

B 1 Engine Test, Adjustment

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B 1 Engine Test, Adjustment**Listing of Test Steps**

1	Test equipment	connect/disconnect.
2	CFI control module on-off ratio test (Ignition: ON)	perform.
3	CFI control module on-off ratio test (Engine: closed throttle)	perform (wait until readout display oscillates).
4	Diagnsotic trouble code read-out of CFI control module (Ignition: ON)	perform.
5	Engine systems (MAS) control module (N16) diagnostic trouble code read-out (Ignition: ON)	perform.
6	Ignition control module diagnostic trouble code read-out (at engine rpm)	perform.
7	Air filter	remove and install.
8.0	Linkage rods	check throttle valve for free movement and condition. Lubricate bearings, slotted lever and ball sockets.
8.1	Closed throttle (idle) contact	check, adjust.
8.2	Wide open throttle contact	check using accelerator pedal, adjust.
9	Control pressure cable	check, adjust.
10	Cruise control (without ASR)	check, adjust.
11	Engine coolant level	check, correct.
12	Engine oil level	check, observe condition of oil.
13	Voltage at ignition coils	check (see Test and Adjustment Data, Section A).
14	Ignition timing and vacuum advance	check (see Test and Adjustment Data, Section A).

- 15 Oscilloscope patterns evaluate (see section C).
- 16 Engine oil temperature approximately 80 °C.
- 17 Intake system check for leakage.
- 18 Closed throttle (idle) speed check.
- 19 Lambda control system test.
- 20 Closed throttle under load check.

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Connection Diagram – Test Equipment Engine 104 CFI



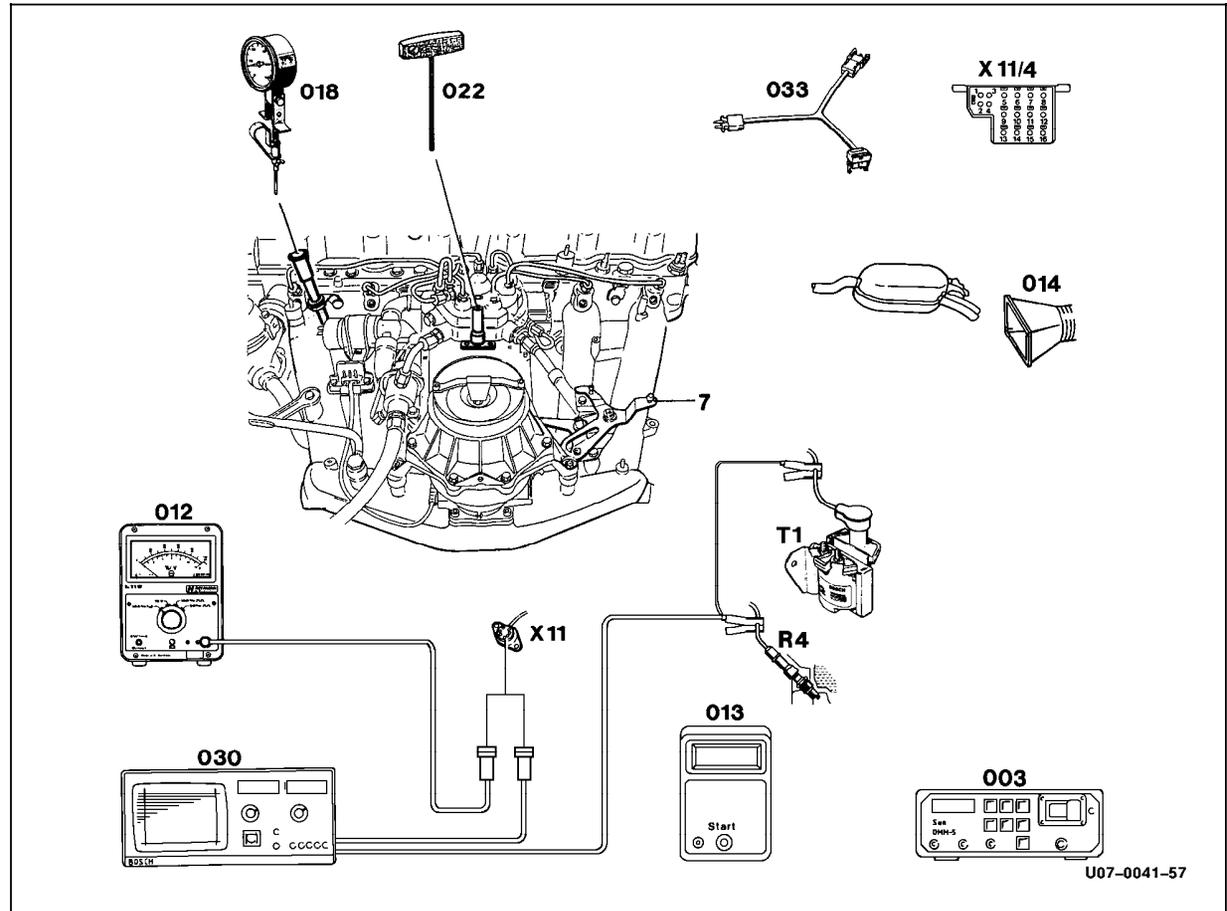
Set engine tester to 6 cylinder position

Figure 1

- R4 Spark plugs (cylinder 1)
- T1 Ignition coil
- X11 Diagnostic connector (9-pole)
- X11/4 Diagnostic connector (16-pole)
- 7 Throttle linkage
- 003 Multimeter
- 012 On-off ratio tester
- 013 Impulse counter scan tool
- 014 Exhaust vent hose
- 018 Oil thermometer
- 022 Hex. socket wrench ¹⁾
- 030 Engine analyzer with oscilloscope
- 033 Test cable

¹⁾ Required only for mixture adjustment when replacing fuel mixture adjustment tower.

Note: Depending on test equipment available, it may be necessary to alternately connect the engine analyzer and on-off ratio tester to diagnostic connector(X11).



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**Connection Diagram – Test Equipment
Engine 119,120 CFI**



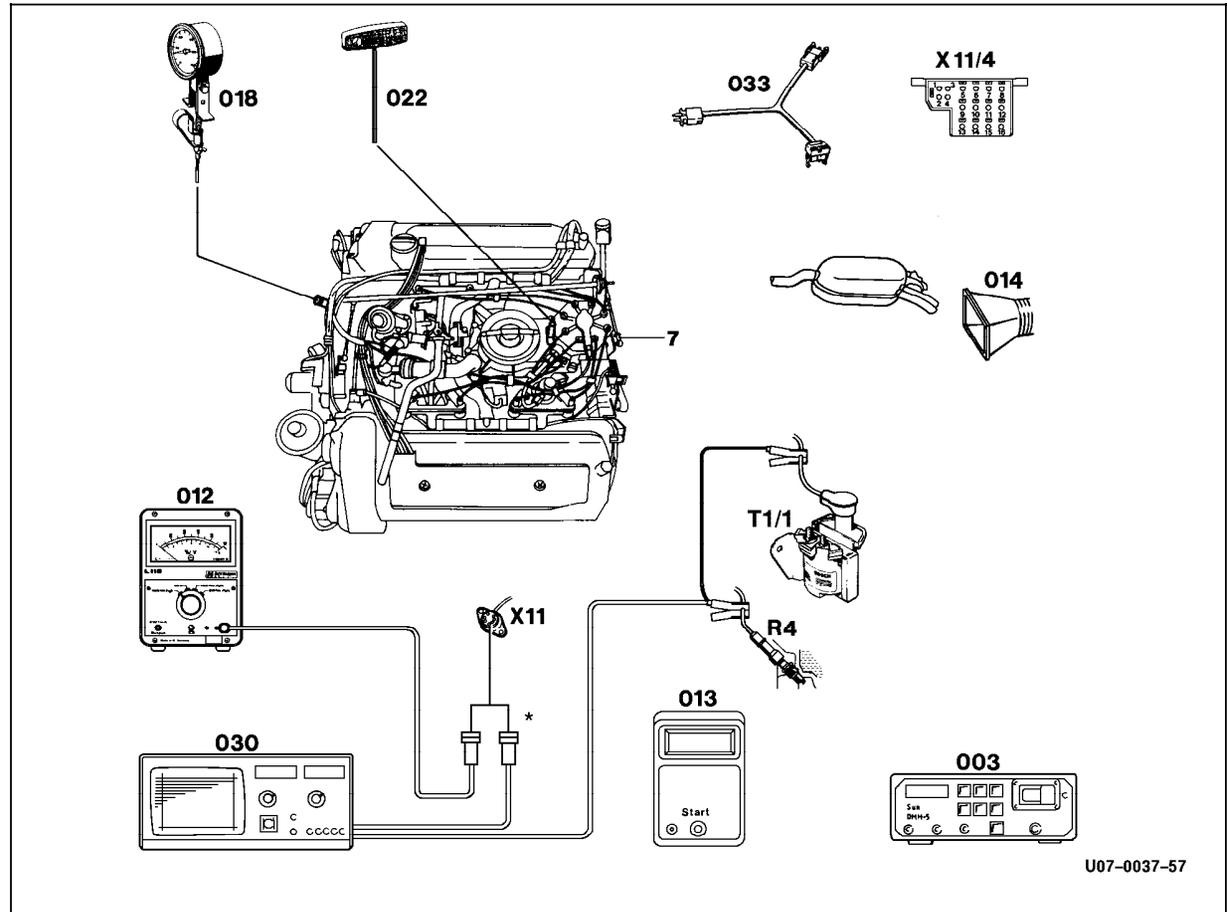
Set engine tester to 4 cylinder position. Only **one** ignition circuit can be checked at a time.

Figure 2

- R4 Spark plugs (cylinder 1)
- T1/1 Ignition coil 1
- X11 Diagnostic connector (9-pole)
- X11/4 Diagnostic connector (16-pole)
- 7 Throttle linkage
- 003 Multimeter
- 012 On-off ratio tester
- 013 Impulse counter scan tool
- 014 Exhaust vent hose
- 018 Oil thermometer
- 022 Hex. socket wrench ¹⁾
- 030 Engine analyzer with oscilloscope
- 033 Test cable

¹⁾ Required only for mixture adjustment when replacing injection system components.

Note: Depending on test equipment available, it may be necessary to alternately connect the engine analyzer and on-off ratio tester to diagnostic connector (X11).



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**Connection Diagram – Impulse Counter Scan Tool and On/off Ratio Tester
Engine 104, 119,120 CFI**

Note:

Connect red wire to X4/10.

Connect black wire to socket 1.

Connect yellow wire of impulse counter scan tool to:

Socket 3 for CFI control module

Socket 8 for Ignition control module

Socket 14 for Engine systems control module (MAS)

The red wire of the impulse counter scan tool may be optionally connected to socket 16 (circuit 15) of diagnostic onnector (X11/4) instead of terminal block.

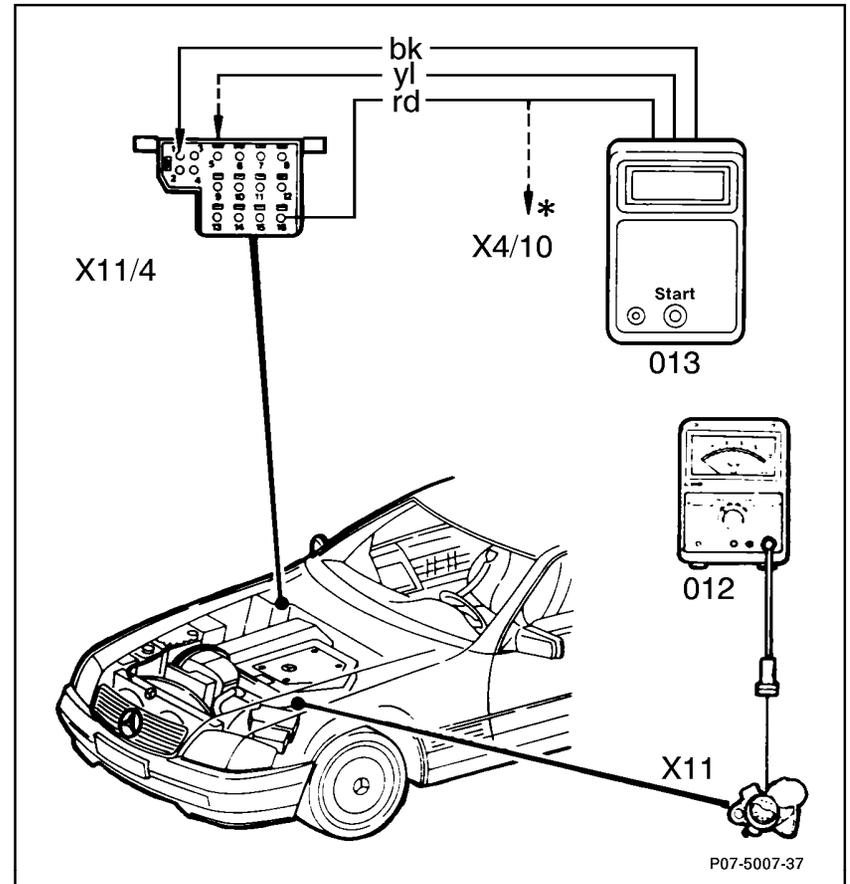


Figure 3

- 012 On/off ratio tester
- 013 Impulse counter scan tool
- X4/10 Terminal block, terminal 30/30Ü/61e87L
- X11 Diagnostic connector
- X11/4 Diagnostic connector (16-pole)

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Connection chart for test equipment without diagnostic adapter for two circuit ignition systems

Test equipment version	Cylinder no. setting on test equipment	Type of measurement	Circuit on Diagnostic connector			Trigger clamp on ignition cable	kV-Clamp on ignition cable ignition circuit
			X11 Engine 119	X11/2 Engine 120 L.	X11/3 Engine 120 R.		
SUN MEA1500-MBT	Engine 119: 4 Engine 120: 6	RPM/ dwell angle of Ignition circuit →	T1/1		T1/1		
		RPM/ dwell angle of Ignition circuit →		T1/2			
		Timing of Ignition circuit →	T1/1		T1/1	Cylinder 1	Engine 119: T1/1 Engine 120: T1/1
		Timing of Ignition circuit →	T1/2	T1/2		Engine 119: cyl. 2 ¹⁾ Engine 120: cyl. 12	Engine 119: T1/2 Engine 120: T1/2
		Oscilloscope primary/secondary → and voltage at terminal 15/1 of Ignition coil	T1/1		T1/1	Engine 119: cyl. 1 Firing order 1-4-6-7 Engine 120: cyl. 1 Firing order 1-5-3-6-2-4	Engine 119: T1/1 Firing order 1-4-6-7 Engine 120: T1/1 Firing order 1-5-3-6-2-4
		Oscilloscope primary/secondary → and voltage at terminal 15/1 of Ignition coil		T1/2		Engine 119: cyl. 5 Firing order 5-8-3-2 Engine 120: cyl. 12 Firing order 12-8-10-7-11-9	Engine 119: T1/2 Firing order 5-8-3-2 Engine 120: T1/2 Firing order 12-8-10-7-11-9

1) On engine 119 subtract 90° crankshaft from measured value.
Example: measured: 107° crankshaft, 107°-90°= 17° crankshaft timing

B 1 Engine Test, Adjustment**Notes regarding on/off ratio check using on/off ratio tester**

The operation of the Lambda control can be tested by checking the on/off ratio. In addition, any malfunctions that exist momentarily can be recognized. The tests distinguish between malfunctions that occur with the ignition **ON** or with the engine **at idle**.

The on/off ratio can be checked using the on/off ratio tester or engine analyzer. An on/off ratio of 50% indicates that all input signals are OK, but Lambda control is not functioning. A varying on/off ratio indicates that the Lambda control is functioning correctly. On/off ratios from 10% to 95% are each assigned a specific malfunction (see DTC memory, DM Engines, Volume 2, Section 2). After testing the on/off ratio, a diagnostic trouble code (DTC) readout using the impulse counter scan tool must always be performed.

Notes regarding diagnostic trouble code (DTC) readout using the Impulse counter scan tool

When diagnosing engine running complaints, or when the CHECK-ENGINE lamp is illuminated, the DTC memory should be read out and the DTC's noted before any repairs are attempted. This will ensure that the technician can differentiate between actual malfunctions and "simulated malfunctions," since testing done on a running engine will cause malfunctions to be stored that were caused by a simulation or a disconnected circuit.

When testing is completed, the DTC memory of the CFI and Ignition control modules and the Engine systems control module (MAS) must be cleared.

B 1 Engine Test, Adjustment**Notes regarding DTC readout using Impulse counter scan tool****1. Connect impulse counter scan tool according to diagram.**

The LED "U-Batt" should come on. If not, check the following:

- a) Voltage supply.
- b) Impulse counter scan tool fuse.

2. DTC memory readout

- a) Ignition: **ON**.
- b) Push start button for 2-4 seconds.
- c) Read and record DTC readout.
- d) Push start button again.
- e) Read and record DTC readout.

Repeats steps d) and e) until the first DTC readout reappears.

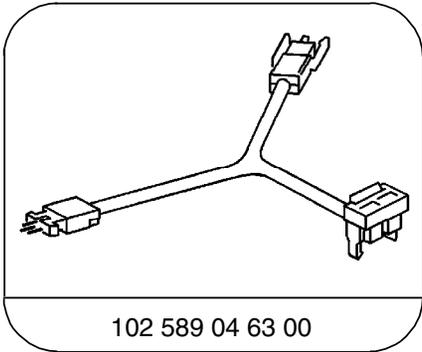
3. Clearing DTC memory

Note: The clearing process must occur within 20 seconds after the DTC readout.

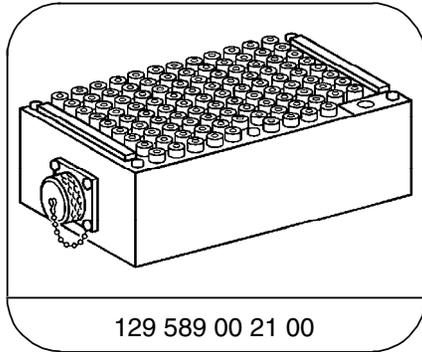
- a) Push start button 2-4 seconds (Impulse display appears).
- b) After a waiting period of 3 seconds, push the start button for 6-8 seconds which will erase the previously displayed DTC.
- c) Erase each DTC separately.

