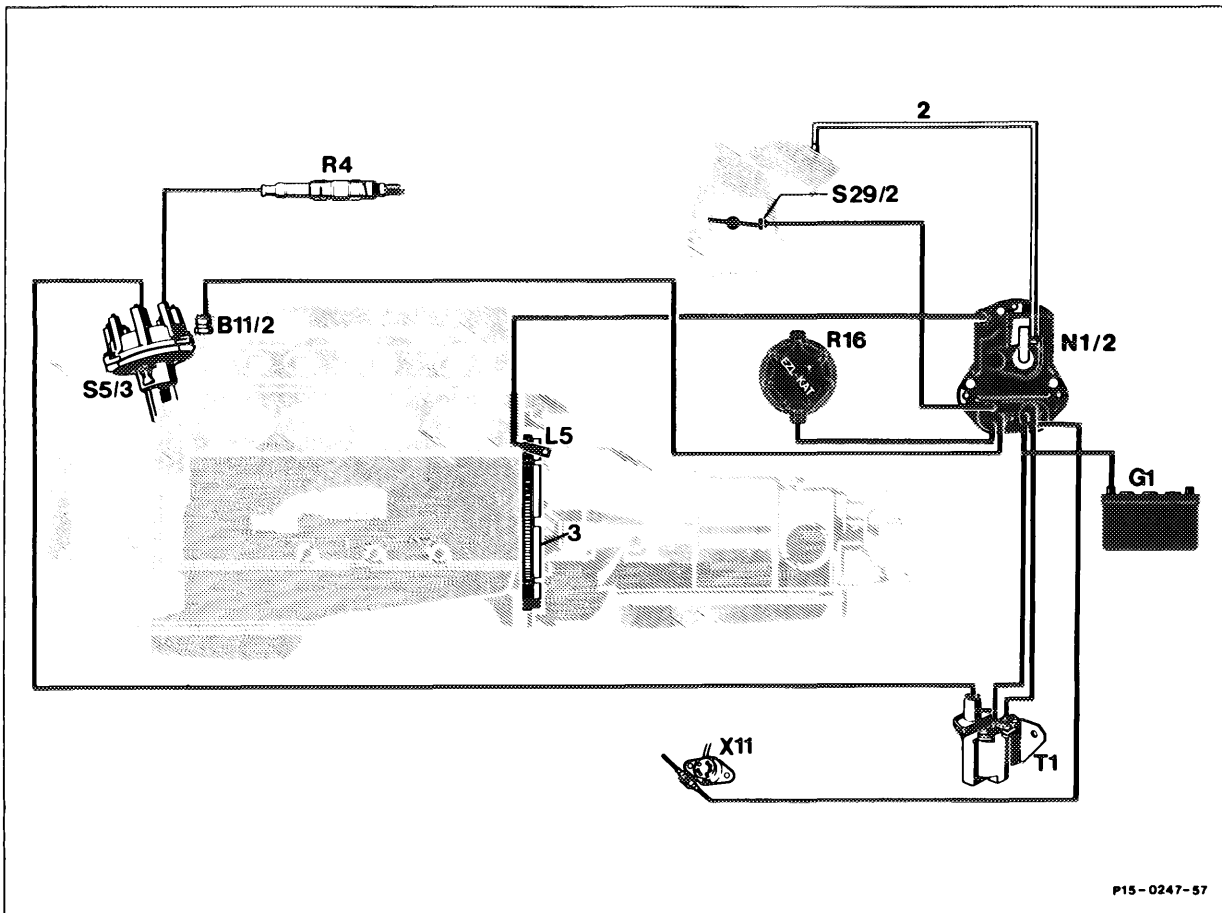


15-540 Testing electronic ignition system with electronic timing adjustment (EZL)

Test requirement

Spark plugs, ignition parts, distributor rotor and distributor cap in proper mechanical and electronic condition.

Test e.g. by means of visual inspection, resistance measurement and ignition oscilloscope.



