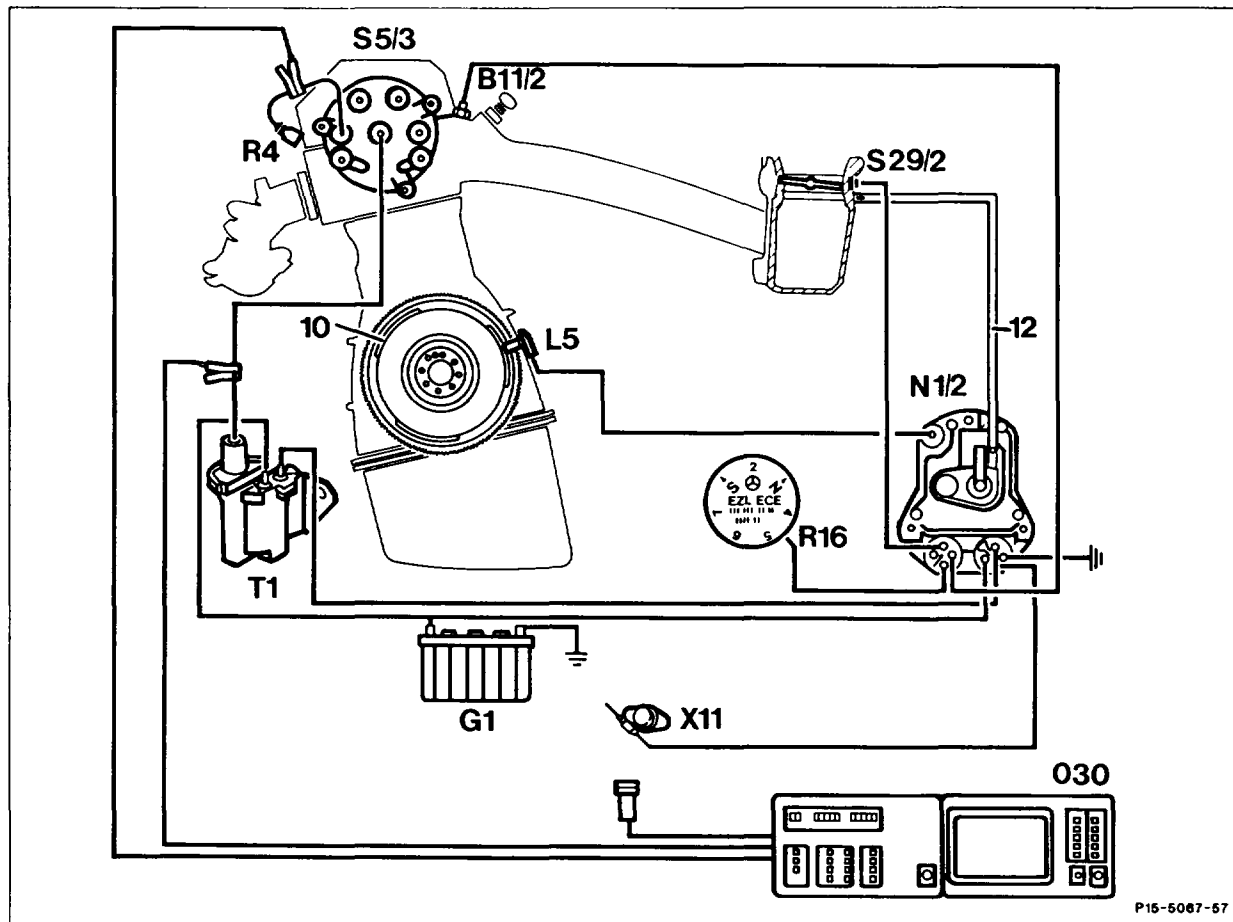


15-1250 Testing electronic ignition system with variable characteristics EZL

Operation no. of operation texts and work units or standard texts and flat rates:
15-1250.

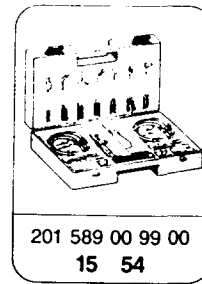
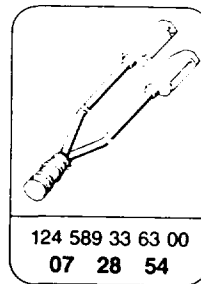
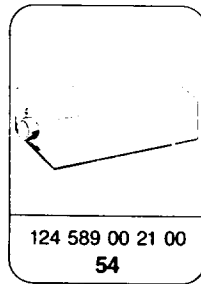
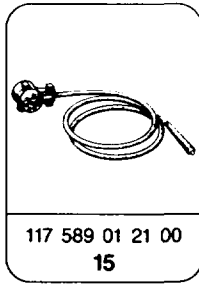


