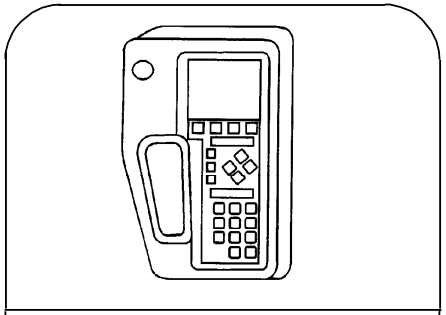
9.5 Model 163

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Preparation for DTC Readout

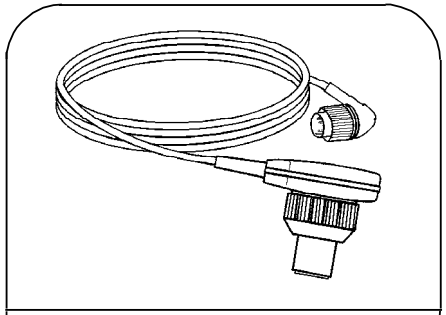
1. Review section 0 and 21, 22, 23
2. Connect Hand-Held Tester (HHT) to data link connector (X11/4) according to connection diagram (see section 0).
3. Ignition: **ON**
4. Read out DTC memory for the ETS, ME-SFI and ETC control modules.
5. Perform nominal/actual values comparison.
6. Perform activations.
7. Follow-up and repair all displayed DTCs.
8. After successful repairs, erase all DTCs.

Special Tools



965 589 00 01 00

Hand-Held-Tester



965 589 00 40 00

Test cable

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

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	ETS/SPS control module (N47-2)	N47-2
C 1010	Battery voltage too low, circuit 15	23 ⇒ 1.0
C 1012	Battery voltage too high, circuit 15	23 ⇒ 1.0
C 1020	CAN communication faulty overall	Wiring, 23 ⇒ 3.0
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 1029	CAN communication with All-Activity control module (AAM) (N10) interrupted	Read out DTC's from (N10).
C 1030	CAN communication with Transfer case control module (N78) interrupted	Read out DTC's from (N78).
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 ⇒ 6.0
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 ⇒ 7.0

[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	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 ⇒ 8.0
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 ⇒ 9.0
C 1200	Stop lamp switch (S9/1) short/open circuit S9/1 implausible	Wiring, S/91
C 1210	Brake fluid level switch (S11) short/open circuit	Wiring, S/11
C 1300	Left front axle solenoid valve (hold) (A7/3y6), short/open circuit	23 ⇒ 11.0
C 1301	Left front axle solenoid valve (release) (A7/3y7), short/open circuit	23 ⇒ 12.0
C 1302	Right front axle solenoid valve (hold) (A7/3y8), short/open circuit	23 ⇒ 13.0
C 1303	Right front axle solenoid valve (release) (A7/3y9), short/open circuit	23 ⇒ 14.0
C 1304	Left rear axle solenoid valve (hold) (A7/3y10), short/open circuit	23 ⇒ 15.0

[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 1305	Left rear axle solenoid valve (release) (A7/3y11), short/open circuit	23 ⇒ 16.0
C 1306	Right rear axle solenoid valve (hold) (A7/3y12), short/open circuit	23 ⇒ 17.0
C 1307	Right rear axle solenoid valve (release) (A7/3y13), short/open circuit	23 ⇒ 18.0
C 1314	Solenoid valves (A7/3), voltage supply	23 ⇒ 10.0 23 ⇒ 2.0
C 1316	Pressure circuit 1 switchover solenoid valve (A7/3y24) short/open circuit	23 ⇒ 19.0
C 1317	Pressure circuit 1 vacuum solenoid valve (A7/3y26)	23 ⇒ 21.0
C 1318	Pressure circuit 2 switchover solenoid valve (A7/3y25) short/open circuit	23 ⇒ 20.0
C 1319	Pressure circuit 2 vacuum solenoid valve (A7/3y27) short/open circuit	23 ⇒ 22.0
C 1401	High pressure return pump (A7/3m1), short/open circuit High pressure return pump (A7/3m1), will not shut off	23 ⇒ 5.0
C 1512	Brakes overheated	Brakes were momentarily overloaded, erase DTC.

[1] Observe Preparation for Test, see 22.

