2.1 Electronic Automatic Transmission Control (ETC) Contents

2.1 Model 129 with CFI, (722.5)

Diagnosis - Function Test

Test Drive Evaluation [1)]

Determine if transmission shifts into all 5 gears during test drive.

A. Allow vehicle to reach highest gear.
   1. Place selector lever in transmission range (TR) “4.”
   2. Maintain a vehicle speed of 56 mph (90 km/h).
   3. Release accelerator pedal.
   4. Immediately moved selector lever from TR “4” into TR “D”.
   5. The transmission should shift 4 → 5.
   6. Move selector lever from TR “D” to TR “4,” transmission should downshift from 5 → 4.
   7. Move selector lever from TR “4” to TR “3,” transmission should downshift from 4 → 3.
   8. If both downshifts occur, all gears are in operating condition.
   9. If only one downshift occurs, a gear (4GR or 5GR) is not functioning properly.

B. Determine engine rpm vs. transmission gear ratio.
   10. Maintain vehicle speed at 62 mph (100 km/h).
   11. Check engine rpm with selector lever in transmission ranges (TR) “3,” “4,” and “D.”

       TR “3” = approximately 4500 rpm
       TR “4” = approximately 3150 rpm
       TR “D” = approximately 2300 rpm

1) MBUSA neither recommends nor requires testing on public roads which exceeds posted speed limits. In those states or provinces where the recommended vehicle speed exceeds posted speed limits, testing should be conducted on a test rack or a dynamometer.

Diagnosis - Diagnostic Trouble Code (DTC) Memory

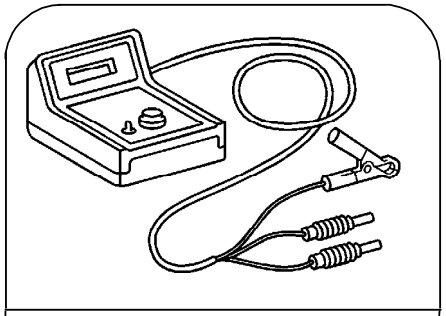
Test Preparation for DTC Readout

1. Connect impulse counter scan tool to data link connector (X11/4) as shown in section 0.

   Note: Connect yellow wire from impulse counter scan tool to socket 10 for impulse output from transmission control module (N15/1).

2. Ignition: **ON**.
3. Read DTC memory for transmission control module (N15/1).

Special Tools



124 589 19 21 00

Pulse counter

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Diagnostic trouble code (DTC)	Possible cause	Test step/Remedy [1]
1	No fault in system.	In case of complaint: 23 (entire test)
3	Load signal interrupted.	23⇒ 7.0
4	Throttle valve switch (potentiometer) interrupted.	23⇒ 2.0
5	Engine speed signal interrupted.	23⇒ 5.0, Check engine systems (MAS) control module (N16) or DI control module (N1/3)
6	VSS interrupted.	23⇒ 6.0
7	Output fault in TCM (N15/1) or fault in valve block control valve circuit (Y3/1y2).	23⇒ 9.0
8	Transmission control module (N15/1).	Replace N15/1
9	Valve block control valve (Y3/1y2) . [2]	23⇒ 9.0
10	Valve block control valve (Y3/1y2), short circuit.	23⇒ 9.0

1) Observe Preparation for Test, see 22.

2) If DTC 9 is displayed, it may be attributable to previous repair work done on the vehicle. For example, the valve block connector (Y3/1x1) on the transmission was not connected/reconnected while the engine was idling > 1000 rpm.
Clear DTC 9 by using impulse counter scan tool. Start engine and idle at > 1000 rpm for approximately 10 seconds, check DTC with impulse counter scan tool, if DTC 9 reappears 23 ⇒ 9.0.

Diagnosis - Complaint Related Diagnostic Chart

Complaint/Problem	Possible cause	Test step/Remedy [1]
Customer complaint: Transmission does not shift into 5GR or 4GR (vague complaint)	**Determine exact complaint by performing a test drive**	**11**
Transmission occasionally does not shift into 5GR, no DTC in memory	Sockets on TB switch AP potentiometer connector (S29/4x2) spread	Repair sockets on connector
Transmission shifts into 5GR only under WOT	Vacuum line from intake manifold and DI control module (N1/3) not connected or leaking	Connect/replace vacuum line
Transmission shifts 4 → 5 → 4 at approximately 2200 rpm or DTC's can only be read with engine running	Wires (socket 8 and 9) reversed on interior/engine connector (X26)	Correct wiring/pin layout
Transmission shifts 3 → 5, DTC 9	Valve block connector (Y3/1x1) on transmission not reconnected after repair work and engine idled > 100 rpm	Erase DTC 9 If DTC 9 reappears 23⇒ 9.0
Transmission occasionally does not shift into 5GR, transmission shifts 4 → 5 → 4	Loose contact on TB switch AP potentiometer connector (S29/4x2), incorrect TCM (N15/1) installed	Repair loose contact, install correct TCM.
No 5GR	Load signal DI control module (N1/3) Wiring between N1/3 and N15/1	23⇒ 7.0
No 5GR	Accelerator pedal signal Wiring Connector	23⇒ 2.0

[1] Observe Preparation for Test, see 22.

