

14-100 Testing EGR

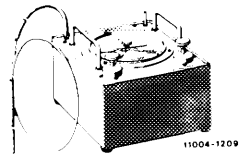
For complaints such as: Very poor engine performance, black or blue smoke.

Test conditions: Throttle linkage correctly adjusted, connect tachometer, engine at operating temperature, run engine at idle ($750 \pm 100/\text{min}$), steering in straightahead position, air conditioning turned off, selector lever of automatic transmission in position "P".

Tested: Exhaust gas recirculation (EGR).

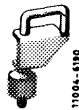
Special tools

Tester 0-100 mbar for vacuum and gauge pressure



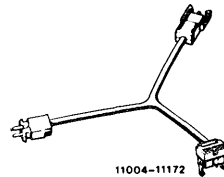
201 589 13 21 00

Clamp



000 589 40 37 00

Test cable



102 589 04 63 00

Adjusting roller

916 589 00 21 00

Conventional tools

Digital tester

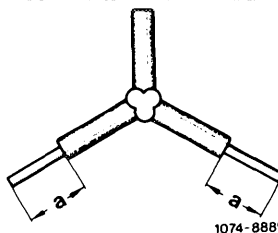
e.g. Bosch, MOT 001.03
e.g. Sun, DIT 9000
e.g. Sun, 1019

Multimeter

e.g. Sun, DMM-5

Self-made test connection

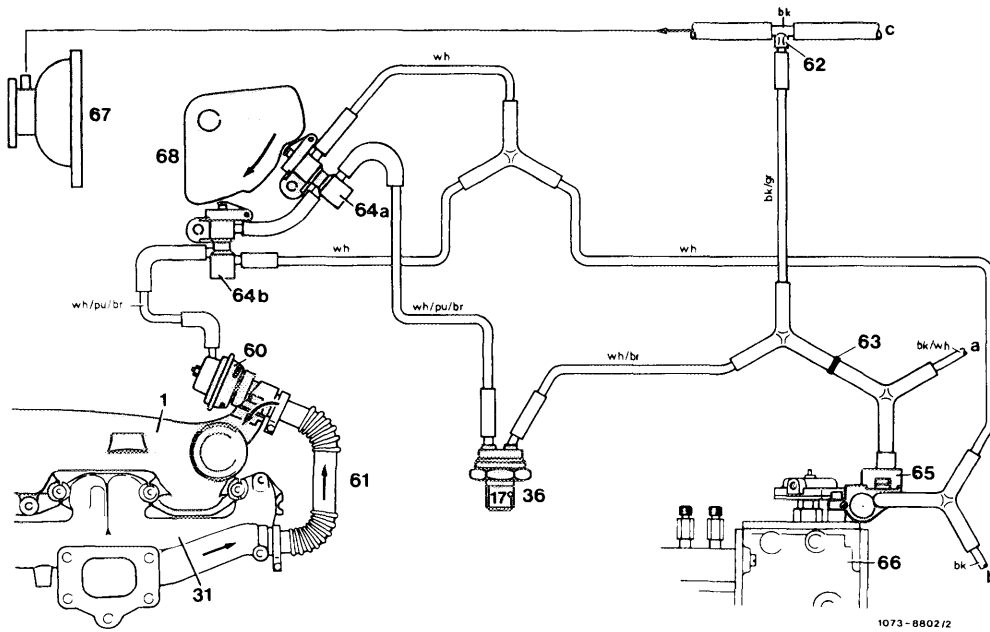
Distributor



117 078 01 45

a Vacuum line 4 x 1 x 400 mm

Test line 4 x 1 x 400 mm



Operational diagram vacuum line layout

- 1 Intake manifold
- 31 Exhaust manifold
- 36 Therموvalve 17 °C/63 °F
- 60 Exhaust gas recirculation valve (EGR)
- 61 Corrugated tubing
- 62 Orifice
- 63 Orifice
- 64a Switchover valve, idle speed shutoff – EGR
- 64b Switchover valve, full load shutoff – EGR

- 65 Vacuum control valve
- 66 Injection pump
- 67 Vacuum pump
- 68 Guide lever with cam
- a Automatic transmission
- b Vent to passenger compartment
- c Brake unit

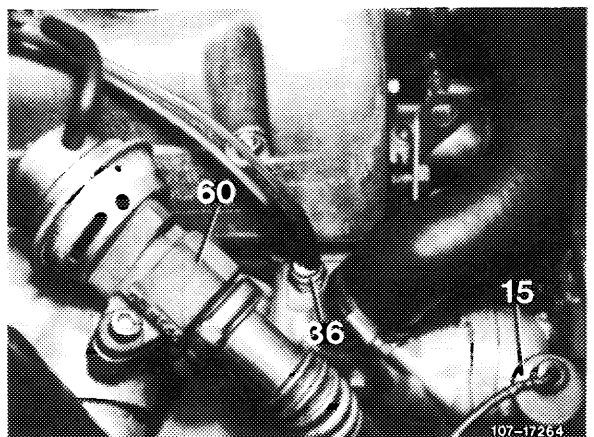
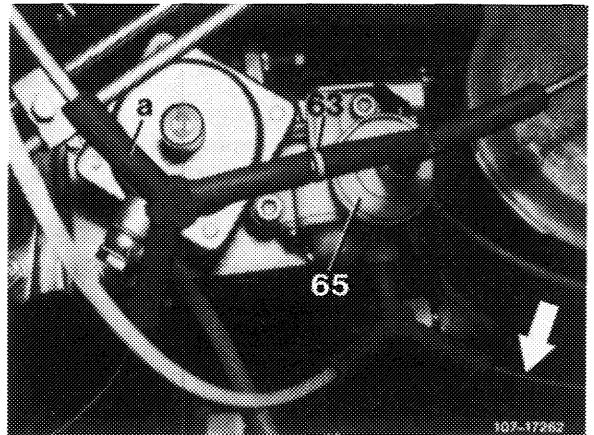
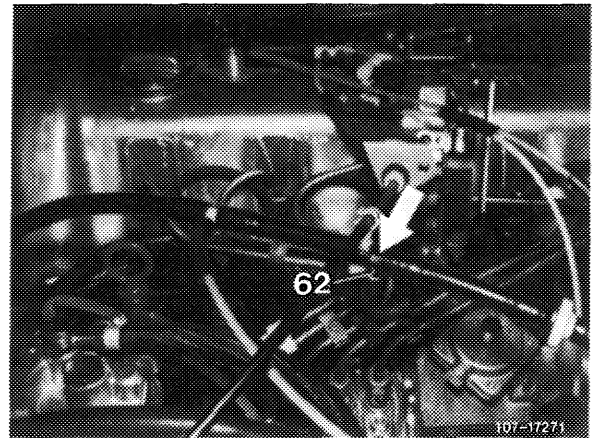
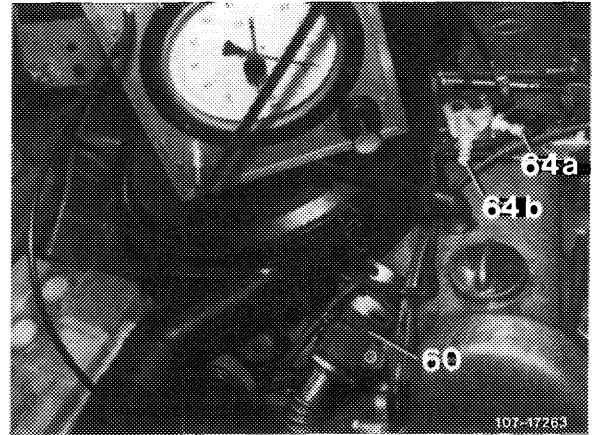
- bk = black
- br = brown
- gr = green
- pu = purple
- re = red
- wh = white

Testing EGR

Connect vacuum tester between EGR valve (60) and switchover valve (64b) to vacuum line (white/purple/brown). At idle, with throttle linkage at idle stop, no vacuum should be indicated. Advance control linkage until free travel of free travel rod is eliminated (do not pull on stop lever). Vacuum should now amount to 350–500 mbar.

