

Table c. Terminal and circuit numbers	
Number	Circuit description
30	Battery positive (+) voltage. Supplies power whenever battery is connected. (Not dependent on ignition switch position, unfused)
31	Ground, battery negative (-) terminal
50	Supplies power from battery to starter solenoid when ignition switch is in START position only
+54	Originates at ignition switch. Supplies power when ignition switch is in the RUN position only
85	Ground side (-) of relay coil
86	Power-in side (+) of relay coil
87	Relay actuated contact
D	Alternator warning light and field energizing circuit

Additional abbreviations shown in the wiring diagrams are given below.

Table d. Common E46 abbreviation

Abbreviation	Component or system	Abbreviation	Component or system
ABS	antilock brakes	KL 50	ignition switch start position
A/C	air conditioning	LDP	fuel tank leak diagnosis pump (DME MS 42.0)

Abbreviation	Component or system	Abbreviation	Component or system
ADB, ADB-X	automatic differential lock	LEV	low emission vehicle
AGS	adaptive transmission control	LSZ	light switch module
AIC	rain sensor	MAF	mass air flow sensor
ASC	traction control	MBC	maximum braking control
AUC	automatic air recirculation	MFL	multifunction steering wheel
BST	Battery safety terminal	MRS	multiple restraint system
CAN	Controller Area Network (BUS)	NLEV	national low emission vehicle program
CBC	cornering brake control	NTC	negative temperature coefficient resistor
DBC	dynamic brake control	OBC	on board computer
DK	throttle valve	OBD II	second generation on-board diagnostics
DLC	diagnostic link connector	ORVR	on-board refueling vapor recovery
DME	digital motor electronics	PDC	park distance control (optional)
DMTL	diagnosis module-tank leakage (DME MS 43.0)	PWG	pedal position sensor
DSC III	dynamic stability control	RAM	random access memory
DTC	diagnostic trouble code	RDC	tire pressure control (optional)
DWA	anti-theft alarm system	RPS	rollover protection system
E-box	electronics box under engine hood	RXD	receive data line
ECM	engine control module	SBE	front passenger seat sensor
EGS	electronic transmission control	SGS	seat integrated belt system
EPROM	erasable/programmable read-only memory	SHD	sunroof module
EWS	electronic immobilizer	SII	service interval indicator
FZV	keyless entry	SM	seat memory module

Abbreviation	Component or system	Abbreviation	Component or system
GM	general module (see ZKE)	SRS	supplemental restraint system-airbag
HPS	head protection system	TCM	transmission control module
IHKA	automatic heating and air conditioning system	TDC	top dead center
IHKR	manual heating and air conditioning system	TLEV	transitional low emissions vehicle
ITS	head protection system	TXD	transmit data line
KL 15	battery positive, ignition switch on "run"	UIS	ultrasonic interior protection
KL 30	battery positive "hot" all the time	ULEV	ultra low emissions vehicle
KL 31	battery/chassis ground	ZKE	central body electronics

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Electrical Troubleshooting

Four things are required for current to flow in any electrical circuit: a voltage source, wires or connections to transport the voltage, a load or device that uses the electricity, and a connection to ground.

Most problems can be found using a digital multimeter (volt/ohm/amp meter) to check the following:

- ◆ Voltage supply
- ◆ Breaks in the wiring (infinite resistance/no continuity)
- ◆ A path to ground that completes the circuit.

Electric current is logical in its flow, always moving from the voltage source toward ground. Electrical faults can usually be located through a process of elimination. When troubleshooting a complex circuit, separate the circuit into smaller parts. General tests outlined below may be helpful in finding electrical problems. The information is most helpful when used with wiring diagrams.

Be sure to analyze the problem. Use wiring diagrams to determine the most likely cause. Get an understanding of how the circuit works by following the circuit from ground back to the power source.

When making test connections at connectors and components, use care to avoid spreading or damaging the connectors or terminals. Some tests may require jumper wires to bypass

components or connections in the wiring harness. When connecting jumper wires, use blade connectors at the wire ends that match the size of the terminal being tested. The small internal contacts are easily spread apart, and this can cause intermittent or faulty connections that can lead to more problems.

Voltage and voltage drops

Wires, connectors, and switches that carry current are designed with very low resistance so that current flows with a minimum loss of voltage. A voltage drop is caused by higher than normal resistance in a circuit. This additional resistance actually decreases or stops the flow of current. A voltage drop can be noticed by problems ranging from dim headlights to sluggish wipers. Some common sources of voltage drops are corroded or dirty switches, dirty or corroded connections or contacts, and loose or corroded ground wires and ground connections.

A voltage drop test is a good test to make if current is flowing through the circuit, but the circuit is not operating correctly. A voltage drop test will help to pinpoint a corroded ground strap or a faulty switch. Normally, there should be less than 1 volt drop across most wires or closed switches. A voltage drop across a connector or short cable should not exceed 0.5 volts.

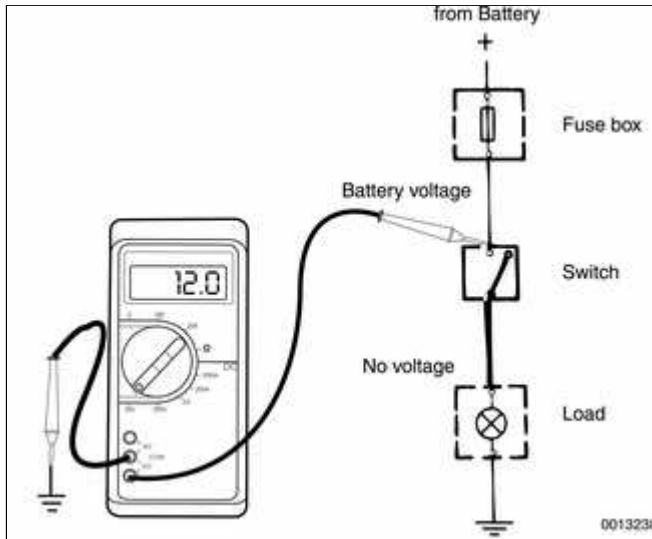
Note:

- ◆ *A voltage drop test is generally more accurate than a simple resistance check because the resistances involved are often too small to measure with most ohmmeters. For example, a*

resistance as small as 0.02 ohms would results in a 3 volt drop in a typical 150 amp starter circuit. (150 amps x 0.02 ohms =3 volts).

- ◆ *Keep in mind that voltage with the key on and voltage with the engine running are not the same. With the ignition on and the engine off (battery voltage), voltage should be approximately 12.6 volts. With the engine running (charging voltage), voltage should be approximately 14.0 volts. Measure voltage at the battery with the ignition on and then with the engine running to get exact measurements.*

Voltage, measuring



- ◀ Connect digital multimeter negative lead to a reliable ground point on car.

Note:

The negative (-) battery terminal is always a good ground point.

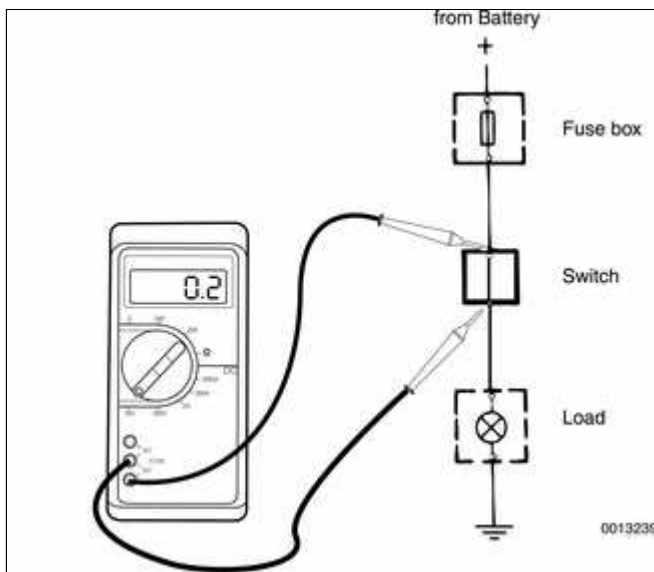
- Connect digital multimeter positive lead to point in circuit you wish to measure.
- ◆ If a reading is obtained, current is flowing through circuit.

Note:

The voltage reading should not deviate more than 1 volt from voltage at the battery. If voltage drop is more than this, check for a corroded connector or loose ground wire.

Voltage drop, testing

Voltage drop can only be checked when there is a load on the circuit, such as when operating the starter motor or turning on the headlights. A digital multimeter should be used to ensure accurate readings.



Connect digital multimeter positive lead to positive (+) battery terminal or a positive power supply close to battery source.

- Connect digital multimeter negative lead to other end of cable or switch being tested.
- With power on and circuit working, meter shows voltage drop (difference between two points). This value should not exceed 1 volt.

Note:

The maximum voltage drop in an automotive circuit, as recommended by the Society of Automotive Engineers (SAE), is as follows: 0 volts for small wire connections; 0.1 Volts for high current connections; 0.2 volts for high current cables; and 0.3 volts for switch or solenoid contacts. On longer wires or cables, the drop may be slightly higher. In any case, a voltage drop of more than 1.0 volt usually indicates a problem.

Continuity, checking

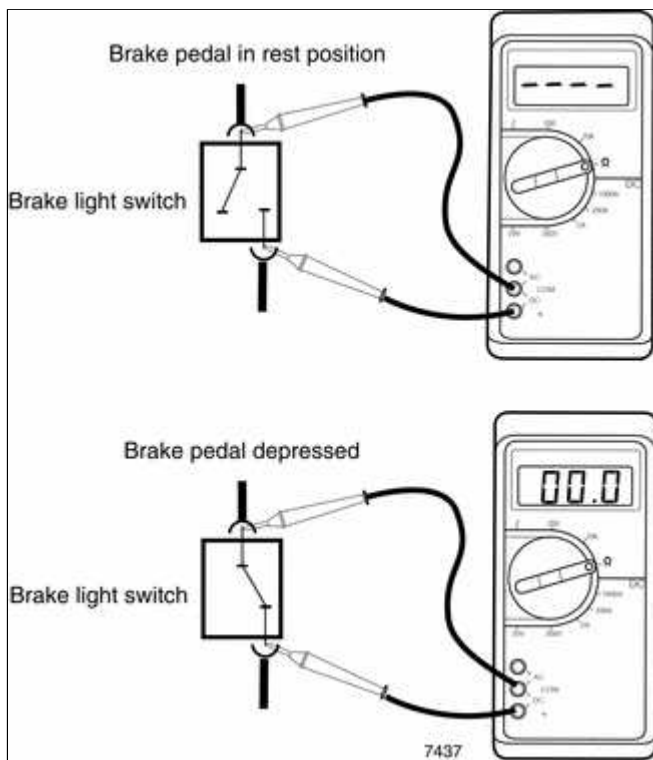
Continuity tests can be used to check a circuit or switch. Because most automotive circuits are designed to have little or no resistance, a circuit or part of a circuit can be easily checked

for faults using an ohmmeter. An open circuit or a circuit with high resistance will not allow current to flow. A circuit with little or no resistance allows current to flow easily.

When checking continuity, the ignition should be off. On circuits that are powered at all times, the battery should be disconnected. Using the appropriate wiring diagram, a circuit can be easily tested for faulty connections, wires, switches, relays and engine sensors by checking for continuity.

✦ For example, to test brake light switch for continuity:

- ◆ With brake pedal in rest position (switch open) there is no continuity (infinite Ω).
- ◆ With pedal depressed (switch closed) there is continuity (0Ω).



Short circuits

Short circuits are exactly what the name implies. The circuit takes a shorter path than it was designed to take. The most common short that causes problems is a short to ground where the insulation on a positive (+) wire wears away and the metal wire is exposed. When the wire rubs against a metal part of the car or other ground source, the circuit is shorted to ground. If the exposed wire is live (positive

battery voltage), a fuse will blow and the circuit may possibly be damaged.

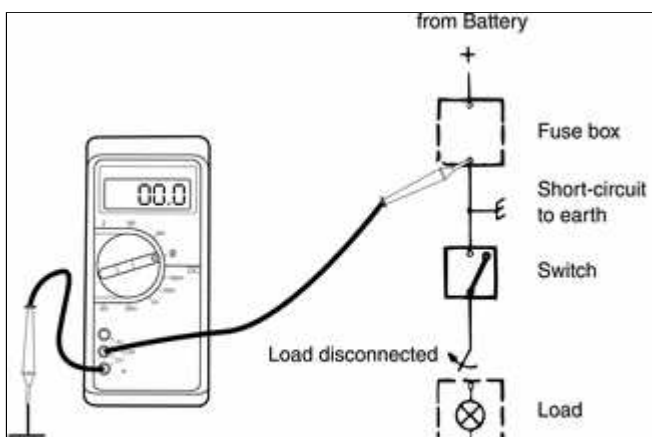
Shorts to ground can be located with a digital multimeter. Short circuits are often difficult to locate and may vary in nature. Short circuits can be found using a logical approach based on current path.

