

**B 2 Closed Throttle Position (CTP) Test, Adjustment**

	Page
Engines 104, 119 CFI .....	31/1
Engines 104, 119, 120 LH-SFI .....	41/1
Engines 104, 111 HFM-SFI .....	42/1
Engines 111, 119, 120 ME-SFI .....	43/1

**B 2 Idle Test, Adjustment**

**Listing of Test Steps**

1	Test equipment .....	connect/disconnect.
2.0	Throttle control .....	check throttle operation and condition.
2.1	Closed throttle stop .....	check.
3	Ignition timing and vacuum advance .....	check (see Test and Adjustment Data, Section A).
4	Engine oil temperature .....	approx. 80 °C.
5	Closed throttle rpm .....	check
6	Lambda control .....	check
7	Closed throttle under load .....	check in transmission range D with all electrical consumers on.

## B 2 Idle Test, Adjustment

### Connection of Test Equipment Engine 104



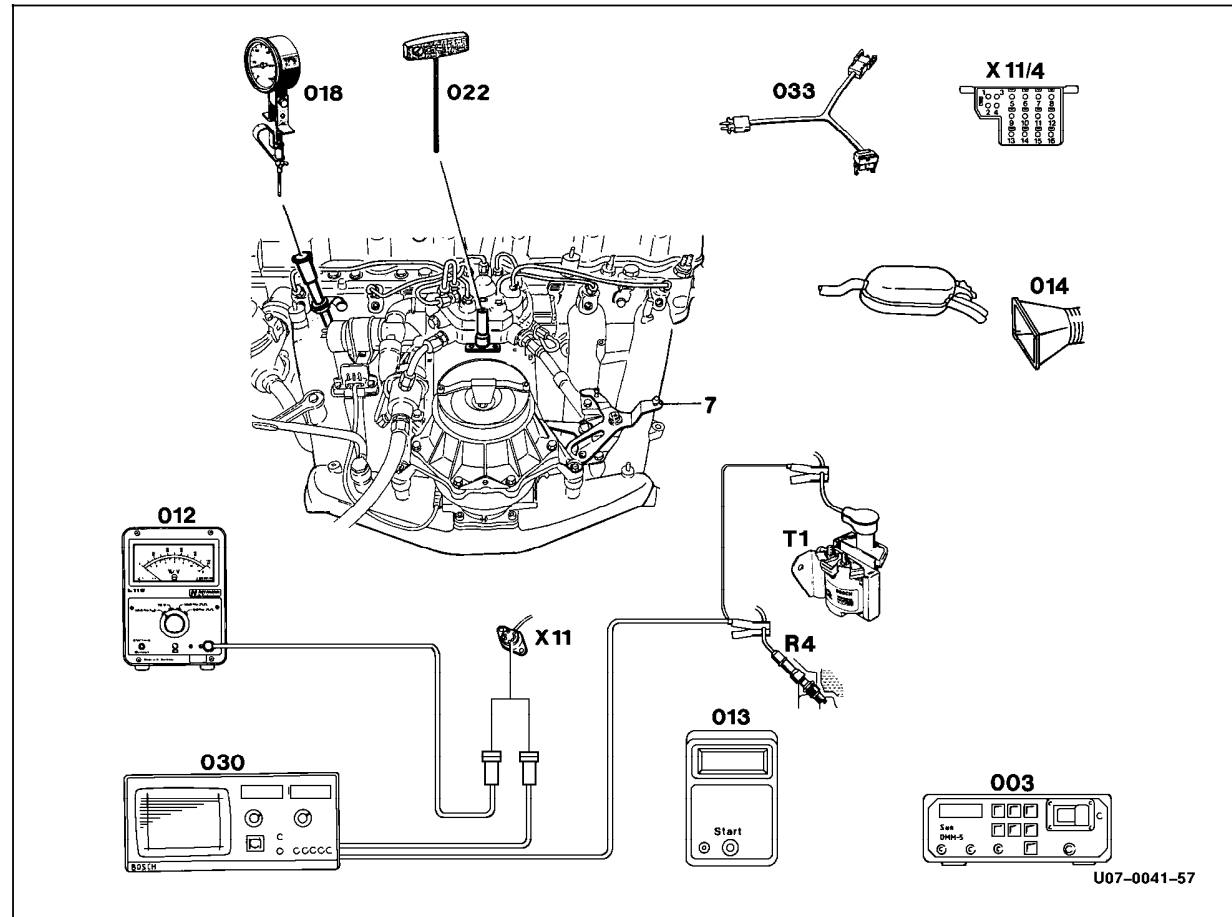
Set engine tester to 6 cylinder position

Fig. 1

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

<sup>1)</sup> 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 socket (X11).



