Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0	C 1010	**ESP/SPS control module (N47-5)** Circuit 87 Voltage supply	N47-5 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: **Models 129, 140** Base module (N16/1) **Model 210** Relay module (K40)	N47-5 W15/1 — V — 14 (1.14)	Ignition: **ON**	11 – 14 V	Fuse (F3) on N16/1, DM, Chassis & Drivetrain, Vol. 1, sections 1.1 23, Wiring.
1.2		Ground wire **Model 129** **Model 140** **Model 210** **Model 129** **Model 140** **Model 210**	N47-5 W27 W15/1 — Ω — 57 (2.23) W16/3 W27 W15/1 — Ω — 81 (2.47) W16/3	Ignition: **OFF**	< 1 Ω	Wiring, **Model 129:** bracket ground (W27) (control module box/module box). **Model 140:** electronics- right footwell ground (W15/1). **Model 210:** output ground - left wheel housing ground (W16/3).

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
2.0		**ESP/SPS control module (N47-5)** Circuit 30 Voltage supply	N47-5 57 (2.23) — V — 58 (2.24) 57 (2.23) — V — 82 (2.48)	Ignition: **OFF**	11 – 14 V	Wiring.
3.0		**Instrument cluster data bus** (for vehicles without CAN connection to instrument cluster)	N47-5 57 (2.23) — V — 9 (1.9)	Ignition: **ON**	3 – 4 V A1e6, A1e7, A1e17, A1e41, A1e42: **ON**.	Wiring, N47-5.
4.0		**Diagnosis output**	N47-5 57 (2.23) — V — 13 (1.13)	Ignition: **ON**	10 – 14 V	Wiring, N47-5.
5.0		**Engine speed (rpm)**		Engine: **at Idle**	Engine speed	DM Engines Vol. 4, section 9

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
6.0	C 1200	**Stop lamp switch (S9/1)** N.O. contact N.C. contact		Brakes not applied. Brakes applied. Brakes not applied. Brakes applied.	OFF ON OFF ON	⇒ 6.1, Wiring, S9/1.
6.1		Circuit 15 Voltage supply		Brakes not applied. Brakes applied.	< 1V 11 – 14V	Wiring.
7.0		**Parking brake switch (S12)**		Engine: **at Idle** Apply parking brake. Release parking brake.	ON Parking brake indicator lamp (A1e7): **ON** OFF A1e7: **OFF**	Wiring, S12, A1e7.
8.0	C 1312	**Master brake cylinder switchover valve (Y61) (Models 129.067/076, 140 only)**		Press ON button. Press OFF button.	ON OFF Y61 audibly switches over.	⇒ 8.1, N47-5.

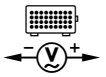
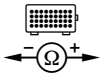
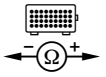
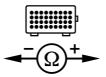
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
8.1		Internal resistance	N47-5 44 (2.10) — Ω — 43 (2.9)	Ignition: **OFF** Disconnect control module (N47-5).	7 – 8 Ω	Wiring, Y61.
9.0	C 1400	**ASR/ESP charging pump (M15)**		Activate M15. Brake pressure sensor.	M15 audibly runs. 3 – 15 bar	Wiring, M15.
10.0	C 1401	**ASR/ETS/ESP hydraulic unit, high-pressure/return pump (A7/3m1)**		Activate A7/3m1.	A7/3m1 audibly runs.	Wiring, ⇒ 11.0
11.0	C 1401	**High-pressure/return pump relay (K20/1)** **Model 129, 140: K20/1** **Model 210: N65k4** Voltage supply	N47-5 57 (2.23) — V — 47 (2.13)	Ignition: **ON**	11 – 14 V	Wiring, ⇒ 7.1
11.1		Coil resistance	N47-5 46 (2.12) — Ω — 47 (2.13)	Ignition: **OFF** Disconnect control module (N47-5).	40 – 80 Ω	Wiring, **Models 129, 140:** K20/1 (relay box). **Model 210:** Pulse module (N65).