9.5 Traction Systems (ETS)

Diagnosis – Complaint Related Diagnostic Chart

Preparation for Test

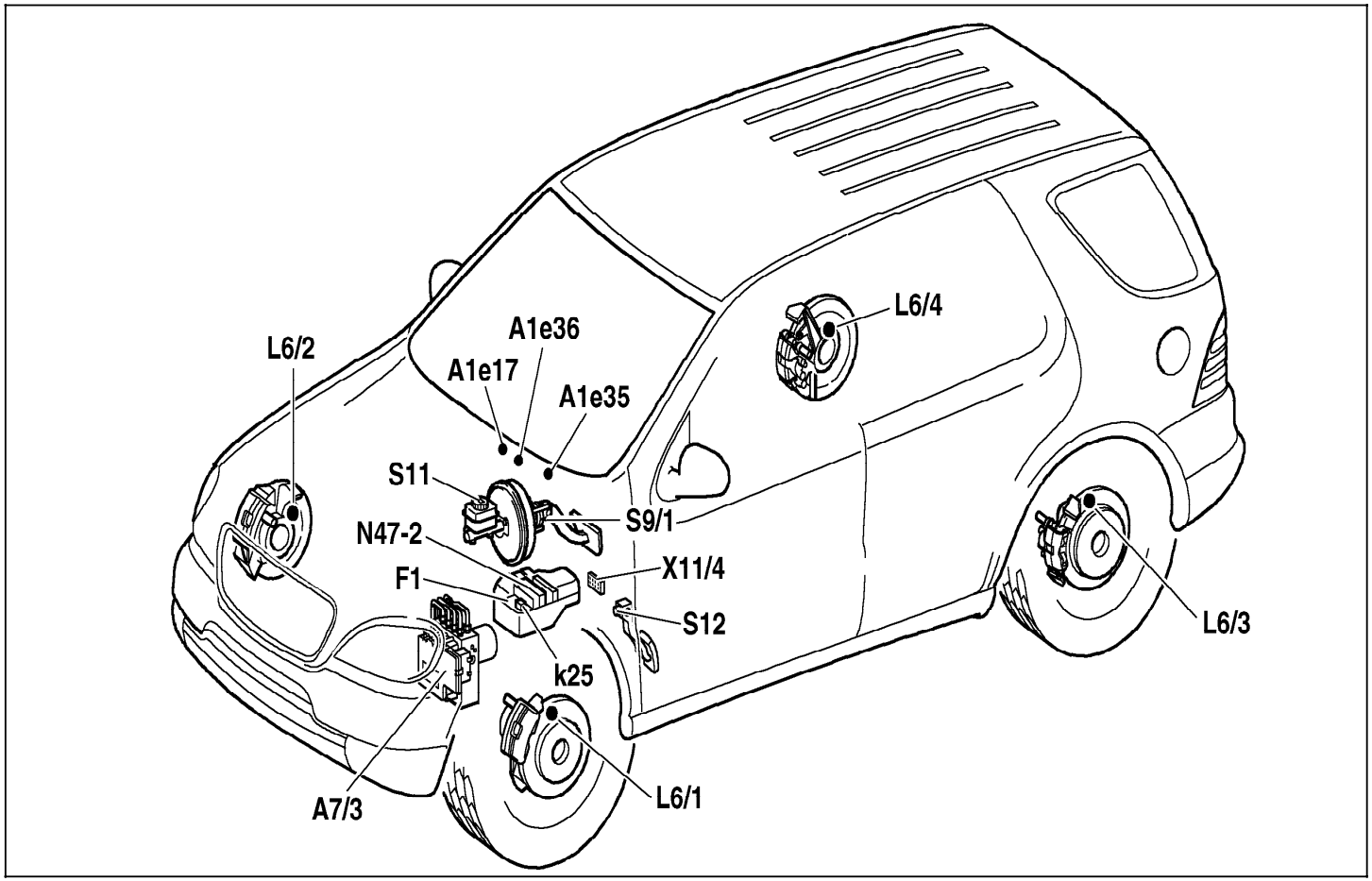
1. Review 21

Complaint/Problem	Possible cause	Test step/Remedy [1]
ETS MIL (A1e35) or ABS MIL (A1e17) illuminate when engine is running		Read out DTC using HHT, 12
ETS MIL (A1e35) or ABS MIL (A1e17) illuminate while driving and do not go out		Read out DTC using HHT, 12
Low brake fluid/parking brake/brake-force proportioning indicator lamp (A1e7) illuminates while driving and does not go out. Additionally, an acoustical warning tone is heard.	Fault in the electronic brake force distribution.	Read out DTC using HHT, 12
BAS/ETS MIL(A1e49) 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), ETS warning lamp (A1e36), ABS MIL (A1e17) or ETS MIL (A1e35) do not illuminate with ignition switch ON	CAN data line.	Read out DTC for Instrument cluster, using HHT, 23 ⇒ 3.0
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 using HHT, 12