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**B 2 Idle Test, Adjustment**

**Connection of Test Equipment Engine 119**



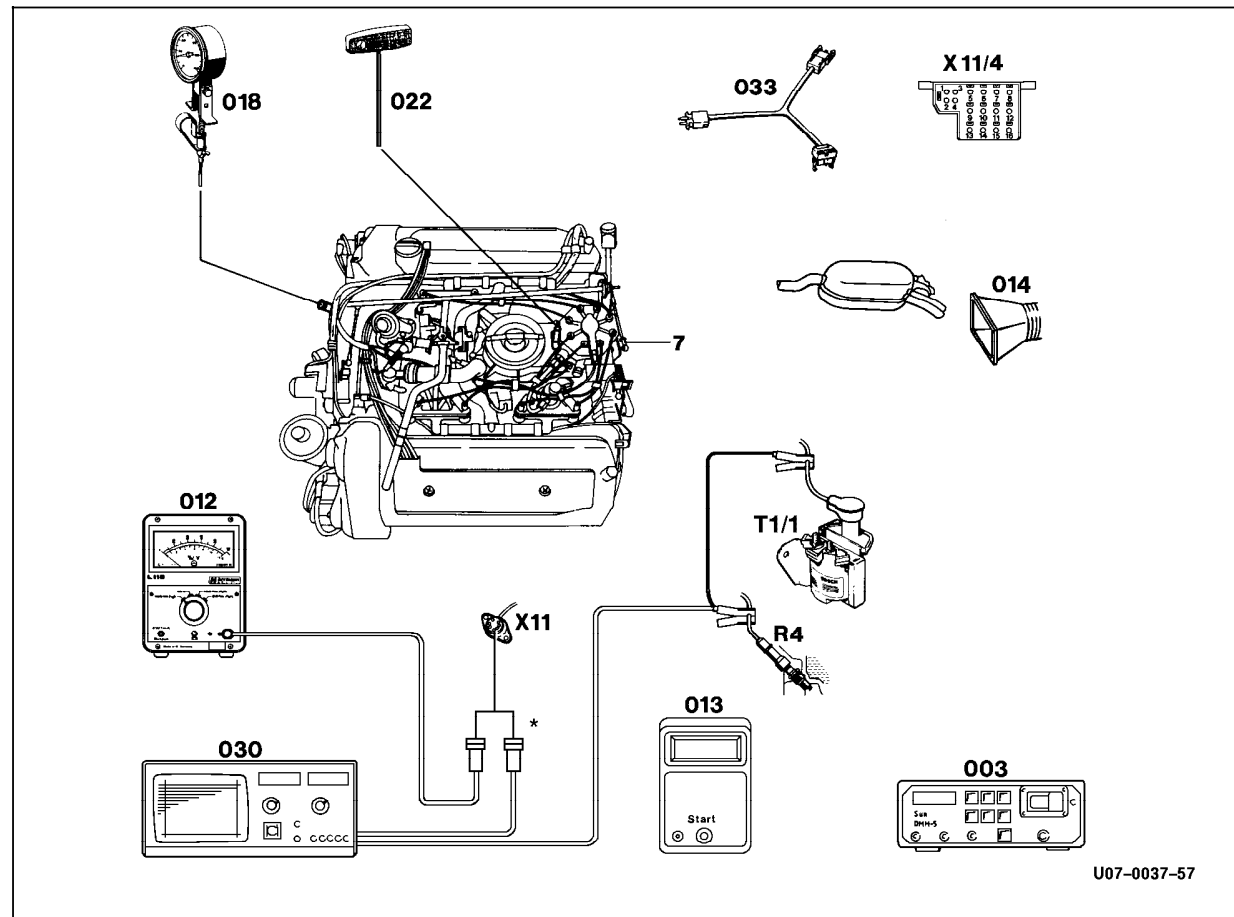
Set engine tester to 4 cylinder position. Only one ignition circuit can be checked at a time.

Fig. 2

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

<sup>1)</sup> 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 socket (X11).



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**B 2 Idle Test, Adjustment**

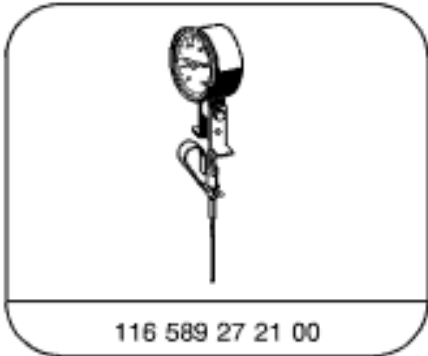
**Connection chart for test equipment without diagnostic adapter for two circuit ignition systems**

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
SUN MEA-1500MB	4	RPM/ dwell angle of Ignition circuit →	T1/1		
		Timing of Ignition circuit →	T1/1	Cylinder 1	T1/1
		Timing of Ignition circuit →	T1/2	Cylinder 2 <sup>1)</sup>	T1/2
		Oscilloscope primary/secondary → and voltage at terminal 15/1 of Ignition coil	T1/1	Cylinder 1 Firing order on oscilloscope 1-4-6-7	T1/1 Firing order on oscilloscope 1-4-6-7
		Oscilloscope primary/secondary → and voltage at terminal 15/1 of Ignition coil	-	Cylinder 5 Firing order on oscilloscope 5-8-3-2	T1/2 Firing order on oscilloscope 5-8-3-2

1) Subtract 90 °CKA from measured value.,  
Example: measured: 107 °crankshaft, 107-90= 17 °crankshaft timing