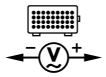
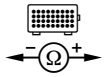
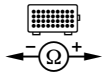
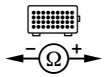
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
12.0	C 1501	**SPS P-valve (Y10)** Voltage supply		Engine: **at Idle** Press MAX key Press MIN key	> 800mA steering is light < 400mA steering is heavy	⇒ 12.1, N47-5.
12.1		Coil resistance	N47-5 35 (2.1) — Ω — 36 (2.2)	Ignition: **OFF** Disconnect control module (N47-5).	3 – 8 Ω	Wiring, Y10.
13.0	C 1100 C 1500	**Left front axle VSS sensor (L6/1)**		Raise front of vehicle. Ignition: **ON** Rotate left front tire by hand (> 1 rev./sec.).	> 2 mph (3 km/h)	⇒ 13.1, ⇒ 13.2
13.1		Internal resistance	N47-5 77 (2.43) — Ω — 78 (2.44)	Ignition: **OFF** Disconnect control module (N47-5).	0.8 – 2.3 kΩ	Wiring, L6/1.
13.2		Insulation resistance	N47-5 57 (2.23) — Ω — 77 (2.43)	Ignition: **OFF** Disconnect control module (N47-5).	> 20 kΩ	Wiring, L6/1.

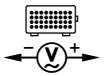
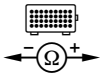
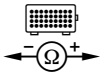
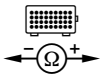
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
14.0		**Left front axle VSS sensor (L6/1) output**	N47-5  57 (2.23) — 1 (1.1)	Raise front of vehicle. Ignition: **ON** Rotate left front tire by hand (> 1 rev./sec.).	> 3 V	Wiring, ⇒ 14.1, N47-5.
14.1		Load with control modules connected	N47-5  57 (2.23) — 1 (1.1)	Ignition: **OFF** Disconnect control module (N47-5).	> 5 kΩ	Wiring, Connected control modules (N3/12, etc.), ⇒ 13.0
15.0	C 1101 C 1500	**Right front axle VSS sensor (L6/2)**		Raise front of vehicle. Ignition: **ON** Rotate right front tire by hand (> 1 rev./sec.).	> 2 mph (3 km/h)	⇒ 15.1, ⇒ 15.2
15.1		Internal resistance	N47-5  52 (2.18) — 51 (2.17)	Ignition: **OFF** Disconnect control module (N47-5).	0.8 – 2.3 kΩ	Wiring, L6/2.
15.2		Insulation resistance	N47-5  57 (2.23) — 52 (2.18)	Ignition: **OFF** Disconnect control module (N47-5).	> 20 kΩ	Wiring, L6/2.

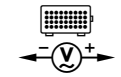
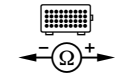
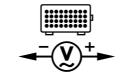
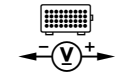
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
16.0		**Right front axle VSS sensor (L6/2) output**	N47-5  57 (2.23) — 2 (1.2)	Raise front of vehicle. Ignition: **ON** Rotate right front tire by hand (> 1 rev./sec.).	> 3 V	Wiring, ⇒ 16.1, N47-5.
16.1		Load with control modules connected	N47-5  57 (2.23) — 2 (1.2)	Ignition: **OFF** Disconnect control module (N47-5).	> 5 kΩ	Wiring, Connected control modules, ⇒ 15.0
17.0	1102 1500	**Left rear axle VSS sensor (L6/3)**		Raise rear of vehicle. Ignition: **ON** Rotate left rear tire by hand (> 1 rev./sec.).	> 2 mph (3 km/h)	⇒ 17.1, ⇒ 17.2
17.1		Internal resistance	N47-5  26 (1.26) — 25 (1.25)	Ignition: **OFF** Disconnect control module (N47-5).	0.6 – 1.6 kΩ	Wiring, L6/3.
17.2		Insulation resistance	N47-5  57 (2.23) — 26 (1.26)	Ignition: **OFF** Disconnect control module (N47-5).	> 20 kΩ	Wiring.

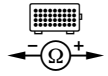
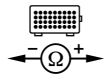
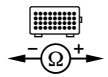
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
18.0		**Left rear axle VSS sensor (L6/3) output**	N47-5  57 (2.23) — 3 (1.3)	Raise rear of vehicle. Ignition: **ON** Rotate left rear tire by hand (> 1 rev./sec.).	> 3 V	Wiring, ⇒ 18.1, N47-5.
18.1		Load with control modules connected	N47-5  57 (2.23) — 3 (1.3)	Ignition: **OFF** Disconnect control module (N47-5).	> 5 kΩ	Wiring, Connected control modules, ⇒ 17.0
19.0	[1103 [1500	**Right rear axle VSS sensor (L6/4)**		Raise rear of vehicle. Ignition: **ON** Rotate right rear tire by hand (> 1 rev./sec.).	> 2 mph (3 km/h)	⇒ 19.1, ⇒ 19.2
19.1		Internal resistance	N47-5  28 (1.28) — 27 (1.27)	Ignition: **OFF** Disconnect control module (N47-5).	0.6 – 1.6 kΩ	Wiring, L6/4.
19.2		Insulation resistance	N47-5  57 (2.23) — 28 (1.28)	Ignition: **OFF** Disconnect control module (N47-5).	> 20 kΩ	Wiring.

