-style-type: none"> <li>1. EVAP canister purge valve duty cycle.</li> <li>2. Lambda regulation deviation during tank vent valve diagnosis.</li> <li>3. Not allocated</li> <li>4. Result of test.</li> </ol>
77 Secondary Air Injection System (code ANB)	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine coolant temperature.</li> <li>3. Secondary air injection air mass</li> <li>4. Result of test.</li> </ol>
91 Camshaft Adjustment (non-turbo)	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Operating mode of camshaft adjustment.</li> <li>4. Active camshaft adjustment angle.</li> </ol>
95 Variable Manifold (non-turbo)	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Engine coolant temperature.</li> <li>4. Status.</li> </ol>
100 Readiness Code (code ANB)	<ol style="list-style-type: none"> <li>1. Readiness code (for the relevance of this display line, see Table 66).</li> <li>2. Engine coolant temperature.</li> <li>3. Period since last engine start.</li> <li>4. Diagnosis status.</li> </ol>
114 Turbo Charge Pressure Control	<ol style="list-style-type: none"> <li>1. Specified engine load.</li> <li>2. Specified engine load after correction (see note below).</li> <li>3. Actual engine load.</li> <li>4. Charge pressure control solenoid duty cycle.</li> </ol>
<i>NOTE: Reduced after knock control, altitude adaption and coolant temperature regulation.</i>	
115 Turbo Charge Pressure Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Specified turbo charge pressure.</li> <li>4. Actual turbo charge pressure.</li> </ol>
117 Turbo Charge Pressure Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Accelerator pedal position (sensor 1).</li> <li>3. Throttle valve angle (sensor 1).</li> <li>4. Specified turbo charge pressure.</li> </ol>

118 Turbo Charge Pressure Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Intake air temperature.</li> <li>3. Turbo charge pressure control valve duty cycle.</li> <li>4. Actual turbo charge pressure.</li> </ol>
120 Traction Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified engine load.</li> <li>3. Actual engine load.</li> <li>4. Status.</li> </ol>

**Table 60 - Group 1 Operating Condition**

Relevant when '1' is displayed in the 8-digit blocks								
X	X	X	X	X	X	X	X	Display group 1 - Line 4
							1	Coolant temperature above 80°C
						1		Speed below 2000 rpm
					1			Throttle valve closed
				1				Lambda regulation OK
			1					Idle switch closed
		1						A/C compressor switch off
	1							Not assigned
1								No faults recognised

**Table 61 - Group 30 Lambda Regulation Status**

Relevant when '1' is displayed in the 3-digit blocks			
X	X	X	Display group 30 - Lines 1 & 2
		1	Lambda regulation active
	1		Oxygen sensor operationally ready
1			Oxygen sensor heating on

**Table 62 - Group 55 Speed Regulation Operating Condition**

Relevant when '1' is displayed in the 5-digit blocks					
X	X	X	X	X	Display group 55 - Line 4
				1	A/C compressor switch on
			1		Selected gear
		1			A/C system switched on
	X				Not relevant
1					Not relevant

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**Table 63 - Group 56 Speed Regulation Operating Mode**

Relevant when '1' is displayed in the 5-digit blocks					
X	X	X	X	X	Display group 56 - Line 4
				1	A/C compressor switch on
			1		Selected gear
		1			A/C system switched on
	X				Not relevant
1					Not relevant

**Table 64 - Group 66 Brake/Clutch Switch Monitor**

Relevant when '1' is displayed in the 4-digit blocks				
X	X	X	X	Display group 66 - Line 2
			1	Brake depressed (brake light switch)
		1		Brake depressed (brake pedal switch)
	1			Clutch depressed (AT: always 1)
1				Cruise control system operational (CCS)