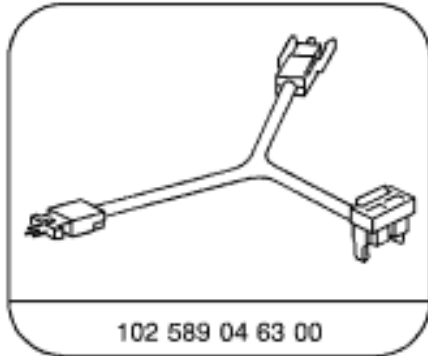
**B 2 Idle Test, Adjustment**

**Special Tools**



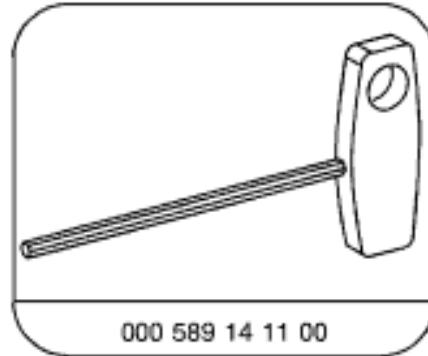
116 589 27 21 00

Oil thermometer



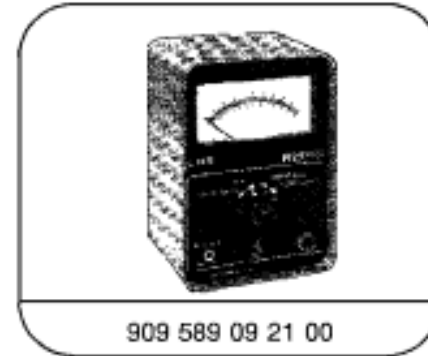
102 589 04 63 00

Test cable



000 589 14 11 00

3 mm screwdriver, 3 mm



909 589 09 21 00

On-off ratio tester

**Equipment**

Engine analyzer <sup>1)</sup>	Bear DACE (Model 40-960) Sun EMT-1019/Master 3 Sun MCM-2110 Sun MEA-1500MB
Digital multimeter <sup>1)</sup>	Fluke Models 23, 83, 85, 87

<sup>1)</sup> Available through the MBUSA Standard Equipment Program.

**B 2 Idle Test, Adjustment**

**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 <b>Connect test equipment according to diagram</b>	Ignition: <b>OFF</b>	–	–
⇒ 2 <b>Check condition of linkage and throttle valve</b>	Operate throttle linkage without ASR: Ignition: <b>OFF</b> with ASR: Ignition: <b>ON</b>	Smooth operation, no binding should be evident.	Lubricate all bearings and ball sockets
⇒ 2.1 <b>Check idle speed position</b>	Engine: <b>Idle</b>	Throttle valve lever must rest against idle stop.	Adjust throttle linkage (SMS Job No. 30-300)
⇒ 3 <b>Check ignition timing and vacuum advance</b>	Engine: <b>Start</b> Check ignition timing at idle Check ignition timing with and without vacuum at specified engine rpm.	Test and adjustment data (section A)	DM, Engines, Volume 2, Section 5.1

**B 2 Idle Test, Adjustment**

Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy
⇒ 4 <b>Warm engine oil to operating temperature 80° C</b>	Engine rpm: <b>approx. 3000 rpm</b>	Engine oil temperature approx. 80 °C	-
⇒ 5 <b>Check idle rpm</b>	Engine: <b>idle</b> Selector lever in P position, climate control system OFF, engine oil temperature approx. 80° C	Test and adjustment data (section A)	DM, Engines, Volume 2, Section 2.1
⇒ 6 <b>Check Lambda control system <sup>1)</sup></b>	Selector lever in P position, 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: <b>idle</b>	Test and adjustment data (section A)	DM, Engines, Volume 2, Section 2.1

<sup>1)</sup> The fuel mixture adjustment screw is secured against unauthorized adjustment by means of a steel ball in the adjustment tower. After fuel mixture adjustment in 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.

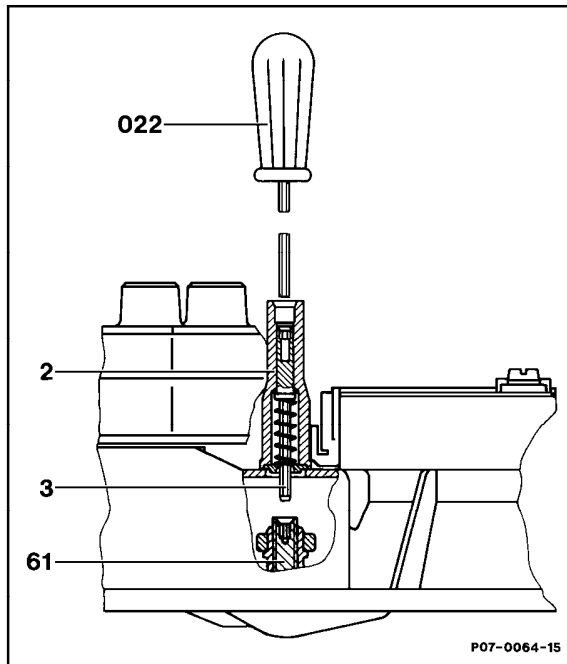


**B 2 Idle Test, Adjustment**

Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy
⇒ 7 <b>Check idle under load</b>	Engine: <b>idle</b> Transmission range D. Switch on all electrical consumers, Turn steering wheel to full lock.	Engine must continue to idle within specified range.	DM, Engines, Volume 2, Section 2.1

