9.3 Models 129, 140, 202 as of 09/95
Model 170
Model 208
Model 210 with engine 112, (except 4MATIC) 113, 119
Model 210 with engines 104, 606 as of 06/96
Model 210.08, 210.28
(above Models without ESP)

9.3 Traction Systems (ABS, ASR, ETS) and SPS

Diagnosis - Function Test

Preliminary testing

1. Review section 0 entirely before connecting the HHT.

DTC readout is not possible using an impulse counter scan tool.

2. Connect the HHT to the data link connector (X11/4) according to the connection diagram (refer to section 0).

Test cables are not to be hooked up to the HHT while performing component activations.

Read out DTC memory from ABS, ASR OR ETS control modules before starting repair procedures. DTC memory must also be read out from ME-SFI and EA control modules on vehicles with ASR.
The HHT will indicate the defective components in the display or will refer to the proper test step in the diagnostic manual.

Version Coding of control modules

When swapping ETS control modules, the ETS control module must be version coded using the HHT. Follow the directions as indicated in the display of the HHT. By using the test button "?" on the HHT, the version code of the control module will be displayed.

3. Additionally review: 21, 22, 23 (connector connections).

4. Review the following ETM diagrams:

   PE00.19-P-1100B
   PE42.00-P-1100B
   PE00.19-P-1100D
   PE42.00-P-1100D
   PE00.19-P-1100A
   PE42.00-P-1100A

5. Ignition: **ON**
6. Read out DTC memory.
7. Read out nominal/actual value displays.
8. Perform component activations.
9. Perform repairs according to DTC memory readout.
10. After completing repairs erase DTC memory.

The Electrical Test Program, see 23, pertains to the ABS, ETS, ASR and SPS systems.
In order to prevent the listing of all the control modules used in the various systems, for each test step, the following is used:

N47 = Control modules for Traction systems

A7/3 = Hydraulic unit for Traction systems

Diagnosis – Function Test (ASR only)

Test step/Test scope	Test condition	Nominal value	Possible cause/Remedy [1]
ASR only ⇒ 1.0 Brake torque control circuit	(!) **Test cables are not to be hooked up to the HHT while performing function tests.** Lift rear of vehicle so that both rear wheels can be rotated freely. ⚠ **Secure vehicle!** Engine: **at Idle** Selector lever in transmission range “D”. Apply WOT using accelerator pedal. (!) Should ASR not come into effect: Release accelerator pedal to idle speed.	The rear wheels are noticeably braked; simultaneously the return/pressure pump can audibly be heard operating. Engine speed is reduced to appprox. 1000 rpm. The ASR warning lamp (A1e21) will blink.	Test, using HHT, Engines HFM-SFI, EA, or ME-SFI
⇒ 2.0 Switching off ASR using ASR Off switch (S76/5)	Engine: **at idle** Selector lever in transmission range “N”. Press ASR OFF switch (S76/5). Selector lever in transmission range “D”. Slowly press on accelerator pedal.	The ASR warning lamp (A1e21) will remain on. The engine speed will not be reduced. The rear brakes will not be applied. The ASR warning lamp (A1e21) will blink.	Test, using HHT.

[1] Observe Preparation for Test, see 22.

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Preparation for DTC Readout

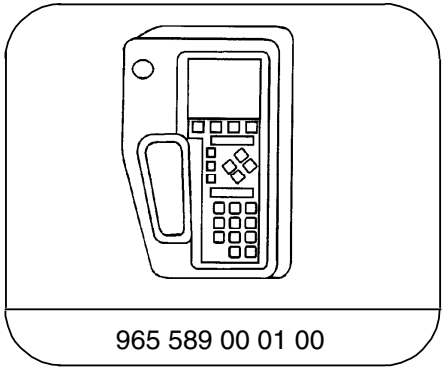
DTC readout is no longer possible using the impulse counter scan tool.

1. Connect Hand-Held Tester (HHT) to data link connector (X11/4) according to connection diagram (see section 0).
2. Ignition: **ON**
3. Read out DTC memory for control modules.

Test cables are not to be hooked up to the HHT while performing function tests.

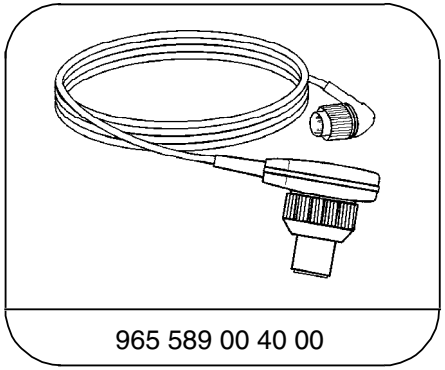
Read out DTC memory from ABS, ASR OR ETS control modules before starting repair procedures. DTC memory must also be read out from ME-SFI and EA control modules on vehicles with ASR.

Special Tools



965 589 00 01 00

Hand-Held-Tester



965 589 00 40 00

Test cable

9.3 Traction Systems (ABS, ASR, ETS) and SPS

Diagnosis - Diagnostic Trouble Code (DTC) Memory

DTC 	Possible cause	Test step/Remedy [1]
–	No fault in system	In case of complaint: 23 (entire test).
C 1000	Traction system control module (N47)	N47
C 1010	Battery voltage too low, circuit 87	23 ⇒ 1.0
C 1011	Voltage supply for ASR/ETS/ESP hydraulic unit (A7/3) solenoid valves, short/open circuit	23 ⇒ 5.0 23 ⇒ 2.0
C 1012	Battery voltage too high, circuit 87	23 ⇒ 1.0
C 1020	CAN communication overall faulty	Wiring.
C 1021	CAN communication with EA/CC/ISC control module (N4/1) interrupted	Read out DTC's from (N4/1).
C 1022	CAN communication with engine control module (ME-SFI) (N3/10) interrupted	Read out DTC's from (N3/10).
C 1024	CAN communication with transmission control module (N15/3) interrupted	Read out DTC's from (N15/3).
C 1100	Left front axle VSS sensor (L6/1), open circuit Left front axle VSS sensor (L6/1), loose connection Left front axle VSS sensor (L6/1), implausible [2]	23 ⇒ 11.0
C 1101	Right front axle VSS sensor (L6/2), open circuit Right front axle VSS sensor (L6/2), loose connection Right front axle VSS sensor (L6/2), implausible [2]	23 ⇒ 13.0

[1] Observe Preparation for Test, see 22.

[2] Rotor with incorrect tooth count, dirt accumulation on or damaged rotor, incorrect rear axle ratio, wrong wheel or tire size.
If DTC appears only after repair work, it was caused by applying the brakes or driving vehicle on a dynamometer, erase DTC.

Diagnosis - Diagnostic Trouble Code (DTC) Memory

DTC 	Possible cause	Test step/Remedy [1]
C 1102 **ETS/ASR:**	Left rear axle VSS sensor (L6/3), open circuit Left rear axle VSS sensor (L6/3), loose connection Left rear axle VSS sensor (L6/3), implausible [2]	23 ⇒ 16.0
ABS:	Left axle VSS sensor (L6), open circuit Left axle VSS sensor (L6), loose connection Left axle VSS sensor (L6), implausible [2]	23 ⇒ 15.0
C 1103	Right rear axle VSS sensor (L6/4), open circuit Right rear axle VSS sensor (L6/4), loose connection Right rear axle VSS sensor (L6/4), implausible [2]	23 ⇒ 19.0
C 1104	Left front axle VSS sensor (L6/1), implausible [2]	23 ⇒ 11.0
C 1105	Right front axle VSS sensor (L6/2), implausible [2]	23 ⇒ 13.0
C 1106 **ETS/ASR:**	Left rear axle VSS sensor (L6/3), implausible [2]	23 ⇒ 16.0
ABS:	Rear axle VSS sensor (L6), implausible [2]	23 ⇒ 15.0
C 1107	Right rear axle VSS sensor (L6/4), implausible [2]	23 ⇒ 19.0
C 1142	ABS lateral acceleration sensor (B24/2), short/open circuit	23 ⇒ 8.0
C 1143	ABS lateral acceleration sensor (B24/2), implausible	23 ⇒ 8.0
C 1200	Stop lamp switch (S9/1) short/open circuit S9/1 implausible	Wiring S/91

[1] Observe Preparation for Test, see 22.

[2] Rotor with incorrect tooth count, dirt accumulation on or damaged rotor, incorrect rear axle ratio, wrong wheel or tire size.
If DTC appears only after repair work, it was caused by applying the brakes or driving vehicle on a dynamometer, erase DTC.

Diagnosis - Diagnostic Trouble Code (DTC) Memory

DTC 	Possible cause	Test step/Remedy [1]
C 1300	Left front axle solenoid valve (hold) (A7/3y6), short/open circuit	23 ⇒ 21.0
C 1301	Left front axle solenoid valve (release) (A7/3y7), short/open circuit	23 ⇒ 22.0
C 1302	Right front axle solenoid valve (hold) (A7/3y8), short/open circuit	23 ⇒ 23.0
C 1303	Right front axle solenoid valve (release) (A7/3y9), short/open circuit	23 ⇒ 24.0
C 1304	Left rear axle solenoid valve (hold) (A7/3y10), short/open circuit	23 ⇒ 25.0 23 ⇒ 26.0
C 1305	Left rear axle solenoid valve (release) (A7/3y11), short/open circuit	23 ⇒ 27.0 23 ⇒ 28.0
C 1306	Right rear axle solenoid valve (hold) (A7/3y12), short/open circuit	23 ⇒ 29.0
C 1307	Right rear axle solenoid valve (release) (A7/3y13), short/open circuit	23 ⇒ 30.0
C 1311	Switchover/solenoid valve (A7/3y5), short/open circuit	23 ⇒ 31.0
C 1312	Master brake cylinder switchover valve (Y61)	23 ⇒ 9.0
C 1313	Solenoid valve relay (A7/3k1)	N47

[1] Observe Preparation for Test, see 22.

Diagnosis - Diagnostic Trouble Code (DTC) Memory

DTC 	Possible cause	Test step/Remedy [1]
C 1314	Solenoid valve relay (A7/3), voltage supply	23 ⇒ 5.0 23 ⇒ 2.0
C 1315	Inlet solenoid valve (A7/3y15)	23 ⇒ 32.0
C 1401	High pressure return pump (A7/3m1), short/open circuit High pressure return pump (A7/3m1), will not shut off	23 ⇒ 6.0
C 1500	VSS sensor implausible [2]	23 ⇒ 11.0, 13.0, 15.0, 16.0, 19.0
C 1501	SPS P-valve (Y10)	23 ⇒ 7.0
C 1511	ETS/SPS control module (N47-2), not version coded	N47-2
C 1512	Brakes overheated	Brakes were momentarily overloaded, erase DTC.
C 1513	ASR/SPS (N47-1) OR ME-SFI (N3/10), engine control module, version coding incorrect	N47-1 N3/10
C 1514	SPS P-valve (Y10), adjustment data	23 ⇒ 7.0 N47
C 1515	Version coding, SPS	N47
C 1600	Temperature after engine is turned off	N47

[1] Observe Preparation for Test, see 2.

[2] Rotor with incorrect tooth count, dirt accumulation on or damaged rotor, incorrect rear axle ratio, wrong wheel or tire size.
If DTC appears only after repair work, it was caused by applying the brakes or driving vehicle on a dynamometer, erase DTC.