P15-5067-57

Connection diagram for engine tester with oscilloscope

B11/2	Coolant temperature sensor (EZL/KE, LH), 4-pin	S29/2	Throttle valve switch, full load/idle speed recognition
G1	Battery	T1	Ignition coil
L5	Crankshaft position sensor	X11	Diagnostic socket/terminal block, terminal TD
N1/2	EZL ignition control unit	10	Segments on flywheel/driven plate
R4	Spark plugs	12	Vaccum line
R16	EZL resistance trimming plug	030	Engine tester with oscilloscope
S5/3	High voltage distributor		

Special tools



Commercially available tools and testers

Designation	e.g. Make, order no.
Multimeter	Sun, DMM-5 Fluke, Multimeter 23 Hermann, Avometer 2003
Engine tester	Hermann, Datascope 9800 Bosch, MOT 301/400 Sun, 2110 BEAR, D AC E



Pay attention to the safety regulations when working on the ignition system (15-0505). Switch off ignition when plugging in and unplugging the connectors at the EZL ignition control unit.

Note

If dealing with faults regarding handling, first of all test the ignition. Then, continue fault finding at the KE injection system.

The test is divided into two sections:

a) Engine not running

In this section the basic functions of the ignition system are tested.

If the fault cannot be rectified, continue troubleshooting in section b), "Engine running."

b) Engine running

Faults in the ignition timing or at the corresponding components can affect vehicle handling.

Test data

Resistances (test data from 0 – 100 °C)

Ignition coil	primary (terminals 1 and 15)	Ω	0.3–0.6
Ignition coil	secondary (terminals 1 and 4)	kΩ	8–13
Position indicator	coil resistance (terminals 7 and 31d)	Ω	680–1200
	insulation (terminal 7 and ground)	kΩ	≥ 200
Distributor cap per terminal, distributor rotor, spark plug connector		Ω	700–1300

Voltages, engine not running, ignition switched on

Battery voltage	V	> 11.5
Terminals 15 and 31 (contacts 5 and 2 diagnostic socket)	V	> 11
Between terminals 15 and 1 (contacts 5 and 4 diagnostic socket)	V	0
4-pin round connector, terminals 15 and 31	V	> 11
4-pin round connector, terminals 16 and 31	V	> 11

Voltages at starting speed

Battery voltage	V	≥ 10
Ignition coil terminal 15	V	≥ 10
Ignition coil terminal 1	V	8.5–10.5

Voltages at idle speed

Battery voltage	V	13–14.5
Ignition coil terminal 15	V	13–14.5
Ignition coil terminal 1	V	12.5–14

Dwell angle

At starting speed		1 – 30°
At 3200 rpm		24 – 53°

Ignition timing point at starting speed	in ° KW	TDC ± 2°
-----------------------------------------	---------	----------

EZL ignition timing point

Engine	EZL ignition control unit	Engine speed 1/min	Ignition timing point in ° CA before TDC		
			Resistance trimming plug position or type of fuel	without vacuum	with vacuum

Basic version KAT/RÜF and (CH) KAT, (S) KAT

103.940	003 545 95 32	3200	S	25-29	40-44
103.941	003 545 96 32		N	19-23	
103.942	005 545 84 32				
103.943	005 545 86 32	Idle speed	S and N	7-11	7-11
	006 545 73 32				
	006 545 75 32				
	008 545 61 32				
	008 545 63 32				
	011 545 88 32				
	011 545 89 32				
103.980	003 545 14 32	3200	1/ leaded premium	23-27	39-43
	003 545 15 32	Idle speed		8-13	8-13
		3200	3/ unleaded premim	19-23	39-43
		Idle speed		8-13	8-13
103.981	004 545 44 32	3200	S	27-31	40-44
103.983	004 545 46 32		N	21-25	40-44
103.985	005 545 85 32	Idle speed	S and N	6-11	6-11
	005 545 87 32				
	006 545 74 32				
	006 545 76 32				
	007 545 86 32				
	007 545 87 32				
	008 545 62 32				
	008 545 64 32				
103.982	004 545 44 32				
	004 545 46 32				
	005 545 85 32				
	005 545 87 32				
	006 545 74 32				
	006 545 76 32				
103.984	007 545 86 32				
	007 545 87 32				

National version (CH) 1986, (S) 1986 1)

103.981	004 545 69 32	3200	S	29-33	40-44
103.983	005 545 49 32		N	23-27	
	005 545 88 32	Idle speed	S and N	TDC ± 2	TDC ± 2

1) For (CH) KAT, (S) KAT, same values as basic version KAT.