P15-0247-57

Connection diagram for engine tester with oscilloscope

B11/2	Coolant temperature sensor (EZL/CIS-E)	S29/2	Throttle valve switch, full load/idle
G1	Battery	T1	Ignition coil
L5	Crankshaft position sensor	X11	Diagnostic socket/terminal block (circuit TD)
N1/2	Electronic ignition control unit (EZL)		
R4	Spark plugs	2	Vacuum line
R16	Resistance trimming plug (EZL) - not used R16/1 used on USA vehicles	3	Segments on driven plate
S5/3	High-voltage distributor		

Note

Pay attention to the safety instructions when working on the ignition system (15-505). Switch off ignition when connecting and disconnecting the plugs at the EZL control unit.

The test is divided into two sections:

A. Engine not running

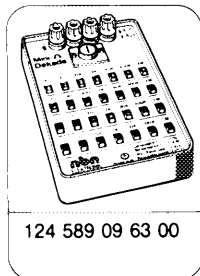
In this section of the test, the basic functions of the ignition system are tested.

B. Engine running

Fault sources in the ignition advance mechanism or at the appropriate components may influence the performance of the vehicle.

If complaints are received regarding performance, first of all test ignition system. Then, continue troubleshooting the CIS-E injection system.

Special tools



Commercial testers

Multimeter	e.g. Sun, DMM-5 Fluke Multimeter 23 Hermann Avometer 2003
Engine tester	e.g. Hermann Datascope 9800 Bosch MOT 301/400 Sun 2110 BEAR D AC E

Test data

Resistances (test values from 0–100° C)

Ignition coil	primary (terminals 1 and 15)	Ω	0.2–0.4
Ignition coil	secondary (terminals 1 and 4)	$k\Omega$	8–13
Position sensor	resistor coils (terminals 7 and 31d)	Ω	680–1200
	insulation (terminals 7 and ground)	$k\Omega$	≥ 200
Distributor cap per terminal, distributor rotor, spark plug connector		Ω	700–1300

Voltages (engine not running, ignition switched on)

Terminals 15 and 31 (contacts 5 and 2 diagnostics socket)	V	battery voltage
Between terminals 15 and 1 (contacts 5 and 4 of diagnostics socket)	V	0
4-pin round connector terminals 15 and 31	V	battery voltage
4-pin round connector terminals 16 and 31	V	battery voltage

Dwell angle

At starting speed	1°–18° or 1–40 %
At 3500 rpm	27°–40° or 60–90 %

Ignition timing

Engine	EZL control unit	Resistance trimming plug or trimming plug position	Engine speed in rpm	Ignition point in ° CA before TDC	
				without vacuum	with vacuum

(USA) effective 1986

116.965	003 545 92 32 003 545 91 32	Reference resistor 750 Ω	3500	28–32	41–45
			idle speed	3–7	10–14
117.967 117.968	004 545 53 32 004 545 55 32	Reference resistor 750 Ω	3500	24–28	40–44
			idle speed	3–7	10–14

Ignition timing at starting speed	in ° CA before TDC	3–7
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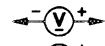
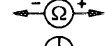
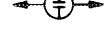
A. Engine not running

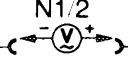
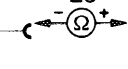
Note

If the specified value of a test step, e.g. step 1, is in order, continue immediately with step 2.







If the specified value of step 1 is not in order, the procedure must be continued with step 1.1.



Symbols for variables measured with multimeter

-  Multimeter D.C. voltage mode
-  Multimeter resistance mode
-  Oscilloscope

Display on/off factor	Test step/ Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause: Remedy
-	1.0 Power supply	N1/2 31 —  — 15	Ignition: ON	Battery voltage	Test wiring and contacts according to wiring diagram (from battery through ignition lock to EZL control unit)
-	2.0 Crankshaft position sensor (L5)	L5 31d —  — 7	Ignition: OFF Detach crankshaft position sensor plug at EZL control unit	680– 1200 Ω	Renew crankshaft position sensor.