Vacuum nominal value of 350–500 mbar is attained.

Vacuum nominal value is not attained or exceeded.



Check vacuum lines

Check all vacuum lines for control of EGR system and of automatic transmission according to **operational diagram vacuum line layout** for correct connection and leaks. Blow through orifice (62) at vacuum tapping point.

Check black vent line (arrow) from vacuum control valve to passenger compartment for free passage.

Check thermovalve 40 °C/104 °F (36, color code blue)

Pull off vacuum line (white/purple/brown) on diagonal connection of thermovalve.

Check vacuum line (white/brown) on distributor (a) and check for passage. If there is no passage, replace thermovalve.

When thermostatic valve is **cooling down**, thermostatic valve should have no passage at temperatures below 7 °C/45 °F.

Check switchover valve (64a)

Pull connection (arrow) of vacuum line (white/purple/brown) from switchover valve.

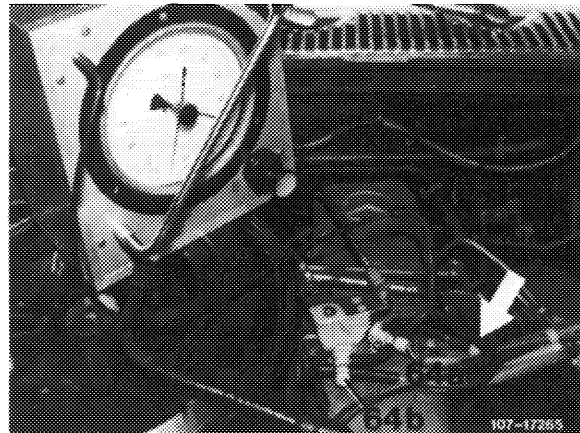
Connect vacuum tester to free connection of switchover valve and connect with pulled off vacuum line. Vacuum readout approx. 350–500 mbar (regulating linkage at idle speed stop).

Leak test

Disconnect distributor of white/purple/brown vacuum line.

Vacuum should remain constant for approx. 2 minutes.

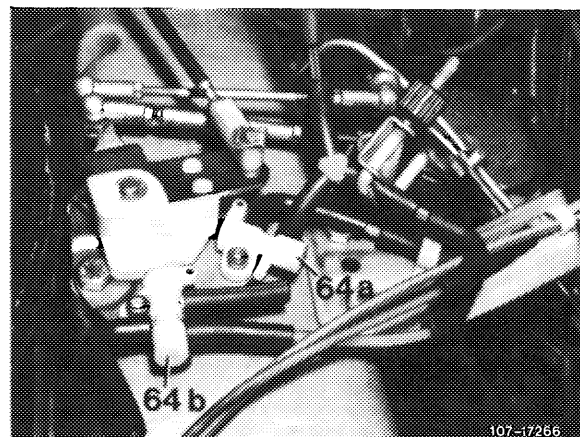
If vacuum drops, replace switchover valve.



If vacuum remains constant, check **switchover**:

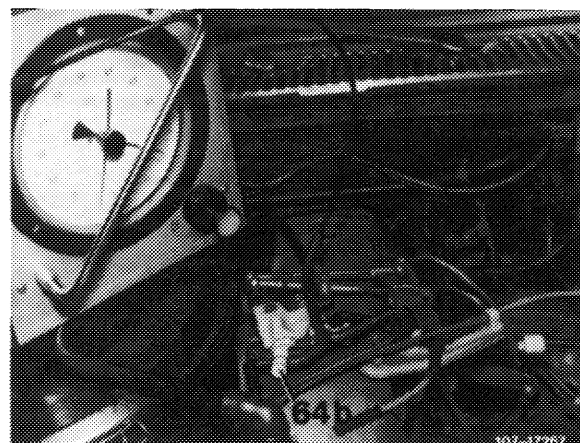
For this purpose, remove clamp, pull off connecting hose between the two switchover valves and bridge free travel on free travel rod.

Vacuum should distinctly drop. If vacuum is not dropping, replace switchover valve.



Checking switchover valve (64b)

Pull off vacuum line (white) on switchover valve (64b). Pull off vacuum line (white/purple/brown) on switchover valve (64a). Connect vacuum tester to free connection of switchover valve (64b) and connect with pulled off vacuum line (white/purple/brown). Vacuum readout 350–500 mbar.



Leak test

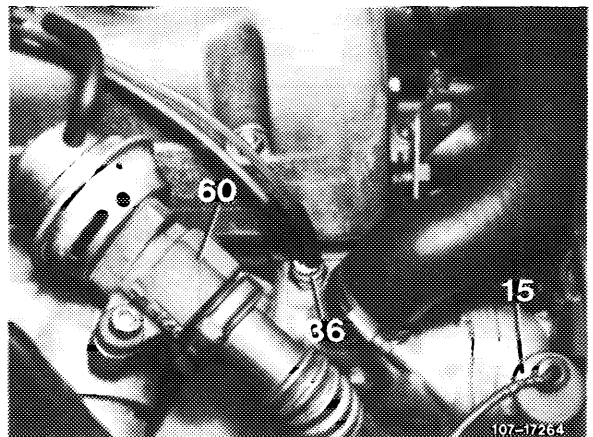
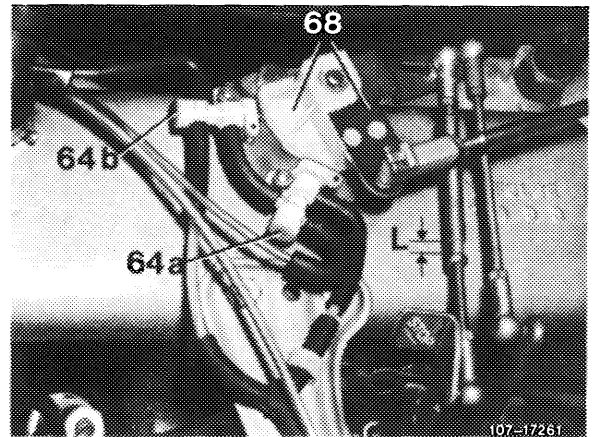
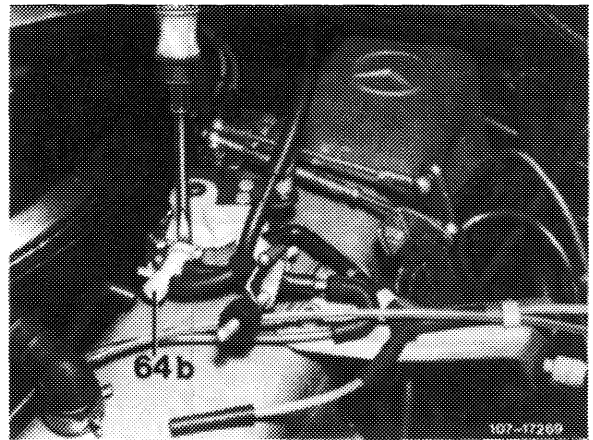
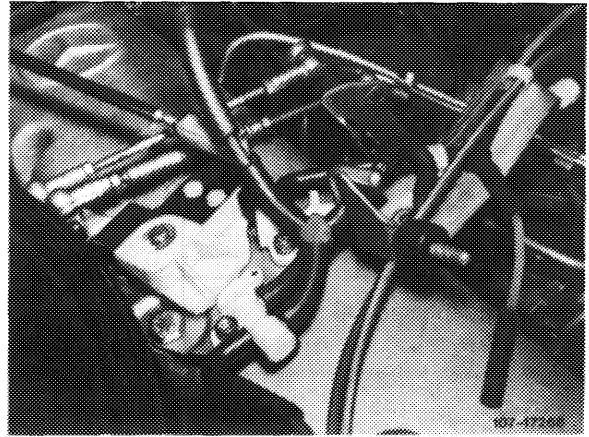
For this purpose, disconnect distributor of vacuum line (white/purple/brown). Vacuum should remain constant for approx. 2 minutes.