CAUTION!

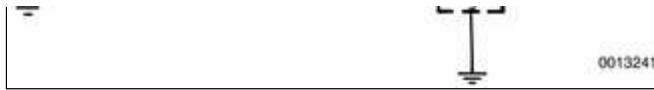
- ♦ ***On circuits protected with high rating fuses (25 amp and greater), wires or circuit components may be damaged before the fuse blows. Always check for damage before replacing fuses of this rating.***
- ♦ ***When replacing blown fuses, use only fuses having the correct rating. Always confirm the correct fuse rating printed on the fuse/relay panel cover.***

Short circuit, testing with ohmmeter

- Remove blown fuse from circuit and disconnect cables from battery. Disconnect harness connector from circuit load or consumer.



- ✦ Using an ohmmeter, connect one test lead to load side of fuse terminal (terminal leading to circuit) and the other test lead to ground.
 - If there is continuity to ground, there is a short to ground.
 - If there is no continuity, work from wire harness nearest to fuse/relay



panel and move or wiggle wires while observing meter. Continue to move down harness until meter displays a reading. This is the location of short to ground.

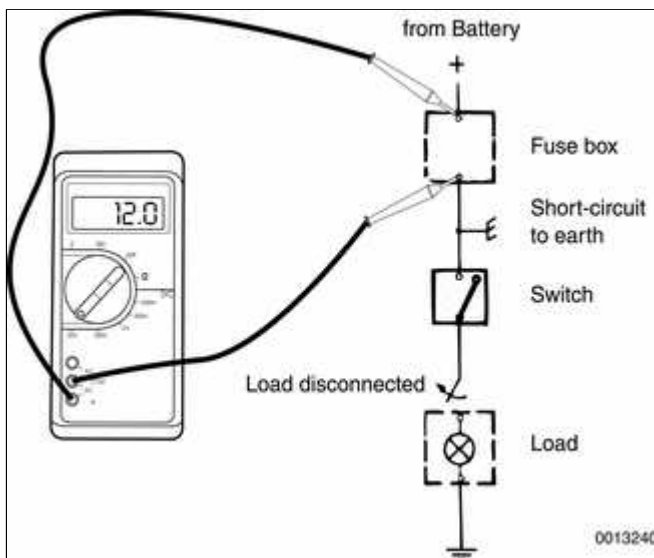
- Visually inspect wire harness at this point for any faults. If no faults are visible, carefully slice open harness cover or wire insulation for further inspection. Repair any faults found.

Short circuit, testing with voltmeter

- Remove blown fuse from circuit. Disconnect harness connector from circuit load or consumer.

Note:

Most fuses power more than one consumer. Be sure all consumers are disconnected when checking for a short circuit.



Using a digital multimeter, connect test leads across fuse terminals. Make sure power is present in circuit. If necessary turn key on.

- If voltage is present at voltmeter, there is a short to ground.
- If voltage is not present, work from wire harness nearest to fuse/relay panel and move or wiggle wires while observing meter. Continue to move down harness until meter displays a reading. This is the location of short to ground.
- Visually inspect wire harness at

this point for any faults. If no faults are visible, carefully slice open harness cover or wire insulation for further inspection. Repair any faults found.

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General

This repair group covers fuse, relay and control module location information. Ground points and other component locations are also covered, primarily via photos or illustrations.

For additional E46 electrical system information, see:

- ◆ ⇒ [600 Electrical System—General](#).
- ◆ Electrical Wiring Diagrams

Fuses, relays and control modules

The complex nature of E46 electrical systems requires a very large number of fuses and electrical components. Locating this array of equipment is always an important first step in any kind of electrical diagnosis.

Investigating and correcting ground problems often clears mysterious and difficult to trace electrical problem. This repair group covers the major ground locations on the vehicle.

Keep in mind that electrical equipment and accessories installed vary depending on model and model year. Always confirm that the proper electrical component has been identified by using the electrical wiring diagrams at the back of this manual.

Electrical system safety precautions

Please read the following warnings and

cautions before doing any work on your electrical system.

WARNING!

The battery safety terminal, pyrotechnic seat belt tensioners, and airbags utilize explosive devices and must be handled with extreme care. Refer to the warnings and cautions in ⇒ [121 Battery, Alternator, Starter](#); ⇒ [720 Seat Belts](#); and ⇒ [721 Airbag System \(SRS\)](#).

CAUTION!

- ♦ *Prior to disconnecting the battery, read the battery disconnection cautions given at the front of this manual on page viii.*
- ♦ *Relay and fuse positions are subject to change and may vary from car to car. If questions arise, an authorized BMW dealer is the best source for the most accurate and up-to-date information.*
- ♦ *A good way to verify a relay position is to compare the wiring colors at the relay socket to the colors indicated on the wiring diagrams located at the rear of this manual.*
- ♦ *Always switch the ignition off and remove the negative (-) battery cable before removing any electrical components. Connect and disconnect ignition system wires, multiple connectors, and ignition test equipment leads only while the ignition is switched off.*

- ♦ ***Only use a digital multimeter for electrical tests.***

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Fuse Positions

There are three locations for fuses in E46 cars:

- ◆ Main harness fuse in trunk
- ◆ Fuse panel above glove compartment
- ◆ E-box in engine compartment left side

Note:

- ◆ *In BMW repair information, fuses are numbered F1 through F108. There are two fuses with the same designation: F5 in the main fuse panel is rated 5A and protects the horn circuit. F5 in the E-box fuse carrier is rated 30A and protects the unloader relay circuit in 1999 - 2000 models, and fuel injector relay in 2001 models.*
- ◆ *In a few cases, a fuse may have two different amperage ratings depending on equipment in the vehicle. In such cases the second rating is put in parenthesis in the fuse rating tables.*

Main harness fuse



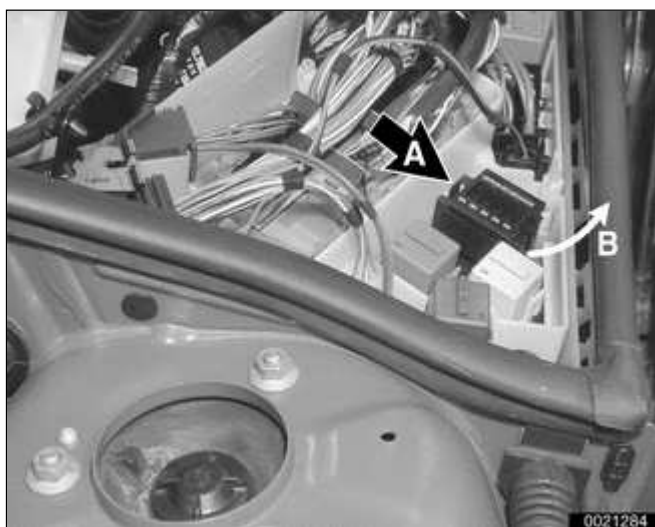
✦ Fig. 1 Main harness fuse in trunk:

- ◆ Working ahead of battery in trunk, remove trim liner clips.



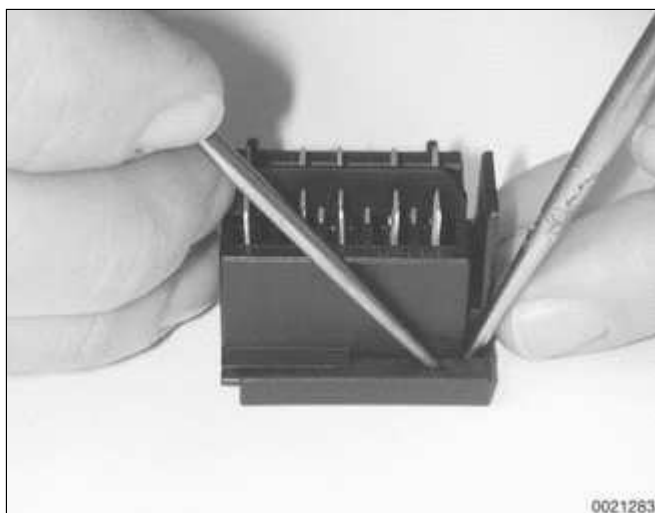
- ◆ Peel back liner to access F108 (200 amp) fuse (**arrow**) in main power distribution circuit.

Electronics box (E-box) fuse carrier



- ✎ Fig. 2 Engine electronics fuse pack in E-box:

- ◆ Working in left rear of engine compartment, remove E-box plastic cover.
- ◆ Push on hold-down lock clip (**A**) to release fuse pack carrier.
- ◆ Pull up on fuse pack lock clip (**B**) to release fuse pack.



- ✎ To remove an individual defective fuse inside fuse pack carrier, slide cover off by prying gently while you use pin tool to squeeze lock tabs. nothing

CAUTION!

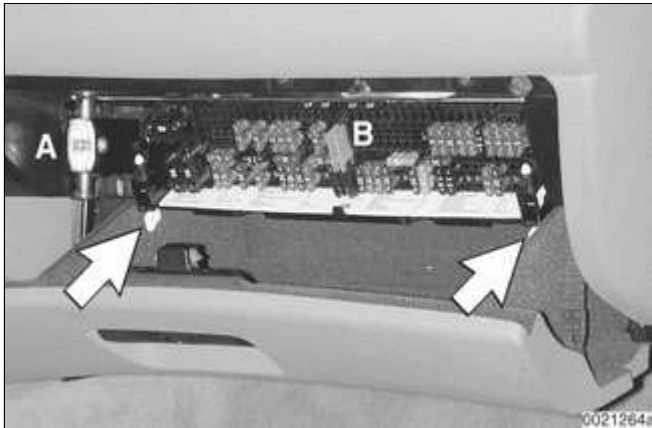
Once cover is off, fuses can fall out easily. Be sure to keep them in order while replacing defective fuse.

Table a. E-box fuse pack

Fuse	Rating	Protected circuits
1	30A	Not used (1999 - 2000 models) DME main relay (2001 models) Ignition coils

Table a. E-box fuse pack		
Fuse	Rating	Protected circuits
		(2001 models)
2	30A	DME control module (ECM) Evaporative emissions valve Fuel injectors Idle speed control valve Resonance valve, intake manifold Secondary air injection pump Suction jet pump valve, LDP system Vanos solenoids
3	20A	A/C compressor clutch relay Camshaft position sensors Crankshaft position sensor DME main relay Fuel pump relay Leakage diagnosis pump (fuel tank) Mass air flow sensor Secondary air injection pump relay Thermostat
4	30A	Changeover valve, running losses (3/2 valve) Oxygen sensors
5	30A	Fuel injector relay (2001 models) Unloader relay to ignition coils (1999 - 2000 models)

Main fuse panel



✦ Fig. 3 Fuse panel above glove compartment:

- ◆ Open glove compartment door.
- ◆ Working inside compartment, twist each plastic lock tab (**arrows**) at top of compartment 90°.
- ◆ Pull down on fuse panel to swing it down.