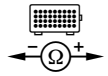
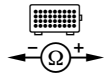
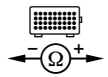
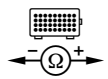
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
20.0		**Right rear axle VSS sensor (L6/4) output**	N47-5  57 (2.23) — 4 (1.4)	Raise rear of vehicle. Ignition: **ON** Rotate right rear tire by hand (> 1 rev./sec.).	> 3 V	⇒ 20.1, N47-5.
20.1		Load with control modules connected	N47-5  57 (2.23) — 4 (1.4)	Ignition: **OFF** Disconnect control module (N47-5).	> 5 kΩ	Wiring, Connected control modules, ⇒ 19.0
21.0		**VSS sensor output status** Signal: Vehicle stationary	N47-5  57 (2.23) — 5 (1.5)	Ignition: **ON**	> 3 V	Wiring, N47-5.
22.0		**ASR/ETS/ESP hydraulic unit (A7/3)** Solenoid valve voltage supply	N47-5  57 (2.23) — 80 (2.46)	Ignition: **ON**	11 – 14 V	Wiring, N47-5.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
23.0	C 1300 – C 1307	**ASR/ETS/ESP hydraulic unit (A7/3)** Solenoid valves (A7/3y6 – A7/3y13)		Raise vehicle. Activate all solenoid valves, one after the other. ON and apply brakes. OFF and apply brakes.	ON Wheels not braked. OFF Wheels braked.	Wiring, ⇒ 23.1 – 23.8
23.1	C 1300	ASR/ETS/ESP hydraulic unit, left front axle solenoid valve (hold) (A7/3y6) Internal resistance	N47-5  80 (2.46) — 73 (2.39)	Ignition: **OFF** Disconnect control module (N47-5).	5.4 – 12.6 Ω	Wiring, A7/3.
23.2	C 1301	ASR/ETS/ESP hydraulic unit, left front axle solenoid valve (release) (A7/3y7) Internal resistance	N47-5  80 (2.46) — 72 (2.38)	Ignition: **OFF** Disconnect control module (N47-5).	2.8 – 6.6 Ω	Wiring, A7/3.
23.3	C 1302	ASR/ETS/ESP hydraulic unit, right front axle solenoid valve (hold) (A7/3y8) Internal resistance	N47-5  80 (2.46) — 74 (2.40)	Ignition: **OFF** Disconnect control module (N47-5).	5.4 – 12.6 Ω	Wiring, A7/3.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
23.4	C 1303	ASR/ETS/ESP hydraulic unit, right front axle solenoid valve (release) (A7/3y9) Internal resistance	N47-5  80 (2.46) — 71 (2.37)	Ignition: **OFF** Disconnect control module (N47-5).	2.8 – 6.6 Ω	Wiring, A7/3.
23.5	C 1304	ASR/ETS/ESP hydraulic unit, left rear axle solenoid valve (hold) (A7/3y10) Internal resistance	N47-5  80 (2.46) — 69 (2.35)	Ignition: **OFF** Disconnect control module (N47-5).	5.4 – 12.6 Ω	Wiring, A7/3.
23.6	C 1305	ASR/ETS/ESP hydraulic unit, left rear axle solenoid valve (release) (A7/3y11) Internal resistance	N47-5  80 (2.46) — 70 (2.36)	Ignition: **OFF** Disconnect control module (N47-5).	2.8 – 6.6 Ω	Wiring, A7/3.
23.7	C 1306	ASR/ETS/ESP hydraulic unit, right rear axle solenoid valve (hold) (A7/3y12) Internal resistance	N47-5  80 (2.46) — 64 (2.30)	Ignition: **OFF** Disconnect control module (N47-5).	5.4 – 12.6 Ω	Wiring, A7/3.