If vacuum drops, replace switchover valve.

If vacuum remains constant, **check switchover:**

For this purpose, remove clamp and pull off vacuum line (white/purple/brown) on switchover valve (64b). Switch over switchover valve with screwdriver. Vacuum should drop to "0".

If vacuum is not dropping to "0", replace switchover valve.



Checking EGR valve (60)	
Switch over switchover valve (64a) by bridging free travel "L" on free travel rod. Pull off vacuum line on EGR valve and plug on again.	
EGR valve should audibly close.	EGR valve not closing.

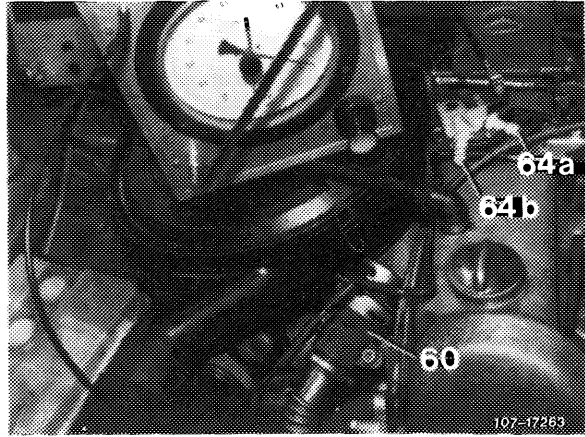
Replace EGR valve (60).

Checking vacuum control

Connect vacuum tester to vacuum line between EGR valve (60) and switchover valve (64b). Increase idle speed to 1000 ± 10 /min by operating regulating linkage (do not pull on stop lever)

Vacuum amounts to 320–350 mbar.

Vacuum is below or above specified value.



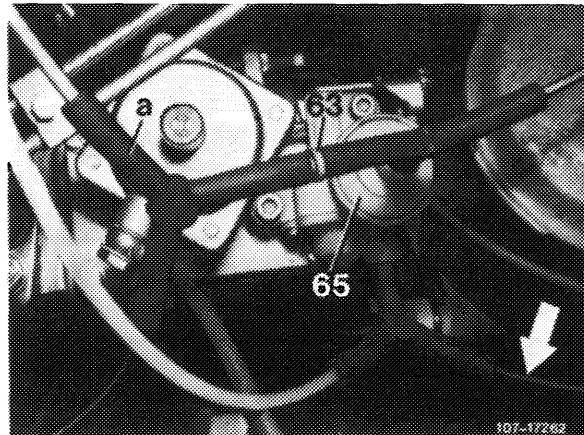
Check orifice (63)

Check if orifice is open and blow through, if required.

Change orifice (63)

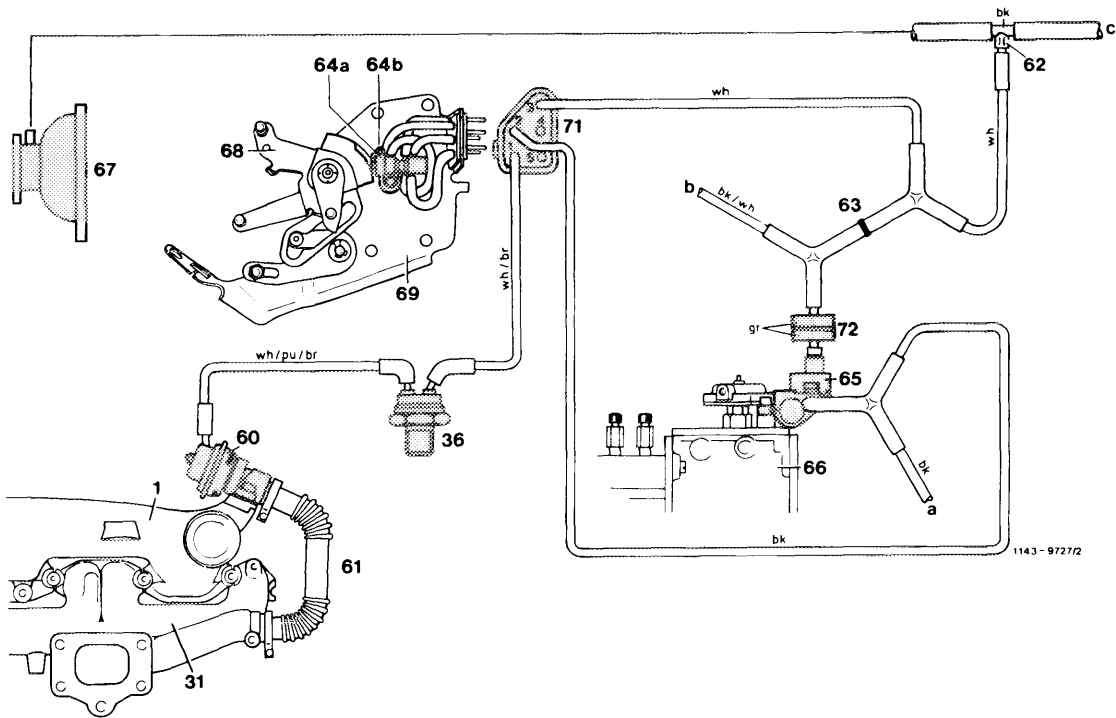
If the vacuum is not attained or is exceeded, install the next larger size orifice, if the vacuum is too high and the next smaller orifice if the vacuum is too low.

If the correct vacuum is **not** attained by the installation of another orifice, replace **vacuum control valve (65)**.



End of test

B. (USA) starting model year 1981



Operational diagram, vacuum line layout

- 1 Intake manifold
- 31 Exhaust manifold
- 36 Thermovalve 40 °C/104 °F
- 60 Exhaust gas recirculation valve (EGR)
- 61 Corrugated tubing
- 62 Orifice
- 63 Orifice
- 64a Switchover valve, idle speed shutoff – EGR
- 64b Switchover valve, full throttle shutoff – EGR
- 65 Vacuum control valve

- 66 Injection pump
- 67 Vacuum pump
- 68 Guide lever with cam
- 69 Valve plate
- 71 Central plug
- 72 Vacuum damper
- a Vent to passenger compartment
- b Automatic transmission
- c Brake unit

