

14–100 Test Program

For complaints such as: On-Off ratio cannot be maintained, poor engine warm-up performance, uneven idle, engine not accelerating or splashing when accelerating, the following test have to be made.

Testing of Lambda control
Testing of air injection
Testing of fuel evaporation control system

Condition: Assuming that the fuel injection and ignition system is o.k.

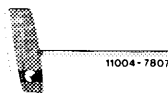
Special Tools

Remote oil temperature gauge



116 589 27 21 00

Allen wrench 3 mm



000 589 14 11 00

Adapter for testing electrical circuits and individual parts

110 589 14 21 00

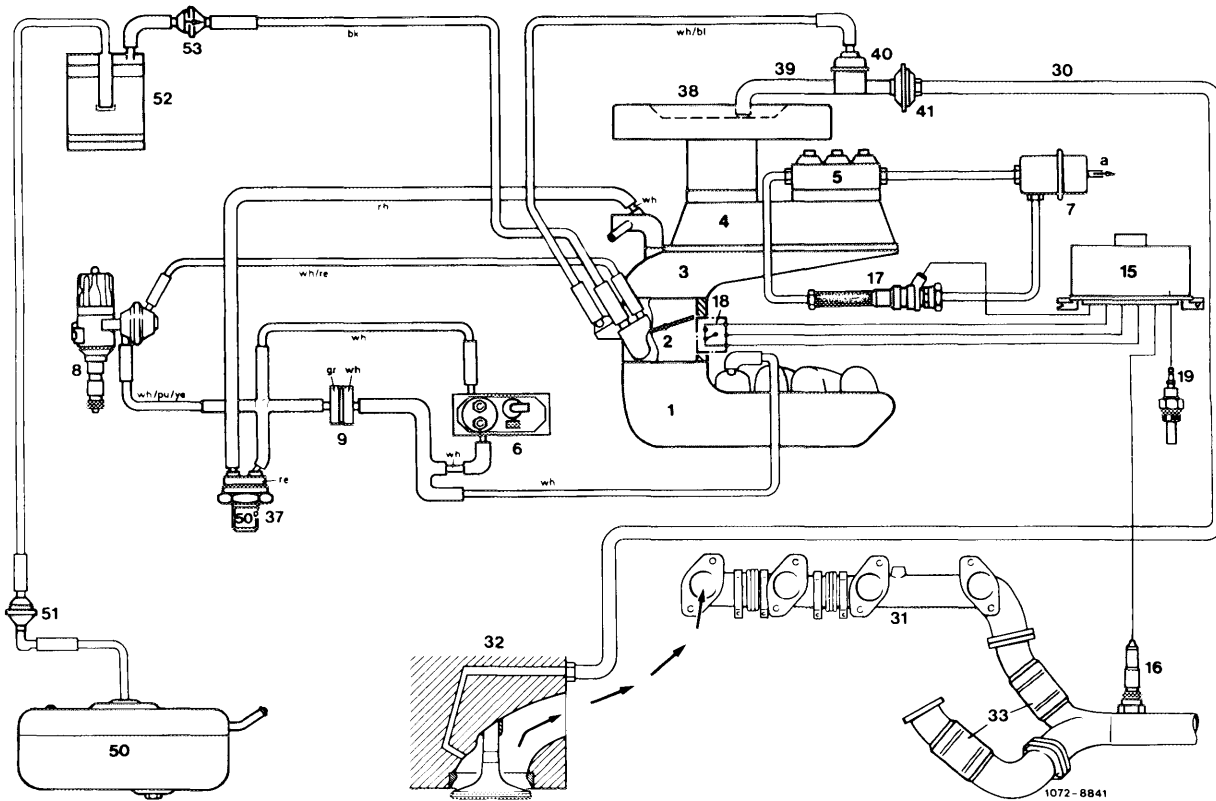
Shop Tools

Tachometer, Multimeter (Volts – Ohms)

Lambda control tester

KDJE–P 600

Functional Schematic



- 1 Intake manifold
- 2 Throttle valve housing
- 3 Air duct housing
- 4 Air flow sensor
- 5 Fuel distributor
- 6 Warm-up enrichment compensator
- 7 Pressure damper
- 8 Ignition distributor
- 9 Restricting orifice
- 15 Electronic control unit

- 16 Oxygen sensor
- 17 Frequency valve
- 18 Throttle valve switch
- 19 Temperature switch, oil 16 °C/60 °F
- 30 Air injection line
- 31 Exhaust manifold
- 32 Cylinder head
- 33 Primary catalyst
- 37 Thermo-vacuum valve 50 °C/122 °F
- 38 Air filter

- 39 Special shaped hose
- 40 Air shut-off valve
- 41 Aspirator valve
- 50 Fuel tank
- 51 Vent valve
- 52 Charcoal canister
- 53 Purge valve
- a Leak-off connection

- Color Code
- bk = black
 - bl = blue
 - gr = green
 - re = red
 - rh = rubber
 - ye = yellow
 - wh = white
 - pu = purple

A. Quick test with lambda control tester KDJE-P600

The lambda control tester can be used for adjusting on/off ratio at idle, but also for a quick diagnosis of lambda control.

Connect lambda control tester to diagnosis socket and revolution counter. Connect oil telethermometer.

Note: If the specified nominal value is not attained, refer to quick test with adapter.

