

MEGANE

3 Chassis

38C ANTI-LOCK BRAKING SYSTEM

BOSCH 8.0 ESP

Vdiag No.: 08, 09, 0A, 0B, 11, 12

Fault finding - Introduction	38C - 2
Fault finding - System operation	38C - 7
Fault finding - Replacement of components	38C - 11
Fault finding - Configurations and programming	38C - 12
Fault finding - Fault summary table	38C - 14
Fault finding - Interpretation of faults	38C - 15
Fault finding - Conformity check	38C - 59
Fault finding - Status and parameter summary tables	38C - 60
Fault finding - Parameter procedures	38C - 61
Fault finding - Dealing with commands	38C - 62
Fault finding - Interpretation of statuses	38C - 64
Fault finding - Customer complaints	38C - 67
Diagnostic - Fault finding chart	38C - 69

1. SCOPE OF THIS DOCUMENT

This document presents the fault finding procedure applicable to all computers with the following specifications:

Vehicle(s): **MEGANE II, SCENIC II**

Function concerned: **ESP**

Name of computer: **ESP 8.0**

Vdiag No.: **08, 09, 0A, 0B, 11 and 12**

2. PREREQUISITES FOR FAULT FINDING

Documentation type

Fault finding procedures (this manual):

- Assisted fault finding (integrated into the diagnostic tool), Dialogys.

Wiring Diagrams:

- Visu-Schéma (CD-ROM), paper.

Type of diagnostic tools

- **CLIP**

Special tooling required

Special tooling required	
Multimeter	
Elé. 1681	Universal bornier

3. RECAP

Procedure

To perform fault finding on the vehicle's computers, switch on the ignition in fault finding mode.

Proceed as follows:

- vehicle's card in reader;
- press and hold the Start button (longer than 5 seconds) with start-up conditions not present,
- connect the diagnostic tool and perform the required operations.

Note:

The left and right-hand xenon bulb computers are supplied when the dipped headlights are lit. Therefore fault finding can only be carried out on them after the ignition has been switched on in fault finding mode (forced + after ignition feed) and the dipped headlights have been switched on.

To **cut off + after ignition feed**, proceed as follows:

- disconnect the diagnostic tool,
- press the Start button twice briefly (less than 3 seconds),
- ensure that the + after ignition feed has been cut off by checking that the computer indicator lights on the instrument panel have gone out.

Faults

Faults are declared as either present or stored (depending on whether they appeared in a certain context and have disappeared since, or whether they remain present but have not been diagnosed within the current context).

The **present** or **stored** status of faults should be taken into consideration when the diagnostic tool is switched on after the + after ignition feed (without any system components being active).

For a **present fault**, apply the procedure described in the **Interpretation of faults** section.

For a **stored fault**, note the faults displayed and apply the instructions in the **Notes** section.

If the fault is **confirmed** when the instructions in the Notes section are applied, the fault is present. Deal with the fault.

If the fault is **not confirmed**, check:

- the electrical lines which correspond to the fault,
- the connectors for these lines (for oxidation, bent pins, etc.),
- the resistance of the component detected as faulty,
- the condition of the wires (melted or split insulation, wear).

Conformity check

The aim of the conformity check is to check data that does not produce a fault on the diagnostic tool because the data is inconsistent. Therefore, this stage is used to:

- carry out fault finding on faults that do not have a fault display, and which may correspond to a customer complaint.
- check that the system is operating correctly and that there is no risk of a fault recurring after repairs.

This section gives the fault finding procedures for statuses and parameters and the conditions for checking them.

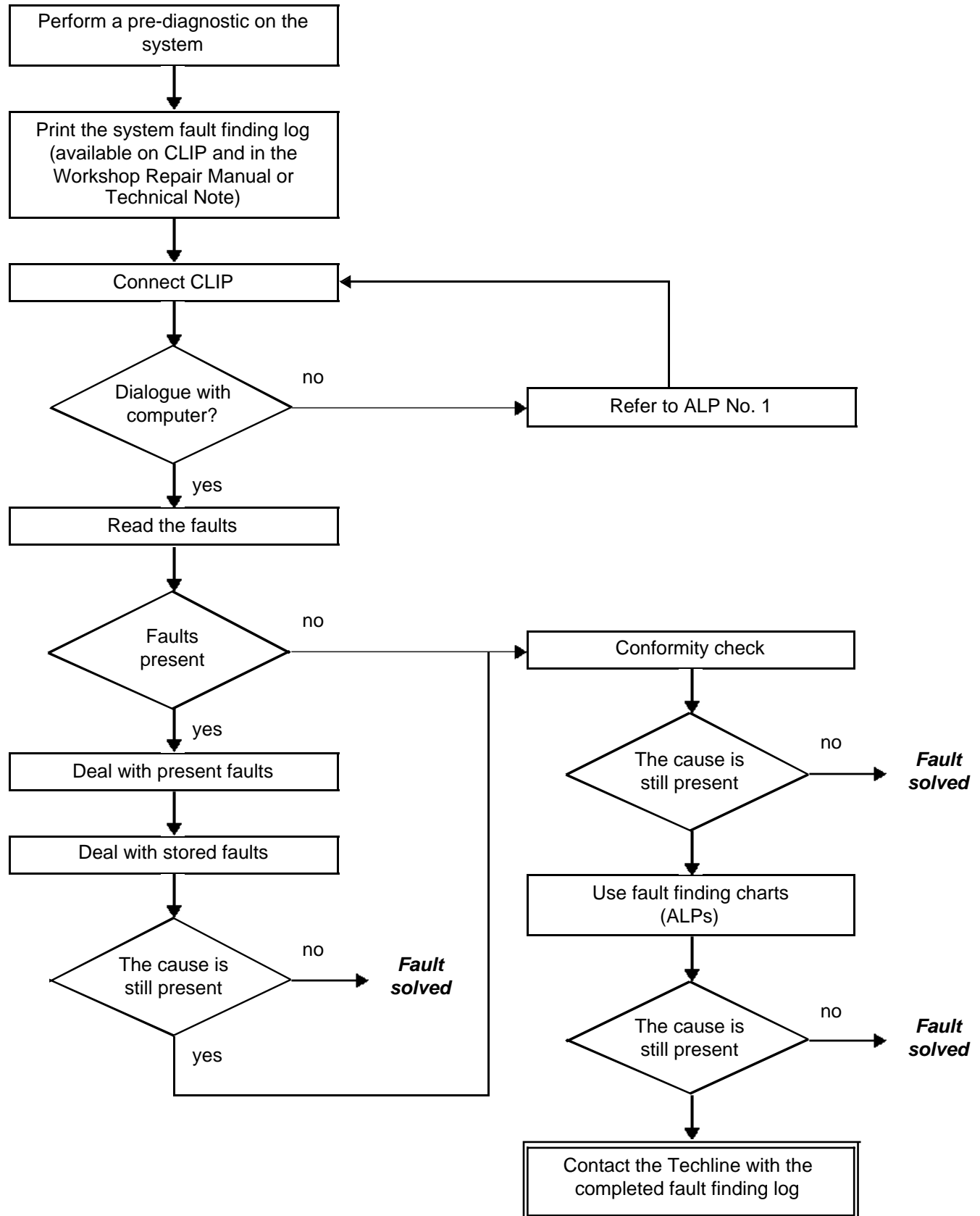
If a status is not behaving normally or a parameter is outside the permitted tolerance values, consult the corresponding fault finding page.

Customer complaints - Fault finding chart

If the test with the diagnostic tool is OK but the customer complaint is still present, the fault should be processed by **customer complaint**.

A synopsis of the general procedure to follow is provided on the following page in the form of a flow chart.

4. FAULT FINDING PROCEDURE



4. FAULT FINDING PROCEDURE (continued)

Wiring check

Fault finding problems

Disconnecting the connectors and/or manipulating the wiring harness may temporarily remove the cause of a fault. Electrical measurements of voltage, resistance and insulation are generally correct, especially if the fault is not present when the analysis is made (stored fault).

Visual inspection

Look for damage under the bonnet and in the passenger compartment.
Carefully check the fuses, insulators and wiring harness routing.
Look for signs of oxidation.

Tactile inspection

While manipulating the wiring harness, use the diagnostic tool to note any change in fault status from stored to present.
Make sure that the connectors are properly locked.
Apply light pressure to the connectors.
Twist the wiring harness.
If there is a change in status, try to locate the source of the fault.

Inspection of each component

Disconnect the connectors and check the appearance of the clips and tabs, as well as the crimping (no crimping on the insulating section).
Make sure that the clips and tabs are properly locked in the sockets.
Check that no clips or tabs have been dislodged during connection.
Check the clip contact pressure using an appropriate model of tab.

Resistance check

Check the continuity of entire lines, then section by section.
Look for a short circuit to earth, to + 12 V or to another wire.

If a fault is detected, repair or replace the wiring harness.

5. FAULT FINDING LOG



IMPORTANT

IMPORTANT

Any fault on a complex system requires thorough fault finding with the appropriate tools. The FAULT FINDING LOG, which should be completed during the procedure, enables you to keep track of the procedure which is carried out. It is an essential document when consulting the manufacturer.

IT IS THEREFORE MANDATORY TO FILL OUT A FAULT FINDING LOG EACH TIME FAULT FINDING IS CARRIED OUT.

You will always be asked for this log:

- when requesting technical assistance from Techline,
- for approval requests when replacing parts for which approval is mandatory,
- to be attached to monitored parts for which reimbursement is requested. The log is needed for warranty reimbursement, and enables better analysis of the parts removed.

6. SAFETY ADVICE

Safety rules must be observed during any work on a component to prevent any damage or injury:

- Check the battery voltage to avoid incorrect operation of computer functions,
- Use the proper tools.
- **It is forbidden to carry out a road test while the diagnostic tool is communicating with the computer, because the ABS and Electronic Braking Distribution (EBD) functions are deactivated. Braking pressure is identical on both vehicle axles (risk of a spin under heavy braking).**

The **ESP** system on this vehicle incorporates the following functions:

- The **ABS** (anti-lock braking system). The main functions of the **ABS** system are electronic front and rear braking distribution (EBD) by controlling rear wheel slip, and preventing the wheels from locking by controlling the slipping of all four wheels.
- **MSR** (engine torque control). Traction control on the driven wheels under no load by limiting the engine braking.
- **ASR** (traction control). It limits skidding of the drive wheels during starting or acceleration phases by limiting the engine torque and braking the wheel(s) which are skidding.
- **ESP** (electronic stability program). Electronic stability program limiting oversteer or understeer by braking certain wheels and controlling the engine torque.
- **CSV** (understeer control). Specific control of situations involving pronounced understeer by significant vehicle braking in conjunction with a specific dynamic stability program.
- **AUTOMATIC LIGHTING OF HAZARD WARNING LIGHTS**. Generation on the **CAN** network, for the **UCH**, of a request for switching on the hazard warning lights in case of braking causing a very hard deceleration (according to the legislation of the country).
- **AUTOMATIC BRAKE LIGHTS SWITCH-ON**. In the event of understeer control (**CSV** only), the **ESP** computer switches on the brake lights, via a relay, to give warning of severe deceleration generated by the system (according to national legislation).

The system also supplies the other computers with information on the vehicle speed via a wire connection for the xenon bulbs, the radio and the electric sunroof, and via the multiplex network for the other computers. The **ABS/ESP** computer provides the odometry for the instrument panel and navigation aid over the multiplex network.

IDENTIFICATION

From the outside, two factors distinguish an ABS unit from an ABS/ESP unit:

- The size of the units (the **ABS/ESP** unit is bigger than the **ABS**) unit. **The ABS unit has 8 solenoid valves and the ABS/ESP unit has 12.**
- The number of computer tracks (the **ABS computer has 26 tracks** and the **ABS/ESP computer has 46 tracks**).

FAULT FINDING WARNING LIGHT ILLUMINATION STRATEGY for Mégane II ph1 and Scénic II ph 1.