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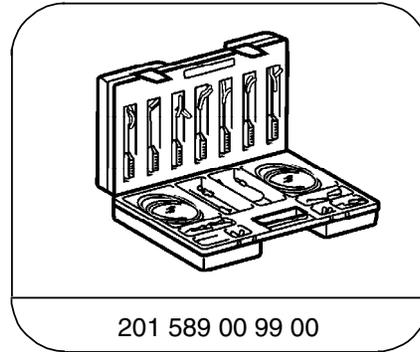
Special Tools



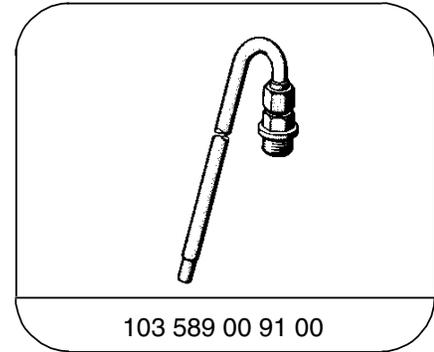
Test cable



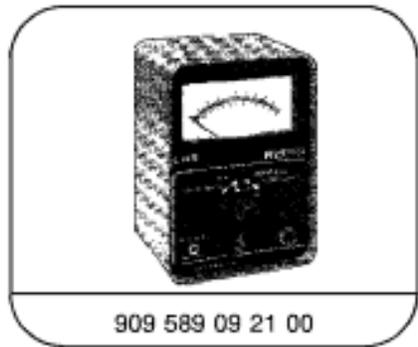
126-pin socket box



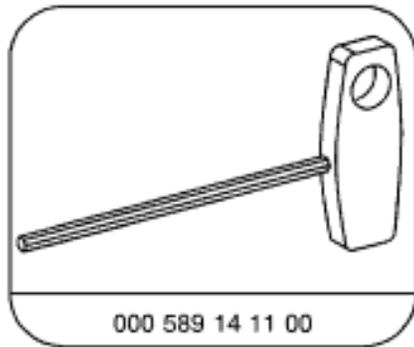
Electrical connecting set



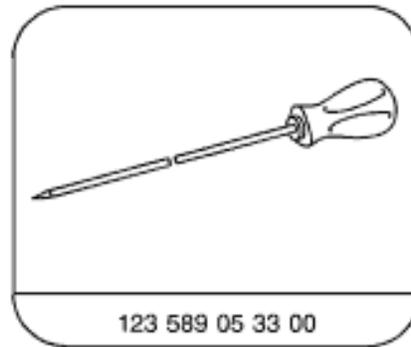
Measuring connection



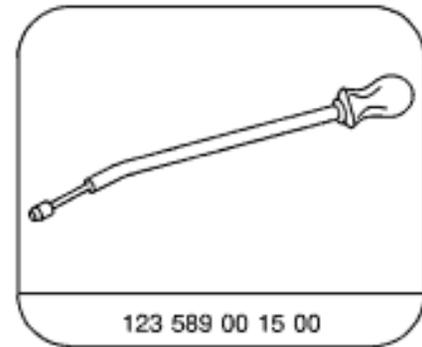
On-off ratio tester



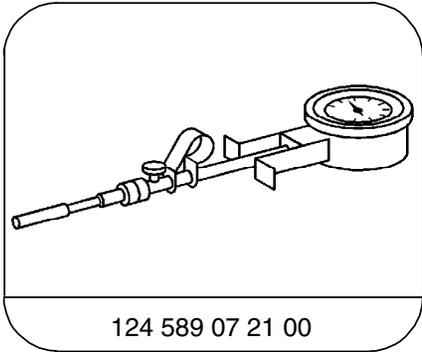
3 mm screwdriver, 3 mm



Puller

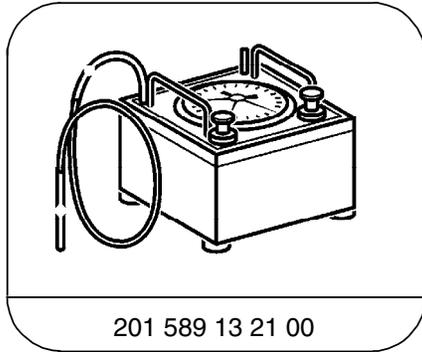


Drift punch



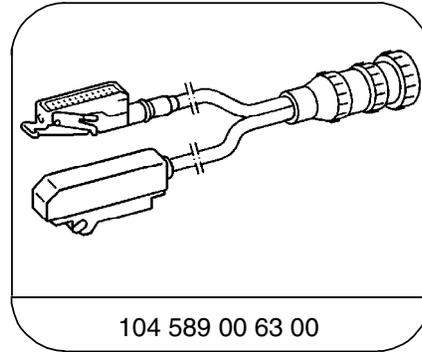
124 589 07 21 00

Remote thermometer



201 589 13 21 00

Tester



104 589 00 63 00

Test cable

B 1 Engine Test, Adjustment**Equipment**

Engine analyzer ¹⁾	Bear DACE (Model 40-960) with dual ignition adapter Sun EMT-1019/Master 3 ²⁾ Sun MCM-2110 ²⁾ Sun MEA-1500MB ²⁾
Multimeter ¹⁾	Fluke Model 23, 83, 85, 87 Sun DMM-5

¹⁾ Available through the MBUSA Standard Equipment Program.

²⁾ On engines with dual ignition system, only one cylinder bank can be measured at a time, using the present equipment.

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Note:

The Lambda control system test should not be performed on a very hot engine, for example, after a fast drive or after an output test on a dynamometer.

Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy ¹⁾
⇒ 1 Connect test equipment according to diagram	Ignition: OFF	–	–
⇒ 2 CFI control module on/off ratio readout	Ignition: ON Coolant temperature 80° C	50%	See DTC memory diagnosis (DM Engines Vol. 2, Section 2)
⇒ 3 CFI control module on/off ratio readout	Engine: closed throttle (idle) Coolant temperature 80° C	Readout oscillates	See DTC memory diagnosis (DM Engines Vol. 2, Section 2) Adjust Lambda control ⇒ 19
⇒ 4 CFI control module DTC readout	Connect impulse counter scan tool: yellow wire to socket 3 of diagnostic connector X11/4 Ignition: ON	DTC readout 1	See DTC memory diagnosis (DM Engines Vol. 2, Section 2)

¹⁾ Observe Preparation for Test, see 22.

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Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy ¹⁾
<p>⇒ 5 Engine systems control module DTC readout</p>	<p>Connect impulse counterscan tool: yellow wire to socket 14 of diagnostic connector X11/4 Ignition: ON</p>	<p>DTC readout 1</p>	<p>See DTC memory diagnosis (DM Engines Vol. 2, Section 2)</p>
<p>⇒ 6 Ignition control module DTC readout</p>	<p>Connect impulse counter scan tool: yellow wire to socket 8 of diagnostic connector X11/4 Engine: Start</p> <p>Vacuum hose to ignition control module connected. Hold engine at 3100-3600 rpm for 8 seconds. Disconnect vacuum hose at idle, set parking brake, move selector lever from transmission range "P" to "D" and back to "P". Hold engine at more than 5000 rpm for at least 2 seconds. Reconnect vacuum hose at idle. Raise engine to approx 2300 rpm, followed by brief opening to wide open throttle position (wide open throttle contacts must close). Engine: closed throttle (idle) Readout stored DTC's from memory.</p>	<p>DTC readout 1</p>	<p>See DTC memory diagnosis (DM Engines Vol. 2, Section 2)</p>

¹⁾ Observe Preparation for Test, see 22.

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Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy ¹⁾
⇒ 7 Remove air cleaner	Ignition: OFF	–	–
⇒ 8.0 Check condition of linkage and throttle valve	Operate throttle linkage without ASR: Ignition: OFF with ASR: Ignition: ON	Smooth operation, no binding should be evident.	Lubricate all bearings and ball sockets
⇒ 8.1 Check closed throttle (idle) speed position	Ignition: OFF Accelerator pedal at closed throttle position	Throttle valve lever must rest against closed throttle stop. without ASR: Roller must contact slotted lever at closed throttle stop free of tension. with ASR: Lever (53) must contact closed throttle stop.	Adjust throttle linkage (SMS, Job No. 30-300)
⇒ 8.2 Check wide open (full) throttle position	Ignition: ON , Engine OFF Accelerator pedal at wide open throttle position (not kickdown)	without ASR: Throttle lever must stop approx. 0.5-1 mm away from the wide open throttle stop. with ASR: Throttle lever must contact wide open throttle stop.	Adjust throttle linkage (SMS, Job No. 30-300)

¹⁾ Observe Preparation for Test, see 22.

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Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy ¹⁾
⇒ 9 Check automatic transmission control pressure cable	Ignition: OFF Accelerator pedal at closed throttle position	Arrows must align (Fig. 4-7)	Adjust control pressure cable (SMS, Job No. 30-300)
⇒ 10 Check cruise control (without ASR)	Ignition: OFF Accelerator pedal at closed throttle position	Push actuator lever (Fig. 4-7) to closed throttle position, then pull approx. 1 mm away from closed throttle contact and adjust linkage rod (21) so that it can be attached free of tension.	Adjust throttle linkage (SMS, Job No. 30-300)
⇒ 11 Engine coolant level	Ignition: OFF	Marking: min - max	Correct engine coolant level
⇒ 12 Engine oil level	Ignition: OFF	Marking: min - max	Correct oil level

¹⁾ Observe Preparation for Test, see 22.

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Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy ¹⁾	
<p>⇒ 13 Check voltage at ignition coil</p>	<p>Ignition: ON</p>		<p>See checking ignition system, (DM Engines Vol. 2, Section 5)</p>	
	<p>Engine 104: Ignition coil T1</p>			
	<p>X11</p>			
	<p>2 —   X11</p>	<p>5 11–14 V</p>		
	<p>X11</p>			
	<p>4 —   X11</p>	<p>5 0 V</p>		
	<p>Engine 119: Ignition coil T1/1</p>			
	<p>X11</p>			
<p>2 —   X11</p>	<p>5 11–14 V</p>			
<p>X11</p>				
<p>4 —   X11</p>	<p>5 0 V</p>			
<p>Ignition coil T1/2</p>				
<p>X11</p>				
<p>4 —   X11</p>	<p>5 11–14 V</p>			
<p>X11</p>				
<p>4 —   X11</p>	<p>5 0 V</p>			

¹⁾ Observe Preparation for Test, see 22.

B 1 Engine Test, Adjustment

Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy ¹⁾
⇒ 14 Check ignition timing and vacuum advance	Engine: Start Check ignition timing at closed throttle. Check ignition timing with and without vacuum at specified engine rpm.	See Test and adjustment data (section A)	See checking ignition system, (DM Engines Vol. 2, Section 5)
⇒ 15 Evaluate oscilloscope patterns	Engine: closed throttle (idle) Briefly accelerate to 3000 rpm	Voltage difference between cylinders should be no more than 3kV. Voltage increase with engine accelerated should be no more than 6 kV over idle value.	Evaluate with engine analyzer (section C)
⇒ 16 Warm engine oil to operating temperature	Engine rpm: approx. 3000 rpm	Engine oil temperature approx. 80 ° C	–
⇒ 17 Check intake system for leakage	Engine: closed throttle (idle) Spray connections with carburetor cleaner.  Do not use conventional fuel for leak test (dangerous fumes). Note fire risk and do not spray on red hot parts or on ignition system.	–	Repair leaks

¹⁾ Observe Preparation for Test, see 22.

B 1 Engine Test, Adjustment

Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy ¹⁾
⇒ 18 Check closed throttle (idle) rpm	Engine: closed throttle (idle) Transmission range "P", climate control system OFF, engine oil temperature approx. 80° C	See Test and adjustment data (section A)	Check closed throttle speed control (DM Engines Vol. 2, Section 2)
⇒ 19 Adjust Lambda control system ²⁾	Transmission range "P", climate control system OFF. Disconnect purge line to throttle valve housing at purge valve and plug. Reconnect line after measurement. Engine oil temperature approx. 80° C. Engine: closed throttle (idle)	See Test and adjustment data (section A)	If the specified value cannot be obtained, check electrical components with socket box tester (DM Engines Vol. 2, Section 2)

1) Observe Preparation for Test, see 22.

2) The fuel mixture adjustment screw is secured against unauthorized adjustment by means of a steel ball in the adjustment tower. After fuel mixture adjustment at the factory, the ball is installed in the adjustment tower using a special tool and **must not be removed**.

The fuel mixture may only be corrected when replacing a fuel injection system component or when performing an engine repair. To do so, the fuel mixture adjustment tower must be replaced.

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Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy ¹⁾
⇒ 20 Check closed throttle under load	Engine: closed throttle (idle) Transmission range "D" Switch on all electrical consumers, Turn steering wheel to full lock.	Engine must continue to idle within specified range.	Check closed throttle speed control (DM Engines Vol 2, Section 2)

¹⁾ Observe Preparation for Test, see 22.

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**Accelerator Control 104 CFI
(without ASR)**

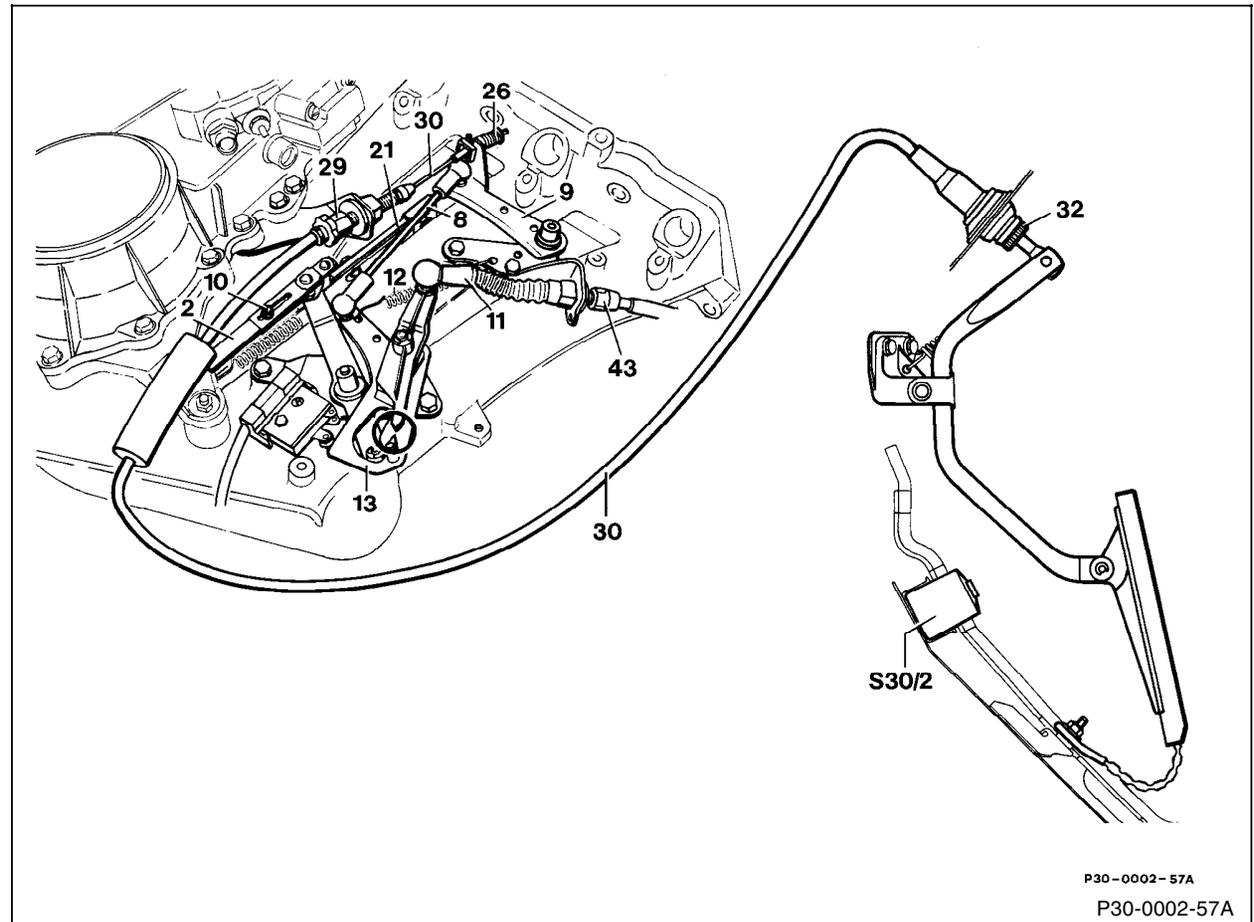


Figure 4

- 2 Linkage rod
- 8 Linkage rod
- 9 Control lever
- 10 Set screw
- 11 Control pressure cable for automatic transmission
- 12 Release spring
- 13 Slotted lever
- 21 Cruise control linkage rod
- 26 Spring
- 29 Adjustment nut
- 30 Bowden cable
- 32 Adjustment nut
- 43 Adjustment nut
- S30/2 Kickdown switch