- bk = black
- br = brown
- gr = green
- pu = purple
- re = red
- wh = white

Checkup

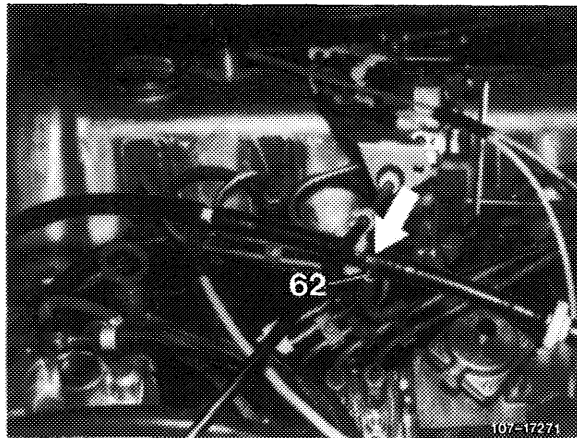
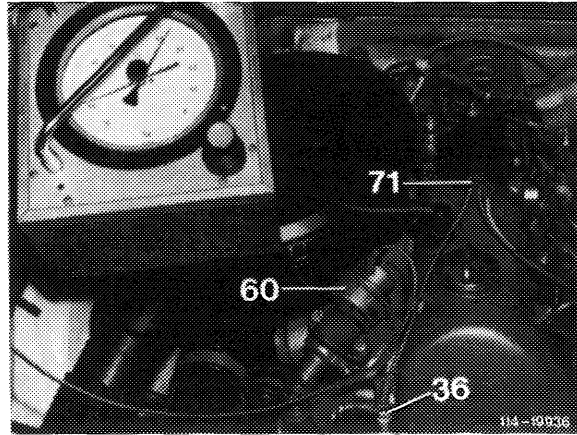
Note: At begin of test, yellow orifice (63) should be installed.

Testing EGR

Connect vacuum tester between EGR valve (60) and straight connection of thermovalve (36). At idle, with throttle linkage at idle stop, no vacuum should be indicated. Advance control linkage until free travel of free travel rod is eliminated (do not pull on stop lever). The vacuum should now amount to 350–500 mbar.

Idle, no vacuum present.
Vacuum of 350–500 mbar is attained.

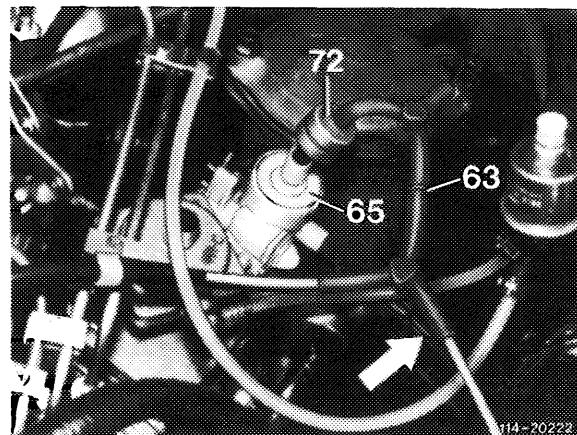
Vacuum present.
Vacuum not attained or exceeded.



Check vacuum lines

Check all vacuum lines for control of EGR and automatic transmission according to **operating diagram vacuum line layout** for correct connection and leaks. Blow through orifice (62) in vacuum tapping point, if required.

Check black vent line (arrow) from vacuum control valve to passenger compartment for free passage.

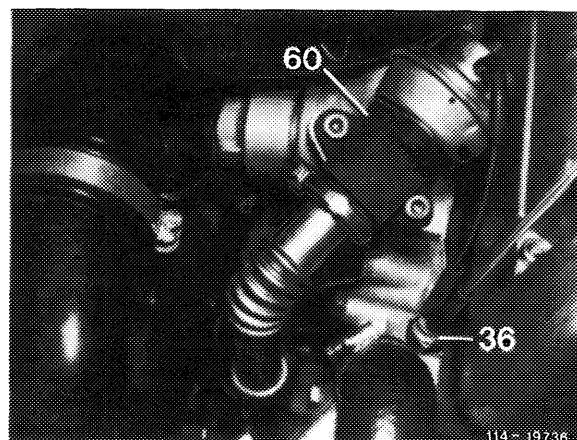


Check thermovalve 40 °C/104 °F (36, color code blue)

Pull off white/brown vacuum line on diagonal connection of thermovalve.

Pull off white/purple/brown vacuum line on EGR valve and blow through.

If there is no passage, remove thermovalve.



Check switchover valve (64a)

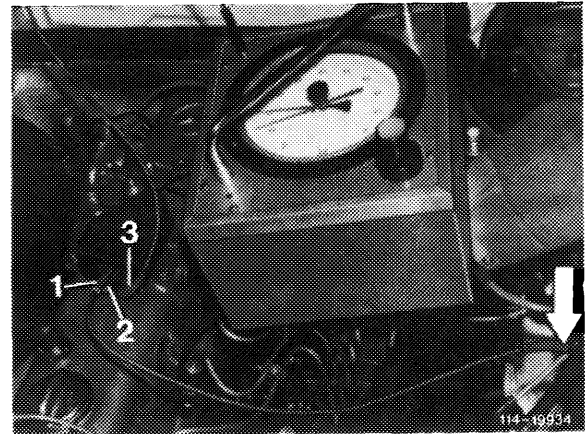
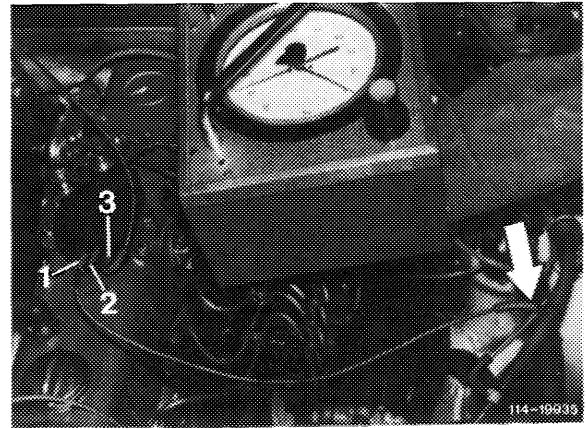
Pull central plug (71) from valve plate (69). Connect test line between tapping point (black orifice, arrow) on vacuum line for brake unit and valve plate connection (1). Connect vacuum tester to connection (2). Close connection (3).

Vacuum readout at switchover:
Idle speed (throttle linkage at idle speed stop) "0" mbar.
Bridge idle speed (do not pull on stop lever) approx. 700–800 mbar.

Leak test:
Let throttle linkage return to idle speed stop, stop engine.

Vacuum should remain constant for approx. 2 minutes.
Pull closing cap from connection (2).
Bridge idle speed.
Vacuum should drop to "0".

If test values are not attained:
Replace switchover valve (64a).



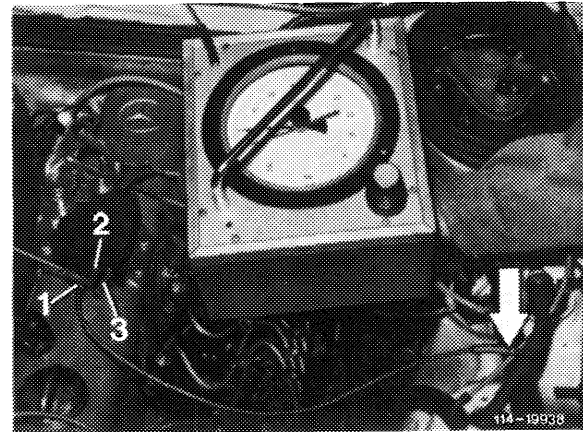
Check switchover valve (64b)

Pull central plug (71) from valve plate (69). Connect test line between tapping point (black orifice, arrow) on vacuum line brake unit and valve plate connection (1). Connect vacuum tester to connection (2).

Close connection (3), start engine.

Vacuum readout:
Idle speed (regulating linkage on idle speed stop) approx. 700–800 mbar.