Instrument panel warning light					Instrument panel message		Meaning
					MEGANE II	SCENIC II	
Brake faults	ABS	ESP	SERVICE	STOP	ESP/ASR* not working	ESP/ASR* not working, faulty braking	Electronic braking regulation and ABS and ESP not working.
	ABS	ESP	SERVICE		ESP/ASR* not working	ESP/ASR* not working check ABS	ESP and ABS function not working.
		ESP	SERVICE		ESP/ASR* not working	ESP/ASR* not working	ESP function not working, Electronic Braking Distribution and anti-lock braking system working
		ESP			ASR* disconnected	ASR* disconnected	– ESP disconnection button registered OR – ESP temporarily disconnected after disconnection of the battery.
Brake faults flashing at 2 Hz.	ABS flashing at 2 Hz	ESP flashing at 2 Hz			No message	No message	ABS computer is in fault finding mode.
Brake faults	ABS faults flashing at 8 Hz	ESP flashing at 8 Hz		STOP	No message	No message	Vehicle parameters and tachometric index not programmed.
Brake faults	ABS	ESP flashing at 8 Hz	SERVICE	STOP	No message	No message	Vehicle parameters not programmed.
	ABS faults flashing at 8 Hz				No message	No message	Tachometric index not programmed.
		ESP flashing at 8 Hz			No message	No message	ESP being regulated. ASR* being regulated. MSR being regulated.

Note:

The STOP warning light is always accompanied by a single audible warning (1 beep).

*ASR: Traction control

FAULT FINDING WARNING LIGHT ILLUMINATION STRATEGY for Mégane II ph 2 and Scénic II ph 2.

Instrument panel warning light					Instrument panel message		Meaning
					MEGANE II PH2	SCENIC II PH2	
Brake faults	ABS	ESP	SERVICE	STOP	Braking fault		Electronic braking regulation and ABS and ESP not working.
	ABS	ESP	SERVICE		Check the ABS		ESP and ABS function not working, electronic braking regulation in backup.
		ESP	SERVICE		Check the ESP		ESP function not working, electronic braking regulation operational and ABS in backup.
		ESP			TRACTION CONTROL DEACTIVATED ¹		<ul style="list-style-type: none"> – ESP/ASR* disconnection button registered OR – ESP/ASR* temporarily disconnected after disconnection of the battery.
Brake faults flashing at 2 Hz.	ABS flashing at 2 Hz	ESP flashing at 2 Hz			No message		ESP computer in fault finding mode.

Note:

1: On Mégane Sport, this message is replaced by "**ASR/ESP off**".

The STOP warning light is always accompanied by a single audible warning (1 beep).

*ASR: Traction control

FAULT FINDING WARNING LIGHT ILLUMINATION STRATEGY for Mégane II ph 2 and Scénic II ph 2. (continued)

Instrument panel warning light					Instrument panel message		Meaning
					MEGANE II PH2	SCENIC II PH2	
		ESP flashing at 8 Hz			No message		ESP being regulated. ASR* being regulated. MSR* being regulated.
	ABS faults flashing at 8 Hz				No message		Tachometric index and/or speed at initialisation not programmed.
Brake faults	ABS	ESP flashing at 8 Hz	SERVICE	STOP	No message		Vehicle parameters not programmed.
Brake faults	ABS faults flashing at 8 Hz	ESP flashing at 8 Hz		STOP	No message		Vehicle parameters and tachometric index not programmed.
							Vehicle parameters and speed at initialisation not programmed.
							Vehicle parameters and tachometric index and speed at initialisation not programmed.

Note:

The STOP warning light is always accompanied by a single audible warning (1 beep).

*MSR: Engine torque control

*ASR: Traction control

REPLACING THE COMPUTER

When replacing the computer/pump assembly, follow this procedure:

- switch off the ignition,
- replace the computer (see MR 364 Mechanical or MR 370 Mechanical, 38C, Anti-lock braking system, Hydraulic unit),
- enter the VIN using command VP001,
- configure the tachometric index using command VP007,
- configure the vehicle parameters with command VP004.

If Vdiag 0B, 11 or 12:

- configure the vehicle speed at initialisation with command VP032,

IMPORTANT

It is imperative to check that the parameters selected match the vehicle's description.

- inhibit or authorise the automatic brake light illumination (depending on the country's legislation) using commands VP021 "Inhibit automatic brake light illumination" or VP022 "Authorise automatic brake light illumination",
- enter the most recent After Sales operation date using command VP006,
- perform a road test followed by a fault reading to confirm that the system is operating correctly.

REPLACING THE COMBINED SENSOR

When replacing the combined sensor, you must erase the programming of the ESP sensors with command **RZ003** (if available).

Note:

Run this command every time the electric power steering is removed and refitted, and each time the steering wheel angle is calibrated in the electric power steering subgroup.

Command **RZ003 "Programming ESP sensors"** is only available on Vdiag 09, 0A, 0B, 11, 12

SETTINGS

VP001: Write VIN.

This command permits manual entry of the vehicle's VIN into the computer. Use this command each time the computer is replaced. The VIN number (VF...) can be found on the manufacturer's plate on the front right-hand door pillar and on the body panel under the left-hand side of the windscreen.

VP004: Vehicle parameters.

This command is used to configure the engine type + braking definition + body type. Select command **VP004** on the diagnostic tool (the parameters selected must correspond with the vehicle type).

VP006: Write last After-Sales operation date.

The date of the operation must be entered whenever the ESP system is worked on in the workshop. Select command **VP006** on the diagnostic tool. Enter the operation date with the tool keyboard.

VP007: Tachometric index.

This command is used to program the computer memory with the index required to calculate vehicle speed from the speed at which the wheels turn. The **Bosch 8.0 ESP** computer transmits the vehicle speed signal to all areas where this signal is needed (instrument panel, engine management, etc.). This vehicle speed signal replaces the one supplied by the speed sensor located on the gearbox. The ESP computer calculates the vehicle speed from the wheel speed and the tyre circumference.

Note:

The vehicle speed is conveyed by wire (track 33) to the xenon bulbs, radio and electric sunroof, and by the multiplex network to the other computers.

The tyre circumference must be programmed into the memory of a new computer. This consists of entering an **index X** using the **diagnostic tool** and command **VP007 Tachometric index**. Once the index has been entered using the **VP007** command, clear the computer fault memory and then switch off the ignition. Use the **PR030** parameter to check that the index has been stored correctly.

SETTINGS (continued)

VP021: Automatic brake lights deactivation.

Use this command only in those countries where legislation prohibits the brake lights lighting automatically without the brake pedal being depressed. Brake light activation is not authorised with ESP control (in accordance with national legislation).

VP022: Automatic brake lights authorisation.

This command is used to reactivate automatic lighting of the brake lights by ESP intervention after it has been inhibited by command **VP021** (in accordance with national legislation).

VP023: Automatic reconnection threshold of the ESP.

If the value of PR064 is not 30 mph (50 km/h), use this command to set the automatic ESP reconnection threshold to 30 mph (50 km/h).

VP032: Vehicle speed at initialisation.

Vehicle speed transmitted via the multiplex network when the computer is initialised. Select "Type 1" or "Type 2" according to the information supplied by the tool.

Tool fault	Associated DTC	Diagnostic tool title
DF001	50CC	Computer supply
DF006	501F	Front left-hand wheel speed sensor circuit
DF007	503F	Rear left-hand wheel speed sensor circuit
DF017	50C3	Computer
DF020	50C3	Tachometric index programming
DF026	500F	Front right-hand wheel speed sensor circuit
DF027	502F	Rear right-hand wheel speed sensor circuit
DF055	50C3	Vehicle parameter programming
DF063	5046	Wheel speed inconsistency
DF066	5180	No injection multiplex signal
DF090	5041	Front right-hand wheel target
DF091	5042	Front left-hand wheel target
DF092	5043	Rear right-hand wheel target
DF093	5044	Rear left-hand wheel target
DF097	5188	No automatic transmission multiplex signal
DF126	50F4	Combined sensor signal plausibility
DF152	50E6	Multiplex network
DF153	50C3	Multiplex network
DF186	5182	No instrument panel multiplex signal
DF187	50CE	Brake light activation relay circuit
DF188	50C6	Brake light switch circuit
DF189	50F4	Combined sensor circuit
DF190	50F4	Combined sensor
DF191	50C9	ESP on/off button circuit
DF193	5180	Invalid injection multiplex signals
DF194	5158	Invalid electric power steering signals
DF195	5188	Invalid automatic gearbox multiplex signals
DF196	5158	No power-assisted steering multiplex signal

DF001 PRESENT OR STORED	COMPUTER SUPPLY VOLTAGE 1.DEF: below minimum threshold 2.DEF: above maximum threshold 3.DEF: abnormal voltage
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NOTES	Special notes: The fault appears during a road test at a vehicle speed of > 6 mph (10 km/h) . The computer signals an external supply fault.
	Conditions for applying the fault finding procedure to stored faults: Apply the fault finding procedure whether the fault is present or stored.

Check the condition and connection of the battery terminals.
Check the condition and position of the **ABS/ESP fuses** in the engine fuse and relay box.
Check the 50A power fuse in position 5 on the power fuse board.
Check **fuse F13 (25A) on the UPC** and the correct locking of the grey 4-track PPH1 connector (Vdiag 44) or the **25A fuse F8 on the UPC** and the correct locking of the black 6-track CM connector (Vdiag 48).
Check the connection and condition of the tab 1 red wire of the grey connector.
Check the connections on the ABS/ESP computer 46-track connector.
Check the **ABS earths on tracks 1 and 4** (mounted under the **ABS/ESP** unit) and visually inspect all the ABS/ESP wiring.
Check the continuity between the fuses and **tracks 2 and 3** of the computer connector (+ before ignition feed on the tracks) and between the UCH and **track 28 of the computer** (+ after ignition feed on the track).

Clear the computer fault memory. Switch off the ignition.
Switch on the ignition again and carry out a new check using the diagnostic tool.
If the fault is still present, contact the Techline.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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**DF006
PRESENT
OR
STORED****FRONT LEFT-HAND WHEEL SPEED SENSOR CIRCUIT**

CO.0 : open circuit or short circuit to earth

1.DEF: internal electronic fault of the sensor

2.DEF: magnetic/mechanical target fault

Vdiag No.: 08 and 09**NOTES****Special notes:**

The **wheel speed sensors** are supplied with **+ 12 V after ignition** but it is not possible to measure this feed on **Vdiag 08 and 09** (supply cut off when the sensor is faulty).

Conditions for applying the fault finding procedure to stored faults:

The fault is declared present following a road test at a speed of > 36 mph (60 km/h).

CO.0**NOTES****None**

Check the connection and the condition of the sensor connectors.

Swap the two front wheel speed sensors over.

Clear the computer memory.

Carry out a road test followed by another check with the diagnostic tool.

– If the fault initially displayed, **DF006 Front left-hand wheel speed sensor circuit, changes to DF026 Front right-hand wheel speed sensor circuit** present, replace the wheel speed sensor.

– If the fault remains on the same side, the wiring between the computer and the sensor is faulty.

Check the connection and the condition of the computer connections. Repair if necessary.

Check and ensure the continuity of the following connections:

Sensor connector **one of the two tracks** —————> **Track 5** computer connector

Sensor connector **the other track** —————> **Track 26** computer connector

Also check the insulation between these two connections.

Repair if necessary.

AFTER REPAIR

Clear the computer fault memory.

Carry out a road test followed by another check with the **diagnostic tool**.

DF006
CONTINUED

Vdiag No.: 08 and 09

1.DEF

NOTES

None

Replace the front left-hand wheel speed sensor.

2.DEF

NOTES

None

Visually inspect the condition of the target and sensor (for dirt, metallic contamination, bearing grease, etc.), and clean using compressed air if necessary.

If there is a lot of grease on the target, contact the Techline.

Check the quality of the mounting of the wheel speed sensor (correct clipping without excessive play).

Check the sensor/target air gap over one wheel revolution: **0.1 mm < front wheel air gap < 1.2 mm.**

Check the conformity of the target (condition, number of teeth = 48) using the specific command **SC001 Check target teeth.**

If the checks are correct:

- the computer fault memory has been cleared,
- exit fault finding mode, switch off the ignition and carry out a road test.

Replace the instrumented bearing if the fault recurs.

AFTER REPAIR

Clear the computer fault memory.

Carry out a road test followed by another check with the **diagnostic tool.**

DF006 PRESENT OR STORED	FRONT LEFT-HAND WHEEL SPEED SENSOR CIRCUIT CO.0 : open circuit or short circuit to earth 1.DEF: internal electronic fault of the sensor 2.DEF: magnetic/mechanical target fault 3.DEF: open circuit or short circuit
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Vdiag: 0A, 0B, 11, 12

NOTES	None.
	Conditions for applying the fault finding procedure to stored faults: The fault is declared present following a road test at a speed of > 36 mph (60 km/h).