**B 2 Idle Test, Adjustment**

**Component location: mixture adjustment, purge valve, purge switchover valve**

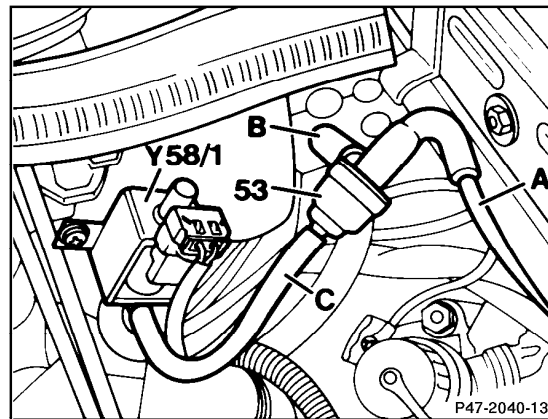


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**Figure 3**

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

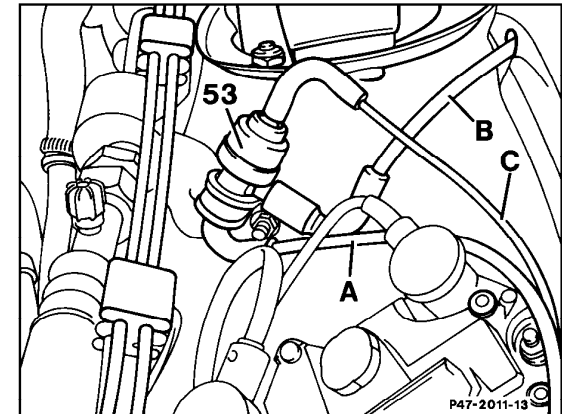
The fuel mixture may only be corrected when replacing a fuel injection system component or when performing an engine repair. To do so, the fuel mixture adjustment tower must be replaced.



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**Figure 4**

- 53 Purge valve
- Y58/1 Purge switchover valve



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**Figure 5**

- 53 Purge valve

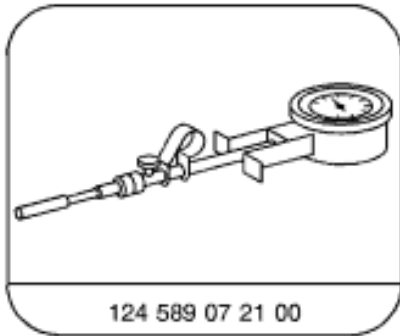
**B 2 Idle Test, Adjustment**

**Listing of Test Steps**

1	Test equipment .....	connect/disconnect.
2.0	Throttle control linkage .....	check throttle valve for free movement and condition. Lubricate bearings, gate levers and ball sockets.
2.1	Idle stop .....	check, adjust
3	Ignition timing with and without vacuum ⇒ Engine: <b>at Idle</b> .....	check (see Test and Adjustment Data, Section A).
4	Engine rpm (at Idle) .....	check.
5	On-off ratio control .....	check.
6	CTP speed under load .....	check in TR "D" (with service and parking brake applied) and with all consumers turned on.

**B 2 Idle Test, Adjustment**

**Special Tools**



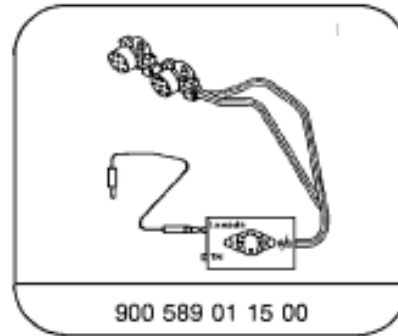
124 589 07 21 00

Remote thermometer



909 589 09 21 00

On-off ratio tester



900 589 01 15 00

On-off ratio signal adapter

**Equipment**

Engine analyzer <sup>1)</sup>	Bear DACE (Model 40-960) Sun MEA-1500MB
Digital multimeter <sup>1)</sup>	Sun DMM-5 Fluke Model 23 with 80i-410 current probe

<sup>1)</sup> Available through the MBUSA Standard Equipment Program.

**Note:**

Two adapters 900 589 01 15 00 are required for testing engine 120

## B 2 Idle Test, Adjustment

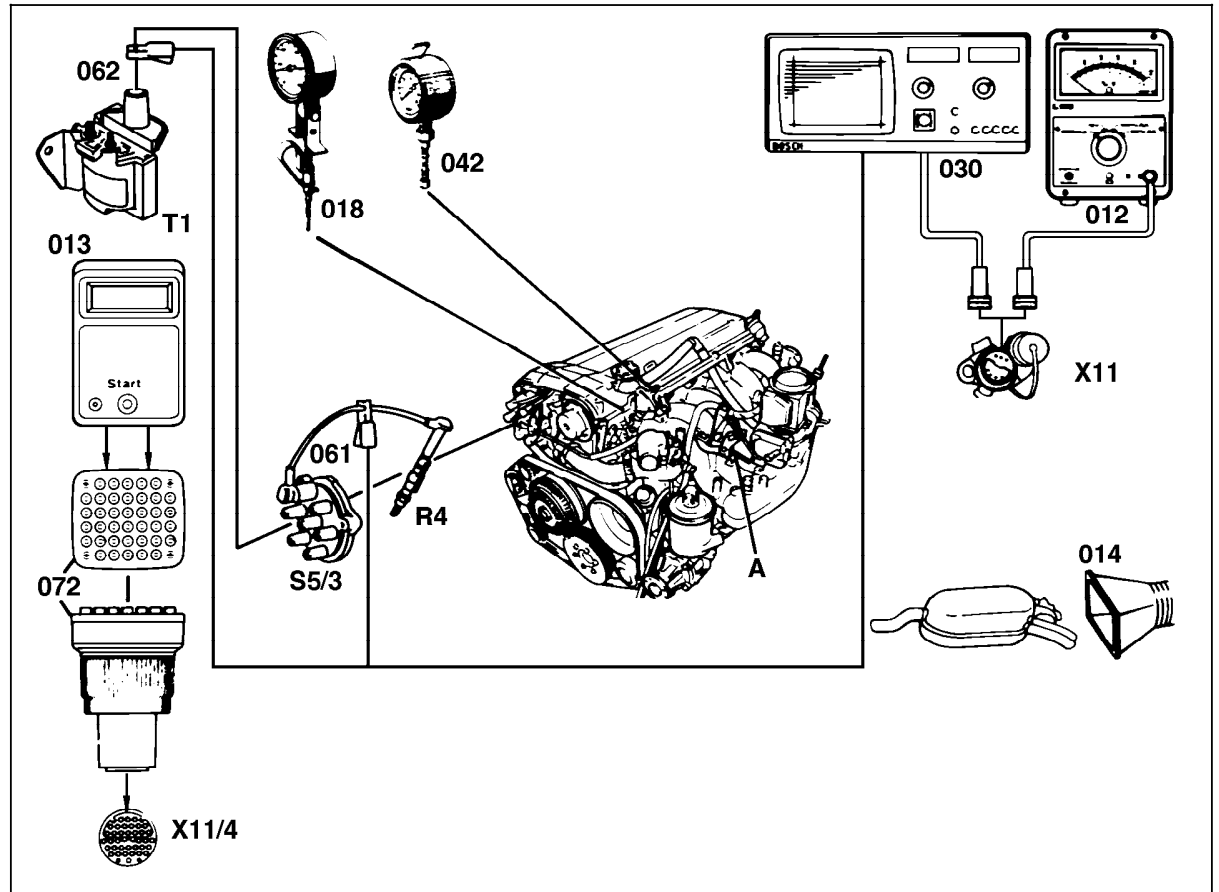
### Connection Diagram – Test Equipment Engine 104 LH-SFI