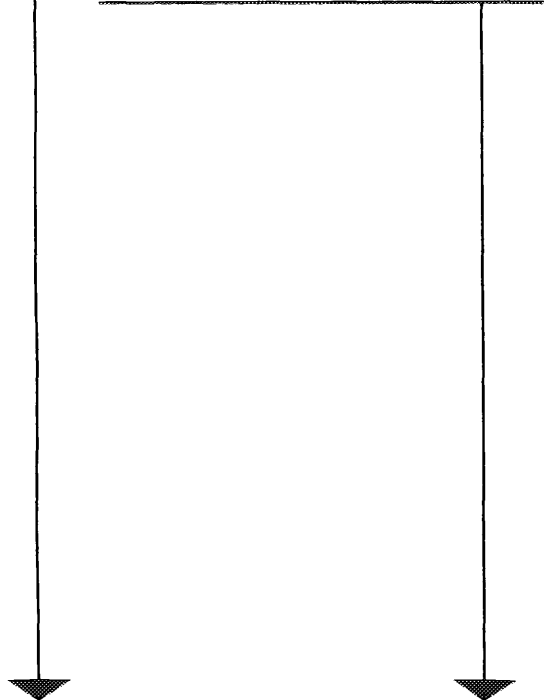
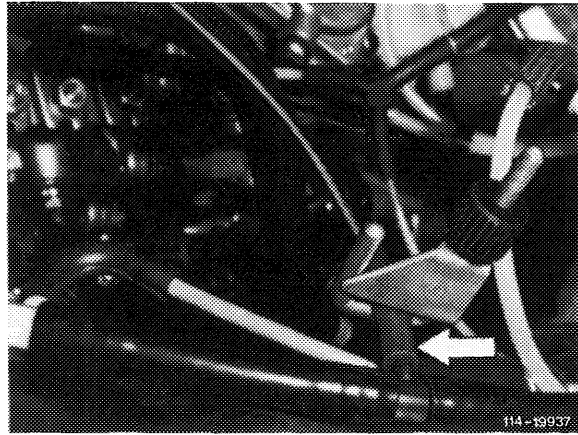
Leak test:
Disconnect tapping point for test line (arrow). Stop engine, vacuum should remain constant for approx. 2 minutes.



Vacuum readout at switchover:
Throttle linkage at full throttle stop,
vacuum should remain constant.
Let throttle linkage return to idle speed
stop and pull off test line.

Vacuum should drop to "0".

If test values are not attained, renew
switchover valve (64b).

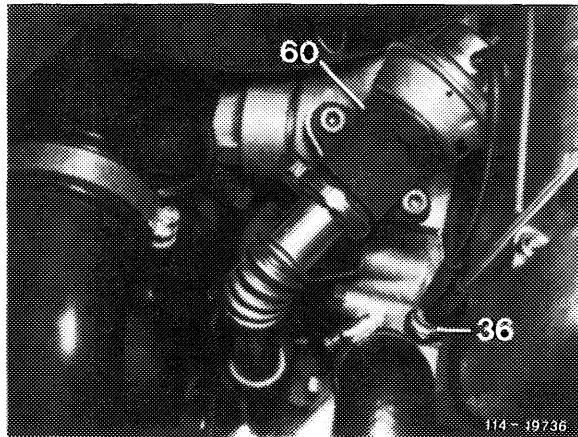


Checking EGR valve (60)

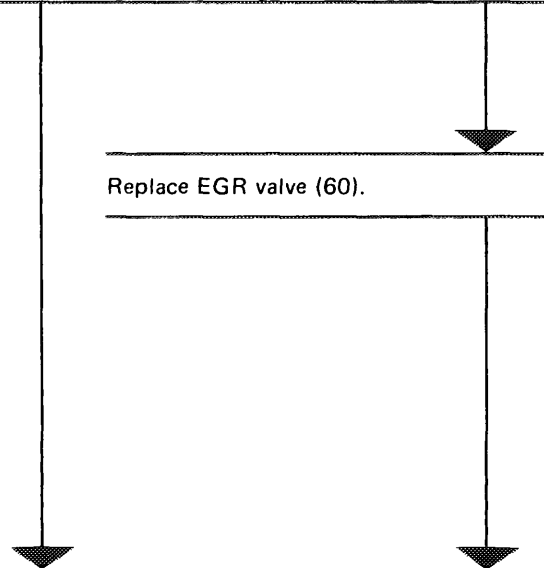
Start engine. Operate switchover valve (64a) by
eliminating free travel "L" on free travel rod.
Pull off vacuum line on EGR valve and plug-on
again.

EGR valve should
audibly close.

EGR valve not
closing.



Replace EGR valve (60).



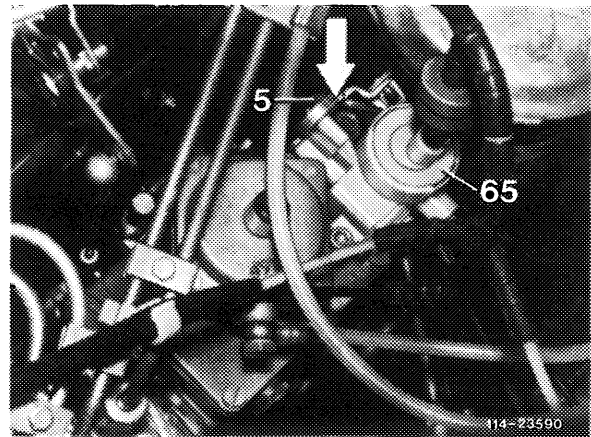
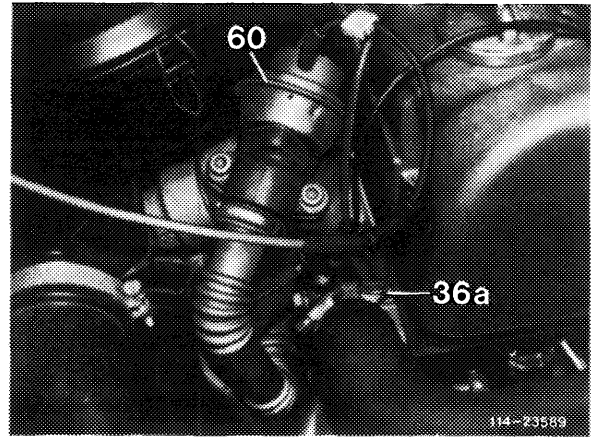
Note: Check adjustment of vacuum control valve prior to test.

Testing vacuum control

Connect vacuum tester between EGR-valve (60) and straight connection of thermovalve (36a). Disconnect connecting rod (5) on ball head. Start engine, increase rpm to approx. 900/min. Place adjusting roller on vacuum control valve (65) and set lever against stop (arrow).

Note: Engage connecting rod after test.