CO.0 3.DEF	NOTES	Special notes: command AC013 Test wheel speed sensor supply, must be used only once.
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Check the connection and the condition of the sensor connectors. Disconnect the sensor, run command AC013 Test wheel speed sensor supply and check that voltage pulses of approximately 12 V are detected by a multimeter at the sensor connector terminals on the computer side. Are voltage pulses detected?
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YES	The wiring between the computer and the sensor, as well the supply via the computer, is OK. Front left-hand wheel speed sensor fault - replace the sensor.
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NO	Check the connection and the condition of the computer connections. Repair if necessary. Check and ensure the continuity of the following connections: <div style="margin-left: 40px;"> Sensor connector, one of the two tracks  Track 5 computer connector </div> <div style="margin-left: 40px;"> Sensor connector, the other track  Track 26 computer connector </div> Also check the insulation between these two connections. If all the checks are in order, contact Techline.
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AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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DF006 CONTINUED	
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Vdiag: 0A, 0B, 11, 12

1.DEF	NOTES	None
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Replace the front left-hand wheel speed sensor.

2.DEF	NOTES	None
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<p>Visually inspect the condition of the target and sensor (for dirt, metallic contamination, bearing grease, etc.), and clean using compressed air if necessary.</p> <p>If there is a lot of grease on the target, contact the Techline.</p> <p>Check the quality of the mounting of the wheel speed sensor (correct clipping without excessive play).</p> <p>Check the sensor/target air gap over one wheel revolution: 0.1 mm < front wheel air gap < 1.2 mm.</p> <p>Check the conformity of the target (condition, number of teeth = 48) using the specific command SC001 Check target teeth.</p> <p>If the checks are correct:</p> <ul style="list-style-type: none"> – the computer fault memory has been cleared, – exit fault finding mode, switch off the ignition and carry out a road test. <p>Replace the instrumented bearing if the fault recurs.</p>

AFTER REPAIR	<p>Clear the computer fault memory.</p> <p>Carry out a road test followed by another check with the diagnostic tool.</p>
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**DF007
PRESENT
OR
STORED****REAR LEFT-HAND WHEEL SPEED SENSOR CIRCUIT**

CO.0 : open circuit or short circuit to earth
1.DEF: internal electronic fault of the sensor
2.DEF: magnetic/mechanical target fault

Vdiag No.: 08 and 09**NOTES****Special notes:**

The wheel speed sensors are supplied with + 12 V after ignition but it is not possible to measure this supply on Vdiag 08 and 09 (supply cut off when the sensor is faulty).

Conditions for applying the fault finding procedure to stored faults:

The fault is declared present following a road test at a speed of > 36 mph (60 km/h).

CO.0**NOTES****None**

Check the connection and the condition of the sensor connectors.
Swap the two rear wheel speed sensors over.
Clear the computer's fault memory.
Carry out a road test followed by another check with the diagnostic tool.

- If the fault initially displayed, **DF007 Rear left-hand wheel speed sensor circuit, changes to DF027 Rear right-hand wheel speed sensor circuit**, replace the wheel speed sensor.
- If the fault remains on the same side, the wiring between the computer and the sensor is faulty. Check the connection and the condition of the computer connections. Repair if necessary. Check the connections (**Track 31 and 32**) at the **R2 black 52-track** intermediate connection beneath the front left-hand seat. Repair if necessary. Check and ensure the continuity of the following connections:

Sensor connector **one of the two tracks** —————> **Track 6** computer connector

Sensor connector **the other track** —————> **Track 27** computer connector

Also check the insulation between these two connections. If the connections are faulty, carry out the following checks:

Check the continuity, insulation and absence of interference resistance between:

Computer connector **track 6** —————> **Track 32** on the intermediate connector

Computer connector **track 27** —————> **Track 31** on the intermediate connector

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

DF007
CONTINUED

Vdiag No.: 08 and 09

Also check the insulation between these two connections. Repair or replace the wiring if necessary.
Check the continuity, insulation and absence of interference resistance between:

Sensor connector **one of the 2 tracks** —————→ **Track 31** on the intermediate connector

Sensor connector **the other track** —————→ **Track 32** on the intermediate connector

Also check the insulation between these two connections.
Repair or replace the wiring if necessary.

1.DEF

NOTES

None

Replace the rear left-hand wheel speed sensor.

2.DEF

NOTES

None

Visually inspect the condition of the target and sensor (for dirt, metallic contamination, bearing grease, etc.), and clean using compressed air if necessary.

If there is a lot of grease on the target, contact the Techline.

Check that the wheel speed sensor mounting is in good condition.

Check the sensor/target air gap through one wheel revolution: **0.1 mm < Rear wheel air gap < 1.2 mm.**

Check the conformity of the target (condition, number of teeth = 48) using the specific command **SC001 Check target teeth**.

If the checks are correct:

- the computer fault memory has been cleared,
- exit fault finding mode, switch off the ignition and carry out a road test.

Replace the rear left-hand "disc-hub-bearing" assembly (see **MR 364 or MR 370 Mechanical, 33A, Rear axle components, Bearing: Removal - Refitting**) if the fault reappears.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

<p>DF007 PRESENT OR STORED</p>	<p><u>REAR LEFT-HAND WHEEL SPEED SENSOR CIRCUIT</u></p> <p>CO.0 : open circuit or short circuit to earth 1.DEF: internal electronic fault of the sensor 2.DEF: magnetic/mechanical target fault 3.DEF: open circuit or short circuit</p>
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<p>Vdiag: 0A, 0B, 11, 12</p>

<p>NOTES</p>	<p>None</p>
	<p>Conditions for applying the fault finding procedure to stored faults: The fault is declared present following a road test at a speed of > 36 mph (60 km/h).</p>

<p>CO.0 3.DEF</p>	<p>NOTES</p>	<p>Special notes: Command AC013 must only be used once</p>
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<p>Check the connection and the condition of the sensor connectors. Disconnect the sensor, run command AC013 Test wheel speed sensor supply and check that voltage pulses of approximately 12 V are detected by a multimeter at the sensor connector terminals on the computer side. Are voltage pulses detected?</p>

<p>YES</p>	<p>The wiring between the computer and the sensor, as well the supply via the computer, is OK. Rear left-hand wheel speed sensor fault - replace the sensor.</p>
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<p>AFTER REPAIR</p>	<p>Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool.</p>
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DF007
CONTINUED 1

Vdiag: 0A, 0B, 11, 12

NO

Check the connection and the condition of the computer connections. Repair if necessary.

Check the connections (**Track 31 and 32**) on the 52-track intermediate black connection **R2** under the front left-hand seat. Repair if necessary.

Check and ensure the continuity of the following connections:

Sensor connector **one of the two tracks** —————▶ **Track 6** computer connector

Sensor connector **the other track** —————▶ **Track 27** computer connector

Also check the insulation between these two connections. If the connections are faulty, carry out the following checks:

Check the continuity, insulation and absence of interference resistance between:

Computer connector **track 6** —————▶ **Track 32** on the intermediate connector

Computer connector **track 27** —————▶ **Track 31** on the intermediate connector

Also check the insulation between these two connections.

Check the continuity, insulation and absence of interference resistance between:

Sensor connector **one of the 2 tracks** —————▶ **Track 31** on the intermediate connector

Sensor connector **the other track** —————▶ **Track 32** on the intermediate connector

Also check the insulation between these two connections. If all the checks are in order, contact Techline.

AFTER REPAIR

Clear the computer fault memory.

Carry out a road test followed by another check with the **diagnostic tool**.

DF007 CONTINUED 2	
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Vdiag: 0A, 0B, 11, 12

1.DEF	NOTES	None
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Replace the rear left-hand wheel speed sensor.

2.DEF	NOTES	None
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Visually inspect the condition of the target and sensor (for dirt, metallic contamination, bearing grease, etc.), and clean using compressed air if necessary.
If there is a lot of grease on the target, contact the Techline.
Check that the wheel speed sensor mounting is in good condition.
Check the sensor/target air gap through one wheel revolution: **0.1 mm < Rear wheel air gap < 1.2 mm.**
Check the conformity of the target (condition, number of teeth = 48) using the specific command **SC001 Check target teeth**.

If the checks are correct:

- the computer fault memory has been cleared,
- exit fault finding mode, switch off the ignition and carry out a road test.
- replace the rear left-hand "disc-hub-bearing" assembly (see **MR 364 or MR 370 Mechanical, 33A, Rear axle components, Bearing: Removal - Refitting**) if the fault reappears.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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DF017 PRESENT OR STORED	<u>COMPUTER</u> 1.DEF: power supply fault or internal electronic malfunction 2.DEF: programming / initialisation invalid
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NOTES	Special notes: The voltage displayed in the parameter (PR005) is the + after ignition feed voltage of the computer and not the hydraulic unit power feed.
	Conditions for applying the fault finding procedure to stored faults: The fault is declared present following a road test at a speed > 36 mph (60 km/h) .

1.DEF	NOTES	None
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Check the condition and connection of the battery terminals.
Check the condition and position of the **ABS/ESP fuses** in the **engine fuse and relay box**.
Check the **50A** power fuse in position **5** on the power fuse board.
Check the **25A fuse F13** on the **UPC** and the correct locking of the grey 4-track **PPH1** connector (Vdiag 44) or the **25A fuse F8** on the **UPC** and the correct locking of the black 6-track **CM** connector (Vdiag 48).
Check the connection and condition of the tab 1 red wire of the grey connector.
Check the connections on the ABS/ESP computer 46-track connector.
Check the **ABS earths on tracks 1 and 4** (mounted under the ABS/ESP unit) and visually inspect all the ABS/ESP wiring.
Check the continuity between the fuses and **tracks 2 and 3 of the computer connector (+ before ignition feed on the tracks)** and between the UCH and **track 28 of the computer (+ after ignition feed on the track)**.
Clear the computer fault memory. Switch off the ignition.
Switch on the ignition again and carry out a new check using the **diagnostic tool**.
If the fault is still present, contact the Techline.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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DF017
CONTINUED

2.DEF

NOTES

Special notes:

No programming of **PR020 Vehicle speed at initialisation**, ABS warning light flashes at 8 Hz outside fault finding conditions.

Vdiag No.: 08, 09, 0A

Check that the value of **PR064 Automatic ESP reconnection threshold** is 30 mph (50 km/h). If not, run command **VP023 Automatic ESP reconnection threshold**.

View **ET030 Automatic brake light illumination** and configure (according to the law of the land) the authorisation or inhibition of the brake light illumination with commands **VP021 Inhibit automatic brake light illumination** or **VP022 Authorise automatic brake light illumination**.

Clear the computer fault memory, switch off the ignition and carry out a road test. If the fault is still present, contact the Techline.

Vdiag: 0B, 11, 12

View **ET030 Automatic brake light illumination** and configure (according to the law of the land) the authorisation or inhibition of the brake light illumination with commands **VP021 Inhibit automatic brake light illumination** or **VP022 Authorise automatic brake light illumination**.

Read the value of **PR020 Vehicle speed at initialisation** and the related **Help on the Clip**. If necessary, **configure the vehicle speed with command VP032 Vehicle speed at initialisation**.

Clear the computer fault memory, switch off the ignition and carry out a road test. If the fault is still present, contact the Techline.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

DF020 PRESENT	<u>TACHOMETRIC INDEX PROGRAMMING</u>
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NOTES	Special notes: ABS warning light flashing at 8 Hz out of fault finding mode.
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The **Bosch 8.0 ESP** computer transmits the vehicle speed signal to all areas where this signal is needed (instrument panel, engine management, etc.).

This vehicle speed signal replaces the one supplied by the speed sensor located on the gearbox. The **ESP computer** calculates the vehicle speed from the wheel speed and the tyre circumference.

Note:

The vehicle speed is conveyed by wire (**track 33**) to the xenon bulbs, radio and electric sunroof, and by the multiplex network to the other computers.

The tyre circumference must be programmed into the memory of a new computer. This consists of entering an X index using the diagnostic tool and the command VP007 Tachometric index.

Once the index has been entered using command **VP007 Tachometric index**, clear the computer fault memory and then switch off the ignition. Use parameter **PR030 Tachometric index** to check that the index entered is being used correctly by the system.

If the fault is still present, contact the Techline.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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**DF026
PRESENT
OR
STORED****FRONT RIGHT-HAND WHEEL SPEED SENSOR CIRCUIT**

CO.0 : open circuit or short circuit to earth
1.DEF: internal electronic fault of the sensor
2.DEF: magnetic/mechanical target fault

Vdiag No.: 08 and 09**NOTES****Special notes:**

The wheel speed sensors are supplied by **+ 12 V after ignition** but it is not possible to measure this supply on **Vdiag 08 and 09** (supply cut off when the sensor is faulty).