Note:

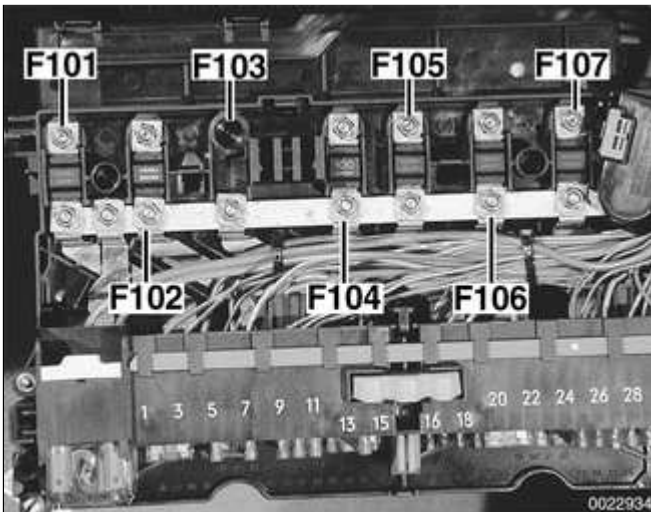
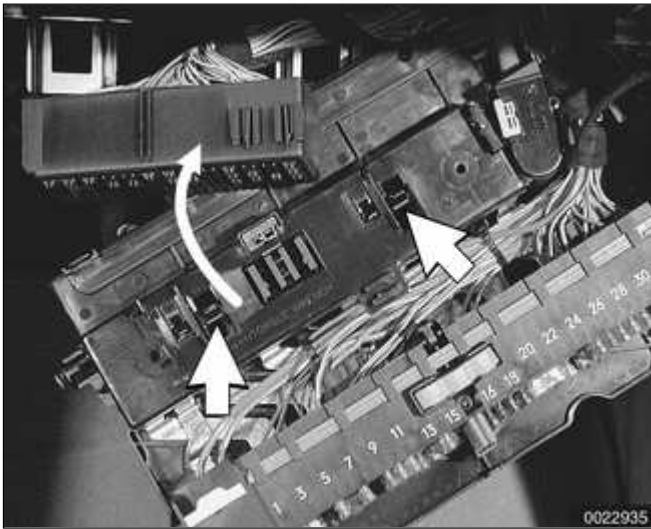
- ◆ *When the fuse box is up in locked position, the plastic tabs should point toward each other. When unlocked, they point to the back of the car.*
- ◆ *A small built in flashlight (A) is in the glove compartment next to the fuse box.*
- ◆ *A red plastic fuse puller (B) is in the center of the fuse box.*
- ◆ *The sheet of paper with the fuse assignments, below the fuses, can be slid out for reference.*
- ◆ *Vertical fuses are active. Horizontal fuses are spares.*

Fuse locations in the main panel are detailed in ⇒ [Table c. 1999 fuse positions](#) and ⇒ [Table d. 2000-2001 fuse positions](#).

Additional high amperage fuses are

found on top of the glove compartment fuse panel beneath an access panel.

- ✦ Lower glove compartment fuse panel fully.
- ◆ Slide harness connector block off top of panel (**curved arrow**).
- ◆ Detach access panel by squeezing retaining clips (**arrows**).



- ✦ Fig. 4 High amperage fuses above main fuse panel:

- ◆ Fuses F101 through F107 are mounted in this location.

Table b. High amperage fuse positions

Fuse	Rating	Protected circuits
101	50A	Engine cooling fan (1999 - 2000 models)
102	80A	B+ terminal DME mail relay Engine control module Fuse 5 E-box fuse pack Transmission control module (TCM)
103	80A	not used
104	100A	Preheater relay
105	50A	Ignition switch DLC

Table b. High amperage fuse positions

Fuse	Rating	Protected circuits
106	50A	Light switching center control module
107	50A	Light switching center control module Trailer module
108	200A	Main harness fuse (in trunk, see ⇒ Fig. 1)

E46 main fuse panel**E46 main fuse panel**

Spare fuses			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
			Spare fuses																	Spare fuses																
35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52		53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70

Table c. 1999 fuse positions

Fuse	Rating	Protected circuit
1	not used	
2		
3		
4		
5	5A	Horn (see also fuse 55)
6	5A	Make-up mirror light

Fuse	Rating	Protected circuit
7	5A	Navigation (see also fuse 41) On-board monitor (see also fuse 41) Radio (see also fuse 41) Telephone (see also fuse 39)
8	not used	
9	5A	Brake light Light module (see also fuse 32) On-board computer Speed control
10	5A	Instrument cluster (see also fuses 34, 43)
11	5A	Airbag Side-impact airbag
12	7.5A	Roller sun blind
13	not used	
14	5A	Electronic immobilizer (EWS) (see also fuse 67) Starter interlock
15	5A	Rain sensor
16	not used	
17		
18		
19		
20		
21		
22		
23		
24	5A	Electrochromic rear view mirror (see also fuse 67) Parking distance control
25	5A	Heated outside mirror, passenger Heated spray nozzles
26	5A	Garage door opener Overheat JP
27	10A	Back-up lights

Fuse	Rating	Protected circuit
28	5A	Heater-A/C (see also fuses 62, 63) Heater-A/C blower (see also fuse 37)
29	5A	Engine control (see also fuse 30)
30	7.5A	Engine control (see also fuse 29) OBD II system
31	5A	Outside mirror Tire pressure control (see also fuse 69)
32	5A	Light module (see also fuse 9)
33	5A	ABS/ASC (see also fuses 53, 56) ABS/DSC (see also fuses 40, 53, 56, 61)
34	5A	Instrument cluster (see also fuses 10, 43)
35	not used	
36	50A	Secondary air pump
37	50A	Heater-A/C blower (see also fuse 28)
38	10A (15A)	Front fog lights
39	5A	Telephone (see also fuse 7)
40	5A	ABS/DSC (see also fuses 33, 53, 56, 61) Shift gate illumination
41	30A	Navigation (see also fuse 7) On-board monitor (see also fuse 7) Radio (see also fuse 7)
42	not used	
43	5A	Clock Instrument cluster (see also fuses 10, 34) OBD II system
44	20A	Trailer module
45	not used	
46	30A	Sunroof
47	15A (20A)	Cigarette lighter / power outlet
48	30A	Window, front (see also fuse 49)
49	5A	Anti-theft (see also fuse 67) Central locking system (see also fuse 60) Interior light (see also fuse 52)

Fuse	Rating	Protected circuit
		Power window, front (see also fuse 48) Windshield washer system (see also fuses 52, 59)
50	25A	Seat heating
51	30A	Headlight cleaning system
52	30A	Central locking system, trunk Glove box light Interior light (see also fuse 49) Passenger compartment/trunk lighting Windshield washer system (see also fuses 49, 59)
53	30A	ABS/ASC (see also fuses 33, 56) ABS/DSC (see also fuses 33, 40, 56, 61)
54	15A	Fuel pump
55	15A	Horn (see also fuse 5)
56	30A	ABS/ASC (see also fuses 33, 53) ABS/DSC (see also fuses 33, 40, 53, 61)
57	5A	Outside mirror
58	not used	
59	30A	Windshield washer system (see also fuses 49, 52)
60	25A	Central locking (see also fuse 49)
61	30A	ABS/DSC (see also fuses 33, 40, 53, 56)
62	7.5A	A/C (see also fuses 28, 63)
63	7.5A	A/C (see also fuses 28, 62)
64	20A	Auxiliary heater (diesel)
65	30A	Driver seat adjustment
66	not used	
67	5A	Anti-theft (see also fuse 49) Electrochromic rear view mirror (see also fuse 24) Electronic immobilizer (EWS) (see also fuse 14)
68	30A	Heated rear window
69	5A	Tire pressure control (see also fuse 31)

Fuse	Rating	Protected circuit
70	30A	Passenger seat adjustment
71	30A (10A Coupe)	Hinged window (Coupe) Window, rear

Table d. 2000-2001 fuse positions

Fuse	Rating	Protected circuit
1	not used	
2		
3		
4		
5	5A	Horn (see also fuse 55)
6	5A	Make-up mirror light Power top (Convertible, see also fuses 12, 35, 42, 46)
7	5A	Heated rear window (Convertible, see also fuse 68) Navigation system (see also fuse 41) On-board monitor (see also fuse 41) Radio (see also fuse 41) Telephone (see also fuse 39)
8	5A	Sequential transmission (M3, see also fuse 22)
9	5A	Brake light Light module (see also fuse 32) On-board computer Speed control
10	5A	Instrument cluster (see also fuses 34, 43)
11	5A	Airbag Side-impact airbag
12	7.5A	ABS/ASC (see also fuses 33, 42, 53, 56) ABS/DSC (see also fuses 33, 40, 42, 53, 56, 61) ABS/DSC all-wheel drive (see also fuses 33, 35, 40, 42, 53) Manual top (Convertible, see also fuses 42, 46) Power top (Convertible, see also fuses 6, 35, 42,

Fuse	Rating	Protected circuit
		46) Seat heating (see also fuse 42) Roller sun blind (see also fuse 42) Tire pressure control (see also fuses 31, 42, 69)
13	7.5A	Roll-over protection system (Convertible)
14	5A	Electronic immobilizer (EWS) (see also fuse 67) Starter interlock
15	5A	Rain sensor Rear wiper (Sport Wagon, see also fuse 45)
16	not used	
17		
18		
19		
20		
21		
22	5A	Engine control (M3, see also fuses 29, 30) Sequential transmission (M3, see also fuse 22)
23	5A	Heater (see also fuses 28, 62)
24	5A	Electrochromic rear view mirror (see also fuse 67) Park distance control
25	5A	Heated outside mirror, passenger Heated spray nozzles
26	5A	Cigarette lighter (Australia, see also fuse 47) Garage door opener
27	10A	Engine control (see also fuses 29, 30) Back-up light
28	5A	Air conditioner (see also fuses 62, 63) Blower (see also fuse 50) Heater (see also fuses 23, 62)
29	5A	Engine control (see also fuses 27, 30) Engine control (M3, see also fuses 22, 30)
30	7.5A	Engine control (see also fuses 27, 29) Engine control (M3, see also fuses 22, 29) OBD II system (see also fuse 43)

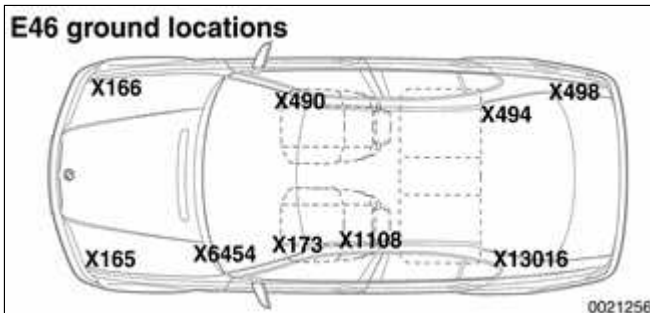
Fuse	Rating	Protected circuit
31	5A	Outside mirror (see also fuse 57) Tire pressure control (see also fuses 12, 42, 69)
32	5A	Light module (see also fuse 9)
33	5A	ABS/ASC (see also fuses 12, 42, 53, 56) ABS/DSC (see also fuses 12, 40, 42, 53, 56, 61) ABS/DSC all-wheel drive (see also fuses 12, 35, 40, 42, 53)
34	5A	Instrument cluster (see also fuses 10, 43)
35	50A	Power top (Convertible, see also fuses 6, 12, 42, 46) ABS/DSC all-wheel drive (see also fuses 12, 33, 40, 42, 53)
36	50A	Secondary air pump
37	50A	Engine cooling fan
38	10A (15A)	Front foglights
39	5A	Telephone (see also fuse 7)
40	5A	ABS/DSC (see also fuses 12, 33, 42, 53, 56, 61) ABS/DSC all-wheel drive (see also fuses 12, 33, 35, 42, 53) Shift gate illumination
41	30A	Navigation system (see also fuse 7) On-board monitor (see also fuse 7) Radio (see also fuse 7)
42	30A	ABS/ASC (see also fuses 12, 33, 53, 56) ABS/DSC (see also fuses 12, 33, 40, 53, 56, 61) ABS/DSC all-wheel drive (see also fuses 12, 33, 35, 40, 53) Manual top (Convertible, see also fuses 12, 46) Power top (Convertible, see also fuses 6, 12, 35, 46) Seat heating (see also fuse 12) Roller sun blind (see also fuse 12) Tire pressure control (see also fuses 12, 31, 69)
43	5A	Instrument cluster (see also fuses 10, 34) OBD II system (see also fuse 30)
44	20A	Trailer module
45	20A	Rear wiper (Sport Wagon, see also fuse 15)

Fuse	Rating	Protected circuit
46	30A (20A convertible)	Power top (Convertible, see also fuses 6, 12, 35, 42) Manual top (Convertible, see also fuses 12, 42) Sunroof
47	15A (20A)	Cigarette lighter / power outlet (Australia, see also fuse 26)
48	30A	Power window, front (see also fuse 49)
49	5A	Anti-theft (see also fuse 67) Central locking system (see also fuses 52, 60, Sport Wagon, see fuse 58) Interior light (see also fuse 52) Windshield washer system (see also fuses 52, 59) Window, front (see also fuse 48)
50	40A	Heater-A/C blower (see also fuse 28)
51	30A	Headlight washer system
52	30A	Central locking system (see also fuses 49, 60, Sport Wagon see fuse 58) Glove compartment light Hand lamp Interior lights (see also fuse 49) Passenger compartment/trunk lighting Windshield washer system (see also fuses 49, 59)
53	30A	ABS/ASC (see also fuses 12, 33, 42, 56) ABS/DSC (see also fuses 12, 33, 40, 42, 56, 61) ABS/DSC all-wheel drive (see also fuses 12, 33, 35, 40, 42)
54	15A	Fuel pump
55	15A	Horn (see also fuse 5)
56	30A	ABS/ASC (see also fuses 12, 33, 42, 53) ABS/DSC (see also fuses 12, 33, 40, 42, 53, 61)
57	5A	Outside mirror (see also fuse 31)
58	7.5	Central locking (Sport Wagon, see also fuses 49, 52, 60)
59	30A	Windshield washer system (see also fuses 49, 52)

