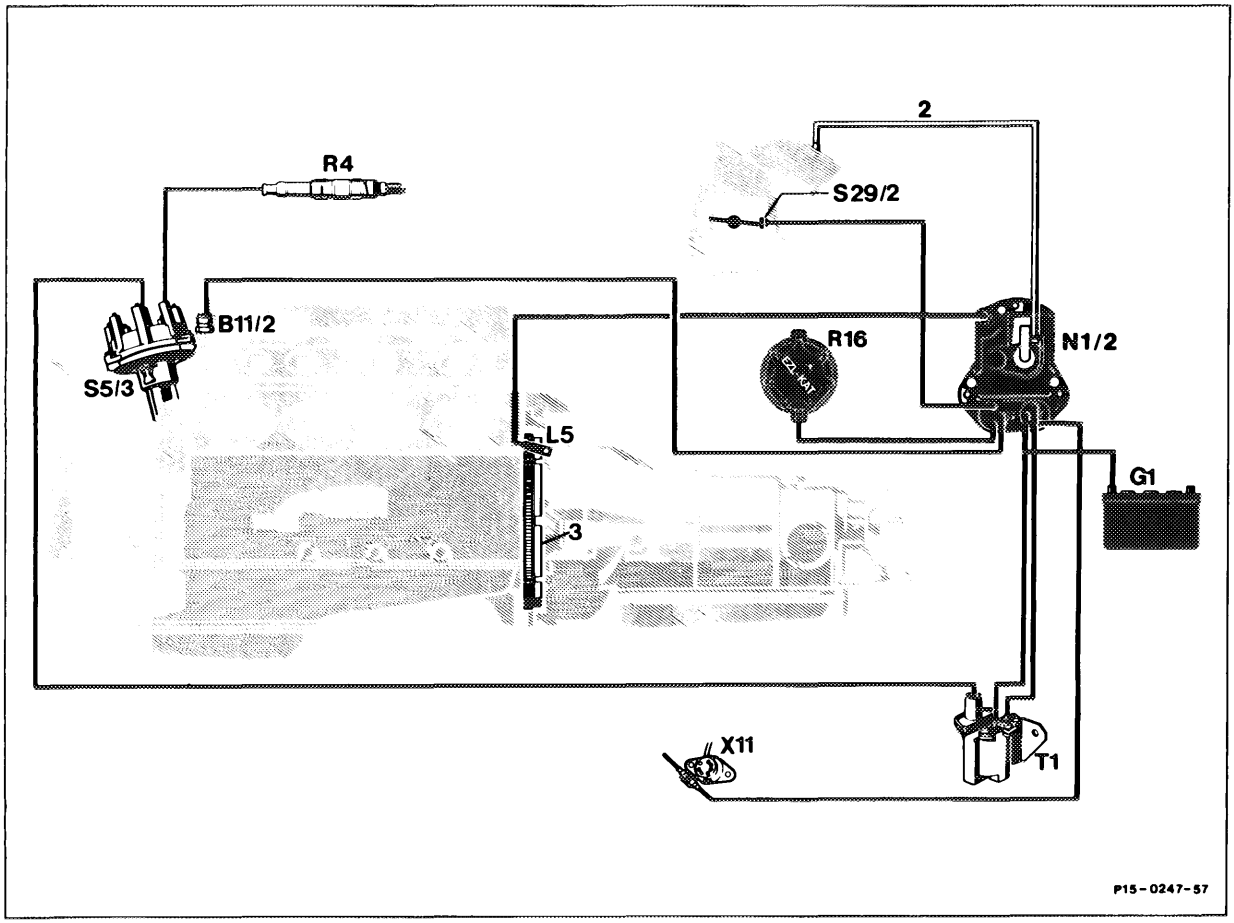
15-540 Testing electronic ignition system with electronic timing adjustment (EZL)

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.



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.

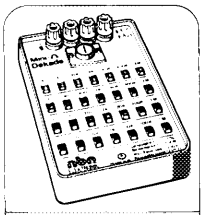
The test is divided into two sections:

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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201 589 00 99 00

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)	kΩ	8–13
Position sensor	resistor coils (terminals 7 and 31d) insulation (terminals 7 and ground)	 Ω kΩ	 680–1200 ≥ 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

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.

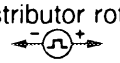
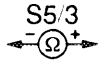
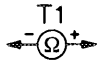
If the specified value of step 1 is not in order, the procedure must be continued with step 1.1.