ETS MIL (A1e35) illuminates while driving and then after a while goes out (DTC code of C1512 is stored)	Brakes were at one time overloaded.	Read out DTC using HHT, 12

[1] Observe Preparation for Test, see 22.

Electrical Test Program – ETS Component Locations

Model 163



P42.35-0237-09

Figure 1

A1e17	ABS MIL
A1e35	ETS MIL
A1e36	ETS warning lamp
A7/3	ASR/ETS/ESP hydraulic unit
F1	Fuse and relay box
k25	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
N47-2	ETS/SPS control module
S9/1	Stop lamp switch (4-pole)
S11	Brake fluid level switch
S12	Parking brake switch
X11/4	Data link connector (DTC read out)

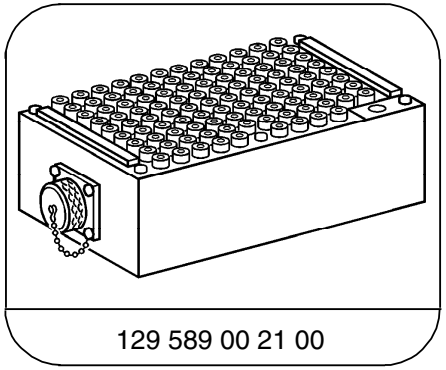
9.5 Traction Systems (ETS)

Electrical Test Program – Preparation for Test

1. Review section 0
2. Review 21, 22, 23 (connector connections).
3. Ignition: **OFF**
4. Disconnect ETS/SPS control module (N47-2).
5. Connect socket box with test cable as per connection diagram (Figure 1).

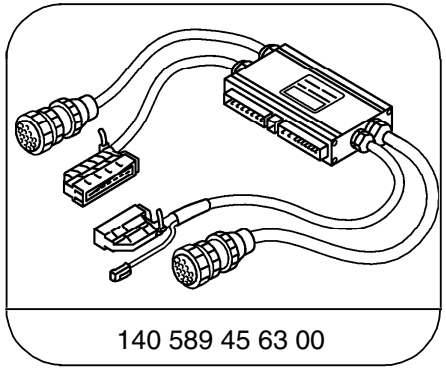
Electrical Wiring Diagrams:
(location of grounds and connectors).
Electrical Troubleshooting Manual, Model 163 (via WIS only).