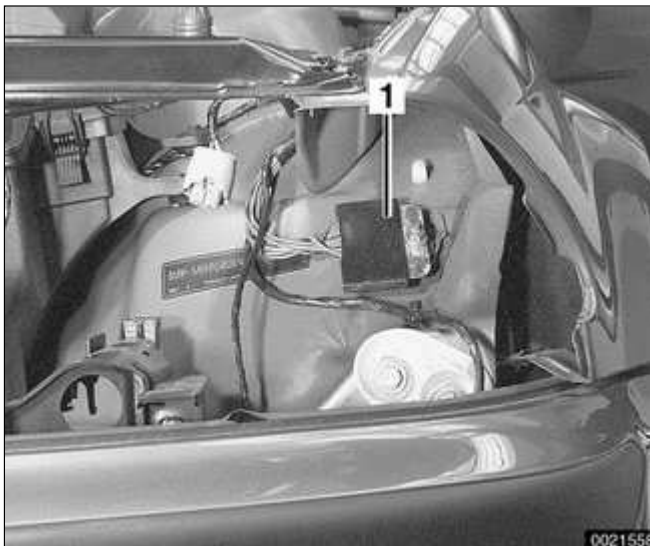
Fuse	Rating	Protected circuit
60	25A	Central locking (see also fuses 49, 52, Sport Wagon, see fuse 58)
61	30A	ABS/DSC (see also fuses 12, 33, 40, 42, 53, 56, 61)
62	7.5A	Heater-A/C (see also fuses 28, 63) Heater (see also fuses 23, 28)
63	7.5A	Heater-A/C (see also fuses 28, 62)
64	not used	
65	30A	Driver seat adjustment
66	not used	
67	5A	Anti-theft (DWA) (see also fuse 49) Electrochromic rear view mirror (see also fuse 24) Electronic immobilizer (EWS) (see also fuse 14)
68	30A	Heated rear window (Convertible, see also fuse 7)
69	5A	Tire pressure control (see also fuses 12, 31, 42)
70	30A	Passenger seat adjustment
71	30A (10A Coupe)	Hinged window (Coupe) Window, rear

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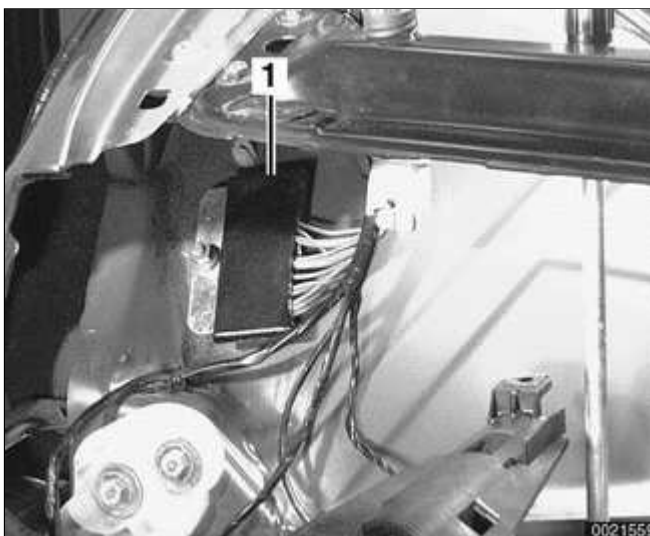
Ground Locations



- Grounds are widely distributed throughout the vehicle body. Several are found under the interior carpets. Lugs and connectors attached to ground are susceptible to damage and corrosion. Clean or renew them as necessary.



- Fig. 5 Left front engine compartment, behind left headlight
- 1 - Ground X165



- Fig. 6 Right front engine compartment, behind right headlight
- 1 - Ground X166



- Fig. 7 On bulkhead behind E-box
- 1 - Ground X6454



Fig. 8 Under left front carpet on door sill

1 - Ground connector X173

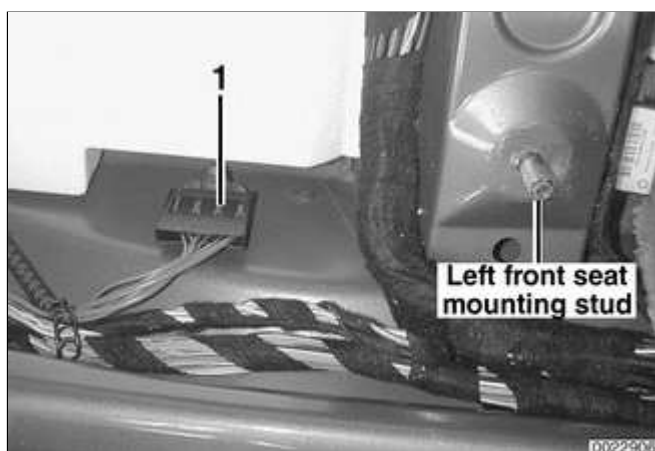


Fig. 9 On door sill, under driver seat carpet

1 - Ground connector X1108

2 - Side impact airbag crash sensor

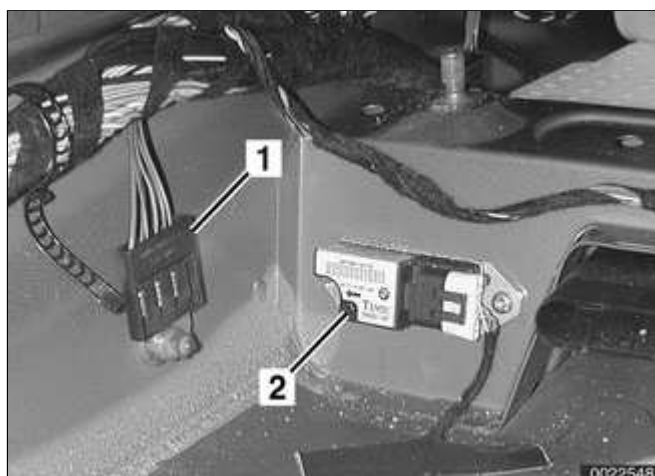


Fig. 10 Under right front carpet on door sill

1 - Ground connector X490

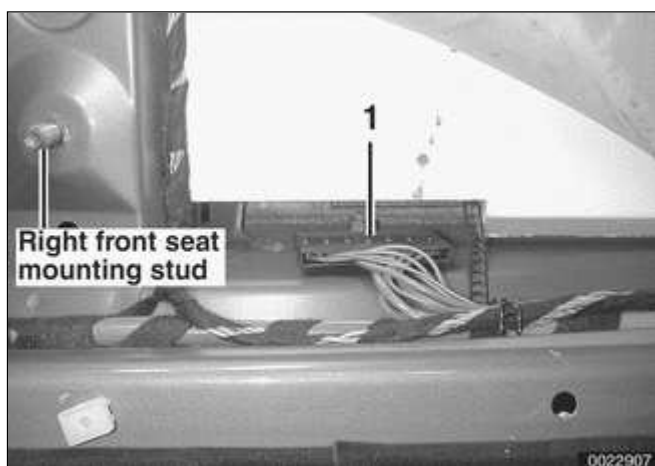


Fig. 11 Behind right rear seat backrest

1 - Ground X494



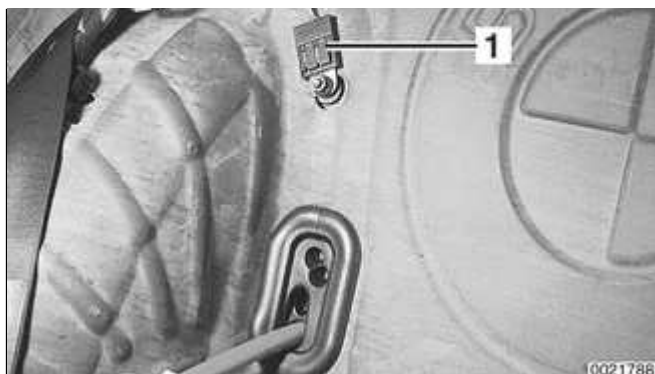
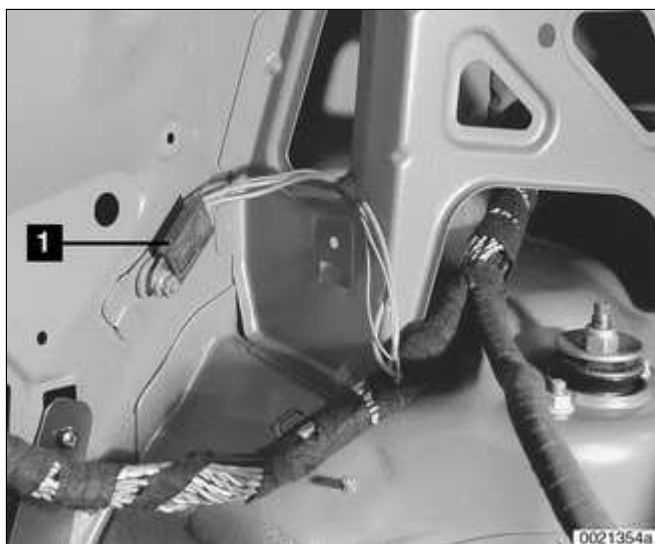


Fig. 12 Right side trunk, behind trim
1 - Ground X498



Fig. 13 Left side trunk, behind trim
1 - Ground X13016



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Component Locations

On the following pages are photos and illustrations showing the location of major electrical components in E46 vehicles.

Note:

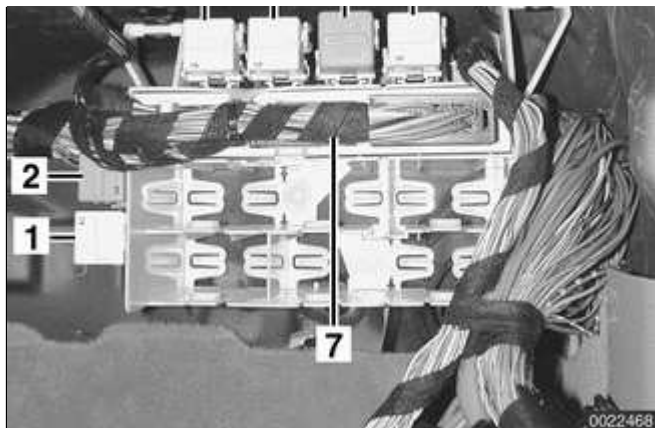
- ◆ *Every component is not installed in every car.*
- ◆ *Due to changes in production, component locations may vary from what is illustrated. Consult your BMW dealer for the latest information.*
- ◆ *The automatic transmission range switch is also sometimes referred to as the gear-position switch.*
- ◆ *The EWS 3.3 system is also known as the driveway protection system or the electronic immobilization system.*
- ◆ *All-Season Traction (AST) is a marketing term that refers to ABS/ASC.*

Main relay panel

- To access main relay panel, located under right side of dashboard, remove glove compartment as described in ⇒ [513 Interior Trim](#).