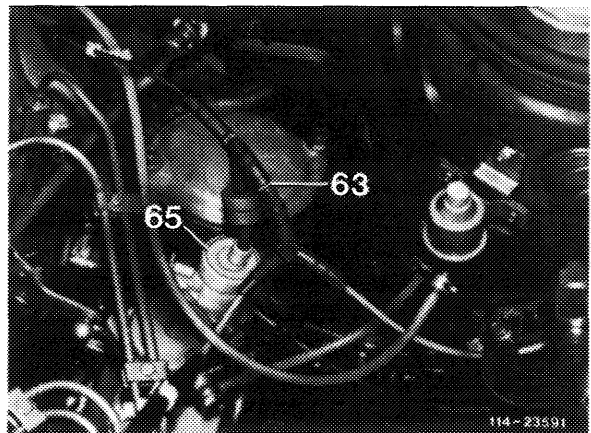
Vacuum readout 150–190 mbar	Vacuum is above or below requirements.
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Test orifice (63)

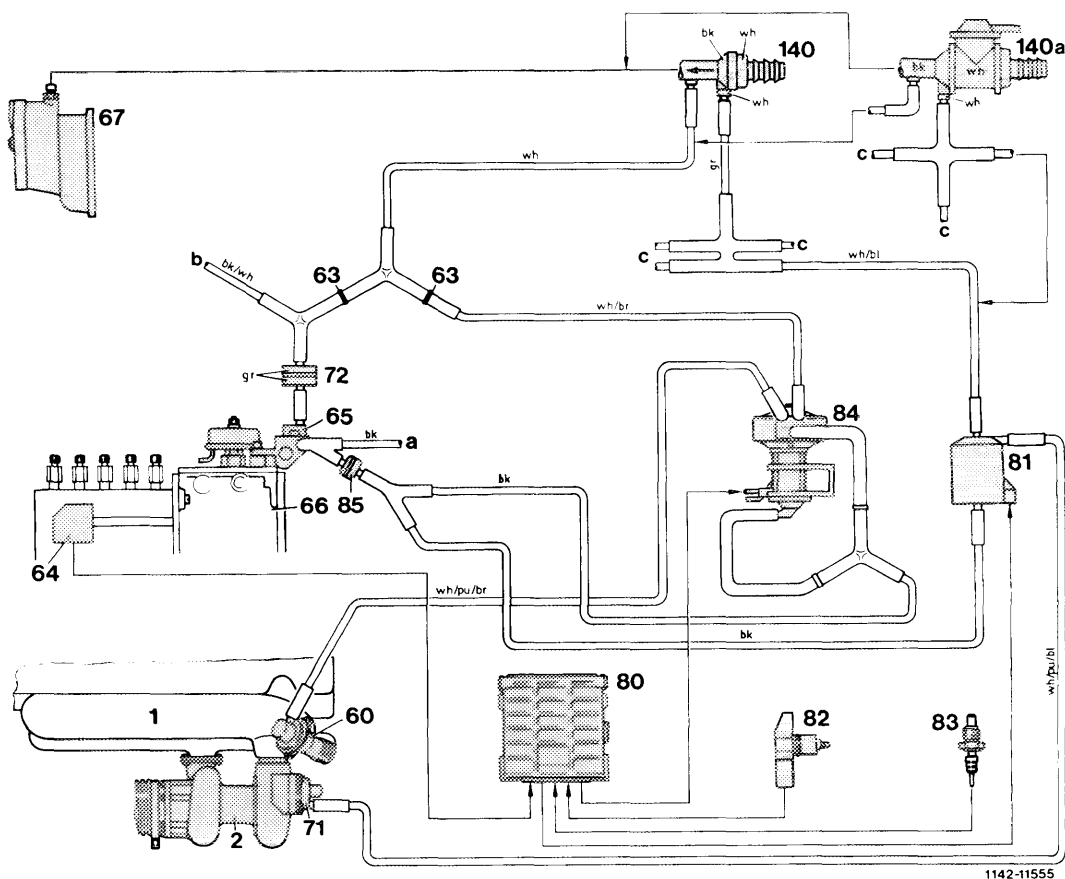
Test orifice for free passage and blow out, if required.

If the vacuum is not within tolerance, install the next larger orifice if the vacuum is too high, and the next smaller orifice if the vacuum is too low. If the specified vacuum is not attained by installing another orifice, replace vacuum control valve (65).



End of test

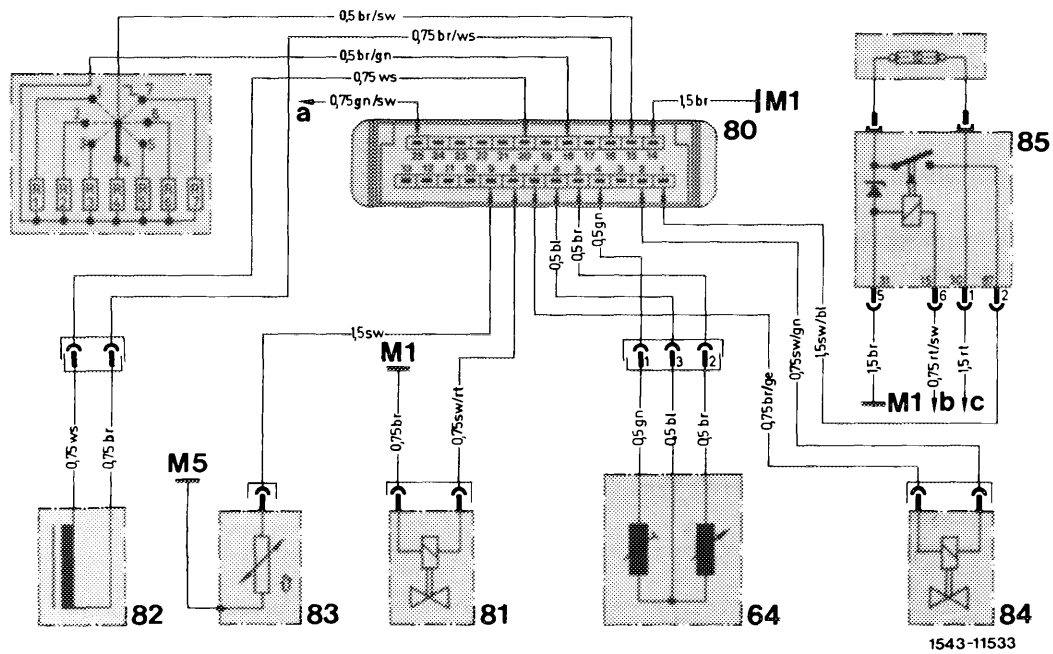
C.  model year 1984 California



1142-11555

Function diagram vacuum line installation

- | | | |
|---------------------------------|--------------------------------------|-------------|
| 1 Intake manifold | 81 Switchover valve | bk = black |
| 2 Exhaust gas turbocharger | 82 Rpm sensor | bl = blue |
| 50 EGR-valve | 83 Temperature sensor coolant (NTC) | br = brown |
| 63 Orifice 0.5 mm | 84 Pressure converter | gr = green |
| 64 Control rod travel indicator | 85 Vent filter | pu = purple |
| 65 Vacuum control valve | 140 Check valve, model 123 | re = red |
| 66 Injection pump | 140a Check valve, model 126 | wh = white |
| 67 Vacuum pump | a Vent line to passenger compartment | |
| 71 Circulating air safety valve | b To automatic transmission | |
| 72 Vacuum damper | c Remaining consumers | |
| 80 Control unit | | |