Conditions for applying the fault finding procedure to stored faults:

The fault is declared present following a road test at a speed **> 36 mph (60 km/h)**.

CO.0**NOTES****None**

Check the connection and the condition of the sensor connectors.
Swap the two front wheel speed sensors over.
Clear the computer fault memory.
Carry out a road test followed by another check with the diagnostic tool.

- If the fault initially displayed, **DF026 Front right-hand wheel speed sensor circuit**, changes to **DF006 Front left-hand wheel speed sensor circuit**", replace the wheel speed sensor.
- If the fault remains on the same side, the wiring between the computer and the sensor is faulty.
Check the connection and the condition of the computer connections. Repair if necessary.
Check and ensure the continuity of the following connections:

Sensor connector, one of the two tracks —————> Track 9 computer connector

Sensor connector, the other track —————> Track 10 computer connector

Also check the insulation between these two connections. Repair if necessary.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

DF026
CONTINUED

Vdiag No.: 08 and 09

1.DEF

NOTES

None

Replace the front right-hand wheel speed sensor.

2.DEF

NOTES

None

Visually inspect the condition of the target and sensor (for dirt, metallic contamination, bearing grease, etc.), and clean using compressed air if necessary.
If there is a lot of grease on the target, contact the Techline.
Check the quality of the mounting of the wheel speed sensor (correct clipping without excessive play).
Check the sensor/target air gap over one wheel revolution: **0.1 mm < front wheel air gap < 1.2 mm.**
Check the conformity of the target (condition, number of teeth = 48) using the specific command **SC001 Check target teeth.**

If the checks are correct:

- the computer fault memory has been cleared,
- exit fault finding mode, switch off the ignition and carry out a road test.

Replace the instrumented bearing if the fault recurs.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool.**

<p>DF026 PRESENT OR STORED</p>	<p>FRONT RIGHT-HAND WHEEL SPEED SENSOR CIRCUIT</p> <p>CO.0 : open circuit or short circuit to earth 1.DEF: internal electronic fault of the sensor 2.DEF: magnetic/mechanical target fault 3.DEF: open circuit or short circuit</p>
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<p>Vdiag: 0A, 0B, 11, 12</p>

<p>NOTES</p>	<p>None</p>
	<p>Conditions for applying the fault finding procedure to stored faults: The fault is declared present following a road test at a speed of > 36 mph (60 km/h).</p>

<p>CO.0 3.DEF</p>	<p>NOTES</p>	<p>Special notes: Command AC013 "Wheel speed sensor supply test", must be used only once.</p>
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<p>Check the connection and the condition of the sensor connectors. Disconnect the sensor, run command AC013 Test wheel speed sensor supply and check that voltage pulses of approximately 12 V are detected by a multimeter at the sensor connector terminals on the computer side. Have you found voltage impulsions?</p>
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<p>YES</p>	<p>The wiring between the computer and the sensor, as well the supply via the computer, is OK. Front right-hand wheel speed sensor fault - replace the sensor.</p>
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<p>NO</p>	<p>Check the connection and the condition of the computer connections. Repair if necessary. Check and ensure the continuity of the following connections:</p> <p>Sensor connector one of the two tracks → Track 9 computer connector</p> <p>Sensor connector the other track → Track 10 computer connector</p> <p>Also check the insulation between these two connections. If all the checks are in order, contact Techline.</p>
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<p>AFTER REPAIR</p>	<p>Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool.</p>
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DF026
CONTINUED

Vdiag: 0A, 0B, 11, 12

1.DEF

NOTES

None

Replace the front right-hand wheel speed sensor.

2.DEF

NOTES

None

Visually inspect the condition of the target and sensor (for dirt, metallic contamination, bearing grease, etc.), and clean using compressed air if necessary.

If there is a lot of grease on the target, contact the Techline.

Check the quality of the mounting of the wheel speed sensor (correct clipping without excessive play).

Check the sensor/target air gap over one wheel revolution: **0.1 mm < front wheel air gap < 1.2 mm.**

Check the conformity of the target (condition, number of teeth = 48) using the specific command **SC001 Check target teeth.**

If the checks are correct:

- the computer fault memory has been cleared,
 - exit fault finding mode, switch off the ignition and carry out a road test.
- Replace the instrumented bearing if the fault recurs.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool.**

**DF027
PRESENT
OR
STORED****REAR RIGHT-HAND WHEEL SPEED SENSOR CIRCUIT**

CO.0 : open circuit or short circuit to earth
1.DEF: internal electronic fault of the sensor
2.DEF: magnetic/mechanical target fault

Vdiag No.: 08 and 09**NOTES****Special notes:**

The wheel speed sensors are supplied by **+ 12 V after ignition** but it is not possible to measure this supply on **Vdiag 08 and 09** (supply cut off when the sensor is faulty).

Conditions for applying the fault finding procedure to stored faults:

The fault is declared present following a road test at a speed **> 36 mph (60 km/h)**.

CO.0**NOTES****None**

Check the connection and the condition of the sensor connectors.
Swap the two rear wheel speed sensors over.
Clear the computer fault memory.
Carry out a road test followed by another check with the diagnostic tool.

– If the fault initially displayed, **DF027 Rear right-hand wheel speed sensor circuit**, changes to **DF007 Rear left-hand wheel speed sensor circuit**, replace the wheel speed sensor.

– If the fault remains on the same side, the wiring between the computer and the sensor is faulty.

Check the connection and the condition of the computer connections. Repair if necessary.

Check the connections (**tracks 33 and 34**) on the 52-track intermediate black connection **R2** under the front left-hand seat. Repair if necessary.

Check and ensure the continuity of the following connections:

Sensor connector **one of the two tracks** —————> **Track 8** computer connector

Sensor connector **the other track** —————> **Track 29** computer connector

Also check the insulation between these two connections. If the connections are faulty, carry out the following checks:

Check the continuity, insulation and absence of interference resistance between:

Computer connector **track 8** —————> **Track 34** on the intermediate connector

Computer connector **track 29** —————> **Track 33** on the intermediate connector

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

DF027
CONTINUED

Vdiag No.: 08 and 09

Also check the insulation between these two connections. Repair or replace the wiring if necessary.
Check the continuity, insulation and absence of interference resistance between:

Sensor connector **one of the 2 tracks** —————→ **Track 33** on the intermediate connector

Sensor connector **the other track** —————→ **Track 34** on the intermediate connector

Also check the insulation between these two connections. Repair or replace the wiring if necessary.

1.DEF

NOTES

None

Replace the rear right-hand wheel speed sensor.

2.DEF

NOTES

None

Visually inspect the condition of the target and sensor (for dirt, metallic contamination, bearing grease, etc.), and clean using compressed air if necessary.
If there is a lot of grease on the target, contact the Techline.
Check that the wheel speed sensor mounting is in good condition.
Check the sensor/target air gap through one wheel revolution: **0.1 mm < Rear wheel air gap < 1.2 mm**.
Check the conformity of the target (condition, number of teeth = 48) using the specific command **SC001 Check target teeth**.

If the checks are correct:

- the computer fault memory has been cleared,
- exit fault finding mode, switch off the ignition and carry out a road test.
- replace the rear right-hand "disc-hub-bearing" assembly (see **MR 364 or MR 370 Mechanical, 33A, Rear axle components, Bearing: Removal - Refitting**) if the fault reappears.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

<p>DF027 PRESENT OR STORED</p>	<p><u>REAR RIGHT-HAND WHEEL SPEED SENSOR CIRCUIT</u></p> <p>CO.0 : open circuit or short circuit to earth 1.DEF: internal electronic fault of the sensor 2.DEF: magnetic/mechanical target fault 3.DEF: open circuit or short circuit</p>
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<p>Vdiag: 0A, 0B, 11, 12</p>

<p>NOTES</p>	<p>None.</p>
	<p>Conditions for applying the fault finding procedure to stored faults: The fault is declared present following a road test at a speed of > 36 mph (60 km/h).</p>

<p>CO.0 3.DEF</p>	<p>NOTES</p>	<p>Special notes: Only run command AC013 once.</p>
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<p>Check the connection and the condition of the sensor connectors. Disconnect the sensor, run command AC013 Test wheel speed sensor supply and check that voltage pulses of approximately 12 V are detected by a multimeter at the sensor connector terminals on the computer side. Are voltage pulses detected?</p>

<p>YES</p>	<p>The wiring between the computer and the sensor, as well the supply via the computer, is OK. Rear right-hand wheel speed sensor fault - replace the sensor.</p>
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<p>AFTER REPAIR</p>	<p>Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool.</p>
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DF027
CONTINUED 1

Vdiag: 0A, 0B, 11, 12

NO

Check the connection and the condition of the computer connections. Repair if necessary.

Check the connections (**tracks 33 and 34**) on the 52-track intermediate black connection **R2** under the front left-hand seat. Repair if necessary.

Check and ensure the continuity of the following connections:

Sensor connector **one of the two tracks** —————> **Track 8** computer connector

Sensor connector **the other track** —————> **Track 29** computer connector

Also check the insulation between these two connections. If the connections are faulty, carry out the following checks:

Check the continuity, insulation and absence of interference resistance between:

Computer connector **track 8** —————> **Track 34** on the intermediate connector

Computer connector **track 29** —————> **Track 33** on the intermediate connector

Also check the insulation between these two connections.

Check the continuity, insulation and absence of interference resistance between:

Sensor connector **one of the 2 tracks** —————> **Track 33** on the intermediate connector

Sensor connector **the other track** —————> **Track 34** on the intermediate connector

Also check the insulation between these two connections. If all the checks are in order, contact Techline.

AFTER REPAIR

Clear the computer fault memory.

Carry out a road test followed by another check with the **diagnostic tool**.

<p>DF027 CONTINUED 2</p>	
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Vdiag: 0A, 0B, 11, 12

1.DEF	NOTES	None
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Replace the rear right-hand wheel speed sensor.

2.DEF	NOTES	None
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<p>Visually inspect the condition of the target and sensor (for dirt, metallic contamination, bearing grease, etc.), and clean using compressed air if necessary. If there is a lot of grease on the target, contact the Techline. Check that the wheel speed sensor mounting is in good condition. Check the sensor/target air gap through one wheel revolution: 0.1 mm < Rear wheel air gap < 1.2 mm. Check the conformity of the target (condition, number of teeth = 48) using the specific command SC001 Check target teeth.</p> <p>If the checks are correct:</p> <ul style="list-style-type: none"> – the computer fault memory has been cleared, – exit fault finding mode, switch off the ignition and carry out a road test. – replace the rear right-hand "disc-hub-bearing" assembly (see MR 364 or MR 370 Mechanical, 33A, Rear axle components, Bearing: Removal - Refitting) if the fault reappears.

AFTER REPAIR	<p>Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool.</p>
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DF055 PRESENT	<u>VEHICLE PARAMETER PROGRAMMING</u> 1.DEF: absence of vehicle parameter programming 2.DEF: programming invalid
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NOTES	Special notes: No programming or erroneous value of PR063 "Vehicle parameters" . ESP warning light flashing at 8 Hz outside fault finding conditions.
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Read **PR063 Vehicle parameters**, use command **VP004 Vehicle parameters** to define the appropriate vehicle type variant.
It is imperative to select the variant corresponding to the vehicle being tested.
If the fault is still present, contact the Techline.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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DF063 PRESENT OR STORED	<u>WHEEL SPEED CONSISTENCY</u> CC.1 : short circuit to + 12 V 1.DEF: interference
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NOTES	Special notes: This fault indicates that the wheel speeds are inconsistent with each other. The computer does not know how to determine which one is faulty.
	Priorities when dealing with a number of faults: Deal with faults DF006, DF007, DF026 and DF027 first, even when stored.
	Conditions for applying the fault finding procedure to stored faults: The fault appears after a road test at a speed of > 36 mph (60 km/h) on a winding road.

Check the condition of the axle assemblies (impacts, damage, etc.) and the conformity and good condition of the tyres.

Ensure that the braking system is in good condition (condition of the linings, tightness, grip, bleeding, bearing play, lubricant on the targets, etc.).

Check that the wheel speed sensor mountings are in good condition.

Check the sensor/target air gap over one wheel revolution: **0.1 mm < wheel air gap < 1.2 mm**.

Check the conformity of the target (condition, number of teeth = 48) using the specific command **SC001 Check target teeth**.

Repair if necessary.