Fig. 14 Behind glove compartment (no headlight cleaning system)



- 1 - A/C relay
- 2 - Secondary air pump relay
- 3 - Fuel pump relay
- 4 - A/C relay
- 5 - Foglight relay
- 6 - Horn relay
- 7 - General module (GM V)

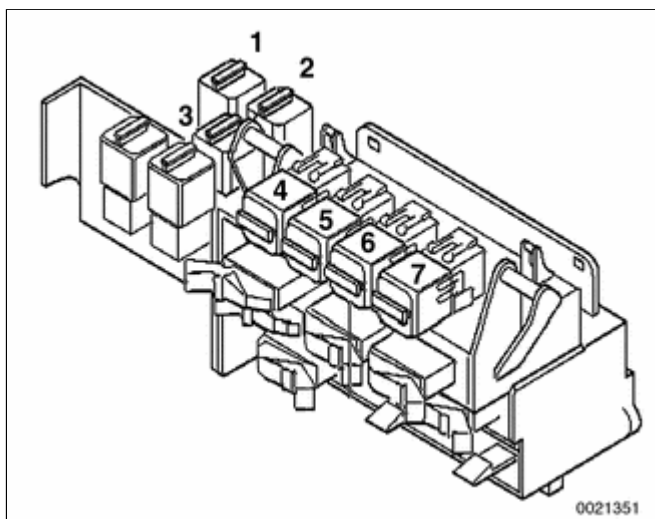


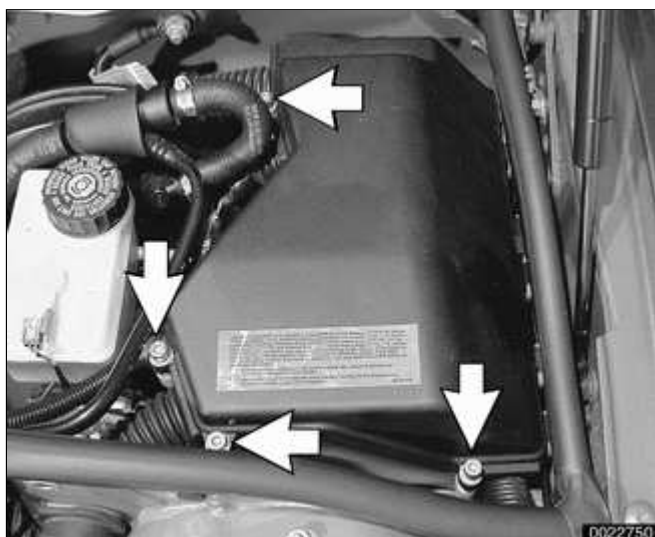
Fig. 15 Behind glove compartment (with headlight cleaning system)

- 1 - Headlight cleaning relay
- 2 - Secondary air pump relay
- 3 - A/C relay
- 4 - Fuel pump relay
- 5 - A/C relay
- 6 - Foglight relay
- 7 - Horn relay

Electronics box (E-box)

To access E-box components:

- ◆ Working in left rear of engine compartment, remove M6 Allen head bolts (**arrows**).
- ◆ Lift off E-box cover.



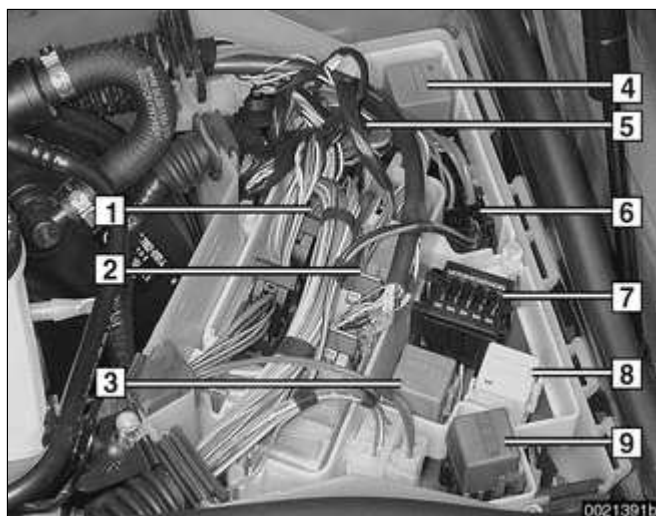


Fig. 16 E-box

- 1 - Engine control module (ECM)
- 2 - Automatic transmission control module (TCM)
- 3 - DME main relay
- 4 - Windshield washer double relay
- 5 - E-box temperature sensor
- 6 - B+ connector
- 7 - Engine electronics fuse pack
- 8 - 1999 - 2000 models: Unloader relay 2001 models: fuel injector relay
- 9 - Back-up light relay (automatic transmission only)

Component location table

⇒ [Table e. E46 component locations](#) is a cross-referenced listing of electrical components in E46 vehicles. Where available, photos of components in this repair group are referred to in the fourth column.

Note:

- ◆ *Every attempt has been made in this repair manual to standardize component names. Nevertheless, in some cases, the same component may appear with different names.*
- ◆ *No E46 vehicle is equipped with all components illustrated. Where necessary, year and model applications are given in the component location table and the illustrations.*

Table e. E46 component locations

Component	Year, model	Location	Refer to
12 volt auxiliary power socket		see Power socket, 12-volt	
3/2-way valve	1999 - 2000	Under car ahead of fuel filter, under protective cover	
A/C blower final stage (resistor pack)	1999 - 2001	Right side of IHKA housing below glove compartment	⇒ Fig. 40
A/C blower relay	1999 - 2001	Main relay panel behind glove compartment	⇒ Fig. 14 , ⇒ Fig. 15
A/C blower	1999 - 2001	Behind engine compartment rear bulkhead	
A/C compressor	1999 - 2001	Right front lower engine compartment	
A/C compressor clutch relay	1999 - 2001	Main relay panel behind glove compartment	⇒ Fig. 14 , ⇒ Fig. 15
A/C control module	1999 - 2001	Center of dashboard	
A/C evaporator temperature sensor	1999 - 2001	Left side of IHKA housing below instrument cluster	⇒ Fig. 39
A/C pressure sensor	1999 - 2001	Behind right headlight on top of receiver/drier	⇒ Fig. 32
ABS wheel speed sensor connector, front (right/left)	1999 -2001	In wheel housing (right/left)	⇒ Fig. 62
ABS wheel speed sensor connector, rear (right/left)	1999 - 2001	Ahead of rear wheel housing (right/left)	
ABS wheel speed sensor, front (right/left)	1999 - 2001	In front wheel bearing housing(right/left)	⇒ Fig. 60
ABS wheel speed sensor, rear (right/left)	1999 - 2001	In rear wheel bearing housing (right/left)	⇒ Fig. 61
ABS/ASC control module/hydraulic unit	1999	Left rear engine compartment, below brake master cylinder	

Component	Year, model	Location	Refer to
ABS/ASC/DSC warning lights	1999 - 2001	In instrument cluster	
ABS/DSC charge pressure sensor	1999 - 200 rear wheel drive with DSC	Base of master cylinder, left side	⇒ Fig. 18
ABS/DSC charge pressure sensor	2001 rear wheel drive	In ABS/DSC hydraulic unit, right rear engine compartment	
ABS/DSC control module/hydraulic unit	1999 - 2000; 2001 all wheel drive	Right rear of engine compartment	⇒ Fig. 19
ABS/DSC control module/hydraulic unit	2001 rear wheel drive	Left rear of engine compartment	
ABS/DSC lateral acceleration sensor	1999 - 2001 rear wheel drive	Behind driver kickpanel	
ABS/DSC lateral acceleration sensor	200 all wheel drive	Combined with rotational rate (yaw) sensor under driver side carpet	
ABS/DSC precharge pump	1999 - 2001	Left rear engine compartment, below brake master cylinder	⇒ Fig. 18
ABS/DSC rotational rate (yaw) sensor	1999 - 2001	Under driver side carpet	
ABS/DSC steering angle sensor	1999 -2001	Base of upper steering column	⇒ Fig. 35
ABS/DSC switch		see ASC/DSC switch	
Accelerator pedal sensor (PWG)	1999 - 2000	At throttle housing	
Accelerator pedal sensor (PWG)	2001	Above accelerator pedal	
AGS (adaptive transmission control)		see Automatic transmission control module	
Air distribution motors	1999 - 2001	In IHKA housing under dashboard (see ⇒ 640 Heating and Air Conditioning)	
Air flow sensor		see Mass air flow sensor	
Air quality sensor (AUC) (for automatic	2000 - 2001	Right side of radiator	⇒ Fig. 17 , ⇒ Fig. 29

Component	Year, model	Location	Refer to
recirculation system)			
Airbag connector, passenger side	1999 - 2001	Right side dashboard support	⇒ Fig. 41
Airbag connector, steering wheel	1999 - 2001	Under steering wheel airbag	⇒ Fig. 34
Airbag control module (MRS module)	1999 - 2001	Under parking brake lever console, under carpet	⇒ Fig. 9
Airbag crash sensor, side-impact airbag (left/right)	1999 - 2001	Front seat crossmember under carpet (left/right)	
Airbag warning light	1999 - 2001	In instrument cluster	
Airbag, driver side	1999 - 2001	Steering wheel center pad	
Airbag, head protection (HPS), electrical connector (left/right)	1999 - 2001	At bottom of windshield pillar (A pillar) behind dashboard (left/right)	⇒ Fig. 42
Airbag, passenger side	1999 - 2001	Right side dashboard	⇒ Fig. 41
Airbag, side-impact (left/right front/rear)	1999 - 2001	Inside door (left/right, front/rear)	
Alarm control module (DWA)	1999 - 2001	Above main fuse box behind glove box	
Alarm indicator LED (DWA)	1999 - 2001	Attached to rear view mirror	
Alarm siren (DWA)	1999 - 2001	Right side rear of engine compartment near wipers	
Alarm siren battery (DWA)	1999 - 2001	Inside alarm siren	
All season traction (AST)		see ABS/ASC entries	
Alternator (generator)	1999 -2001	Left front of cylinder block	
Amplifier, radio	1999 - 2001	Left side trunk or cargo compartment behind trim panel	⇒ Fig. 54 , ⇒ Fig. 57

Component	Year, model	Location	Refer to
Antenna amplifier, diversity	Convertible	On convertible top storage cover	
Antenna amplifier, diversity	Sport Wagon	Behind left side cargo area storage cover	⇒ Fig. 57
Antenna amplifier, main	Convertible	Below mast antenna in trunk	
Antenna amplifier, main	Sedan, Coupe	Behind left rear roof pillar (C-pillar) trim panel	⇒ Fig. 44
Antenna amplifier, main	Sport Wagon	Below rear spoiler	
Antenna diversity switching module	Convertible	Below mast antenna in trunk	
Antenna, AM	Sport Wagon	In rear spoiler	
Antenna, diversity	Convertible	In convertible top storage cover	
Antenna, diversity	Sport Wagon	Left rear side window	
Antenna, FZV (keyless entry)	Convertible	Interior rear view mirror	
Antenna, FZV (keyless entry)	Sedan, Coupe	Rear window, lower antenna grid	
Antenna, FZV (keyless entry)	Sport Wagon	Center rear window, combined with FM2 antenna	
Antenna, main	Convertible	Mast on left rear fender	
Antenna, main (FM1 and FM2)	Sport Wagon	Rear window center and right	
Antenna, telephone	Convertible	Wound around mast antenna	
Antenna, telephone	Coupe, Sedan, Sport Wagon	In roof above rear window	
Anti-slip (traction)		see ABS/ASC entries	
Anti-slip (traction) control switch		see ASC/DSC switch	
Anti-theft		see Alarm entries	
ASC		see ABS/ASC entries	
ASC+T		see ABS/ASC entries	

Component	Year, model	Location	Refer to
ASC/DSC switch	1999 - 2001	Bottom of center console, left of shifter	
AST		see ABS/ASC entries	
Automatic climate control (IHKA)		see A/C entries	
Automatic transmission control module (TCM)	1999 - 2001	Left rear engine compartment in E-box	⇒ Fig. 16
Automatic transmission range switch (gear position/neutral safety switch)	GM trans.	Left side of transmission, inside transmission case	
Automatic transmission range switch (gear position/neutral safety switch)	ZF trans.	Left side of transmission	⇒ Fig. 64
Automatic transmission range switch harness connector	ZF trans.	Left side of transmission	⇒ Fig. 64
B+ jumper connector	1999 - 2001	Next to right front strut tower, right rear engine compartment	⇒ Fig. 17 , ⇒ Fig. 19
B+ supply, E-box		Left side of E-box	⇒ Fig. 16
Back-up light switch (automatic transmission)		see Automatic transmission range switch	
Back-up light switch (manual transmission)	1999 - 2000	Top left side of transmission housing	
Back-up light relay (automatic transmission)	1999 - 2001	Left rear engine compartment, in E-box	⇒ Fig. 16
Battery	1999 - 2001	Right side trunk or cargo compartment, under tray	
Battery safety terminal (BST)	1999 - 2001	On positive battery terminal	