9.3 Traction Systems (ABS, ASR, ETS) and SPS

Diagnosis – Complaint Related Diagnostic Chart

Complaint/Problem	Possible cause	Test step/Remedy [1]
ASR MIL (A1e22) or ETS MIL (A1e35) or ABS MIL (A1e17) illuminate when engine is running		Read out DTC using HHT, 12
ASR MIL (A1e22) or ETS MIL (A1e35) and ABS MIL (A1e17) illuminate while driving and do not go out		Read out DTC using HHT, 12
ASR MIL (A1e22) or ETS MIL (A1e35) and ABS MIL (A1e17) illuminate while driving and then go out	Vehicle system voltage < 11 V, too many electrical consumers in use.	Check generator (G2), Read out DTC using HHT, 12
Brake pad wear indicator lamp (A1e6), low brake fluid level /parking brake indicator lamp (A1e7), ASR warning lamp (A1e21), ETS warning lamp (A1e36), ABS MIL (A1e17), ASR MIL (A1e22) or ETS MIL (A1e35) will not illuminate when turning ignition on.	Data bus to instrument cluster (instrument cluster **without** CAN connection) CAN data line (instrument cluster with CAN connection)	12 Read out DTC‘s instrument cluster
ABS MIL (A1e17) illuminates with engine running after brake test or dynamometer use	Nonplausible rpm signal due to different rpm at front and rear axles.	Read out DTC, erase using HHT. 12
ETS only, ETS MIL (A1e35) illuminates while driving and then after a while goes out (DTC code C 1512 is stored)	Rear brakes at one time were overloaded	Read out DTC, erase using HHT. 12

[1] Observe Preparation for Test,

Electrical Test Program – ASR V / ETS Component Locations

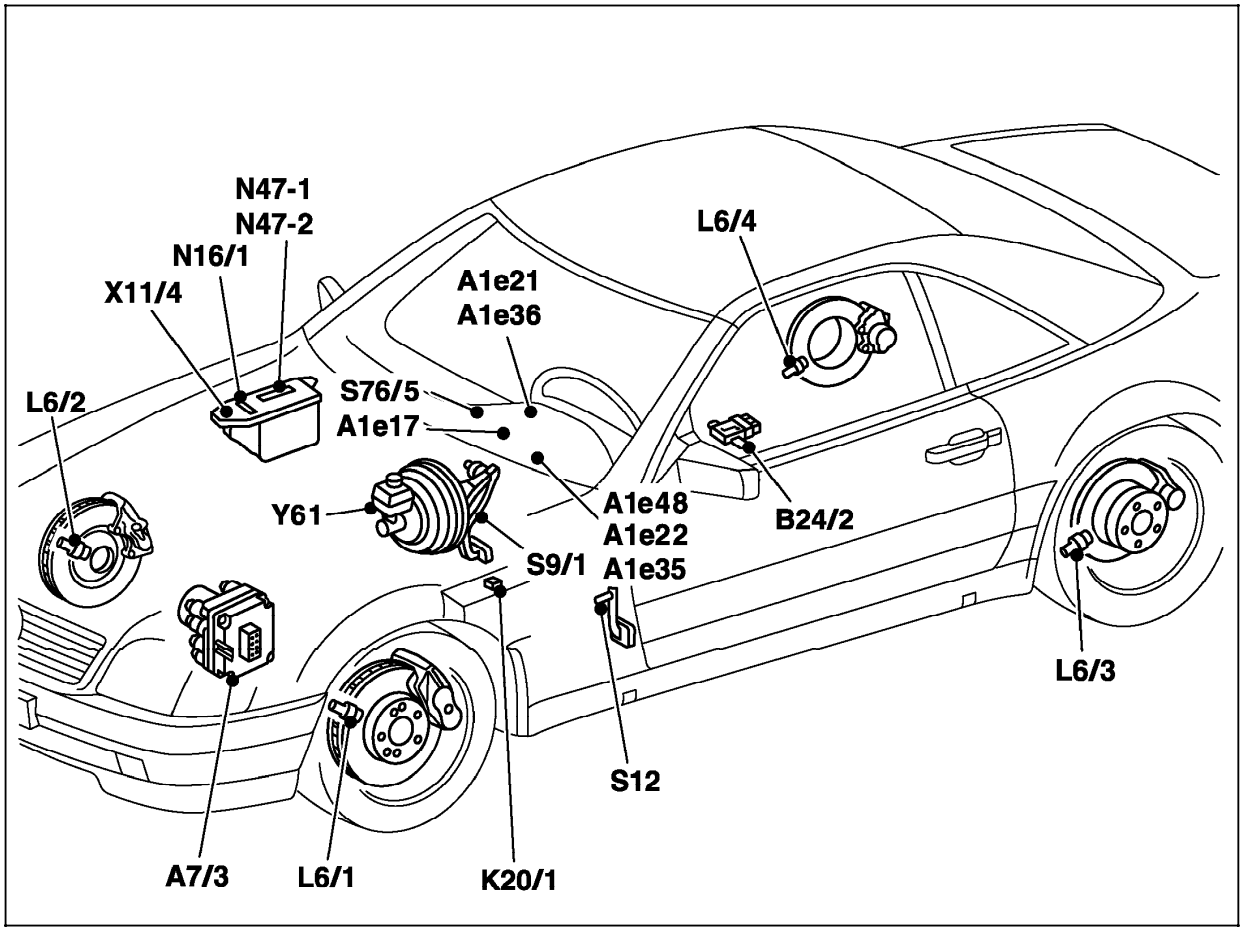
Model 129

Figure 1

A1e17 ABS MIL
A7/3 ASR/ETS/ESP hydraulic unit
B24/2 ABS lateral acceleration sensor (129.076)
K20/1 High pressure/return pump relay
L6/1 Left front axle VSS sensor
L6/2 Right front axle VSS sensor
L6/3 Left rear axle VSS sensor
L6/4 Right rear axle VSS sensor
N16/1 Base module (BM)
S9/1 Stop lamp switch (4-pole)
S12 Parking brake switch
X11/4 Data link connector (DTC read out)
Y61 Master brake cyllinder switchover valve (129.076)

ASR only
A1e21 ASR warning lamp
A1e22 ASR MIL
A1e48 BAS/ASR MIL (on vehicles with BAS only)
N47-1 ASR/SPS control module
S76/5 ASR Off switch

ETS only
A1e35 ETS MIL
A1e36 ETS warning lamp
N47-2 ETS/SPS control module



P42.40-0292-06

Electrical Test Program – ASR V / ETS Component Locations

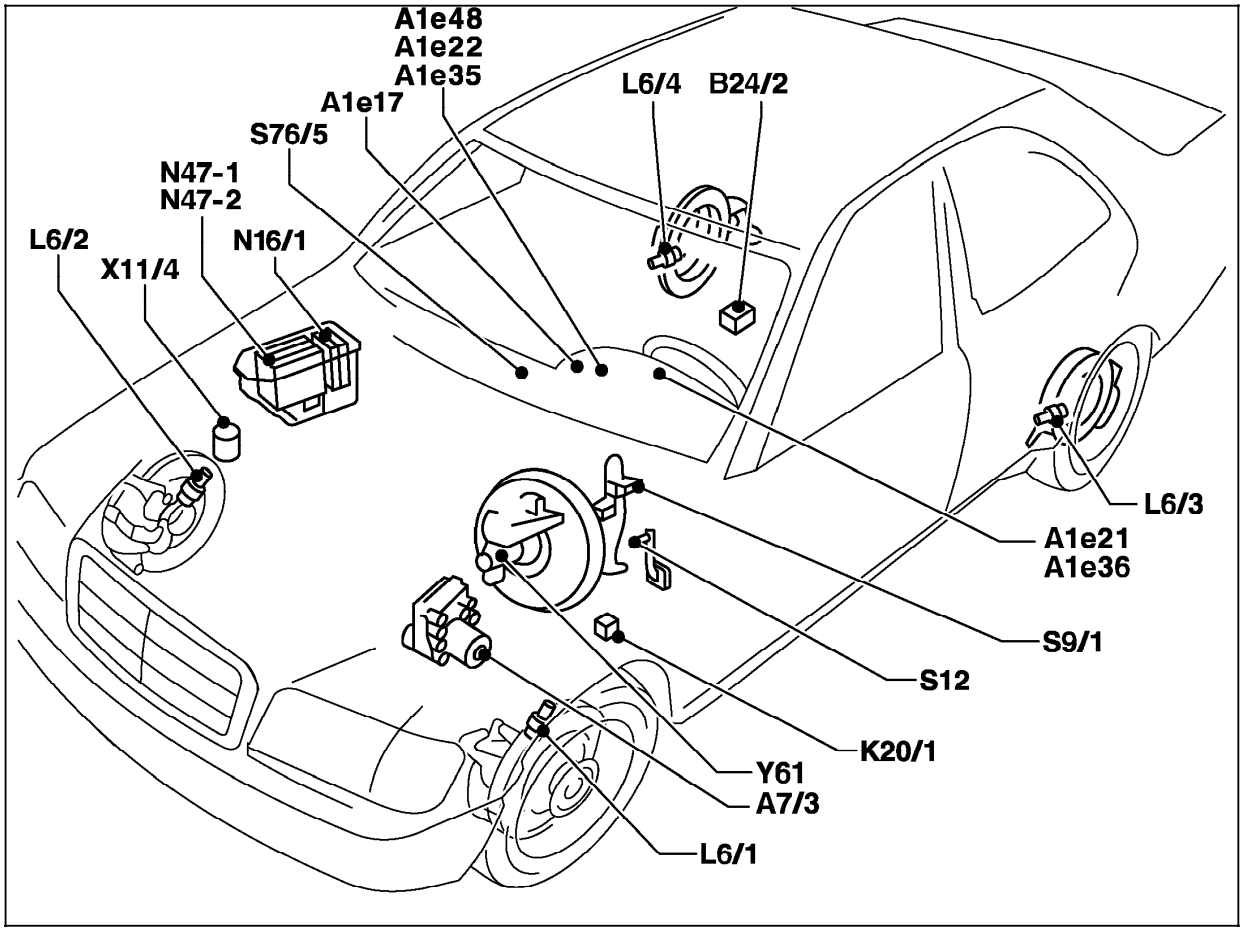
Model 140

Figure 2

A1e17 ABS MIL
A7/3 ASR/ETS/ESP hydraulic unit
B24/2 ABS lateral acceleration sensor (140.04/05/07)
K20/1 High pressure/return pump relay
L6/1 Left front axle VSS sensor
L6/2 Right front axle VSS sensor
L6/3 Left rear axle VSS sensor
L6/4 Right rear axle VSS sensor
N16/1 Base module (BM)
S9/1 Stop lamp switch (4-pole)
S12 Parking brake switch
X11/4 Data link connector (DTC readout)
Y61 Master brake cyllinder swichover valve (140.04/05/07)

ASR only
A1e21 ASR warning lamp
A1e22 ASR MIL
A1e48 BAS/ASR MIL
N47-1 ASR/SPS control module
S76/5 ASR Off switch

ETS only
A1e35 ETS MIL
A1e36 ETS warning lamp
N47-2 ETS/SPS control module



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Electrical Test Program – ASR V / ETS Component Locations

