
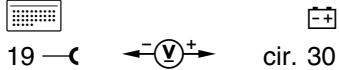
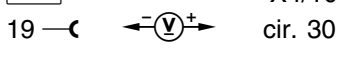
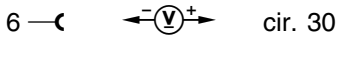
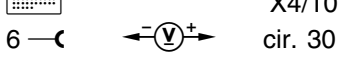


## 2.1 Continuous Fuel Injection System

## Engines 104, 119 CFI

### Electrical Test Program – Test


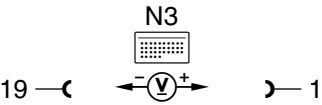
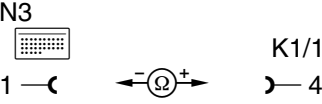
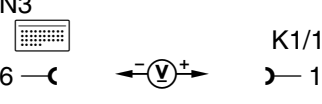
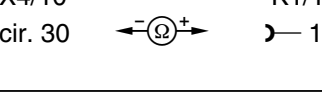
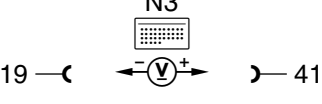
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0 <sup>1)</sup>		<b>Ground, engine (W11)</b> (connection point for ground wires) <b>Model 124</b>	N3  cir. 30	—	11 – 14 V	Wiring, Ground connection W11 (Figure 21) loose.
		<b>Model 129</b>	N3  X4/10 cir. 30	—	11 – 14 V	Wiring, Ground connection W11 (Figure 21) loose.
1.1		Ground, battery (W10) <b>Model 124</b>	N3  cir. 30	—	11 – 14 V	Wiring, Ground connection W10 (Figure 20) loose.
		Ground, component compartment (W16) <b>Model 129</b>	N3  X4/10 cir. 30	—	11 – 14 V	Wiring, Ground connection W16 (Figure 23) loose.

<sup>1)</sup> On-off ratio 100% when measured with on-off ratio tester.

## 2.1 Continuous Fuel Injection System

## Engines 104, 119 CFI

### Electrical Test Program – Test






⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
2.0 <sup>1)</sup>		<b>CFI control module (N3)</b> Voltage supply, Circuit 30a		–	11 – 14 V	Wiring, Overvoltage protection relay module (K1/1) fuse, K1/1.
2.1		Wiring from N3 to K1/1		CFI control module (N3) unplugged.	< 1 Ω	Wiring.
2.2		Wiring from circuit 30 to K1/1		–	11 – 14 V	Wiring.
2.3		Wiring from circuit 30 to K1/1		–	< 1 Ω	Wiring.
3.0 <sup>1)</sup>		<b>CFI control module (N3)</b> Voltage supply, Circuit 87E		Ignition: <b>ON</b> Overvoltage protection relay module (K1/1) plugged in.	11 – 14 V	Wiring, Connected components are shorted to circuit 31 (ground).

<sup>1)</sup> On-off ratio 100% when measured with on-off ratio tester.


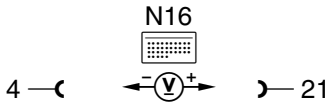
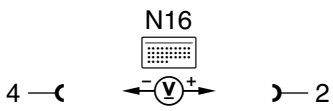
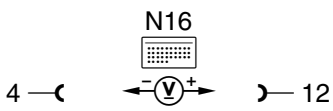
## 2.1 Continuous Fuel Injection System

## Engines 104, 119 CFI

### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
4.0		<b>Engine systems control module (N16)</b> Ground	N16  X4/10 cir. 30	–	11 – 14 V	Wiring, Loose ground connection: Model 124: W10 (Figure 20) Model 129: W16 (Figure 23).
5.0		<b>Engine systems control module (N16)</b> Voltage supply Circuit 30	N16  1	–	11 – 14 V	Wiring, Loose wire at terminal block, terminal 30/61 (battery) (X4/10): Model 124: (Figure 25) Model 129: (Figure 26)
6.0		<b>Engine systems control module (N16)</b> Voltage supply Circuit 15 unfused	N16  10	Ignition: <b>ON</b>	11 – 14 V	Wiring, Loose wire at fuse and relay box (F1), plug connection: Model 124: Interior/engine connector (X26) (Figure 30) Model 129: Multi-function connector block (X30/1) (Figure 31).
7.0		<b>Engine systems control module (N16)</b> Voltage supply Circuit 15	N16  21	Ignition: <b>ON</b>	11 – 14 V	Wiring, Loose wire at fuse and relay box (F1), plug connection: Model 124: Interior/engine connector (X26) (Figure 30) Model 129: Multi-function connector block (X30/1) (Figure 31).





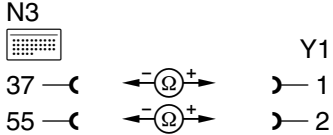
### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
8.0		<b>Fuel pumps (M3m1, M3m2)</b> Operation		Ignition: <b>OFF</b> Engine systems control module (N16) unplugged.  Ignition: <b>ON</b>	11 – 14 V	Wiring, FP harness connector (X36): Model 124: (Figure 32) Model 129: (Figure 33) M3m1 or M3m2.
9.0		<b>Fuel pumps (M3m1, M3m2)</b> Control		N16 plugged in. Connector 2 of DI control module unplugged (Figure 7). Engine: <b>Crank</b>	10 ± 2V while cranking	⇒ 9.1, N16.
9.1		Control signal, Circuit 50		Connector 2 of DI control module unplugged (Figure 7). Engine: <b>Crank</b>	10 ± 2V while cranking	Wiring, Model 124: Interior/engine connector (X26) (Figure 30) defective,  Model 129: AT/engine connector(X22/2) (Figure 29) defective.

## 2.1 Continuous Fuel Injection System



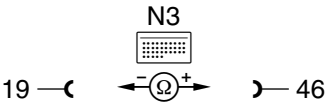
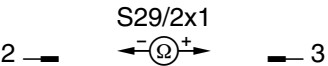
## Engines 104, 119 CFI

### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
10.0	9 <sup>1)</sup>	<b>Electrohydraulic actuator (Y1)</b> Current check	1 —  2	Connect test cable 102 589 04 63 00 to Y1.  Ignition: <b>ON</b>	<b>Engine 104:</b> 20 mA  <b>Engine 119:</b> 75 mA	Wiring to CFI control module (N3), Y1.
11.0 <sup>1)</sup>		<b>Electrohydraulic actuator (Y1)</b> Malfunction circuit	55 —  37	Ignition: <b>OFF</b> Unplug N3	19.5 ± 1 Ω	Wiring, Y1.
11.1		Resistance	1 —  2	Ignition: <b>OFF</b> Y1 unplugged	19.5 ± 1 Ω	Y1.
11.2		Wiring	N3 	Ignition: <b>OFF</b> N3 and Y1 unplugged.	< 1 Ω	Wiring, Wires in connector (Y1) reversed.

<sup>1)</sup> On-off ratio 90% when measured with on-off ratio tester.

### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
12.0	 1) 2)	<b>WOT/CTP switch (S29/2)</b> Malfunction circuit – WOT contact		Ignition: OFF Unplug CFI control module (N3) connector and connector “B” (Figure 7) of DI control module (N1/3). Ignition: ON (ASR only)  Accelerator pedal in CTP  Disconnect AT control pressure cable on vehicles without ASR.  Accelerator pedal in WOT position.	$\infty \Omega$          $< 1 \Omega$	Wiring, WOT contact, S29/2, Polarity reversed at connector S29/2x1: Engine 104: (Figure 18), Engine 119: (Figure 19).
12.1		WOT contact		Ignition: ON (ASR only) Connector (S29/2x1) unplugged: Engine 104: (Figure 18) Engine 119: (Figure 19)  Accelerator pedal in CTP  Accelerator pedal in WOT position.	$\infty \Omega$          $< 1 \Omega$	Adjust or replace S29/2.


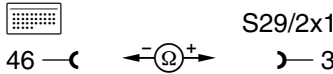
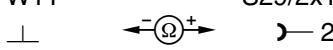
1) On-off ratio 20% when measured with on-off ratio tester.

2) On-off ratio 10% when measured with on-off ratio tester.



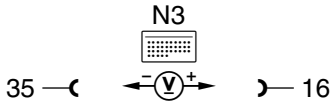
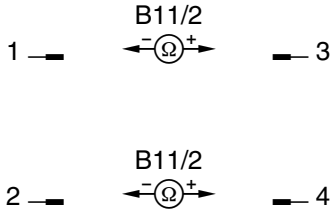
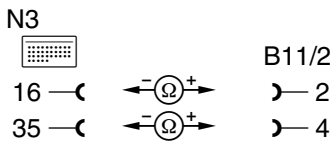
## 2.1 Continuous Fuel Injection System

## Engines 104, 119 CFI

### Electrical Test Program – Test


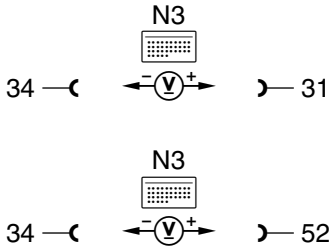
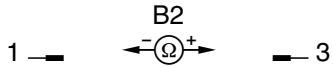
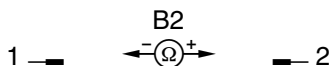
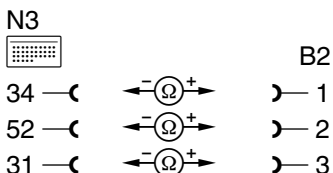
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
12.2		Wiring	<p>N3</p>  <p>46 — 3</p>	Ignition: <b>OFF</b> CFI control module (N3) unplugged.	< 1 Ω	Wiring.
12.3		Wiring	<p>W11</p>  <p>— 2</p>	Ignition: <b>OFF</b>	< 1 Ω	Wiring, Ground connection (W11) loose (Figure 21).

### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
13.0	 28 29 <sup>1)</sup>	<b>ECT sensor (B11/2)</b> Malfunction circuit		Ignition: <b>ON</b>	See Table I	Wiring, B11/2, CFI control module (N3).
13.1		B11/2		B11/2 connector unplugged. Measure connections diagonally and compare both values (Figure 12).	See Table I (both values must be the same).	B11/2.
13.2		Wiring		Ignition: OFF N3 connector unplugged. Terminal layout of connector (B11/2, Figure 12).	< 1 Ω	Wiring.

<sup>1)</sup> On-off ratio 30% when measured with on-off ratio tester.