**Table 65 - Group 66 Cruise Control Switch Monitor**

Relevant when '1' is displayed in the 4-digit blocks				
X	X	X	X	Display group 66 - Line 4
			1	CCS sliding switch at off (switch locked)
		1		CCS sliding switch at off (switch unlocked)
	1			'SET' button depressed
1				CCS sliding switch at 'RES'

**Table 66 - Group 100 Readiness Code**

Relevant when '1' is displayed in the 8-digit blocks								
X	X	X	X	X	X	X	X	Display group 100 - Line 1
							0	Catalyst
						0		Catalyst heating
					0			EVAP system
				0				Secondary air system
			0					Air conditioner
		0						Oxygen sensor
	0							Oxygen sensor heating
0								EGR system

## Engine Codes: APR and AQD

Display Group	Description
1	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine coolant temperature.</li> <li>3. Lambda regulator - Bank 1 (see note below).</li> <li>4. Lambda regulator - Bank 2 (see note below).</li> </ol>
<p><i>NOTE: Bank 1 = cylinders 1, 2 and 3</i>  <i>Bank 2 = cylinders 4, 5 and 6</i></p>	
2	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Injection duration.</li> <li>4. Intake air mass.</li> </ol>
3	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Intake air mass.</li> <li>3. Throttle valve angle (sensor 1).</li> <li>4. Ignition timing.</li> </ol>
4	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. ECU supply voltage.</li> <li>3. Engine coolant temperature.</li> <li>4. Intake air temperature.</li> </ol>
5	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Vehicle speed.</li> <li>4. Operating mode (idle, part load).</li> </ol>

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6	<ol style="list-style-type: none"> <li>1. Engine speed</li> <li>2. Engine load.</li> <li>3. Intake air temperature.</li> <li>4. Altitude correction factor.</li> </ol>
10 Ignition	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Throttle valve angle (sensor 1).</li> <li>4. Ignition timing.</li> </ol>
22 Knock Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Retardation of ignition timing by knock control - cylinder 1.</li> <li>4. Retardation of ignition timing by knock control - cylinder 2.</li> </ol>
23 Knock Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Retardation of ignition timing by knock control cylinder 3.</li> <li>4. Retardation of ignition timing by knock control cylinder 4.</li> </ol>
24 Knock Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Retardation of ignition timing by knock control cylinder 5.</li> <li>4. Retardation of ignition timing by knock control cylinder 6.</li> </ol>
28 Knock Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Engine coolant temperature.</li> <li>4. Result of knock sensor test.</li> </ol>
30 Lambda Regulation	<ol style="list-style-type: none"> <li>1. Oxygen sensor status - Bank 1 (for the relevance of this display line, see Table 67).</li> <li>2. Not allocated</li> <li>3. Oxygen sensor status - Bank 2 (for the relevance of this display line, see Table 67).</li> <li>4. Not allocated</li> </ol>
31 Oxygen Sensor Voltage	<ol style="list-style-type: none"> <li>1. Oxygen sensor status - Bank 1.</li> <li>2. Not allocated</li> <li>3. Oxygen sensor status - Bank 2.</li> <li>4. Not allocated.</li> </ol>
32 Lambda Learnt Values	<ol style="list-style-type: none"> <li>1. Idle speed lambda learnt values - Bank 1 (additive) (see note below).</li> <li>2. Part load lambda learnt values - Bank 1 (multiplicative) (see note below).</li> <li>3. Idle speed lambda learnt values - Bank 2 (additive) (see note below).</li> <li>4. Idle speed lambda learnt values - Bank 2 (multiplicative) (see note below).</li> </ol>

*NOTE: A low value indicates that the engine is running too rich and therefore the ECU is weakening the mixture.*

*A high value indicates that the engine is running too weak and therefore the ECU is enriching the mixture.*

*Additive: The effects of a fault (e.g. Intake air leak), will reduce as the engine speed increases, so the injection period will be modified by a fixed amount. This amount is not dependent on the basic injection duration period.*