Scope of test	Actuation	Readout/nominal value
Cold running control		
a) Engine oil temperature $< 13^{\circ}\text{C}$	Engine at idle	Constant between 56–64 %
b) Simulation	Pull plug from temperature switch $16^{\circ}\text{C}/61^{\circ}\text{F}$ and connect to ground	Readout as above
Warm-up control		
a) Engine oil temperature $< 20^{\circ}\text{C}/68^{\circ}\text{F}$, oxygen sensor not yet ready for operation ($< \text{approx. } 300^{\circ}\text{C}/572^{\circ}\text{F}$)	Engine at idle	Constant between 46–54 %
b) Simulation	Separate plug of oxygen sensor	Readout as above
Control at operating temperature		
Engine oil temperature approx. 80°C , oxygen sensor ready for operation ($< \text{approx. } 300^{\circ}\text{C}$)	Engine at idle	Slowly swinging needle
Idle contact closed	Throttle valve at idle stop	Deflection of needle approx. 8–12 %
Idle contact open	Slightly open throttle valve	Deflection of needle approx. 13–23 %
Full throttle contact closed	Apply full throttle for a short moment	Constant between 56–64 %
Lean stop control unit	Separate plug of oxygen sensor	Constant
	Connect plug for control unit to 2 Volt output of tester for a short moment	$< \text{approx. } 20\%$
Rich stop control unit	Separate plug of oxygen sensor	Constant
	Connect plug for control unit to ground for a short moment	$> 87\%$

B. Quick test with adapter

Connect adapter to plug control unit and multimeter to adapter.

Test Set-Up	Circuit or Component Tested	Setting of Controls	Specified value <i>If deviating see individual component test program section</i>
Adapter Position 1 with voltmeter	Supply voltage	Ignition turned on	12 ± 2 Volts, adapter indicator light on <i>If deviating see section I</i>
Adapter Position 2 with ohmmeter	Throttle valve switch	Ignition off Idle position Full throttle position	∞ Ohms (infinity) 0 Ohms <i>If deviating see sections IV + V</i>
	16 °C/60 °F Temperature switch	Ignition off	Below $< 16 \pm 3$ °C = 0 Ohms Above $> 16 \pm 3$ °C = ∞ Ohms <i>If deviating see sections II + III</i>
Adapter Position 3 with ohmmeter	Throttle valve switch	Ignition off Idle position Advance throttle linkage slightly . . .	0 Ohms ∞ Ohms <i>If deviating see sections IV + V</i>
Adapter Position 4 with voltmeter	Frequency valve	Ignition on crank engine	12 ± 2 volts <i>If deviating see sections VI + IX</i>
Adapter Position 5 with ohmmeter	O ₂ Sensor probe cable and connection to electronic control unit	Ignition off Pull off O ₂ sensor connection and bridge plug going to electronic control unit	∞ Ohms 0 Ohms <i>If deviating see sections VII + VIII</i>
Disconnect special testing adapter and reinsert plug into the electronic unit. Connect Lambda control tester		Run engine until operating temperature is obtained	On-Off ration 50 % $\pm$ 10 % <i>If deviating see section X</i>
Remove special shaped hose from the air shut-off valve		Start engine	Suction sound must be audible from the aspirator valve <i>If deviating see section XI</i>
Disconnect purge line at the charcoal canister leading to the throttle valve housing		Run engine at idle at approx. 2000 rpm	No vacuum present Vacuum present <i>If deviating see section XII</i>

C. Test Program for Individual Components

Test Section A

Test Requirements: Special testing adapter connected to plug of electronic control unit and multimeter connected to the special testing adapter.

Connect remote oil temperature gauge.

I Voltage supply test for the electronic control unit

Turn selector knob of testing adapter to position 1, set multimeter to 0–30 V range, turn ignition on and read voltage.

Indicator light of testing adapter:

Light on	Light off
approx. 12 Volt	0 Volt

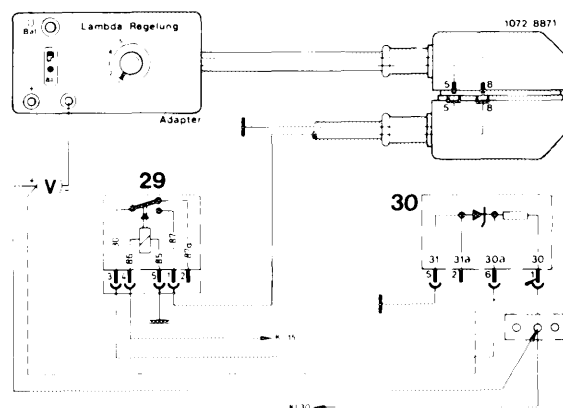
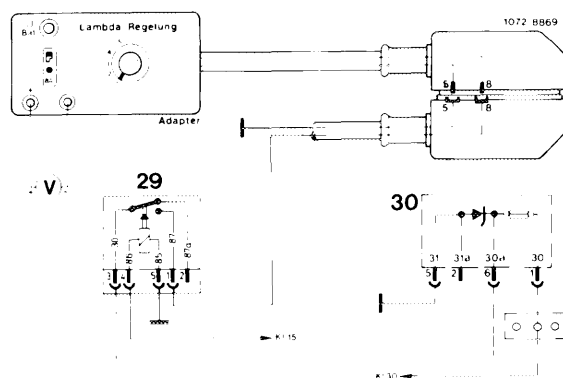
Disconnect positive lead of Voltmeter from the testing adapter and take reading at:

Terminal block (terminal 30). Excess-voltage protection unit, terminal 1

Reading
approx. 12 Volt
0 Volt

Check for break in electrical wiring and repair.

Reading approx. 12 Volt.