Diagnosis - Complaint Related Diagnostic Chart

Complaint/Problem	Possible cause	Test step/Remedy 1)
No 5GR	RPM signal DI control module (N1/3) Engine systems (MAS) control module (N16) CFI control module (N3) Wiring	23⇒ 5.0
No 5GR	Vehicle speed signal (VSS) Instrument cluster Wiring	23⇒ 2.0
No 4GR	Valve block control valve (Y3/1y2) TCM (N15/1)	23⇒ 9.0
No 4GR	No control voltage Overvoltage protection relay module (K1/2)	23⇒ 1.0

1) Observe Preparation for Test, see 22.

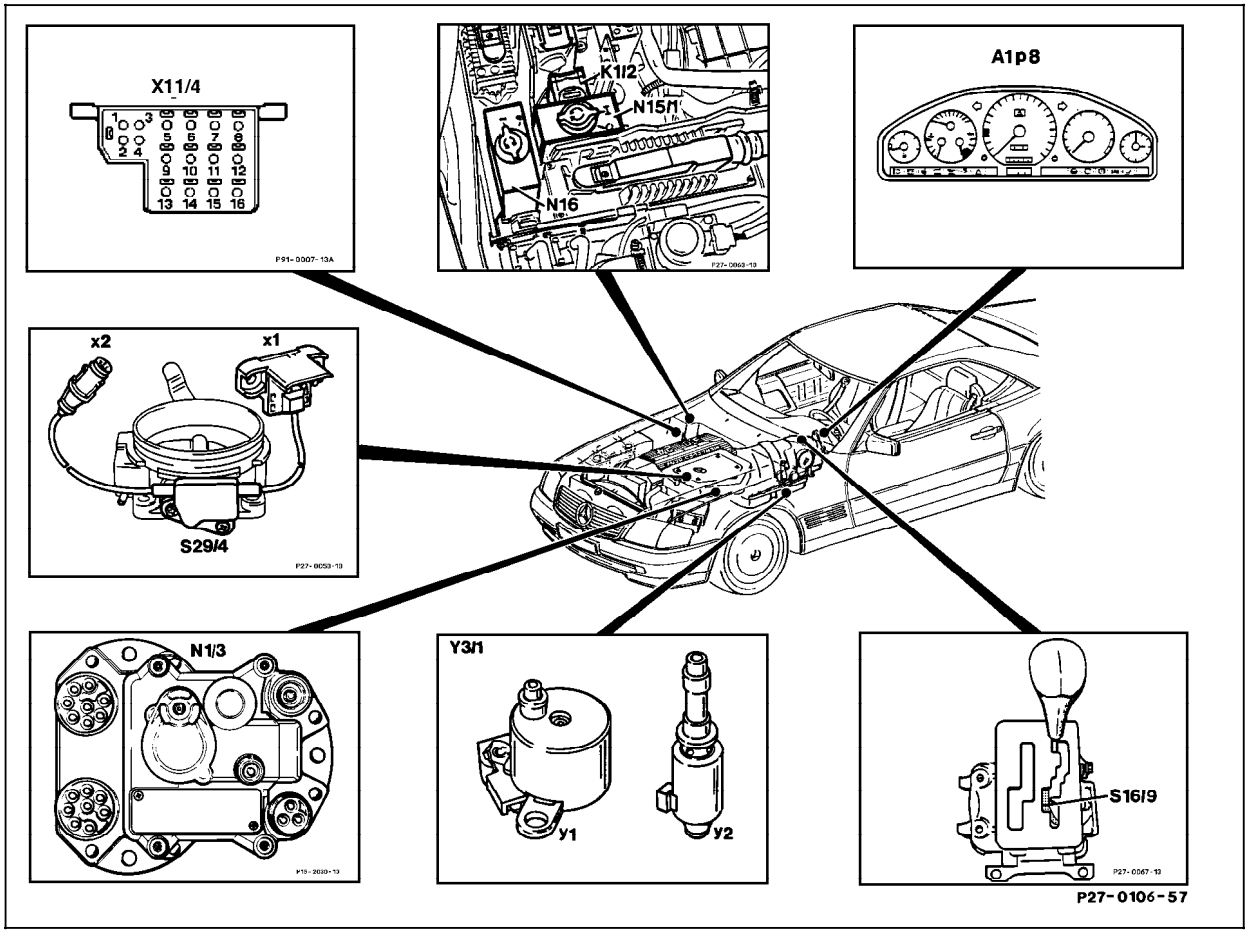
The following signals are not recognizeable via the data link connector (X11/4)

Complaint/Problem	Signal	Test step/Remedy 1)
No 5GR	TR “D“ signal	23⇒ 3.0
No kickdown or downshift	Kickdown signal	23⇒ 8.0

1) Observe Preparation for Test, see 22.