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)
- 072 Impulse counter scan tool adaptor



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**B 2 Idle Test, Adjustment**

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

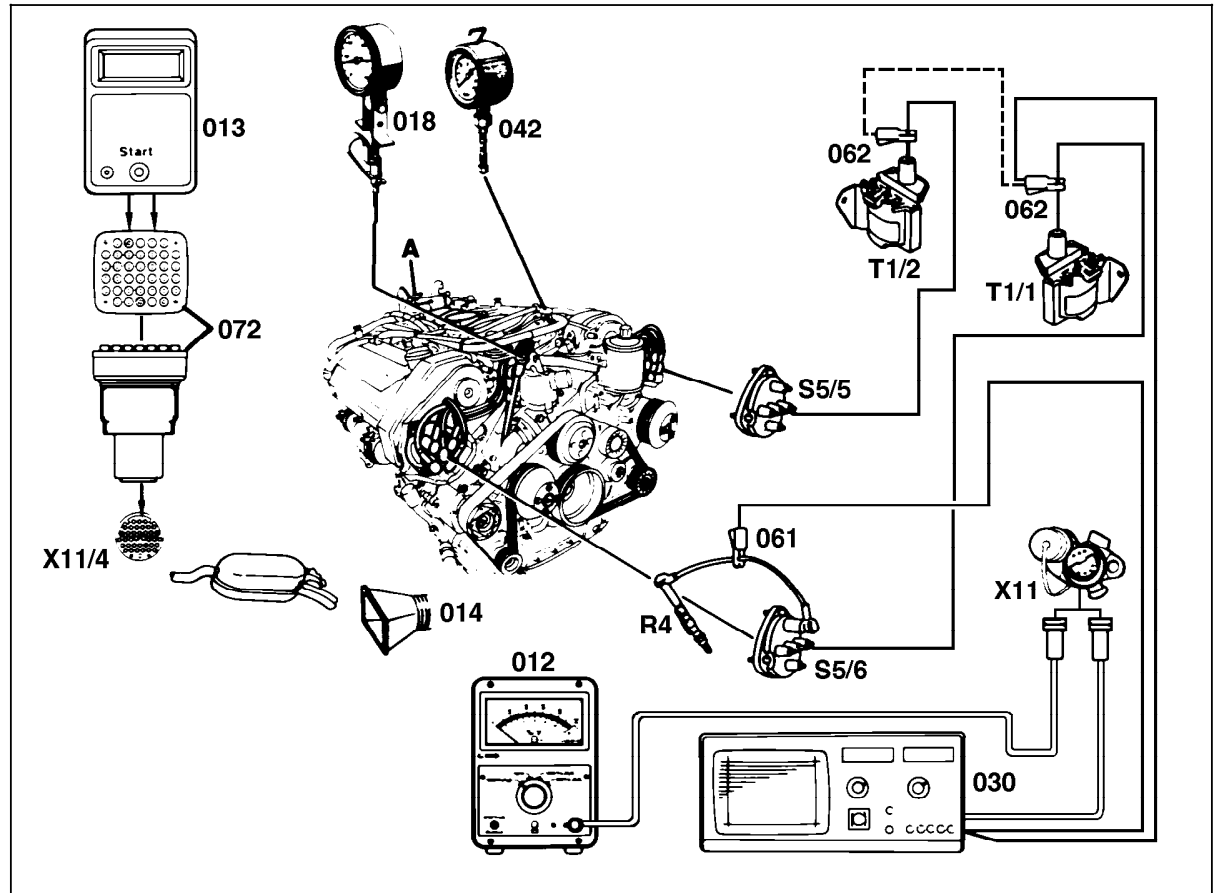
Without Diagnostic Socket (X11) see Connection Diagram 21/5.