Insert the excess-voltage protection unit (30) into the plug in such a way, that the voltage on terminal 6 can be measured with the positive voltmeter lead.

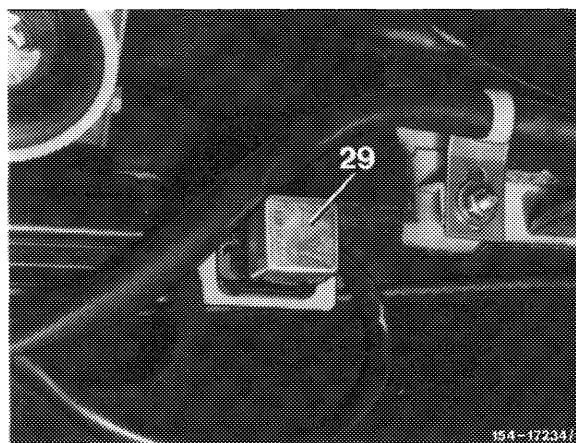
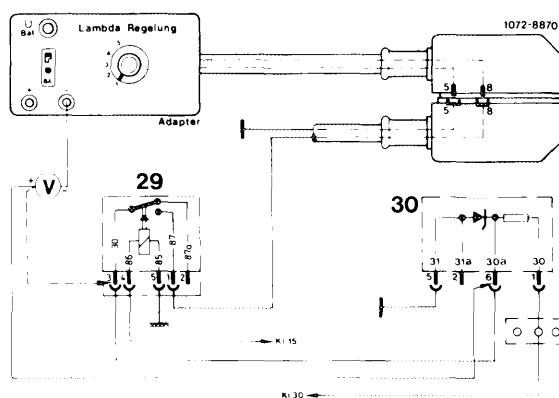
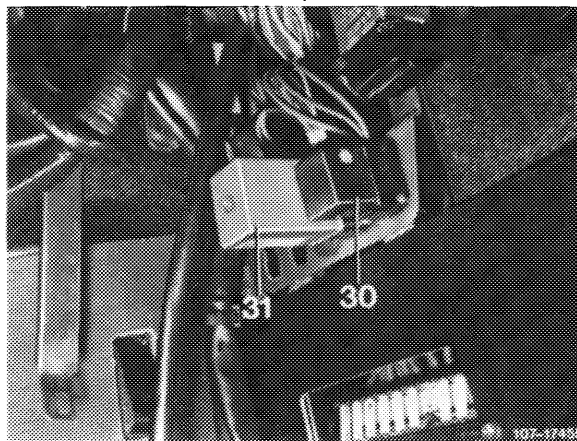
Reading	
approx. 12 Volt	0 Volt

Replace excess-voltage protection unit (30).
Reading approx. 12 Volt.

Insert the voltage supply relay (29) into the plug in such a way, that the voltage on terminal 3 can be measured with the positive voltmeter lead.

Reading	
approx. 12 Volt	0 Volt

Check for break in wire between the excess voltage protection unit and the voltage supply relay and repair.
Reading approx. 12 Volt.



Measure voltage at terminal 4 ignition turned on.

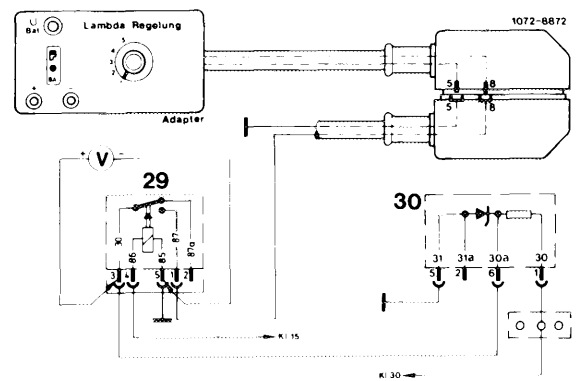
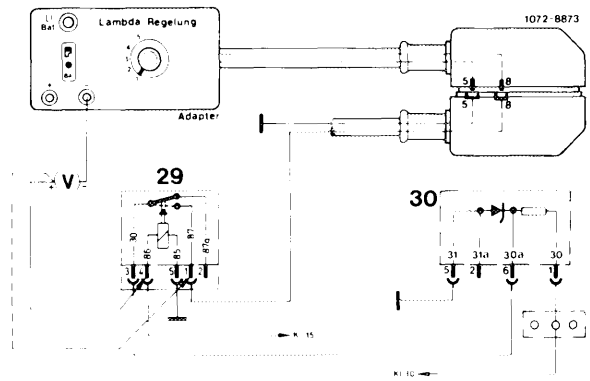
Reading	
approx. 12 Volt	0 Volt

Check for break in wire leading to terminal 15 and repair.
Reading approx. 12 Volt.

Connect voltmeter across terminal 3 and 5.

Reading	
approx. 12 Volt	0 Volt

Check ground wire (terminal 5)
for break and repair.
Reading approx. 12 Volt.



Insert the voltage supply relay in the plug in such a way, that the voltage on terminal 1 can be measured.