EZL ignition timing point

Engine	EZL ignition control unit	Engine speed 1/min	Ignition timing point in ° CA before TDC		
			Resistance trimming plug position or type of fuel	without vacuum	with vacuum

National version (AUS)

103.940	005 545 84 32	3200	Reference resistor 220 Ω	19-23	40-44
103.942	005 545 86 32 006 545 73 32 006 545 75 32 008 545 61 32 008 545 63 32	Idle speed		7-11	7-11
103.981	004 545 44 32	3200	Reference resistor 220 Ω	21-25	40-44
103.983	004 545 46 32 005 545 85 32 005 545 87 32 006 545 74 32 006 545 76 32 008 545 62 32 008 545 64 32	Idle speed		6-11	6-11

National version (J)

103.940	005 545 84 32	3200	Reference resistor 750 Ω	25-29	40-44
103.942	005 545 86 32 006 545 73 32 006 545 75 32 008 545 61 32 008 545 63 32	Idle speed		7-11	7-11
103.981	004 545 44 32	3200	Reference resistor 750 Ω	27-31	40-44
103.983	004 545 46 32	Idle speed		6-11	6-11
103.985	005 545 85 32 005 545 87 32 006 545 74 32 006 545 76 32 008 545 62 32 008 545 64 32				

National version (USA)

103.940	005 545 84 32	3200	Reference resistor 750 Ω	25-29	40-44
103.942	005 545 86 32 006 545 73 32 006 545 75 32 008 545 61 32 008 545 63 32 008 545 95 32 009 545 79 32	Idle speed		7-11	7-11
103.981	004 545 44 32	3200	Reference resistor 750 Ω	27-31	40-44
103.983	004 545 46 32 005 545 85 32 005 545 87 32 006 545 74 32 006 545 76 32 008 545 96 32 009 545 80 32	Idle speed		6-11	6-11





Resistances of EZL resistance trimming plug (R16)

Position	Resistance k Ω	EZL resistance trimming plug		
		"EZL-ECE"	"EZL-KAT"	"EZL"
A	∞	S	1	1
B	2.4	2	2	2
C	1.3	N	3	3
D	0.75	4	S	4
E	0.47	5	5	5
F	0.22	6	N	6
G	0	7	7	7

a) Engine not running




Symbols for testers

-  Contact
-  Connector

Preconditions for test

- Spark plugs, ignition cables, distributor rotor and distributor cap in proper mechanical and electronic order.
Test e.g. by visual inspection, measuring resistance and ignition oscilloscope.
- Battery voltage 11 – 14 V

Symbols for test mode with multimeter

-  Multimeter
DC voltage mode
-  Multimeter
Resistance mode
-  Oscilloscope

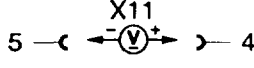
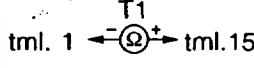
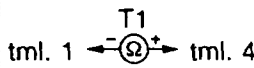


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




If the specification of a main test step, e.g. test step 1.0, is in order, continue with the next main test step, e.g. test step 2.0.

If the specification of a main test step, e.g. test step 1.0, is not achieved, continue test with sub-test step, e.g. test step 1.1.

See appropriate wiring diagram volume for wiring diagrams.



Test step	Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause/Remedy
1.0	Voltage supply		Unplug 4-pin round connector at EZL control unit. Ignition: ON	11–14 V	Test voltage supply via ignition lock, Test ground cable, Test wiring and contacts according to wiring diagram, replace if necessary
1.1	Ground cable		Ignition: OFF	< 1 Ω	Open circuit in wiring
2.0	Crankshaft position sensor (L5)		Ignition: OFF Unplug crankshaft position sensor connector (L5) at EZL control unit.	680–1200 Ω	Replace crankshaft position sensor (L5)
2.1			Unplug crankshaft position sensor connector (L5) at EZL control unit. Engine: start Starting speed.	$U_S \geq 1 \text{ V}$ see "diagram crankshaft position sensor signal (L5)"	Signal too small or no signal → replace position sensor, different voltage levels → test segments on flywheel/driven plate (visual check) Signal in order → replace EZL control unit
2.2	Insulation at sensor coil		Ignition: OFF Unplug crankshaft position sensor connector (L5) at EZL control unit.	$\geq 200 \text{ k}\Omega$	Visual check of control cable, Replace crankshaft position sensor (L5)

Test step	Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause/Remedy
3.0	Dwell angle at starting speed	Engine tester	Engine: start	1–30° or 1–50 %	Dwell angle not to tolerance → replace EZL control unit No dwell angle → test no-load current cutoff
3.1	No-load current cutoff		Ignition: ON	0 V	Replace EZL control unit and ignition coil
4.0	Ignition coil (T1) primary		Ignition: OFF Disconnect cables at ignition coil	< 1 Ω	Replace ignition coil
5.0	Ignition coil (T1) secondary		Ignition: OFF Disconnect cables at ignition coil	8–13 kΩ	Replace ignition coil
6.0	Primary voltage	Engine tester  Oscilloscope image: Parade primary	Engine: start	200 – 350 V	Replace EZL control unit
7.0	Primary current limiting	Engine tester  Oscilloscope image: Superposition secondary	Engine: start	See "diagram good image superposition" (Diagnosis Manual Engine, Vol. 1, Register C)	Replace EZL control unit