*Multiplicative: The effects of a fault (e.g. Injector fault) will increase as engine speed increases, so a multiplicative learnt value is a proportional change to the injection duration. The change is dependent on the basic injection duration period.*

33 Lambda Regulation Values	<ol style="list-style-type: none"> <li>1. Lambda regulation - Bank 1.</li> <li>2. Oxygen sensor voltage - Bank 1.</li> <li>3. Lambda regulation - Bank 2</li> <li>4. Oxygen sensor voltage - Bank 2</li> </ol>
99 Lambda Regulation	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine coolant temperature.</li> <li>3. Lambda regulator.</li> <li>4. Lambda regulation operating mode.</li> </ol>
50 Idle Speed Regulation	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified engine speed.</li> <li>3. A/C system operating mode.</li> <li>4. A/C compressor status.</li> </ol>
54 Idle Speed Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Operating mode (idle, part load, etc.).</li> <li>3. Accelerator pedal position - sensor 1.</li> <li>4. Throttle valve angle - sensor 1.</li> </ol>
55 Idle Speed Stabilisation	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Idling regulator.</li> <li>3. Idle regulator learning value.</li> <li>4. Operating mode (for the relevance of this display line, see Table 68).</li> </ol>
56 Idle Speed Stabilisation	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified engine speed.</li> <li>3. Idle regulator.</li> <li>4. Operating mode (for the relevance of this display line, see Table 69).</li> </ol>
60 Electronic Throttle System	<ol style="list-style-type: none"> <li>1. Throttle valve angle - sensor 1.</li> <li>2. Throttle valve angle - sensor 2.</li> <li>3. Learning step counter.</li> <li>4. Adaption condition.</li> </ol>

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61 Electronic Throttle System	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. ECU supply voltage.</li> <li>3. Throttle valve angle - sensor 1.</li> <li>4. Operating mode (for the relevance of this display line, see Table 70).</li> </ol>
62 Electronic Throttle System	<ol style="list-style-type: none"> <li>1. Throttle valve angle - sensor 1.</li> <li>2. Throttle valve angle - sensor 2.</li> <li>3. Accelerator pedal position - sensor 1.</li> <li>4. Accelerator pedal position - sensor 2.</li> </ol>
63 Electronic Throttle System - kick down adaption	<ol style="list-style-type: none"> <li>1. Throttle valve angle - sensor 1.</li> <li>2. Throttle valve angle - sensor 2.</li> <li>3. Accelerator pedal position.</li> <li>4. Operating mode.</li> </ol>
66 Cruise Control System (CCS)	<ol style="list-style-type: none"> <li>1. Vehicle speed.</li> <li>2. Brake, clutch and CCS switch positions (for the relevance of this display line, see Table 71).</li> <li>3. Specified road speed (last value stored by CCS).</li> <li>4. Position of CCS control switch (for the relevance of this display line, see Table 72).</li> </ol>
120 Traction Control System	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified engine load.</li> <li>3. Measured engine load</li> <li>4. Status.</li> </ol>

**Table 67 - Group 30 Lambda Regulation**

Relevant when '1' is displayed in the 3-digit blocks			
X	X	X	Display group 30 - Lines 1 & 2
		1	Lambda regulation active
	1		Oxygen sensor operationally ready
1			Oxygen sensor heating on



**Table 68 - Group 55 Idle Speed Operating Mode**

Relevant when '1' is displayed in the 5-digit blocks					
X	X	X	X	X	Display group 55 - Line 4
				1	A/C compressor switch on
			1		Selected gear
		1			A/C system switched on
	X				Not relevant
1					PAS pressure switch on

**Table 69 - Group 56 Idle Speed Operating Mode**

Relevant when '1' is displayed in the 5-digit blocks					
X	X	X	X	X	Display group 55 - Line 4
				1	A/C compressor switch on
			1		Selected gear
		1			A/C system switched on
	X				Not relevant
1					PAS pressure switch on