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)
- 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)
- 072 Impulse counter scan tool adaptor



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**B 2 Idle Test, Adjustment**

**Connection Diagram –Test Equipment**

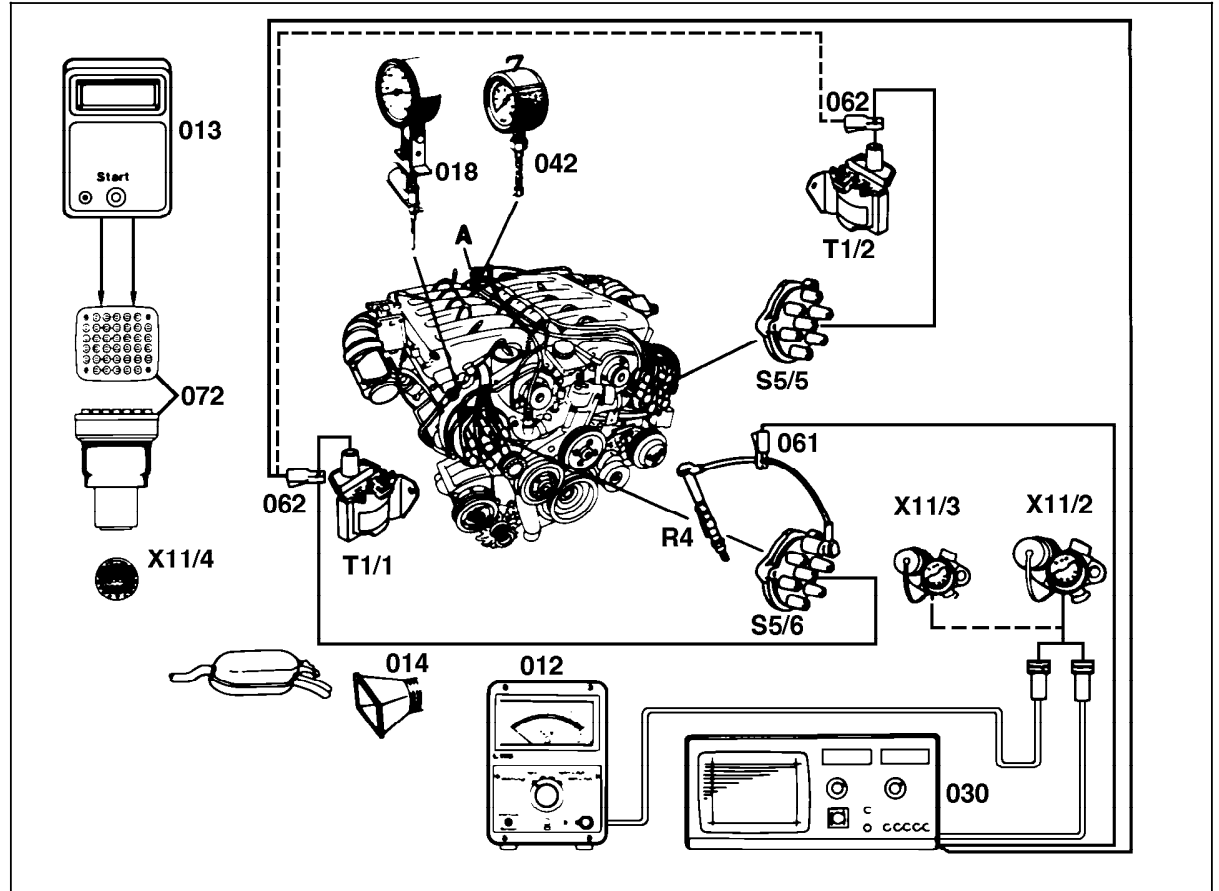
**Engine 120 LH-SFI with Diagnostic Socket (X11)**  
 Connection diagram without diagnostic socket (X11) see 21/5.



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

Figure 3

- 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)
- 072 Impulse counter scan tool adapter



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**B 2 Idle Test, Adjustment**

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

Engine analyzer version	Cylinder no. setting on engine analyzer	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	<b>Engine 119 : 4</b>  <b>Engine 120 : 6</b>	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	<b>Engine 119:</b> T1/1 <b>Engine 120:</b> T1/1
		Timing of Ignition circuit →	T1/2	T1/2		<b>Engine 119:</b> cyl. 2 <sup>1)</sup> <b>Engine 120:</b> cyl. 12	<b>Engine 119:</b> T1/2 <b>Engine 120:</b> T1/2
		Oscilloscope primary/secondary → and voltage at terminal 15/1 of Ignition coil	T1/1		T1/1	<b>Engine 119:</b> cyl. 1 Firing order 1-4-6-7 <b>Engine 120:</b> cyl. 1 Firing order 1-5-3-6-2-4	<b>Engine 119:</b> T1/1 Firing order 1-4-6-7 <b>Engine 120:</b> T1/1 Firing order 1-5-3-6-2-4
		Oscilloscope primary/secondary → and voltage at terminal 15/1 of Ignition coil		T1/2		<b>Engine 119:</b> cyl. 5 Firing order 5-8-3-2 <b>Engine 120:</b> cyl. 12 Firing order 12-8-10-7-11-9	<b>Engine 119:</b> T1/2 Firing order 5-8-3-2 <b>Engine 120:</b> T1/2 Firing order 12-8-10-7-11-9

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



### B 2 Idle 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 <sup>1)</sup>
⇒ 1 <b>Connect test equipment according to diagram</b>	Ignition: <b>OFF</b>	-	-
⇒ 2 <b>Check condition and free movement of throttle linkage and throttle valve</b>	Ignition: <b>OFF</b> Actuate throttle linkage	Smooth operation, no binding should be evident.	Lubricate all bearings and ball sockets.
⇒ 2.1 <b>Check idle speed position</b>	Ignition: <b>OFF</b> Accelerator pedal at CTP	Throttle valve lever must rest against CTP stop (audible contact).	Adjust CTP stop on engine (SMS, Job No. 30-1010)
⇒ 3 <b>Check ignition timing with and without vacuum</b>	Engine: <b>at Idle</b> Selector lever in "P" Climate control system: <b>OFF</b>	See Test and adjustment data (section A)	Check ignition system (DM Engines, Vol. 2 – 5.2 or 5.3)

<sup>1)</sup> Observe Preparation for Test, see 22.