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	Specification	Possible cause/Remedy
–	1.0 Power supply	N1/2 31 — (V) — 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 — (Ω) — 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	Specification	Possible cause/Remedy
–	2.1	L5 31d —(⊕)— 7	Detach crankshaft position sensor plug at EZL control unit Engine: **Start**	see diagram U_S ≥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	L5 —(Ω)— 7 ⊥	Detach crankshaft position sensor plug at EZL control unit	≥200 kΩ	Renew crankshaft position sensor.
–	3.0 Dwell angle	Engine tester	Engine: **Start**	1°–18° or 1–40%	Dwell angle not to tolerance: Renew EZL control unit. No dwell angle: Test closed circuit cutoff.
–	4.0 Closed circuit cutoff	T1 tm. 1 —(V)— tm. 15	Ignition: **ON**	0 V	Renew EZL control unit and ignition coil.
		T1 tm. 1 —(V)— tm. 15	Engine: **Start**	0 V >0 V	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)	T1 tm. 1 —(Ω)— tm. 15	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.

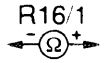
Display on/off factor	Test step/ Test scope	Test connection	Operation/ Requirement	Specification	Possible cause/Remedy
–	6.0 Primary current limiting	 Engine tester Scope image Secondary deviations	Engine: **Start**	see diagram	Renew EZL control unit.
–	7.0 Ignition voltage at ignition coil terminal 4	 Engine tester Scope image Secondary parade	Engine: **Start**	≥ 8 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 Ω	Renew ignition cable terminal 4.
–	7.2 Distributor rotor	Distributor rotor  Middle Point	Ignition: **OFF** Remove distributor cap.	700–1300 Ω and visual inspection	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 inspection	Renew distributor cap.
–	7.4 Ignition coil secondary T1	T1 tm. 4  tm. 1	Ignition: **OFF** Unscrew wiring at ignition coil	8–13 kΩ	Renew ignition coil.

Display on/off factor	Test step/ Test scope	Test connection	Operation/ Requirement	Specification	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	Specification	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)	N1/2 — 3 4-pin sensor connector	Ignition: **OFF** Detach sensor connector at EZL control unit.	750 Ω	Reference resistor Wiring Contacts
–	1.1.1 EZL reference resistor (R16/1)	R16/1	Ignition: **OFF** Disconnect reference resistor.	750 Ω	Reference resistor

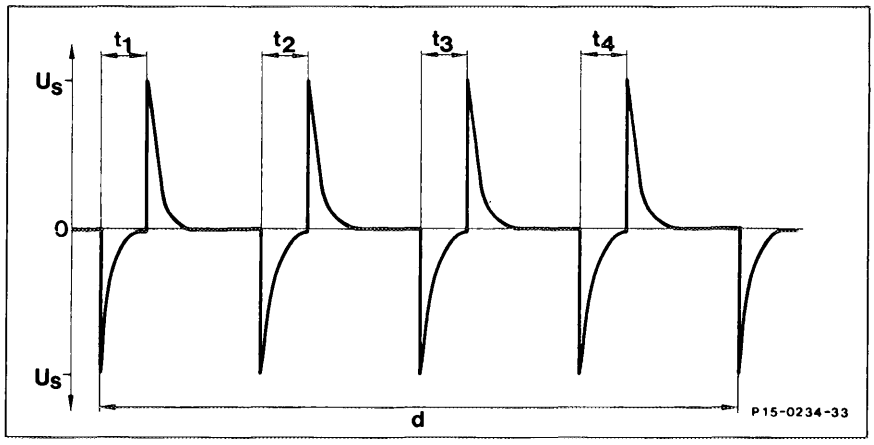
Display on/off factor	Test step/ Test scope	Test connection	Operation/ Requirement	Specification	Possible cause/Remedy
–	1.1.2 Wiring and contacts	R16/1 — N1/2 — 3  4-pin sensor connector	Ignition: **OFF** Disconnect reference resistor. Detach sensor connector at EZL control unit.	< 1 Ω	Renew wiring or contacts.
		R16/1 		< 1 Ω	Test negative cable to ground, front left wheelhouse (ignition coil) (W11) (Model 126) or engine ground (electric cable bolted on) (W3) (Model 107), renew.
–	1.2 Coolant temperature sensor (B11/2)	N1/2 — 1  4-pin sensor connector	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)	B11/2 	Ignition: **OFF** Detach connector at temperature sensor.		Renew coolant temperature sensor (B11/2).
–	1.2.2 Wiring and contacts	B11/2 — N1/2 — 1  4-pin sensor connector	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	Specification	Possible cause/Remedy
–	1.3 Throttle valve switch, full load detection (S29/2x)	S29/2x 2 — Ω — 3	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	N1/2 — 2 — Ω — 5 — N3 4-pin sensor connector	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.	Ignition timing retarded	Vacuum hose leaking Connection at intake manifold blocked Pressure sensor in EZL control unit faulty
			Fit vacuum hose onto EZL control unit.	Ignition timing advanced	Vacuum hose leaking Connection at intake manifold blocked Pressure sensor in EZL control unit faulty
–	1.5	L5 31d — ⏚ — 7	Detach crankshaft 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.