Electrical Test Program - Component Locations

Model 129



P27-0106-57

Figure 1

A1p8	Electronic speedometer
K1/2	Overvoltage protection relay module (87E/87L/30a, 9-pole)
N1/3	DI control module
N15/1	Transmission control module (TCM) (5-speed automatic)
N16	Engine systems control module
S16/9	Transmission range “D” contact switch (5-speed automatic transmission)
S29/4	TB switch
S29/4x1	CTP/WOT switch connector
S29/4x2	AP potentiometer connector
X11/4	Data link connector (DTC readout)
Y3/1	Valve block (5-speed AT)
Y3/1y1	Kickdown solenoid valve
Y3/1y2	Control valve

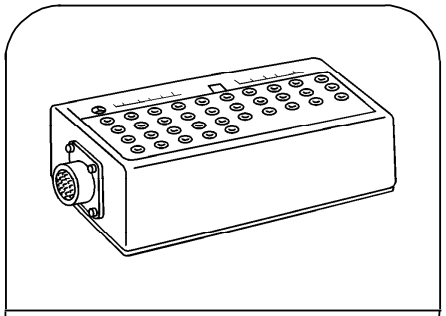
Electrical Test Program - Preparation for Test

Preliminary work:
Diagnosis - Diagnostic Trouble Code (DTC) Memory 12

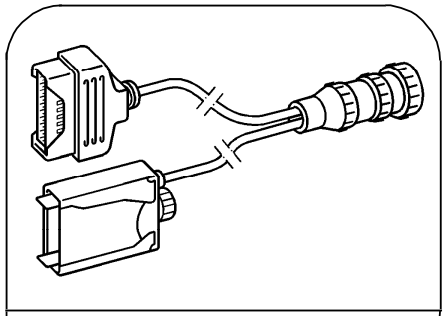
1. Disconnect TCM (N15/1).
2. Connect socket box and test cable according to connection diagram on following page.
3. Test accelerator control, full load stop.
4. Disconnect ABS/ASR control module (N30/1) (if so equipped).

Wiring Diagrams
Electrical Troubleshooting Manual, Model 129.

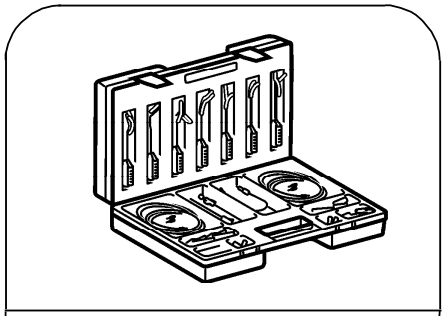
Special Tools



124 589 00 21 00
35-pin socket box



129 589 05 63 00
22-pin test cable



201 589 00 99 00
Electrical connecting set

Equipment

Digital multimeter [1]	Fluke models 23, 83, 85, 87

[1] Available through the MBUSA Standard Equipment Program.