### B 2 Idle Test, Adjustment

Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy <sup>1)</sup>
⇒ 4 <b>Warm engine oil to operating temperature</b>	Engine rpm: <b>maintain at approx. 3000 rpm</b>	Engine oil temperature approx. 80 °C	–
⇒ 5 <b>Check CTP rpm</b>	Engine: <b>at Idle</b> 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)
⇒ 6 <b>Check on-off ratio control system</b>	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 measurement. Engine: <b>at Idle</b>	See Test and adjustment data (section A)	Check electrical components with socket box tester (DM Engines, Vol. 2 – 3.1 or 3.2)

<sup>1)</sup> Observe Preparation for Test, see 22.

**B 2 Idle Test, Adjustment**

Test step/Test sequence	Test condition	Nominal value	Possible cause/Remedy <sup>1)</sup>
⇒ 7 <b>Check CTP speed under load</b>	Engine: <b>at Idle</b> 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)

<sup>1)</sup> Observe Preparation for Test, see 22.

## B Test and Adjustment Jobs

## Engines 104, 119, 120 LH-SFI

### B 2 Idle Test, Adjustment

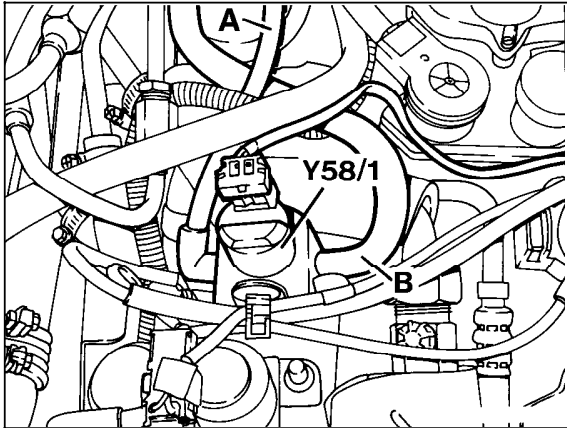


Figure 1  
Model 140, Engine 104, 119  
Y58/1 Purge control valve  
B Purge line

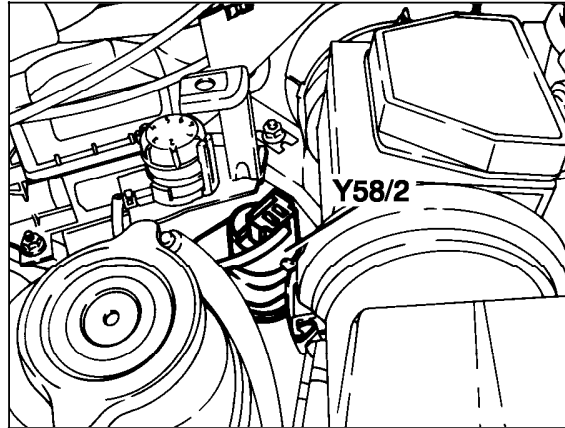


Figure 2  
Model 140, Engine 120  
Y58/2 Left purge control valve (located on right side of engine)

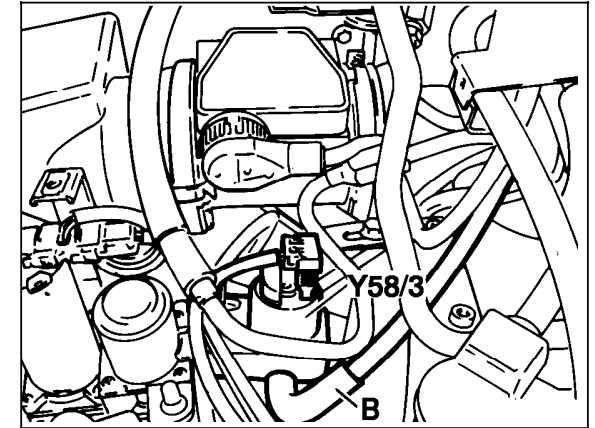
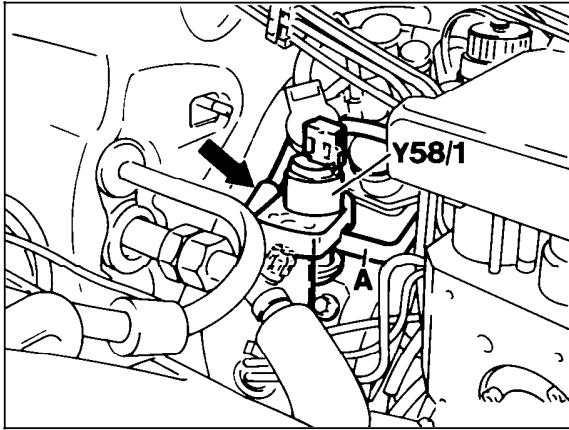


Figure 3  
Model 140, Engine 120  
Y58/3 Right purge control valve (located on left side of engine)  
B Purge line