**Table 70 - Group 61 Electronic Throttle Operating Mode**

Relevant when '1' is displayed in the 5-digit blocks					
X	X	X	X	X	Display group 55 - Line 4
				1	A/C compressor switch on
			1		Selected gear
		1			A/C system switched on
	X				Not relevant
1					PAS pressure switch on

**Table 71 - Group 66 Brake/Clutch Switch Monitor**

Relevant when '1' is displayed in the 4-digit blocks					
X	X	X	X		Display group 66 - Line 2
			1		Brake depressed (brake light switch)
		1			Brake depressed (brake pedal switch)
	1				Clutch depressed (AT: always 1)
1					Cruise control system operational (CCS)

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**Table 72 - Group 66 Cruise Control Switch Monitor**

Relevant when '1' is displayed in the 4-digit blocks				
X	X	X	X	Display group 66 - Line 4
			1	CCS sliding switch at off (switch locked)
		1		CCS sliding switch at off (switch unlocked)
	1			'SET' button depressed
1				CCS sliding switch at 'RES'

## Engine Codes: AHL and ARM

Display Group	Description
1	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine coolant temperature.</li> <li>3. Oxygen sensor voltage.</li> <li>4. Adjustment condition for matching throttle valve (for the relevance of this display line, see Table 73).</li> </ol>
2	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Intake air mass.</li> <li>3. Vehicle speed.</li> <li>4. Engine operating conditions (for the relevance of this display line, see Table 74).</li> </ol>
3	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Intake air mass.</li> <li>3. Throttle valve angle.</li> <li>4. Throttle valve positioner duty cycle.</li> </ol>
4	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Intake air mass (engine load).</li> <li>3. Injection duration.</li> <li>4. Intake air mass.</li> </ol>
5	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. ECU supply voltage.</li> <li>3. Engine coolant temperature.</li> <li>4. Intake air temperature.</li> </ol>
6 Altitude Correction	<ol style="list-style-type: none"> <li>1. Engine speed</li> <li>2. Intake air mass.</li> <li>3. Throttle valve angle.</li> <li>4. Altitude correction factor.</li> </ol>
7 Idling Adjustment	<ol style="list-style-type: none"> <li>1. Throttle valve angle.</li> <li>2. Idling control learnt value (transmission in Neutral or Park).</li> <li>3. Idling control learnt value (automatic transmission drive gear selected).</li> <li>4. Engine operating condition (for the relevance of this display line, see Table 75).</li> </ol>

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8 Idling Stabilisation	<ol style="list-style-type: none"> <li>1. Actual engine speed.</li> <li>2. Specified engine speed.</li> <li>3. Idling control.</li> <li>4. Intake air mass.</li> </ol>
9 Idling Air Requirements	<ol style="list-style-type: none"> <li>1. Idling control.</li> <li>2. Throttle valve control part operating status (for the relevance of this display line, see Table 76).</li> <li>3. Engine coolant temperature.</li> <li>4. Engine speed.</li> </ol>
10 Lambda Regulation and EVAP System	<ol style="list-style-type: none"> <li>1. Lambda control.</li> <li>2. Oxygen sensor voltage.</li> <li>3. EVAP canister purge valve duty cycle.</li> <li>4. Lambda correction factor whilst tank venting is active.</li> </ol>
11 Lambda Learning Values	<ol style="list-style-type: none"> <li>1. Injection duration.</li> <li>2. Lambda learnt value at idle.</li> <li>3. Lambda learnt value at part load.</li> <li>4. Tank vent valve condition (for the relevance of this display line, see Table 77).</li> </ol>
12 Lambda Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Intake air mass (engine load).</li> <li>3. Lambda control.</li> <li>4. Oxygen sensor voltage.</li> </ol>
13 Fuel Consumption	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Intake air mass (engine load).</li> <li>3. Vehicle speed.</li> <li>4. Fuel consumption.</li> </ol>
14 Knock Control	<ol style="list-style-type: none"> <li>1. Retardation of ignition timing by knock control - cylinder 1.</li> <li>2. Retardation of ignition timing by knock control - cylinder 2.</li> <li>3. Retardation of ignition timing by knock control - cylinder 3.</li> <li>4. Retardation of ignition timing by knock control - cylinder 4.</li> </ol>
15 Knock Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Intake air mass (engine load).</li> <li>3. Retardation of ignition timing by knock control - cylinder 1.</li> <li>4. Retardation of ignition timing by knock control - cylinder 2.</li> </ol>
16 Knock Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Intake air mass (engine load).</li> <li>3. Retardation of ignition timing by knock control - cylinder 3.</li> <li>4. Retardation of ignition timing by knock control - cylinder 4.</li> </ol>
17 Knock Control	<ol style="list-style-type: none"> <li>1. Cylinder 1 knock sensor voltage.</li> <li>2. Cylinder 2 knock sensor voltage.</li> <li>3. Cylinder 3 knock sensor voltage.</li> <li>4. Cylinder 4 knock sensor voltage.</li> </ol>