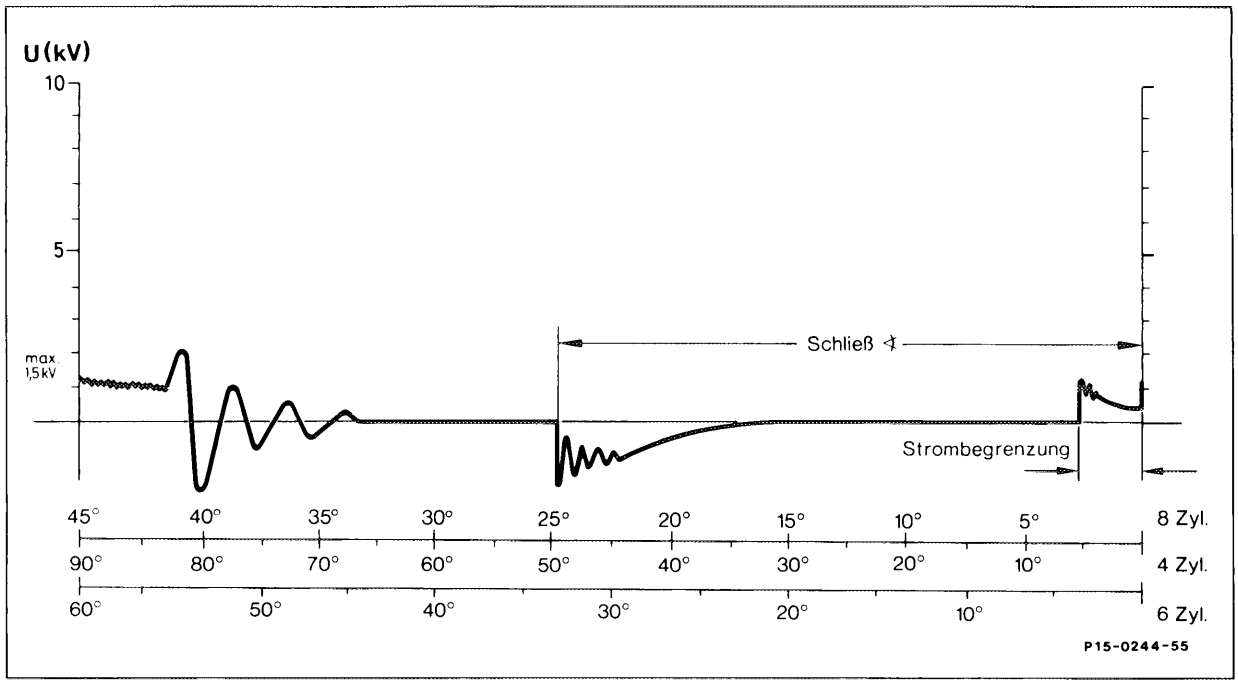
Display on/off factor	Test step/ Test scope	Test connection	Operation/ Requirement	Specifi-cation	Possible cause/Remedy
–	2.0 Dwell angle	Engine tester	Speed 3500 rpm. Engine at normal operating temperature. Detach sensor connector at EZL control unit and vacuum line. Engine: **Start**	27–40° or 60–90%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

Display on/off factor	Test step/ Test scope	Test connection	Operation/ Requirement	Specification	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