B 1 Engine Test, Adjustment

**Accelerator Control 104 CFI
(with ASR)**

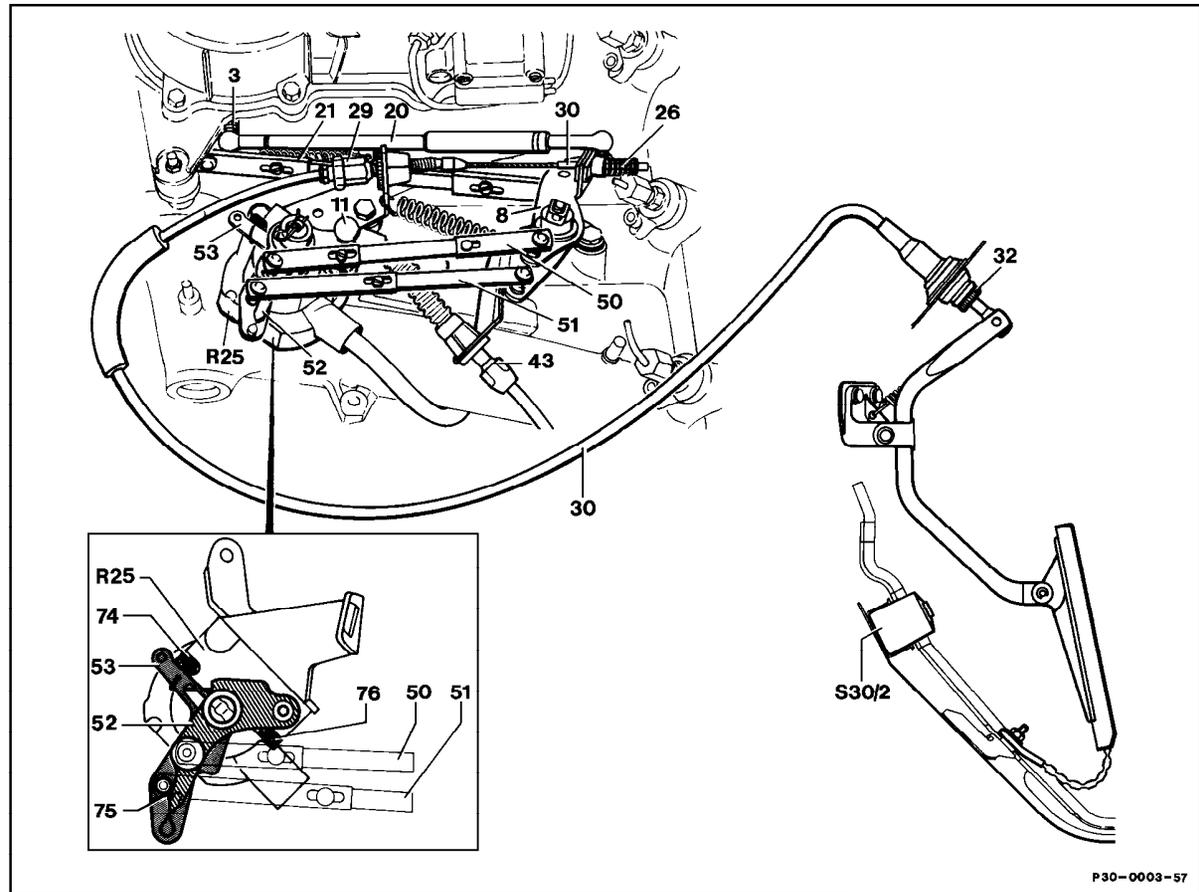


Figure 5

- 3 Throttle valve lever
- 8 Control lever
- 11 Control pressure cable for automatic transmission
- 20 Telescoping rod (backup rod)
- 21 Connecting rod
- 26 Spring
- 29 Adjustment nut
- 30 Bowden cable
- 32 Adjustment nut
- 43 Adjustment nut
- 50 Connecting rod
- 51 Connecting rod
- 52 Lever
- 53 Lever
- 74 Closed throttle stop of lever (53)
- 75 Closed throttle stop of lever (52)
- 76 Wide open throttle stop
- R25 Accelerator pedal position sensor
- S30/2 Kickdown switch

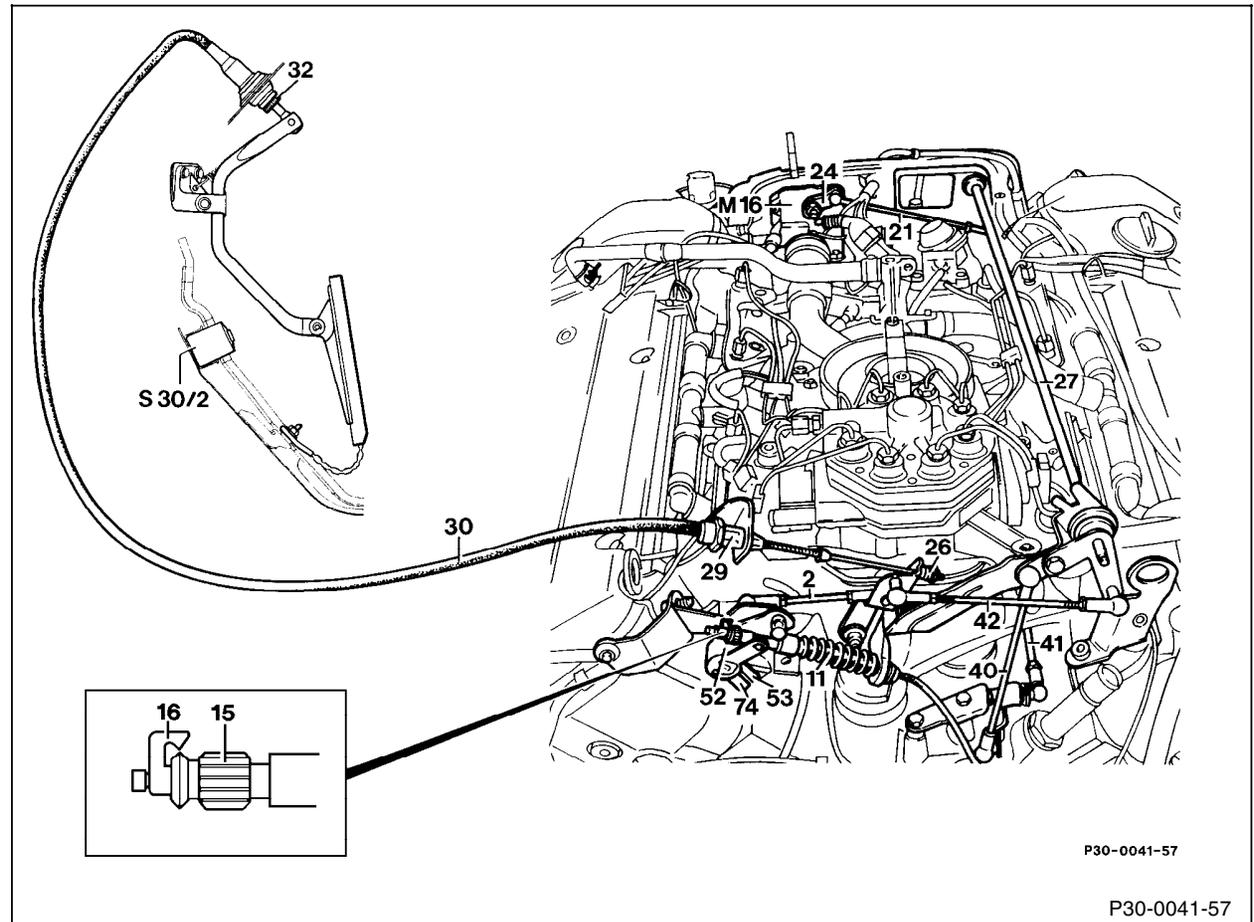
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**Accelerator Control 119 CFI
(without ASR)**

Figure 6

- 2 Linkage rod
- 11 Control pressure cable for automatic transmission
- 15 Adjustment nut
- 16 Spacer sleeve
- 21 Cruise control linkage rod
- 24 Actuator lever
- 26 Spring
- 27 Longitudinal control shaft
- 29 Adjustment nut
- 30 Bowden cable
- 32 Adjustment nut
- 40 Linkage rod
- 41 Linkage rod
- 42 Linkage rod
- 52 Lever
- 53 Lever
- 74 Idle stop
- M16 Cruise control actuator
- S30/2 Kickdown switch

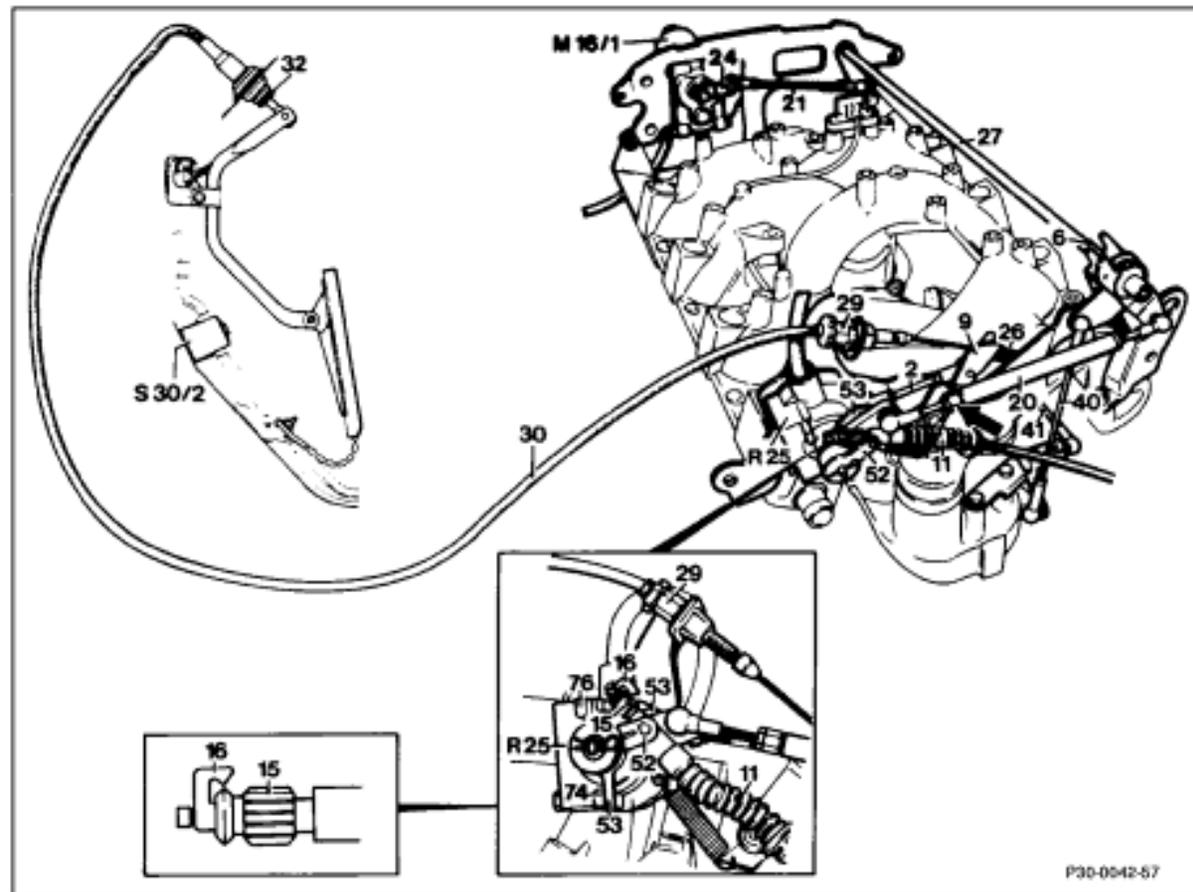


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**Accelerator Control 119 CFI
(with ASR)**

Figure 7

- 2 Linkage rod
- 6 Lever on longitudinal control shaft
- 9 Control lever
- 11 Control pressure cable for automatic transmission
- 15 Adjustment nut
- 16 Spacer sleeve
- 20 Telescoping rod (backup rod)
- 21 Linkage rod
- 24 Actuator lever
- 26 Spring
- 27 Longitudinal control shaft
- 29 Adjustment nut
- 30 Bowden cable
- 32 Adjustment nut
- 40 Linkage rod
- 41 Linkage rod
- 52 Lever
- 53 Lever
- 74 Closed throttle stop
- 76 Wide open throttle stop
- M16/1 Electronic accelerator actuator
- S30/2 Kickdown switch



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Component Location: Mixture Adjustment, Purge Valve, Purge Switchover Valve

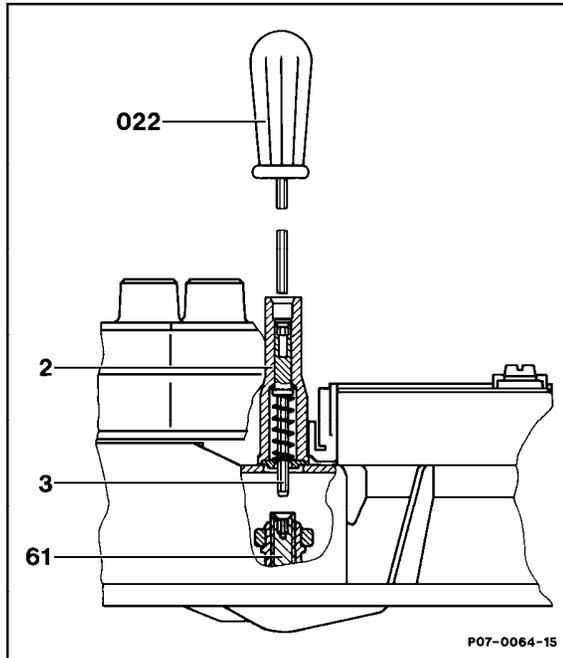


Figure 8 P07-0064-15

- 022 Hex. socket wrench
- 2 Fuel mixture adjustment tower
- 3 Hex. head
- 61 Fuel mixture adjustment screw

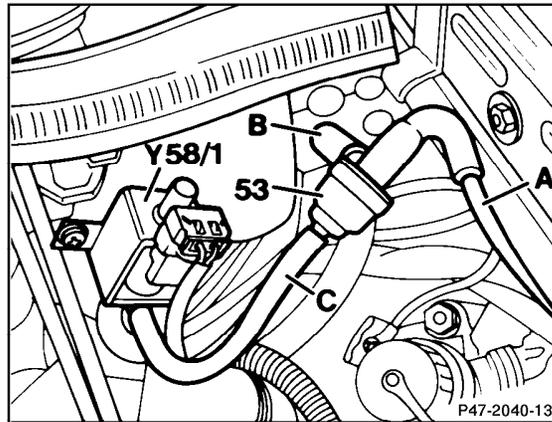


Figure 9 P47-2040-13

- 53 Purge valve
- Y58/1 Purge switchover valve

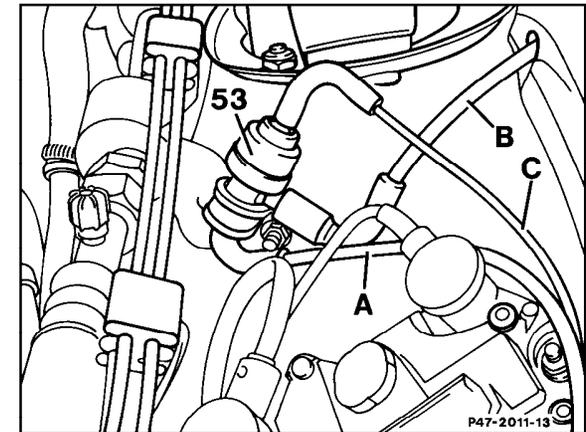


Figure 10 P47-2011-13

- 53 Purge valve

B 1 Engine Test, Adjustment

With starting or warm up complaints do not condition engine to operating conditions but proceed according to complaint.

Listing of Test Steps

1	Test equipment	connect/disconnect according to Connection Diagram.
2	Base module DTC readout ⇒ Ignition: ON	perform.
3	LH-SFI control module DTC readout ⇒ Ignition: ON	perform.
4	DI control module DTC readout ⇒ Ignition: ON	perform.
5.0	EA/CC/ISC control module DTC readout ⇒ Ignition: ON	perform.
5.1	CC/ISC control module DTC readout ⇒ Ignition: ON	perform.
6	Air filter	remove and install.
7.0	Throttle control linkage	check throttle valve for free movement and condition. Lubricate all bearings, gate levers and ball sockets.
7.1	WOT contact	check, adjust.
7.2	CTP contact	check using accelerator pedal, adjust.
8	Control pressure cable of AT	check, adjust.
9	Fuel pressure	check. (Engine must be at closed throttle to test)
10	Engine coolant level	check, correct.

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11	Engine oil level	check, observe condition of oil.
12	Ignition system, primary, secondary ⇒ Engine: at Idle	check (see Test and Adjustment Data, Section A).
13	Ignition timing and vacuum advance ⇒ Engine: at Idle	check (see Test and Adjustment Data, Section A).
14	Oscilloscope pattern brief acceleration to 3000 rpm ⇒ Engine: at Idle ..	evaluate (see Test and Adjustment Data section C).
15	Engine oil temperature	approximately 80 °C.
16	CTP RPM	check.
17	On-off ratio control system	check(readout oscillates).
18	Not applicable for U.S. version vehicles	—
19	CTP speed under load	check in TR “D” (service and parking brake applied) and with all accessories turned on.