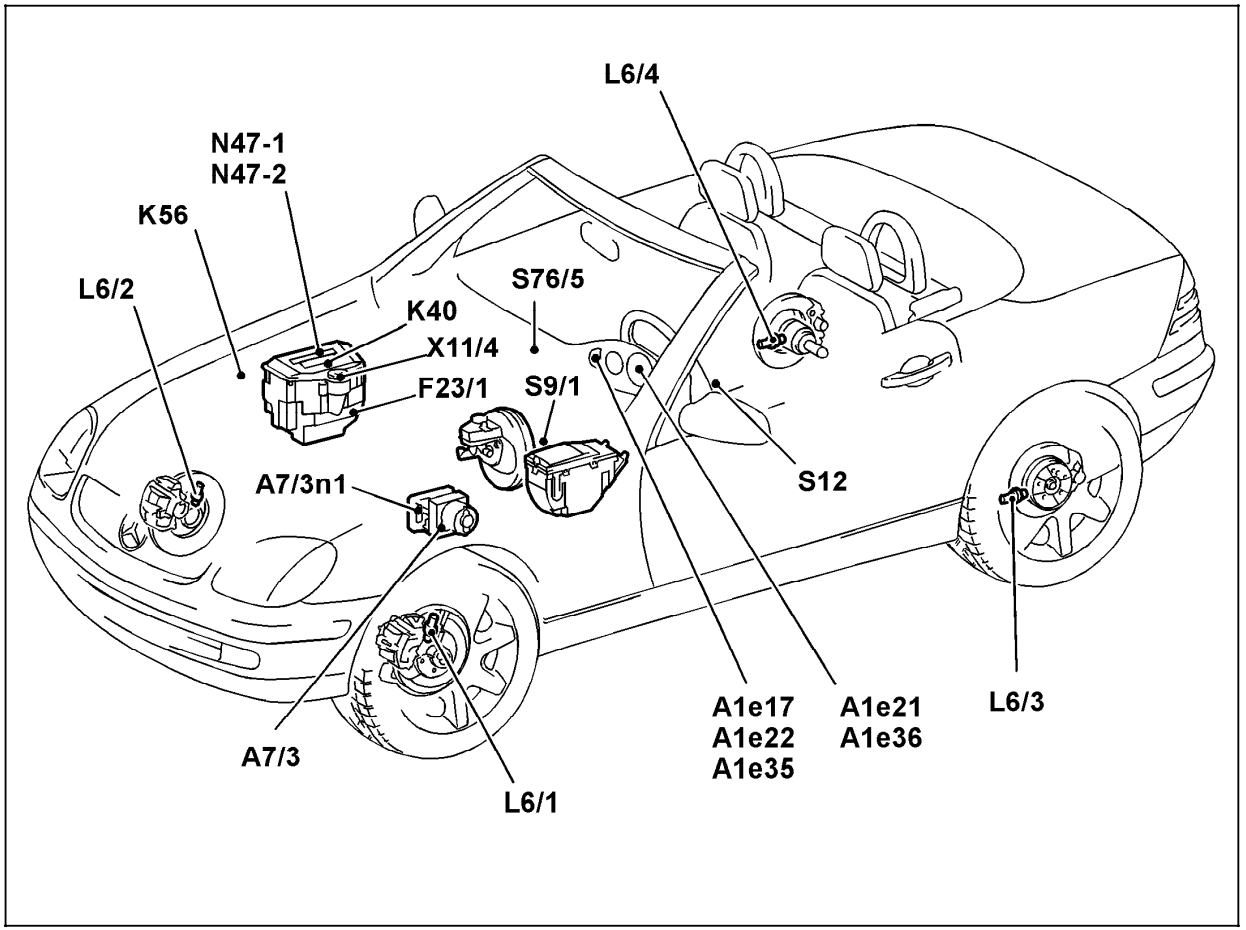
Model 170

Figure 3

A1e17 ABS MIL
A7/3 ASR/ETS/ESP hydraulic unit
A7/3n1 Cycling module/high pressure return pump
F23/1 Control module box
K40 Relay module (ME-SFI, base function)
K56 Crash separation relay module (generator/battery)
L6/1 Left front axle VSS sensor
L6/2 Right front axle VSS sensor
L6/3 Left rear axle VSS sensor
L6/4 Right rear axle VSS sensor
S9/1 Stop lamp switch (4-pole)
S12 Parking brake switch
X11/4 Data link connector (DTC readout)

ASR only
A1e21 Rear axle VSS sensor
A1e22 ASR MIL
N47-1 ASR/SPS control module
S76/5 ASR OFF switch

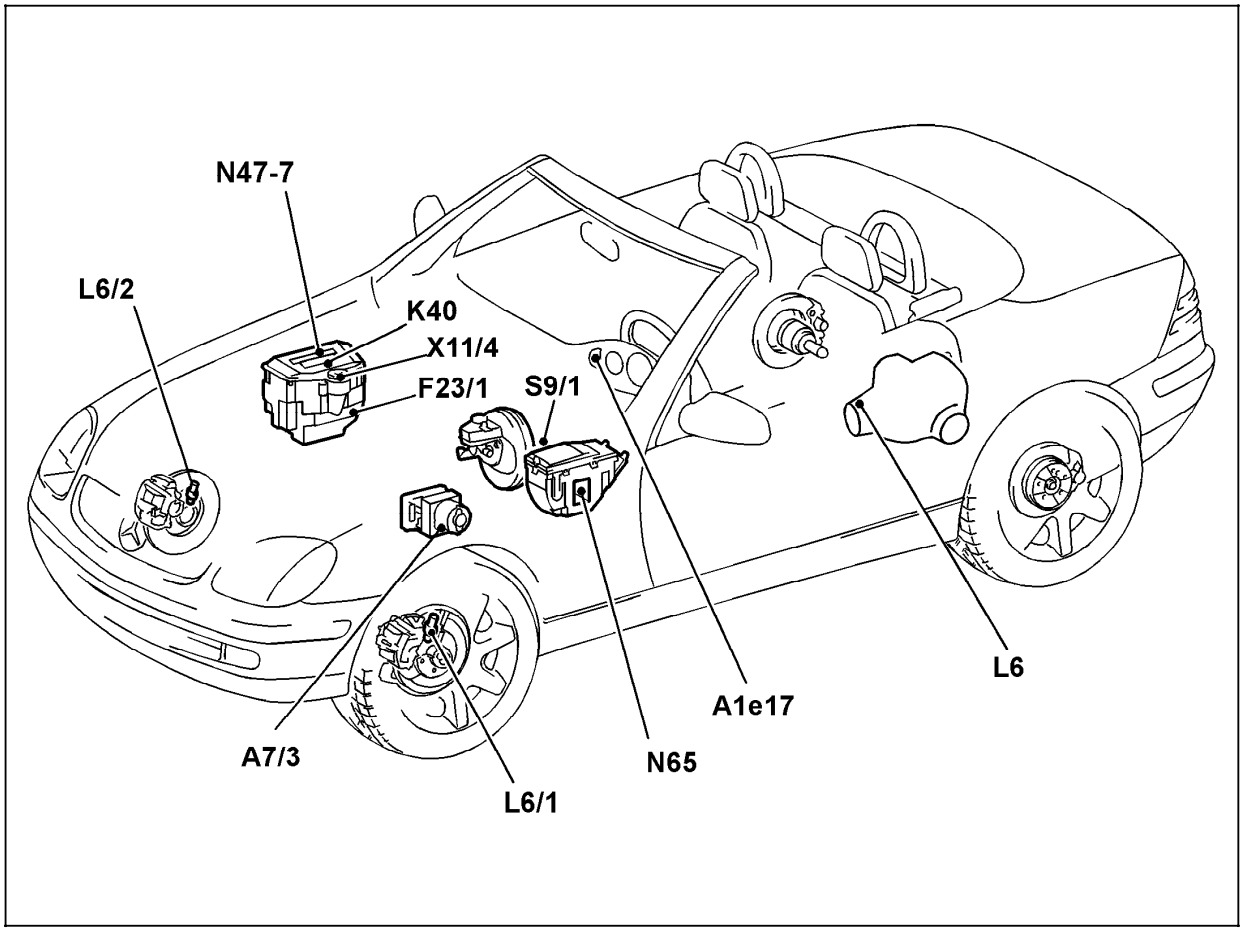
ETS only
A1e35 ETS MIL
A1e36 ETS warning lamp
N47-2 ETS/SPS control module



P42.40-0294-06

Electrical Test Program – ABS Component Locations

Model 170



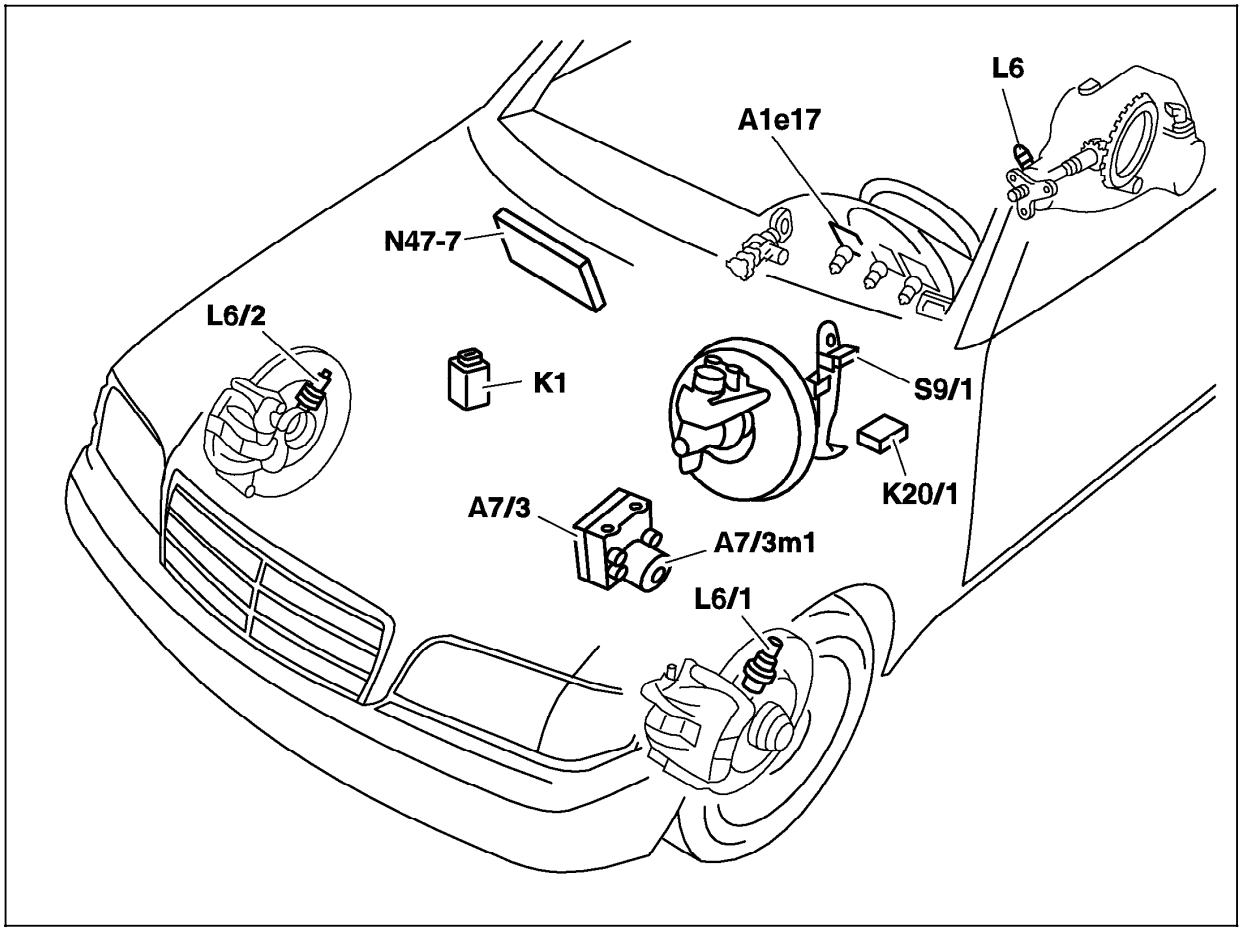
P42.30-0232-06

Figure 4

A1e17	ABS MIL
A7/3	ASR/ETS/ESP hydraulic unit
F23/1	Control module box
K40	Relay module (ME-SFI, base function)
L6	Rear axle VSS sensor
L6/1	Left front axle VSS sensor
L6/2	Right front axle VSS sensor
N47-7	ABS controlmodule
N65	Pulse module (traction systems, HC, ATA, AAC)
S9/1	Stop lamp switch (4-pole)
X11/4	Data link connector (DTC readout)