**B 2 Idle Test, Adjustment**



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Figure 4

Model 124, Engine 119

Y58/1 Purge control valve

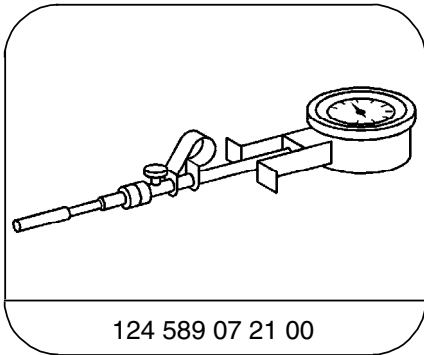
A Purge line

**B 2 Idle Test, Adjustment**

**Listing of Test Steps**

1	Test equipment .....	connect/disconnect according to connection diagram
2.0	Throttle control linkage .....	check throttle valve for free movement and condition. Lubricate bearings, gate levers and ball sockets.
2.1	CTP contact <sup>1)</sup> .....	check, adjust (see SMS, Job No. 30 – 1010).
3	Ignition timing ⇒ Engine: <b>at Idle</b> .....	check (see Test and Adjustment Data, section A).
4	Engine rpm (at closed throttle) .....	check, only possible using HHT (see Test and Adjustment Data, section A).
5	On-off ratio control .....	check only possible using HHT (see Test and Adjustment Data, section A).
5.1	CTP contact .....	check, (HHT display “ON“ only with HHT).
5.2	Not applicable for U.S. version vehicles	
7	CTP speed under load .....	check in TR “D” (with service and parking brake applied) and with all consumers turned on.

<sup>1)</sup> Only possible with HHT.

**B 2 Idle Test, Adjustment****Special Tools**

124 589 07 21 00

Remote thermometer

**Equipment**

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

<sup>1)</sup> Available through the MBUSA Standard Equipment Program.

**B 2 Closed Throttle Position (CTP) Test, Adjustment <sup>1)</sup>**

07-2053 or 2056 <sup>15)</sup>

**Listing of Test Steps**

1	HHT with multiplexer to data link connector .....	connect/disconnect.
2	Throttle control .....	check throttle operation and condition. Lubricate bearings, gate levers and ball sockets.
2.1	WOT, CTP stop at pedal value sensor (B37) .....	check.
3	Selector lever position .....	P/N
4	Engine oil temperature .....	check.
5	ECT .....	check.
6	Ignition timing ⇒ Engine: <b>at idle</b> .....	check (see Test and Adjustment Data, Section A).
7	Engine RPM at idle .....	check (see Test and Adjustment Data, Section A).
8.0	On/off ratio .....	check <sup>1)</sup> .
8.1	CTP recognition (accelerator pedal not depressed) .....	check, HHT display <b>ON</b> <sup>1)</sup> .
9	Closed throttle under load .....	check with selector lever in “D“(with service and parking brake applied) and consumers on.

<sup>1)</sup> Only possible using HHT (Test and Adjustment Data, section A).

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

**Note:**

Refer to section B1, Engine Test and Adjustment, for Special Tools and connection diagram.



**B 2 Closed Throttle Position (CTP) Test, Adjustment**

**Connection Diagram –  
Engines 111, 119, 120 ME-SFI**  
(Measuring engine RPM without HHT)

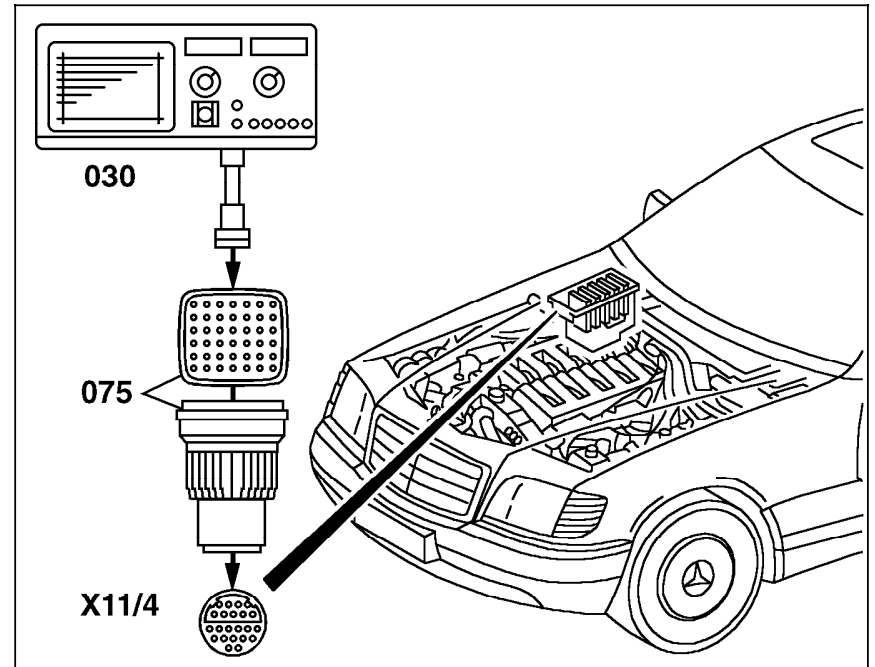
Connector 1: Circuit 31 (ground)  
Connector 13: TN-Signal



Engine 120: Set cylinder selection switch to 6 cylinder position.

Figure 1

- X11/4 Data link connector, (DTC readout, 38-pole)
- 030 Engine analyzer with oscilloscope (RPM reading only)
- 075 Adapter



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