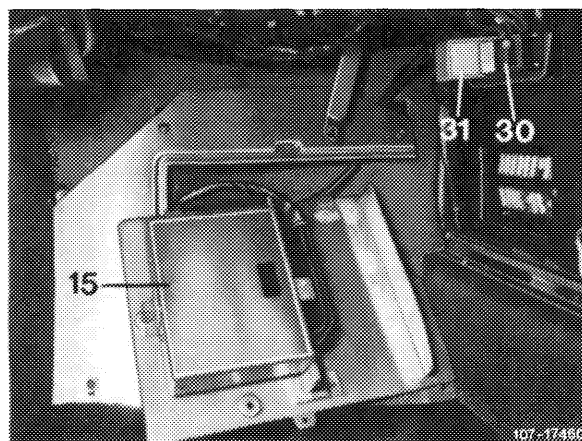
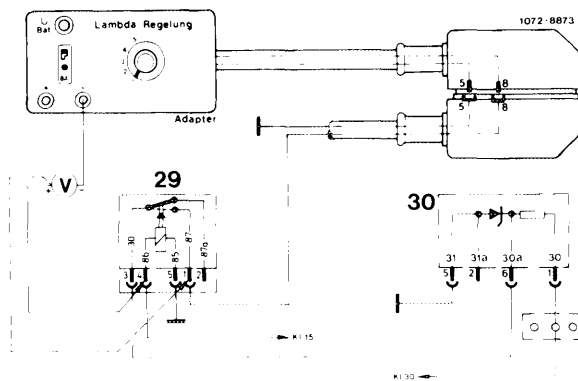
Reading	
approx. 12 Volt	0 Volt.

Replace voltage supply relay.
Reading approx. 12 Volt.

Connect voltmeter to the testing adapter and check voltage.

Reading	
approx. 12 Volt	0 Volt

Check for break in wire between voltage supply relay (29) and plug of electronic control unit and repair.
Reading approx. 12 Volt.



End of test

II Testing of Temperature Switch — Oil 16 °C/ 60 °F (Oil temperature below 13 °C/55 °F)

Turn selector knob of testing adapter to position 2, set multimeter to 0—∞ Ohm range, turn ignition off and read Ohms. Disconnect plug on throttle valve switch.

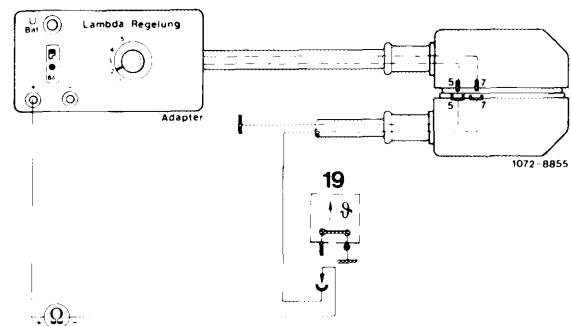
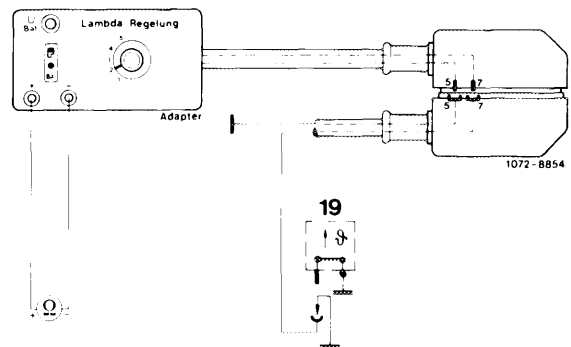
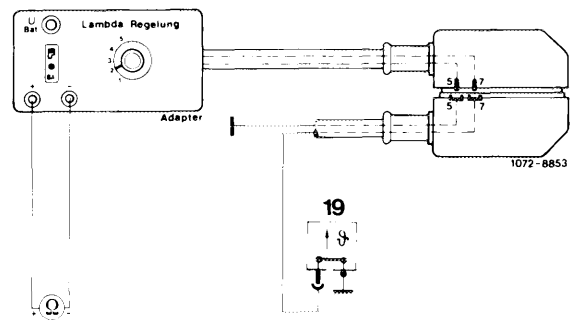
Reading	
0 Ohm	∞ Ohm

Disconnect plug of temperature switch — oil, and ground plug.

If reading is 0 Ohm, replace temperature switch.

If reading is ∞ Ohm, check for break in wire leading from plug of electronic control unit (terminal 7) to the temperature switch plug.

End of test



III Testing of Temperature Switch — Oil 16 °C/ 60 °F (Oil temperature above 20 °C/68 °F)

Turn selector knob of testing adapter to position 2, set multimeter to 0—∞ Ohm range and ignition off.

Disconnect plug of throttle valve switch.
Read Ohms.

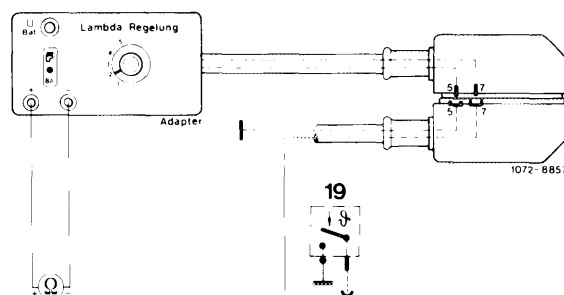
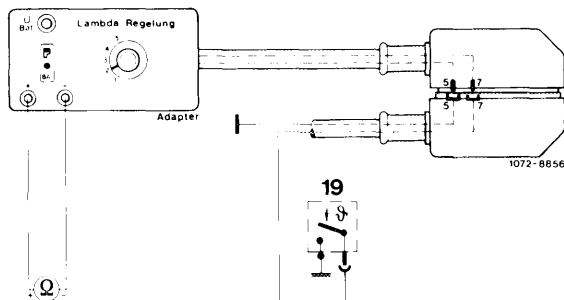
Reading	
∞ Ohm	0 Ohm

Disconnect plug from temperature switch — oil, and ground plug.