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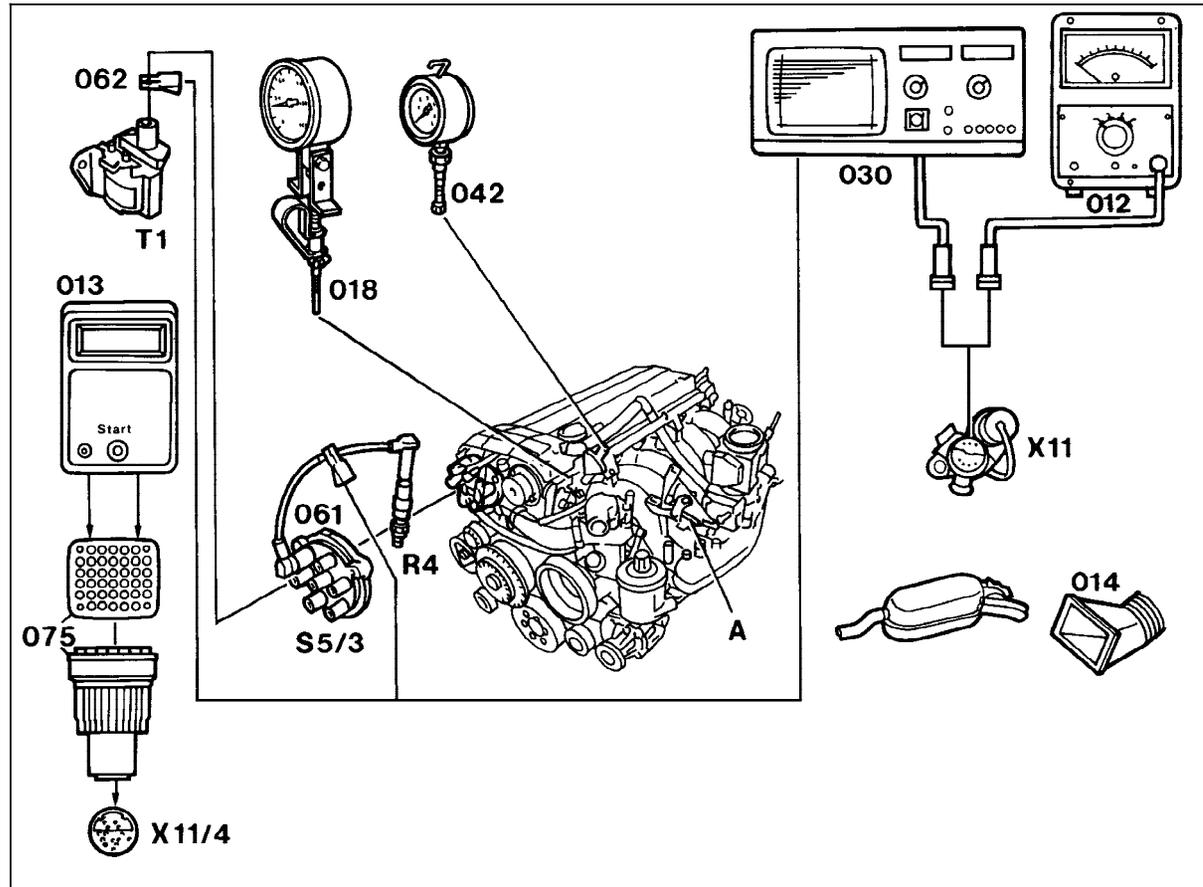
**Connection Diagram – Test Equipment
Engine 104 LH-SFI**



Set engine analyzer to 6 cylinder position

Figure 1

- A Throttle linkage
- R4 Spark plug (cylinder 1)
- S5/3 High-voltage distributor
- T1 Ignition coil
- X11 Diagnostic socket (9-pole)
- X11/4 Data link connector, (DTC readout, 38-pole)
- 012 On-off ratio tester
- 013 Impulse counter scan tool
- 014 Exhaust vent hose
- 018 Oil thermometer
- 030 Engine analyzer with oscilloscope
- 042 Pressure gauge
- 061 Trigger clamp (on cylinder 1)
- 062 Kilovolt clamp (on ignition coil)
- 075 Impulse counter scan tool adapter



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B 1 Engine Test, Adjustment

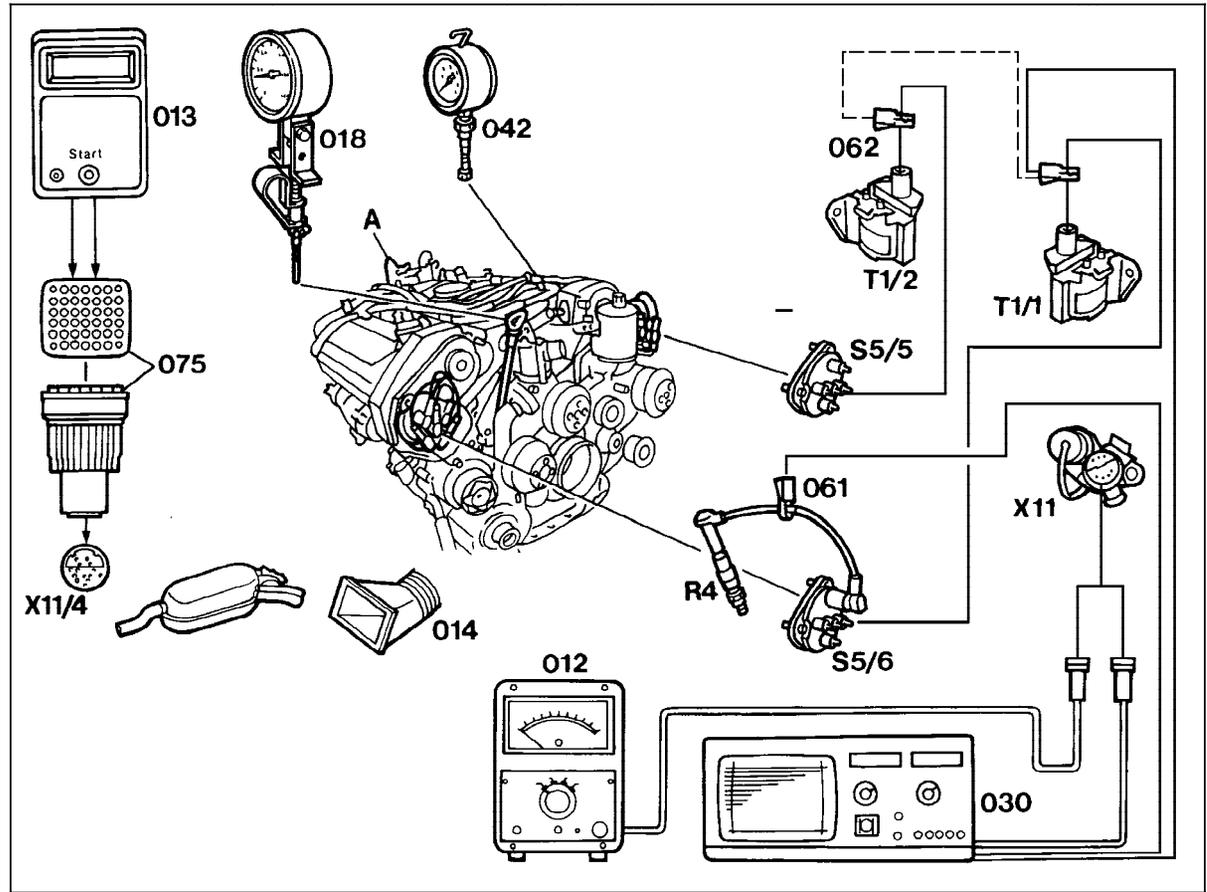
**Connection Diagram – Test Equipment
Engine 119 LH-SFI with Diagnostic
Socket (X11)**



Set engine analyzer to 4 cylinder position.
Without the diagnostic adaptor tool only one
ignition circuit can be checked at a time.

Figure 2

- A Throttle linkage
- R4 Spark plug (cylinder 1)
- S5/5 Left high-voltage distributor
- S5/6 Right high-voltage distributor
- T1/1 Ignition coil 1 (right cylinder bank)
- T1/2 Ignition coil 2 (left cylinder bank)
- X11 Diagnostic socket (9-pole)
- X11/4 Data link connector, (DTC readout, 38-pole)
- 012 On-off ratio tester
- 013 Impulse counter scan tool
- 014 Exhaust vent hose
- 018 Oil thermometer
- 030 Engine analyzer with oscilloscope
- 042 Pressure gauge
- 061 Trigger clamp (on cylinder 1)
- 062 Kilovolt clamp (on ignition coil, T1/1 or T1/2)
- 075 Impulse counter scan tool adaptor



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B 1 Engine Test, Adjustment

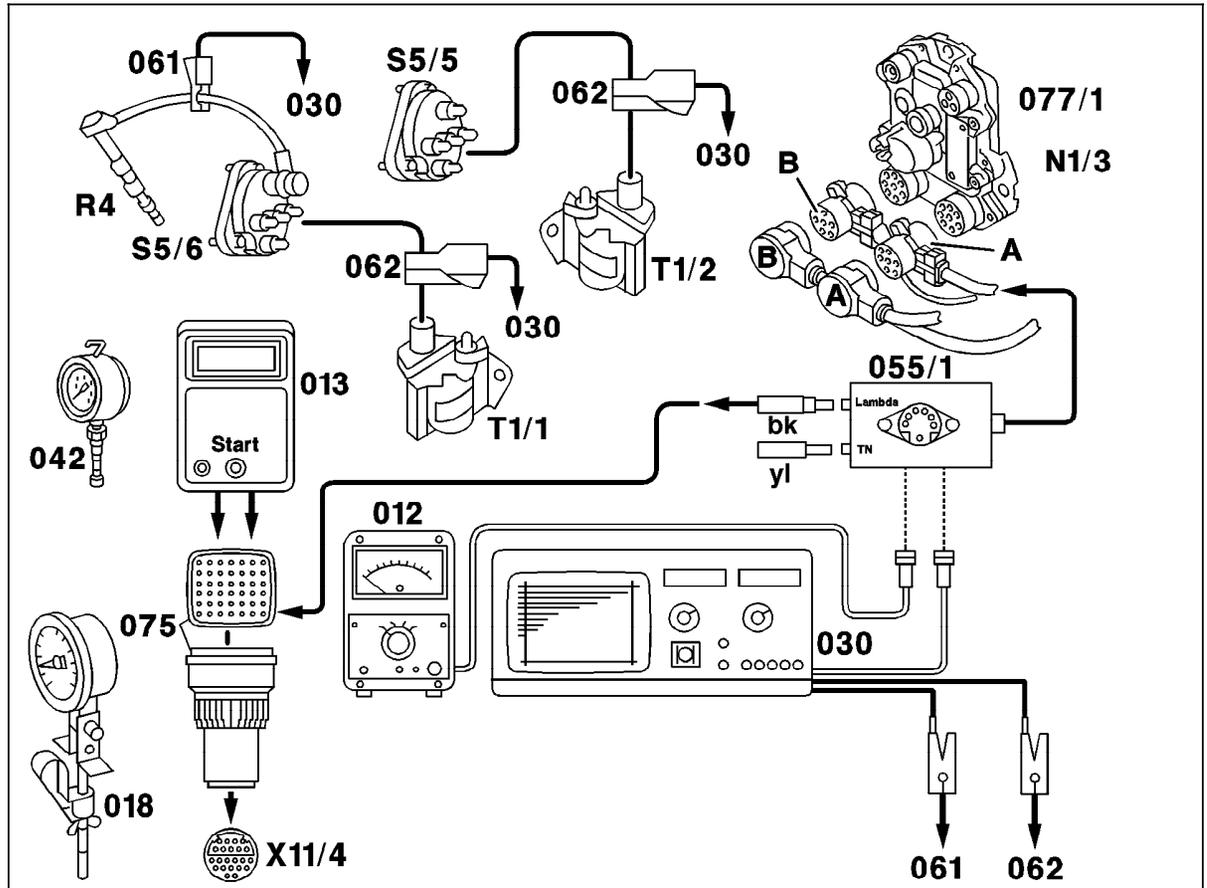
**Connection Diagram – Test Equipment
Engine 119 LH-SFI without Diagnostic
Socket (X11)**



Set engine analyzer to 4 cylinder position. Without the diagnostic adaptor tool only one ignition circuit can be checked at a time.

Figure 3

- N1/3 DI control module
- R4 Spark plug
- S5/5 Left high-voltage distributor
- S5/6 Right high-voltage distributor
- T1/1 Ignition coil 1 (right cylinder bank)
- T1/2 Ignition coil 2 (left cylinder bank)
- X11/4 Data link connector (DTC readout)
- 012 On-off ratio tester
- 013 Impulse counter scan tool
- 018 Oil thermometer
- 030 Engine analyzer with oscilloscope
- 042 Pressure gauge
- 055/1 On-off ratio signal adaptor (900 589 01 15 00)
- 061 Trigger clamp (on cylinder 1)
- 062 Kilovolt clamp (on ignition coil)
- 075 Impulse counter scan tool adaptor
- 077/1 TN signal, on-off ratio signal connector (see connector A, B in wiring diagram)



U07-6577-57

B 1 Engine Test, Adjustment

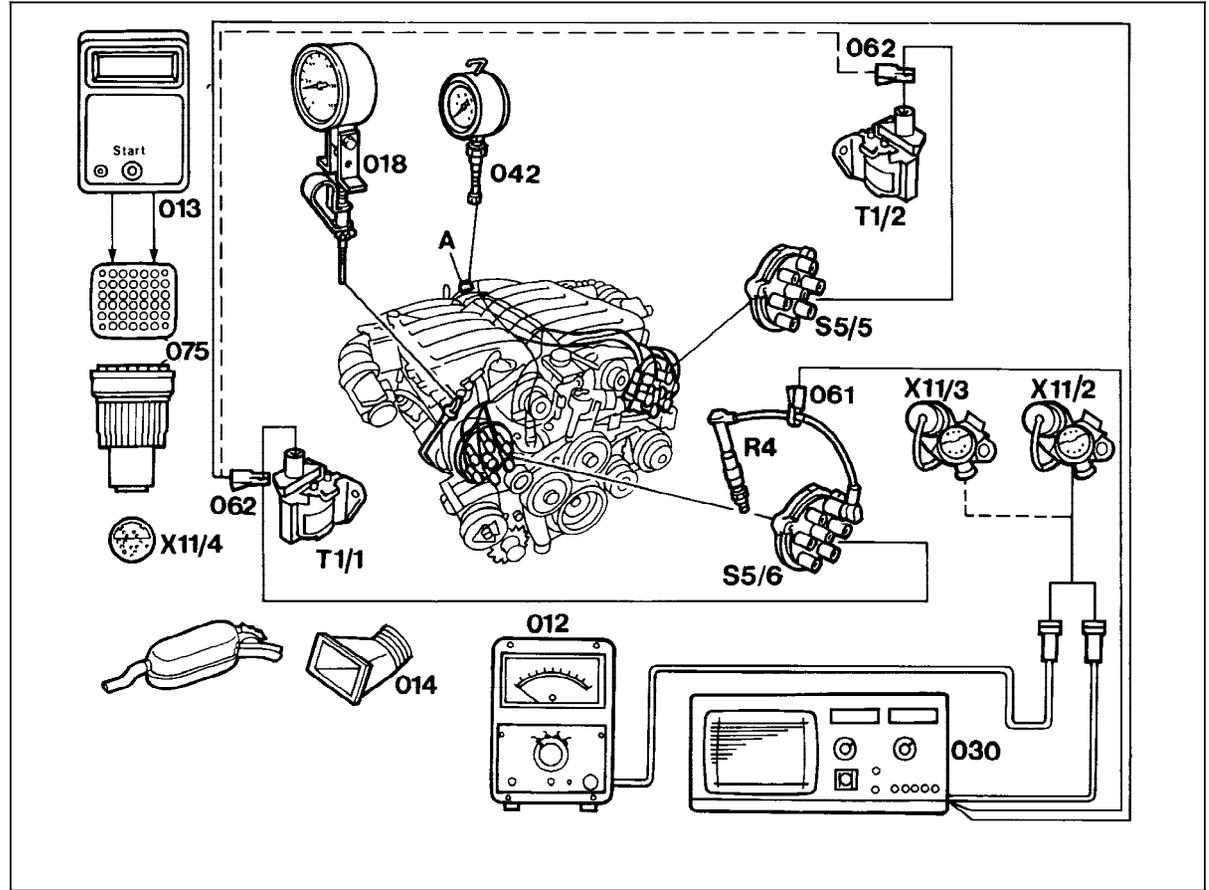
**Connection Diagram –Test Equipment
Engine 120 LH-SFI with Diagnostic Socket (X11)**
Connection diagram without diagnostic socket (X11)
see engine 119.



Set engine analyzer to 6 cylinder position. Without the diagnostic adaptor tool only one ignition circuit can be checked at a time.

Figure 4

- A Throttle linkage
- R4 Spark plug (cylinder 1)
- S5/5 Left high-voltage distributor
- S5/6 Right high-voltage distributor
- T1/1 Ignition coil 1 (right cylinder bank)
- T1/2 Ignition coil 2 (left cylinder bank)
- X11/2 Left diagnostic socket (9-pole)
- X11/3 Right diagnostic socket (9-pole)
- X11/4 Data link connector, (DTC readout, 38-pole)
- 012 On-off ratio tester
- 013 Impulse counter scan tool
- 014 Exhaust vent hose
- 018 Oil thermometer
- 030 Engine analyzer with oscilloscope
- 042 Pressure gauge
- 061 Trigger clamp (on cylinder 1)
- 062 Kilovolt clamp (on ignition coil, T1/1 or T1/2)
- 075 Impulse counter scan tool adapter



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B Test and Adjustment Jobs

Engine 104, 119, 120 LH-SFI

B 1 Engine Test, Adjustment

Connection Diagram – Impulse Counter Scan Tool and On/off Ratio Tester with Diagnostic socket (X11)

Yellow wire from Impulse counter scan tool to LH-SFI control module

Engine 104, 119 Socket 4
Engine 120 Socket 4, cylinder 1 – 6
Socket 5, cylinder 7 – 12

Yellow wire from Impulse counter scan tool to DI control module

Engine 104, 119 Socket 17
Engine 120 Socket 17, cylinder 1 – 6
Socket 18, cylinder 7 – 12

Yellow wire from Impulse counter scan tool to Base module

Engine 104, 119, 120 Socket 8

Impulse Counter Scan Tool voltage supply

Engine 104, 119, 120 Socket 1, circuit 31 ground (brown wire)
Socket 3, circuit 30 plus (red wire)