Test step	Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause/Remedy
8.0	Ignition voltage	Engine tester  Oscilloscope image: Parade secondary	Engine: start	8 – 20 kV	See test steps 8.1–8.5
8.1	Distributor cap (each terminal individually)	Distributor cap  inside outside	Ignition: OFF Remove distributor cap. Disconnect ignition cables.	700– 1300 Ω per terminal	Replace distributor rotor
8.2	Distributor rotor	Distributor rotor  Middle Peak	Ignition: OFF Remove distributor cap.	700– 1300 Ω and visual check	Replace distributor rotor
8.3	Ignition cable terminal 4 at ignition coil (T1)	T1 tml. 4  S5/3 tml. 4	Ignition: OFF Disconnect ignition cable terminal 4 at ignition coil (T1) and at distributor cap.	< 1 Ω	Replace ignition cable terminal 4
8.4	Ignition cables with spark plug connector	Ignition cable Spark plug connector 	Ignition: OFF Disconnect ignition cable at HT distributor (S5/3) and spark plug connector	700– 1300 Ω per ignition cable	Replace ignition cable with spark plug connector
8.5	Spark plugs	Visual inspection	Ignition: OFF Remove all spark plugs.	Electrode gap 0.8 mm	Replace according to condition
9.0	Ignition timing point at starting speed	Engine tester	Engine: start Starting speed	TDC $\pm 2^\circ$	Test ignition coil and HT distributor

b) Engine running

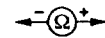

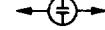
Symbols for testers

-  Contact
-  Connector

Preconditions for test

- Engine at operating temperature.
 - Coolant temperature < 95 °C.
 - Test ignition timing point at idle speed.
 - Test ignition timing point at 3200/min with and without vacuum (detach vacuum line at EZL control unit).
- Pay attention to resistance trimming plug position.
- Switch off engine during test only if stated.

Symbols for test mode with multimeter

-  Multimeter
-  Resistance mode
-  Oscilloscope



Pay attention to notes for work on breakerless transistorized ignition system (15-0505).

Note

If the specification of a main test step, e.g. test step 2.0, is in order, continue with the next main test step, e.g. test step 3.0.

If the specification of a main test step, e.g. test step 2.0, is not achieved, continue test with sub-test step, e.g. test step 2.1.

See appropriate wiring diagram volume for wiring diagrams.

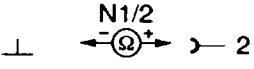
Test step	Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause/Remedy
1.0	Ignition timing point	Engine tester	Engine: start Idle speed	See table of ignition timing points	Test EZL resistance trimming plug (R16), Test EZL reference resistor (R16/1) (Pay attention to national version and Part no.), Test throttle valve switch, full load/idle speed recognition (S29/2), Test pressure sensor, Test coolant temperature sensor (B11/2), Coolant temperature > 95 °C
2.0	EZL resistance trimming plug (R16) ¹⁾		Ignition: OFF Compare engine version and resistance trimming plug inscription. Unplug 4-pin coupling at EZL control unit.	See table of resis- tances of EZL trimming plug (R16)	Test Ω values in resistance trimming plug, Replace resistance trimming plug

¹⁾ Except (AUS) (USA) (J)

Test step	Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause/Remedy
2.1	EZL resistance trimming plug (R16) ¹⁾		Ignition: OFF Compare engine version and resistance trimming plug inscription (see table resistances EZL trimming plug (R16)). Unplug 4-pin coupling at EZL control unit. Test clockwise between middle and outer connector pins.	A ∞ B 2.4 k Ω C 1.3 k Ω D 750 Ω E 470 Ω F 220 Ω G 0 Ω	Replace EZL resistance trimming plug
2.2	EZL reference resistor (R16/1) ²⁾		Ignition: OFF Pay attention to national version and Part no., see table. Unplug 4-pin coupling at EZL control unit.	∞	Replace EZL resistance trimming plug
2.3	EZL reference resistor (R16/1) ²⁾		Ignition: OFF Unplug EZL reference resistor.	Part no. and Ω value see table EZL reference resistor (R16/1).	Replace EZL resistance trimming plug




1) Except (AUS) (J) (USA)

2) Only (AUS) (J) (USA)

Test step	Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause/Remedy
3.0	Throttle valve switch, full load/idle speed recognition (S29/2)		Ignition: OFF	Idle position approx. 0 Ω. Full load approx. 0 Ω. Part load position ∞. See also table "re- sistances at throttle valve switch full load/ idle speed re- cognition (S29/2)"	Adjust or replace throttle valve switch, Rectify open circuit in wiring according to wiring diagram
4.0	Pressure sensor	Engine tester	Vacuum line at EZL control unit dis- connected. Coupling disconnected from throttle valve switch. Engine: start Engine speed/ gear lever position: idling.	When vacuum line con- nected, ignition timing point must advance.	Check vacuum line from intake manifold to EZL control unit for leaks. If no fault found, replace EZL control unit.