If reading is ∞ Ohm, replace temperature switch.

If reading is 0 Ohm, check for grounding out of wire leading from plug of electronic control unit (terminal 7) to the plug of the temperature switch.

End of test



IV Testing of Throttle Valve Switch

(Idle position, engine oil temperature above
20 °C/68 °F)

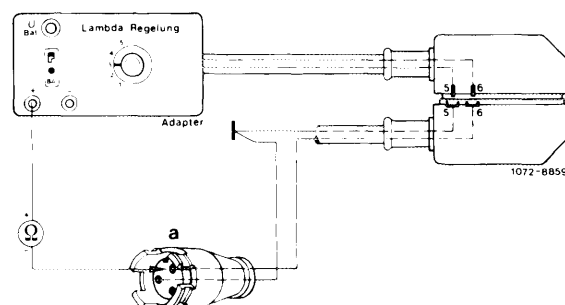
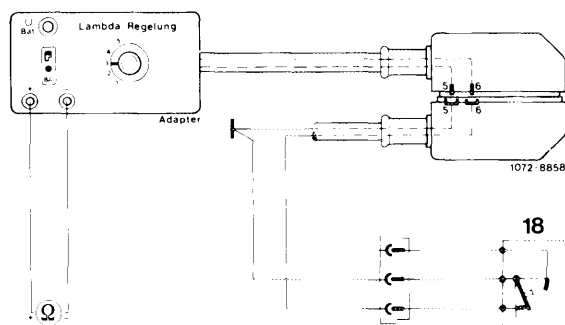
Turn selector knob of testing adapter to position 3, set multimeter to 0—∞ Ohm range, and ignition off.

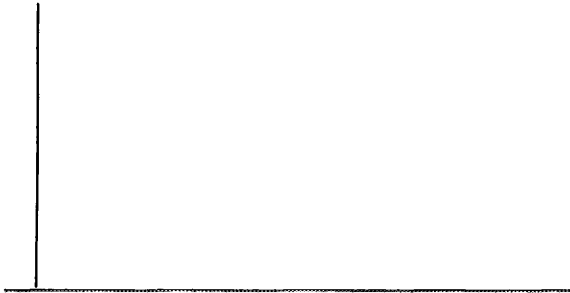
Throttle valve in idle position. Read Ohms.

Reading	
Idle position 0 Ohm	∞ Ohm
Advance throttle linkage slightly ∞ Ohm	0 Ohm

Disconnect plug from throttle valve switch.
Check for broken wires from plug (a) to plug
of electronic control unit (terminal 6 and 15)
according to the wiring diagram.

If wires are in order, replace throttle valve switch.





End of test

V Testing of the Throttle Valve Switch
(Full throttle position, engine oil temperature above 20 °C/68 °F)

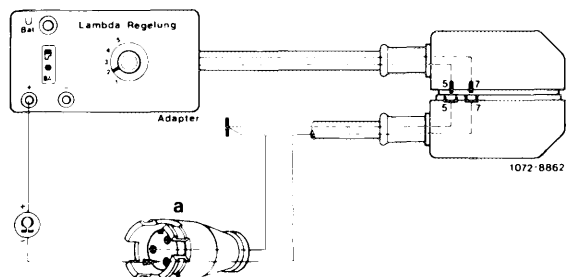
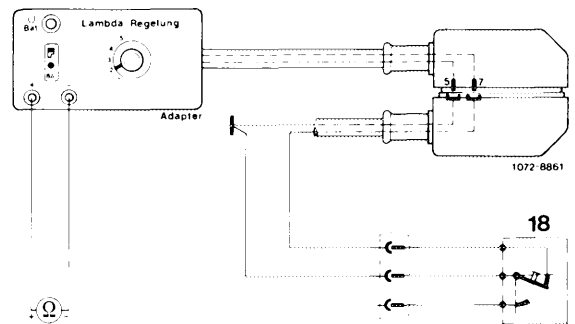
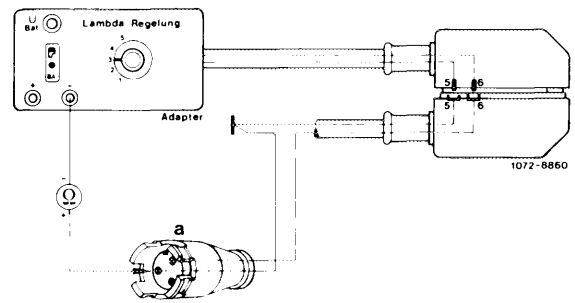
Turn selector knob of testing adapter to position 2, multimeter to ∞ Ohm range and ignition off.

Advance throttle linkage to full throttle position. Read Ohms

	Reading
Full throttle position — 0 Ohm	∞ Ohm
Return throttle linkage slightly	0 Ohm
∞ Ohm	

Disconnect plug from throttle valve switch. Check for broken wires from plug (a) to plug of electronic control unit (terminal 7). If wires are in order, replace throttle valve switch.

End of test



VI Testing of the Frequency Valve

Turn selector knob to position 4, set multi-meter to 0–30 Volt range, turn on ignition and crank engine. Read voltage indicated.