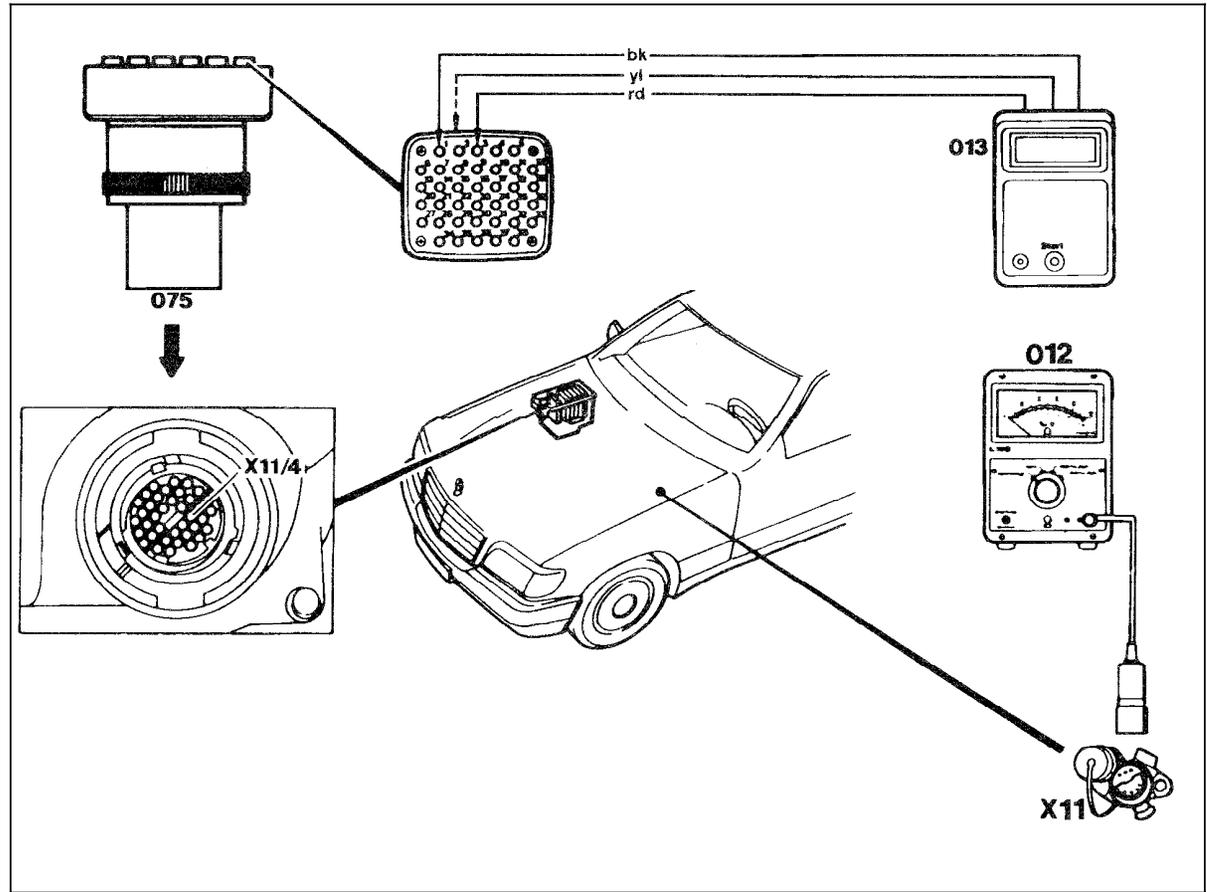


Figure 5

- 012 On-off ratio tester
- 013 Impulse counter scan tool
- 075 Impulse counter scan tool adapter
- X11 Diagnostic socket (9-pole)
- X11/4 Data link connector(DTC readout, 38-pole)

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B 1 Engine Test, Adjustment

Connection Diagram – Impulse Counter Scan Tool and On/off Ratio Tester without Diagnostic socket (X11)

a) Impulse Counter Scan Tool

Yellow wire from Impulse counter scan tool to LH-SFI control module

- Engine 104, 119 Socket 4
- Engine 120 Socket 4, cylinder 1 – 6
- Socket 5, cylinder 7 – 12

Yellow wire from Impulse counter scan tool to DI control module

- Engine 104, 119 Socket 17
- Engine 120 Socket 17, cylinder 1 – 6
- Socket 18, cylinder 7 – 12

Yellow wire from Impulse counter scan tool to Base module

- Engine 104, 119, 120 Socket 8

Impulse Counter Scan Tool voltage supply

- Engine 104, 119, 120 Socket 1, circuit 31 ground (brown wire)
- Socket 3, circuit 30 plus (red wire)

b) On-off Ratio Tester

Black wire from 055/1 to X11/4

- Engine 119 Socket 14
- Engine 120 Socket 14, cylinder 1 – 6
- Socket 15, cylinder 7 – 12

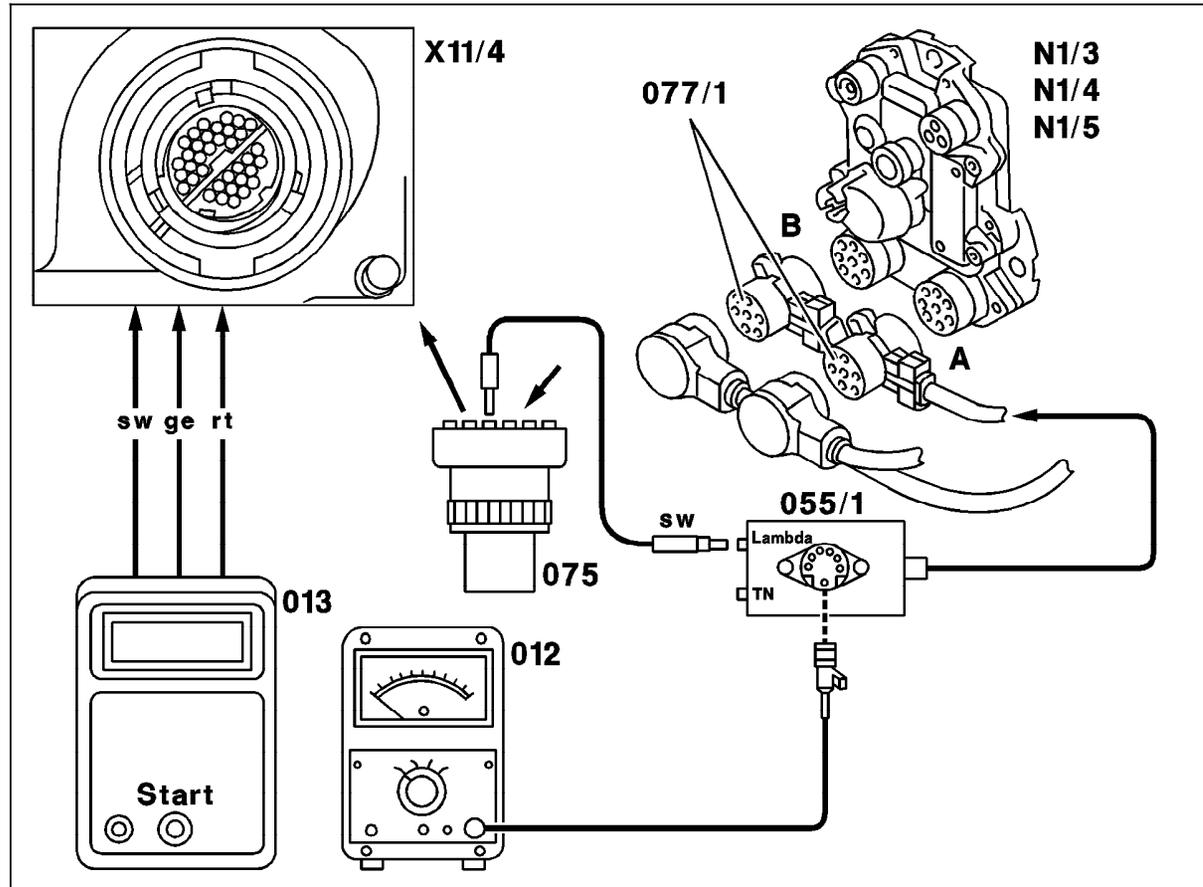


Figure 6

- 012 On-off ratio tester
- 013 Impulse counter scan tool
- 075 Impulse counter scan tool adaptor
- X11/4 Data link connector (DTC readout)
- 055/1 On-off ratio signal adaptor (900 589 01 15 00)
- 077/1 TN signal, on-off ratio signal connector (see connector A, B in wiring diagram)

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B 1 Engine Test, Adjustment

Connection chart for test equipment without diagnostic adapter for two circuit ignition systems

Test equipment version	Cylinder no. setting on test equipment	Type of measurement	Circuit on Diagnostic socket			Trigger clamp on ignition cable	kV-Clamp on ignition cable ignition circuit
			X11 Engine 119	X11/2 Engine 120 L.	X11/3 Engine 120 R.		
Bear DACE (Model 40-960) Sun MEA-1500MB	Engine 119: 4 Engine 120: 6	RPM/ dwell angle of Ignition circuit →	T1/1		T1/1		
		RPM/ dwell angle of Ignition circuit →		T1/2			
		Timing of Ignition circuit →	T1/1		T1/1	Cylinder 1	Engine 119: T1/1 Engine 120: T1/1
		Timing of Ignition circuit →	T1/2	T1/2		Engine 119: cyl. 2 ¹⁾ Engine 120: cyl. 12	Engine 119: T1/2 Engine 120: T1/2
		Oscilloscope primary/secondary → and voltage at terminal 15/1 of Ignition coil	T1/1		T1/1	Engine 119: cyl. 1 Firing order 1-4-6-7 Engine 120: cyl. 1 Firing order 1-5-3-6-2-4	Engine 119: T1/1 Firing order 1-4-6-7 Engine 120: T1/1 Firing order 1-5-3-6-2-4
		Oscilloscope primary/secondary → and voltage at terminal 15/1 of Ignition coil		T1/2		Engine 119: cyl. 5 Firing order 5-8-3-2 Engine 120: cyl. 12 Firing order 12-8-10-7-11-9	Engine 119: T1/2 Firing order 5-8-3-2 Engine 120: T1/2 Firing order 12-8-10-7-11-9

¹⁾ On engine 119 subtract 90 °CKA from measured value. Example: measured: 107 °CKA, 107-90= 17 °ignition timing

B 1 Engine Test, Adjustment**Notes regarding on/off ratio check using on/off ratio tester**

The operation of the on-off ratio control can be tested by checking the on-off ratio. In addition, any malfunctions that exist momentarily can be recognized. The tests distinguish between malfunctions that occur with the ignition **ON** or with the engine **at idle**.

The on-off ratio can be checked using the on-off ratio tester or engine analyzer. An on-off ratio of 50% indicates that all input signals are OK, but on-off ratio control is not functioning. A varying on-off ratio indicates that the on-off ratio control is functioning correctly. On-off ratios from 10% to 95% are each assigned a specific malfunction (see DTC memory, DM Engines, Volume 2, Section 2). After testing the on-off ratio, a diagnostic trouble code (DTC) readout using the impulse counter scan tool **must always** be performed.

Notes regarding diagnostic trouble code (DTC) readout using the impulse counter scan tool

When diagnosing engine running complaints, or when the CHECK-ENGINE lamp is illuminated, the DTC memory should be read out and the DTC's noted before any repairs are attempted. This will ensure that the technician can differentiate between actual malfunctions and "simulated malfunctions," since testing done on a running engine will cause malfunctions to be stored that were caused by a simulation or a disconnected circuit.

When testing is completed, the DTC memory of the LH-SFI control module, base module, DI control module and the EA/CC/ISC control module or CC/ISC control module must be cleared.

B 1 Engine Test, Adjustment**Notes regarding DTC readout using Impulse counter scan tool****1. Connect impulse counter scan tool according to diagram.**

The LED "U-Batt" should come on. If not, check the following:

- a) Voltage supply.
- b) Impulse counter scan tool fuse.

2. DTC memory readout

- a) Ignition: **ON**.
- b) Push start button for 2-4 seconds.
- c) Read and record DTC readout.
- d) Push start button again.
- e) Read and record DTC readout.

Repeats steps d) and e) until the first DTC readout reappears.

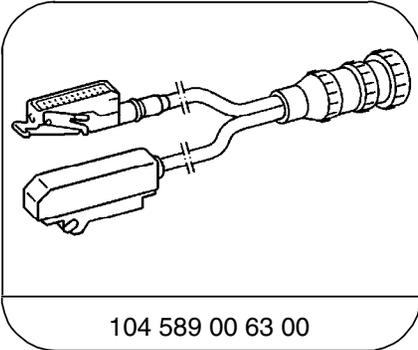
3. Clearing DTC memory

Note: The clearing process must occur within 20 seconds after the DTC readout.

- a) Ignition: **ON**
- b) Push start button 2-4 seconds (Impulse display appears).
- c) After a waiting period of 3 seconds, push the start button for 6-8 seconds which will erase the previously displayed DTC.
- d) Erase each DTC separately.
- e) Turn off ignition for at least 30 seconds.

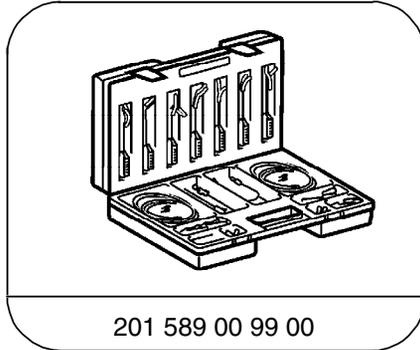
B 1 Engine Test, Adjustment

Special Tools



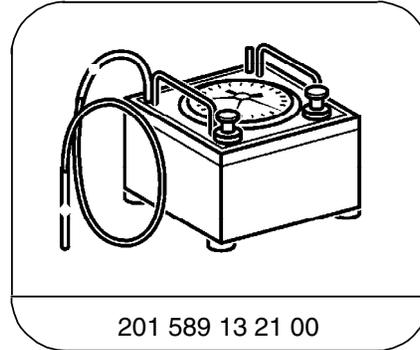
104 589 00 63 00

Test cable



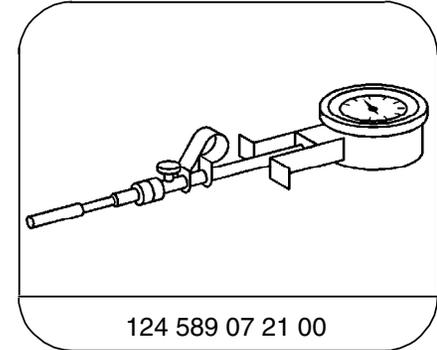
201 589 00 99 00

Electrical connecting set



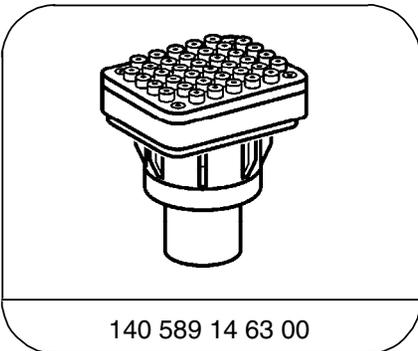
201 589 13 21 00

Tester



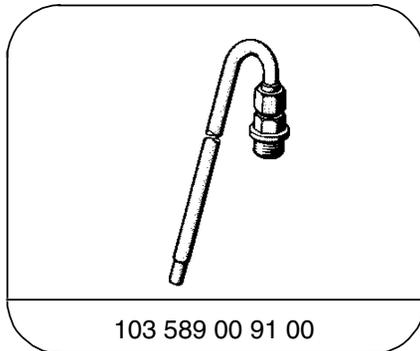
124 589 07 21 00

Remote thermometer



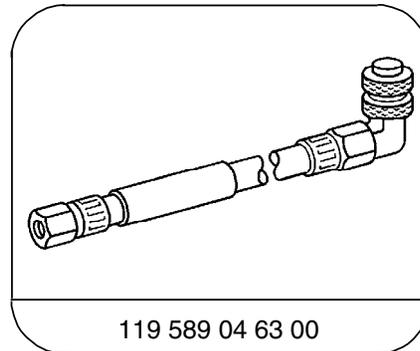
140 589 14 63 00

Adapter



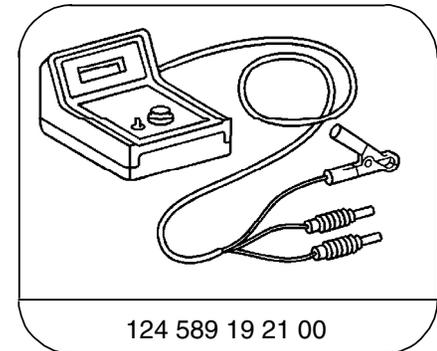
103 589 00 91 00

Measuring connection



119 589 04 63 00

Pressure hose



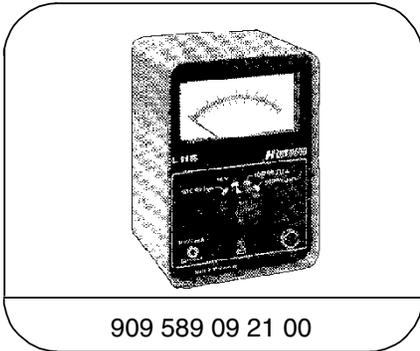
124 589 19 21 00

Pulse counter

B Test and Adjustment Jobs

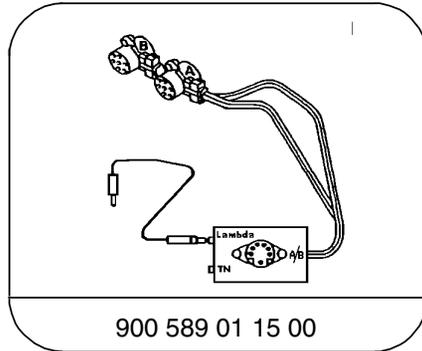
Engine 104, 119, 120 LH-SFI

B 1 Engine Test, Adjustment



909 589 09 21 00

On-off ratio tester



900 589 01 15 00

On-off ratio signal adapter

Equipment

Engine analyzer ¹⁾	Bear DACE (Model 40-960) Sun MEA-1500MB
Digital multimeter ¹⁾	Fluke models 23, 83, 85, 87

¹⁾ Available through the MBUSA Standard Equipment Program.

B 1 Engine Test, Adjustment

Note:

The on-off ratio control system test should not be performed on a very hot engine, for example, after a fast drive or after an output test on a dynamometer.

Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy ¹⁾
⇒ 1 Connect test equipment according to diagram	Ignition: OFF	–	–
⇒ 2 Base module DTC readout	Connect impulse counter scan tool: Yellow wire to socket 8 of data link connector (X11/4) Ignition: ON	DTC readout "I"	See DM Engines, Vol. 2 – 3.1 or 3.2
⇒ 3 LH-SFI control module DTC readout	Connect impulse counter scan tool: Yellow wire to data link connector (X11/4). Engine 104, 119 Socket 4 Engine 120 Socket 5, left LH-SFI control module (cyl. 7 – 12) Socket 4, right LH-SFI control module (cyl. 1 – 6) Ignition: ON	DTC readout "I"	See DM Engines, Vol. 2 – 3.1 or 3.2

¹⁾ Observe Preparation for Test, see 22.