Electrical Test Program - Preparation for Test

Connection Diagram - Socket Box

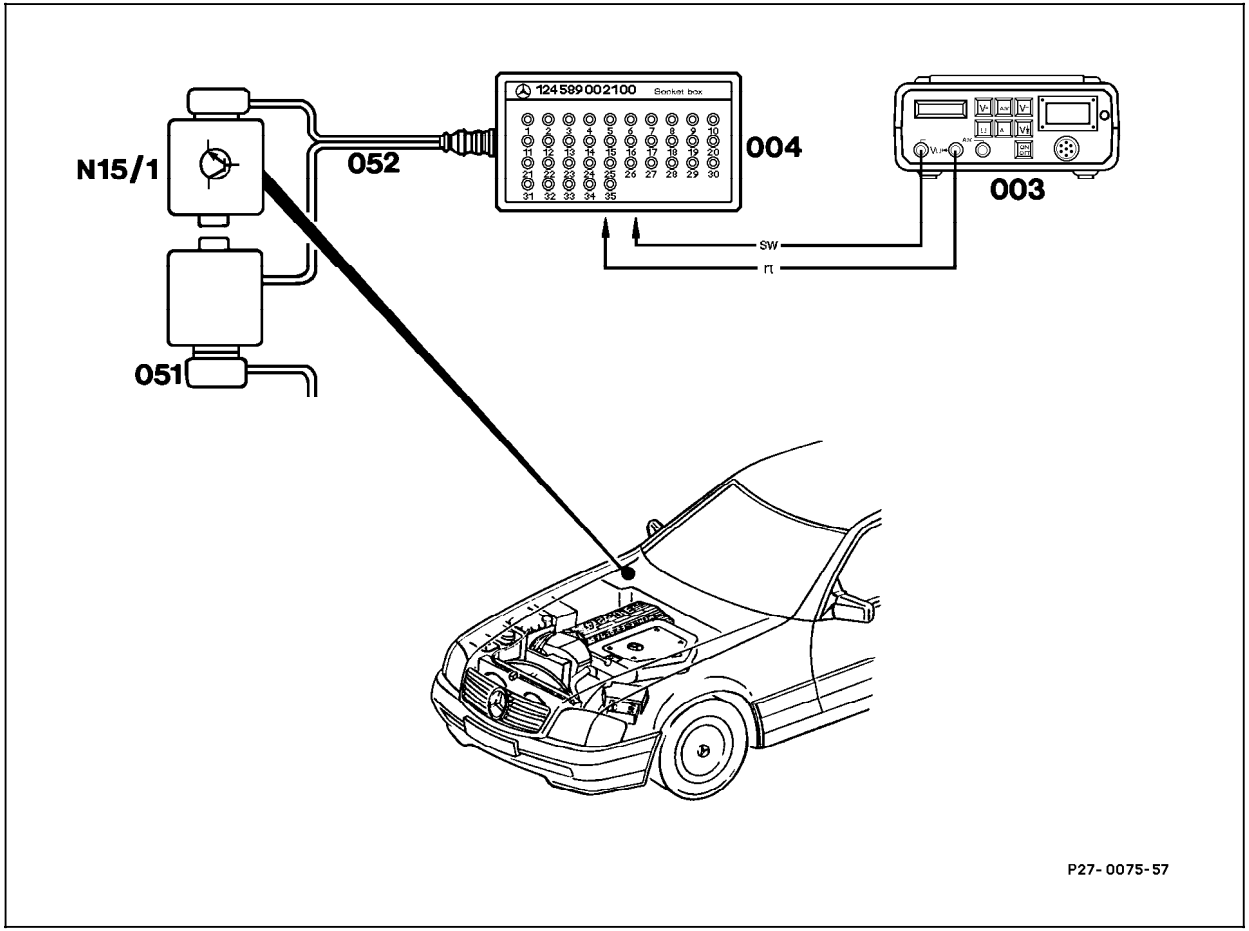


Figure 1

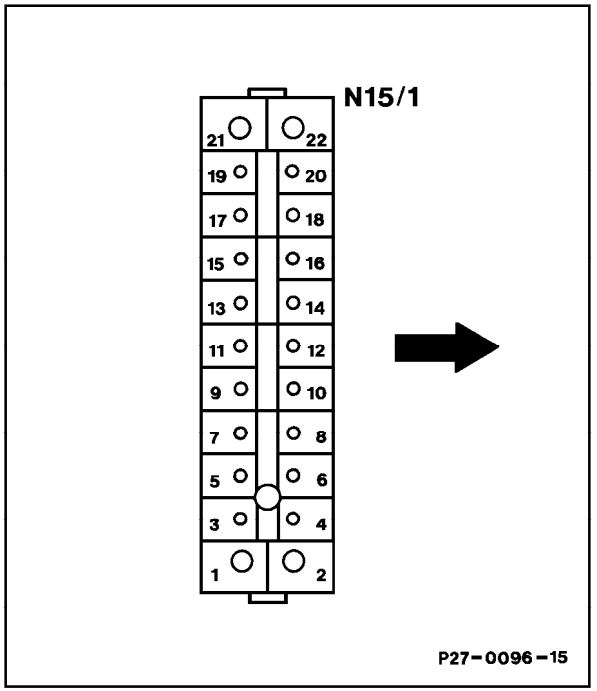
003	Digital multimeter
004	Socket box (35-pole)
051	TCM connector
052	Test cable 129 589 05 63 00
N15/1	TCM

P27-0075-57

Electrical Test Program - Preparation for Test

TCM (N15/1) connector layout

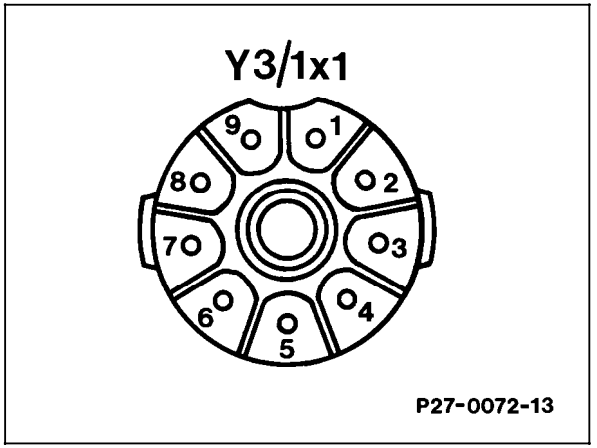
arrow	Driving direction
1	Ground (component compartment) (W16)
2	Valve block control valve (Y3/1y2)
3	TB switch AP potentiometer connector
4-7	Not used
8	TB switch AP potentiometer connector
9-11	Not used
12	TB switch AP potentiometer connector
13	DI control module (N1/3) connector A, socket 6
14	CFI control module (N3) socket 27 and Engine systems control module (N16) socket 11
15	Not used
16	Tachometer
17	TR “D“ contact switch (S16/9)
18	Not used
19	Data link connector (X11/4) socket 13
20	Kickdown switch (S16/6)
21	Overvoltage protection relay module (K1/2) socket 6
22	Valve block control valve (Y3/1y2)