Carry out a visual check on the connection and condition of the sensor and computer connectors Check the connection and condition of the connections (tracks 31, 32, 33 and 34) on the 52-track intermediate black connection **R2** under the front left-hand seat. Repair if necessary.

If all the checks are correct, clear the computer's fault memory.

Exit the fault finding procedure and carry out a road test. If the fault is still present, contact the Techline.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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DF066 PRESENT OR STORED	<u>INJECTION MULTIPLEX SIGNAL ABSENT</u>
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NOTES	<p>Special notes: Although the fault is stored in the computer, it is not caused by ABS/ESP components, but it indicates that the ESP is deactivated due to an injection frame transmission fault. Run fault finding on the injection system.</p> <p>Note: The injection does not always store these transient faults as quickly as the ABS/ESP system. If no fault is stored in the injection computer, start the engine; if there is no fault present, contact the Techline. Once the fault in the injection system has been repaired, clear the ABS/ESP computer fault memory. The injection multiplex signal is transmitted to the ABS/ESP computer via the Protection and Switching Unit.</p>
	<p>Priorities when dealing with a number of faults: Deal with faults DF152 and DF153 first, whether they are present or stored.</p>
	<p>Conditions for applying the fault finding procedure to stored faults: The fault is declared present when the engine is started up.</p>

Check the condition and correct locking of the **blue PEH connector of the UPC (Vdiag 44)** or the grey **CT1 connector** of the UPC (**Vdiag 48 or higher**).
Carry out a multiplex network test and check the injection system with the **diagnostic tool**. If the fault is still present, contact the Techline.

AFTER REPAIR	<p>Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool.</p>
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DF090 STORED	<u>FRONT RIGHT-HAND WHEEL TARGET</u>
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NOTES	Special notes: This fault means that some magnetic poles of the target are not detected by the sensor.
	Conditions for applying the fault finding procedure to stored faults: The fault is declared present following a road test at a speed of > 36 mph (60 km/h).

Check for play in the bearing.
Visually inspect the condition of the target and sensor (for dirt, metallic contamination, bearing grease, etc.), and clean using compressed air if necessary.
If there is a lot of grease on the target, contact the Techline.
Check the quality of the mounting of the wheel speed sensor (correct clipping without excessive play).
Check the sensor/target air gap over one wheel revolution: **0.1 mm < front wheel air gap < 1.2 mm.**
Check the conformity of the target (condition, number of teeth = 48) using the specific command **SC001 Check target teeth.**
Replace the instrumented bearing if the number of teeth is incorrect.

If all the checks are correct, reconnect the computer and the wheel speed sensor.
Clear the computer fault memory.
Exit fault finding mode, switch off the ignition and carry out a road test.
If the fault is still present, contact the Techline.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool.
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DF091 STORED	<u>FRONT LEFT-HAND WHEEL TARGET</u>
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NOTES	Special notes: This fault means that some magnetic poles of the target are not detected by the sensor.
	Conditions for applying the fault finding procedure to stored faults: The fault is declared present following a road test at a speed of > 36 mph (60 km/h).

Check for play in the bearing.
Visually inspect the condition of the target and sensor (for dirt, metallic contamination, bearing grease, etc.), and clean using compressed air if necessary.
If there is a lot of grease on the target, contact the Techline.
Check the quality of the mounting of the wheel speed sensor (correct clipping without excessive play).
Check the sensor/target air gap over one wheel revolution: **0.1 mm < front wheel air gap < 1.2 mm**.
Check the conformity of the target (condition, number of teeth = 48) using the specific command **SC001 Check target teeth**.
Replace the instrumented bearing if the number of teeth is incorrect.

If all the checks are correct, reconnect the computer and the wheel speed sensor.
Clear the computer fault memory.
Exit fault finding mode, switch off the ignition and carry out a road test.
If the fault is still present, contact the Techline.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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DF092 STORED	<u>REAR RIGHT-HAND WHEEL TARGET</u>
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NOTES	Special notes: This fault means that some of the target teeth are not seen by the sensor.
	Conditions for applying the fault finding procedure to stored faults: The fault is declared present following a road test at a speed of > 36 mph (60 km/h).

Visually inspect the condition of the target and sensor (for dirt, metallic contamination, bearing grease, etc.), and clean using compressed air if necessary.
If there is a lot of grease on the target, contact the Techline.
Check that the wheel speed sensor mounting is in good condition.
Check the sensor/target air gap through one wheel revolution: **0.1 mm < Rear wheel air gap < 1.2 mm.**
Check the conformity of the target (condition, number of teeth = 48) using the specific command **SC001 Check target teeth.**
Replace the rear right-hand "disc-hub-bearing" assembly (see **MR 364 or MR 370 Mechanical, 33A, Rear axle components, Bearing: Removal - Refitting**) if the number of teeth is incorrect.

If all the checks are correct, reconnect the computer and the wheel speed sensor.
Clear the computer fault memory.
Exit fault finding mode, switch off the ignition and carry out a road test.
If the fault is still present, contact the Techline.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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DF093 STORED	<u>REAR LEFT-HAND WHEEL TARGET.</u>
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NOTES	Special notes: This fault means that some of the target teeth are not seen by the sensor.
	Conditions for applying the fault finding procedure to stored faults: The fault is declared present following a road test at a speed of > 36 mph (60 km/h).

Visually inspect the condition of the target and sensor (for dirt, metallic contamination, bearing grease, etc.), and clean using compressed air if necessary.
If there is a lot of grease on the target, contact the Techline.
Check that the wheel speed sensor mounting is in good condition.
Check the sensor/target air gap through one wheel revolution: **0.1 mm < Rear wheel air gap < 1.2 mm.**
Check the conformity of the target (condition, number of teeth = 48) using the specific command **SC001 Check target teeth.**
Replace the rear left-hand "disc-hub-bearing" assembly (see **MR 364 or MR 370 Mechanical, 33A, Rear axle components, Bearing: Removal - Refitting**) if the number of teeth is incorrect.

If all the checks are correct, reconnect the computer and the wheel speed sensor.
Clear the computer fault memory.
Exit fault finding mode, switch off the ignition and carry out a road test.
If the fault is still present, contact the Techline.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool.
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DF097 PRESENT OR STORED	<u>NO AUTOMATIC TRANSMISSION MULTIPLEX SIGNAL</u>
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Vdiag: 0A, 0B, 11, 12

NOTES	Special notes: Although it is stored in the computer, this fault does not cause the warning lights to come on or generate a fault message, because the ABS/ESP system is not faulty. Run fault finding on the automatic transmission with the diagnostic tool. Note: When the fault in the automatic transmission system is repaired, clear the ABS/ESP fault memory. The multiplex signal from the automatic transmission is sent to the ABS/ESP via the Protection and Switching Unit.
	Priorities when dealing with a number of faults: Deal with faults DF152 and DF153 first, whether they are present or stored.
	Conditions for applying the fault finding procedure to stored faults: The fault is declared present when the engine is started up.

Using the **diagnostic tool**, check in the parameter screen that the **PR063 "Vehicle parameters"** truly correspond with the vehicle undergoing fault finding.
Is PR063 Vehicle Parameters correct?

YES	Check the condition and correct locking of the blue PEH connector on the UPC (Vdiag 44) or the grey CT1 connector on the USM* (Vdiag 48). Carry out a multiplex network test. If the fault is still present, run fault finding on the automatic transmission gearbox and repair as necessary. If the fault is still present, contact the Techline.
NO	Use command VP004 Vehicle parameters to define the appropriate parameters for the vehicle type. Clear the computer fault memory. Exit fault finding mode, switch off the ignition and carry out a new test with the diagnostic tool . If the fault is still present, contact the Techline.

*USM:

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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DF126 PRESENT OR STORED	<u>COMBINED SENSOR SIGNAL PLAUSIBILITY</u>
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NOTES	<p>Special notes: This fault means that the combined sensor signals are not consistent with the other ESP sensors (steering wheel angle sensor and wheel speed sensors). If the fault appears while the vehicle is being driven on a steep gradient, during a very tight turn or while the vehicle is being transported on a lorry, train, boat, etc., with the engine running, clear the fault and if possible check that the fault has disappeared by carrying out a road test.</p>
	<p>Conditions for applying the fault finding procedure to stored faults: The fault is declared present during a road test.</p>

Check the connection and condition of the combined sensor connector.
Ensure that the sensor is properly fixed to the body in the right direction (arrow pointing to the front of the vehicle).
Check the condition of the axle assemblies (impacts, damage, etc.) and the conformity and good condition of the tyres.

Using the diagnostic tool, calibrate the steering wheel angle in the "Electric power steering" subgroup followed by command **RZ003 "ESP sensor programming"** for Vdiag 09, 0A, 0B, 12 and 11 in the ABS/ESP.

Re-establish dialogue with the ABS/ESP computer, clear the computer fault memory, carry out a road test then check again with the diagnostic tool.

If the fault is still present, adjust the axle assembly geometries. Adjust if necessary and use the diagnostic tool to calibrate the steering wheel angle again in the "Electric power steering" subgroup, then run command **RZ003 ESP sensor programming** for Vdiag 09, 0A, 0B, 12 and 11 in the ABS/ESP.

Carry out a road test.

If the fault is still present, replace the sensor.

AFTER REPAIR	<p>Clear the computer fault memory. If the combined sensor has been replaced, erase the ESP sensor programming (Vdiag 09, 0A, 0B and 11) with command RZ003 ESP sensor programming.</p> <p>Carry out a road test followed by another check with the diagnostic tool.</p>
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DF152 STORED	<u>MULTIPLEX NETWORK (BUS OFF)</u>
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NOTES	Special notes: If several computers are affected by a similar multiplex network fault, contact the Techline to check the cases previously noted first.
	Conditions for applying the fault finding procedure to stored faults: Apply the fault finding procedure as below.

If no other computer has detected a multiplex network fault, but only the absence of ABS/ESP frames, carry out the following checks:

- check the connection and condition (corrosion, bent terminal, crimping, etc.) of the computer connections (tracks 14 and 35).

Repair if necessary.

Check the connection (locking) and condition (corrosion, bent terminals, crimping, etc.) of the **blue PEH connector on the UPC** (Vdiag 44) or the **grey CT1 connector on the UPC** (Vdiag 48).

Repair if necessary.

Check the continuity, insulation and absence of interference resistance between:

- | | | |
|------------------------------------|--------|---|
| Computer connector track 14 | —————▶ | Track 7 of the blue PEH connector of the UPC (Vdiag 44)
or
Track 2 of the grey CT1 connector of the UPC (Vdiag 48) |
| Computer connector track 35 | —————▶ | Track 11 of the blue PEH connector of the UPC (Vdiag 44)
or
Track 3 of the grey CT1 connector of the UPC (Vdiag 48) |

Also check the insulation between these two connections. Repair or replace the wiring if necessary. If the problem is still present, run the fault finding procedure on the multiplex network.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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DF153 PRESENT	<u>MULTIPLEX NETWORK</u>
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NOTES	None
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If no other computer has seen the multiplex network fault, it is an ABS/ESP multiplex line electronic fault, contact the Techline.
Otherwise, run the multiplex network fault finding procedure.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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DF186 PRESENT OR STORED	<u>INSTRUMENT PANEL MULTIPLEX SIGNAL ABSENT</u>
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NOTES	Special notes: Even though it is stored in the computer, this fault does not cause the warning lights to come on or a fault message. Using the diagnostic tool, run fault finding on the instrument panel. Note: Once the fault in the instrument panel system has been remedied, clear the ABS/ESP computer fault memory. The multiplex signal from the instrument panel is sent to the ABS/ESP via the Protection and Switching Unit.
	Priorities when dealing with a number of faults: Deal with faults DF152 and DF153 first, whether they are present or stored.
	Conditions for applying the fault finding procedure to stored faults: The fault is declared present when the engine is started up.

Check the condition and correct locking of the **blue PEH connector of the UPC** (Vdiag 44) or the **grey CT1 connector of the UPC** (Vdiag 48 or higher).

Carry out a multiplex network test.

If the fault is still present, perform fault finding on the instrument panel and repair accordingly.