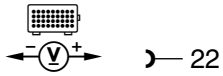
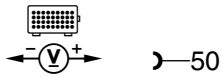
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
23.8	C 1307	ASR/ETS/ESP hydraulic unit, right rear axle solenoid valve (release) (A7/3y13) Internal resistance	N47-5 80 (2.46) — Ω — 65 (2.31)	Ignition: **OFF** Disconnect control module (N47-5).	2.8 – 6.6 Ω	Wiring, A7/3.
24.0	C 1308 C 1311	**ASR/ETS/ESP hydraulic unit(A7/3)** Solenoid valves (A7/3y16 – A7/3y19)		Raise vehicle. Activate all solenoid valves, one after the other. ON and apply service brake. OFF and apply service brake.	ON Wheel not braked. OFF Wheel braked.	Wiring, ⇒ 24.1 – 24.4
24.1	C 1308	ASR/ETS/ESP hydraulic unit, front axle precharge solenoid valve (A7/3y16) Internal resistance	N47-5 80 (2.46) — Ω — 61 (2.27)	Ignition: **OFF** Disconnect control module (N47-5).	2.8 – 6.6 Ω	Wiring, A7/3.
24.2	C 1309	ASR/ETS/ESP hydraulic unit, rear axle precharge solenoid valve (A7/3y17) Internal resistance	N47-5 80 (2.46) — Ω — 63 (2.29)	Ignition: **OFF** Disconnect control module (N47-5).	2.8 – 6.6 Ω	Wiring, A7/3.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
24.3	C 1310	ASR/ETS/ESP hydraulic unit, front axle switchover valve (A7/3y18) Internal resistance	N47-5 80 (2.46) — Ω — 60 (2.26)	Ignition: **OFF** Disconnect control module (N47-5).	5.4 – 12.6 Ω	Wiring, A7/3.
24.4	C 1311	ASR/ETS/ESP hydraulic unit, rear axle switchover valve (A7/3y19) Internal resistance	N47-5 80 (2.46) — Ω — 62 (2.28)	Ignition: **OFF** Disconnect control module (N47-5).	5.4 – 12.6 Ω	Wiring, A7/3.
25.0		**ESP Off switch (S76/6)**		Press and hold switch S76/6: **ON** Release switch Press and hold switch S76/6: **OFF**	1 – 2 V 3.5 – 6 V < 1 V	Wiring, S76/6, N47-5.
26.0	C 1142	**ABS lateral accelration sensor (B24/2)** Static sensor signal (off) Dynamic sensor signal (on)		Vigorously rock vehicle from side to side.	0±1 m/s² > 1 m/s² Value changes with movement of vehicle.	Wiring, B24/2, ⇒ 26.1

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
26.1	C 1142	Voltage suppply to sensor	N47-5  24 (1.24) — 22 (1.22)	Ignition: **ON**	4.75–5.25 V	N47-5.
27.0	C 1141	**ESP brake pressure sensor (B34)** Dynamic sensor signal (on)		Apply service brake.	– 17.5 bar – +17.5 bar Value increase when service brake is applied.	⇒ 27.1, B34.
27.1		Voltage supply	N47-5  48 (2.14) — 50 (2.16)	Ignition: **ON**	4.75–5.25 V	N47-5.
28.0	C 1120	**ESP yaw rate sensor (N64)** Static sensor signal (off) Dynamic sensor signal (on)		Vigorously rock vehicle from side to side.	– 3.5 °/s – +3.5 °/s Value change > 0.5 °/s	⇒ 28.1, Wiring, N64.