Reading	
approx. 12 Volt	0 Volt

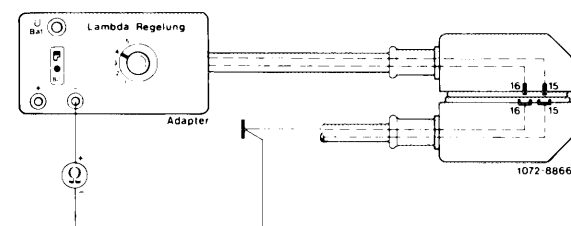
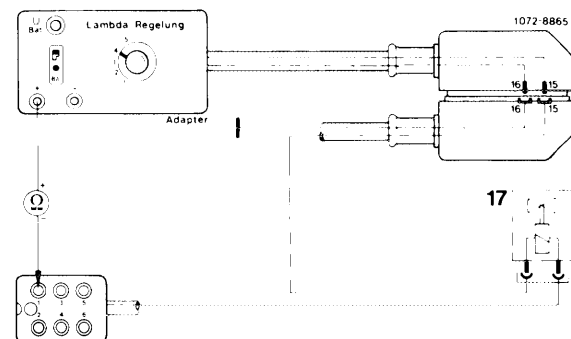
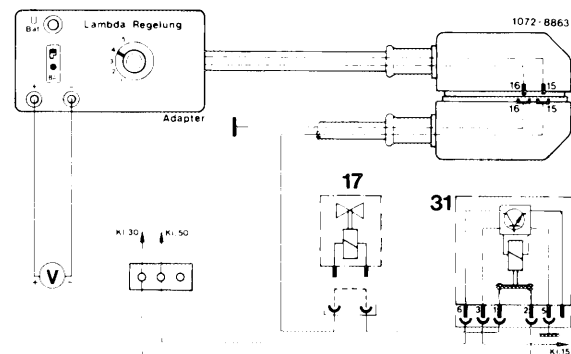
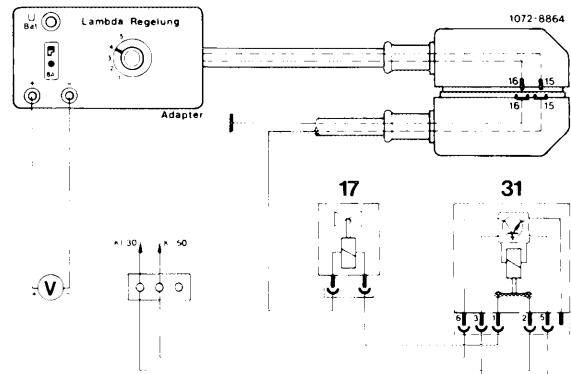
Disconnect plug from frequency valve and bridge the plug.

Crank the engine. If reading is 12 Volt, replace frequency valve.

If reading is 0 Volt, turn off ignition, set multi-meter to 0–∞ Ohm range.

Check for break in wire leading from the plug of the electronic control unit (terminal 15) to the plug of the electronic fuel pump relay (terminal 1), also check for break in wire leading from plug of electronic control unit (terminal 16) to the ground connection in right footwell under instrument panel.

End of test



VII Testing of Wire to O₂ Sensor (16)

Turn selector knob to position 5, set multi-meter to 0-∞ Ohm range, ignition off and O₂ sensor disconnected. Read Ohms indicated.

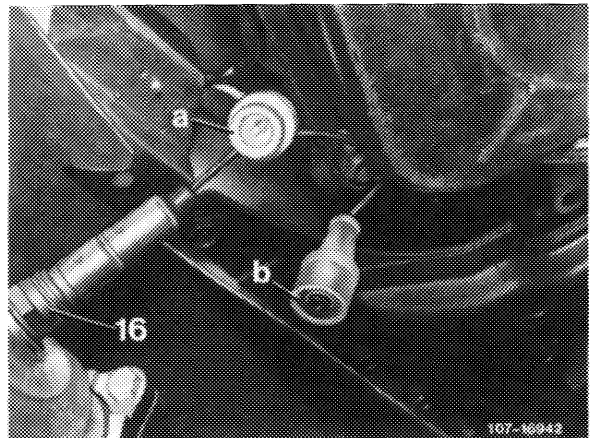
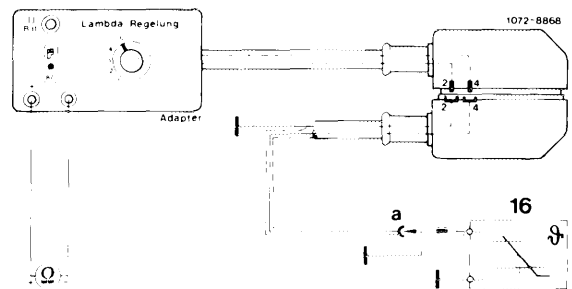
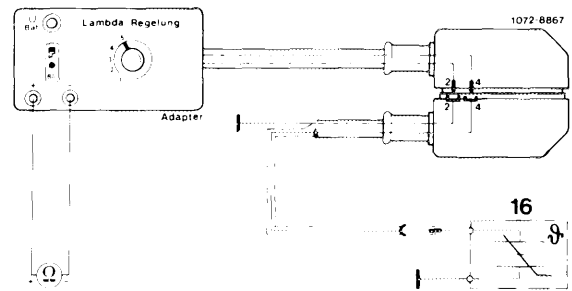
Reading	
∞ Ohm	0 Ohm

The wire leading from the connector of the O₂ sensor to the plug of the electronic control unit is short circuited.

Connect connector (a) to ground.

If reading is 0 Ohm, the wire is in order.

If reading is ∞ Ohm, the wire is broken.