If the fault is still present, contact the Techline.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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DF187 PRESENT	<u>BRAKE LIGHT ACTIVATION RELAY CIRCUIT</u>
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NOTES	Special notes: This fault does not cause the warning lights to come on or a fault message on the instrument panel.
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<p>Check for + 12 V under + after ignition feed between tracks 1 and 5 of the brake lights on relay mounting. If the voltage is incorrect, check the wiring harness.</p>												
<p>Check the condition and wiring of the computer and brake lighting on relay connections. Check and ensure the continuity of the following connections:</p> <table><tr><td>Relay mounting track 1</td><td>————→</td><td>Passenger compartment fuse box and relay</td></tr><tr><td>Relay mounting track 2</td><td>————→</td><td>Track 22 computer connector</td></tr><tr><td>Relay mounting track 3</td><td>————→</td><td>Brake light connector</td></tr><tr><td>Relay mounting track 4</td><td>————→</td><td>Track 30 computer connector</td></tr></table> <p>Also check the insulation between these connections. If the controls are OK, check the brake lights on relay. Replace the brake lights on relay if necessary.</p>	Relay mounting track 1	————→	Passenger compartment fuse box and relay	Relay mounting track 2	————→	Track 22 computer connector	Relay mounting track 3	————→	Brake light connector	Relay mounting track 4	————→	Track 30 computer connector
Relay mounting track 1	————→	Passenger compartment fuse box and relay										
Relay mounting track 2	————→	Track 22 computer connector										
Relay mounting track 3	————→	Brake light connector										
Relay mounting track 4	————→	Track 30 computer connector										
<p>Clear the computer fault memory. Exit fault finding mode, switch off the ignition, carry out a road test and then check again with the diagnostic tool. If the fault is still present, contact the Techline.</p>												

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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DF188 PRESENT OR STORED	<u>BRAKE LIGHT SWITCH CIRCUIT</u> 1.DEF: inconsistency 2.DEF: permanent high signal
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NOTES	Special notes: 1.DEF: This code means that the computer does not detect that the pedal is pressed during braking (pedal pressed in relation to the pressure sensor). 2.DEF: This code means that the computer detects the pedal as pressed all the time or that the brake light bulbs are the wrong ones.
	Conditions for applying the fault finding procedure to stored faults: Clear the stored fault, carry out a road test at a speed of > 36 mph (60 km/h) and test the brakes with ABS regulation.

Using the diagnostic tool, check on the statuses screen that **ET017 Brake pedal** recognises the correct pressed and released positions of the brake pedal.

If the correct pedal position is not displayed, use the interpretation of **ET017 Brake pedal**.

If the fault is still present, contact the Techline.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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DF189 PRESENT	<u>COMBINED SENSOR CIRCUIT</u>
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NOTES	None
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Measure the voltage across **tracks 3 and 6** of the combined sensor connector with + after ignition feed switched on.

If the voltage is not approximately the same as + after ignition feed, contact the Techline.

Check the connection and condition of the combined sensor and computer connectors.
Visually inspect the sensor wiring.
Check and ensure continuity and the insulation of the connections between:

Sensor connector track 1	————→	Track 18 computer connector
Sensor connector track 2	————→	Track 37 computer connector
Sensor connector track 3	————→	Passenger compartment fuse box
Sensor connector track 4	————→	Track 16 computer connector
Sensor connector track 5	————→	Track 20 computer connector
Sensor connector track 6	————→	Track 15 computer connector

Also check the insulation between these connections.

<p>If the results of the checks are correct, reconnect the computer and the combined sensor. Clear the computer fault memory. Exit fault finding mode and switch off the ignition. Switch the ignition on and replace the sensor if the fault recurs.</p>

AFTER REPAIR	<p>Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool.</p>
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DF190 PRESENT	<u>COMBINED SENSOR</u> 1.DEF: internal electronic fault of the sensor 2.DEF: sensor incorrectly fitted
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NOTES	Special notes: None
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1.DEF	NOTES	None
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Check the connection and condition of the combined sensor and computer connectors.

Carry out a visual inspection of the sensor wiring.

Check and ensure continuity and the insulation of the connections between:

Sensor connector track 1	————→	Track 18 computer connector
Sensor connector track 2	————→	Track 37 computer connector
Sensor connector track 3	————→	Passenger compartment fuse box
Sensor connector track 4	————→	Track 16 computer connector
Sensor connector track 5	————→	Track 20 computer connector
Sensor connector track 6	————→	Track 15 computer connector

Also check the insulation between these connections. Repair if necessary.

If the fault is still present replace the combined sensor, taking care not to damage it.

If the combined sensor is replaced, it is imperative to clear the programming of the ESP sensors (Vdiag 09, 0A, 0B, 12 and 11) using command **RZ003 "ESP sensor programming"**.

2.DEF	NOTES	None
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Check that the combined sensor is correctly fitted and attached to the vehicle chassis. The combined sensor is marked with an arrow. You must make sure that this arrow is pointing to the front of the vehicle.

Clear the computer's fault memory and clear the ESP sensor programming (Vdiag 09, 0A, 0B, 12 and 11) with command RZ003 "ESP sensor programming".

Switch off the ignition and carry out a road test.

AFTER REPAIR	Clear the computer fault memory. If the combined sensor has been replaced, erase the ESP sensor programming (Vdiag 09, 0A, 0B and 11) with command RZ003 ESP sensor programming. Carry out a road test followed by another check with the diagnostic tool .
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DF191 PRESENT	<u>ESP ON/OFF BUTTON CIRCUIT</u>
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NOTES	Special notes: This fault does not cause the warning lights to come on or a fault message on the instrument panel. The ESP is not faulty, but disabling the ESP with the button is not possible.
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Apply the interpretation of status **ET023 ESP on/off button**.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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DF193 PRESENT OR STORED	<u>INVALID INJECTION MULTIPLEX SIGNALS</u>
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NOTES	<p>Special notes: Although it is stored in the computer, the ABS/ESP system is not faulty. The ESP is deactivated due to unusable information from the injection system. Perform fault finding on the injection system using the diagnostic tool.</p> <p>Note: The injection does not always store these transient faults as quickly as the ABS/ESP system. If no fault is stored in the injection computer, start the engine; if there is no fault present, contact the Techline. Once the fault in the injection system has been repaired, clear the ABS/ESP computer fault memory.</p>
	<p>Conditions for applying the fault finding procedure to stored faults: The fault is declared present after starting the engine.</p>

Carry out a multiplex network test and check the injection system with the diagnostic tool.
If the fault is still present, contact the Techline.

AFTER REPAIR	<p>Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool.</p>
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DF194 PRESENT OR STORED	<u>ELECTRIC POWER ASSISTED STEERING MULTIPLEX SIGNALS INVALID</u> 1.DEF: inconsistency 2.DEF: fault detected
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NOTES	<p>Special notes: Although it is stored in the computer, the ABS/ESP system is not faulty. The ESP is deactivated due to unusable information from the electric power steering system. Run fault finding on the electric power steering with the diagnostic tool.</p> <p>Note: The electric power steering does not always store these transient faults as quickly as the ABS/ESP system. If no fault is stored in the electric power steering computer memory, start the engine; if no present fault is displayed, contact the Techline. Once the fault in the electric power steering system has been repaired, clear the ABS/ESP computer fault memory.</p> <p>Conditions for applying the fault finding procedure to stored faults: The fault is declared present after starting the engine.</p>
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1.DEF	NOTES	None
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Check the condition of the axle assemblies (impacts, damage, etc.) and the conformity and good condition of the tyres.
 Check the axle assemblies, adjust if necessary.
 Calibrate the steering wheel angle in the electric power-assisted steering using the **diagnostic tool**.
 Ensure that the combined sensor is properly fixed to the body in the right direction (arrow towards the front of the vehicle).

If all the checks are OK, clear the computer fault memory and clear the ESP sensor programming (Vdiag 09, 0A, 0B, 12 and 11) using command **RZ003 "ESP sensor programming"**.
 Carry out a road test.

AFTER REPAIR	<p>Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool.</p>
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DF194 CONTINUED	
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2.DEF	NOTES	None
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Carry out fault finding on the electric power steering using the diagnostic tool and repair if necessary.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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DF195 PRESENT OR STORED	<u>AUTOMATIC GEARBOX MULTIPLEX SIGNALS INVALID</u>
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NOTES	<p>Special notes: Although it is stored in the computer, this fault does not cause the warning lights to come on or generate a fault message, because the ABS/ESP system is not faulty. The ABS/ESP system is not faulty, but has received unusable signals from the automatic transmission. Run fault finding on the automatic transmission with the diagnostic tool. Note: The automatic transmission does not always store these transient faults as quickly as the ABS/ESP. If there is no stored fault in the automatic transmission computer memory, start the engine, and if no present fault is displayed, contact the Techline. Once the fault in the automatic transmission has been repaired, clear the ABS/ESP computer fault memory.</p> <p>Conditions for applying the fault finding procedure to stored faults: The fault is declared present after starting the engine.</p>
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Using the diagnostic tool, check in the parameter screen that the **PR063 Vehicle parameters** truly correspond with the vehicle undergoing fault finding.

Is PR063 Vehicle Parameters correct?

YES	<p>Carry out a multiplex network test and check the automatic transmission system using the diagnostic tool. If the fault is still present, contact the Techline.</p>
NO	<p>Use command VP004 Vehicle parameters to define the appropriate parameters for the vehicle type. Clear the computer fault memory. Exit fault finding mode, switch off the ignition and carry out a new test with the diagnostic tool. If the fault is still present, contact the Techline.</p>

AFTER REPAIR	<p>Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool.</p>
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DF196 PRESENT OR STORED	<u>NO ELECTRIC POWER ASSISTED STEERING MULTIPLEX SIGNAL</u>
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NOTES	<p>Special notes: Although the fault is stored in the computer, it is not caused by ABS/ESP components, but it indicates that the ESP is deactivated due to an electric power steering frame transmission fault. Run fault finding on the electric power steering.</p> <p>Note: The electric power steering does not always store these transient faults as quickly as the ABS/ESP system. If there is no stored fault in the electric power steering computer memory, start the engine; if no present fault is displayed, contact the Techline. Once the fault in the electric power steering system has been repaired, clear the ABS/ESP computer fault memory.</p>
	<p>Priorities when dealing with a number of faults: Deal with faults DF152 and DF153 first, whether they are present or stored.</p>
	<p>Conditions for applying the fault finding procedure to stored faults: The fault is declared present when the engine is started up.</p>

Check the condition and correct locking of the **blue PEH connector on the UPC** (Vdiag 44) or the **grey CT1 connector on the UPC** (Vdiag 48).
Carry out a multiplex network test and check the electric power steering system using the **diagnostic tool**. If the fault is still present, contact the Techline.

AFTER REPAIR	<p>Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool.</p>
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NOTES

Only check conformity after a full check with the **diagnostic tool**.

Order	Function	Parameter or Status checked or Action	Display and Notes	Fault finding
1	Diagnostic tool dialogue		ESP 8.0	Follow ALP 1
2	Computer configuration	PR030: Tachometric index	Check that the index entered matches the vehicle's tyres (see Replacement of components)	None
3	Brake pedal not depressed detection	ET017: Brake pedal	"Released" status confirmed, brake pedal not depressed	In the event of a fault, apply the interpretation of ET017 .
4	Depressed brake pedal detection	ET017: Brake pedal	"Depressed" status confirmed; brake pedal fully depressed	In the event of a fault, apply the interpretation of ET017 .
5	Steering wheel angle programming check	PR033: Steering wheel angle	Right-hand wheel values within: - 10° < PR033 < + 10°	If there is a fault, refer to the interpretation of fault DF196 .
6	Vehicle parameter reading	PR063: Vehicle parameters	Check that the parameters correspond to the vehicle undergoing fault finding.	See Configurations and Programming (VP004).
7	ESP automatic reconnection threshold check	PR064: ESP automatic reconnection threshold	Check that PR064 = 30 mph (50 km/h)	If PR064 is different, use setting VP023 .
8	Vehicle speed at initialisation	PR020: Vehicle speed at initialisation	Check that the value is correct according to the information in the Help section	In the event of a fault, apply parameter VP032 Vehicle speed at initialisation .
9	ESP on/off button	ET023: ESP on/off button	"Released" status confirmed, ESP on/off button not pressed	In the event of a fault, refer to the interpretation of ET023 ESP on/off button .
10			"Pressed" status confirmed, ESP on/off button pressed	

Summary table of statuses

Tool status	Diagnostic tool title
ET017	Brake pedal
ET023	ESP on/off button
ET030	Automatic brake light lighting

Summary table of parameters

Tool parameter	Diagnostic tool title
PR001	Front right-hand wheel speed
PR002	Front left-hand wheel speed
PR003	Rear right-hand wheel speed
PR004	Rear left-hand wheel speed
PR005	Computer feed voltage
PR007	Longitudinal acceleration
PR016	Lateral accel.* programming offset (Vdiag 09, 0A, 0B, 11, 12)
PR020	Vehicle speed at initialisation (Vdiag 0B, 12 and 11)
PR030	Tachometric index
PR033	Steering wheel angle
PR034	Yaw angle
PR036	Transverse acceleration
PR038	Vehicle speed
PR055	Number of teeth in the target
PR063	Vehicle parameters
PR064	Automatic ESP reactivation threshold (Vdiag 08, 09, 12 and 0B)
PR065	Yaw angle programming offset (Vdiag 09, 0A, 0B, 12 and 11)
PR066	Steering wheel angle programming offset (Vdiag 09, 0A, 0B, 12 and 11)

*accel.:

SETTINGS

PR001: Front right-hand wheel speed.