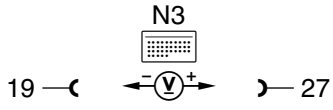
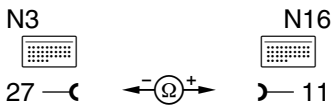
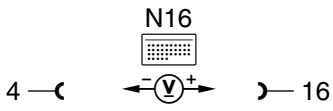
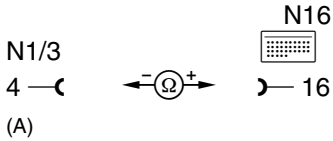
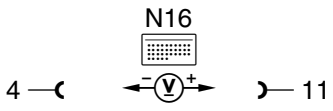
### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
14.0	4 <sup>1) 2)</sup>	<b>VAF sensor (B2)</b> Malfunction circuit		Engine: <b>at Idle</b> and at operating temperature.	4.6 – 5.1 V  0.55 – 0.95 V	B2, CFI control module (N3),  Wiring, N3 B2.
14.1		B2		Ignition: <b>OFF</b> Connector on B2 unplugged.	3.6 – 4.4 kΩ	B2.
14.2		B2		Slowly deflect air flow sensor plate by hand.	Ω-value increases continuously up to 2/3 of travel, then decreases again.	B2.
14.3		Wiring		Ignition: <b>OFF</b> N3 connector unplugged.	< 1 Ω	Wiring.

1) On-off ratio 40% when measured with on-off ratio tester.



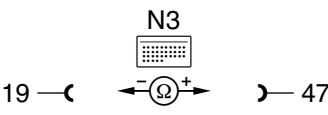

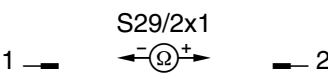
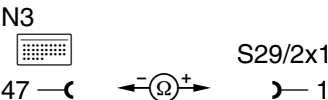
2) On-off ratio 10% when measured with on-off ratio tester.

### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
15.0	1 <sup>1)</sup>	<b>TN-signal</b>		Engine: <b>at Idle</b>	5 – 7 V	Wiring, ⇒ 16.2, TN-signal implausible, other connected components defective.
15.1		Wiring		Ignition: <b>OFF</b>	< 1 Ω	Wiring.
16.0		<b>TN-signal</b>		Engine: <b>at Idle</b>	5 – 7 V	Wiring, DI control module (N1/3).
16.1		TN-signal wire		Ignition: <b>OFF</b> Connector (A) of N1/3 unplugged (Figure 7).	< 1 Ω	Wiring.
16.2		Engine systems control module (N16)		Ignition: <b>OFF</b> Connector (A) of N1/3 connected. Engine: <b>at Idle</b>	5 – 7 V	N16.





1) On-off ratio 70% when measured with on-off ratio tester.

### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
17.0	 1)	<b>WOT/CTP switch (S29/2)</b> Malfunction circuit – CTP contact		Ignition: <b>OFF</b> CFI control module (N3) unplugged.  Accelerator pedal in CTP  Depress accelerator pedal	   $< 1 \Omega$  $\infty \Omega$	Wiring, CTP contact.
17.1		CTP contact		Ignition: <b>OFF</b> Connector (S29/2x1) unplugged. Engine 104: (Figure 18) Engine 119: (Figure 19)  Accelerator pedal in CTP  Accelerator pedal in WOT position	   $< 1 \Omega$  $\infty \Omega$	Adjust or replace S29/2.
17.2		Wiring		Ignition: <b>OFF</b> N3 unplugged.	$< 1 \Omega$	Wiring.


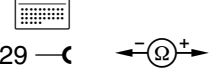



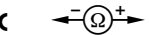


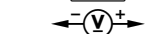
1) On-off ratio 10% when measured with on-off ratio tester.

### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
17.3		Wiring	W11  S29/2x1 2	Ignition: <b>OFF</b> Connector (S29/2x1) unplugged.	< 1 Ω	Wiring, Ground connection (W11) loose (Figure 21).
18.0	14 <sup>1)</sup>	<b>Vehicle speed signal</b>	N3 19 —  29	Ignition: <b>OFF</b> ASR control module (N30/1) connector unplugged.  Engine: <b>Start</b> Drive vehicle onto chassis dynamometer, “drive” vehicle at > 20 km/h (> 13 mph).  <b>Model 124:</b> Ignition: ON Roll vehicle approx. 1 meter.	< 1 V      Needle oscillates: 0 – 12 V (0 – 9 V with consumers)	Wiring, Model 124: Hall-effect speed sensor (B6), Model 129: Electronic speedometer (A1p8).
18.1		Wiring <b>Model 124</b>	N3 19 —  X53/5	Ignition: <b>OFF</b> CFI control module (N3) and Hall-effect sensor multipoint connector (X53/5) unplugged.	< 1 Ω	Wiring, Hall-effect speed sensor (B6).






<sup>1)</sup> On-off ratio 60% when measured with on-off ratio tester.

### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
[18.1]		<b>Model 129</b>	N3 	Ignition: <b>OFF</b> CFI control module (N3) and connector A2 of multi-function connector block (X30/1) (Figure 31) unplugged.	< 1 Ω	Wiring, Check X30/1 (Figure 31).
18.2		Wiring <b>Model 129</b>	X30/1 3 —  (A2)  A1p8 1 (1)	Ignition: <b>OFF</b> Connector (1) of A1p8 unplugged.	< 1 Ω	Wiring, Check A1p8, see DM, body and accessories, Vol. 1 – 1.2.
19.0	27 <sup>1)</sup>	<b>Data line</b> CFI control module (N3) ↔ DI control module (N1/3)	N3 26 —   N1/3 7 (A)	Ignition: <b>OFF</b> Connector (A) of N1/3 unplugged (Figure 7).	< 1 Ω	Wiring, Check for correct part no. matching of control modules N3 and N1/3.
20.0		<b>IAT sensor (B17/2)</b> Malfunction circuit	N3 5 —   14	Ignition: <b>ON</b>	See Table I	Wiring, Engine 104: (Figure 1), Engine 119: (Figure 2), B17/2, N3.

<sup>1)</sup> On-off ratio 80% when measured with on-off ratio tester.

### Electrical Test Program – Test



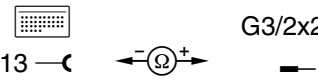

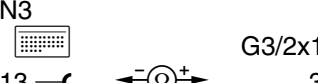

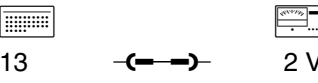
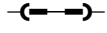




⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
20.1		Resistance	 B17/2	Ignition: <b>OFF</b> Connector of B17/2 unplugged.	See Table I	B17/2.
20.2		Wiring	 N3 B17/2	Ignition: <b>OFF</b> CFI control module (N3) and B17/2 unplugged.	< 1 $\Omega$	Wiring.
21.0	5 <sup>1)</sup>	<b>O2S 1 (beforeTWC) (G3/2)</b> Malfunction circuit	 N3	Engine: at Idle and at operating temperature.	Oscillates between 0.1 – 0.9 V	Wiring, G3/2, N3, ⇒ 35.0 Check mixture adjustment.
21.1	17	Insulation, O2S 1 wire	 N3	Ignition: <b>OFF</b> N3 connector and O2S 1 signal connector (G3/2x2) or O2S 1 connector (G3/2x1) unplugged. Model 124: (Figure 13) Model 129: (Figure 14).	$\infty \Omega$	Wiring.

1) On-off ratio 50% when measured with on-off ratio tester.

## 2.1 Continuous Fuel Injection System

## Engines 104, 119 CFI

### Electrical Test Program – Test


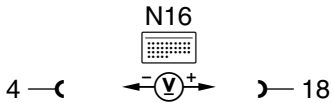
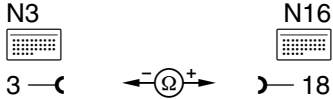

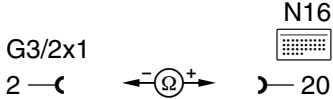
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
21.2		O2S 1 wire <sup>1)</sup> Model 124  Model 129	<p>N3              13 —  — G3/2x2</p> <p>N3              13 —  — 3</p>	<p>Ignition: <b>OFF</b> CFI control module (N3) and O2S 1 signal connector (G3/2x2) unplugged.</p> <p>Ignition: <b>OFF</b> CFI control module (N3) and O2S 1 connector (G3/2x1) unplugged.</p>	<p>&lt; 1 Ω</p> <p>&lt; 1 Ω</p>	<p>Wiring,</p> <p>Wiring.</p>
21.3		O2S 1 (before TWC) (G3/2)	<p>N3              13 —  — 2 V</p>	<p>On-off ratio tester connected. Engine: <b>at Idle</b> Connector G3/2x1 connected.</p>	0 – 10% at on-off ratio tester after 30 seconds.	G3/2.
21.4		CFI control module (N3)	<p>N3              13 —  — 6</p>	<p>On-off ratio tester connected. Engine: <b>at Idle</b> Connector G3/2x1 unplugged.</p>	90 – 100% at on-off ratio tester after 30 seconds.	N3.
22.0		O2S 1 heater Voltage supply	<p>N16              4 —  — 20</p>	Engine: <b>at Idle</b>	11 – 14 V	Wiring, N3, Engine systems control module (N16).

<sup>1)</sup> Drive vehicle onto lift.

## 2.1 Continuous Fuel Injection System

## Engines 104, 119 CFI


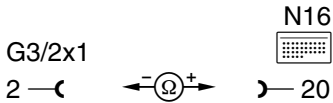
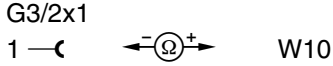
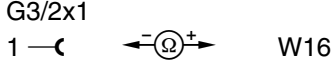
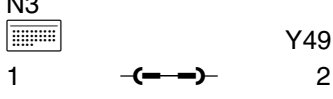
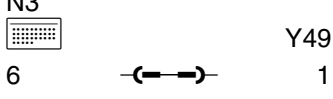
### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
22.1		Control signal O2S 1 heater		Engine: <b>at Idle</b>	11 – 14 V	Wiring, CFI control module (N3).
22.2		Wiring		Ignition: <b>OFF</b> N3 and engine systems control module (N16) unplugged.	< 1 Ω	Wiring.
22.3	22	Control signal O2S 1 heater		Ignition: <b>OFF</b> N16 unplugged. O2S 1 connector (G3/2x1) connected. Model 124: (Figure 13) Model 129: (Figure 14).	0.5 – 1.7 A	Wiring, O2S 1 (before TWC) (G3/2).
22.4		<b>Model 124</b> Wiring		Ignition: <b>OFF</b> N16 and G3/2x1 unplugged.	< 1 Ω	Wiring.