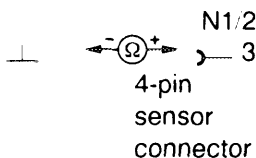
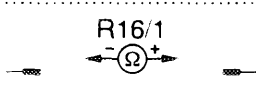
Display on/off factor	Test step/ Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause/Remedy
-	2.1		Detach crankshaft position sensor plug at EZL control unit Engine: Start	see diagram $U_S \geq 1V$	Signal too small/no signal: Renew position sensor. Inconsistent voltage peaks: Check segments (visual inspection). Renew EZL control unit.
-	2.2 Insulation of sensor coil		Detach crankshaft position sensor plug at EZL control unit	$\geq 200 \text{ k}\Omega$	Renew crankshaft position sensor.
-	3.0 Dwell angle	Engine tester	Engine: Start	$1^\circ - 18^\circ$ or $1 - 40\%$	Dwell angle not to tolerance: Renew EZL control unit. No dwell angle: Test closed circuit cutoff.
-	4.0 Closed circuit cutoff	 	Ignition: ON Engine: Start	0 V 0 V $> 0 \text{ V}$	Renew EZL control unit and ignition coil. Test wiring and contacts from EZL control unit to ignition coil or renew EZL control unit. Renew ignition coil.
-	4.1 Ignition coil primary (T1)		Ignition: OFF Unscrew wiring at ignition coil.	0.2– 0.4 Ω	Renew ignition coil.
-	5.0 Primary voltage	 Engine tester Scope image Parade primary	Engine: Start	190– 290 V	Renew EZL control unit.

Display on/off factor	Test step/ Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause/Remedy
-	6.0 Primary current limiting	 Engine tester Scope image Secondary deviations	Engine: Start	see diagram	Renew EZL control unit.
-	7.0 Ignition voltage at ignition coil terminal 4	 Engine tester Scope image Secondary parade	Engine: Start	$\geq 8 \text{ kV}$	Test ignition cable terminal 4, distributor rotor, distributor cap and ignition coil.
-	7.1 Ignition cable terminal 4	T1 tm. 4  S5/3 tm. 4	Ignition: OFF Detach ignition cable terminal 4 at ignition coil and distributor cap.	$< 1 \Omega$	Renew ignition cable terminal 4.
-	7.2 Distributor rotor	Distributor rotor  Middle Point	Ignition: OFF Remove distri- butor cap.	700– 1300 Ω and visual inspec- tion	Renew distributor rotor.
-	7.3 Distributor cap	S5/3 tm. 4  Carbon contact	Ignition: OFF Distributor cap removed and detach ignition cable terminal 4.	700– 1300 Ω per terminal and visual inspec- tion	Renew distributor cap.
-	7.4 Ignition coil secondary T1	T1 tm. 4  tm. 1	Ignition: OFF Unscrew wiring at ignition coil	8–13 $\text{k}\Omega$	Renew ignition coil.

Display on/off factor	Test step/ Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause/Remedy
-	8.0 Ignition voltage at single cylinder	 Engine tester Scope image Secondary parade High voltage sensor clamps on cylinder ignition cable (e.g. cylinder 3)	Engine: Start	> 6 kV	Test distributor cap, distributor rotor, ignition cables with spark plugs.
-	8.1 Ignition cable with spark plug connector	 Ignition cable Spark plug connector	Ignition: OFF Detach ignition cable with spark plug connector at spark plug and distributor.	700– 1300 Ω	Renew ignition cable with spark plug connector.
-	8.2 Spark plugs	Visual inspection	Ignition: OFF Remove spark plugs.	Electrode gap 0.8 mm	Renew according to condition.

B. Engine running




Pay attention to safety instructions (15-505).

Display on/off factor	Test step/ Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause/Remedy
-	1.0 Ignition timing	Engine tester	Engine: Test at normal operating temperature at specified rpm and with/without vacuum	see table	Reference resistor, coolant temperature sensor, throttle valve switch, vacuum advance.
-	1.1 EZL reference resistor (R16/1)		Ignition: OFF Detach sensor connector at EZL control unit.	750 Ω	Reference resistor Wiring Contacts
-	1.1.1 EZL reference resistor (R16/1)		Ignition: OFF Disconnect reference resistor.	750 Ω	Reference resistor