P27-0096-15

Electrical Test Program - Preparation for Test

Valve block connector (Y3/1x1) layout

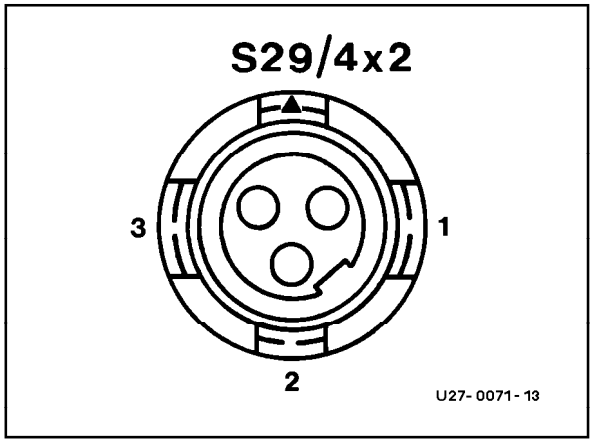


P27-0072-13

1	Valve block kickdown solenoid valve (Y3/1y1)
4 and 7	Valve block control valve (Y3/1y2)

Electrical Test Program - Preparation for Test

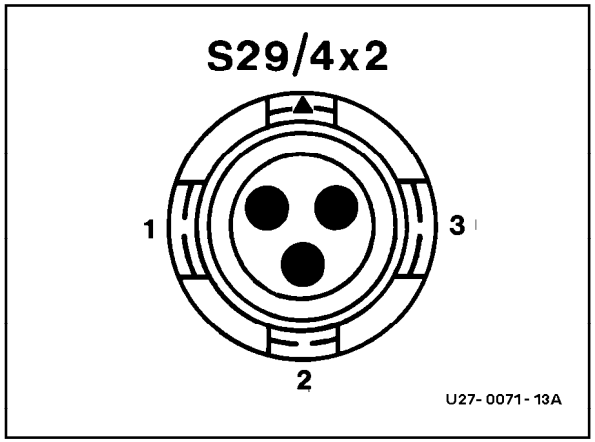
TB switch AP potentiometer connector (S29/4x2) layout
Harness side (female)



U27-0071-13

1	TCM (N15/1) connector, socket 12
2	TCM (N15/1) connector, socket 3
3	TCM (N15/1) connector, socket 8

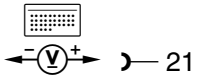
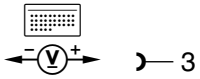
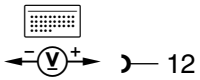
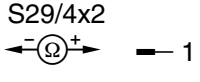
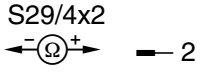
TB switch AP potentiometer connector (S29/4x2) layout
Connector side (male)



U27-0071-13A

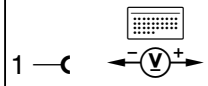
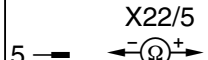
1	WOT
3	CTP

Electrical Test Program - Test

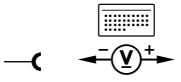
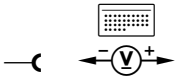
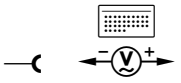
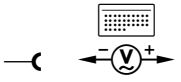
Test step **DTC**	Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
⇒ 1.0	**Voltage supply**	N15/1  1 — 21	Igition: **ON**	11 – 14 V	Wiring, Ground (component compartment) (W16), Overvoltage protection relay module (K1/2).
⇒ 2.0 [1] 4	**Accelerator pedal signal**	N15/1  8 — 3	Ignition: **ON** Accelerator pedal in: CTP WOT CTP	 < 1 V < 2 V 2 – 3 V	Wiring, TB switch (S29/4), TCM (N15/1).
	Reference voltage	N15/1  8 — 12	 CTP WOT CTP	 < 1 V < 2 V 2 – 3 V	 Wiring, ⇒ 2.1.
⇒ 2.1	TB Switch (S29/4)	S29/4x2  3 — 1 S29/4x2  3 — 2	Ignition: **OFF** Disconnect TB switch AP potentiometer connector (S29/4x2).	900 – 1600 Ω 2.0 – 3.8 kΩ	S29/4

[1] The voltage should increase continually when bringing the accelerator pedal to WOT.