End of test

Test Section B

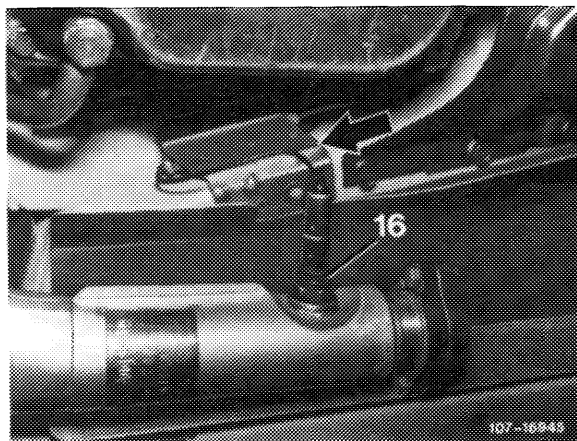
Test Requirements: Remove testing adapter and connect electronic control unit.

Connect the on-off ratio tester to the diagnostic plug. Start engine (coupling of O₂ sensor connected).

VIII Testing of the O₂ Sensor (16)

Temperature of the O ₂ sensor below + 300 °C. Read on-off ratio.	
Constant 50 %	Reading Constant 92 %
O ₂ sensor is short circuited. Replace O ₂ sensor.	

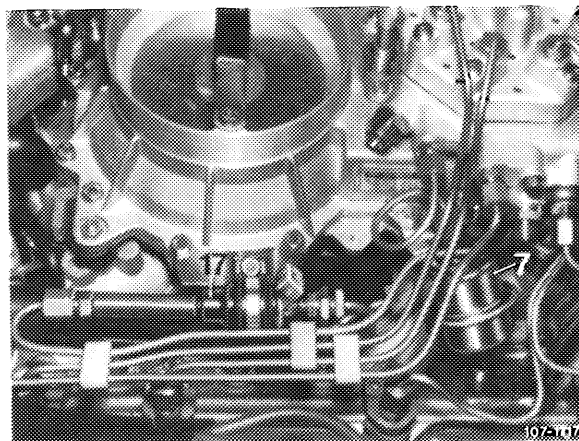
End of test



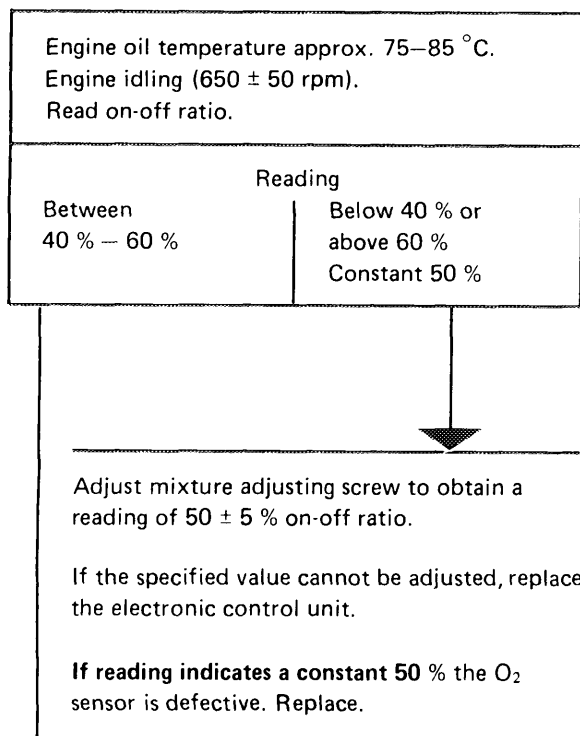
IX Testing of the Frequency Valve (17)

Engine oil temperature above 20 °C/68 °F. Engine at idle. Place hand on frequency valve.	
Operation of frequency valve can be felt	Frequency valve does not operate
Replace frequency valve	