Display on/off factor	Test step/ Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause Remedy
-	1.1.2 Wiring and contacts	<p>R16/1 N1/2</p> <p>4-pin sensor connector</p> <p>R16/1</p>	Ignition: OFF Disconnect reference resistor. Detach sensor connector at EZL control unit.	< 1 Ω	Renew wiring or contacts.
-	1.2 Coolant temperature sensor (B11/2)	<p>N1/2</p> <p>4-pin sensor connector</p>	Ignition: OFF Detach sensor connector at EZL control unit.	at 80 °C 290– 360 Ω further values, see diagram	Coolant temperature sensor (B11/2) Wiring Contacts
-	1.2.1 Coolant temperature sensor (B11/2)	<p>B11/2</p>	Ignition: OFF Detach connector at temperature sensor.		Renew coolant temperature sensor (B11/2).
-	1.2.2 Wiring and contacts	<p>B11/2 N1/2</p> <p>4-pin sensor connector</p>	Ignition: OFF Detach connector and temperature sensor and sensor connector at EZL control unit.	< 1 Ω	Renew wiring or contacts.

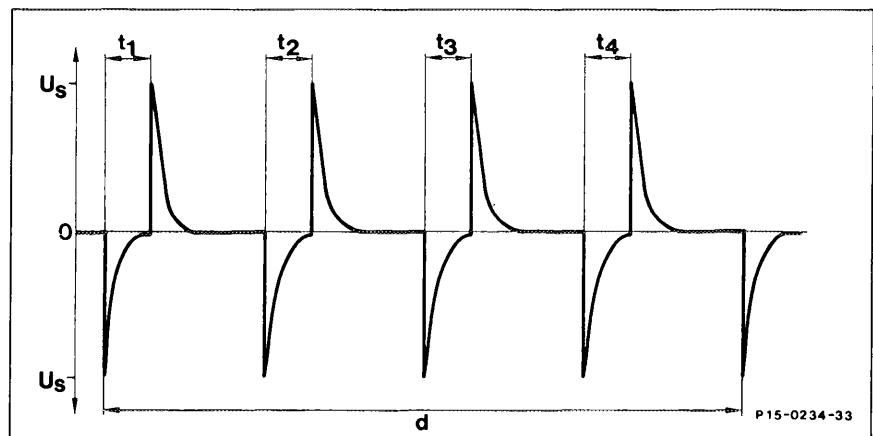
Display on/off factor	Test step/ Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause/Remedy
-	1.3 Throttle valve switch, full load detection (S29/2x)		Ignition: OFF Detach connector (S29/2x)	Full load position: < 1 Ω Other positions: ∞	Set throttle valve switch or renew open circuit
-	1.3.2 Wiring and contacts		Ignition: OFF Detach sensor connector at EZL control unit and CIS-E control unit	< 1 Ω	Renew wiring or contacts.
-	1.4 Vacuum advance	Engine tester	Engine: normal operating temperature, 1500 rpm. Detach vacuum hose at EZL control unit. Fit vacuum hose onto EZL control unit.	Ignition timing retarded Ignition timing advanced	Vacuum hose leaking Connection at intake manifold blocked Pressure sensor in EZL control unit faulty Vacuum hose leaking Connection at intake manifold blocked Pressure sensor in EZL control unit faulty
-	1.5		Detach crank- shaft position sensor connector at EZL control unit. Engine: Start	see diagram $U_S \geq 1 V$	Inconsistent voltage peaks: Check segments (visual inspection). Renew driven plate with segments.