Electrical Test Program – ABS Component Locations

Model 202
As of 9.1.95, up to 8.1.96



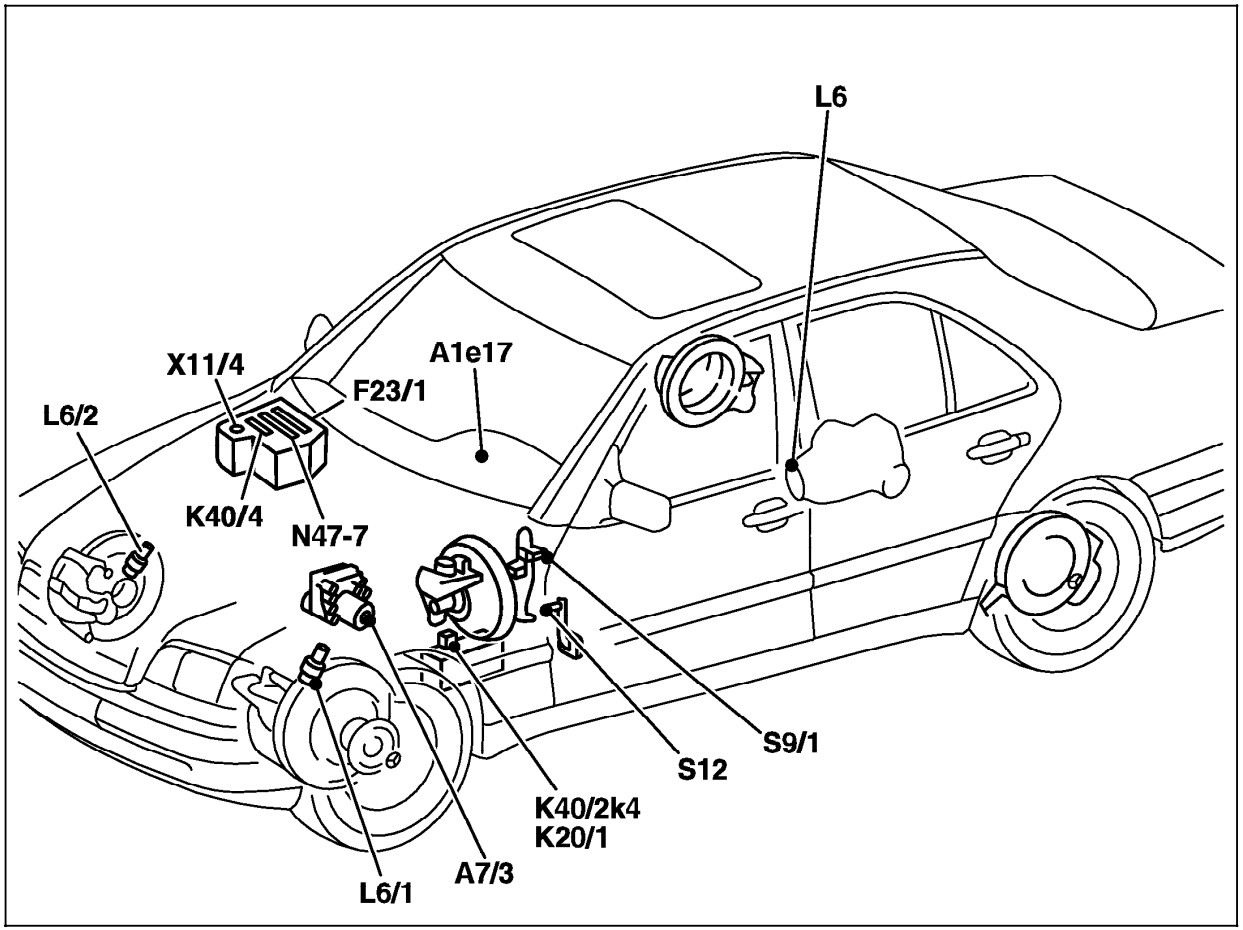
P42.30-0216-06

Figure 5

A1e17	ABS MIL
A7/3	ASR/ETS/ESP hydraulic unit
A7/3m1	High pressure/return pump
K1	Over voltage protection relay module
K20/1	High pressure/return pump relay
L6	Rear axle VSS sensor
L6/1	Left front axle VSS sensor
L6/2	Right front axle VSS sensor
N47-7	ABS control module
S9/1	Stop lamp switch (4-pole)

Electrical Test Program – ABS Component Locations

Model 202
As of 8.1.96
Model 208



P42.30-0233-06

Figure 6

A1e17	ABS MIL
A7/3	ASR/ETS/ESP hydraulic unit
F23/1	Control module box
K20/1	High pressure/return pump relay (up to 6.1.97)
K40/2	Driver-side fuse and relay module box (as of 6.1.97)
k4	High pressure/return pump relay module
K40/4	Passenger-side fuse and relay module box
L6	Rear axle VSS sensor
L6/1	Left front axle VSS sensor
L6/2	Right front axle VSS sensor
N47-7	ABS control module
S9/1	Stop lamp switch (4-pole)
S12	Parking brake switch
X11/4	Data link connector (DTC readout)

Electrical Test Program – ASR V / ETS Component Locations

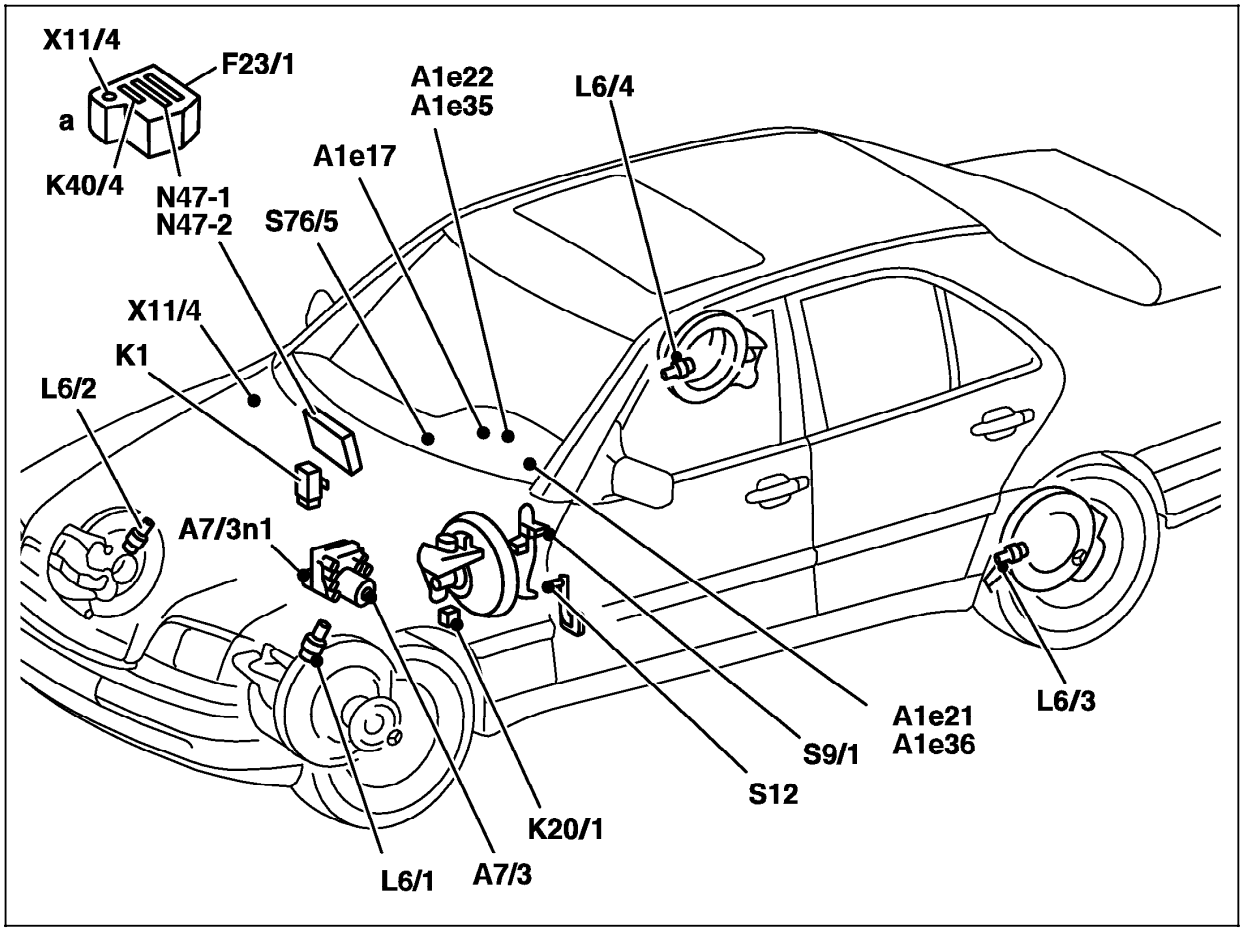
Model 202
(up to 05.97)

Figure 7

a Version using a control module box
A1e17 ABS MIL
A7/3 ASR/ETS/ESP hydraulic unit
A7/3n1 Cycling module/high pressure return pump
F23/1 Control module box
K1 Overvoltage protection relay module
K20/1 High pressure/return pump relay
K40/4 Passenger-side fuse and relay module box
L6/1 Left front axle VSS sensor
L6/2 Right front axle VSS sensor
L6/3 Left rear axle VSS sensor
L6/4 Right rear axle VSS sensor
S9/1 Stop lamp switch (4-pole)
S12 Parking brake switch
X11/4 Data link connector (DTC readout)

ASR only
A1e21 ASR warning lamp
A1e22 ASR MIL
N47-1 ASR/SPS control module
S76/5 ASR Off switch

ETS only
A1e35 ETS MIL
A1e36 ETS warning lamp
N47-2 ETS/SPS control module



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Electrical Test Program – ASR V / ETS Component Locations

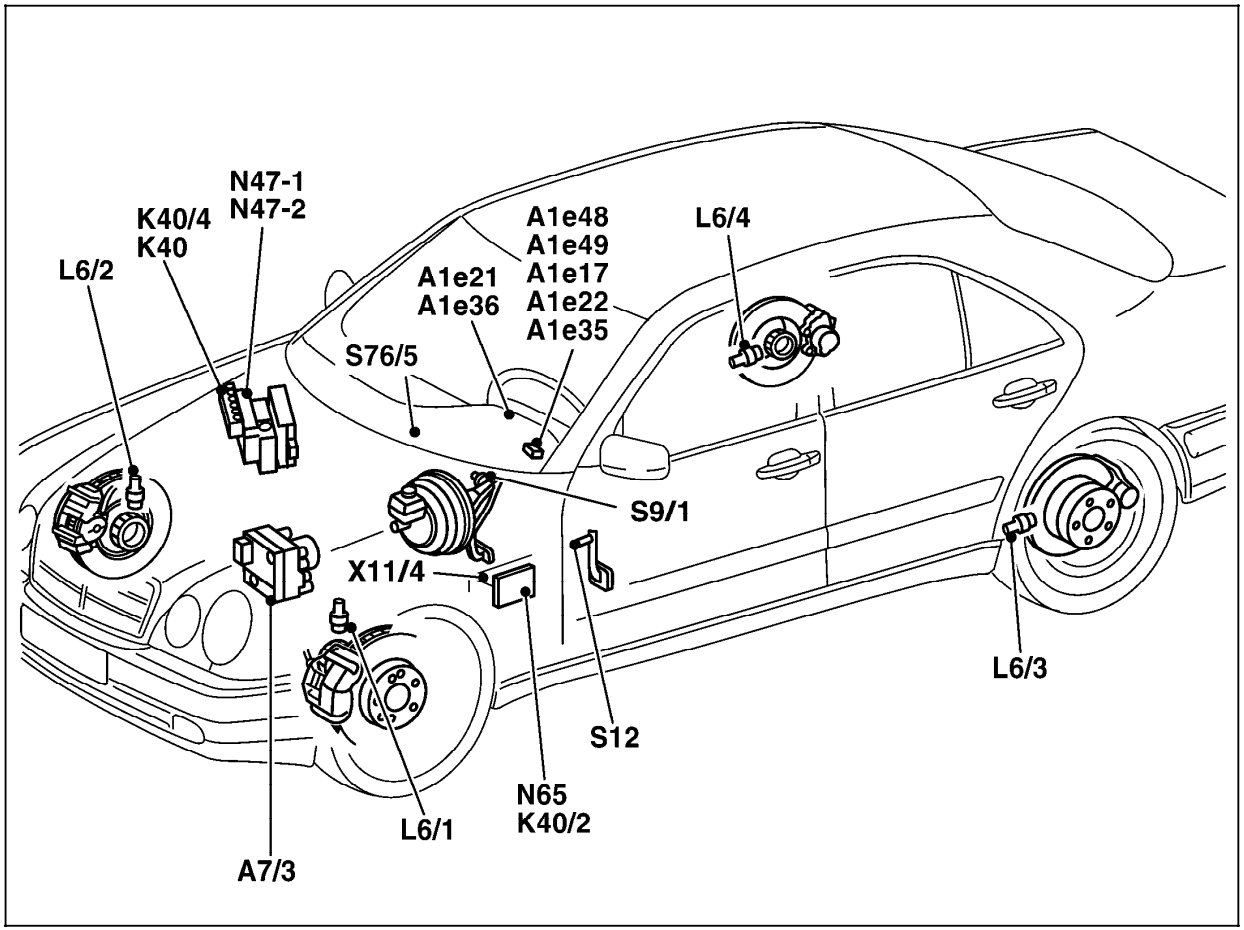
Model 210
(except 210.08/28)