## 2.1 Continuous Fuel Injection System

## Engines 104, 119 CFI

### Electrical Test Program – Test











⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
[22.4]		<b>Model 129</b> Wiring <sup>1)</sup>		N16 and G3/2x1 unplugged.	< 1 Ω	Wiring.
22.5		Model 124 Wiring		Ignition: <b>OFF</b> O2S 1 heater coil connector (G3/2x1) unplugged.	< 1 Ω	Wiring,
		Model 129 Wiring <sup>1)</sup>		Ignition: <b>OFF</b> Connector G3/2x1 unplugged.	< 1 Ω	Wiring.
23.0		<b>Adjustable camshaft timing solenoid (Y49) and mechanical camshaft adjustment</b> <b>Engine 104</b>	 	Ignition: <b>OFF</b> Connector on Y49 unplugged. Engine: <b>at Idle</b>		Y49, Check mechanical camshaft adjustment (see SMS, Repair Instructions, Engine 104, Group 05, Job No. 217).
				Bridge for a max. of 10 seconds.	Engine shakes	

<sup>1)</sup> Drive vehicle onto lift.

## 2.1 Continuous Fuel Injection System

## Engines 104, 119 CFI


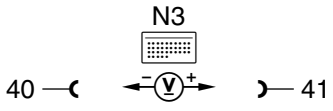
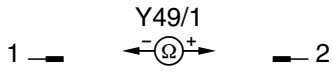
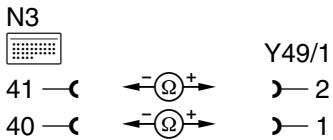
### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
24.0		<b>Engine 104</b> Camshaft adjustment (electrical) (Y49)	1 —  —  — 2	Ignition: <b>OFF</b> Connect test cable 102 589 04 63 00 to adjustable camshaft timing solenoid (Y49). Engine: <b>Start</b>  Increase engine speed to approx. 2000 rpm.	Briefly 1.5 A, then 1 A	Wiring, Y49, CFI control module (N3).
25.0		<b>Engine 119</b> Left adjustable camshaft timing solenoid (Y49/1) and left mechanical camshaft timing adjustment	N3  1 —  — 2  N3  6 —  — 1	Ignition: <b>OFF</b> Connector on Y49/1 unplugged. Engine: <b>at Idle</b>   Bridge for a max. of 10 seconds.	Engine shakes	Y49/1, Check mechanical camshaft adjustment (see SMS, Repair Instructions, Engine 119, Group 05, Job No. 217).
26.0		<b>Engine 119</b> Left camshaft adjustment (electrical) (Y49/1)	1 —  —  — 2	Ignition: <b>OFF</b> Connect test cable 102 589 04 63 00 to adjustable camshaft timing solenoid (Y49/1). Engine: <b>Start</b>  Increase engine speed to approx. 3000 rpm.	Briefly 1.5 A, then 1 A	Wiring, Y49/1, Check contacts at engine separation point connector (X26/2), CFI control module (N3).

## 2.1 Continuous Fuel Injection System

## Engines 104, 119 CFI














### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
26.1		Left camshaft adjustment Control		Increase engine speed to approx. 3000 rpm.	Briefly 7.5 V then approx. 5 V	If nominal value is greater than 11 V, check CFI control module (N3) wiring for open circuit, ⇒ 26.2.
26.2		Left adjustable camshaft timing solenoid (Y49/1)		Ignition: <b>OFF</b> Connector on Y49/1 unplugged.	$5 \pm 1 \Omega$	Y49/1.
26.3		Wiring		Ignition: <b>OFF</b> CFI control module (N3) and connector on Y49/1 unplugged.	$< 1 \Omega$	Wiring


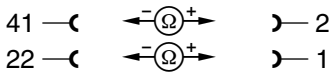
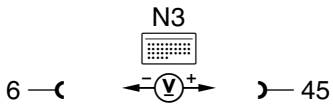
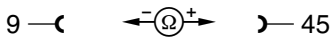
## 2.1 Continuous Fuel Injection System

## Engines 104, 119 CFI


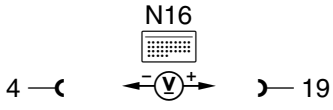
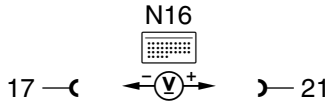
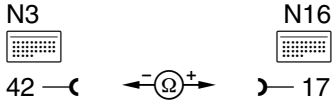
### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
27.0		<b>Engine 119</b> Right adjustable camshaft timing solenoid (Y49/2) and right mechanical camshaft adjustment	<p>N3              1 —  — Y49/2 2</p> <p>N3              6 —  — Y49/2 1</p>	<p>Ignition: <b>OFF</b>            Connector on Y49/2 unplugged.            Engine: <b>at Idle</b></p> <p>            Bridge for a max. of 10 seconds.</p>	Engine shakes	Y49/2, Check mechanical camshaft adjustment (see SMS, Repair Instructions, Engine 119, Group 05, Job No. 217).
28.0		Right camshaft adjustment (electrical) (Y49/2)	<p>Y49/2            1 —  —  — Y49/2 2</p>	<p>Ignition: <b>OFF</b>            Connect test cable 102 589 04 63 00 to adjustable camshaft timing solenoid (Y49/2).            Engine: <b>Start</b></p> <p>Increase engine speed to approx. 3000 rpm.</p>	Briefly 1.5 A, then 1 A	Wiring, Y49/2, CFI control module (N3).
28.1		Right camshaft adjustment Control	<p>N3              22 —  —  — N3 41</p>	Increase engine speed to approx. 3000 rpm.	Briefly 7.5 V then approx. 5 V	Wiring, Y49/2, N3.
28.2		Right adjustable camshaft timing solenoid (Y49/2)	<p>Y49/2            1 —  —  — Y49/2 2</p>	<p>Ignition: <b>OFF</b>            Connector on Y49/2 unplugged.</p>	5 ± 1 Ω	Y49/2.


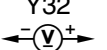
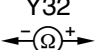
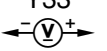
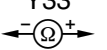
### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
28.3		Wiring	<p>N3</p>  <p>41 —┐    ─┐⊖⊕┐    ┐— 2 22 —┐    ─┐⊖⊕┐    ┐— 1</p>	Ignition: <b>OFF</b> CFI control module (N3) and connector on Y49/2 unplugged.	< 1 Ω	Wiring.
29.0		<b>A/C compressor engagement signal</b>	<p>N3</p>  <p>6 —┐    ─┐⊖⊕┐    ┐— 45</p>	Engine: <b>at Idle</b> Switch <b>ON</b> automatic climate control (A/C compressor).	5 – 10 V	Wiring, Engine systems control module (N16), Check A/C compressor cut-out (see DM, Climate Control, Vol. 1).
29.1		Wiring	<p>N16</p>  <p>9 —┐    ─┐⊖⊕┐    ┐— 45</p>	Ignition: <b>OFF</b> N3 and A/C compressor control module (N6) unplugged.	< 1 Ω	Wiring.


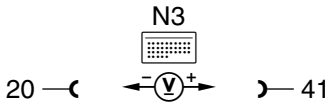
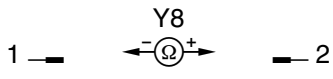
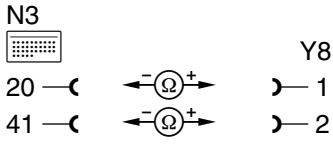
### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
30.0	II	<b>Electromagnetic AIR pump clutch (Y33)</b> Control		Ignition: <b>OFF</b> ECT sensor (B11/2) unplugged. Using two resistance substitution units, simulate 2.5 kΩ resistance (+ 20°C) at sockets 2 and 4 as well as at sockets 1 and 3 (Figure 12).  Engine: <b>at Idle</b>  Disconnect air hose to check valve.	11 – 14 V (for approx. 2 minutes after start)  Noticeable air flow at air hose.	⇒ 30.1, Engine systems control module (N16).
30.1		Secondary air injection control signal		Ignition: <b>OFF</b> ECT sensor (B11/2) unplugged. Simulate 2.5 kΩ resistance (+ 20°C) at sockets 2 and 4 as well as at sockets 1 and 3 (Figure 12). Engine: <b>at Idle</b>	11 – 14 V (for approx. 2 minutes after start)	Wiring, CFI control module (N3).
30.2		Wiring		Ignition: <b>OFF</b> N3 and N16 unplugged.	< 1 Ω	Wiring.



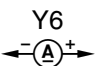
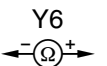
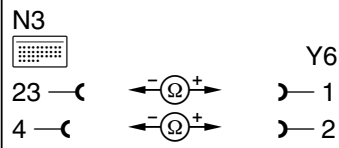
### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
30.3		AIR pump switchover valve (Y32) Control	1 —  — 2	Ignition: <b>OFF</b> ECT sensor (B11/2) unplugged. Simulate 2.5 kΩ resistance (+ 20°C) at sockets 2 and 4 as well as at sockets 1 and 3 (Figure 12). Connector on Y32 unplugged. Engine: <b>at Idle</b>	11 – 14 V (for approx. 2 minutes after start)	Wiring to Y32 (located in engine compartment): Model 124: (Figure 5), Model 129: (Figure 6).
30.4		AIR pump switchover valve (Y32)	1 —  — 2	Ignition: <b>OFF</b> Connector on Y32 unplugged.	25 ± 5 Ω	Y32.
30.5		Electromagnetic AIR pump clutch (Y33) Control	1 —  — 2	Ignition: <b>OFF</b> ECT sensor (B11/2) unplugged. Simulate 2.5 kΩ resistance (+ 20°C) at sockets 2 and 4 as well as at sockets 1 and 3 (Figure 12). Connector on Y33 unplugged. Engine: <b>at Idle</b>	11 – 14 V (for approx. 2 minutes after start)	Wiring to Y33 (located in harness channel in front of right spring tower).
30.6		Electromagnetic AIR pump clutch (Y33)	1 —  — 2	Connector on Y32 unplugged.	5 ± 1 Ω	Y33.


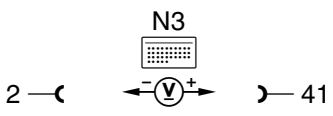
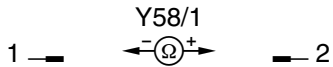
### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
31.0	25	<b>Start valve (Y8)</b> Control		Ignition: <b>OFF</b> ECT sensor (B11/2) unplugged. Using two resistance substitution units, simulate 2.5 kΩ resistance (+ 20°C) at sockets 2 and 4 as well as at sockets 1 and 3 (Figure 12). Engine: <b>at Idle</b>	Briefly 10 ± 2 V	CFI control module (N3), see “Testing Starting System” ( 33), ⇒ 32.0.
32.0		Start valve (Y8) Resistance		Ignition: <b>OFF</b> Connector on Y8 unplugged.	10 – 15 Ω	Y8.
32.1		Wiring		Ignition: <b>OFF</b>	< 1 Ω	Wiring, Intermittent contact (X26/2).