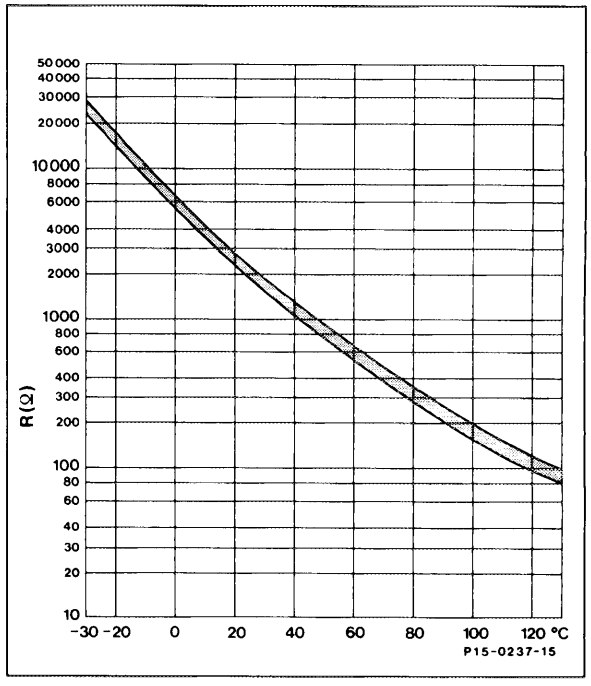
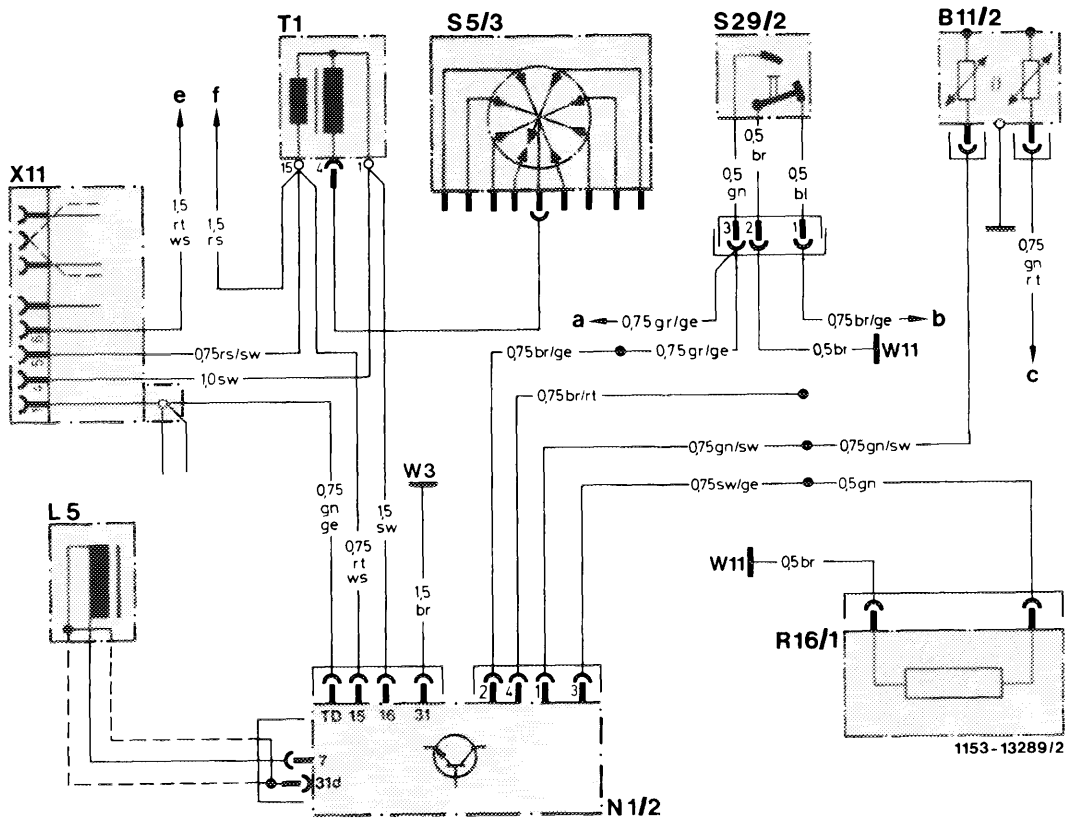


Diagram of 4-pole coolant temperature sensor (EZL/CIS-E), (B11/2)



Wiring diagram EZL

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