Test step	Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause/Remedy
5.0	Coolant temperature sensor (B11/2)		Ignition: OFF Unplug 4-pin coupling at EZL control unit, test Ω values at two temperatures	Ω values, see diagrammed coolant temperature sensor (2/4-pin) Example: + 20 °C 2.28– 2.72 k Ω + 80 °C 290– 364 Ω	Replace cable according to wiring diagram. Replace coolant temperature sensor (B11/2)
6.0	Ignition timing point	Engine tester	Detach vacuum line at EZL control unit. Engine: start	See table ignition timing points	Replace EZL ignition control unit
7.0	Dwell angle at 3200 rpm	Engine tester	Vacuum line and 4-pin coupling EZL control unit connected. Engine: start	24–53°	Replace EZL ignition control unit



Test step	Test scope	Test connection	Operation/Requirement	Specification	Possible cause/Remedy
8.0	HT distributor (S5/3)  Pay close attention to safety notes (15-0505).	Visual check	Ignition: OFF Remove distributor cap.		Distributor cap, mechanical damage in HT distributor, replace HT distributor if necessary.
9.0	Interference suppression resistors, distributor cap, distributor rotor, spark plug connector		Ignition: OFF Remove distributor cap. Measure resistances individually.	1 kΩ	Replace faulty parts
10.0	Ignition coil	Engine tester  Oscilloscope image: Parade	Ignition: ON Engine: start Idle speed	Good/poor, see analyzing oscilloscope image (Diagnosis Manual, Engine, Vol. 1, Register C).	Replace ignition coil

1)

Ignition voltage: (average value) 6 – 16 kV. Difference of cylinders to each other ≤3 kV.

Ignition voltage rise: the ignition voltage measured at idle speed must rise by not more than 6 kV when engine speed is increased up to 3000 rpm by blipping the throttle.

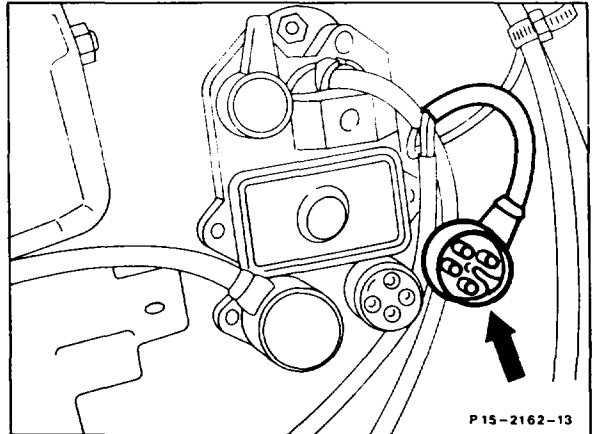
Combustion curve starting point: 0.6 – 1.2 kV. Difference of the cylinders to each other ≤0.3 kV.

Combustion time: 1.9 – 2.5 ms. Difference of the cylinders to each other ≤0.3 ms.

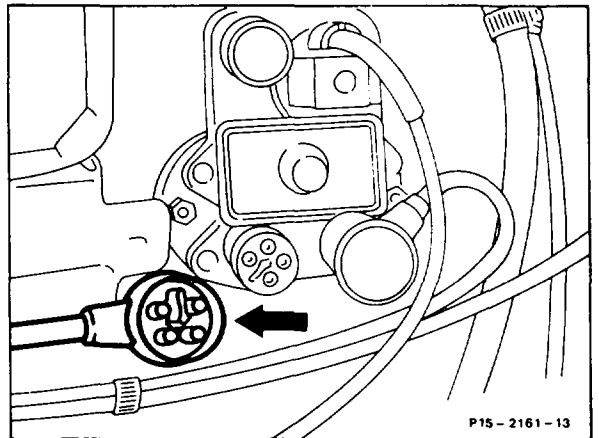


Location of components

Round power supply connector at EZL ignition control unit (N1/2)

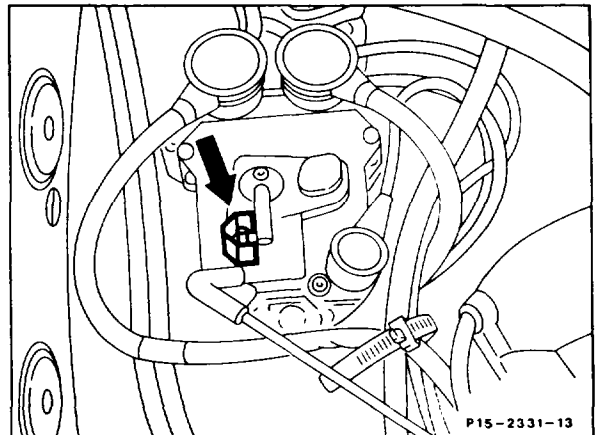


EZL ignition control unit (N1/2)