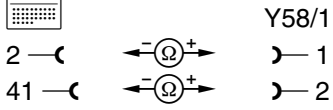
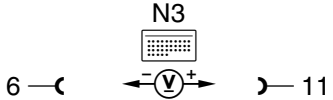
### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
33.0		<b>ISC valve (Y6)</b> Current check		Ignition: <b>OFF</b> Connect test cable to Y6.  Engine: <b>at Idle</b>	<b>Engine 104</b> 600 ± 50 mA  <b>Engine 119</b> 700 – 1000 mA	Wiring, Intermittent contact (X26/2), CFI control module (N3).
33.1		Resistance		Ignition: <b>OFF</b>	<b>Engine 104</b> 7.5 – 10 Ω  <b>Engine 119</b> 3.5 – 5.5 Ω	Y6, Intermittent contact (X26/2).
33.2		Wiring		Ignition: <b>OFF</b> N3 unplugged.	< 1 Ω	Wiring, Intermittent contact (X26/2).

### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
34.0		<b>Charcoal canister purging</b> Operation		<b>Note to Test connection:</b> Connect vacuum tester to side connection (B) of purge valve (53): Model 124: (Figure 8), Model 129: (Figure 9, 11).  Ignition: <b>OFF</b> Purge line (B, Figures 8, 9 or 11) disconnected from charcoal canister at purge valve. Engine: <b>at Idle</b> and at operating temperature. Slowly increase engine speed to a maximum of 3000 rpm.	Vacuum increases with increasing rpm.	Wiring, CFI control module (N3), Purge control valve (Y58/1), Check vacuum lines, ⇒ 13.0, Intermittent contact (X26/2).
34.1	23	Purge control valve (Y58/1) Control		Engine: <b>at Idle</b> Increase engine speed to > 800 rpm	11 – 14 V	Wiring, N3, Y58/1, Intermittent contact (X26/2).
34.2		Purge control valve (Y58/1)		Ignition: <b>OFF</b> Connector on Y58/1 (Figures 8, 10) unplugged.	25 ± 5 Ω	Y58/1.

### Electrical Test Program – Test



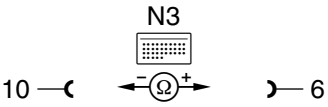
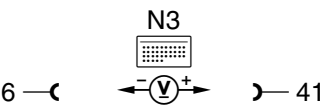
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
34.3		Wiring	<p>N3</p>  <p>Y58/1</p>	Ignition: <b>OFF</b> N3 unplugged.	< 1 Ω	Wiring, Intermittent contact (X26/2).
35.0		<b>Non-USA vehicles.</b> <b>Continue to next test step.</b>				
36.0 <sup>1)</sup>		<b>Circuit 50</b> Activation	<p>N3</p> 	Plug 2 on DI control module (N1/3) disconnected (Figure 7). Engine: <b>Start</b>	10 ± 2 V while cranking	Wiring (circuit 50).

<sup>1)</sup> On-off ratio 70% when measured with on-off ratio tester.








## 2.1 Continuous Fuel Injection System

## Engines 104, 119 CFI

### Electrical Test Program – Test


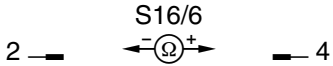
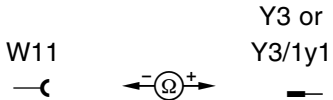
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
37.0		<b>Deceleration shut-off Engine 104</b>		<b>Note to Test connection:</b> Connect  to diagnostic socket (X11).  Engine: <b>Start</b> Increase engine speed to 2000 – 2500 rpm, then close throttle valve.	On-off ratio momentarily jumps up to 95%.	Wiring, Check adjustment of linkage and throttle valve switch, S27/2.
37.1		Deceleration shut-off microswitch (S27/2)		Ignition: <b>OFF</b> CFI control module (N3) unplugged. Accelerator pedal in CTP.  Depress accelerator pedal.	$< 1 \Omega$  $\infty \Omega$	Open circuit, S27/2.  Short circuit, S27/2.
37.2		Vehicles with ASR Idle speed switching signal		Ignition: <b>ON</b> Accelerator pedal in CTP.  Depress accelerator pedal.	$11 - 14 \text{ V}$  $< 1 \text{ V}$	ACCelerator pedal position sensor, Check EA/CC/ISC control module (N4/1), see DM, Engines, Vol. 2 – 6.1.

### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
37.3		Electrohydraulic actuator (Y1) Current check	1 —   — 2	Ignition: <b>OFF</b> Connect test cable 102 589 04 63 00 to electrohydraulic actuator.  Engine: <b>Start</b> Increase engine speed to 2000 – 2500 rpm and close throttle valve.	Momentarily approx. – 60 mA until combustion resumes.	⇒ 1.0 – 3.0 and ⇒ 10.0, N3.
38.0		<b>Engine 104</b> Kickdown cut-out Malfunction circuit  <b>Engine 119</b> Kickdown cut-out Malfunction circuit	7 —   — 1	Ignition: <b>OFF</b> Engine systems control module (N16) unplugged. Kickdown switch (S16/6) activated.	<b>Engine 104:</b> 450 ± 50 mA <sup>1)</sup> 850 ± 50 mA <sup>1)</sup>  <b>Engine 119:</b> 450 ± 50 mA <sup>1)</sup> 250 ± 50 mA <sup>1)</sup>	Wiring, S16/6, AT kickdown valve (Y3, Figure 4).
38.1		Kickdown switch (S16/6) Voltage supply	7 —   — 1	Ignition: <b>OFF</b> N16 unplugged.  Ignition: <b>ON</b> Accelerator pedal in CTP.  Accelerator pedal in kickdown position.	< 1 V  11 – 14 V	s16/6, AT kickdown valve (Y3, Figure 4). Wiring, ⇒ 38.2.

<sup>1)</sup> Nominal value may vary from one manufacturer to another.

### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
38.2		Kickdown switch (S16/6) Resistance		Ignition: <b>OFF</b> Kickdown switch (S16/6) activated.  Kickdown switch (S16/6) not activated.	$< 1 \Omega$  $\infty \Omega$	S16/6.
38.3		AT kickdown valve (Y3) or kickdown solenoid valve (Y3/1y1) <sup>2)</sup>		Ignition: <b>OFF</b> Connector Y3 unplugged or, with 5-speed AT, valve block connector (Y3/1x1) disconnected.	$12 \pm 3 \Omega$ <sup>1)</sup> $28 \pm 5 \Omega$ <sup>1)</sup>	Y3 or Y3/1y1.



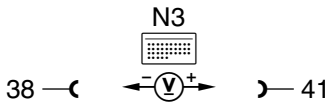
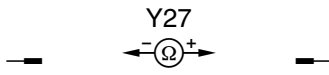
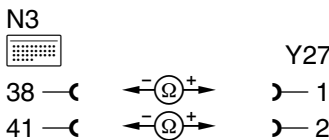
<sup>1)</sup> Nominal value may vary from one manufacturer to another.

<sup>2)</sup> Kickdown solenoid valve (Y3/1y1) in 5-speed AT 722.5 only.

## 2.1 Continuous Fuel Injection System

## Engines 104, 119 CFI


### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
39.0		<b>EGR valve (static test)</b>		<b>Note to Test connection:</b> Connect vacuum tester to EGR valve.  Apply 500 mbar vacuum. Disconnect vacuum line on EGR valve.	EGR valve closes audibly	EGR valve.
39.1		EGR valve (dynamic test)		<b>Note to Test connection:</b> Vacuum tester connected to EGR valve.  Engine: <b>at Idle</b> Engine rpm > 1000 rpm	> 400 mbar	Vacuum lines, Vacuum supply, EGR switchover valve (Y27), Model 124: (Figure 5), Model 129: (Figure 6), Throttle valve housing.
40.0		<b>EGR switchover valve (Y27) Control</b>		Engine: <b>at Idle</b> Engine rpm > 3000 rpm	Approx. 12 V	Wiring, CFI control module (N3).
40.1		EGR switchover valve (Y27)		Ignition: <b>OFF</b>	$30 \pm 5 \Omega$	Y27: Model 124: (Figure 5), Model 129: (Figure 6).
40.2		Wiring		Ignition: <b>OFF</b> N3 and Y27 unplugged.	< 1 $\Omega$	Wiring.





## 2.1 Continuous Fuel Injection System

Engines 104, 119 CFI


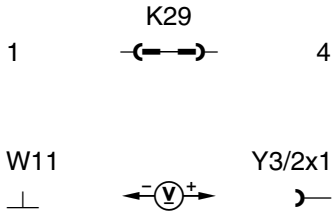
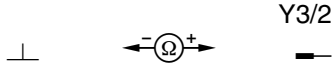
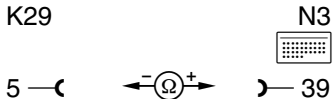
### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
41.0		<b>Non-USA vehicles.</b> <b>Continue to next test step.</b>				
42.0		<b>Non-USA vehicles.</b> <b>Continue to next test step.</b>				
43.0		<b>Non-USA vehicles.</b> <b>Continue to next test step.</b>				


### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
44.0		<b>Transmission upshift delay relay module (K29)</b> Solenoid valve (Y3/2) Control	W11 └┐  Y3/2 └┐	Ignition: <b>OFF</b> ECT sensor (B11/2) unplugged. Using two resistance substitution units, simulate 2.5 kΩ resistance (+ 20°C) at sockets 2 and 4 as well as at sockets 1 and 3 (Figure 12). Engine: <b>at Idle</b>	11 – 14 V Engine 104: max. 80 sec.  Engine 119: max. 120 sec.	⇒ 44.1, ⇒ 44.2, ⇒ 44.3, ⇒ 44.4, CFI control module (N3), K29.
44.1		Transmission upshift delay relay module (K29) Voltage supply	W11 └┐  K29 └┐ 3  W11 └┐  K29 └┐ 4	Ignition: <b>OFF</b> K29 unplugged: Model 124: (Figure 16), Model 129: (Figure 17). Ignition: <b>ON</b>	11 – 14 V     11 – 14 V	Overvoltage protection relay (K1/1), Wiring.









### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
44.2		Wiring to solenoid valve (Y3/2)		Ignition: <b>OFF</b> Transmission upshift delay relay (K29) unplugged: Model 124: Figure 16 Model 129: Figure 17 Solenoid valve connector (Y3/2x1) unplugged. Ignition: <b>ON</b>	11 – 14 V	Open circuit.
44.3		Solenoid valve (Y3/2)		Ignition: <b>OFF</b> Solenoid valve connector (Y3/2x1) unplugged.	10 – 18 Ω	Y3/2.
44.4		Wiring from CFI control module (N3) to transmission upshift delay relay module (K29)		Ignition: <b>OFF</b> Socket box connected to N3. K29 unplugged.	< 1 Ω	Open circuit.

### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
45.0		<b>Transmission upshift delay switchover valve (Y3/3)</b> Operation		Note to Test connection: Disconnect vacuum line (Figure 38) on Y3/3.  Connect vacuum tester with Y-distributor to Y3/3.  Ignition: <b>OFF</b> ECT sensor (B11/2) unplugged. Using two resistance substitution units, simulate 2.5 kΩ resistance (+ 20°C) at sockets 2 and 4 as well as at sockets 1 and 3 (Figure 12). Engine: <b>at Idle</b>	> 400 mbar (for a maximum of 80 seconds)	Control of Y3/3, Short/open circuit, Y3/3 defective, Vacuum element for transmission upshift delay, Vacuum line.

### Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
45.1		Control	<p>W11  Y3/3 </p> <p>Y3/3 1  + </p>	<p>Ignition: <b>OFF</b> Connector of Y3/3 (Figure 38) unplugged. Using two resistance substitution units, simulate 2.5 kΩ resistance (+ 20oC) at sockets 2 and 4 as well as at sockets 1 and 3 (Figure 12).</p> <p>Engine: <b>Start</b></p>	<p>11 – 14 V</p> <p>11 – 14 V (for a maximum of 80 seconds)</p>	<p>Overvoltage protection relay module (K1/1), Short/open circuit.</p> <p>Short/open circuit, CFI control module (N3).</p>
45.2		Coil resistance	<p>Y3/3  Y3/3 </p> <p>1  2</p>	<p>Ignition: <b>OFF</b> Connector of Y3/3 (Figure 38) unplugged.</p>	25 – 40 Ω	Y3/3 defective.

**Electrical Test Program – Test**

Temperature (°C)	Resistance (Ω)	Voltage (V) at IAT sensor (B17/2)	Voltage (V) at ECT sensor (B11/2)
– 20	15700	2.85 – 3.49	5.12 – 5.60
– 10	10000	2.50 – 3.06	4.49 – 5.11
0	5900	2.10 – 2.56	4.12 – 4.48
10	3700	1.69 – 2.07	3.77 – 4.11
20	2500	1.32 – 1.62	3.36 – 3.76
30	1700	1.03 – 1.25	2.92 – 3.35
40	1170	0.77 – 0.94	2.51 – 2.91
50	830	0.57 – 0.69	2.09 – 2.50
60	600	0.42 – 0.52	1.69 – 2.08
70	435	0.32 – 0.40	1.36 – 1.68
80	325	0.25 – 0.31	1.09 – 1.35
90	245	0.18 – 0.22	0.88 – 1.08
100	185	0.14 – 0.17	0.75 – 0.87

### Electrical Test Program – Test

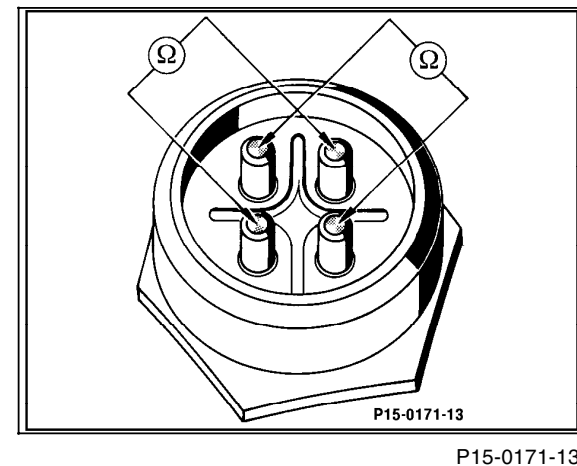
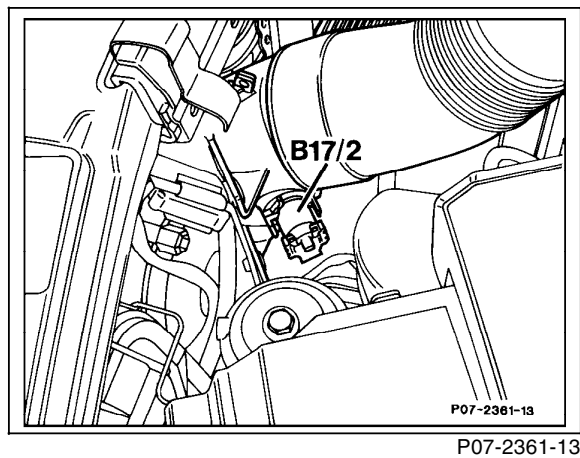
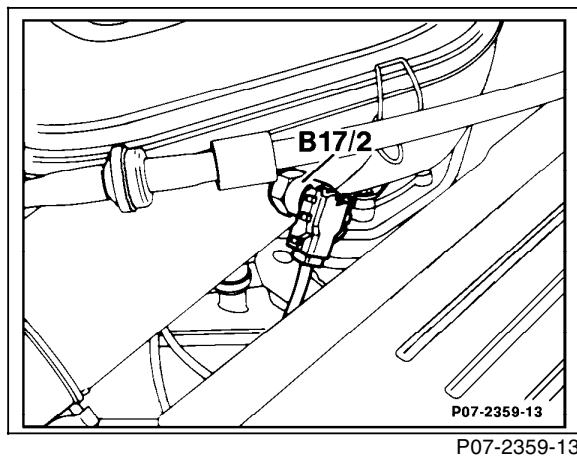


Figure 1  
Engine 104

B17/2 IAT sensor

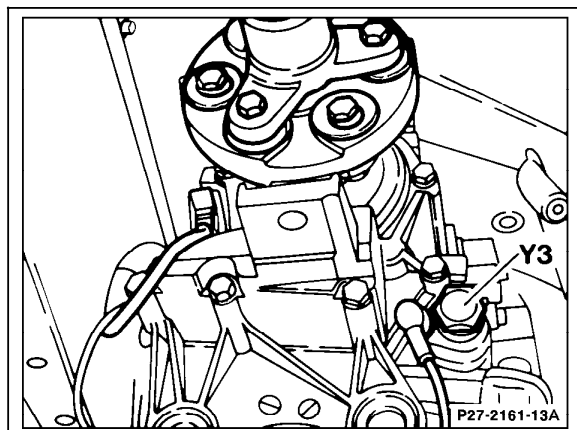
Figure 2  
Engine 119

B17/2 IAT sensor

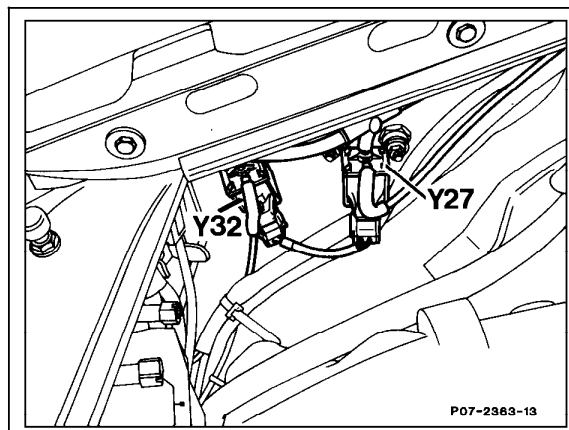
Figure 3

B11/2 ECT sensor (4-pole)

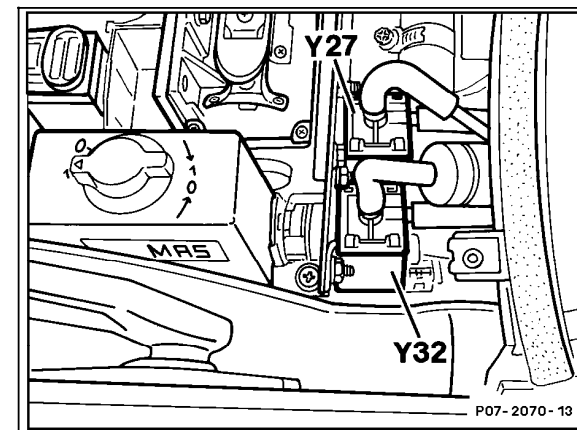
### Electrical Test Program – Test



P27-2161-13A



P07-2363-13



P07-2070-13

Figure 4

Y3 Kickdown valve (AT)

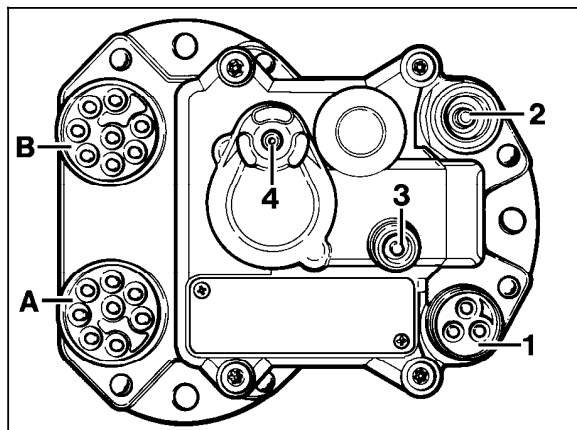
Figure 5  
Model 124

Y27 EGR solenoid valve  
Y32 AIR pump solenoid valve

Figure 6  
Model 129

Y27 EGR solenoid valve  
Y32 AIR pump solenoid valve

### Electrical Test Program – Test

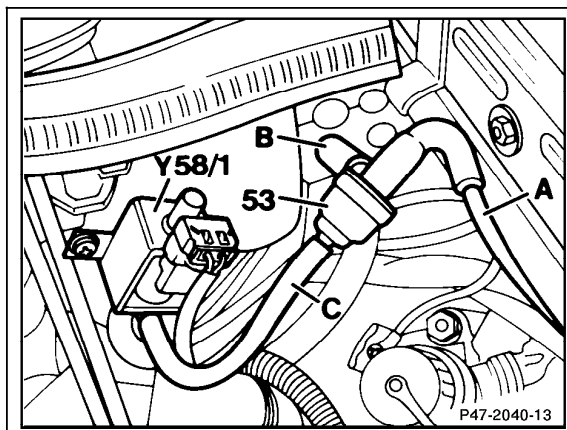


P15-2030-13A

Figure 7

#### DI control module

- 1 Knock sensor
- 2 CKP sensor (L5)
- 3 Reference resistor
- 4 Vacuum connection
- A 8-pole plug connection
- B 8-pole plug connection