Figure 8

A1e17 ABS MIL
A7/3 ASR/ETS/ESP hydraulic unit
K40 Relay module (HFM-SFI, HFM-LP, ME-SFI, EDC, base function)
K40/2 Driver-side fuse and relay module box
K40/4 Passenger-side fuse and relay module box
L6/1 Left front axle VSS sensor
L6/2 Right front axle VSS sensor
L6/3 Left rear axle VSS sensor
L6/4 Right rear axle VSS sensor
N65 Pulse module (traction systems, HCS, ATA, AAC)
S9/1 Stop lamp switch (4-pole)
S12 Parking brake switch
X11/4 Data link connector

ASR only
A1e21 ASR warning lamp
A1e22 ASR MIL (on vehicles without BAS)
A1e48 BAS/ASR MIL (on vehicles with BAS only)
N47-1 ASR/SPS control module
S76/5 ASR Off switch

ETS only
A1e35 ETS MIL
A1e36 ETS warning lamp (on vehicles without BAS)
A1e49 BAS/ETS MIL (on vehicles with BAS only)
N47-2 ETS/SPS control module



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9.3 Traction Systems (ABS, ASR, ETS) and SPS

Electrical Test Program – Preparation for Test

Preparation for Test

1. Review section 0 entirely before starting Electrical Test Program.

2. Additionally review: 21, 22, 23 (connector connections).

3. Review the following ETM diagrams:
   PE00.19-P-1100B
   PE42.00-P-1100B
   PE00.19-P-1100D
   PE42.00-P-1100D
   PE00.19-P-1100A
   PE42.00-P-1100A

4. Review control module CAN data, starting with 22/6
5. Ignition: **OFF**
6. Disconnect traction control module (N47).
7. Connect socket box with test cable as per connection diagram (Figures 1-3).
8. Perform test steps.

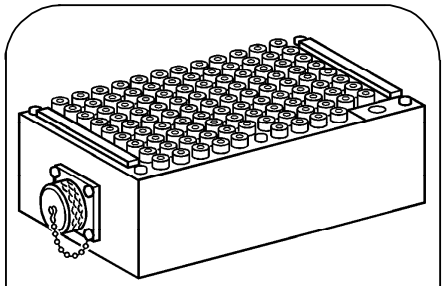
Electrical Wiring Diagrams:
(location of grounds and connectors).
Electrical Troubleshooting Manual, Models 129, 140, 170, 202, 208, 210

When exchanging an ETS/SPS control module, the replacement module must have the code data entered via the HHT. Follow instructions as given by HHT display. In order to code the control module, select **"?"** on HHT key pad.

The electrical test includes ETS, ASR and SPS. In order to avoid listing all traction control modules (ABS [N47-7], ETS [N47-2], ASR [N47-1]) and all hydraulic units (ASR/ETS/ESP [A7/3]) used in the traction control systems, the general designation N47 (traction control module) will be used for all traction control modules, and A7/3 (ASR/ETS/ESP hydraulic unit) for all traction control hydraulic units, regardless of what is actually installed in vehicle.

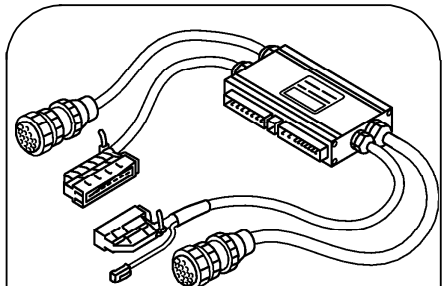
Electrical Test Program – Preparation for Test

Special Tools



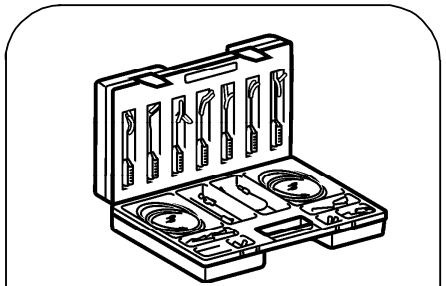
129 589 00 21 00

126-pin socket box



140 589 45 63 00

80-pin test cable



201 589 00 99 00

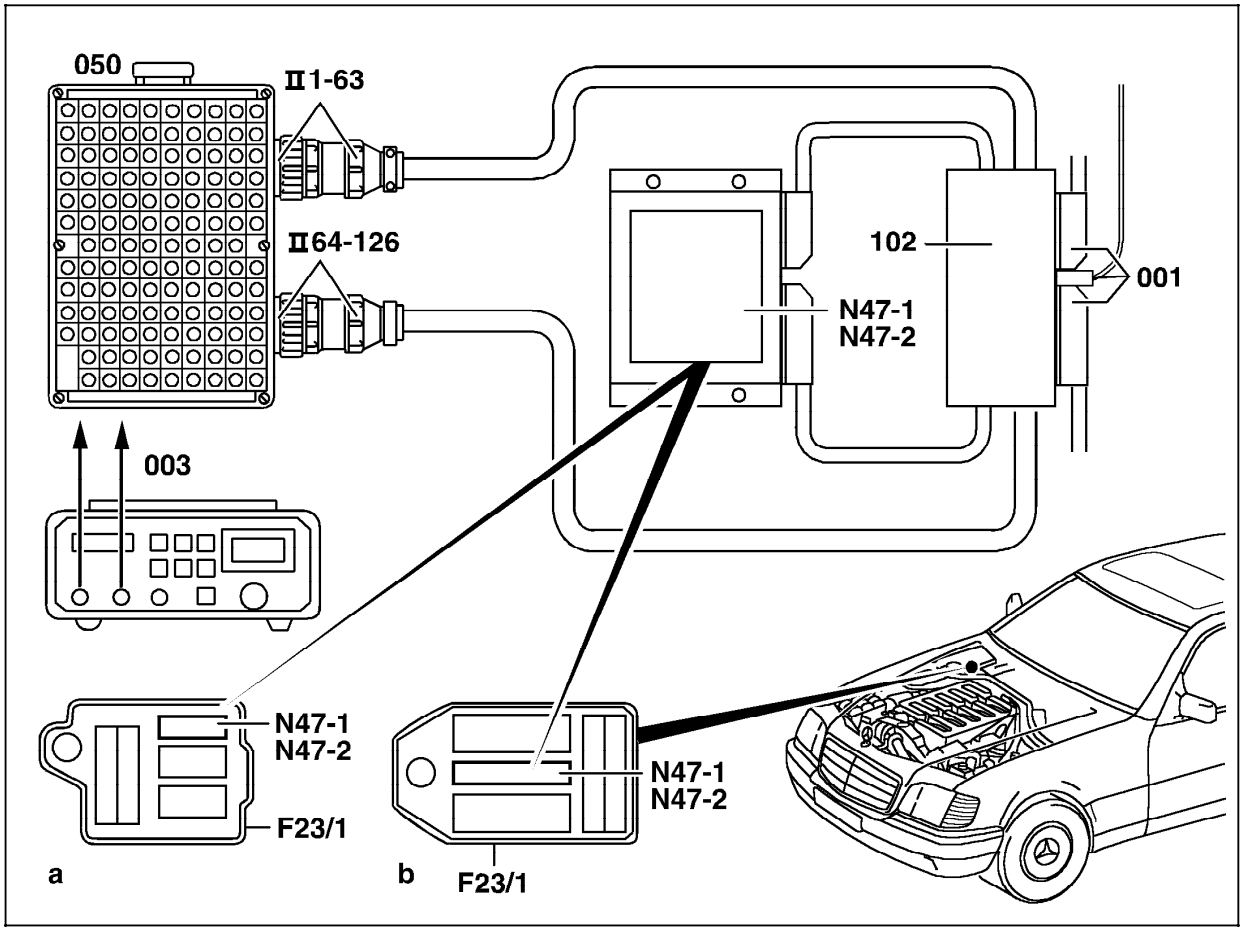
Electrical connecting set

Test equipment; See MBUSA Standard Service Equipment Program

Description	Brand, model, etc.
Digital multimeter	Fluke models 23, 77 III, 83, 85, 87

Electrical Test Program – Preparation for Test

Connection Diagram – Socket Box
Model 129, 140



P42.40-0279-06

Figure 1

001	Control module connector
003	Digital multimeter
050	Socket box, 126-pole
102	Test cable
F23/1	Control module box
N47-1	ASR/SPS control module
N47-2	ETS/SPS control module
a	Model 129
b	Model 140