Arrow 4-pin connector sensor

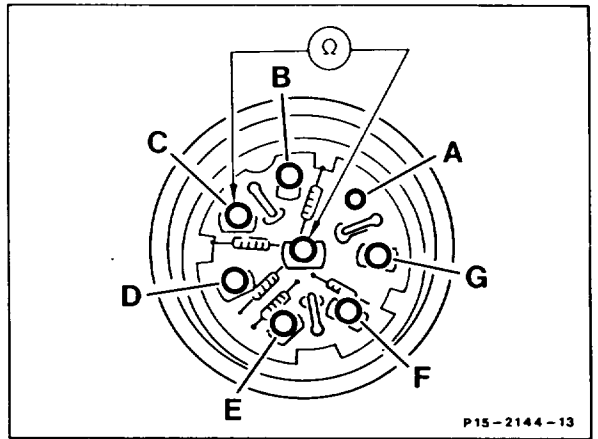
EZL ignition control unit (N1/2)



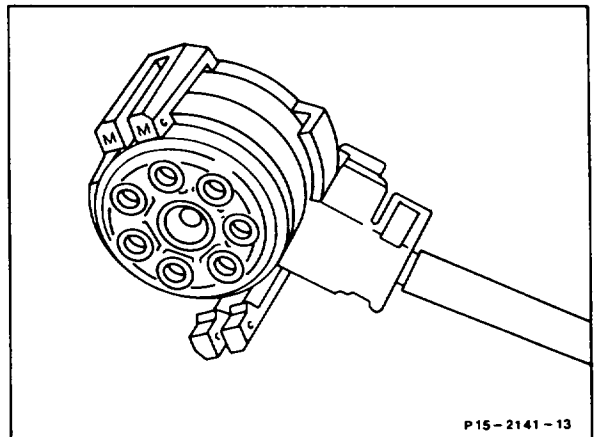
Arrow Vacuum line

EZL resistance trimming plug (R16)

A	-	
B	2.4	k Ω
C	1.3	k Ω
D	0.75	k Ω
E	0.47	k Ω
F	0.22	k Ω
G	0	k Ω

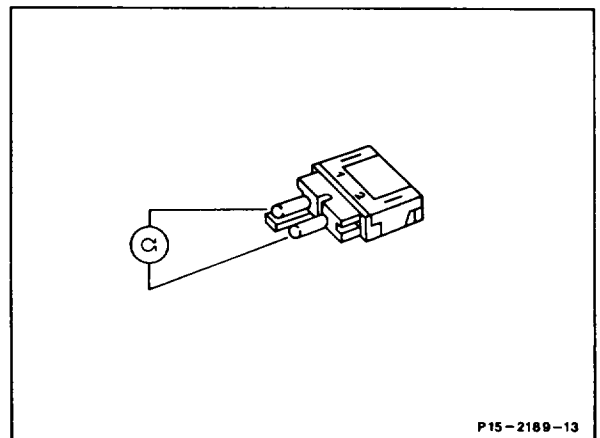


Bottom part of connector, EZL resistance trimming plug (R16)

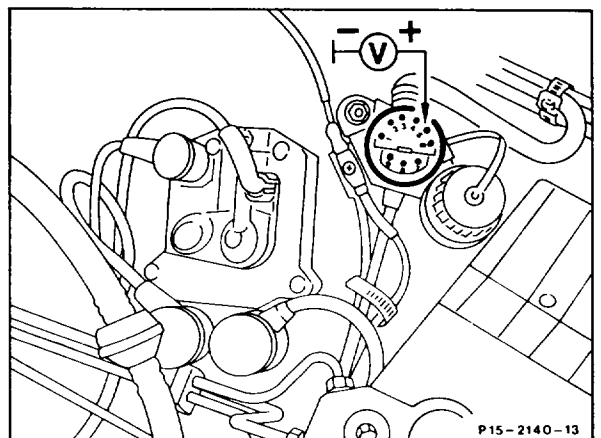


EZL reference resistor (R16/1)

Part no.	Resistance	National version
000 540 22 81	220 Ω	(AUS)
000 540 24 81	750 Ω	(J) (USA)