Component	Year, model	Location	Refer to
Blower		see A/C blower	
Body electronics control module		see General module (GM V)	
Brake fluid level sensor	1999 - 2001	Top of brake fluid reservoir, left rear engine compartment	⇒ Fig. 17 , ⇒ Fig. 18
Brake fluid pressure sensor		see ABS/DSC charge pressure sensor	
Brake light switch	1999 -2001	At pedal cluster	⇒ Fig. 37
Brake pad sensor, left front	1999 - 2001	Left front brake pad	
Brake pad sensor, right rear	1999 - 2001	Right rear brake pad	
Brake pad wear sensor connector, left front	1999 - 2001	In left front wheel housing	⇒ Fig. 62
Brake pad wear sensor connector, right rear	1999 - 2001	Ahead of right rear wheel housing	
Camshaft actuator (VANOS)		see VANOS	
Camshaft position sensor, exhaust	1999 - 2001	Right front of cylinder head	⇒ Fig. 29
Camshaft position sensor, intake	1999 - 2001	Left front of cylinder head	⇒ Fig. 28
Carbon canister valve	1999 - 2000	Right side of spare tire well under floor pan	
CD changer	1999 - 2001	Left side of trunk	
Center brake light	Sedan, Coupe	Rear of headliner	
Central locking switch		see Hazard warning/central locking switch	
Changeover valve, intake manifold		see Resonance valve, intake manifold	
Changeover valve, running losses		see 3/2-way valve	

Component	Year, model	Location	Refer to
Charge pressure sensor		see ABS/DSC charge pressure sensor	
Child protection window control		see Window lock-out switch, rear	
Chime module, park distance control (PDC)	1999 - 2001	In left footwell top trim	
Clock	1999 - 2001	In on-board computer display of instrument cluster	
Clutch pedal position switch	1999 - 2001	On pedal cluster	
Combination (stalk) switch		see Turn-signal/headlight dimmer switch (stalk switch) see also Wiper/washer switch (stalk switch)	
Convertible top control module (CVM II)	Convertible	Left rear quarter panel behind trim panel	⇒ Fig. 66
Convertible top hydraulic motor	Convertible	In left side of trunk behind trim cover	⇒ Fig. 66
Convertible top main pillar Hall sensor	Convertible	Behind rear seat in C pillar position	⇒ Fig. 66
Convertible top solenoid valves	Convertible	Left and right rear main pillar, behind quarter panel windows	⇒ Fig. 66
Convertible top storage compartment floor microswitch	Convertible	Right side storage compartment hinge in trunk	⇒ Fig. 66
Convertible top storage cover Hall sensor	Convertible	Left rear of convertible top cover	⇒ Fig. 66
Convertible top storage cover lock Hall sensor	Convertible	Center of cover, between rear seat backrests	⇒ Fig. 66
Convertible top storage cover lock motor Hall sensor	Convertible	Center of cover, between rear seat backrests	⇒ Fig. 66
Convertible top storage cover motor	Convertible	Center of cover, between rear seat backrests	⇒ Fig. 66

Component	Year, model	Location	Refer to
Convertible top switch	Convertible	Bottom of center console, ahead of shifter	⇒ Fig. 66
Convertible top tension bow Hall sensor	Convertible	Top rear of convertible top	⇒ Fig. 66
Convertible top visor latch Hall sensor	Convertible	Top of windshield	⇒ Fig. 66
Coolant level sensor	1999 - 2001	At bottom of coolant expansion tank	
Coolant temperature sensor, radiator outlet	1999 - 2001	In lower radiator hose, right front of engine	⇒ Fig. 31
Coolant temperature sensor		see Engine coolant temperature (ECT) sensor	
Coolant thermostat	1999 - 2001	Front of cylinder head	
Cooling fan		see Engine cooling fan entries	
Crankshaft position sensor	1999 - 2001	Left rear of engine block, under starter motor	⇒ Fig. 22
Cruise control cut-off switch	1999 - 2001	At pedal cluster	⇒ Fig. 37
Cruise controls (steering wheel)	1999 - 2001	Steering wheel right side keypad	
Data link connector (20-pin DLC)	1999 - 2000	Right rear engine compartment (see also OBD II connector)	⇒ Fig. 17
Diagnosis module tank leakage (DMTL)	2001	see Fuel tank leakage diagnosis pump (LDP or DMTL)	
Digital motor electronics control module		see Engine control module (ECM)	
Directional switch (stalk switch)		see Turn signal/headlight dimmer switch (stalk switch)	
DLC		see Data link connector see also OBD II connector	
DME control module		see Engine control module (ECM)	
DME main relay	1999 - 2001	Left rear engine compartment in E-box	⇒ Fig. 16

Component	Year, model	Location	Refer to
DMTL	2001	see Fuel tank leakage diagnosis pump (LDP or DMTL)	
Door lock	1999 - 2001	In door	
Door lock Hall sensor	1999 - 2001	In door lock mechanism	
Door lock microswitch	1999 - 2001	In door lock mechanism	
Drive-away protection		see EWS	
DSC		see ABS/DSC entries	
DSC switch		see ASC/DSC switch	
DWA		see Alarm entries	
Dynamic stability control		see ABS/DSC entries	
E-box	1999 - 2001	Left rear engine compartment, under plastic cover	⇒ Fig. 16
E-box cooling fan	1999 - 2001	Bottom rear of E-box	
E-box temperature sensor	1999 - 2001	Rear of E-box	⇒ Fig. 16
ECT sensor		see Engine coolant temperature (ECT) sensor	
Electric coolant thermostat		see Coolant thermostat	
Electronic immobilizer		see EWS entries	
Electronics box		see E-box entries	
Engine compartment light switch		see Engine hood contact switch	
Engine control module (ECM)	1999 - 2001	Left rear engine compartment in E-box	⇒ Fig. 16
Engine coolant temperature (ECT) sensor	1999 - 2001	Under rear of intake manifold at rear of cylinder block	⇒ Fig. 21
Engine cooling fan (electric)	1999 - 2001	Models with automatic transmission: In front of radiator	⇒ Fig. 17

Component	Year, model	Location	Refer to
		Models with standard transmission: In back of radiator	
Engine cooling fan final stage (resistor)	1999 - 2001	In engine cooling fan housing	
Engine electronics fuse pack		see Fuses, engine electronics	
Engine hood contact switch	1999 - 2001	Right rear engine compartment	⇒ Fig. 19
Evaporative control valve	1999 - 2001	Left front of engine mounted on intake manifold	
Evaporator temperature sensor		see A/C evaporator temperature sensor	
EWS control module	1999 - 2001	On passenger compartment bulkhead, above pedal cluster	⇒ Fig. 38
EWS ring antenna	1999 - 2001	Around ignition switch	⇒ Fig. 36
EWS transmitter module	1999 - 2001	In ignition key	
Exhaust camshaft position sensor	1999 - 2001	Right front of engine, top	⇒ Fig. 29
Exhaust camshaft VANOS solenoid	1999 - 2001	Right front of engine, top	⇒ Fig. 29
Fog light relay	1999 - 2001	Main relay panel behind glove compartment	⇒ Fig. 14 , ⇒ Fig. 15
Footwell light, left	1999 - 2001	In left footwell top trim (pedal cluster trim)	
Footwell light, right	1999 - 2001	In right footwell top trim	
Fresh air distribution motor		see Air distribution motors	
Fuel filler door lock motor	1999 - 2001	In right side of trunk or cargo compartment, behind trim	
Fuel injector relay	2001	Left rear engine compartment in E-box	⇒ Fig. 16
Fuel injectors electrical harness	1999 - 2001	Top of engine, under plastic cover	

Component	Year, model	Location	Refer to
Fuel level sensor, left	1999 - 2001	Top of fuel tank, under left rear seat cushion	⇒ Fig. 52
Fuel level sensor, right	1999 - 2001	Top of fuel tank, under right rear seat cushion, combined with fuel pump	⇒ Fig. 52
Fuel pump	1999 - 2001	Top of fuel tank, under right rear seat cushion, combined with right fuel level sensor	⇒ Fig. 52
Fuel pump relay	1999 - 2001	Main relay panel behind glove compartment	⇒ Fig. 14 , ⇒ Fig. 15
Fuel tank leakage diagnosis pump (LDP or DMTL)	1999 - 2001	Under right rear of vehicle, right side of trunk, under protective cover	⇒ Fig. 65
Fuel tank vent valve		see Evaporative control valve	
Fuse for main harness F108 (200 amp)	1999 - 2001	Right wheel housing in trunk	⇒ Fig. 1
Fuse panel, main	1999 - 2001	Above glove compartment	⇒ Fig. 14 , ⇒ Fig. 15
Fuses, additional high amperage	1999 - 2001	Above main fuse panel	⇒ Fig. 4
Fuses, engine electronics	1999 - 2001	Left rear engine compartment in E-box	⇒ Fig. 2
FZV antenna		see Antenna, FZV (keyless entry)	
Gas generator, airbag		see Airbag entries	
Gear position indicator light	1999 - 2001	Under shifter bezel	⇒ Fig. 47
Gear position/neutral safety switch		see Automatic transmission range switch	
General module (GM V)	1999 - 2001	Main relay panel behind glove compartment	⇒ Fig. 14
Generator		see Alternator (generator)	
Glove compartment lock motor		Above glove compartment lock	
GM V		see General module (GM V)	

Component	Year, model	Location	Refer to
GPS receiver module	1999 - 2001	In trunk, mounted behind left rear well	
Ground jumper connection	1999 - 2001	Right rear engine compartment	⇒ Fig. 19
Grounds:			
X1108	1999 - 2001	Under driver seat carpet on door sill	⇒ Fig. 9
X13016	1999 - 2001	Left side trunk	⇒ Fig. 13 , ⇒ Fig. 54
X165	1999 - 2001	Left front, engine compartment	⇒ Fig. 5
X166	1999 - 2001	Right front, engine compartment	⇒ Fig. 6
X173	1999 - 2001	Under left front carpet on door sill	⇒ Fig. 8
X217	1999 - 2001	Under right side dashboard	
X218	1999 - 2001	Under right side tunnel carpet	
X490	1999 - 2001	Under right front seat carpet on door sill	⇒ Fig. 10
X494	1999 - 2001	Behind rear seat backrest	⇒ Fig. 11
X498	1999 - 2001	Right side trunk	⇒ Fig. 12 , ⇒ Fig. 53
X6454	1999 - 2001	On bulkhead, left rear engine compartment	⇒ Fig. 7
Hazard warning/central locking switch	1999 - 2001	On center console, behind shifter	
Head protection airbag (HPS)		see Airbag listings	
Headlight dimmer relay	1999 - 2001	In light control center (LSZ)	
Headlight flasher		see Turn-signal/headlight dimmer switch (stalk switch)	
Headlight vertical aim actuator (left/right) (models with xenon headlights)	1999 - 2001	In headlight assembly (left/right)	

Component	Year, model	Location	Refer to
Headlight vertical aim load sensor, front	1999 - 2001	Front subframe, right side	⇒ Fig. 59
Headlight vertical aim load sensor, rear	1999 - 2001	Rear subframe, right side	
Headlight washer pump	1999 - 2001	Front of washer tank, right front engine compartment	
Heater blower		see A/C blower entries	
Heater core temperature sensor	1999 - 2001	Behind center console below radio	⇒ Fig. 45
Heater recirculation distribution motor		see Air distribution motors	
Heater regulator air distribution motor		see Air distribution motors	
Heater valve assembly	1999 - 2001	Mounted on inner side of left strut tower	⇒ Fig. 27
Heating-A/C		see A/C entries	
High beam switch		see Turn signal/headlight dimmer switch (stalk switch)	
Hood switch		see Engine hood security switch	
Horn button	1999 - 2001	On steering wheel pad	
Horn relay	1999 - 2001	Main relay panel behind glove compartment	⇒ Fig. 14 , ⇒ Fig. 15
Horn (left/right)	1999 - 2001	Next to front bumper impact absorber (left/right)	
Hot-film mass air flow sensor		see Mass air flow sensor	
Idle speed control valve	1999 - 2001	Under intake manifold	⇒ Fig. 23
Ignition coils	1999 - 2001	Top of cylinder head, under plastic cover	⇒ Fig. 25
Ignition relay		see Unloader relay	
Ignition switch	1999 - 2001	Right side steering column	
IHKA		see A/C entries	