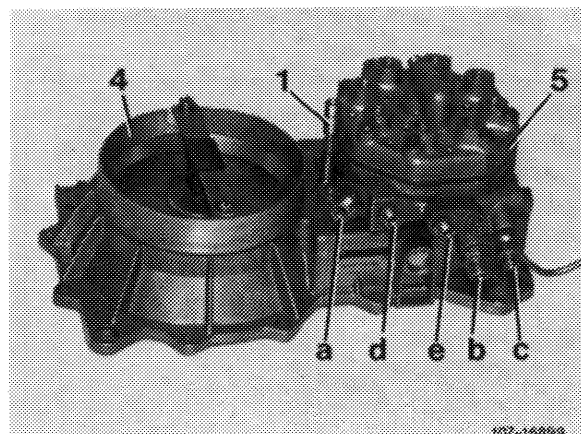
End of test



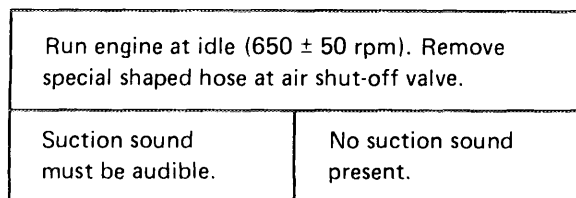
X Testing of Lambda Control



End of test



XI Air Injection Test

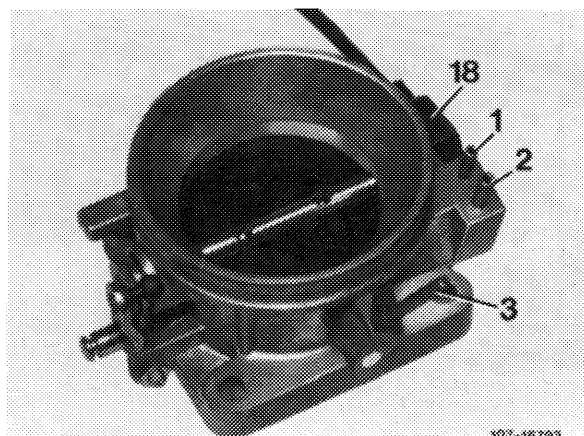
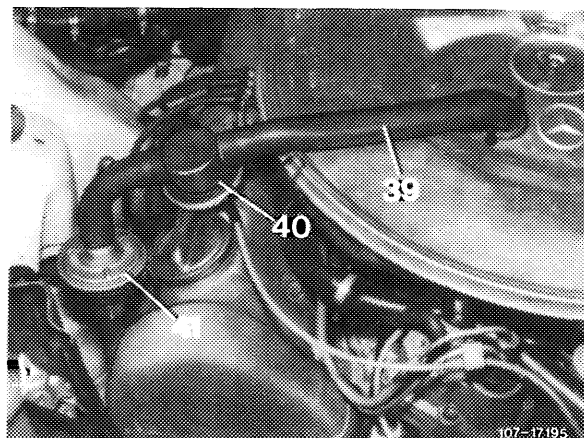


Check vacuum lines and vacuum supply. The blue vacuum line is connected from the throttle valve housing (connection 3) to the air shut-off valve.

Remove vacuum line from the air shut-off valve and check if vacuum is present.

If vacuum is not present, blow out vacuum connection at throttle valve housing.

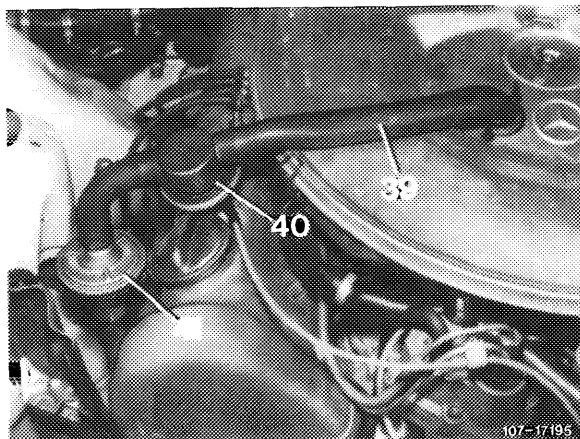
If vacuum is present, remove air shut-off valve (40).



If the suction sound is now audible, renew air shut-off valve.

If no suction sound is audible, replace the aspirator valve (41).

End of test



XII Testing of Fuel Evaporation Control System

Remove purge line (A) from charcoal canister (leading to the throttle valve housing) and close off with finger. Slowly increase engine speed to above 2000 rpm.

No vacuum at engine idle. With increasing rpm, increase in vacuum.

No vacuum with increasing rpm.

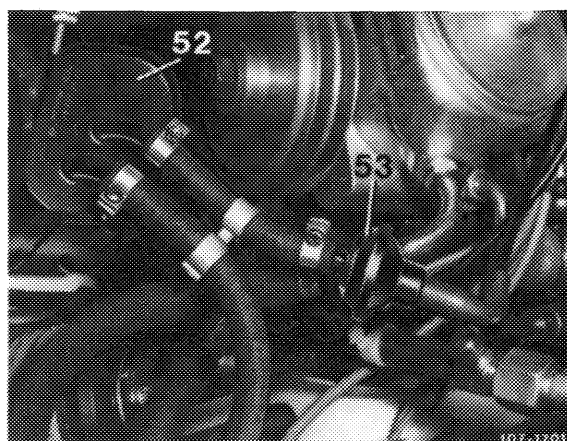
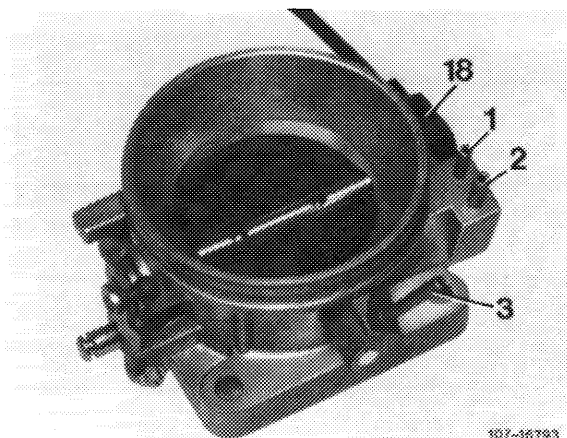
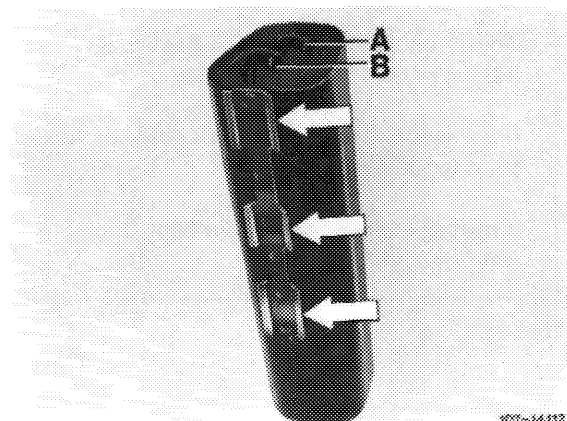


Testing of purge line connection and purge valve.

The purge line must be connected to the throttle valve housing (2). Make certain that the purge line does not leak. Blow out connection at throttle valve housing with compressed air.

If vacuum is still not present, remove the purge line in front of purge valve (53) and repeat the test.

If vacuum is present, replace purge valve.



End of test