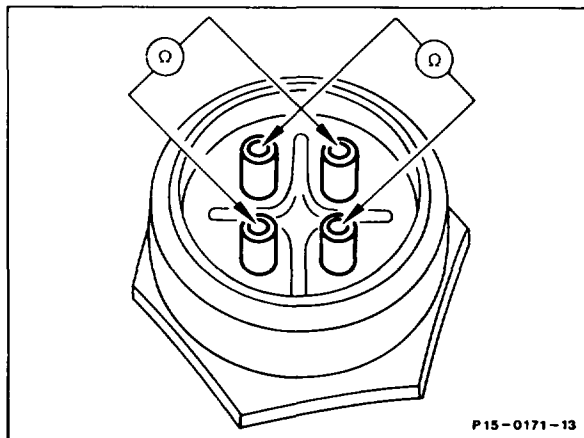


Diagnostic socket/terminal block (X11)

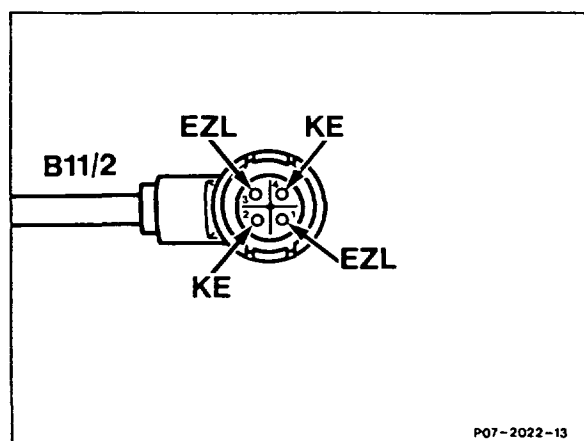


Terminal TN

EZL/KE, LH) coolant temperature sensor, 4-pin (B11/2)

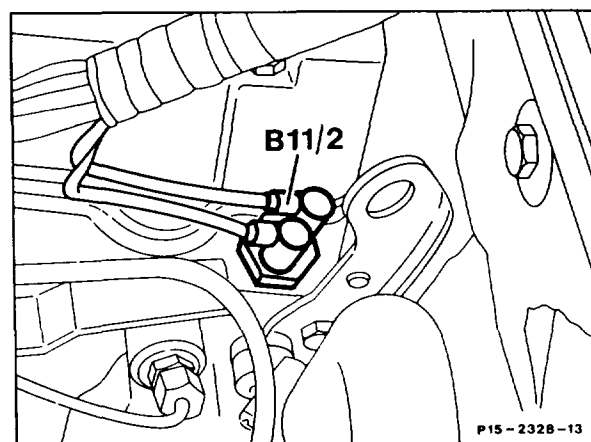


Connect 4-pin connector, coolant temperature sensor (B11/2)

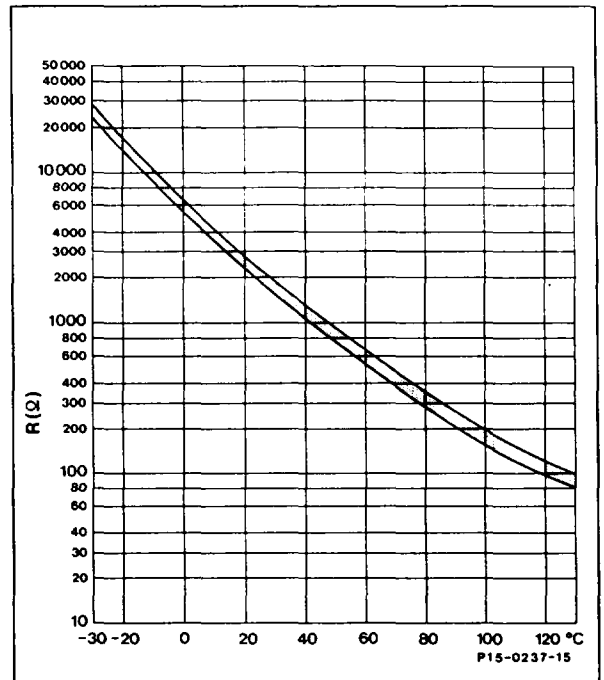


- Pin assignment (positions stamped in connector)
- 1 EZL/AKR temperature sensor
 - 2 KE temperature sensor
 - 3 Ground, EZL/AKR ignition control unit
 - 4 Ground, KE control unit

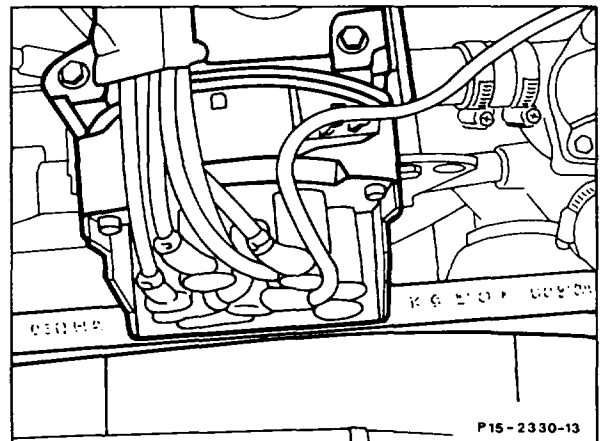
Coolant temperature sensor (B11/2), 2-pin