Special Tools



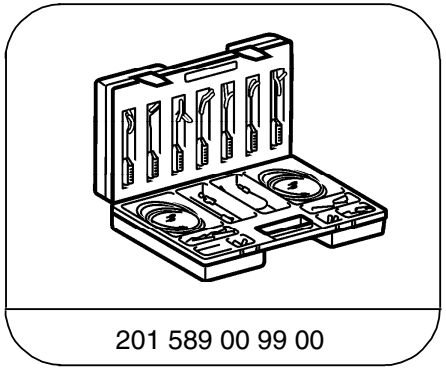
129 589 00 21 00

126-pin socket box



140 589 45 63 00

80-pin test cable



201 589 00 99 00

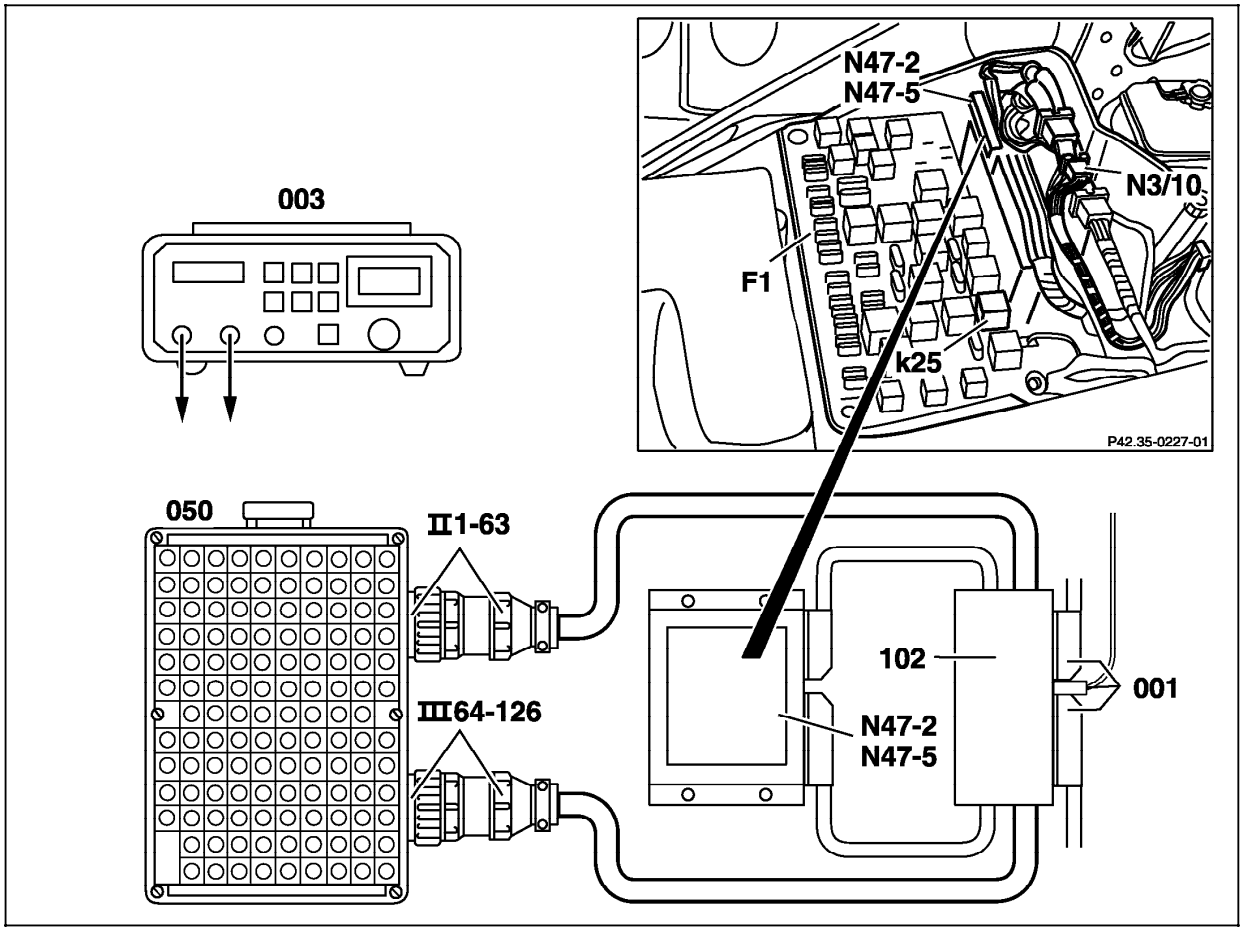
Electrical connecting set

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 163



P42.35-0246-06

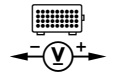
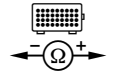
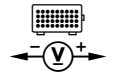
Figure 1

001	Control module connector
003	Digital multimeter
050	Socket box, 126-pole
102	Test cable
F1	Fuse and relay box
N47-2	ETS/SPS control module

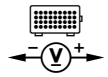
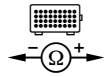
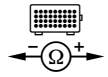
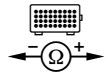
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0	1010 1012	**ETS/SPS Control module (N47-2)** Circuit 15 Voltage supply	N47-2 57 (2.23) — V — 14 (1.14) 81 (2.47) — V — 14 (1.14)	Ignition: **ON**	11 – 14 V	⇒ 1.1, ⇒ 1.2
1.1		Voltage supply from: **Fuse and relay box (F1)**	⊥ — V — N47-2 14 (1.14)	Ignition: **ON**	11 – 14 V	Fuse (f22) in F1, Wiring.
1.2		Ground wire	W9 — Ω — N47-2 57 (2.23) W9 — Ω — 81 (2.47)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	< 1 Ω	Wiring, Ground (left headlamp unit), (W9).