B 1 Engine Test, Adjustment

Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy ¹⁾
⇒ 4 DI control module DTC readout	Connect impulse counter scan tool: yellow wire to data link connector (X11/4) Engine 104, 119 Socket 17 Engine 120 Socket 18, left DI control module (cyl. 7 – 12) Socket 17, right DI control module (cyl. 1 – 6) Ignition: ON	DTC readout "I"	See DM Engines, Vol. 2 – 5.2 or 5.3
⇒ 5.0 EA/CC/ISC control module (N4/1) DTC readout	Connect impulse counter scan tool: yellow wire to socket 7 of data link connector X11/4 Ignition: ON	DTC readout "I"	See DM Engines, Vol. 2 – 6.2 or 6.3
⇒ 5.1 CC/ISC control module (N4/3) DTC readout	Connect impulse counter scan tool: yellow wire to socket 7 of data link connector X11/4 Ignition: ON	DTC readout "I"	See DM Engines, Vol. 2 – 7.1
⇒ 5.2 Not applicable for U.S. version vehicles	–	–	–

¹⁾ Observe Preparation for Test, see 22.

B Test and Adjustment Jobs

Engine 104, 119, 120 LH-SFI

B 1 Engine Test, Adjustment

Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy ¹⁾
⇒ 6 Remove and install air cleaner	Ignition: OFF	–	–
⇒ 7 Check condition and free movement of throttle linkage and throttle valve	Ignition: OFF Actuate throttle linkage	Smooth operation, no binding should be evident.	Lubricate all bearings and ball sockets.
⇒ 7.1 Check WOT position	Ignition: OFF Accelerator pedal at WOT position (do not actuate kickdown switch).	Throttle valve lever must rest against wide open throttle stop (audible contact).	Adjust WOT stop (SMS, Job No. 30 – 1010).
⇒ 7.2 Check CTP	Ignition: OFF Accelerator pedal at CTP.	Throttle valve lever must rest against closed throttle stop (audible contact).	Adjust CTP stop on engine (SMS, Job No. 30 – 1010).
⇒ 8 Check automatic transmission control pressure cable	Ignition: OFF Accelerator pedal at CTP.	Arrows must align.	Adjust control pressure cable (SMS, Job No. 30 – 1010).

¹⁾ Observe Preparation for Test, see 22.

B 1 Engine Test, Adjustment

Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy ¹⁾
⇒ 9 Check fuel pressure	Connect/disconnect pressure gauge Engine: at Idle	3.2 to 3.6 bar	Check fuel pumps and FP relay module (DM Engines, Vol. 2 – 3.1 or 3.2).
⇒ 10 Engine coolant level	Ignition: OFF	Marking: min - max	Correct engine coolant level
⇒ 11 Engine oil level	Ignition: OFF	Marking: min - max	Correct engine oil level
⇒ 12 Check primary and secondary ignition circuits	Ignition: at Idle	See Test and Adjustment Data (Section A)	Check ignition system (DM Engines, Vol. 2 – 5.2 or 5.3)
⇒ 13 Check ignition timing with and without vacuum	Engine: at Idle Transmission range “P” Climate control system: OFF	See Test and Adjustment Data (Section A)	Check ignition system (DM Engines, Vol. 2 – 5.2 or 5.3)

¹⁾ Observe Preparation for Test, see 22.

B 1 Engine Test, Adjustment

Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy ¹⁾
⇒ 14 Evaluate oscilloscope patterns	Engine: at Idle Briefly accelerate to 3000 rpm	Voltage difference between cylinders 3kV. Voltage increase with engine accelerated should be no more than 6 kV over idle value.	Check ignition system (DM Engines, Vol. 2 – 5.2 or 5.3)
⇒ 15 Warm engine oil to operating temperature	Engine rpm: Maintain at approx. 3000 rpm	Engine oil temperature approx. 80 °C	–
⇒ 16 Check closed throttle (idle) rpm	Engine: at Idle Selector lever in “P”, climate control system “OFF”.	See Test and adjustment data (section A)	Test program: Check EA/CC/ISC system (DM Engines, Vol. 3 – 6.2 or 6.3), Check CC/ISC system (DM Engines, Vol. 3 – 7.1)
⇒ 17 Check on-off ratio control system	Selector lever in “P”, Climate control system OFF. Disconnect and plug purge line (A or B) at switchover valve (Figure 1, 3 and 4). Reconnect line after measurment. Engine: at Idle	See Test and adjustment data (section A)	Check electronic components with socket box tester (DM Engines, Vol. 2 – 3.1 or 3.2)

¹⁾ Observe Preparation for Test, see 22.

B 1 Engine Test, Adjustment

Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy ¹⁾
⇒ 18 Not applicable for U.S. version vehicles	—	—	—
⇒ 19 Check CTP speed under load	Engine: at Idle TR “D” (service and parking brake applied), Switch on all electrical consumers, Turn steering wheel to full lock.	Engine must continue to idle within specified range.	Test program: Check EA/CC/ISC system (DM Engines, Vol. 3 – 6.2 or 6.3), Check CC/ISC system (DM Engines, Vol. 3 – 7.1)

¹⁾ Observe Preparation for Test, see 22.

B 1 Engine Test, Adjustment

**Accelerator Control
Engine 119 LH-SFI (without ASR)**

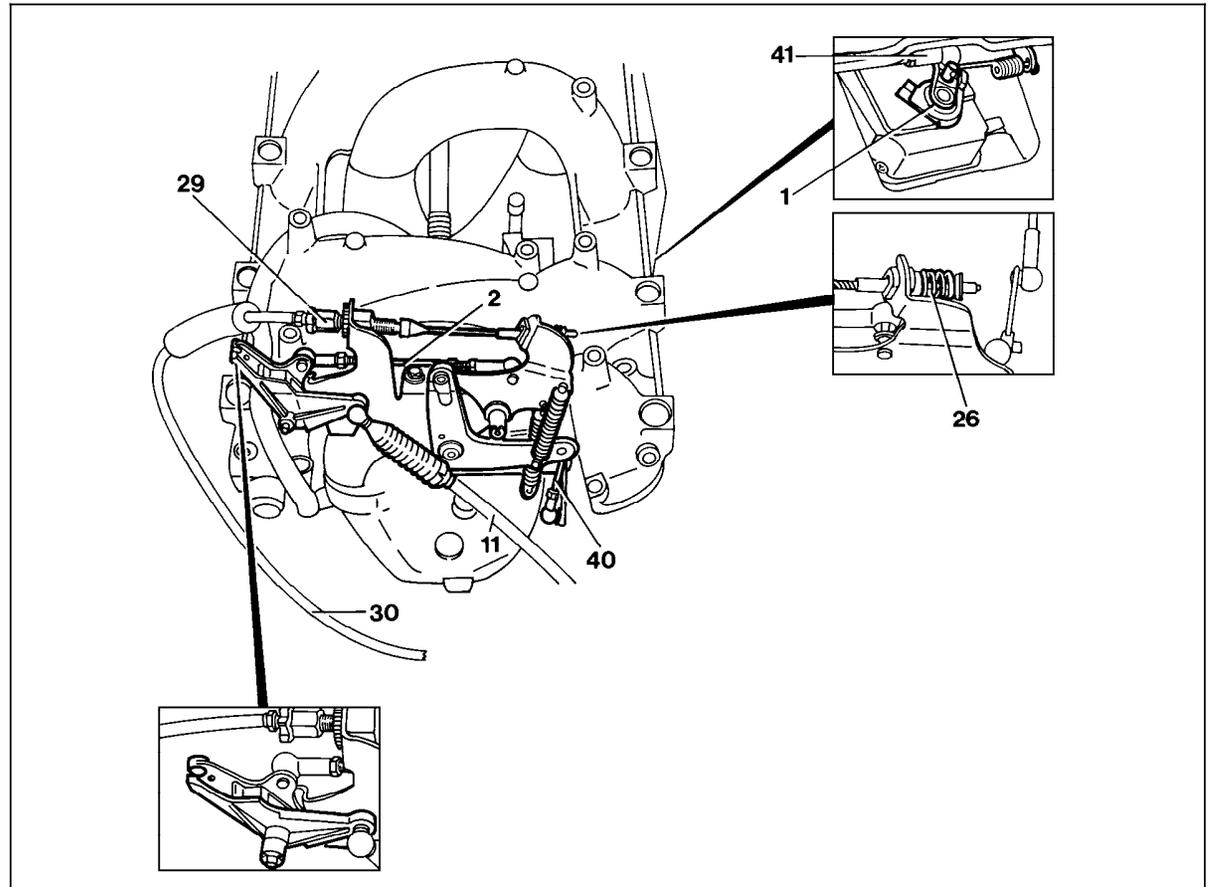


Figure 7

- 1 Bell crank
- 2 Connecting link
- 11 Control pressure cable for automatic transmission
- 26 Spring
- 29 Adjustment screw
- 30 Bowden cable
- 40 Idle travel rod
- 41 Connecting link

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B 1 Engine Test, Adjustment

**Accelerator Control
Engine 119 LH-SFI (with ASR)**

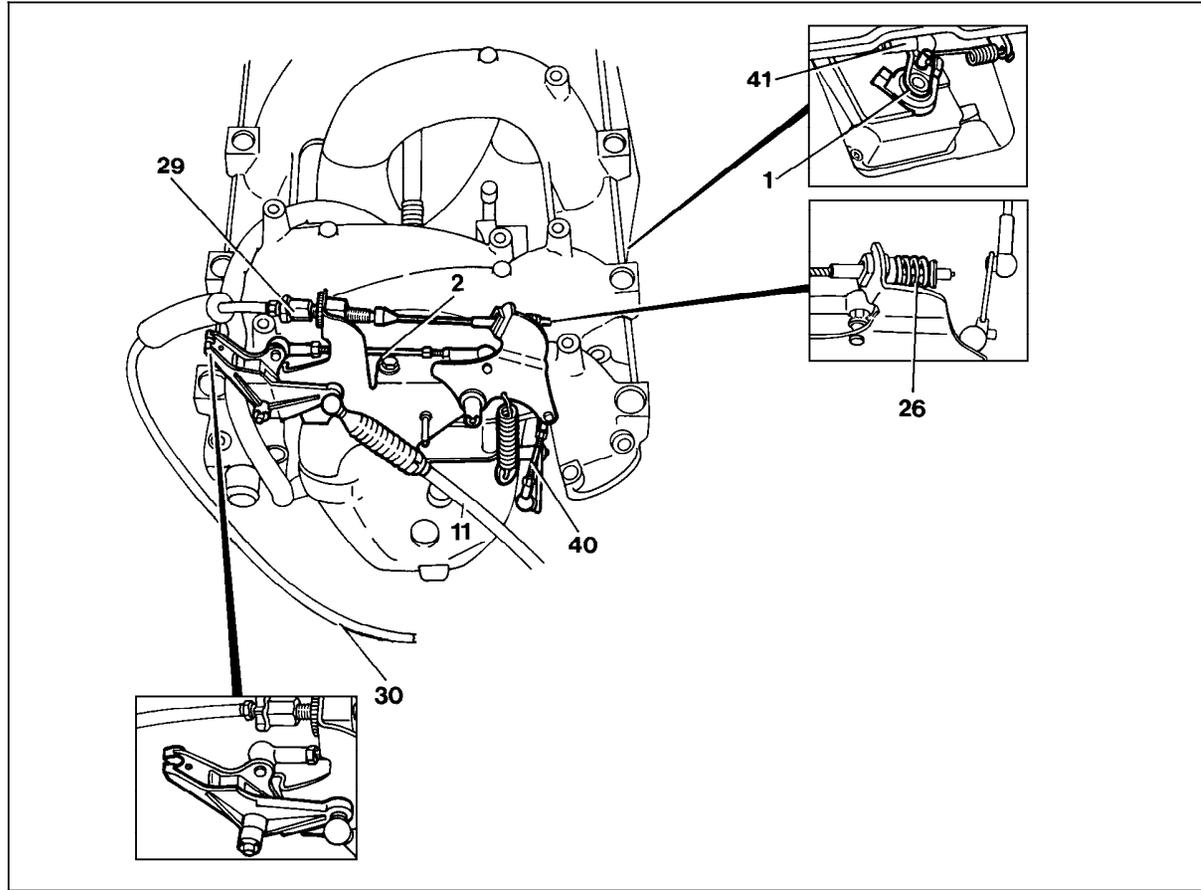


Figure 8

- 1 Bell crank
- 2 Connecting link
- 11 Control pressure cable for automatic transmission
- 26 Spring
- 29 Adjustment screw
- 30 Bowden cable
- 40 Idle travel rod
- 41 Connecting link

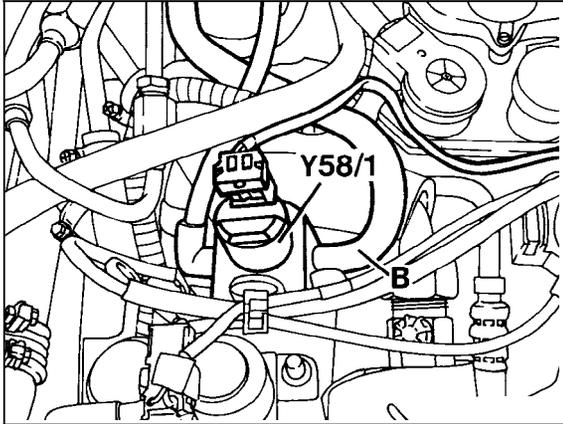
P30-0146-57

B Test and Adjustment Jobs

Engine 104, 119, 120 LH-SFI

B 1 Engine Test, Adjustment

Component Locations

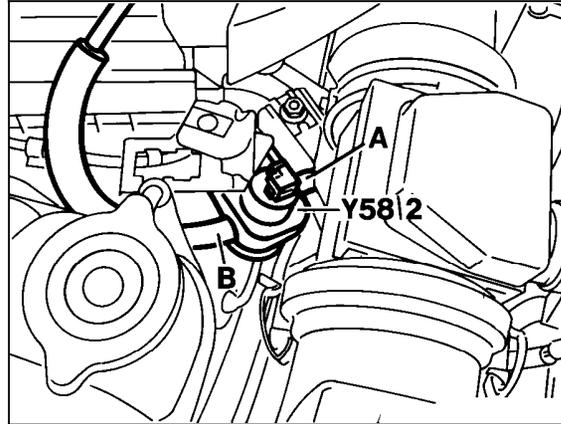


P47-5047-13

Figure 9

Model Model 140, Engine 104, 119

- | | |
|-------|---------------------------------|
| Y58/1 | Purge control valve |
| A | Purge line to engine |
| B | Purge line to charcoal canister |

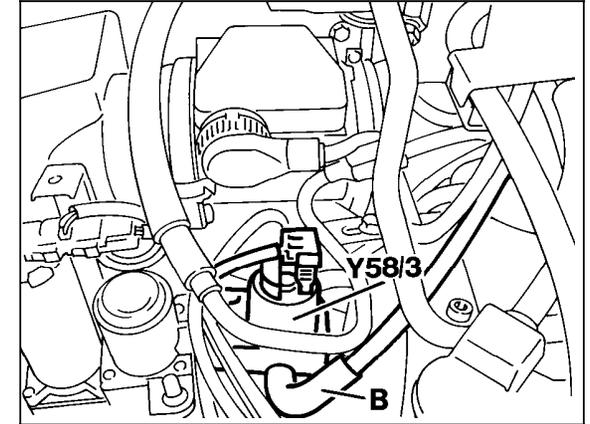


P07-5240-13A

Figure 10

Model Model 140, Engine 120

- | | |
|-------|--|
| Y58/2 | Left purge control valve (located on right side of engine) |
| A | Purge line to engine |
| B | Purge line to charcoal canister |



P47-5056-13

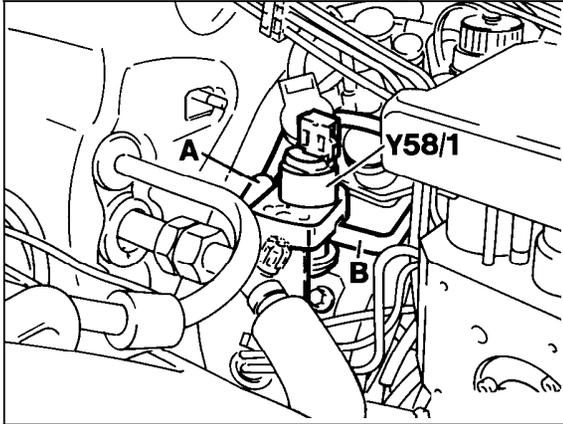
Figure 11

Model Model 140, Engine 120

- | | |
|-------|--|
| Y58/3 | Right purge control valve (located on left side of engine) |
| A | Purge line to engine |
| B | Purge line to charcoal canister |

B 1 Engine Test, Adjustment

Component Locations



P47-5057-13

Figure 12

Model Model 124, Engine 119

- Y58/1 Purge control valve
- A Purge line to engine
- B Purge line to charcoal canister

B 1 Engine Test, Adjustment



With starting or warm up complaints do not condition engine to operating conditions but proceed according to complaint.

Listing of Test Steps

1	Test equipment	connect/disconnect according to connection diagram
2	Engine control module version ⇒ Ignition: ON	read, only possible using HHT, see Parts Microfiche, group 54.
3	Engine coolant level	check, correct.
4	Engine oil level	check, observe condition of oil.
5	DTC's in Engine control module (HFM-SFI) ⇒ Ignition: ON	read using HHT or impulse counter scan tool.
6	DTC's in EA/CC/ISC control module ⇒ Ignition: ON	read using HHT or impulse counter scan tool.
6.1	DTC's in CC/ISC control module ⇒ Ignition: ON	read using HHT or impulse counter scan tool.
6.2	DTC's in ISC control module ⇒ Ignition: ON	read using HHT or impulse counter scan tool.
7	Throttle control linkage	check throttle valve for free movement and condition. Lubricate bearings, gate levers and ball sockets.
7.1	WOT contact ¹⁾	check using accelerator pedal, adjust (see SMS, Job No. 30 – 1010).
7.2	CTP contact ¹⁾	check, adjust (see SMS, Job No. 30 – 1010).
7.3	Control pressure cable of AT	check, adjust (see SMS, Job No. 30 – 1010).
8	Fuel pressure	check (Test and Adjustment Data, section A).
	└ Relief pressure via valve on gauge.	
9	Engine rpm (at Idle)	check, only possible using HHT (Test and Adjustment Data, section A).
10	Ignition timing ⇒ Engine: at Idle	check (Test and Adjustment Data, section A) (Socket 1 on socket box or TNA signal from data link connector X11/4, socket 10).

¹⁾ Wide open and closed throttle contact only possible using HHT.