PR002: Front left-hand wheel speed.

PR003: Rear right-hand wheel speed.

PR004: Rear left-hand wheel speed.

These parameters specify the speed in mph of each wheel of the vehicle.

PR005: Computer supply.

This parameter shows the + after ignition computer feed voltage in volts.

PR007: Longitudinal acceleration.

This parameter indicates the longitudinal acceleration of the vehicle in ms⁻². It should be 0 when the vehicle is stationary.

PR016: Lateral acceleration programming offset (Vdiag 09, 0A, 0B, 12 and 11).

This parameter gives the correction made by the ESP on the gross value of the lateral acceleration sensor.

PR020: Vehicle speed at initialisation (Vdiag 0B, 12 and 11).

This parameter shows the vehicle speed sent to the multiplex network when the computer is initialised.

PR030: Tachometric index.

This parameter specifies the tachometric index entered in the computer for the tyres fitted to the vehicle.

PR033: Steering wheel angle.

This parameter gives the steering wheel angle in degrees. This signal is transmitted by the electric power-assisted steering to the ESP via the multiplex network.

PR034: Yaw angle.

This parameter gives the yaw angle supplied by the dual sensor or combined sensor in °/s. It should be 0 when the vehicle is stationary.

PR036: Transverse acceleration.

This parameter gives the lateral acceleration supplied by the dual sensor or combined sensor in g. It should be 0 when the vehicle is stationary.

PR038: Vehicle speed.

This parameter specifies the vehicle speed in mph.

PR055: Number of teeth on the target.

This parameter shows the number of teeth on the target.

PR063: Vehicle parameters.

This parameter shows whether the configuration (**VP004**) corresponds correctly to the vehicle under diagnosis.

PR064: Automatic ESP reactivation threshold (Vdiag 08, 09, 12 and 0B).

This parameter shows the automatic ESP reactivation threshold in mph (km/h). This parameter should be 30 mph (50 km/h). If the value differs, use command **VP023**.

PR065: Yaw angle programming offset (Vdiag 09, 0A, 0B, 12 and 11).

This parameter shows the correction made by the ESP to the raw yaw sensor value.

PR066: Steering wheel angle programming offset (Vdiag 09, 0A, 0B, 12 and 11).

This parameter shows the correction made by the ESP to the raw EPAS steering wheel angle sensor value.

STATUSES

- ET017: Brake pedal.**
This status gives the position (depressed or released) of the brake pedal
- ET023: ESP On/Off button**
This status is used to check the ESP On/Off button operation. This status (pressed or released) is checked by keeping the button pressed.
- ET030: Automatic brake light illumination.**
This status indicates whether automatic brake lighting is authorised or inhibited during CSV (understeer control)*. The parameters of this status can be modified using commands **VP021** and **VP022** according to the legislation in force in the country concerned.

CLEARING

- RZ001:** Fault memory.
This command is used for clearing the computer's stored faults.
- RZ003:** ESP sensor programming (Vdiag 09, 0A, 0B, 12 and 11).
This command resets the ESP sensor programming. Run this command every time work on the electric power steering required programming of the steering wheel angle or after any operation on the axle assemblies. Use this command when the combined sensor has been removed or replaced.

Control

- AC003:** Front left-hand wheel solenoid valves.
AC004: Front right-hand wheel solenoid valves.
AC005: Rear left-hand wheel solenoid valves.
AC006: Rear right-hand wheel solenoid valves.
These commands permit a check on the hydraulics of each wheel.
Raise the vehicle in order to be able to rotate the wheels, and check that they rotate freely.
Keep the brake pedal depressed to prevent the wheel being tested from being turned by hand (do not brake so firmly that full braking power is reached).
Select and confirm the command for the wheel concerned (e.g. Front left-hand wheel solenoid valve, etc.)
Turn the wheel concerned by hand; you should see it go through 5 locking/unlocking cycles.
- AC013:** Test wheel speed sensor feed (Vdiag 0A, 0B, 12 and 11).
This command is used to check that voltage pulses of approximately 12 V are detected by a multimeter at the sensor connector terminals on the computer side. You must use command **AC013** once only.
- AC016:** Pump motor test.
This command is used to test the pump motor control circuit. Select command **AC016 Pump Motor Test**. The motor must run for 5 seconds.
- AC187:** Brake light on relay.
This command is for testing brake light activation by the ESP when controlling understeer during sharp deceleration.

*CSV:

COMMAND (continued)

- AC195:** Vehicle speed signal.
This command sends a speed other than 0 mph on the computer's vehicle speed wire output (Track 33) to users of that signal (xenon bulbs, radio, sunroof).

Note:

This command has no visible effect on the dashboard speedometer needle.

Xenon bulbs: Switch on the dipped headlights and run command **AC195**. You should see a slight change in the height of the headlight beam (depending on vehicle speed, the height of the beam is adjusted to improve visibility).

- Radio: switch on the radio and check that the speed-dependent volume control function is active. Run command **AC195**. During the command, you should notice the volume of the sound increase and then decrease.
- Sunroof: this command has no visible effect on the sunroof. This command changes the activation threshold of the anti-pinch system (the pressure exerted by the sunroof varies with vehicle speed due to aerodynamic factors).

- AC196:** Request to switch on hazard warning lights.
This command sends the UCH a request to switch on the hazard warning lights to test their operation during emergency braking (depending on UCH configuration).

SPECIAL COMMANDS

- SC001:** Check target teeth.
This command tests the condition of the teeth on each wheel. Select command **SC001 Test target teeth**. The test result should show 48 teeth.
- SC006:** Bleed the hydraulic unit and brake circuits.
Use this command if abnormally long brake pedal travel is noted during a road test with ABS control (the system must have been bled beforehand by the usual procedure).
Select the **SC006 "Bleed hydraulic unit and brake circuit"** command and follow the instructions given by the diagnostic tool.

ET017	<u>BRAKE PEDAL</u>
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NOTES	Special notes: Carry out the checks only if the pressed and released statuses are not consistent with the pedal position.
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STATUS Released Brake pedal depressed.

If the brake lights are working:

- Check the continuity of the connection between track 1 of the brake light switch connector and track 30 of the computer connector.

If the brake lights are not working:

- Check the brake light lighting relay,
- Check the condition and fitting of the brake light switch and brake lights fuse.
- Remove the brake light switch and check that it is operating correctly:

	Continuity between tracks	Insulation between tracks
Switch pressed (Brake pedal released)	3 and 4	1 and 2
Switch released (Brake pedal depressed)	1 and 2	3 and 4

- Replace the switch if necessary.
- Check for **+ after ignition feed** on tracks **2 and 4** on the brake light switch connector.

If the brake lights still fail, check/ensure the continuity between **track 1** of the switch connector and **track 4** of the relay mounting.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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ET017
CONTINUED

Pressed STATUS, Brake pedal released.

Check the condition and fitting of the brake light switch, the brake lights fuse and the conformity of the bulbs.
Remove the brake light switch and check that it is operating correctly:

	Continuity between tracks	Insulation between tracks
Switch pressed (Brake pedal released)	3 and 4	1 and 2
Switch released (Brake pedal depressed)	1 and 2	3 and 4

Replace the switch if necessary.

Check and if necessary repair the insulation from 12 V on the connection between track 1 of the brake light switch connector and track 30 of the computer connector.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.


ET023	<u>ESP ON/OFF BUTTON</u>
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NOTES	Special notes: Carry out the checks only if the "pressed" and "released" statuses are not consistent with the button position.
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STATUS: "Depressed"

Ensure that the ESP start/stop button connector is in good condition and correctly connected. Repair if necessary. Check there is no continuity between switch **tracks A2 and B1** in the released position. If there is continuity, replace the switch.

Check the continuity and insulation against the earth of the connection between:

Switch connector track B1  Track 31 computer connector

STATUS: "Released"

Ensure that the ESP start/stop button connector is in good condition and correctly connected. Repair if necessary. Check the continuity between button **tracks A2 and B1** in the pressed position. If there is no continuity, replace the switch.

Check for earth on **Track A2** of the button connector.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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NOTES

Only consult this customer complaint after a **complete check** with the **diagnostic tool**.

FAULTS DETECTED ON BRAKING WITH ABS/BRAKING REGULATION

LOCKING OF ONE OR MORE WHEELS	ALP2
PULLING	ALP3
DRIFT	ALP4
UNEXPECTED ABS OPERATION AT LOW SPEEDS AND SLIGHT PEDAL PRESSURE	ALP5
UNEXPECTED ABS OPERATION ON A POOR ROAD SURFACE	ALP6
UNEXPECTED ABS OPERATION WHEN USING SPECIAL EQUIPMENT (RADIO TELEPHONE, CB, etc.)	ALP7
LENGTHENING OF BRAKE PEDAL TRAVEL FOLLOWING ABS (WITH PEDAL RECEDING WHEN ENTERING ABS)	ALP8
SPONGY PEDAL	ALP9
BRAKE PEDAL VIBRATION	ALP10
NOISES FROM THE PUMP, PIPES OR HYDRAULIC UNIT	ALP11

NOTES

Only consult this customer complaint after a complete check with the **diagnostic tool**.

OTHER CASES

NO DIALOGUE WITH THE ABS COMPUTER	ALP1
"ABS COMPUTER NOT DETECTED" DURING MULTIPLEX NETWORK TEST ON CLIP	ALP12
FAULTY BRAKE LIGHTS	ALP13
ERRATIC TRIGGERING OF ESP	ALP14
ESP WARNING LIGHT COMES ON WITH THE "ASR DISCONNECTED" MESSAGE WHEN THE CURRENT IS SWITCHED ON WITHOUT PRESSING THE ESP DISCONNECTION BUTTON	ALP15
INTERMITTENT ILLUMINATION OF BRAKE, ABS, SERVICE AND STOP WARNING LIGHTS AND THE MESSAGE "BRAKE FAILURE" ON THE INSTRUMENT PANEL WITH NO FAULT CODES IN THE COMPUTER	ALP16

ALP 1

No dialogue with the ABS computer

NOTES

Special note:

To run fault finding on the vehicle's computers, switch on the ignition in fault finding mode (forced + after ignition feed), i.e. proceed as follows:

- With the vehicle card in the card reader, press the Start button for more than 5 seconds without starting conditions being met.

Check that the CLIP diagnostic tool is equipped with the latest update available.

Try to establish dialogue with a computer on another vehicle to make sure that the diagnostic tool is not faulty. If the tool is not at fault, and dialogue cannot be established with any other computer on the same vehicle, the cause could be a faulty computer interfering on the multiplex network. Check the battery voltage and carry out the operations necessary to obtain the correct voltage (9.5 V < battery voltage < 17.5 V).

Carry out a fault finding procedure on the multiplex network using the **diagnostic tool**.

Check the presence and the condition of the ABS fuses on the passenger compartment fuse board and in the engine fuse box.

Check that the computer connector is properly connected and check the condition of its connections.

Check the ABS earths (good condition, not corroded, earth screw on top of the ABS unit tight).

Check that the supply to the computer is correct:

- Earth on tracks 1 and 4 of the 46-track connector.
- + before ignition feed on tracks 2 and 3 of the 46-track connector.
- + after ignition feed on track 18 of the 46-track connector.

Check that the power supply to the diagnostic socket is correct:

- + before ignition feed on track 16.
- + after ignition feed on track 1.
- Earth on tracks 4 and 5.

If dialogue has still not been established after these checks, contact the Techline.

AFTER REPAIR

Clear the computer fault memory.

Carry out a road test followed by another check with the **diagnostic tool**.

ALP 2

Locking of one or more wheels

NOTES

Only consult this customer complaint after a complete check with the **diagnostic tool**.