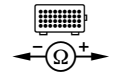
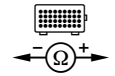
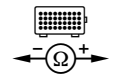
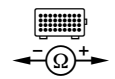
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
2.0	C 1314	**ETS/SPS control module (N47-2)** Circuit 30 Voltage supply	N47-2  57 (2.23) — 58 (2.48) 57 (2.23) — 82 (2.48)	Ignition: **OFF**	11 – 14 V	Fuse (f27) in F1, Wiring.
3.0	C 1020	**CAN data bus**	N47-2  34 (3.L) — 33 (3.H)	Ignition: **ON**	55 – 65 Ω	Wiring, End resistors in ME-SFI and RCL control modules, see DM, Engines and Body and Accessories.
4.0		**Diagnostic output**	N47  57 (2.23) — 13 (1.13)	Ignition: **ON**	10 – 14 V	Wiring, N47-2

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
5.0	C 1401	**High pressure/return pump relay (F1k25)** Voltage supply	N47-2  57 (2.23) — 46 (2.12)	Ignition: **On**	11 – 14 V	Wiring, ⇒5.1
5.1		Coil resistance	N47-2  47 (2.13) — 46 (2.12)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	40 – 80 Ω	Wiring, High pressure/return pump relay (F1k25).
6.0	C 1100	**Left front axle VSS sensor (L6/1)** Internal resistance	N47-2  77 (2.43) — 78 (2.44)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	0.8 – 2.3 kΩ	⇒6.1 Wiring, L6/1
6.1		Insulation resistance	N47-2  57 (2.23) — 77 (2.43)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	>20 kΩ	Wiring, L6/1

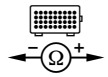
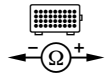
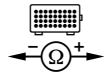
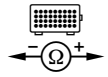
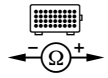
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
7.0	C 1101	**Right front axle VSS sensor (L6/2)** Internal resistance	N47-2  52 (2.18) — 51 (2.17)	Ignition: **OFF** **Disconnect** ETS/SPS module (N47-2).	0.8 – 2.3 kΩ	⇒ 7.1, Wiring, L6/2
7.1		Insulation resistance	N47-2  57 (2.23) — 52 (2.18)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	> 20 kΩ	Wiring, L6/2
8.0	C 1102	**Left rear axle sensor (L6/3)** Internal resistance	N47  26 (1.26) — 25 (1.25)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	0.6 – 1.8 kΩ	⇒ 8.1 Wiring, L6/3
8.1		Insulation resistance	N47-2  57 (2.23) — 26 (1.26)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	> 20 kΩ	Wiring, L6/3

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
9.0	C 1103	**Right rear axle VSS sensor (L6/4)** Internal resistance	N47-2 28 (1.28) — Ω — 27 (1.27)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	0.6 – 1.8 kΩ	⇒ 9.1 Wiring, L6/4
9.1		Insulation resistance	N47-2 57 (2.23) — Ω — 28 (1.28)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	> 20 kΩ	Wiring, L6/4
10.0	C 1314	**ASR/ETS/ESP Hydraulic unit (A7/3)** Solenoid valves Voltage supply	N47-2 57 (2.23) — V — 80 (2.46)	Ignition: **ON**	11 – 14 V	Wiring, N47-2
11.0	C 1300	**Left front axle solenoid valve (hold) (A7/3y6)** Internal resistance	N47-2 73 (2.39) — Ω — 80 (2.46)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	5.4 – 12.6 Ω	Wiring, A7/3
12.0	C 1301	**Left front axle solenoid valve (release) (A7/3y7)** Internal resistance	N47-2 72 (2.38) — Ω — 80 (2.46)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	2.8 – 6.6 Ω	Wiring, A7/3