Electrical Test Program – Preparation for Test

Connection Diagram – Socket Box
Model 202 *without*
control module box

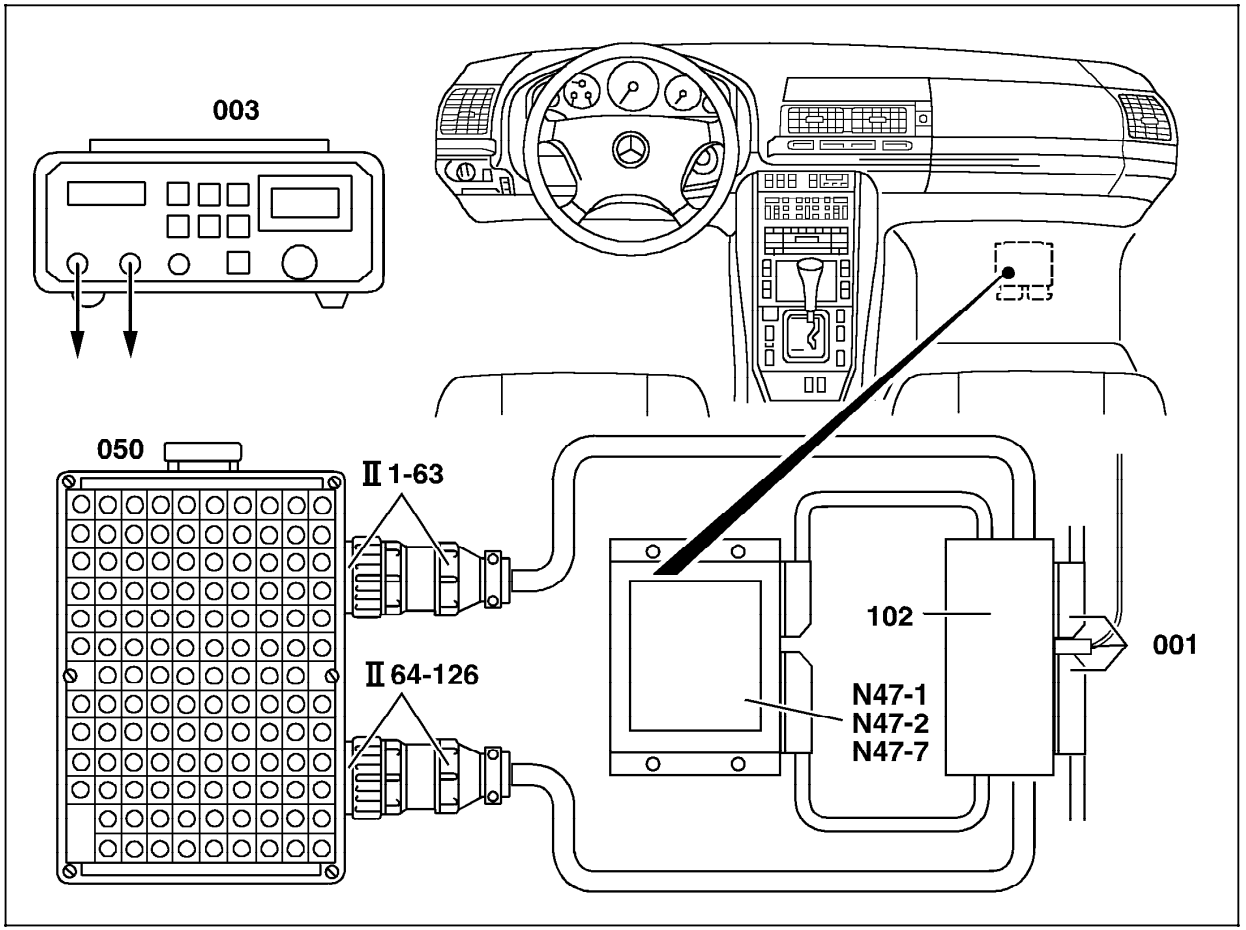


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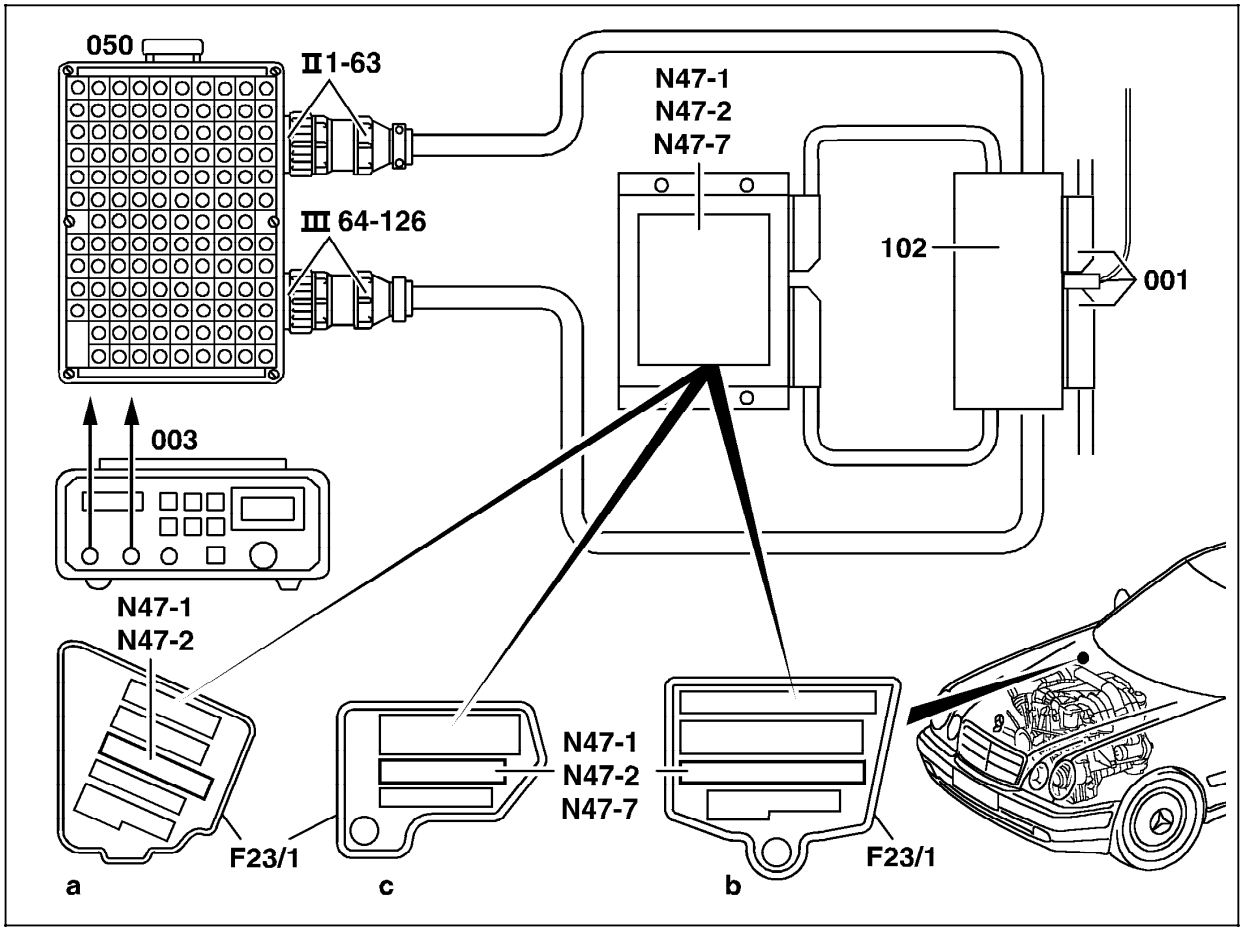
Figure 2

001 Control module connector
003 Digital multimeter
050 Socket box, 126-pole
102 Test cable
N47-1 ASR/SPS control module
N47-2 ETS/SPS control module
N47-7 ABS control module

Electrical Test Program – Preparation for Test

Connection Diagram – Socket Box
Model 170, 208, 210
Model 202 *with* control module box



P42.40-0281-06

Figure 3

001	Control module connector
003	Digital multimeter
050	Socket box, 126-pole
102	Test cable
F23/1	Control module box
N47-1	ASR/SPS control module
N47-2	ETS/SPS control module
N47-7	ABS control module
a	Model 210
b	Model 170
c	Model 202, 208

Electrical Test Program – Preparation for Test

CAN data outputs, ABS control module (N47-7)

CAN signal	Information
ABS status	• Brake lining wear indicator lamp (A1e6) • Parking brake operated indicator lamp (A1e7) • ABS defect indicator lamp (A1e17) • System fault or diagnosis • Stop lamp switch S9/1): brake not operated brake operated no signal • Cruise control operation OFF • ABS operational • ABS operation OFF
Front left wheel vehicle speed signal (VSS)	• Wheel speed
Front right wheel vehicle speed signal (VSS)	• Wheel speed
Rear left wheel vehicle speed signal (VSS)	• Wheel speed
Rear right wheel vehicle speed signal (VSS)	• Wheel speed
Front left wheel speed signal for CC	• Wheel speed
Front right wheel speed signal for CC	• Wheel speed

Electrical Test Program – Preparation for Test

CAN data outputs, ETS/ASR/ESP control module (N47)

CAN signal	Information
ABS status	• Cruise control operation OFF • ABS operational • ABS operation OFF • System fault or diagnosis
ETS/ASR/ESP status	• Brake lining wear indicator lamp (A1e6) • Parking brake operated indicator lamp (A1e7) • ABS defect indicator lamp (A1e17) • ETS/ASR/ESP defect indicator lamp (A1e22/35/42) • ASR/ESP OFF switch operated - warning light on permanently • Slip or system operates - flashing warning light • Stop lamp switch (S9/1): brake not operated brake operated no signal • ASR request "Start off in 2nd gear" • ASR request "Hold gear" • Quicker ASR/EBR torque intervention • Increase in specified engine torque (EBR active)

Electrical Test Program – Preparation for Test

CAN data outputs, ETS/ASR/ESP control module (N47) (continued)

CAN signal	Information
ETS/ASR/ESP status	• Reduction in specified engine torque (ASR active) • Cruise control operation OFF • ASR operational • ABS/ASR operation OFF • System fault or diagnosis
Front left wheel vehicle speed signal (VSS)	Wheel speed
Front right wheel vehicle speed signal (VSS)	Wheel speed
Rear left wheel vehicle speed signal (VSS)	Wheel speed
Rear right wheel vehicle speed signal (VSS)	Wheel speed
Front left wheel speed signal for CC	Wheel speed
Front right wheel speed signal for CC	Wheel speed

Electrical Test Program – Preparation for Test

CAN data inputs, ETS/ASR/ESP control module

CAN signal	Information	From control module
Engine status	• Engine speed (rpm)	• Engine control module
Engine status	• Adjusted engine torque for traction control	• Engine control module
Engine status	• Atmospheric pressure	• Engine control module
Engine status	• Acknowledgment of torque requirement	• Engine control module
Engine status	• Pedal value	• Engine control module
Engine status	• Indicated engine torque	• Engine control module
Engine status	• Engine friction torque	• Engine control module
Engine status	• Maximum engine torque	• Engine control module
Engine status	• Clutch depressed (NON-USA)	• Engine control module
Vehicle code	● Model • Body style • Engine • Transmission	• Engine control module

Electrical Test Program – Preparation for Test

CAN data inputs, ETS/ASR/ESP control module (continued)

CAN signal	Information	From control module
Transmission status	● Actual gear • Target gear	• ETC
Transmission status	● Rear-wheel drive • 4 wheel drive	• ETC
Transmission status	● Shift introduction • Transmission in limp-home mode	• ETC
Transmission code	● Large transmission • Small transmission	• ETC
Transmission status	● Torque converter lockup clutch engaged • Torque converter lockup clutch disengaged • Torque converter lockup clutch slip	• ETC
Automatic clutch status (NON-USA)	• 1st gear	• Automatic clutch control module
Automatic clutch status (NON-USA)	● Shift introduction • Clutch engaged • Clutch disengaged • Clutch slip	• Automatic clutch control module
Automatic clutch status (NON-USA)	● Emergency limp-home mode	• Automatic clutch control module

9.3 Traction Systems (ABS, ASR, ETS) and SPS

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0	C 1010 C 1012	**Traction Systems Control module (N47)** Circuit 87 Voltage supply	N47 57 (2.23) — V — 10 (1.10) 81 (2.47) — V — 10 (1.10)	Ignition: **ON**	11 – 14 V	⇒ 1.1, ⇒ 1.2
1.1		Voltage supply from: **Model 202 without control module box** Overvoltage protection relay module (K1) **Model 170, 210** Relay module (K40, K40/4) **Model 202, 208 with control module box** Passenger-side fuse and relay module box (K40/4) **Models 129, 140** Base module (N16/1)	N47 ⊥ — V — 10 (1.10)	Ignition: **ON**	11 – 14 V	Fuse on K1, (model 202 without control module box), Fuse (F1) on K40 (170, 210), Fuse (F1) on K40/4 (model 202 with control module box), Fuse (F3) on N16/1 (models 129, 140), Wiring, K1 (model 202 without control module box), K40, K40/4 (model 170, 210), K40/4 (model 202, 208 with control module box), N16/1 (models 129, 140)

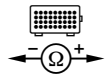
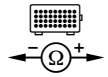
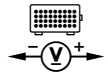
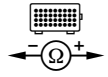
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.2		Ground wire **Model 202 without control module box** **Model 202, 208 with control module box** **Model 140, 210** **Model 129** **Model 170** **Model 202 without control module box** **Model 202, 208 with control module box** **Model 140, 210** **Model 129** **Model 170**	N47 W16/4 Ω 57 (2.23) W29/2 W15/1 W27 W16 W16/4 Ω 81 (2.47) W29/2 W15/1 W27 W16	Ignition: **OFF** **Disconnect** Traction control module (N47).	< 1 Ω	Wiring, Model 202 without control module box Ground, (right components compartment [W16/4]), Model 202, 208: with control module box, Ground, (right “A“ pillar) (W29/2), Model 140, 210: Ground, (right footwell) (W15/1), Model 129: Ground (control module box/control module) (W27), Model 170: Ground, (component compartment) (W16).
2.0	C 1010 C 1011 C 1012	**Traction systems control module (N47)** Circuit 30 Voltage supply	N47 57 (2.23) V 82 (2.48)	Ignition: **OFF**	11 – 14 V	Wiring, **Model 210 only:** Fuse (F1) on K40 **Model 170.447 only:** Crash separation relay module (K56).
3.0		**Data bus instrument cluster** (vehicles without CAN connection to instrument cluster only)	N47 57 (2.23) V 7 (1.7)	Ignition: **ON**	3 - 4 V A1e6/7/17/21/22/22/35/36: **ON**	Wiring, (N47)

