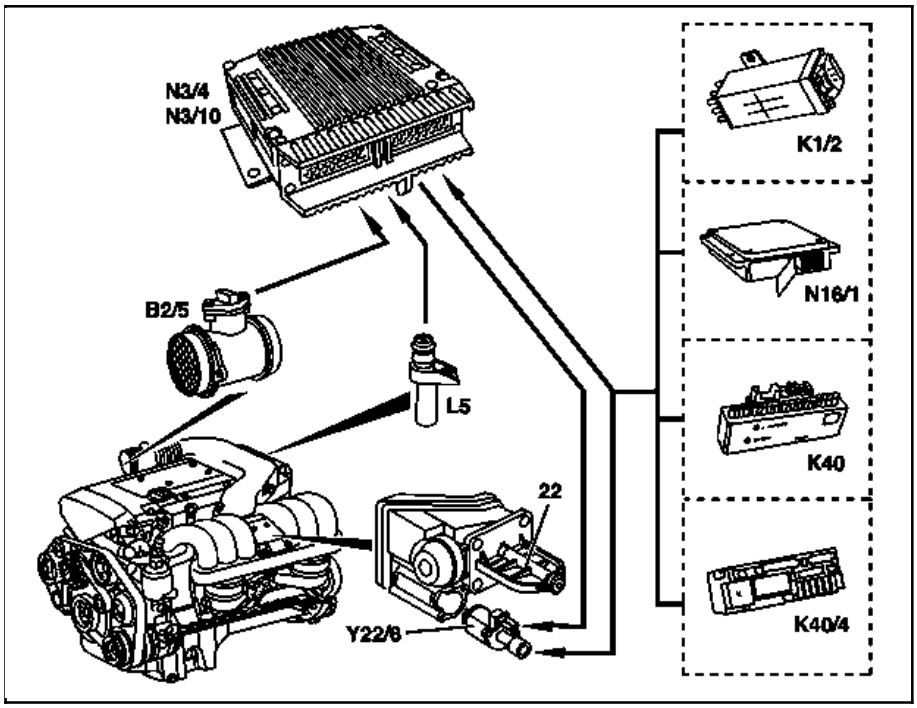
15.03.07	The document has been updated to this date and will no longer be subject to revision.

B2/5 Hot film mass air flow sensor
K1/2 Overvoltage protection relay model 124, 202 up to 7/96
K40 Relay module, model 170, 210 up to 2/97
K40/4 Fuse and relay module model 202 as of 8/96, 210 as of 3/97
L5 Crankshaft position sensor
N3/4 HFM-SFI control module
N3/10 ME-SFI control module
N16/1 Base module, model 129, 140
Y22/6 Resonance flap switchover valve

22 Resonance flap



P07.61-0390-06

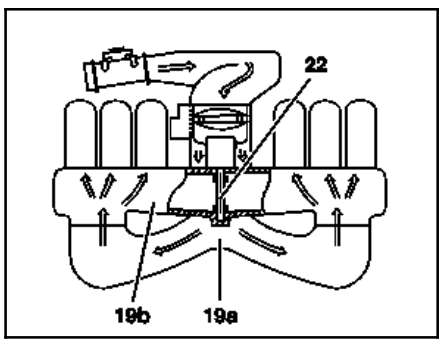
Task
Optimizing the engine torque curve by means of two different lengths of intake manifold.

Design
A pneumatically operated resonance flap (22) is positioned at the intake manifold. The resonance intake manifold switchover valve (Y22/6) is connected to the diaphragm unit for operating the resonance flap (22).
The resonance intake manifold switchover valve is actuated by the engine control module in line with engine load (e.g. at full throttle and about 3400 rpm).

Function
The length of the intake manifold has a decisive effect on the torque curve and the power yield of the internal combustion engine.

In the induction stroke, the pistons produce a powerful vacuum which causes the air contained in the intake manifold to move when the inlet valve is opened. This results in the development of inflowing air and in considerable kinetic energy in the air/fuel mixture. If the inlet valve is closed, this produces a dynamic pressure which immediately begins to expand in the opposite direction.

The level of the pressure depends on the flow velocity and on the mass of the quantity of gas which is contained in the intake manifold. If the gas column is accelerated and decelerated in rapid succession, this produces a vibration the frequency of which depends on the length of the intake manifold. If the engine timing matches the vibrations of the gas column, a certain boost effect is achieved as a result of the resonance vibrations. As the vibrations of the gas column also depend on engine speed, it is possible to achieve the resonance vibrations at a fixed intake manifold length only within a certain engine speed range.
The engines are equipped with a "resonance intake manifold" in order to exploit this boost effect over a larger engine speed range. A "resonance flap" installed in this intake manifold makes it possible to utilize two different intake manifold lengths.



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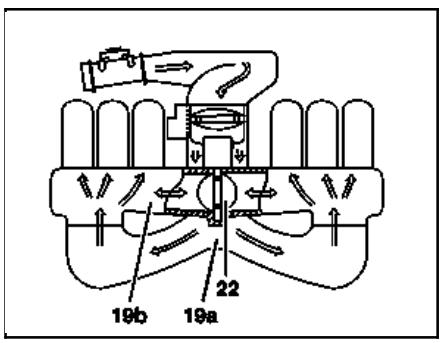

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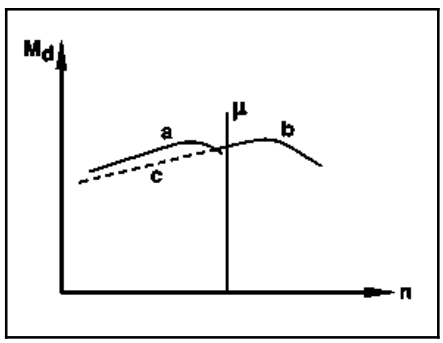

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Resonance flap closed

Resonance flap closed

The air drawn in flows in the resonance intake manifold (19a) through the intake pipes which branch off downstream of the throttle flap, into the air collector housing of the resonance pipe (19b). The air collection volume is split in two by the resonance flap (22). This produces a clear boost in torque in the lower engine speed range.

Resonance flap open

When the resonance intake manifold switchover valve is actuated and the resonance flap is then opened, the air collection volume of the resonance pipe (19b) is not split in two. The length of the intake manifold is shorter. The inducting cylinder makes use of both intake pipes of the resonance intake manifold (19a).

Engine torque curve

a ***Resonance flap closed***

b ***Resonance flap open***

c ***without resonance flap***

Md ***Engine torque***

n ***Engine speed***

n	Control module (HFM-SFI) position/task/ design/function		GF07.51-P-4103D
n	ME-SFI control module position/task/design/ function		GF07.61-P-5000F
n	Crankshaft position sensor position/task/ design/function	ME-SFI (motor electronics) fuel injection and ignition system HFM-SFI (hot film engine management) fuel injection and ignition system	GF07.04-P-4116F GF07.04-P-4116G
n	Hot film mass air flow sensor position/task/ design/function	Round connector with bayonet lock 5-pin connection, integrated intake air temperature sensor	GF07.07-P-4118E GF07.07-P-4118G
n	Resonance intake manifold switchover valve position/task/design/function		GF09.20-P-3101D
n	Overvoltage protection relay position/task/ design/function	Voltage supply, model 124, 202 up to 7/96	GF54.10-P-4100A
	Fuse and relay module	Voltage supply, model 202 as of 8/96 model 210 as of 3/97	
n	Base module position/task/design/function	Voltage supply, model 129, 140	GF54.21-P-4013L
n	Relay module position/task/design/function	Voltage supply, model 210 up to 2/97	GF54.10-P-4033K