Component	Year, model	Location	Refer to
Individual control intake system valve		see Resonance valve, intake manifold	
Inflator assembly, airbag		see Airbag entries	
Instrument cluster control unit	1999 - 2001	In instrument cluster	
Intake air temperature (IAT) sensor	1999 - 2001	Center top of engine, between intake manifold and cylinder head	⇒ Fig. 25
Intake manifold resonance valve		see Resonance valve, intake manifold	
Interior protection control module (SDR)	Convertible	On center tunnel below console	
Interior protection control module (UIS)	Sedan, Coupe, Sport Wagon	In headliner	
Interior temperature intake fan	1999 - 2001	In A/C control module in center console	
Keyless entry antenna		see Antenna, FZV (keyless entry)	
Kickdown switch, automatic transmission		see Accelerator pedal sensor (PWG)	
Knock sensors	1999 - 2001	Under intake manifold	⇒ Fig. 24
Lateral acceleration sensor		see ABS/DSC lateral acceleration sensor entries	
LDP		see Fuel tank leakage diagnosis pump (LDP or DMTL)	
Leakage diagnosis pump (LDP)		see Fuel tank leakage diagnosis pump (LDP or DMTL)	
Light control module	1999 -2001	In light switch center (LSZ)	
Light switch assembly	1999 - 2001	In light switch center (LSZ)	
Light switch center (LSZ)	1999 - 2001	In dashboard, left of steering wheel	
Load-reduction relay		see Unloader relay	

Component	Year, model	Location	Refer to
Lumbar support air compressor	1999 - 2001	Under each seat equipped with support system	
Lumbar support control switch	1999 - 2001	Below seat base trim	
Lumbar support switch	1999 - 2001	Four-way toggle switch at base of seat, near seat control switches	
Main fuse panel		see Fuse panel, main	
Main relay panel		see Relay panel, main	
Main harness fuse		see Fuse for main harness F108 (200 amp)	
Mass air flow sensor	1999 - 2001	Left side engine compartment	⇒ Fig. 17
Mixing actuators		see Air distribution motors	
MRS module		see Airbag control module	
Multi-function clock	1999 - 2001	In dash cluster below speedometer and tachometer	
Multiple restraint system (MRS) module		see Airbag control module	
Navigation computer	1999 - 2001	Left side of trunk	
Neutral safety switch		see Automatic transmission range switch	
OBD II connector (16-pin DLC)	1999 - 2001	In left footwell top trim, under left side of instrument cluster (see also Data link connector)	
Oil pressure switch	1999 - 2001	Left front of engine at oil filter housing	⇒ Fig. 26
Oil temperature sensor	1999 - 2001	Left front of engine at oil filter housing	⇒ Fig. 26
On-board computer	1999 - 2001	In instrument cluster	
On-board monitor	1999 - 2001	In center of dashboard	
Outside air temperature sensor	1999 - 2001	Under left side of front bumper	
Outside mirror control switch	1999 - 2001	On left front door arm rest	

Component	Year, model	Location	Refer to
Oxygen sensor connector, post-catalyst	1999 - 2001	Top of engine, between intake manifold and cylinder head cover	⇒ Fig. 25
Oxygen sensor connector, precatalyst	1999 - 2001	Top of engine, between exhaust manifold and cylinder head cover	⇒ Fig. 25
Oxygen sensor, post-catalyst	1999 - 2001	Bottom of exhaust manifold (access from below)	⇒ Fig. 58
Oxygen sensor, precatalyst	1999 - 2001	Top of exhaust manifold	⇒ Fig. 25
Park angle/tilt sensor	1999 - 2001	In right side trunk behind trim	
Park distance control (PDC) module	1999 -2001	In right side trunk above battery	
Park distance control sensors	1999 - 2001	Rear bumper trim strip	⇒ Fig. 67
Park distance control warning speaker	1999 - 2001	Right rear speaker, rear parcel shelf	
Parking brake warning switch	1999 -2001	Under center console, rear of parking brake handle	⇒ Fig. 49
Pedal position sensor		see Accelerator pedal sensor (PWG)	
Pinch protection, window		see Window anti-trap strip	
Power socket, 12-volt	Sport Wagon	Cargo compartment behind left rear seat	⇒ Fig. 57
Power window motors		see Window motors	
Power window switches		see Window switches	
Pressure sensitive finger guard		see Window anti-trap strip	
Radiator fan		see Engine cooling fan (electric)	
Radio antenna		see Antenna entries	
Radio controls (steering wheel)	1999 - 2001	On steering wheel left keypad	

Component	Year, model	Location	Refer to
Radio speaker: front tweeter (left/right)	1999 - 2001	Front door window frame (left/right)	⇒ Fig. 33
Radio/cassette/CD player	1999 - 2001	Center of dashboard	
Rain sensor	1999 - 2001	Top center of interior windshield surface, directly ahead of rear view mirror	
Rain sensor control module (AIC)	1999 - 2001	Attached to rain sensor at top of windshield	
Rear power window lock-out switch		see Window lock-out switch, rear	
Rear window defogger relay	Convertible	Right rear quarter panel behind trim panel	
Rear window defogger relay	Sedan, Coupe	Right trunk wall, behind trim liner	⇒ Fig. 53
Rear window defogger relay	Sport Wagon	Right rear cargo area behind trim panel	
Rear window washer pump	Sport Wagon	Behind panel in right rear cargo area	⇒ Fig. 56
Relay panel, main	1999 - 2001	Behind glove compartment	
Resonance valve, intake manifold	1999 - 2001	Left of intake manifold	⇒ Fig. 17
Reversing light switch		see Back-up light entries	
Ride level sensor		see Headlight vertical aim sensor entries	
Ring antenna (EWS)		see EWS ring antenna	
Rollover cassette	Convertible	Rear seat headrest	
Rollover sensor	Convertible	Rear seat headrest	
Rotational rate (yaw) sensor		see ABS/DSC rotational rate (yaw) sensor	
Seat backrest motor	1999 -2001	Bottom of seat backrest	⇒ Fig. 51
Seat control switch module	1999 - 2001	At base of seat, on side of seat cushion	⇒ Fig. 50

Component	Year, model	Location	Refer to
Seat cushion tilt motor	1999 - 2001	Bottom of seat cushion	⇒ Fig. 50
Seat forward-back motor	1999 - 2001	Bottom of seat cushion	⇒ Fig. 50
Seat headrest motor	1999 - 2001	Top of front seat backrest	⇒ Fig. 51
Seat heater	1999 - 2001	In front seat cushion and backrest	
Seat heater switch	1999 - 2001	Center console, below IHKA control panel	
Seat heater temperature sensor	1999 - 2001	Front of front seat cushion	
Seat height motor	1999 - 2001	Back of seat cushion	⇒ Fig. 50
Seat load sensor	2000 - 2001	Under passenger seat cushion	
Seat memory module (SM)	1999 - 2001	Front of seat cushion	⇒ Fig. 50
Seat belt lock Hall sensor	1999 - 2001	In seat belt lock	
Seat belt tensioner, pyrotechnic (left/right)	1999 - 2001	Base of seat belt lock (left/right)	
Secondary air injection pump	1999 - 2001	Right side engine compartment, above exhaust manifold	⇒ Fig. 17 , ⇒ Fig. 30
Secondary air injection pump relay	1999 - 2001	Main relay panel behind glove compartment	⇒ Fig. 14 , ⇒ Fig. 15
Secondary air injection pump valve	1999 - 2001	Left front of engine	⇒ Fig. 30
Shift interlock cable	1999 - 2001	Under shifter bezel	⇒ Fig. 46
Shiftlock solenoid	1999 - 2001	Under shifter bezel	
Side-impact airbag		see Airbag entries	
Slip control		see ABS/ASC or ABS/DSC entries	
Socket, 12 volt		see Power socket, 12-volt	
Solar sensor	2000 - 2001	Right defroster outlet at base of windshield	
Sound system amplifier		see Amplifier, radio	

Component	Year, model	Location	Refer to
Speed sensor		see ABS wheel speed sensor entries	
Spiral spring		see Volute spring	
Starter	1999 - 2001	Left rear of engine, under intake manifold	
Starter immobilization switch (manual transmission)		On clutch pedal	
Starter terminals 30, 50	1999 - 2001	Left rear of engine, under intake manifold	⇒ Fig. 22
Steering angle sensor		see ABS/DSC steering angle sensor	
Stepper motors		see Air distribution motors	
Steptronic switch	2000 - 2001	Under shifter bezel	
Stop light switch		see Brake light switch	
Sunroof motor	1999 - 2001	In headliner	⇒ Fig. 43
Sunroof/sunshade switch	1999 - 2001	In center console ahead of shifter	
Supplemental restraint system (SRS)		see Airbag entries	
Tailgate lock (central locking)	Sport Wagon	In tailgate lock	
Tailgate emergency release actuator	Sport Wagon	Rear deck sill, under trim panel, integrated with lock mechanism	
Tailgate unlock switch, exterior	Sport Wagon	Above license plate	
Tailgate unlock switch, interior	Sport Wagon	Left kick panel	
Telephone connector	1999 - 2001	Under center console	⇒ Fig. 48
Telephone antenna		see Antenna entries	
Telephone controls (steering wheel)	1999 - 2001	Steering wheel left keypad	
Telephone speaker	1999 - 2001	In left footwell top trim	

Component	Year, model	Location	Refer to
Telephone transceiver	Sedan, Coupe	In trunk below parcel shelf	
Thermostat, characteristic map cooling		see Coolant thermostat	
Throttle housing (MDK/EDK)	1999 - 2001	Under intake manifold	⇒ Fig. 23
Throttle position sensor		see Accelerator pedal sensor (PWG)	
Tilt sensor		see Park angle/tilt sensor	
Tire pressure control system (RDC) control unit	1999 - 2001	Behind glove compartment	
Toroidal coil		see EWS ring antenna	
Traction control		see ABS/ASC or ABS/DSC entries	
Trailer module	1999 - 2001	Right side trunk	
Transmission control module		see Automatic transmission module	
Transmission range switch		see Automatic transmission range switch	
Transverse acceleration sensor		see ABS/DSC lateral acceleration sensor entries	
Trunk lid microswitch	Sedan, Coupe, Convertible	In trunk lid lock	
Trunk light switch	Sedan, Coupe, Convertible	In trunk lid lock	
Trunk lock (central locking)	Sedan, Coupe, Convertible	In trunk lid lock	
Turn-signal/headlight dimmer switch (stalk switch)	1999 - 2001	Left side of steering column	
Ultrasonic sensor (motion detector) (UIS)	Coupe, Sedan, Sport Wagon	In headliner	
Unloader relay	1999 - 2001	Left rear engine compartment in E-box,	⇒ Fig. 16

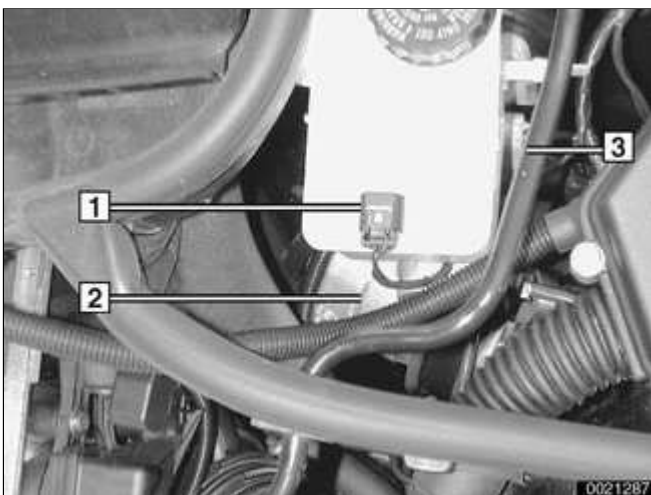
Component	Year, model	Location	Refer to
Valet position switch	1999 - 2001	On trunk lock cylinder	
VANOS solenoid, exhaust side	1999 - 2001	Right front of cylinder head	⇒ Fig. 29
VANOS solenoid, intake side	1999 - 2001	Left front of cylinder head	⇒ Fig. 17
Variable camshaft control		see VANOS	
Volute spring	1999 - 2001	In center of steering wheel under driver airbag	
Washer fluid level sensor	1999 - 2001	Bottom of windshield washer tank	
Wheel speed sensor		see ABS wheel speed sensor entries	
Window anti-trap strip	Sedan, Sport Wagon	Top of window frame in door	
Window lock-out switch, rear	Sedan, Sport Wagon	Left side shifter bezel	
Window motors	1999 - 2001	Inside doors	
Window switches	1999 - 2001	On shifter bezel	
Windshield washer nozzle heaters	1999 - 2001	In nozzles at rear of engine hood	
Windshield washer pump	1999 - 2001	At rear of washer tank, right front engine compartment	
Windshield washer relay	1999 - 2001	Left rear engine compartment in E-box	⇒ Fig. 16
Wiper motor	1999 - 2001	Rear of engine compartment, behind bulkhead	⇒ Fig. 20
Wiper/washer switch (stalk)	1999 - 2001	Right side steering column	
Yaw sensor		see ABS/DSC rotational rate (yaw) sensor	
ZKE V control module		see General Module (GM V)	