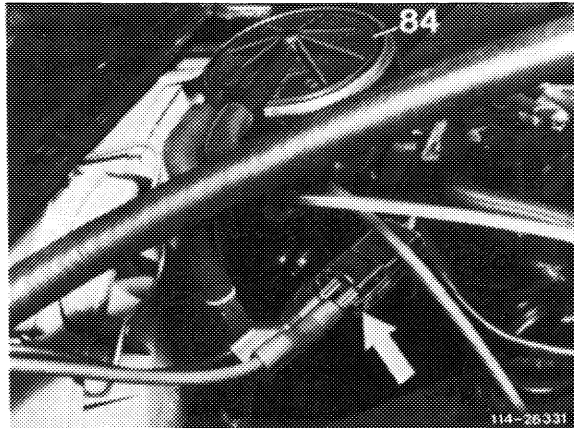
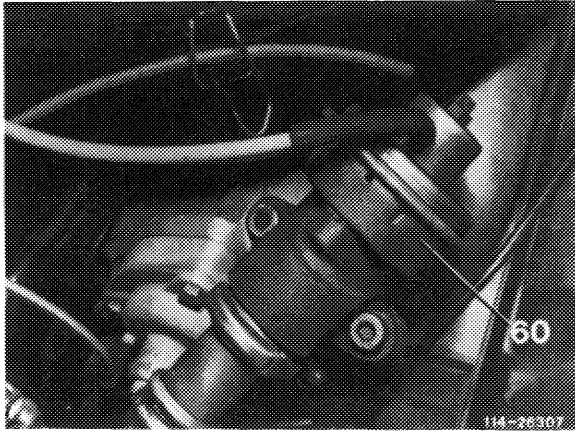
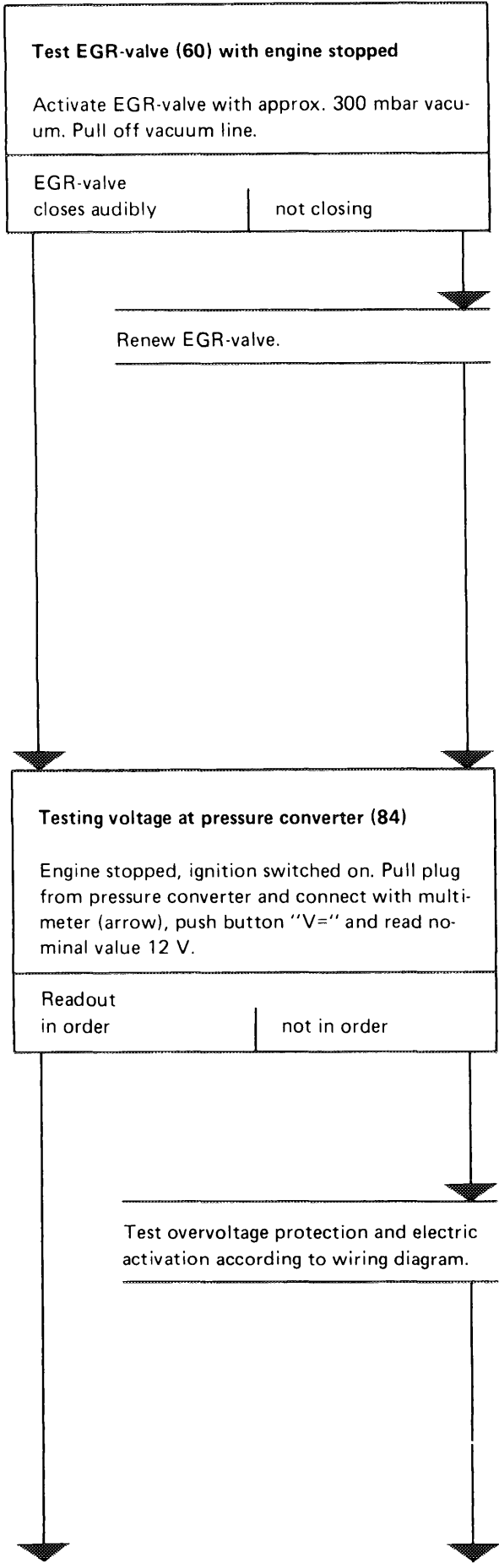
Electric wiring diagram

- 64 Control rod travel indicator
- 80 Control unit
- 81 Switchover valve
- 82 Rpm sensor
- 83 Temperature sensor
- 84 Pressure converter
- 85 Overvoltage protection
- 86 Compensating plug

- M1 Main ground behind instrument cluster
- M5 Ground, engine
- a To revolution counter
- b To fuse capsule, terminal 15
- c To supporting lug, terminal 30

- bl = blue
- br = brown, engine
- ge = yellow
- gn = green
- rt = red
- sw = black

Short test



Testing vacuum control

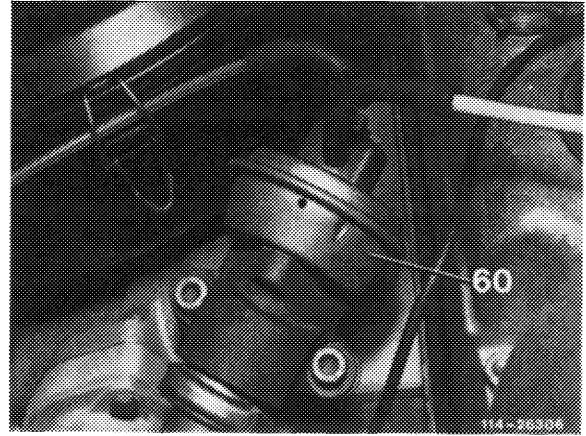
Connect vacuum tester with Y-distributor to EGR-valve (60).

Read vacuum values at the following engine speeds:

1/min	mbar
700–2600 from approx. 2400	280–360 slowly dropping
3000	approx. 60

Vacuum values in order	not in order
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Perform testing individual components.



End of test

Testing individual components

Testing temperature sensor for coolant (83)

Engine stopped.
Pull plug from temperature sensor for coolant.
Test resistance against ground.

For nominal value refer to diagram.
Test resistance at three temperature measuring points.

Example:

+ 20 °C = 2.2–2.8 kΩ

+ 80 °C = 290–364 Ω

+100 °C = 140–222 Ω

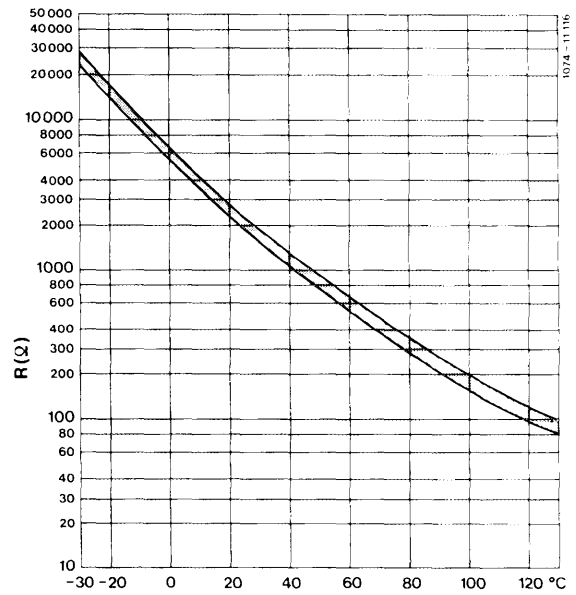
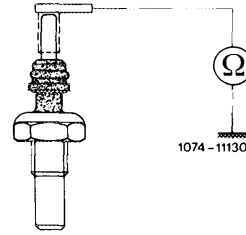
Test

values in order

not in order

Renew temperature sensor

End of test



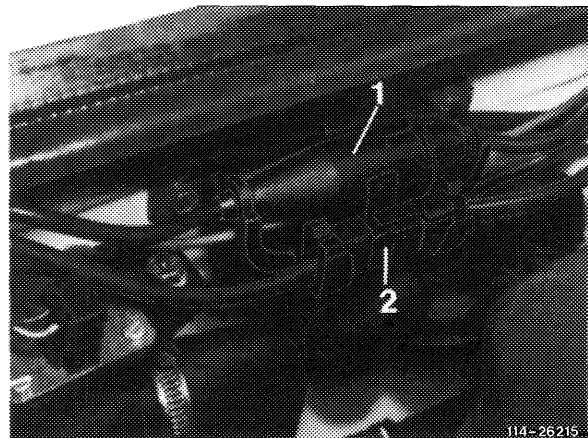
Testing rpm sensor (82)

Engine stopped.
Separate clutch (2) and test resistance with multimeter.
Readout: 1.9 ± 0.2 kΩ

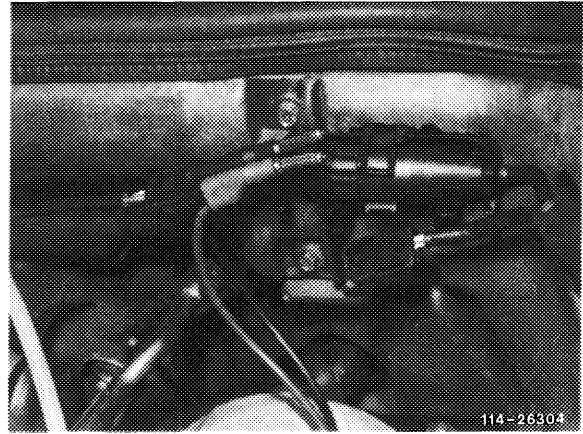
in order

not in order

Renew rpm sensor.