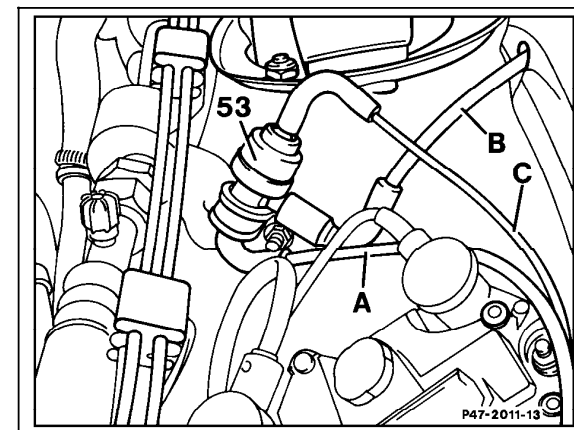


P47-2040-13

Figure 8

#### Engine 104, Model 124

- 53 Purge valve
- Y58/1 Purge control valve
- A Purge line (to throttle valve)
- B Purge line (to charcoal canister)
- C Purge control valve vacuum line



P47-2011-13

Figure 9

#### Engine 104, Model 129

- 53 Purge valve
- Y58/1 Follow vacuum line "C" for location

Electrical Test Program – Test

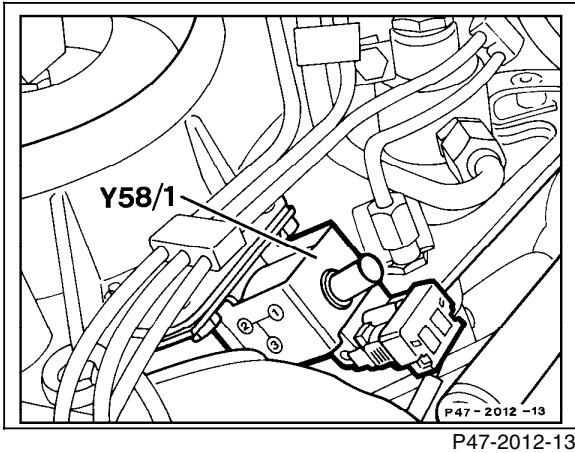


Figure 10  
Engine 119, Model 129  
Y58/1 Purge control valve

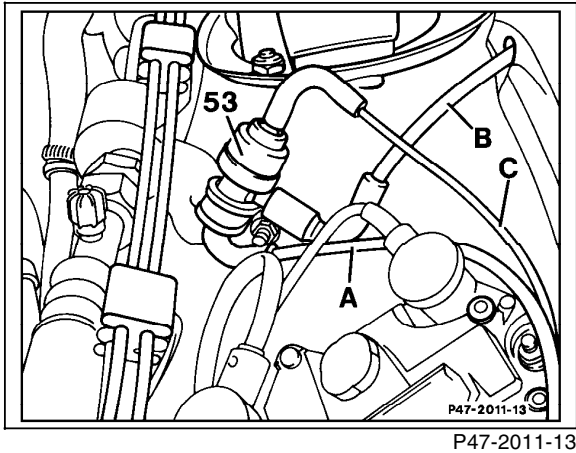


Figure 11  
Engine 119, Model 129  
53 Purge valve  
A Purge line (to throttle valve)  
B Purge line (to charcoal canister)  
C Purge control valve vacuum line

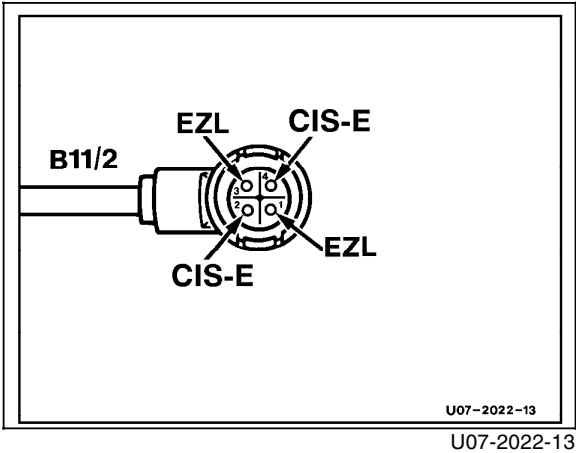
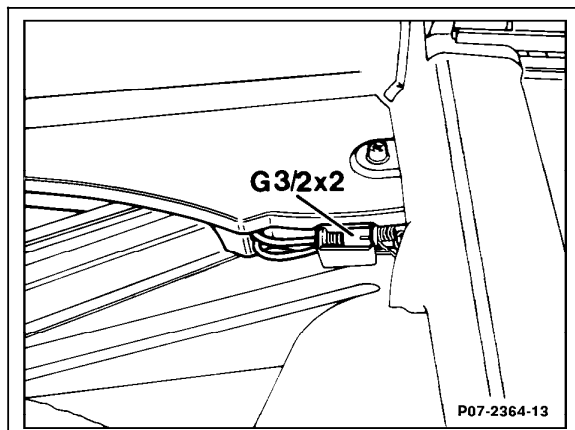


Figure 12  
Model 124  
B11/2 ECT sensor (4-pole), terminal layout

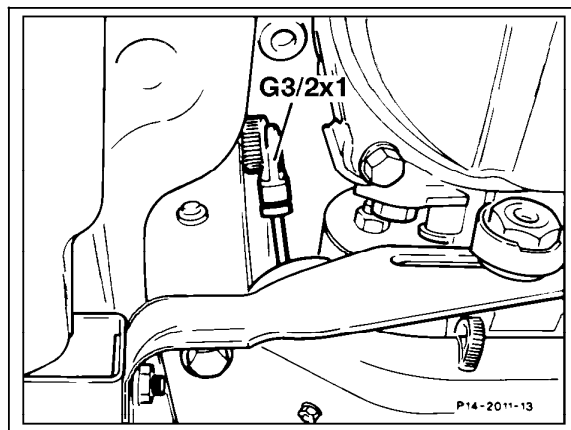
### Electrical Test Program – Test



P07-2364-13

Figure 13  
Model 124

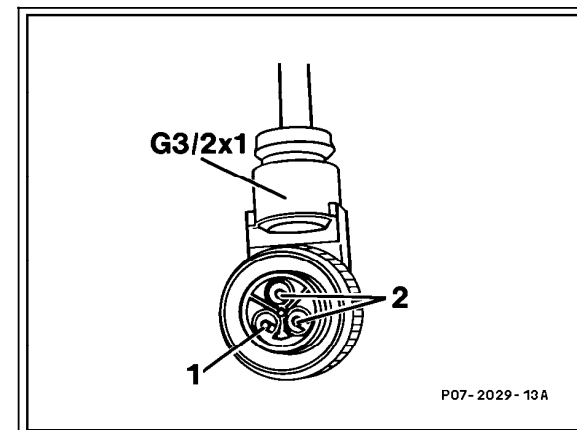
G3/2x2 O2S 1 signal connector



P14-2011-13

Figure 14  
Model 129

G3/2x1 O2S 1 connector (before TWC)



P07-2029-13A

P07-2029-13A

Figure 15  
Model 129

1 O2S 2 signal  
2 O2S 1 heater  
G3/2x1 O2S 1 connector (before TWC)

Electrical Test Program – Test

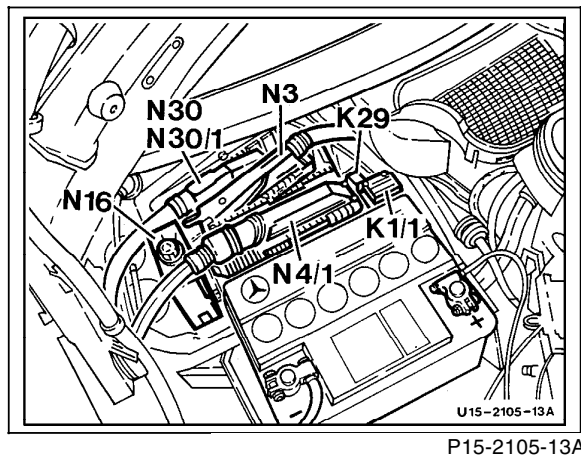


Figure 16  
Model 124  
K29 Transmission upshift delay relay module

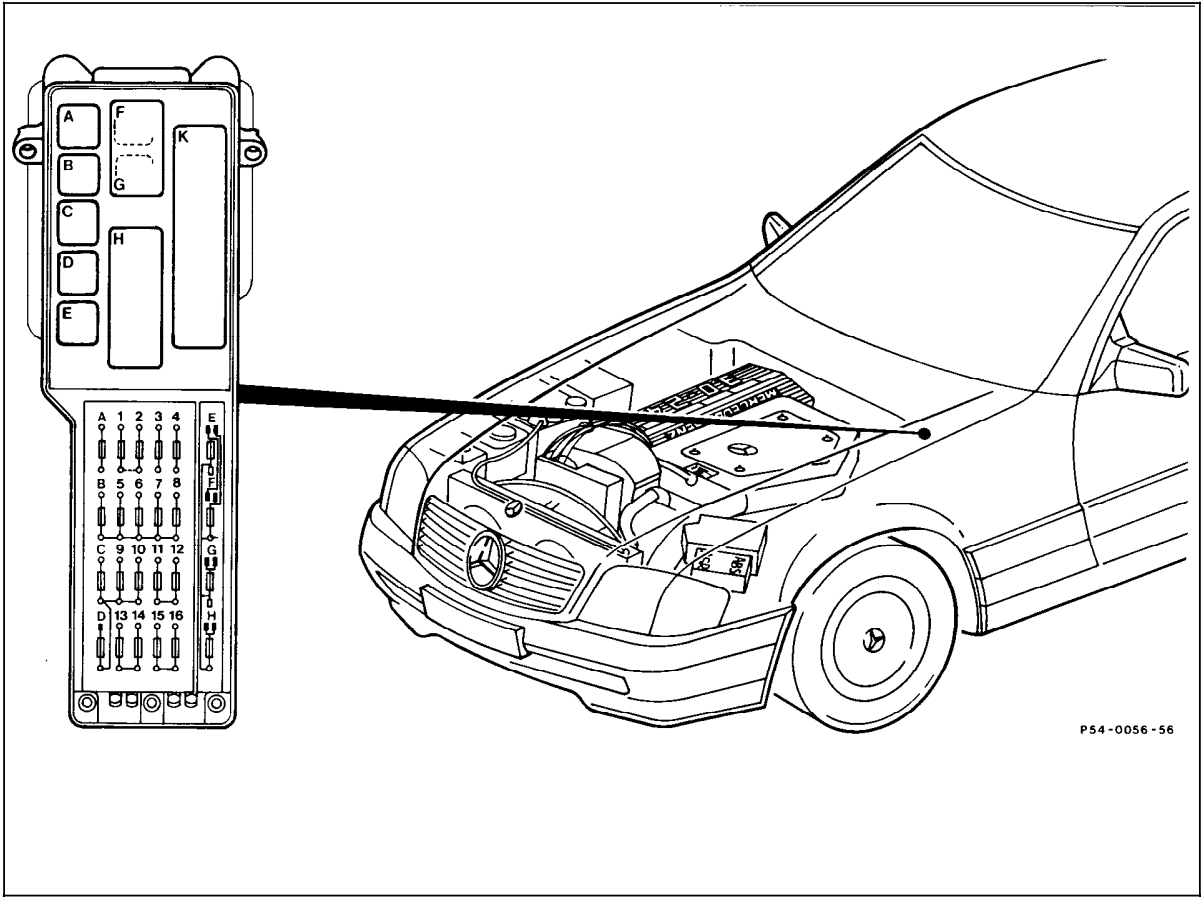
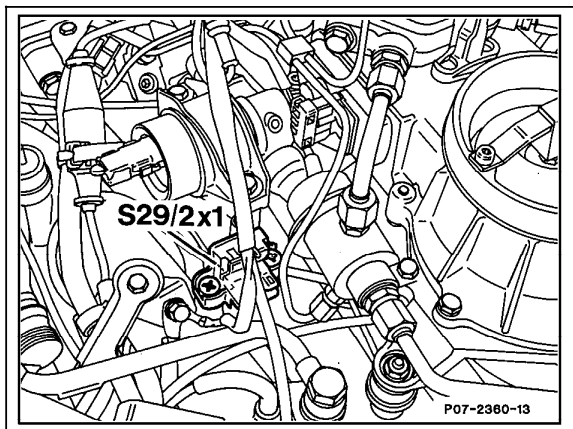