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
4.0		**Diagnostic output**	N47 57 (2.23) — V — 9 (1.9)	Ignition: **ON**	10 – 14 V	Wiring, (N47), K40/4 (model 202, 208 with control module box)
5.0	C 1011 C 1314	**ASR/ETS/ESP hydraulic unit (A7/3)** Voltage supply for solenoid valves	N47 **Bosch** 57 (2.23) — V — 80 (2.46) **Teves** 57 (2.23) — V — 55 (2.21) 57 (2.23) — V — 71 (2.37)	Ignition: **On** **Bosch** **Teves**	 11 – 14 V 5 - 10 V (voltage pulsed) or 11 – 14 V	Wiring, Traction control module (N47)
6.0	C 1401	**High pressure/return pump relay (K20/1)** Voltage supply Model 129,140, 202 (Bosch ABS, ETS, ASR; Teves ABS): (K20/1 or K40/2k4) Model 210: (N65/k4 or K40/2k4) Model 170, 202, 208 (Teves ETS, ASR): (A7/3n1)	N47 57 (2.23) — V — 61 (2.27) 57 (2.23) — V — 82 (2.48)	Ignition: **ON** **Bosch ABS, ETS ASR** **Teves ABS** **Teves ETS** **Teves ASR**	 11 – 14 V 5 – 10 V (voltage pulsed) or 11 – 14 V 5 – 10 V (voltage pulsed) or 11 – 14 V	Wiring. ⇒6.1

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
6.1		**Bosch: ABS, ETS, ASR** **Teves: ABS** Coil resistance	N47  60 (2.26) — 61 (2.27)	Ignition: **OFF** **Disconnect** traction control module (N47).	40 – 80 Ω	Wiring, Models 129, 140, 202 (ABS): K20/1, Models 170: N65k4, Model 210: N65k4 or K40/2k4
7.0	C 1501 C 1514 C 1515	**Model 140, 210 with SPS:** **SPS P-valve (Y10)** Coil resistance	N47  35 (2.1) — 36 (2.2)	Ignition: **OFF** **Disconnect** traction control module (N47).	3 – 8 Ω	Wiring, SPS P-valve (Y10).
8.0	C 1142 C 1143	**Models 129.076, 140.04/05/07** **ABS lateral acceleration sensor (B24/2)** Voltage supply	N47  57 (2.23) — 22 (1.22)	Ignition: **ON**	4.75 – 5.25 V	N47
9.0	C1312	**Models 129.076, 140.04/05/07** **Master brake cylinder switchover valve (Y61)** Internal resistance	N47  44 (2.10) — 43 (2.9)	Ignition: **OFF** Disconnect traction control module (N47).	7 – 8 Ω	Wiring, Y61

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
10.0		**ETS and cruise control only, vehicles without CAN connection to instrument cluster** ETS signal	N47-2 57 (2.23) — V — 26 (1.26)	Ignition: **ON** Engine: **at idle**	< 1V ETS MIL (A1e35) **ON** 11 – 14 V A1e35: **OFF**	Wiring, N47-2
11.0	C 1100 C 1104 C 1500	**Left front axle VSS sensor (L6/1)** Internal resistance	N47 77 (2.43) — Ω — 78 (2.44)	Ignition: **OFF** **Disconnect** Traction control module (N47).	0.8 – 2.3 kΩ	Wiring, L6/1
11.1		Insulation resistance	N47 57 (2.23) — Ω — 77 (2.43)	Ignition: **OFF** **Disconnect** control module (N47).	>20 kΩ	Wiring, L6/1
12.0		**Left front axle VSS sensor (L6/1)** Output	N47 57 (2.23) — V~ — 1 (1.1)	Raise front of vehicle Ignition: **ON** Rotate left front tire by hand (> 1 rev./sec.).	>3 V~	Wiring, ⇒12.1, N47

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
12.1		Load with control modules connected	N47 57 (2.23) — Ω — 1 (1.1)	Ignition: **OFF** **Disconnect** control module (N47).	> 5 kΩ	Wiring, Connected control modules, ⇒ 11.0
13.0	C 1101 C 1105 C 1500	**Right front axle VSS sensor (L6/2)** Internal resistance	N47 52 (2.18) — Ω — 51 (2.17)	Ignition: **OFF** **Disconnect** control module (N47).	0.8 – 2.3 kΩ	Wiring, L6/2
13.1		Insulation resistance	N47 57 (2.23) — Ω — 52 (2.18)	Ignition: **OFF** **Disconnect** control module (N47).	> 20 kΩ	Wiring, L6/2
14.0		**Right front axle VSS sensor (L6/2)** Output	N47 57 (2.23) — V — 2 (1.2)	Raise front of vehicle Ignition: **ON** Rotate right front tire by hand (> 1 rev./sec.).	> 3 V ~	Wiring, ⇒ 14.1, N47
14.1		Load with control modules connected	N47 57 (2.23) — Ω — 2 (1.2)	Ignition: **OFF** **Disconnect** control module (N47).	> 5 kΩ	Wiring, Connected control modules, ⇒ 13.0

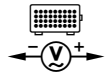
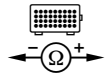
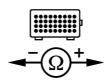
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
15.0	C 1102 C 1106 C 1500	**ABS:** **VSS sensor (L6)** Internal resistance	N47 13 (1.13) — Ω — 12 (1.12)	Ignition: **OFF** **Disconnect** control module (N47).	0.6 – 1.8 kΩ	Wiring, L6/3, ⇒ 15.1
15.1		Insulation resistance	N47 57 (2.23) — Ω — 13 (1.13)	Ignition: **OFF** **Disconnect** control module (N47).	> 20 kΩ	Wiring.
16.0	C 1102 C 1106 C 1500	**ASR or ETS:** **Left rear axle sensor (L6/3)** Internal resistance	N47 13 (1.13) — Ω — 12 (1.12)	Ignition: **OFF** **Disconnect** control module (N47).	0.6 – 1.8 kΩ	Wiring, L6/3, ⇒ 16.1
16.1		Insulation resistance	N47 57 (2.23) — Ω — 3 (1.3)	Ignition: **OFF** **Disconnect** control module (N47).	> 20 kΩ	Wiring.
17.0		**Left rear axle VSS sensor (L6/3)**	N47 57 (2.23) — V~ — 3 (1.3)	Raise rear of vehicle. Ignition: **ON** Rotate left rear tire by hand (> 1 rev./sec.).	> 3 V ~	Wiring, ⇒ 17.1 N47

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
17.1		Load with control modules connected	N47 57 (2.23) — Ω — 3 (1.3)	Ignition: **OFF** **Disconnect** control module (N47).	> 5 kΩ	Wiring, Connected control modules, ⇒ 15.0 ⇒ 16.0
18.0		**Left rear axle VSS sensor (L6/3), ASR or ETS**	N47 57 (2.23) — V~ — 3 (1.3)	Raise rear of vehicle. Ignition: **ON** Rotate left rear tire by hand (> 1 rev./sec.).	> 3 V ~	Wiring, ⇒ 18.1 N47
18.1		Load with control modules connected	N47 57 (2.23) — Ω — 3 (1.3)	Ignition: **OFF** **Disconnect** control module (N47).	> 5 kΩ	Wiring, Connected control modules, ⇒ 15.0 ⇒ 16.0
19.0	C1103 C1107 C1500	**ASR or ETS:** **Right rear axle VSS sensor L6/4,** Internal resistance	N47 15 (1.15) — Ω — 14 (1.14)	Ignition: **OFF** **Disconnect** control module (N47).	0.6 – 1.8 kΩ	Wiring, L6/4, ⇒ 19.1
19.1		Insulation resistance	N47 57 (2.23) — Ω — 15 (1.15)	Ignition: **OFF** **Disconnect** control module (N47).	> 20 kΩ	Wiring.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
20.0		**VSS sensor status** Signal: Vehicle is stationary	N47  57 (2.23) — 5 (1.5)	Engine: **at idle**	> 3 V ~	Wiring, N47
21.0	C 1300	**Left front axle solenoid valve (release) (A7/3y6)** Internal resistance	N47 **Bosch**  73 (2.39) — 80 (2.46) **Teves** 70 (2.36) — 55 (2.21)	Ignition: **OFF** **Disconnect** control module (N47).	5.4 – 12.6 Ω	Wiring, A7/3
22.0	C 1301	**Left front axle solenoid valve (release) (A7/3y7)** Internal resistance	N47 **Bosch**  72 (2.38) — 80 (2.46) **Teves** 80 (2.46) — 55 (2.21)	Ignition: **OFF** **Disconnect** control module (N47).	2.8 – 6.6 Ω	Wiring, A7/3

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
23.0	C 1302	**Right front axle solenoid valve (hold) (A7/3y8)** Internal resistance	N47 **Bosch** 74 (2.40) — Ω — 80 (2.46) **Teves** 69 (2.35) — Ω — 55 (2.21)	Ignition: **OFF** **Disconnect** control module (N47).	5.4 – 12.6 Ω	Wiring, A7/3
24.0	C 1303	**Right front axle solenoid valve (release) (A7/3y9)** Internal resistance	N47 **Bosch** 71 (2.37) — Ω — 80 (2.46) **Teves** 74 (2.40) — Ω — 55 (2.21)	Ignition: **OFF** **Disconnect** control module (N47).	2.8 – 6.6 Ω	Wiring, A7/3
25.0	C 1304	**ABS: Rear axle solenoid valve (hold) (A7/3y20)** Internal resistance	N47 **Bosch** 69 (2.35) — Ω — 80 (2.46) **Teves** 72 (2.38) — Ω — 55 (2.21)	Ignition: **OFF** **Disconnect** control module (N47).	5.4 – 12.6 Ω	Wiring, A7/3

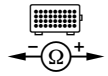
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
26.0	C 1304	**ASR or ETS:** **Left rear axle solenoid valve (hold) (A7/3y10)** Internal resistance	N47 **Bosch** 69 — (2.35) — 80 (2.46) **Teves** 72 — (2.38) — 55 (2.21)	Ignition: **OFF** **Disconnect** control module (N47).	5.4 – 12.6 Ω	Wiring, A7/3
27.0	C 1305	**ABS: Rear axle solenoid valve (release) (A7/3y20)** Internal resistance	N47 **Bosch** 70 — (2.36) — 80 (2.46) **Teves** 73 — (2.39) — 71 (2.21)	Ignition: **OFF** **Disconnect** control module (N47).	2.8 – 6.6 Ω	Wiring, A7/3
28.0	C 1305	**ASR or ETS:** **Left rear axle solenoid valve (release) (A7/3y11)** **ASR or ETS** Internal resistance	**Bosch** N47 70 — (2.36) — 80 (2.46) **Teves** 73 — (2.39) — 55 (2.21)	Ignition: **OFF** **Disconnect** control module (N47).	2.8 – 6.6 Ω	Wiring, A7/3