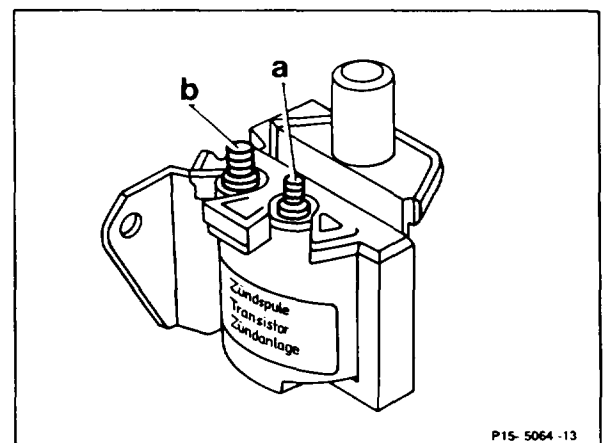
Diagram, coolant temperature sensor
(2/4-pin)



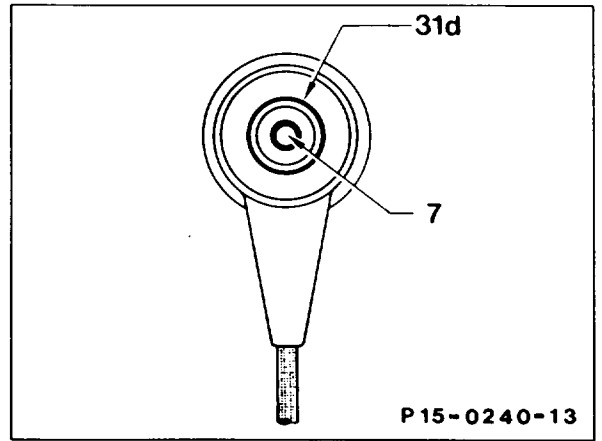
High voltage distributor (S5/3)



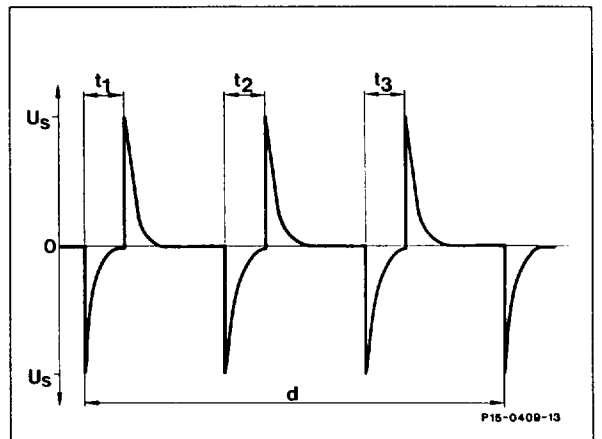
Ignition coil (T1)



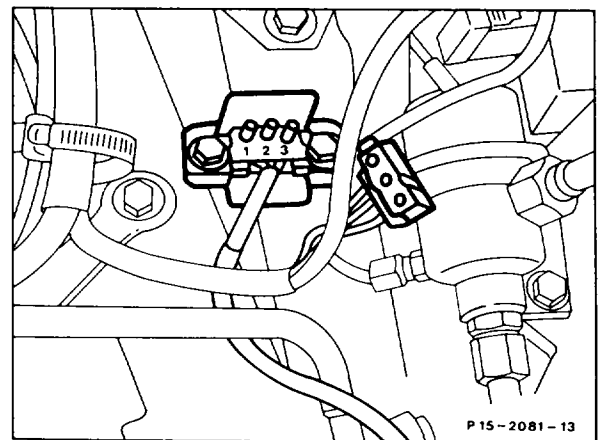
Connector, crankshaft position sensor (L5)



Diagram, crankshaft position sensor (L5) signal

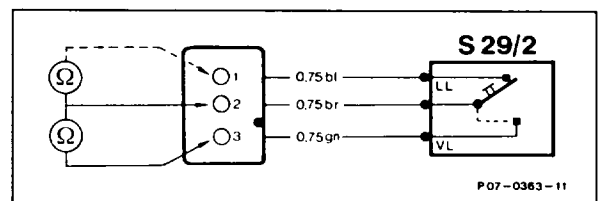


Plug connection, throttle valve switch full load/idle speed recognition (S29/2x1)



Resistances at throttle valve switch full load/idle speed recognition (S29/2)

Idle speed	approx. 0 Ω
Full load	approx. ∞



LL Idle contact
VL Full load