Figure 17  
Model 129  
K29 Transmission upshift delay relay module (location E)

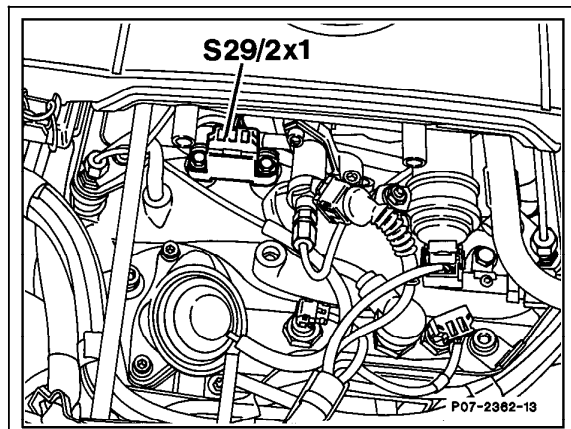
## 2.1 Continuous Fuel Injection System

Engines 104, 119 CFI

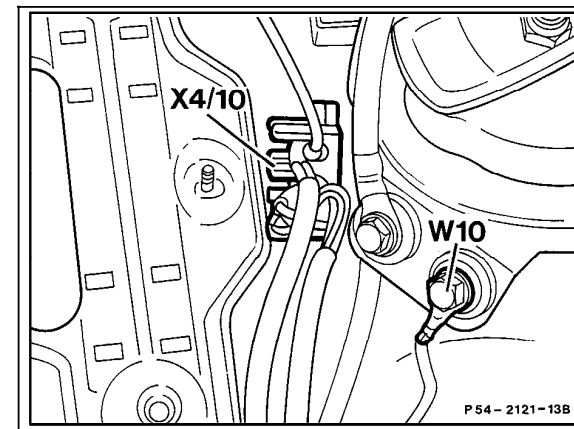
### Electrical Test Program – Test



P07-2360-13



P07-2362-13



P54-2121-13B

Figure 18  
Engine 104

S29/2x1 WOT/CTP switch connector

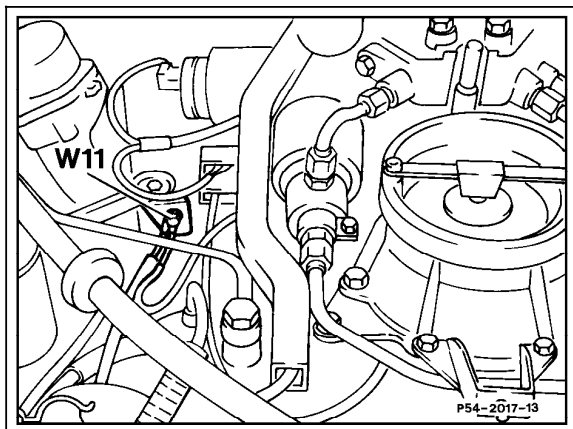
Figure 19  
Engine 119

S29/2x1 WOT/CTP switch connector

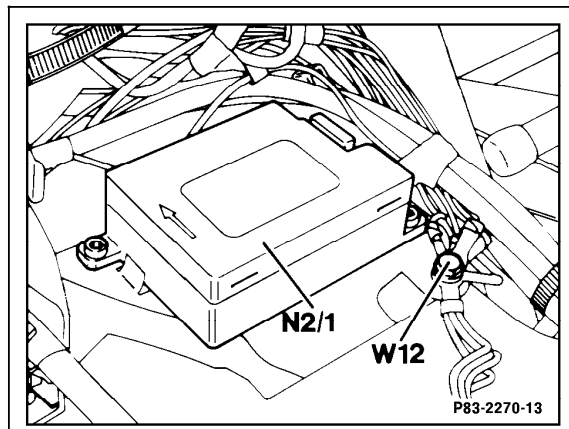
Figure 20  
Model 124

W10 Ground (battery)

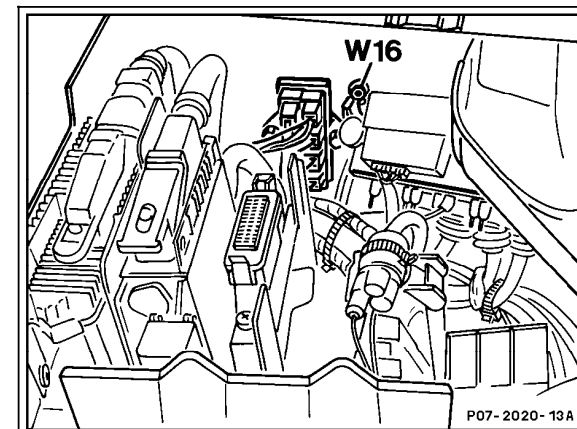
### Electrical Test Program – Test



P54-2017-13



P83-2270-13



P07-2020-13A

Figure 21

W11 Ground (engine - connection point for ground wires)

Figure 22

Model 124

W12 Ground (center console)

Figure 23

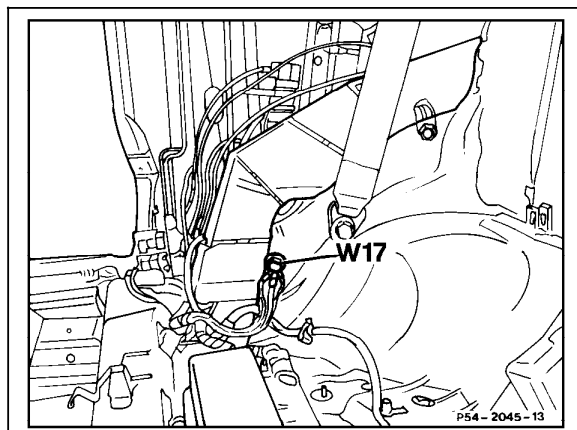
Model 129

W16 Ground (component compartment)

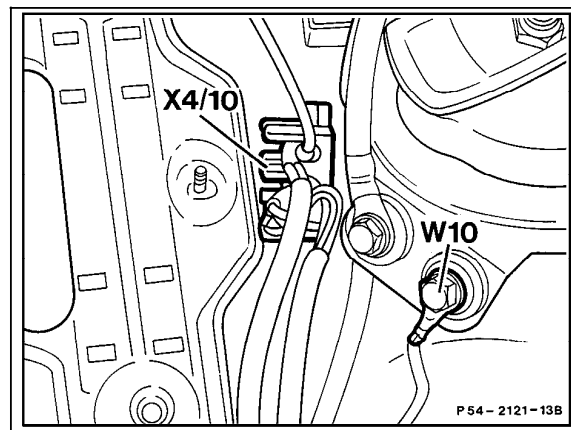
## 2.1 Continuous Fuel Injection System

Engines 104, 119 CFI

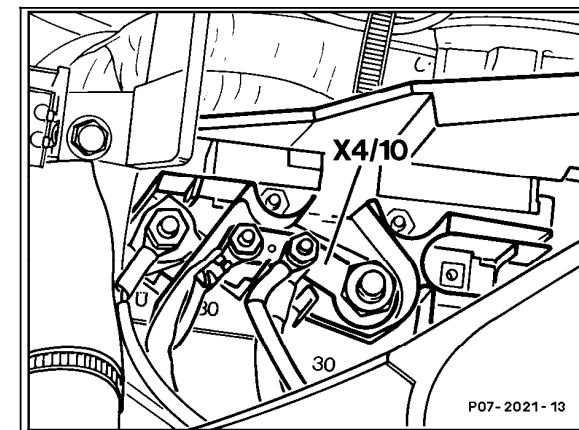
### Electrical Test Program – Test



P54-2045-13



P54-2121-13B



P07-2021-13

Figure 24  
Model 129

W17 Ground (right rear storage area)

Figure 25  
Model 124

X4/10 Terminal block (circuit 30/30Ü/61e/87L) (6-pole)

Figure 26  
Model 129

X4/10 Terminal block (circuit 30/30Ü/61e/87L) (6-pole)