B 1 Engine Test, Adjustment

11	Selector lever position ⇒ Engine: at Idle	check ²⁾ .
12	Not applicable for U.S. version vehicles	—
13	AIR pump ⇒ Engine: at Idle	check ²⁾ .
14	Deceleration shut-off ⇒ Engine: Decelerating	check ²⁾ .
15	Injection time ⇒ Engine: at Idle	check ²⁾ .
16	Air mass/pressure ⇒ Engine: at Idle	check ²⁾ .
17	Self-adaptation ⇒ Engine: at Idle/partial load	check ²⁾ .
18	On-off ratio control ⇒ Engine: at Idle	check ²⁾ .
19	Throttle valve angle ⇒ Engine: at Idle	check ²⁾ .
20	O2S voltage	check ²⁾ .
21	Not applicable for U.S. version vehicles	—
22	CTP speed under load	check in TR “D” (with service and parking brake applied) and with all consumers turned on.
23	Battery voltage	check ²⁾ .
24	Ignition fault counter	check ²⁾ .
25	Coil fault counter	check ²⁾ .
26	Coil spark duration	check ²⁾ .
27	Coil spark voltage	check ²⁾ .
28	Knock ignition angle	check ²⁾ .

²⁾ Only possible using HHT (Test and Adjustment Data, section A).

B 1 Engine Test, Adjustment

Connection Diagram – Engine 104 HFM-SFI

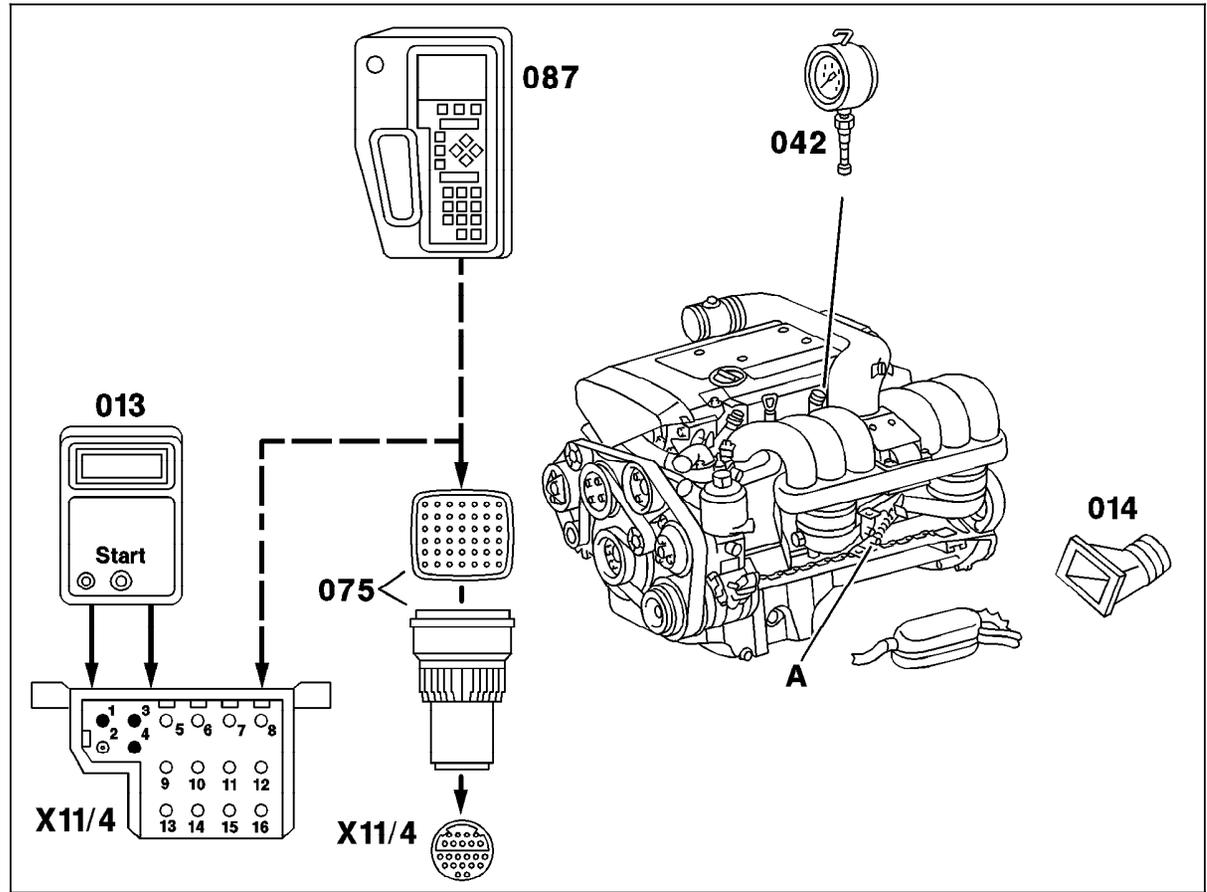


Figure 1

- A Throttle linkage
- X11/4 Data link connector, (DTC readout, 38-pole)
- 013 Impulse counter scan tool
- 014 Exhaust vent hose
- 042 Pressure gauge
- 075 Impulse counter scan tool adapter
- 087 Hand-Held Tester (HHT)

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B 1 Engine Test, Adjustment

Connection Diagram – Engine 111 HFM-SFI

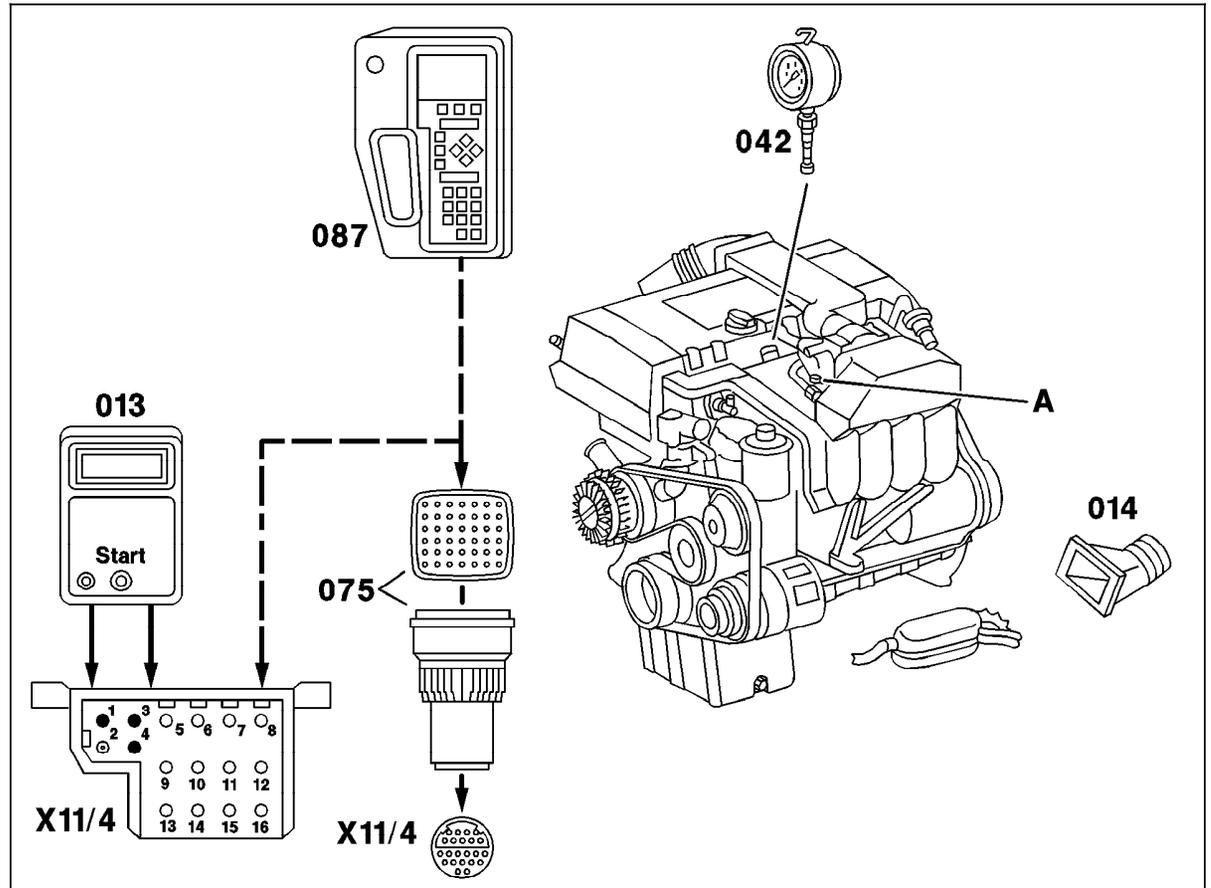


Figure 2

- A Throttle linkage
- X11/4 Data link connector (DTC readout, 16-pole)
- 013 Impulse counter scan tool
- 014 Exhaust vent hose
- 042 Pressure gauge
- 075 Impulse counter scan tool adapter
- 087 Hand-Held Tester (HHT)

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B 1 Engine Test, Adjustment

Connection Diagram – Impulse Counter Scan Tool/HHT

Impulse counter scan tool

- Black wire (circuit 31, ground) Socket 1
- Red wire (circuit 15, ignition) Socket 16
- Yellow wire (diagnostics HFM-SFI) Socket 8

Hand-Held Tester (HHT)

a) on X11/4, 16-pole

- Black wire (circuit 31, ground) Socket 1
- White wire (circuit 15, ignition) Socket 16
- Red wire (circuit 30) Battery + or X11/4
- Yellow wire (diagnostics HFM-SFI) Socket 8

b) with multiplexer (094) on X11/4, 38-pole

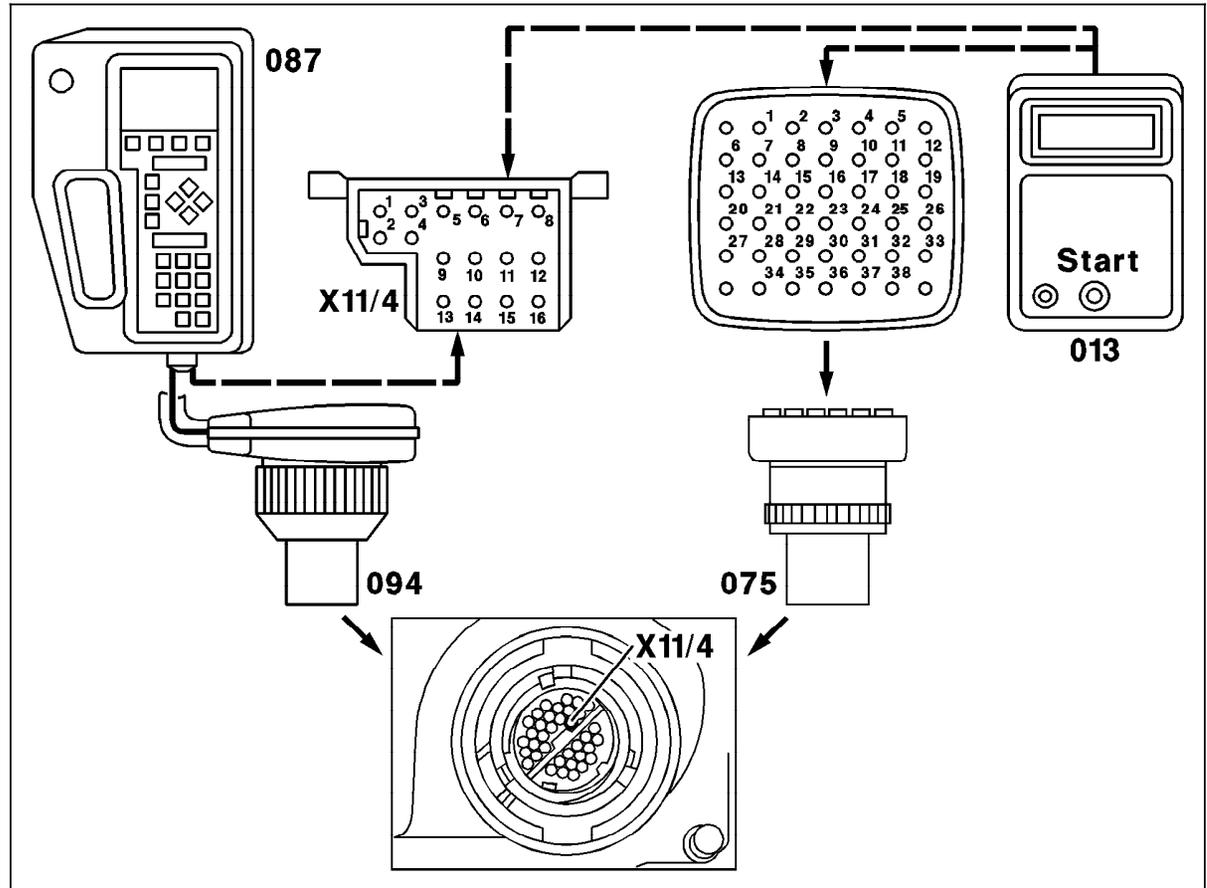


Figure 1

- 013 Impulse counter scan tool
- 075 Impulse counter scan tool adaptor
- 087 Hand-Held Tester (HHT)
- 094 Multiplexer
- X11/4 Data link connector (DTC readout)

P07-6583-57

B 1 Engine Test, Adjustment**Notes Regarding DTC Readout Using Impulse Counter Scan Tool****1. Connect impulse counter scan tool according to diagram.**

The LED "U-Batt" should come on. If not, check the following:

- a) Voltage supply.
- b) Impulse counter scan tool fuse.

2. DTC memory readout

- a) Ignition: **ON**.
- b) Push start button for 2-4 seconds.
- c) Read and record DTC readout.
- d) Push start button again.
- e) Read and record DTC readout.

Repeat steps d) and e) until the first DTC readout reappears.

3. Clearing DTC memory

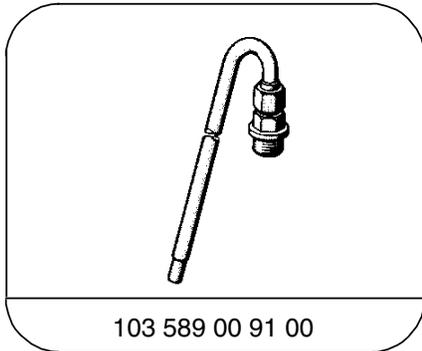
- a) Ignition: **ON**
- b) Press start button for 2-4 seconds (DTC appears).
- c) Push start button 6-8 seconds, thereby clearing the previously displayed malfunction (DTC) from memory.
- d) Repeat steps b) and c) until DTC "I" (no stored DTC's) appears.

4. Resetting and Reactivating the Engine Control Module DTC Memory

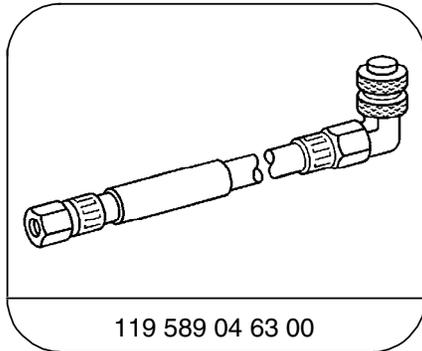
- a) Clear DTC's from memory.
- b) After DTC "I" reappears, press start button for 6-8 seconds.
- c) Turn ignition **OFF** and wait at least 2 seconds.
- d) Turn ignition **ON** and wait at least 10 seconds. Then start engine.

B 1 Engine Test, Adjustment

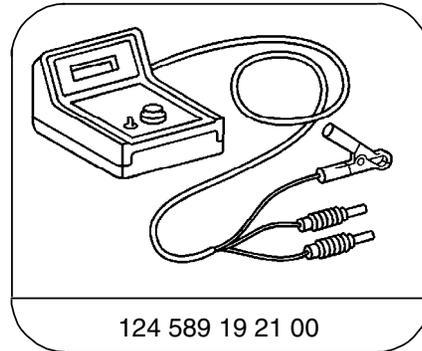
Special Tools



Measuring connection



Pressure hose



Pulse counter

Equipment

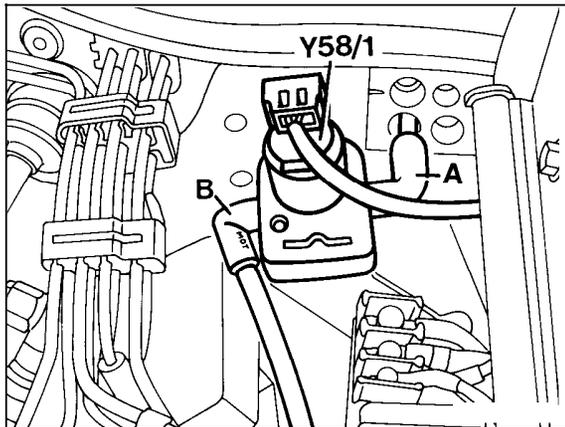
Engine analyzer ¹⁾	Bear DACE (Model 40-960) Sun MEA-1500MB
Hand-Held Tester (HHT)	see applicable Service Information in groups 58 and 99

¹⁾ Available through the MBUSA Standard Equipment Program.

B Test and Adjustment Jobs

Engines 104, 111 HFM-SFI

B 1 Engine Test, Adjustment

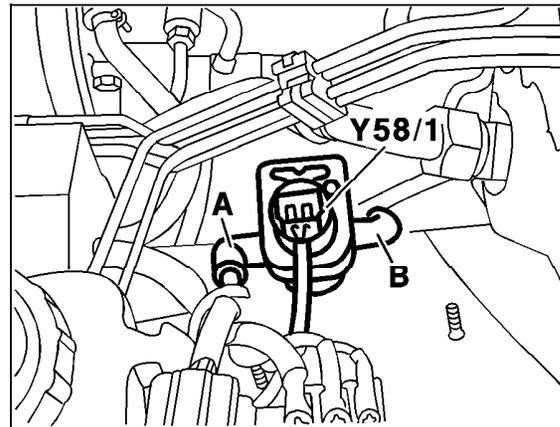


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Figure 1

Model 124, Engine 104

- Y58/1 Purge control valve
A Purge line to engine
B Purge line to charcoal canister

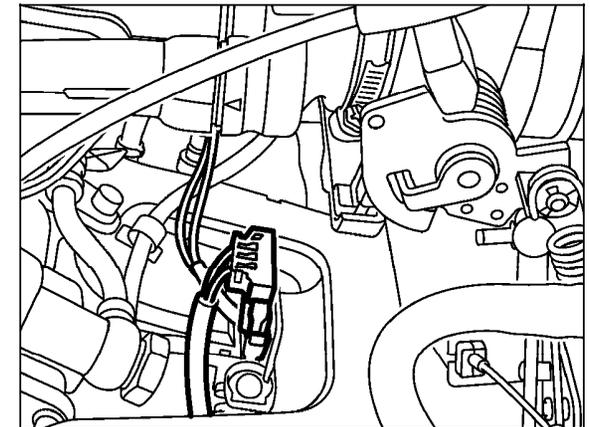


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Figure 2

Model 202, Engine 111

- X12/3 Terminal block (circuit 30/15 unfused) (3-pole)



P07-6246-13

Figure 3

Model 202, Engine 111

- X26/24 Engine/ignition coils connector (3-pole)

B 1 Engine Test, Adjustment ¹⁾

07-1100 ¹⁵⁾



With starting or warm up complaints do not condition engine to operating conditions but proceed according to complaint.