Electrical Test Program - Test

Test step **DTC**	Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
⇒ 3.0	**Transmission range**	N15/1  1 — (V) — 17	Ignition: **ON** Selector lever in: **P-R-N-D** **4-3-2**	 > 10 V < 1 V	 Wiring, ⇒ 3.2, TCM (N15/1), Overvoltage protection relay module (K1/2).
⇒ 3.1	***Non - USA vehicles only***				
⇒ 3.2	Transmission range	X22/5  5 — (Ω) — 4	Ignition: **OFF** Disconnect 5-speed AT/engine connector (X22/5). Selector lever in: **P-R-N-D** **4-3-2**	 < 5 Ω > 20 kΩ	Wiring, TR “D“ contact switch (S16/9)
⇒ 4.0	***Non - USA vehicles only***				

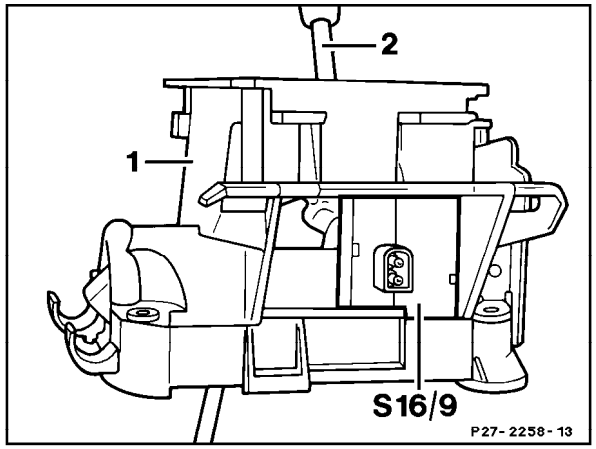
Electrical Test Program - Test

Test step / DTC	Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
⇒ 5.0 5	**Engine speed signal TN**	N15/1  1 — 14	Engine: **at Idle**	6 V	Wiring, ⇒ 5.1, TCM (N15/1).
⇒ 5.1	Control module	N15/1  1 — 14	Engine: **at Idle** TCM (N15/1) disconnected.	6 V	DI control module (N1/3), Engine systems (MAS) control module (N16), CFI control module (N3).
⇒ 6.0 6	**Vehicle speed signal (VSS)**	N15/1  1 — 16	Drive vehicle at approximately 31 mph (50 km/h) on a dynamometer. ABS/ASR control module (N30/1) disconnected.	6 V ~	Wiring, Instrument cluster (A1), DM, B&A, Vol. 1, section 1.2 23, Combination relay (N10), Hall-effect speed sensor (B6).
⇒ 7.0	**Digital load signal**	N15/1  1 — 13	Engine: **at Idle** Vacuum line on DI control module connected (CTP) Vacuum line on DI control module disconnected (WOT)	 approx. 0.8 V ~ > 2 V ~	Wiring, TCM (N15/1), DI control module (N1/3).

Electrical Test Program - Test

Test step DTC	Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
⇒ 8.0	**Kickdown switch (S16/6)** Activation	N15/1 1 — (V) — 20	Engine: **at Idle** Depress kickdown switch by hand (behind pedal).	< 1 V > 10 V	Wiring. ⇒ 8.1, TCM (N15/1), Kickdown switch (S16/6).
⇒ 8.1	Kickdown solenoid valve (Y3/1y1), internal resistance	N15/1 1 — (Ω) — 20	Ignition: **OFF** TCM (N15/1) disconnected.	10 – 30 Ω	Wiring, Valve block (Y3/1).
⇒ 9.0 7 9 10	**Valve block control valve (Y3/1y2)** Activation in 4GR Activation in 5GR	N15/1 2 — (V~) — 22	Engine: **at Idle** Engine speed > 1000 rpm Drive vehicle on a dynamometer at approximately 50 mph (80 km/h). TR “D“	> 5 V ~ < 1 V ~	Wiring ⇒ 9.1, TCM (N15/1) ⇒ 2.0, ⇒ 5.0 – 7.0
⇒ 9.1	Coil resistance	N15/1 2 — (Ω) — 22	Ignition: **OFF** TCM (N15/1) disconnected.	2 – 10 Ω (see control valve resistance table)	Valve block control valve (Y3/1y2)