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18 Torque Reduction (automatic transmission)	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Intake air mass (engine load).</li> <li>3. Retardation of ignition timing for gearbox 'cut-in'.</li> <li>4. Ignition timing.</li> </ol>
19 Operating Conditions	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Selector lever position (0=Neutral).</li> <li>3. A/C system (0=off).</li> <li>4. A/C compressor (0=off).</li> </ol>
20 Lambda Control Operating Conditions	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Intake air mass (engine load).</li> <li>3. Engine coolant temperature.</li> <li>4. Lambda control operating conditions (for the relevance of this display line, see Table 78).</li> </ol>
21 Throttle Valve Control part adaption condition	<ol style="list-style-type: none"> <li>1. Throttle valve control part operating condition (for the relevance of this display line, see Table 79).</li> <li>2. Throttle valve minimum position.</li> <li>3. Throttle valve 'limp home' running position.</li> <li>4. Throttle valve maximum position.</li> </ol>
22 Position of Camshaft in relation to the Crankshaft	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Intake air mass (engine load).</li> <li>3. No. of teeth on the crank sender wheel when the Hall sensor signal changes from - to + (see note below).</li> <li>4. No. of teeth on the crank sender wheel when the Hall sensor signal changes from + to - (see note below).</li> </ol>
<p><i>NOTE: The engine speed sensor on the crankshaft transmits both the engine speed signal and a reference for crankshaft position. The reference signal is generated by a gap in the sender wheel. The Hall sensor rotor ring on the camshaft has a 180° division so that for half a camshaft revolution the window for the Hall sensor is covered, and for the other half revolution the window is exposed. To synchronise the components when starting, the ECU records the instant the Hall sensor rotor ring begins to cover the window (signal changes from - to +) and the instant the window begins to be exposed (signal changes from + to -). When the reference mark signal from the crank sensor is detected, the ECU counts the number of teeth on the crankshaft mounted sender wheel, as soon as it has counted between 26 and 30 teeth after the reference gap, the signal from the Hall sensor should change from - to +. After between 86 and 90 teeth, the Hall sensor signal should change from + to -.</i></p>	
98 Matching Throttle Control part	<ol style="list-style-type: none"> <li>1. Throttle valve potentiometer voltage.</li> <li>2. Throttle valve positioner potentiometer voltage.</li> <li>3. Throttle control part operating condition (for the relevance of this display line, see Table 80).</li> <li>4. Throttle control part matching condition (for the relevance of this display line, see Table 81).</li> </ol>

99 Lambda Regulation	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine coolant temperature.</li> <li>3. Lambda control.</li> <li>4. Operating condition (for the relevance of this display line, see Table 82).</li> </ol>
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**Table 73 - Group 1 Adjustment Condition**