Listing of Test Steps

- | | | |
|----|---|---|
| 1 | Test equipment | connect/disconnect according to connection diagram |
| 2 | Throttle control linkage | check throttle valve for free movement and condition. Lubricate bearings, gate levers and ball sockets. |
| 3 | Engine coolant level | check, correct. |
| 4 | Engine oil temperature | check. |
| 5 | Engine control module version ⇒ Ignition: ON | read, only possible using HHT, see Parts Microfiche, group 54. |
| 6 | DTC's in engine control module (ME-SFI) ⇒ Ignition: ON | read using HHT . |
| 7 | Engine oil level | check, observe condition of oil. |
| 8 | Fuel tank level | check. |
| 9 | WOT contact, CTP contact at pedal value sensor | check. |
| 10 | Fuel pressure | check. |

WARNING!

Release pressure using 2 or 3 way valve on gauge.

- | | | |
|----|--|--------|
| 11 | Engine rpm at Idle (transmission selector lever in P/N position) | check. |
| 12 | ECT | check. |
| 13 | IAT | check. |

¹⁾ Only possible using HHT (Test and Adjustment Data, section A).

¹⁵⁾ Time Guide operation no. and/or SMS job no.

B 1 Engine Test, Adjustment

14	Ignition timing	check.
15	Throttle valve angle	check.
16	Throttle valve stop	check.
17	Battery voltage	check.
18	Purge valve on-off ratio	check.
19	Injection time ⇒ Engine: at Idle	check.
20	EA actuator	check.
21	Deceleration shut-off⇒ Engine: decelerating	check.
22	AIR pump ⇒ Engine: at idle	check.
23	CTP and WOT recognition	check.
24	Camshaft adjustment solenoid	check.
25	Camshaft Hall-effect sensor	check.
26	Air mass ⇒ Engine: at Idle	check.
27	MAP voltage	check.
28	O2S 1 voltage (before TWC)	check.
29	Lambda control (before TWC)	check.
30	O2S 2 voltage (after TWC)	check.
31	Lambda control (after TWC)	check.
32	Self-adaptation ⇒ Engine: at Idle/partial load	check.

B 1 Engine Test, Adjustment

- 33 Transmission range (selector lever position P/N) check.
- 34 A/C compressor check.
- 35 Purge control system check.
- 36 Safety fuel shut-off check.
- 37 Torque check.
- 38 Idle speed under load check with selector lever in "D"(with service and parking brake applied) and consumers on.

B 1 Engine Test, Adjustment

**Connection Diagram –
Engines 111, 119, 120 ME-SFI**
(shown on model 140, engine 120)

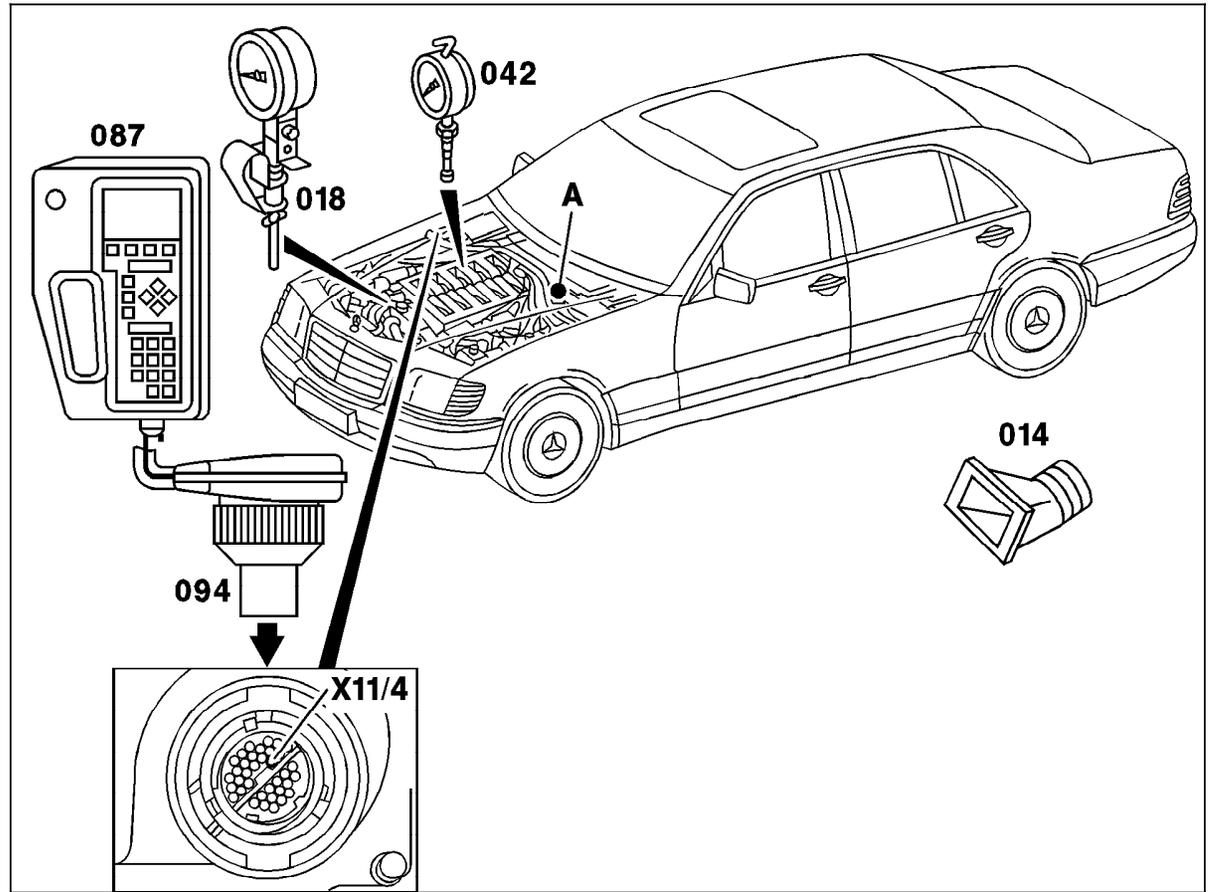


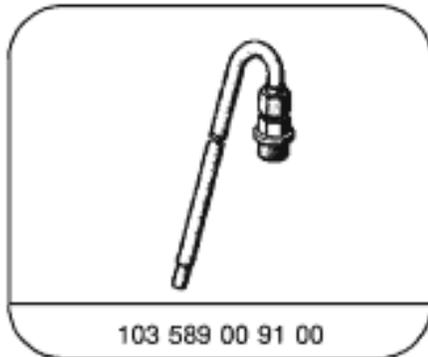
Figure 1

- A Throttle linkage
- X11/4 Data link connector, (DTC readout, 38-pole)
- 014 Exhaust vent hose
- 018 Oil thermometer
- 042 Pressure gauge
- 087 Hand-Held Tester (HHT)
- 094 Multiplexer

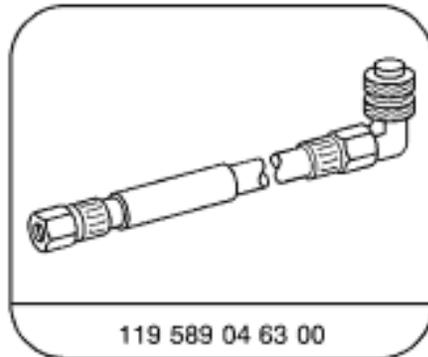
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B 1 Engine Test, Adjustment

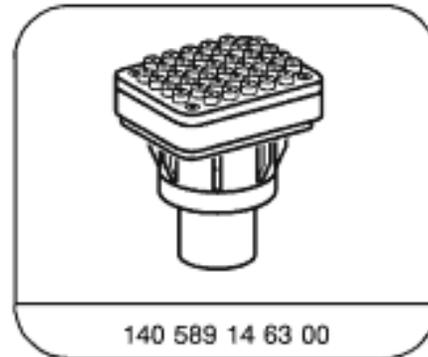
Special Tools



Measuring connection



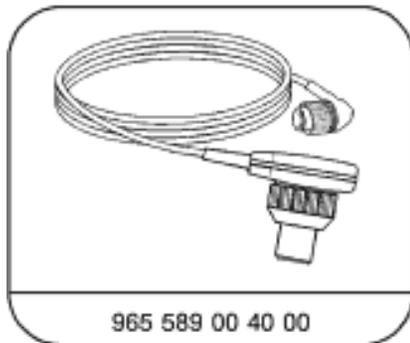
Pressure hose



Adapter



Hand-Held-Tester

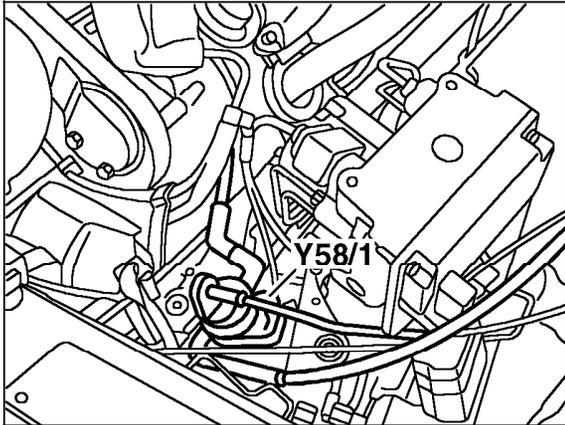


Test cable

B Test and Adjustment Data

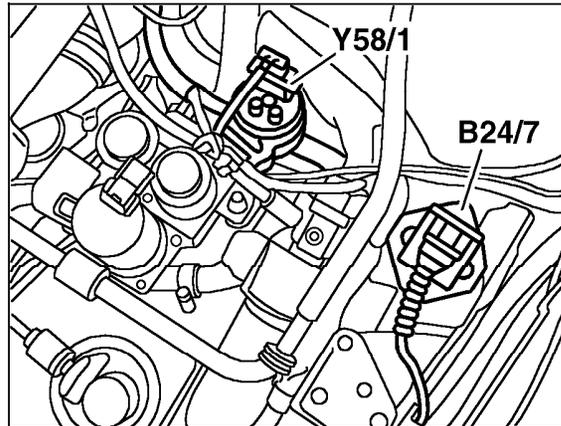
Engines 111, 119, 120 ME-SFI

B 1 Engine Test, Adjustment



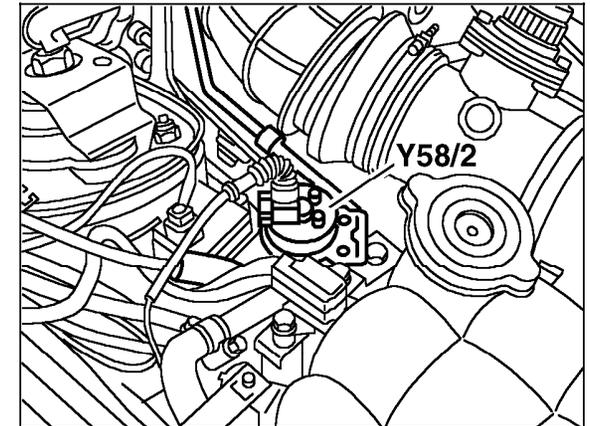
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Figure 2
Model 129, Engine 119
Y58/1 Purge control valve



P07-6809-13

Figure 3
Model 140, Engine 119
Y58/1 Purge control valve



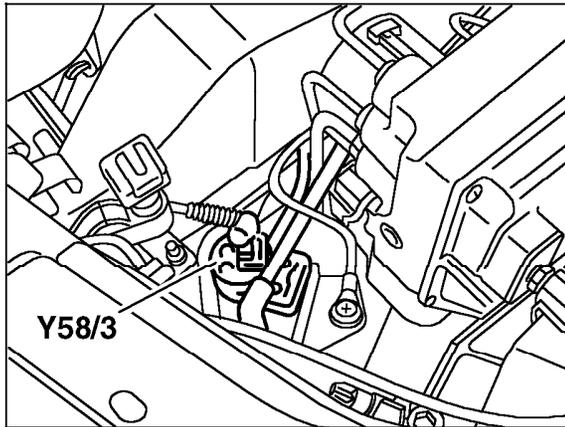
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Figure 4
Model 129, Engine 120
Y58/2 Left purge control valve
Located on right side of engine

B Test and Adjustment Data

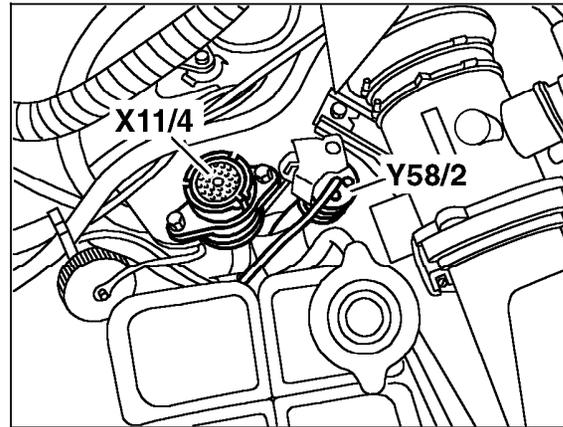
Engines 111, 119, 120 ME-SFI

B 1 Engine Test, Adjustment



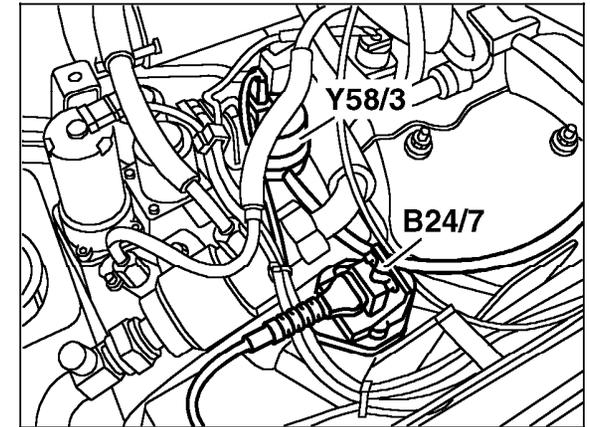
P07-6777-13

Figure 5
Model 129, Engine 120
Y58/3 Right purge control valve
Located on left side of engine



P07-6811-13

Figure 6
Model 140, Engine 120
Y58/2 Left purge control valve
Located on right side of engine



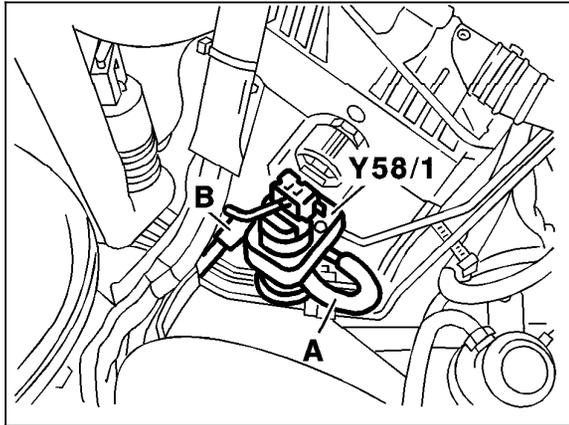
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Figure 7
Model 140, Engine 120
Y58/3 Right purge control valve
Located on left side of engine

B Test and Adjustment Data

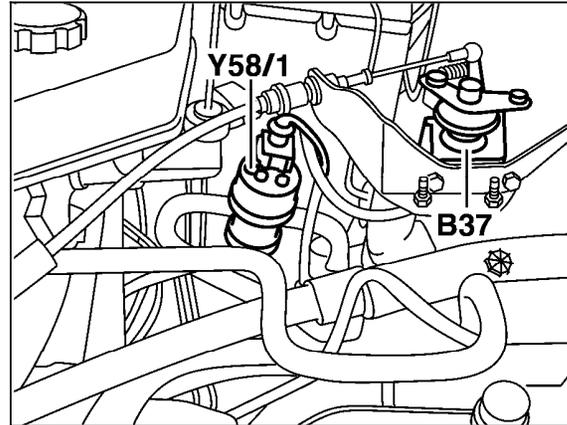
Engines 111, 119, 120 ME-SFI

B 1 Engine Test, Adjustment



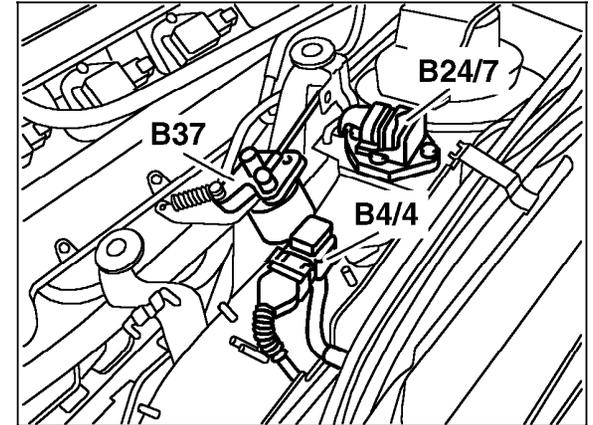
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Figure 8
Model 202, Engine 111
Y58/1 Purge control valve



P07.61-0295-13

Figure 9
Model 170, Engine 111
Y58/1 Purge control valve



P07-6791-13

Figure 10
Model 129
B37 Pedal value sensor