Electrical Test Program – Test

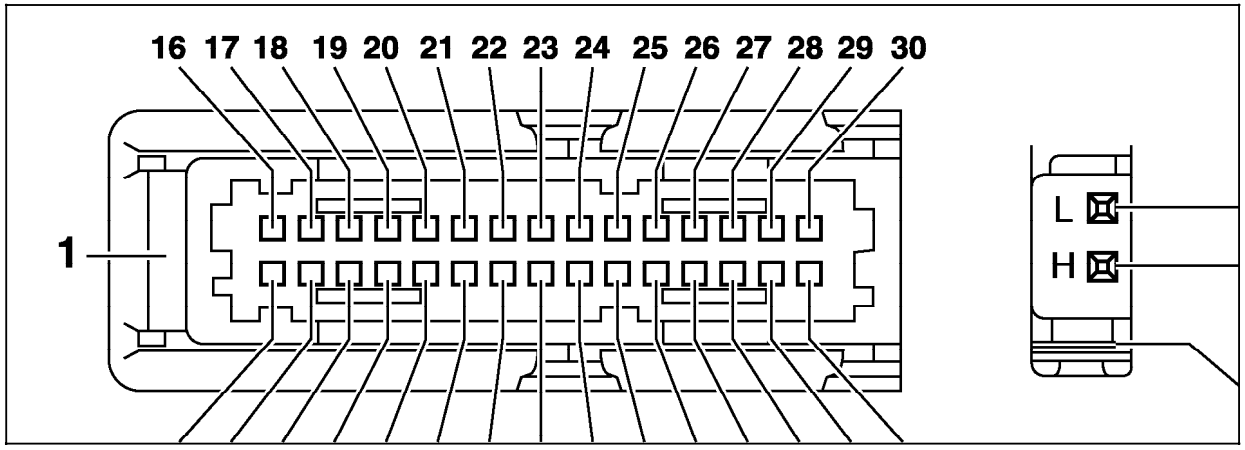
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
29.0	C 1306	**ASR or ETS:** **Right rear axle solenoid valve (hold) (A7/3y12)** **ASR or ETS** Internal resistance	N47 **Bosch** 64 — (2.30) — Ω — 80 (2.46) **Teves** 62 — (2.28) — Ω — 71 (2.37)	Ignition: **OFF** **Disconnect** control module (N47).	5.4 – 12.6 Ω	Wiring, A7/3
30.0	C 1307	**ASR or ETS:** **Right rear axle solenoid valve (release) (A7/3y13)** Internal resistance	N47 **Bosch** 65 — (2.31) — Ω — 80 (2.46) **Teves** 64 — (2.30) — Ω — 71 (2.37)	Ignition: **OFF** **Disconnect** control module (N47).	2.8 – 6.6 Ω	Wiring, A7/3
31.0	C 1311	**ASR or ETS:** **Switchover/solenoid valve (A7/3y5)** Internal resistance	N47 **Bosch** 62 — (2.28) — Ω — 80 (2.46) **Teves** 65 — (2.31) — Ω — 71 (2.37)	Ignition: **OFF** **Disconnect** control module (N47).	5.4 – 12.6 Ω	Wiring, A7/3

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
32.0	C 1315	**ASR or ETS:** **Inlet solenoid** **valve (A7/3y15)** **ASR or ETS** Internal resistance	N47 **Bosch** 63 — (2.29)  — 80 (2.46)	Ignition: **OFF** Disconnect control module (N47).	2.8 – 6.6 Ω	Wiring, A7/3

Electrical Test Program – Test

Connector Layout - Connector 1 (interior harness) and connector 3 (CAN data bus) ABS, ETS, ASR, control module (N47-7, N47-2, N47-1)



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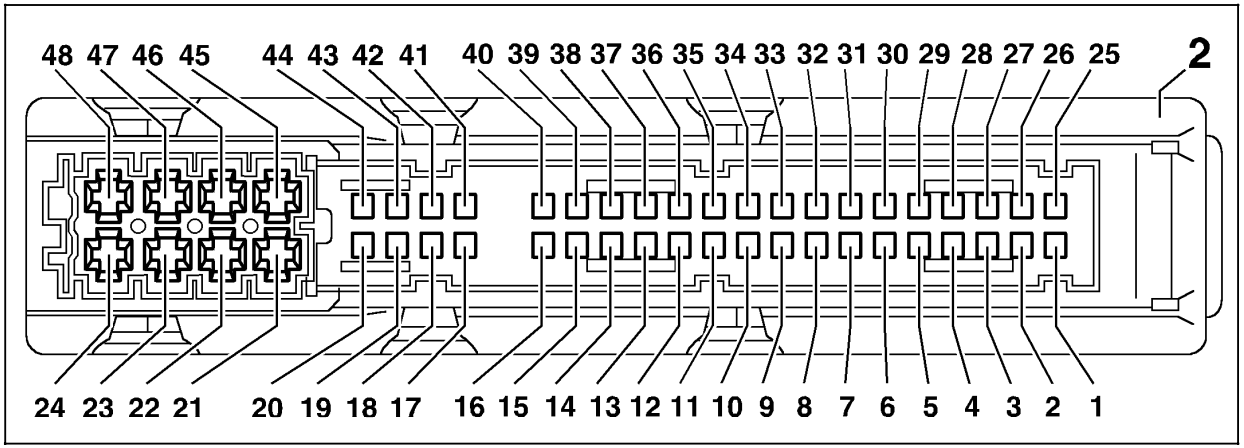
1	Left front axle VSS sensor (L6/1) output	12	Rear axle VSS sensor or left rear axle VSS sensor (L6) or (L6/3) (+)	H	**ASR**: CAN data bus (+)
2	Right front axle VSS sensor (L6/2) output			L	**ASR:** CAN data bus (–)
3	Left rear axle VSS sensor (L6/3) output	13	Rear axle VSS sensor or left rear axle VSS sensor (L6) or (L6/3) (–)		
4	Stop lamp switch (4 pole) (S9/1) N.O. contact				
5	VSS sensor output status	14	**ETS, ASR:** Right rear axle VSS sensor (L6/4) (+)		
6	Parking brake switch (S12)	15	**ETS, ASR:** Right rear axle VSS sensor (L6/4) (–)		
7	Data bus instrument cluster (instrument cluster without CAN connection)	16-25	not used		
		26	**ETS**: ETS signal (instrument cluster without CAN connection)		
8	Not used				
9	Diagnostic output	27	**ASR**: ASR OFF switch (S76/5)		
10	Terminal 87 (voltage supply)	28	Terminal 61		
11	Stop lamp switch (S9/1) N.C. contact	29-30	Right rear brake pad wear sensor (S10/4)		

Electrical Test Program – Test

Connector Layout - Connector 2
(engine harness)
ABS, ETS, ASR,
control modules (N47-7, N47-2, N47-1)
Part 1



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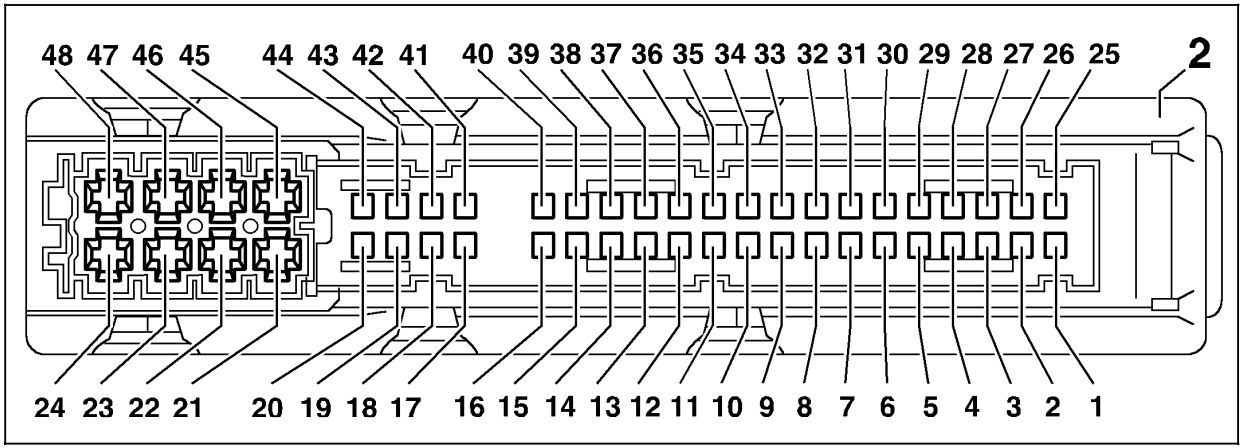
1	SPS P-valve (Y10) (–)
2	SPS P-valve (Y10) (+)
3-8	not used
9	Master brake cylinder switchover valve (Y61) (+)
10	Master brake cylinder switchover valve (Y61) (–)
11-16	not used
17	Right front axle VSS sensor (L6/2) (+)
18	Right front axle VSS sensor (L6/2) (–)
19-20	Right front brake pad wear sensor (S10/2)
21	**Teves:** Solenoid valves, voltage supply
22	not used
23	Ground (W15/1, W16, W16/4, W27, W29/2)
24	not used
25	High pressure return pump relay or high pressure/ return pump relay (A7/3k2 or K20/1) monitoring
26	High pressure/ return pump relay (K20/1) (+)
27	High pressure return pump relay or high pressure/ return pump relay (A7/3k2 or K20/1) (–)
28	**ETS/ASR Bosch:** Switchover/solenoid valve (A7/3y5) (–)
28	**ETS/ASR Bosch:** Right rear axle solenoid valve (hold) (A7/3y12) (–)
29	**ETS/ASR Bosch:** Inlet solenoid valve (A7/3y15) (–)
29	**ETS Teves:** High pressure/return pump relay (A7/3k2) (+)
30	**ETS/ASR Bosch:** Right rear axle solenoid valve (hold) (A7/3y12) (–)
30	**ETS Teves:** Right rear axle solenoid valve (release) (A7/3y13) (–)
31	**ETS/ASR Bosch:** Hydraulic unit, right rear axle solenoid valve (release) (A7/3y13) (–)

Electrical Test Program – Test

Connector Layout - Connector 2
(engine harness)
control modules (N47-7, N47-2, N47-1)
Part 2



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31	**ETS, Teves:** Switchover/solenoid valve (A7/3y5) (–)
32-34	—
35	**ETS/ASR, Bosch:** Left rear axle solenoid valve (hold) (A7/3y10) (–)
35	**ABS/ETS, Teves:** Right front axle solenoid valve (hold) (A7/3y8) (–)
35	**ABS Bosch:** Rear axle solenoid valve (hold) (A7/3y20) (–)
36	**ASR/ETS Boxch:** Left rear axle solenoid valve (release) (A7/3y11) (–)
36	**ABS Bosch:** Rear axle solenoid valve (release) (A7/3y21) (–)
36	**ABS/ETS Teves:** Left front axle solenoid valve (hold) (A7/3y6) (–)
37	**ABS/ASR/ETS Bosch:** Right front axle solenoid valve (release) (A73/y9) (–)
37	**ASR Bosch:** Right front axle solenoid valve (release) (A73/y7) (–)
38	**ETS Teves:** Left rear axle solenoid valve (hold) (A73/y10) (–)
38	**ABS Teves:** Rear axle solenoid valve (hold) (A73/y20) (–)
39	**ABS/ETS/ASR Bosch:** Left front axle solenoid valve (hold) (A7/3y6) (–)
39	**ETS Teves:** Left rear axle solenoid valve (hold) (A7/3y11) (–)
39	**ABS Teves** Rear axle solenoid valve (release) (A7/3y21) (–)
40	**ASR/ETS/ESP Bosch:** Hydraulic unit, right front axle solenoid valve (hold) (A7/3y8) (–)
40	**ABS/ETS Teves:** Hydraulic unit, right front axle solenoid valve (release) (A7/3y9) (–)
40-41	Left front brake pad wear sensor (S10/1)
43	Left front axle VSS sensor (L6/1) (–)
44	Left front axle VSS sensor (L6/1) (+)
45	not used
46	**Bosch:** Solenoid valve voltage supply
46	**ABS/ETS Teves:** Right front axle solenoid valve (release) (A7/3y7) (–)
47	Ground (W15/1, W16, W16/4, W27, W29/2)
48	Circuit 30 voltage