Relevant when '1' is displayed in the 8-digit blocks								
X	X	X	X	X	X	X	X	Display group 1 - Line 4
							1	Coolant temperature below 80°C
						1		Engine running
					1			Throttle valve open
				1				Fault in lambda control
			1					Idle switch open
		1						A/C compressor switch on
	1							Signal from automatic gearbox
1								Fault recognised

**Table 74 - Group 2 Engine Operating Conditions**

Relevant when '1' is displayed in the 4-digit blocks				
X	X	X	X	Display group 2 - Line 4
			1	Full throttle
		1		Part throttle
	1			Idling
1				Overrun

**Table 75 - Group 7 Engine Operating Conditions**

Relevant when '1' is displayed in the 4-digit blocks				
X	X	X	X	Display group 7 - Line 4
			1	Full throttle
		1		Part throttle
	1			Idling
1				Overrun

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**Table 76 - Group 9 Throttle Valve Operating Conditions**

Relevant when '1' is displayed in the 4-digit blocks				
X	X	X	X	Display group 9 - Line 2
			1	Idle switch open
		1		Battery voltage below 8V
	1			No current supply to throttle control part
1				Fault recognised

**Table 77 - Group 11 Tank Vent Valve Condition**

Relevant when '1' is displayed in the 8-digit blocks								
X	X	X	X	X	X	X	X	Display group 11 - Line 4
							1	Tank vent valve closed
						1		Tank vent valve minimum operating level
					1			Tank vent valve operating normally
				1				Vapour content check via tank vent valve
			1					Transition to tank vent valve closure
		1						Transition to tank vent valve minimum operating level
	1							Transition to vapour content check via tank vent valve
0								Not assigned

**Table 78 - Group 20 Lambda Control Operating Conditions**

Relevant when '1' is displayed in the 8-digit blocks								
X	X	X	X	X	X	X	X	Display group 20 - Line 4
							1	Mixture status (1 = rich, 0 = lean)
						1		Oxygen sensor functioning
					1			Lambda control switched on
				1				Lambda control at limit
			1					Restricted operating mode
		0						Not assigned
	0							Not assigned
1								Fault recorded during diagnosis

**Table 79 - Group 21 Throttle Valve Operating Condition**

Relevant when '1' is displayed in the 4-digit blocks				
X	X	X	X	Display group 21 - Line 1
			1	Idle switch open
		1		Battery voltage below 8V
	1			No current supply to throttle control part
1				Fault recognised

**Table 80 - Group 98 Throttle Valve Operating Condition**

Relevant when '1' is displayed in the 4-digit blocks				
X	X	X	X	Display group 21 - Line 1
			1	Idle switch open
		1		Battery voltage below 8V
	1			No current supply to throttle control part
1				Fault recognised

**Table 81 - Group 98 Throttle Valve Matching Condition**

Relevant when '1' is displayed in the 2-digit blocks		
X	X	Display group 98 - Line 4
	1	Throttle control part is being matched
1		Fault recognised

**Table 82 - Group 99 Lambda Regulation Operating Conditions**

Relevant when '1' is displayed in the 8-digit blocks								
X	X	X	X	X	X	X	X	Display group 20 - Line 4
							1	Mixture status (1 = rich, 0 = lean)
						1		Oxygen sensor functioning
					1			Lambda control switched on
				1				Lambda control at limit
			1					Restricted operating mode
		0						Not assigned
	0							Not assigned
1								Fault recorded during diagnosis

# Audi, Seat, Skoda and Volkswagen

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## Engine Codes: AGA, AJG, ALF and ALW