Electrical Test Program – Test

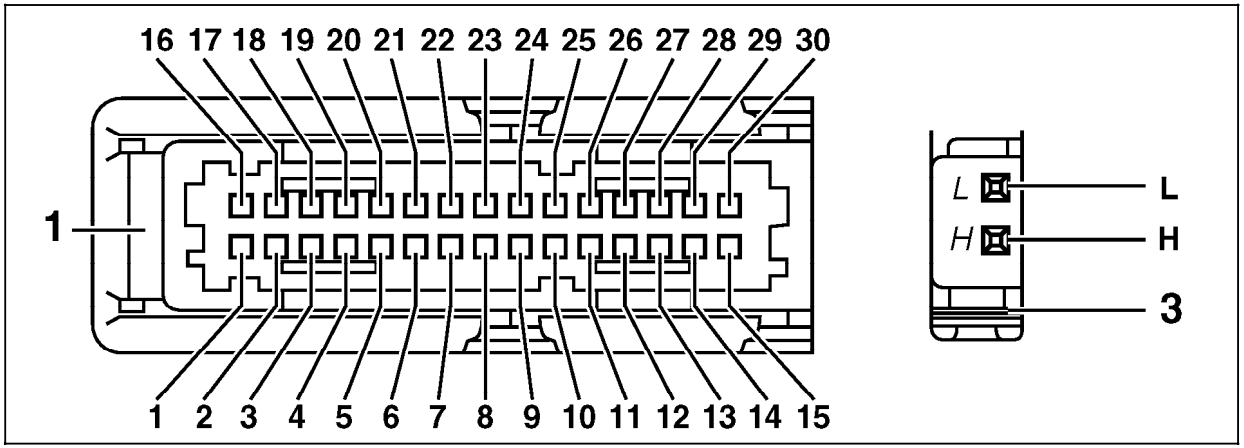
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
28.1		Voltage suppply	N47-5 17 (1.17) — V — 18 (1.18)	Ignition: **ON**	11 – 14 V	N47-5.
29.0	C 1140	**Steering angle sensor (N49)**		Engine: **at Idle** Steering wheel in center position. Slowly turn steering wheel to left stop. Slowly turn steering wheel to right stop.	0° Value continuously changes.	Wiring, N49 not initialized, ⇒ 29.1, N47-5.
29.1		Circuit 30 Voltage supply	N49x1 2 — V — 4	Ignition: **OFF** Disconnect connector N49x1.	11 – 14 V	Wiring.
29.2		Circuit 87 Voltage supply	N49x1 2 — V — 3	Ignition: **ON**	11 – 14 V	Wiring.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
30.0	[1020 [1022	**CAN data bus**		Engine: **at Idle**	Idle speed	Data bus, ⇒ 30.1, ⇒ 30.2
30.1		Engine 119 CAN element in engine control module (ME-SFI, N3/10) Resistance	N3/10 60 — Ω — 61	Disconnect control module (N3/10) and test directly on control module using an ohmmeter.	235 – 245 Ω	N3/10, DM, Engines, Vol. 4, sections 9.5 or 9.6 23.
		Engine 120 CAN element in left or right engine control module (ME-SFI, N3/11 or N3/12) Resistance	N3/11 or N3/12 60 — Ω — 61	Disconnect control module (N3/11 or N3/12) and test directly on control module using an ohmmeter.	235 – 245 Ω	N3/11 or N3/12, DM, Engines, Vol. 4, sections 9.5 or 9.6 23.
30.2		CAN element in RCL control module (N54) Resistance	N54 L — Ω — H	Disconnect 2-pole connector on control module (N54) and test directly on control module using an ohmmeter.	115 – 125 Ω	N54.

Electrical Test Program – Test

Connector Layout - Connector 1 (interior harness) and connector 3 (CAN data bus) ESP/SPS control module (N47-5)



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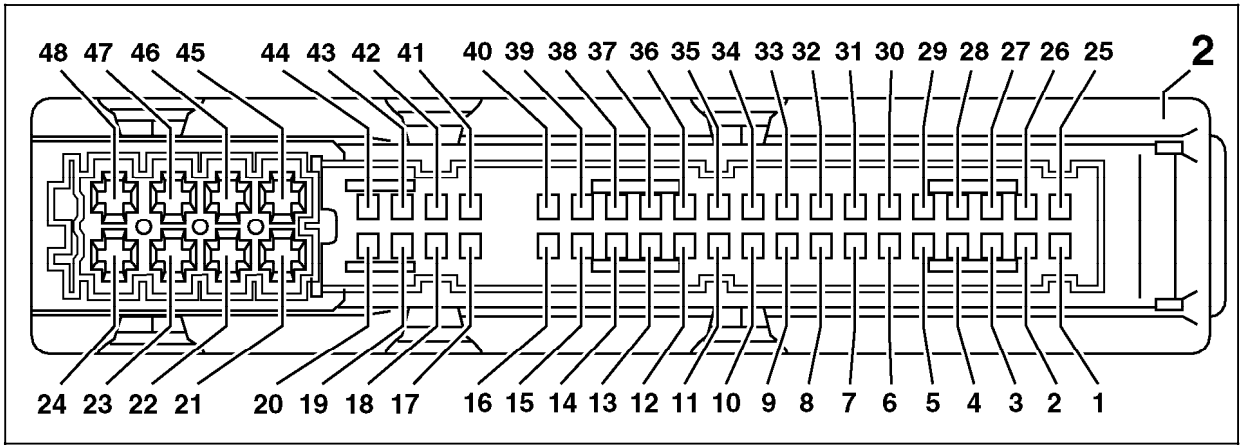
1	Left front axle VSS sensor (L6/1)	11	Stop lamp switch (S9/1) N.C. contact	21	ESP yaw rate sensor (N64) test
2	Right front axle VSS sensor (L6/2)	12	Circuit 61 voltage	22	ABS lateral acceleration sensor (B24/2) (+)
3	Left rear axle VSS sensor (L6/3)	13	Diagnosis output	23	ABS lateral acceleration sensor (B24/2) signal
4	Right rear axle VSS sensor (L6/4)	14	Circuit 87 ABS voltage supply	24	ABS lateral acceleration sensor (B24/2) (–)
5	VSS sensor output status	15	Stop lamp switch (S9/1) N.O. contact	25	Left rear axle VSS sensor (L6/3) (+)
6	not used	16	Steering angle sensor (N49)	26	Left rear axle VSS sensor (L6/3) (–)
7	ESP OFF switch (S76/6)	17	ESP yaw rate sensor (N64) (–)	27	Right rear axle VSS sensor (L6/4) (+)
8	Parking brake switch (S12)	18	ESP yaw rate sensor (N64) (+)	28	Right rear axle VSS sensor (L6/4) (–)
9	Instrument cluster data bus (for vehicles without CAN connection to intrument cluster)	19	ESP yaw rate sensor (N64) signal	29-30	Right rear brake pad wear sensor (S10/4)
		20	ESP yaw rate sensor (N64) reference	H	CAN data bus (+)
10	not used			L	CAN data bus (–)