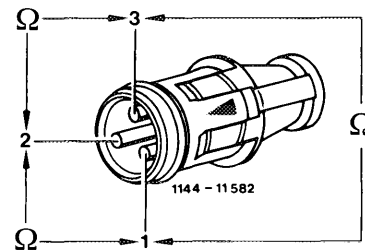
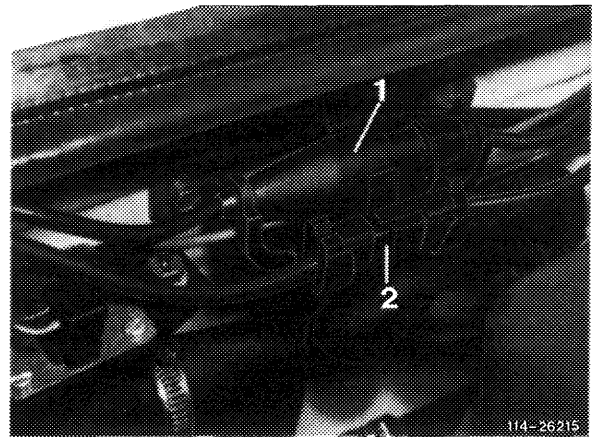
Connection as above. Push "V" button. Read test value at the following engine speed:	
1/min	V ~
700–800	> 4 ¹⁾
Test values in order	not in order
Renew rpm sensor.	



End of test

1) Voltage increasing with increasing engine speed.

Testing control rod travel indicator Engine stopped, separate clutch (1). With multi-meter in position Ω (measuring range up to approx. 100 Ω) and test resistance according to drawing.	
Readout: 1–2 = approx. 25 \pm 2 2–3 = approx. 25 \pm 2 1–3 = approx. 50 \pm 6	
Readout in order	not in order
Exchange injection pump with control and travel indicator.	
Attention! The control rod travel is set by manufacturer on test bench. Do not remove or change its function.	



End of test

Testing pressure converter (84)

Connect vacuum tester to vacuum line of connection (2). Run engine at idle speed. Read vacuum value. Nominal value approx. 450 mbar.

Vacuum in order	not in order
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Test vacuum lines according to function diagram. Test vacuum pump (43–660).

Connect vacuum tester with Y-distributor to connection (1). Connect multimeter with test cable to pressure converter. Push button „mA“

Read test values at the following engine speeds:

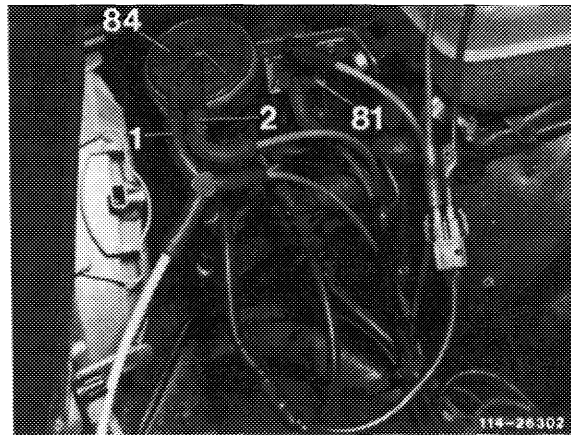
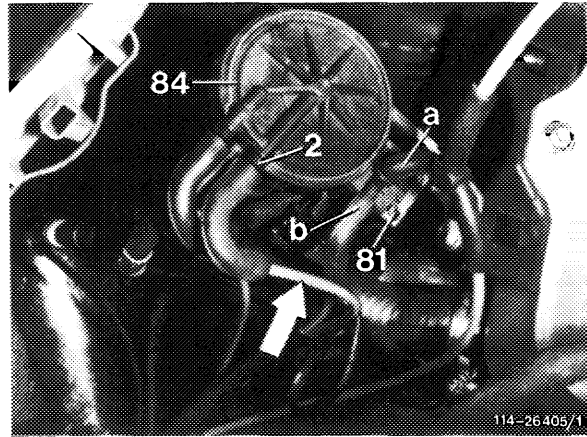
1/min	mbar	mA
700–2600 from approx. 2400	280–360 dropping slowly	\triangleq 530 \triangleq 370
approx. 3000	approx. 60	0

Test values in order	not in order
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Current values in order, renew pressure converter.

Current values not in order, perform activation test according to electric wiring diagram. Renew control unit, if required.

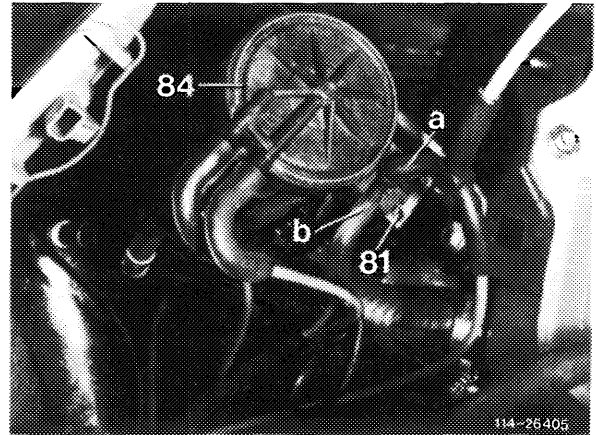
End of test



Testing switchover valve (81)

Connect vacuum tester with Y-distributor to connection (a). Run engine at idle speed. Read vacuum value. Nominal value > approx. 600 mbar.

Vacuum in order	not in order
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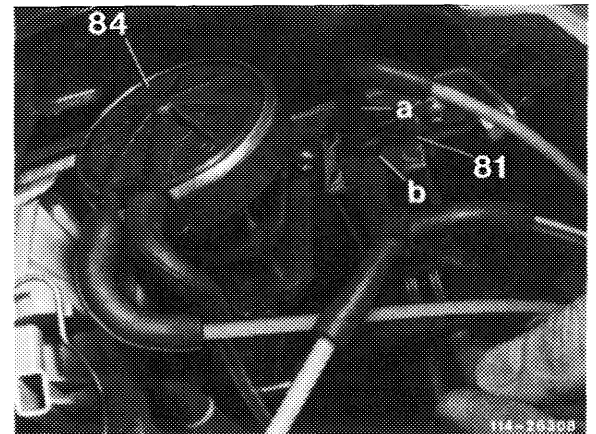


Test vacuum lines according to vacuum diagram. Test vacuum pump (43-660).

Connect vacuum tester with Y-distributor to connection (b). Connect multimeter with switchover valve. Push button "V=". Read test values at the following engine speeds:

1/min	mbar	Volt
700-800	0	0
1000-2500	approx. 600	approx. 12
> 3000	0	0

Test values in order	not in order
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Voltage data in order, renew switchover valve.

Voltage data not in order, perform activation test according to electric wiring diagram. Renew control unit, if required.

End of test