Display Group	Description
1	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine coolant temperature.</li><li>3. Lambda control - bank 1.</li><li>4. Lambda control - bank 2.</li></ol>
2	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Average injection duration.</li><li>4. Intake air mass.</li></ol>
4 Intake Air Temperature at idle speed	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Battery voltage.</li><li>3. Engine coolant temperature.</li><li>4. Intake air temperature.</li></ol>
5 Vehicle Speed	<ol style="list-style-type: none"><li>1. Engine speed.</li><li>2. Engine load.</li><li>3. Vehicle speed.</li><li>4. Engine operating status (part load, idle, etc.).</li></ol>
30 Oxygen Sensor	<ol style="list-style-type: none"><li>1. Oxygen sensor status - bank 1.</li><li>2.</li><li>3. Oxygen sensor status - bank 2.</li><li>4. Not allocated.</li></ol>
32 Lambda Learnt Values	<ol style="list-style-type: none"><li>1. Lambda learnt value at idle speed - bank 1 (additive) (see note below).</li><li>2. Lambda learnt value at part throttle - bank 1 (multiplicative) (see note below).</li><li>3. Lambda learnt value at idle speed - bank 2 (additive) (see note below).</li><li>4. Lambda learnt value at part throttle - bank 2 (multiplicative) (see note below).</li></ol>

*NOTE: A low value indicates that the engine is running too rich and therefore the ECU is weakening the mixture.*

*A high value indicates that the engine is running too weak and therefore the ECU is enriching the mixture.*

*Additive: The effects of a fault (e.g. Intake air leak), will reduce as the engine speed increases, so the injection period will be modified by a fixed amount. This amount is not dependent on the basic injection duration period.*

*Multiplicative: The effects of a fault (e.g. Injector fault) will increase as engine speed increases, so a multiplicative learnt value is a proportional change to the injection duration. The change is dependent on the basic injection duration period.*



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33 Lambda Regulation at idle speed	<ol style="list-style-type: none"> <li>1. Lambda control - bank 1.</li> <li>2. Oxygen sensor voltage - bank 1.</li> <li>3. Lambda control - bank 2.</li> <li>4. Oxygen sensor voltage - bank 2.</li> </ol>
50 Signals to Engine ECM	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified engine speed.</li> <li>3. A/C status.</li> <li>4. A/C compressor status.</li> </ol>
54 Idle Speed Switch	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine operating condition (idle, part load, etc.).</li> <li>3. Throttle valve angle.</li> <li>4. Throttle valve positioner angle.</li> </ol>
56	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified engine speed.</li> <li>3. Intake air mass.</li> <li>4. Operating conditions (for the relevance of this display line, see Table 83).</li> </ol>
90 Camshaft Timing Control	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Camshaft timing control status.</li> <li>3. Feedback signal for adjustment - bank 1.</li> <li>4. Feedback signal for adjustment - bank 2.</li> </ol>
93 Hall Senders	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Phase position - bank 1.</li> <li>4. Phase position - bank 2.</li> </ol>
95 Intake Manifold Change-over	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Engine load.</li> <li>3. Engine coolant temperature.</li> <li>4. Intake manifold change-over status (see note below).</li> </ol>
<i>NOTE: Intake manifold change-over should occur at approximately 4500 rpm.</i>	
98 Throttle Control part adaption	<ol style="list-style-type: none"> <li>1. Throttle valve angle sensor voltage.</li> <li>2. Idle speed positioner voltage.</li> <li>3. Engine operating status (idle, part load, etc.).</li> <li>4. Adaption status.</li> </ol>
122 Torque Reduction during Gearshift	<ol style="list-style-type: none"> <li>1. Engine speed.</li> <li>2. Specified gearbox torque.</li> <li>3. Engine torque.</li> <li>4. Ignition timing reduction status.</li> </ol>

# Audi, Seat, Skoda and Volkswagen

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**Table 83 - Group 56 Operating Conditions**

Relevant when '1' is displayed in the 4-digit blocks				
X	X	X	X	Display group 56 - Line 4
			0	0 = A/C compressor off 1 = A/C compressor on
		0		Gear selector position: 0 = P or N 1 = 2, 3, 4, R or D
	0			Maximum hot/cold air output
0				Always 0