Electrical Test Program – Test

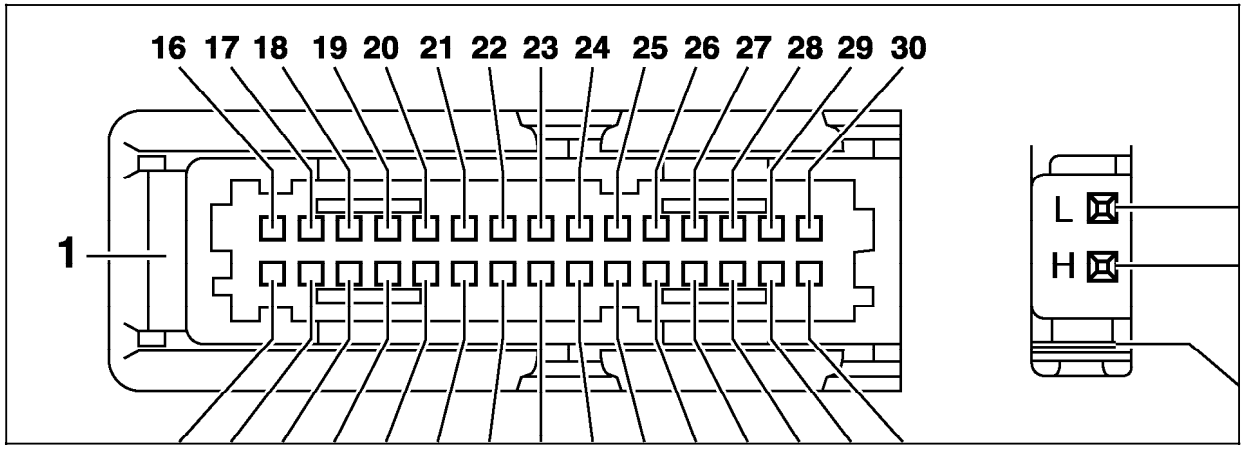
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
13.0	C 1302	**Right front axle solenoid valve (hold) (A7/3y8)** Internal resistance	N47-2  74 (2.40) — 80 (2.46)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	5.4 – 12.6 Ω	Wiring, A7/3
14.0	C 1303	**Right front axle solenoid valve (release) (A7/3y9)** Internal resistance	N47-2  71 (2.37) — 80 (2.46)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	2.8 – 6.6 Ω	Wiring, A7/3
15.0	C 1304	**Left rear axle solenoid valve (hold) (A7/3y10)** Internal resistance	N47-2  69 (2.35) — 80 (2.46)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	5.4 – 12.6 Ω	Wiring, A7/3
16.0	C 1305	**Left rear axle solenoid valve (release) (A7/3y11)** Internal resistance	N47-2  70 (2.36) — 80 (2.46)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	2.8 – 6.6 Ω	Wiring, A7/3
17.0	C 1306	**Right rear axle solenoid valve (hold) (A7/3y12)** Internal resistance	N47-2  64 (2.30) — 80 (2.46)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	5.4 – 12.6 Ω	Wiring, A7/3

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
18.0	C 1307	**Right rear axle solenoid valve (release) (A7/3y13)** Internal resistance	N47-2 65 (2.31) — Ω — 80 (2.46)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	2.8 – 6.6 Ω	Wiring, A7/3
19.0	C 1316	**Pressure circuit 1 switchover solenoid valve (A7/3y24)** Internal resistance	N47-2 60 (2.26) — Ω — 80 (2.46)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	5.4 – 12.6 Ω	Wiring, A7/3
20.0	C 1318	**Pressure circuit 2 switchover solenoid valve (A7/3y25)** Internal resistance	N47-2 62 (2.28) — Ω — 80 (2.46)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	5.4 – 12.6 Ω	Wiring, A7/3
21.0	C 1310	**Pressure circuit 1 vacuum solenoid valve (A7/3y26)** Internal resistance	N47-2 61 (2.27) — Ω — 80 (2.46)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	5.4 – 12.6 Ω	Wiring, A7/3
22.0	C 1319	**Pressure circuit 2 vacuum solenoid valve (A7/3y27)** Internal resistance	N47-2 63 (2.29) — Ω — 80 (2.46)	Ignition: **OFF** **Disconnect** ETS/SPS control module (N47-2).	5.4 – 12.6 Ω	Wiring, A7/3

Electrical Test Program – Test

Connector Layout - Connector 1 (interior harness) and connector 3 (CAN data bus) for ETS control module (N47-2)