Reminder: wheel lock on a vehicle equipped with ABS, or tyre squealing perceived by the customer as locking, may be part of the normal operation of the system and should not be automatically considered as faults:
– Braking with ABS on very poor roads (significant squealing).

However, if the wheels are actually locking, raise the vehicle in order to be able to turn the wheels and check:
– Possible inversion when connecting the speed sensors.
Using parameters **PR001, PR002, PR003 and PR004**, rotate the wheels slowly and check the consistency of the results obtained.
If the value measured is zero, rotate the other wheels to confirm an electrical inversion of the sensors and repair the wiring harness.
– Possible inversion of pipes on the hydraulic unit.
Use commands **AC003 Front left-hand wheel solenoid valves, AC004 Front right-hand wheel solenoid valves, AC005 Rear left-hand wheel solenoid valves and AC006 Rear right-hand wheel solenoid valves** while depressing the brake pedal and check for the occurrence of 5 locking/unlocking cycles on the wheel concerned (see **Dealing with commands**). If the 5 cycles do not occur on the wheel tested (wheel remains locked), check whether they occur on another wheel to confirm transposed pipes.
If the 5 cycles are not detected on a wheel and the pipes have not been subject to inversion, replace the hydraulic unit.

Check that the sensor casing is secured when rotating.
Check the quality of the mounting of the wheel speed sensor (correct clipping without excessive play).
Check the conformity of the targets using special command **SC001 "Check target teeth"**: condition, number of teeth = 48.
If the fault is still present after these checks, contact the Techline.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

ALP 3

Pull

NOTES

Only consult this customer complaint after a complete check with the diagnostic tool.

Disconnect one wheel speed sensor. Start the engine and check that only the ABS fault warning light comes on. Do not drive the vehicle if the brake fault warning light is also lit, as the brake limiter function is no longer guaranteed to operate correctly. Carry out a road test with the ABS deactivated.

Is the fault still present under these conditions?

yes

If the brake pedal travel is relatively long, bleed the brake circuit.
If the travel is normal, check the tyre pressures, the front axle, or for any leaks in the circuit.

no

Raise the vehicle so that you can rotate the wheels and check:

- Possible inversion when connecting the speed sensors.
 - Possible inversion of pipes on the hydraulic unit.
- To carry out these two tests, refer to and follow the procedures given in ALP 2.

Check the condition of the ABS targets and that they conform to specifications.

Also check the sensor/target air gap over one revolution of each front and rear wheel.

If the fault is still present, contact the Techline.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

ALP 4

Drift

NOTES

Only consult this customer complaint after a complete check with the diagnostic tool.

Disconnect one wheel speed sensor. Start the engine and check that only the ABS fault warning light comes on. Do not drive the vehicle if the brake fault warning light is also lit, as the brake limiter function is no longer guaranteed to operate correctly. Carry out a road test with the ABS deactivated.

Is the fault still present under these conditions?

yes →

Road handling fault not connected with the ABS.

Check the condition of the brake linings and that they are to specification and check the tyre pressures, the front axle, etc.

no ↓

Normal behaviour linked to the system operation during the regulation phase, mainly on surfaces with uneven grip or which are poorly laid.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

ALP 5

Unexpected ABS operation at low speed and with slight pedal pressure

NOTES

Only consult this customer complaint after a complete check with the **diagnostic tool**. Important: ABS regulation may be unresponsive when the vehicle is driven on surfaces such as icy roads, cobbled streets, etc.

It is possible to feel brake pedal vibrations which are associated with the reaction of the system in particular circumstances, such as:

- crossing rumble strips,
- tight cornering with lifting of the inside rear wheel.

These vibrations may be linked to simple brake limiter activation, when the pressure on the rear axle is limited. If the fault is different, check the speed sensor connectors (micro-breaks) as well as the air gaps.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

ALP 6

Unexpected ABS system intervention on a poor road surface

NOTES

Only consult this customer complaint after a complete check with the diagnostic tool.

On poor road surfaces it is normal to feel bucking and vibration of the pedal as well as more significant tyre squealing than on good surfaces.
This gives the impression of a variation in efficiency, but this should be considered normal.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

ALP 7

**Unexpected ABS operation when using special equipment
(car phone, CB, etc.)**

NOTES

Only consult this customer complaint after a complete check with the diagnostic tool.

Check that the equipment which is causing the fault is approved.

Check that this equipment has been correctly installed without modification to the original wiring, in particular, that of the ABS system (connections to earth and + after ignition/before ignition of the ABS are not permitted).

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

ALP 8

Lengthening of the brake pedal travel following a regulation phase (with an irregular pedal when entering the regulation phase)

NOTES

Only consult this customer complaint after a complete check with the diagnostic tool.

Air transit from the hydraulic unit regulation channels to the brake circuits.
Bleed the circuits, following the procedure using the diagnostic tool commands (see Command mode procedures).
Following the operation, carry out a road test with ABS regulation.

If the fault is still present, carry out the above operation again 1 or 2 times.
If the customer complaint is particularly pronounced, and the bleeding procedures have not rectified it, contact the Techline.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

ALP 9

Spongy pedal

NOTES

Only consult this customer complaint after a complete check with the diagnostic tool.

Air in the brake circuits.

Bleed the circuits in the conventional way starting with the rear right-hand brake, followed by rear left, front left and finally front right. Repeat the operation if necessary.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

ALP 10

Brake pedal vibration

NOTES

Only consult this customer complaint after a complete check with the diagnostic tool.

Normal reaction of the brake pedal during ABS regulation or of limitation of pressure on the rear axle (brake limiter function).

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

ALP 11

Noise from the pump, pipes or hydraulic unit

NOTES

Only consult this customer complaint after a complete check with the diagnostic tool.

- Vibration of the unit: check the presence and the condition of the unit bracket insulating rubber mounting bushes.
 - Vibration of pipes: check that all the pipes are securely clipped in their retaining clips and that there is no contact between pipes or between pipes and bodywork.
- To determine where the noise is coming from, use the front left-hand wheel solenoid valves, front right-hand wheel solenoid valves, rear left-hand wheel solenoid valves and rear right-hand wheel solenoid valves control commands while depressing the brake pedal.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

ALP 12

**ABS computer not detected during the multiplex network test
on CLIP**

NOTES

Only consult this customer complaint after a complete check with the **diagnostic tool**.
Check that the CLIP diagnostic tool is equipped with the latest update available.

If the ABS computer is not detected after the multiplex network test on the CLIP, carry out the following operations:

- return to the home menu of the CLIP screen,
- switch off the ignition,
- switch on the ignition again,
- test the computers again without the automatic acquisition of the VIN code.

If the fault is still present, follow ALP 1.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

ALP 13

Faulty brake lights lighting

NOTES

Only consult this customer complaint after a complete check with the **diagnostic tool**.

Using the **diagnostic tool**, check that **ET017** is functioning correctly.
If not, apply the fault finding procedure described above for **ET017**.

If the lights still do not work, check the functioning of the light-switch relay.
The relay is passed at rest (check the continuity between tracks 3 and 4 of the relay). Replace the relay if necessary.
Check the continuity of the connection between track 1 of the brake light switch and track 4 of the relay mounting.
Repair if necessary.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

ALP14	Erratic ESP regulation
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NOTES	Only consult this customer complaint after a complete check with the diagnostic tool .
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Check that the four tyres on the vehicle are identical.

Using the **diagnostic tool**, you must ensure that the value of configuration **PR063 "Vehicle parameters"** matches the definition of the vehicle undergoing diagnostics.

If necessary, run command **VP004 Vehicle parameters** using the **diagnostic tool** to define the appropriate parameters for the vehicle type.

Check the connection and condition of the combined sensor connector.

Check that the orientation of the combined sensor on the body is correct and that it is correctly mounted.

Calibrate the steering wheel angle in the Electric power-assisted steering domain using the **diagnostic tool**.

Clear the computer's fault memory and clear the ESP sensor programming (Vdiag 09, 0A, 0B, 12 and 11) with command **RZ003 "ESP sensor programming"**.

Carry out a road test followed by another check with the **diagnostic tool**.

If the fault is still present, adjust the axle assembly geometries. Adjust if necessary and calibrate the steering wheel angle again in the Electric power assisted steering domain using the **diagnostic tool**.

Clear the computer's fault memory and clear the ESP sensor programming (Vdiag 09, 0A, 0B, 12 and 11) with command **RZ003 "ESP sensor programming"**.

If the fault is still present, contact the Techline.

AFTER REPAIR	Clear the computer fault memory. Carry out a road test followed by another check with the diagnostic tool .
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ALP15

ESP warning light comes on with the "ASR* disconnected or off" message when the current is switched on without pressing the ESP disconnection button

NOTES

Consult this customer complaint only if the "Service", "ABS" and "Brake" warning lights are not lit.

After disconnecting the battery, it is probable that the electric power steering loses the steering wheel angle sensor indexing (the electric power steering no longer sends the steering wheel angle signal to the ESP, which is then disabled).

The ESP system is not faulty, no fault is present in the fault memory, the ESP warning light comes on and the "ASR disconnected or off" message indicate this transient and reversible status.

To restore the electric power steering indexing and enable the ESP again, it is necessary to:

- switch on the ignition or start the engine (to obtain maximum steering assistance),
- turn the steering wheel slowly to full right lock, to full left lock, then return slowly to the centre point after going slightly past it,
- the ESP warning light should go out and the message "ASR disconnected or off" should disappear,
- stop the engine and switch off the ignition,
- switch on the ignition, start the engine and see that the warning light no longer lights up.

If the warning light and the message reappear, start the procedure described above again.

If the operation fails again or if this customer complaint appears without the battery having been disconnected, run fault finding on the electric power steering and repair accordingly.

*ASR: Traction control

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

ALP 16

Intermittent illumination of brake, ESP, ABS, SERVICE and STOP warning lights and the message "brake failure" on the instrument panel with no fault codes in the computer

NOTES

Only consult this customer complaint after a **complete check** with the **diagnostic tool**.

Check the condition and connection of the battery terminals.
Is the battery in good condition?

NO

Clean the battery terminals.

YES

Check the **50A** power fuse in position 5 on the power fuse board. Check **fuse F13 (25A) on the UPC** and the correct locking of the grey 4-track PPH1 connector (Vdiag 44) or **the 25A fuse F8 on the UPC** and the correct locking of the black 6-track CM connector (Vdiag 48 or higher).
Are the fuses and connectors correct?

NO

If the connector is faulty and there is a repair procedure (see **Technical Note 6015A, Electrical wiring repair, Wiring: Precautions for repair**), repair the connector, otherwise replace the wiring.
Replace any faulty fuses. Switch on the ignition again.
Is the replaced fuse or fuses correct?

YES

Check the connection and condition of the tab 1 red wire of the grey connector.
Is the connector correct?

NO

Check the **insulation to earth** between:
– fuse **50A** and **track 2** of the computer
– fuse **25A** and **track 3** of the computer
Are the connections correct?

YES

Contact the Techline.

YES

NO

NO

If the connection(s) are faulty and there is a repair method (see **Technical Note 6015A, Repairing electrical wiring, Wiring: Precautions for repair**), repair the wiring, otherwise replace it.

A

If the connector is faulty and there is a repair method (see **Technical Note 6015A, Repairing electrical wiring, Wiring: Precautions for repair**), repair the connector, otherwise replace the wiring.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.

ALP 16
CONTINUED

A

Check the connections on the ABS/ESP computer 46-track connector.
Is the connector correct?

NO

If the connector is faulty and there is a repair procedure (see **Technical Note 6015A, Electrical wiring repair, Wiring: Precautions for repair**), repair the connector, otherwise replace the wiring.

YES

Check the ABS earths on tracks 1 and 4 (mounted under the ABS/ESP unit) and visually inspect all the ABS/ESP wiring.
Are the earths correct?

NO

If the connection(s) are faulty and there is a repair method (see **Technical Note 6015A, Repairing electrical wiring, Wiring: Precautions for repair**), repair the wiring, otherwise replace it.

YES

Check the continuity between the fuses and **tracks 2 and 3** of the computer connector (+ before ignition feed on the tracks) and between the UCH and **track 28 of the computer** (+ after ignition feed on the track).
Is the continuity correct?

NO

If the connection(s) are faulty and there is a repair method (see **Technical Note 6015A, Repairing electrical wiring, Wiring: Precautions for repair**), repair the wiring, otherwise replace it.

YES

If the customer complaint is still present, contact Techline.

AFTER REPAIR

Clear the computer fault memory.
Carry out a road test followed by another check with the **diagnostic tool**.