Engine compartment electrical components



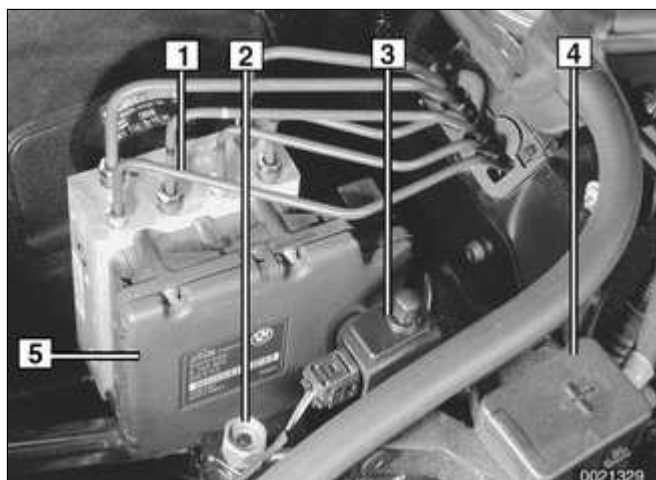
◀ Fig. 17 Engine compartment (1999 323i)

- 1 - Data link connector (DLC) (1999 - mid-2000 models)
- 2 - Hood contact switch
- 3 - B+ jumper connector
- 4 - DSC control module/hydraulic unit
- 5 - Secondary air pump
- 6 - Interior microfilter housing
- 7 - Resonance valve, intake manifold (changeover valve)
- 8 - Mass air flow sensor
- 9 - Brake fluid level sensor
- 10 - Ground lug X6454
- 11 - Electronics box (E-box)
- 12 - Air quality sensor (AUC) (for automatic recirculation control)
- 13 - Intake camshaft VANOS solenoid
- 14 - Engine cooling fan (electric)

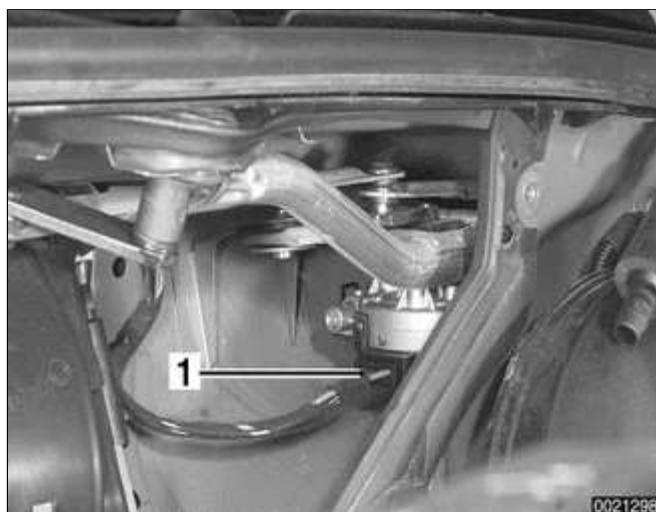


◀ Fig. 18 Left rear corner of engine compartment (near E-box)

- 1 - Brake fluid level sensor
- 2 - DSC precharge pump (Teves DSC MK 20/60)
- 3 - Brake fluid pressure sensor



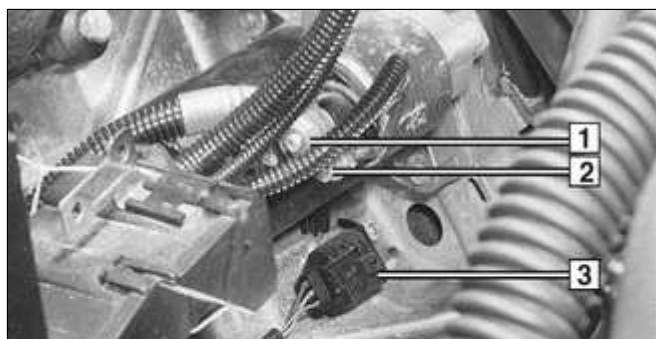
- Fig. 19 Right rear corner of engine compartment (Teves DSC MK 20/60)
- 1 - DSC hydraulic unit
 - 2 - Ground jumper connection
 - 3 - Hood contact switch
 - 4 - B+ jumper connection
 - 5 - DSC control module



- Fig. 20 Rear of engine compartment, behind bulkhead
- 1 - Wiper assembly electrical harness connector



- Fig. 21 Under rear of intake manifold
- 1 - Engine coolant temperature (ECT) sensor



- Fig. 22 Left rear of engine block, under intake manifold
- 1 - Starter motor terminal 50
 - 2 - Starter motor terminal 30
 - 3 - Crankshaft position sensor



4 - Bore hole for crankshaft locking tool

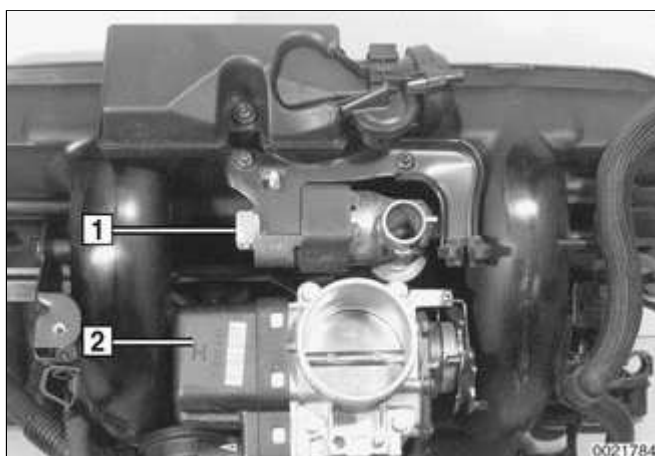


Fig. 23 Under intake manifold
1 - Idle speed control valve
2 - Throttle housing (MDK/EDK)

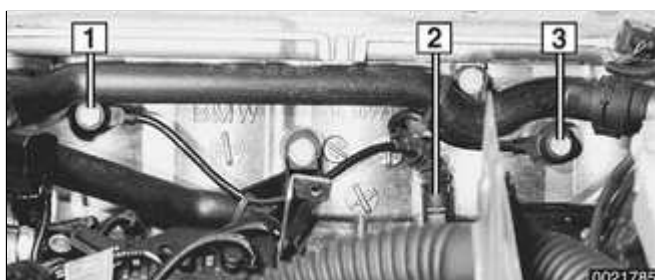


Fig. 24 Under intake manifold, at cylinder head
1 - Knock sensor cylinder 1 - 3
2 - Knock sensor harness connector
3 - Knock sensor cylinder 4 - 6

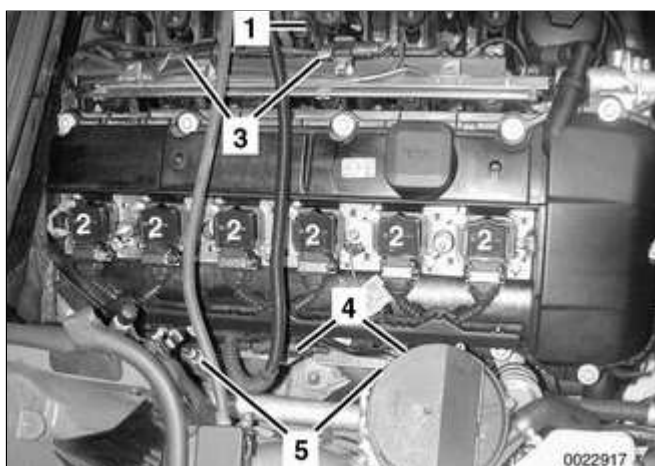


Fig. 25 Center top of engine, under covers
1 - Intake air temperature (IAT) sensor
2 - Ignition coils
3 - Post-catalyst oxygen sensor connectors
4 - Precatalyst oxygen sensor connectors
5 - Precatalyst oxygen sensors



Fig. 26 Left front of engine, at oil filter housing
1 - Oil/coolant temperature sensor
2 - Oil pressure switch



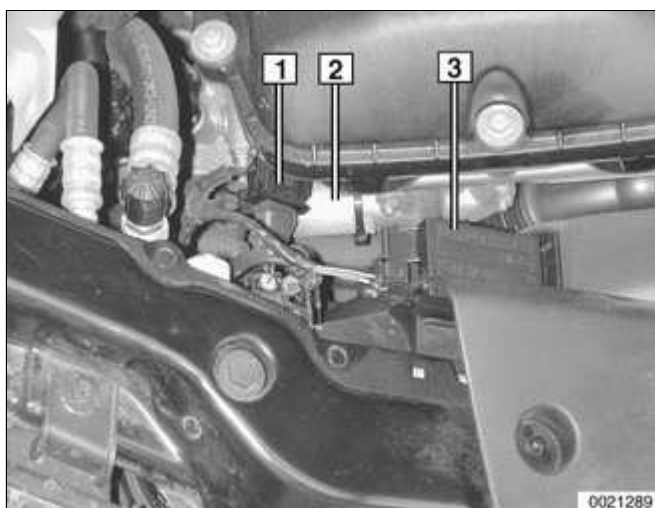
◀ Fig. 27 Left side of engine compartment
1 - Heater control valve

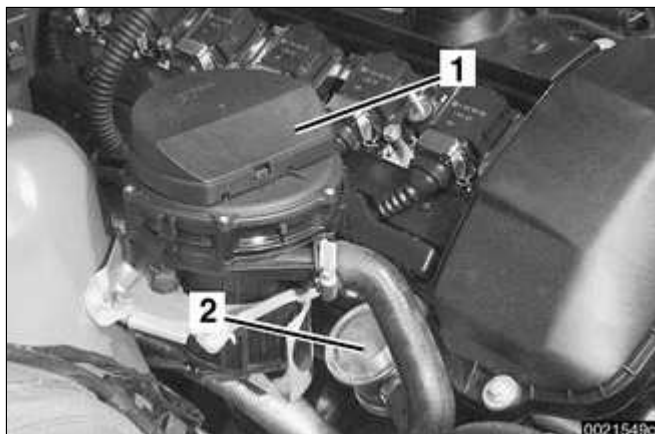


◀ Fig. 28 Cylinder head, left front
1 - Intake camshaft position sensor

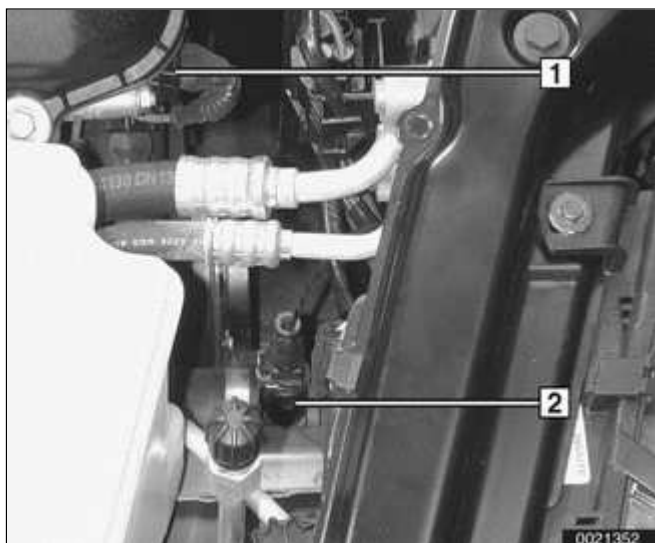


◀ Fig. 29 Right front of engine, top
1 - Exhaust camshaft position sensor
2 - Exhaust camshaft VANOS solenoid
3 - Air quality sensor (AUC) (for automatic recirculation control)





- ◀ Fig. 30 Right front of engine
- 1 - Secondary air injection pump
 - 2 - Secondary air injection pump valve



- ◀ Fig. 31 Right front of engine, low
- 1 - Exhaust camshaft position sensor
 - 2 - Coolant outlet temperature sensor



- ◀ Fig. 32 Top of A/C receiver/drier, right front engine compartment
- 1 - A/C pressure sensor

Car interior electrical components



- ◀ Fig. 33 Front door window frame
- 1 - Door mounted tweeter