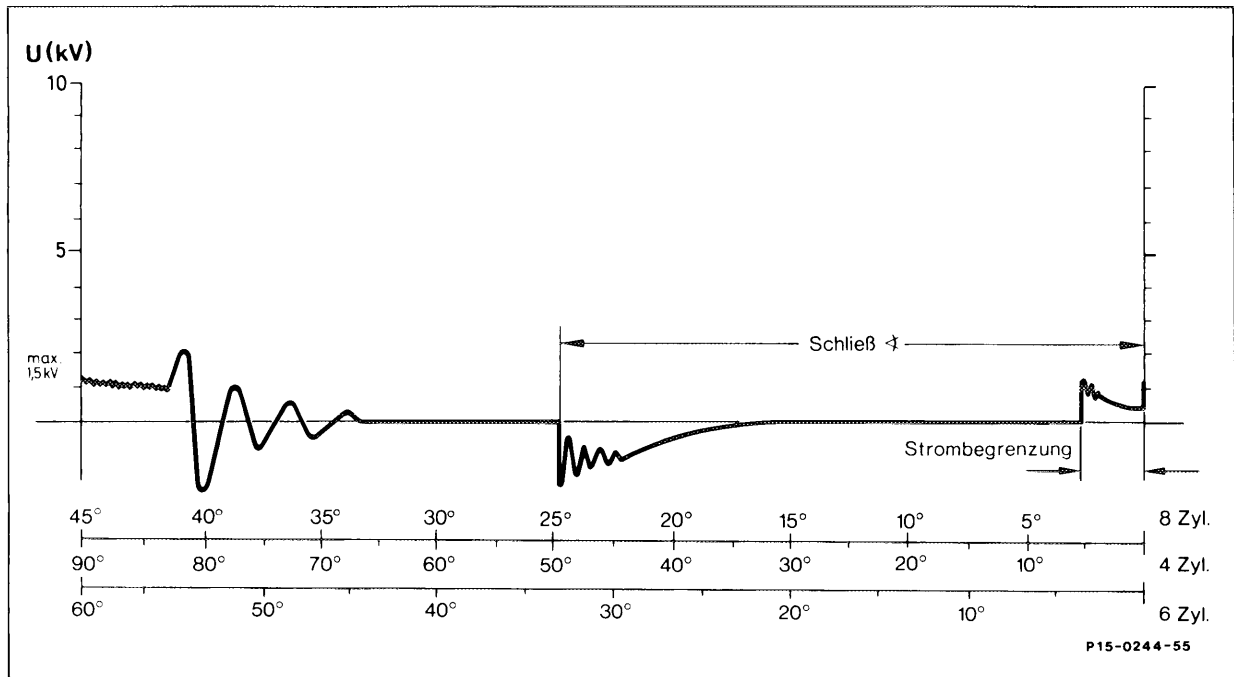
Display on/off factor	Test step/ Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause/Remedy
-	2.0 Dwell angle	Engine tester	Speed 3500 rpm. Engine at normal operating temperature. Detach sensor connector at EZL control unit and vacuum line. Engine: Start	27-40° or 60-90%	Renew EZL control unit

Display on/off factor	Test step/ Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause/Remedy
-	3.0 High voltage distributor/ distributor rotor	Visual inspection	Ignition: OFF Remove distributor cap	-	Distributor cap, distributor rotor has cracks, interference suppression resistors faulty
-	3.1 Distributor cap	S5.3 	Ignition: OFF Remove distributor cap	700–1300 Ω per terminal	Renew distributor cap
-	3.2 Distributor rotor	Distributor rotor  Middle Point	Ignition: OFF Remove distributor cap	700–1300 Ω and visual inspection	Renew distributor rotor
-	4.0 Scope images	Engine tester  Scope images Parade Deviations Raster	Engine: Start Idling speed	see scope images (15–525)	Ignition coil Distributor Ignition components Spark plugs

Crankshaft position sensor signal (L5)

- t1 1st segment
- t2 2nd segment
- t3 3rd segment
- t4 4th segment
- d Period for one crankshaft revolution