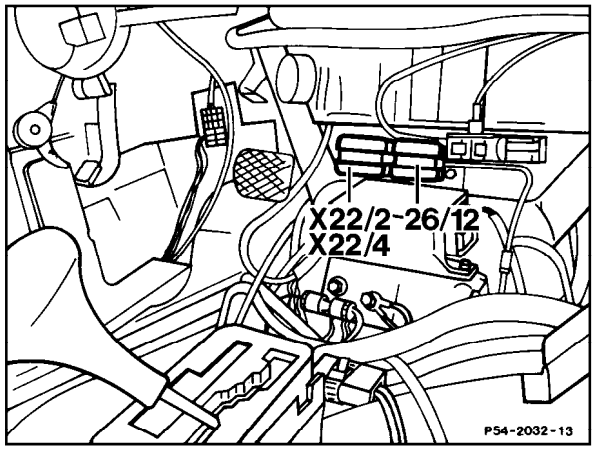
Electrical Test Program - Test



P27-2258-13

Figure 1

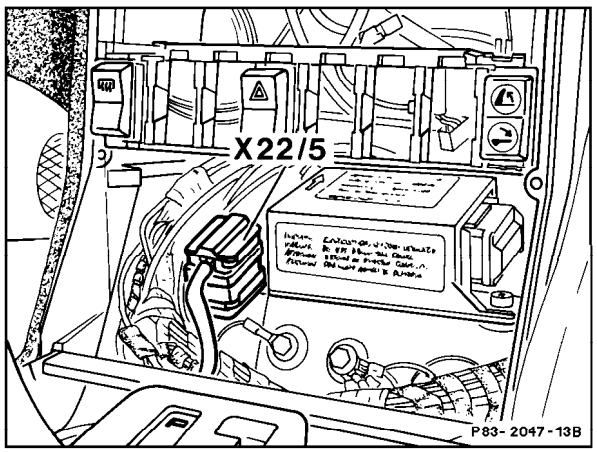
S16/9 Transmission range “D” contact switch