Electrical Test Program – Test

Connector Layout - Connector 2
(engine harness)
ESP/SPS control module (N47-5)



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1	Model 140 with SPS P-valve (Y10) (–)
2	Model 140 with SPS P-valve (Y10) (+)
3-8	not used
9	Master brake cylinder switchover valve (Y61) (+) (models 129.067/076, 140)
10	Master brake cylinder switchover valve (Y61) (–) (models 129.067/076, 140)
11	Model 140, 129 (K20/1), model 210 (N65k4): high pressure/retun pump relay module
12	Model 140, 129 (K20/1), model 210 (N65k4): high pressure/retun pump relay module (–)
13	Model 140, 129 (K20/1), model 210 (N65k4): high pressure/retun pump relay module (+)
14	ESP brake pressure sensor (B34) (–)
15	ESP brake pressure sensor (B34) signal
16	ESP brake pressure sensor (B34) (+)
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	not used
22	ASR/ESP charging pump (M15) (+)
23	Ground (model 129: W27, model 140: W16/1, model 210: W16/3)
24	Circuit 30 voltage
25	not used
26	ASR/ETS/ESP hydraulic unit, rear axle switchover valve (A7/3y18) (–)
27	ASR/ETS/ESP hydraulic unit, rear axle switchover valve (A7/3y18) precharge
28	ASR/ETS/ESP hydraulic unit, switchover/solenoid valve (A7/3y5) (–)
29	ASR/ETS/ESP hydraulic unit, switchover/solenoid valve (A7/3y5) precharge
30	ASR/ETS/ESP hydraulic unit, right rear axle solenoid valve (hold) (A7/3y12) (–)
31	ASR/ETS/ESP hydraulic unit, right rear axle solenoid valve (release) (A7/3y13) (–)
32-34	not used
35	ASR/ETS/ESP hydraulic unit, left rear axle solenoid valve (hold) (A7/3y10) (–)
36	ASR/ETS/ESP hydraulic unit, left rear axle solenoid valve (release) (A7/3y11) (–)
37	ASR/ETS/ESP hydraulic unit, right front axle solenoid valve (release) (A73/y9) (–)
38	ASR/ETS/ESP hydraulic unit, left front axle solenoid valve (release) (A73/y7) (–)
39	ASR/ETS/ESP hydraulic unit, left front axle solenoid valve (hold) (A7/3y6) (–)
40	ASR/ETS/ESP hydraulic unit, right front axle solenoid valve (hold) (A7/3y8) (–)
41-42	Right front brake pad wear sensor (S10/2)
43	Left front axle VSS sensor (L6/1) (–)
44	Left front axle VSS sensor (L6/1) (+)
45	ASR/ESP charging pump (M15) (–)
46	Solenoid valve voltage supply
47	Ground (model 129: W27, model 140: W16/1, model 210: W16/3)
48	Circuit 30 voltage