### Electrical Test Program – Test

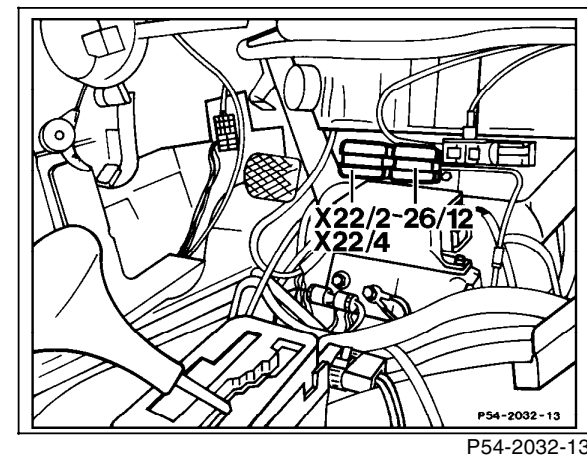
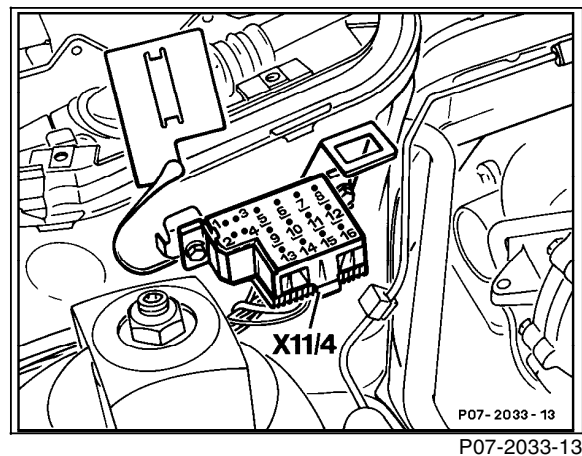
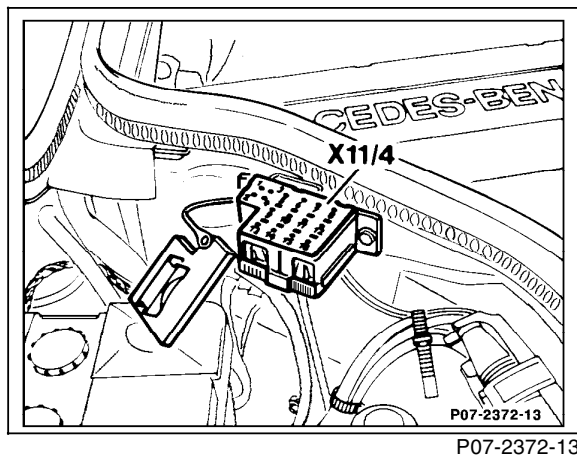
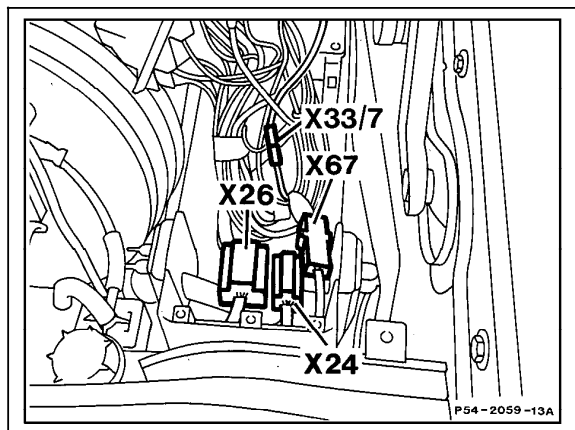


Figure 27  
Model 124  
X11/4 Data link connector (DTC readout)

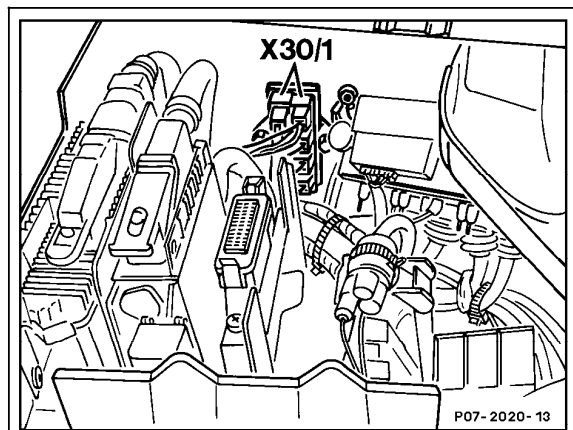
Figure 28  
Model 129  
X11/4 Data link connector (DTC readout)

Figure 29  
Model 129  
X22/2 AT/engine connector (8-pole)

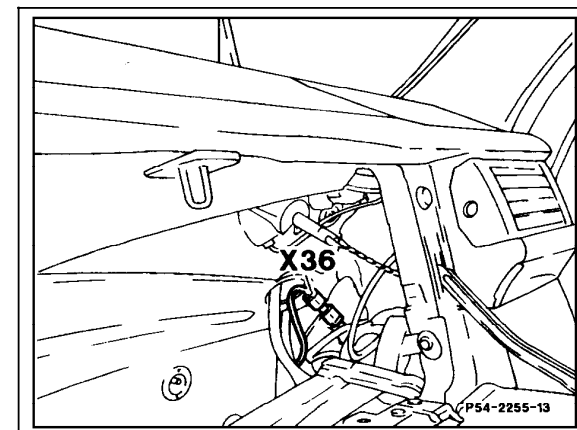
### Electrical Test Program – Test



P54-2059-13A



P07-2020-13



P54-2255-13

Figure 30  
Model 124

X26 Interior/engine connector (12-pole)

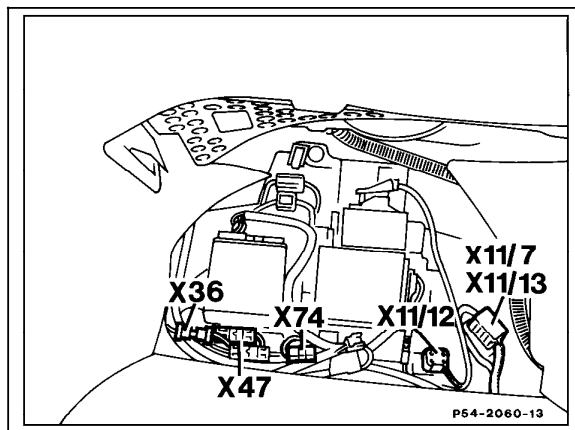
Figure 31  
Model 129

X30/1 Multi-function connector block

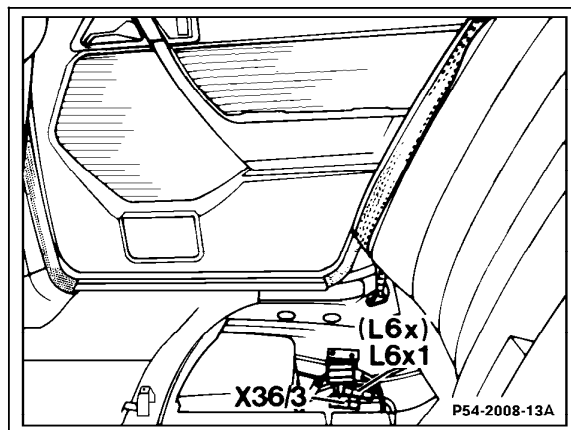
Figure 32  
Model 124

X36 FP harness connector (1-pole)

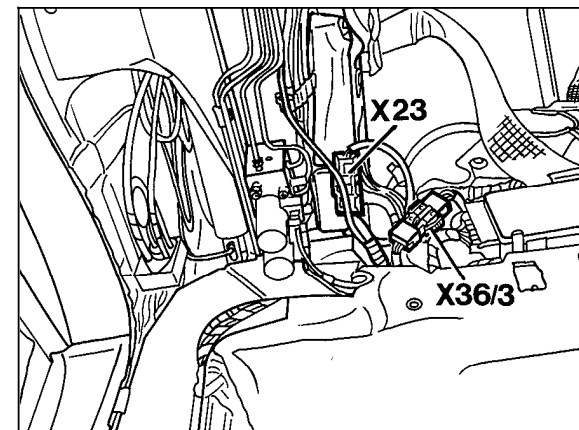
### Electrical Test Program – Test



P54-2060-13



P54-2008-13A



P54-2036-13

Figure 33  
Model 129

X36 FP harness connector (1-pole)

Figure 34  
Model 124

X36/3 FP harness connector (2-pole)

Figure 35  
Model 129

X36/3 FP harness connector (2-pole)

### Electrical Test Program – Test

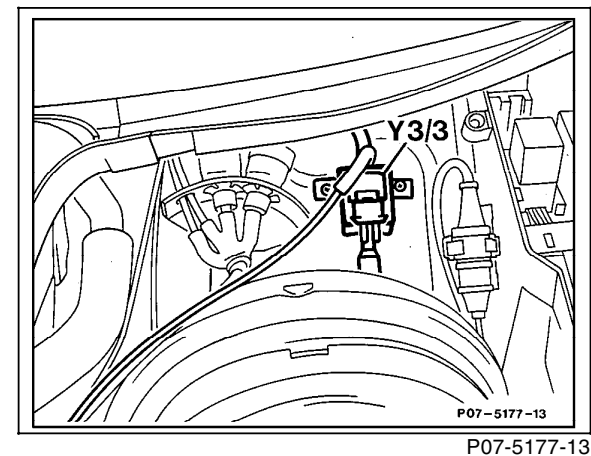
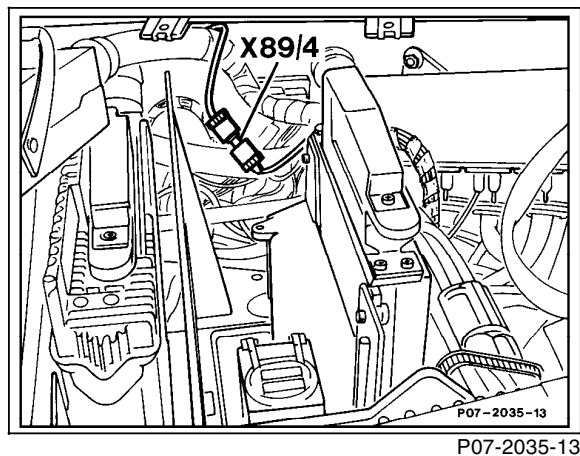
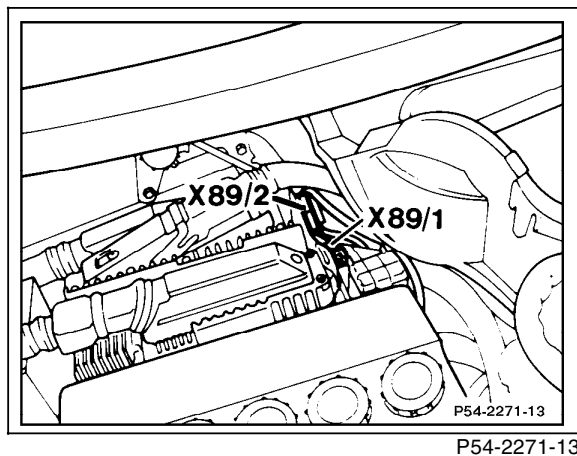


Figure 36  
Model 124

X89/2 EA control module/engine harness connector  
(3-pole)

Figure 37  
Model 129, Engine 104

X89/4 EA control module/CFI connector (1-pole)

Figure 38  
Model 124 (model 129 location similar)

Y3/3 Upshift delay switchover valve