P54-2032-13

Figure 2

X22/2 AT/engine connector

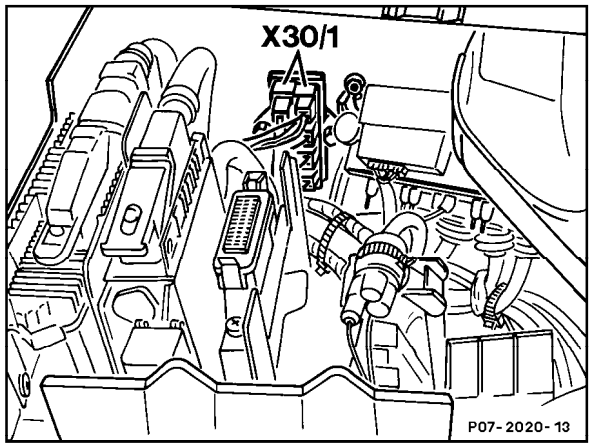


P83-2047-13B

Figure 3

X22/5 5-speed AT/engine connector

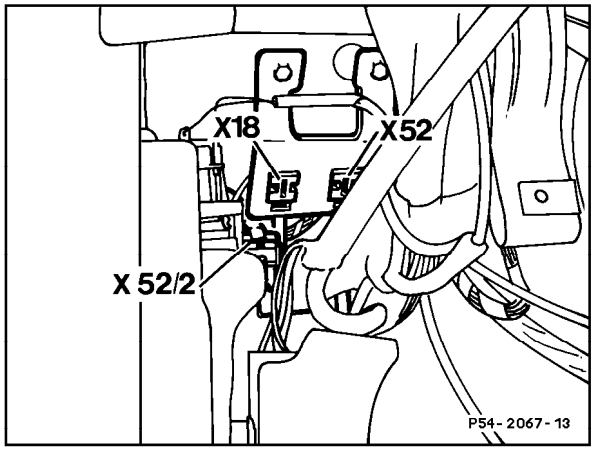
Electrical Test Program - Test



P07-2020-13

Figure 4

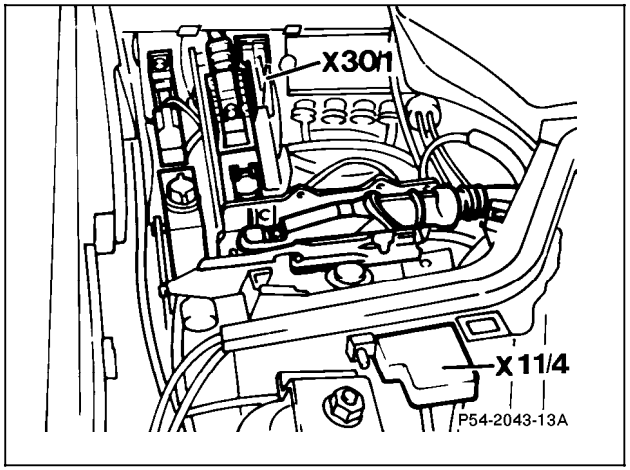
X30/1 Multi-function connector block



P54-2067-13

Figure 5

X18 Interior/taillamp harness connector

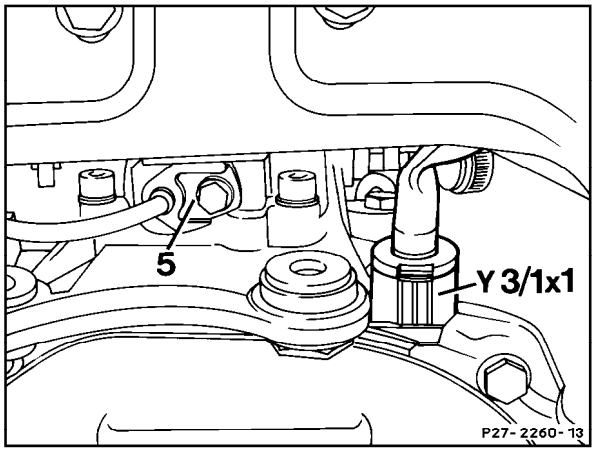


P54-2043-13A

Figure 6

X11/4 Data link connector (DTC readout)
X30/1 Multi-function connector block

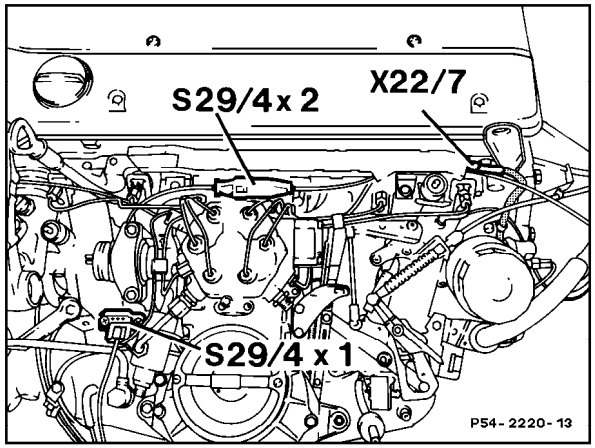
Electrical Test Program - Test



P27-2260-13

Figure 7

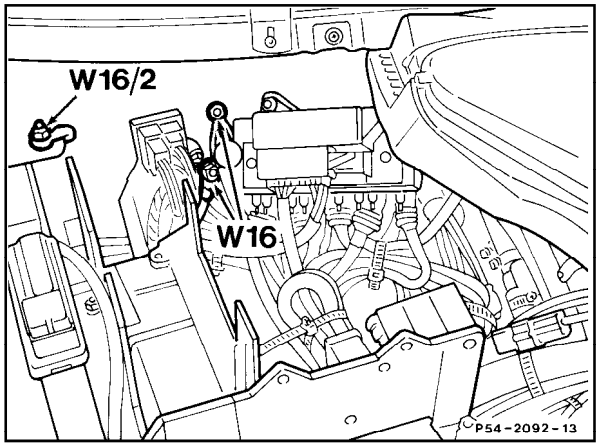
Y3/1x1 Valve block connector (5-speed AT)



P54-2220-13

Figure 8

S29/4x2 AP potentiometer connector

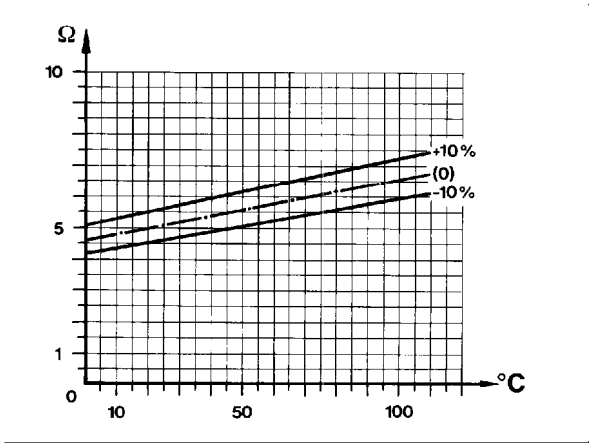


P54-2092-13

Figure 9

W16 Ground (component compartment)

Electrical Test Program - Test



P27-0187-13

Figure 10

Valve block control valve (y3/1y2), temperature dependant resistance table

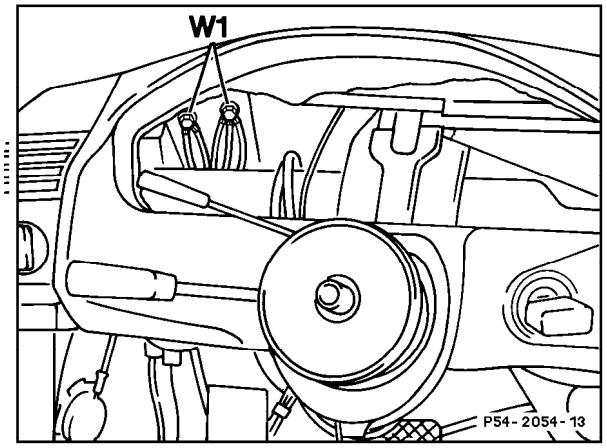


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Figure 11

W1 Main ground (behind instrument cluster)