Current limiting

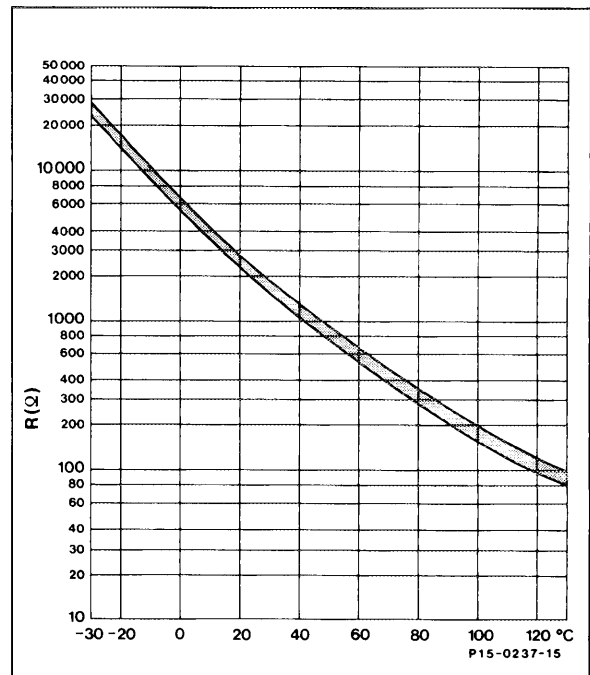
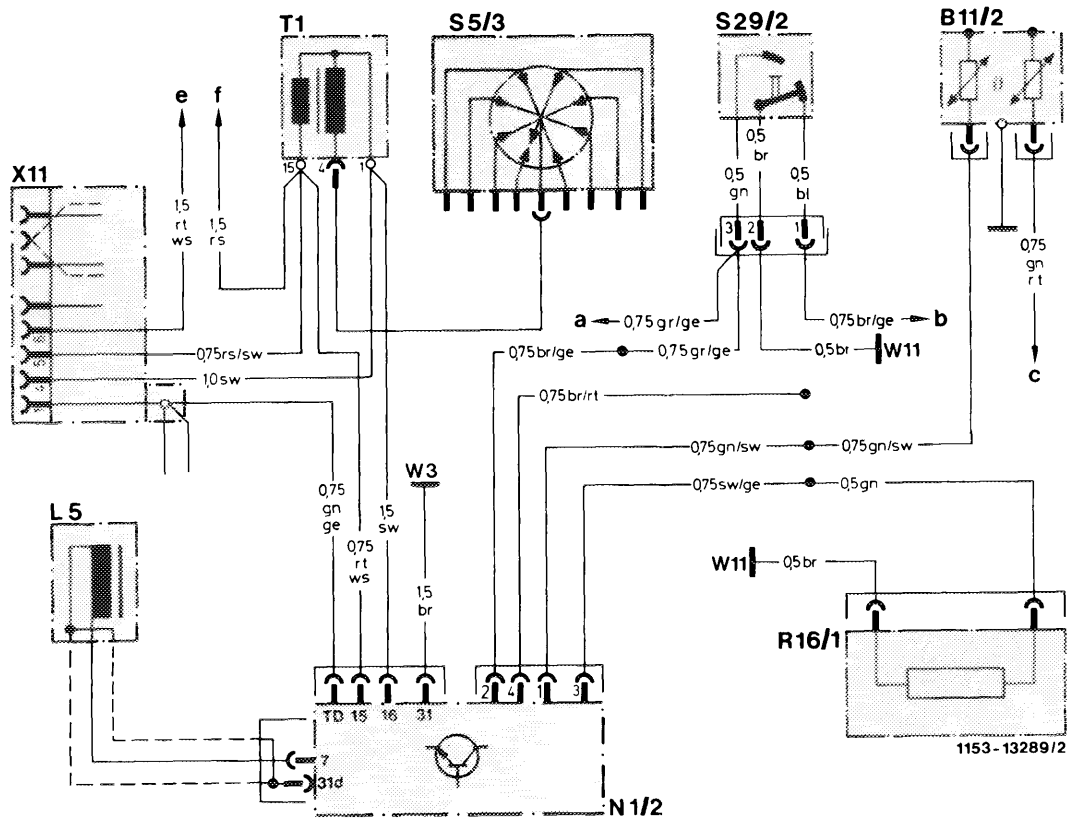


Diagram of 4-pole coolant temperature sensor (EZL/CIS-E), (B11/2)



Wiring diagram EZL

B11/2	Coolant temperature sensor (EZL/CIS-E)	X11	Diagnostic socket/terminal block (circuit TD)
L5	Crankshaft position sensor	X22/1	Connector, transmission overload protection (2-pole)
N1/2	Electronic ignition control unit (EZL)	X26	Connector, interior/engine
R16/1	Reference resistor (EZL)	a	To CIS-E injection system control unit, contact 5
S5/3	High-voltage distributor	b	To idle speed control unit, contact 4
S29/2	Throttle valve switch, full load/idle	c	To CIS-E injection system control unit, cont. 21
T1	Ignition coil	e	To plug connection X 26 on engine, socket 3 (circuit 30)
W3	Ground, left front wheel housing (at ignition coil)	f	To plug connection X 26 on engine, socket 1 (circuit 15)
W9	Ground, at left headlamp unit	g	Not used - ends in wiring harness
W11	Ground, engine (connection point for ground wires)		