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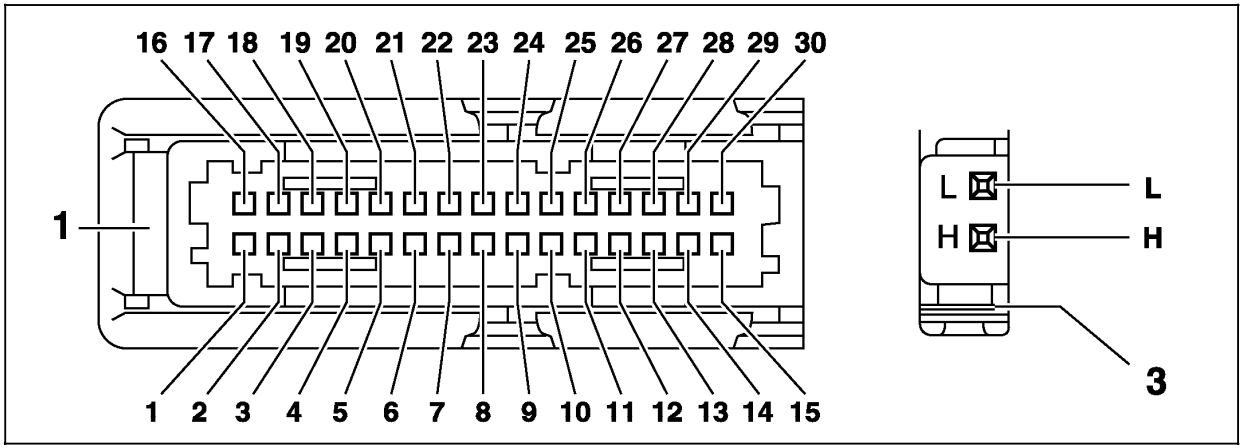
	Connector 1
1	Left front axle VSS sensor (L6/1) output
2	Right front axle VSS sensor (L6/2) output
3	Left rear axle VSS sensor (L6/3) output
4-7	Not used
8	Parking brake switch (S12)
9-10	Not used
11	Stop lamp switch (S9/1) N.O. contact
12	Not used
13	Diagnostic output
14	Circuit 15 voltage supply
15	Stop lamp switch (S9/1) N.C. contact
16-24	Not used
25	Left rear axle VSS sensor (L6/3) (+)
26	Left rear axle VSS sensor (L6/3) (–)
27	Right rear axle VSS sensor (L6/4) (+)
28	Right rear axle VSS sensor (L6/4) (–)
29-30	Not used

	Connector 3
H	CAN data bus (+)
L	CAN data bus (–)

Electrical Test Program – Test

Connector Layout - Connector 2 (engine harness) for ETS control module (N47-2)



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	Connector 2
1-6	Not used
7	Brake fluid level switch (S11)
11	High pressure/return pump relay (F1k25) monitoring
12	High pressure/return pump relay (F1k25) (+)
13	High pressure/return pump relay (F1k25) (–)
12-16	Not used
17	Right front axle VSS sensor (L6/2) (+)
18	Right front axle VSS sensor (L6/2) (–)
19-22	Not used
23	Ground (W9)
24	Circuit 30 voltage supply
26	Pressure circuit 2 switchover solenoid valve (A7/3y25) (–)
27	Pressure circuit 2 vacuum solenoid valve (A7/3y27) (–)
28	Pressure circuit 1 switchover solenoid valve (A7/3y24) (–)
29	Pressure circuit 1 vacuum solenoid valve (A7/3y26) (–)
30	Right rear axle solenoid valve (hold) (A7/3y12) (–)
31	Right rear axle solenoid valve (release) (A7/3y13) (–)
32-34	Not used
35	Left rear axle solenoid valve (hold) (A7/3y10) (–)
36	Left rear axle solenoid valve (release) (A7/3y11) (–)
37	Right front axle solenoid valve (release) (A7/3y9) (–)
38	Left front axle solenoid valve (release) (A7/3y7) (–)
39	Left front axle solenoid valve (hold) (A7/3y6) (–)
40	Right front axle solenoid valve (hold) (A7/3y8) (–)
41-42	Left front brake pads wear sensor (S10/1)
43	Left front axle VSS sensor (L6/1) (–)
44	Left front axle VSS sensor (L6/1) (+)
45	Not used
46	Solenoid valves, Voltage supply
47	Ground (W9)
48	Circuit 30 voltage supply