2.3 Models 129, 140, 163, 170, 202, 208, 210 (722.6)

Diagnosis – Function Test

General

This section is divided into:

- Checking condition of ATF (Initial evaluation)
- ATF level check
- Replacing ETC control module (N15/3)
- Limp-home mode functions
- Shift points with transmission selector lever in "D"
- Transmission adaption (adaption of the ETC)

Diagnosis – Function Test

Checking condition of ATF (Initial Evaluation)

1. Check ATF level, correct fluid level as necessary (see document: AR27.00-P-0101A in WIS).

2. Review section O.

i

Prior to performing any repairs, readout the DTC memory from the transmission control module using the HHT (see 12/1).

Visually inspect condition of transmission fluid, additionally see Illustrations on page 11/3 and review S.I. MBNA 27/32, May 1998.

- Contamination (excessively black transmission fluid color, pungent/burnt smell)
- Water in transmission fluid (milky white discoloration, streaked appearance)
- Metal shavings (metal particles, metal pieces)

The intial dosage of the red pigment in the ATF was too low. Since 10/97, the use of a higher dosage of red pigment in the ATF, has resulted in more stable red pigmentation. A purely brown or black coloring of the ATF does not have an effect on the friction value or function of the ATF, therefore, no fault is indicated regarding the ATF color.
ATF fluid which smells burnt points to a slipping Brake/clutch assembly. After finding the cause (loss of ATF, or seized servos etc.) and removing same, replace both the faulty items and the ATF.

Abrasion particles in the ATF:
Due to the relative movement between the transmission components after a short running distance, a fine "vail" of abrasion particles (gray for aluminum, yellow for brass) can be found in the transmission oil pan.
This "vail" of abrasion does not effect the proper function of the transmission.
If there is however, found in the transmission oil pan, an extremely fine abrasion (graphite residue which when smeared on paper leaves a gray streak) or larger metal shavings (in the milimeter size range) then there is a mechanical fault within the transmission. Based on the complaint, the corresponding components of the transmission or the entire transmission must be replaced. When repairing the transmission, it is important to flush the oil cooler and the transmission hoses afterwards and the replace the ATF with fresh ATF. **Replace the torque converter only if upon draining the ATF, metal shaving are found in the ATF** (see Repair Instructions, Automatic Transmission 722.6).

3. Inspect automatic transmission for external oil leaks (Determine source of fluid leak and repair).

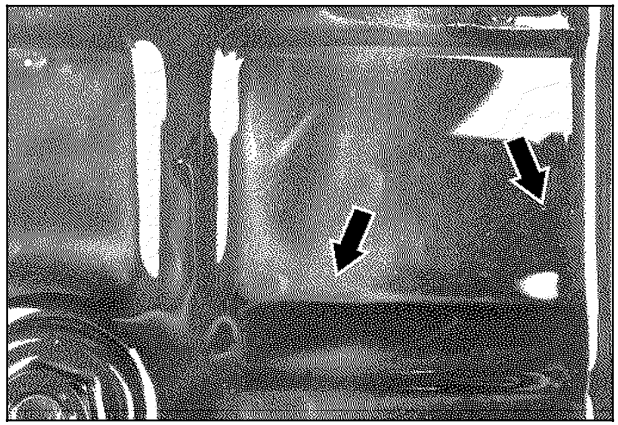
ATF level check

When checking the ATF level, the temperature must be min. 60° C.
The **current ATF temperature** as part of the ATF level check can only be read out using the HHT, with the transmission selector lever in ”R, D, 4, 3, 2, 1”.

Replacing ETC control module (N15/3)
Using the HHT, it is possible to send version coding data from the control module to a new transmission control module (with a later part number) being installed
(valid only for functional software: e 02 → e 03
f 07 → f 08)

Diagnosis – Function Test

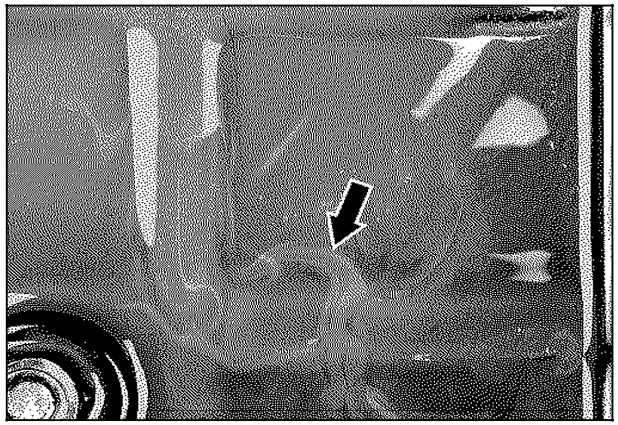
Initial Evaluation Illustrations



P27.00-2027-01

Figure 1

Extremely fine aluminum and/or brass abrasion particles
Transmission is serviceable!



P27.00-2028-01

Figure 2

Extremely fine graphite like abrasion particles

Mechanical damage to transmission

P27.00-2029-01

Figure 3

Large metal shavings, in millimeter size

Mechanical damage to transmission

Note:
Review S.I. MBUSA 27/32, dated May 1998 concerning ATF fluid color as well.

Diagnosis – Function Test

Electrical limp-home mode

In order to prevent damage to the automatic transmission in the event of an **electrical fault**, the gear currently engaged is held and the assigned diagnostic trouble code (DTC) is stored.

The limp-home mode comes into effect with the following procedure:
1. Stop vehicle.
2. Shift transmission selector lever to "P".
3. Shut off engine.
4. Wait at least 10 seconds.
5. Start engine.

After restarting engine, the vehicle can only be driven in 2nd or reverse gear.

The engagement of ”N → D” und ”N → R” will be very harsh, since the electronic control of the automatic transmission has been turned off.
This type of limp-home mode can only reset by repairing the fault and erasing the DTCs with the Hand-Held Tester (HHT).

Mechanical-hydraulic limp-home mode

In order to prevent damage to the automatic transmission in the event of an **mechanical-hydraulic fault,**
- the transmission shifts into 3rd gear and is held in this gear, or
- the transmission shifts to the last "known good" gear and is held in that gear.

This type of limp-home mode is reset by turning the ignition OFF, and then ON again.

Diagnosis – Function Test

Hints regarding "D" shift points for **passenger vehicles** follow:

Up - downshifts using shift programs ("S", "W")

- Mode selector in "S": Tranmission starts in first gear and shifts into first when coasting to a stop.
- Mode selector in "W": Transmission starts in second gear and shifts into second when coasting to a stop. First gear can be attained upon full throttle deployment. (Caution! During engine warm-up the transmission starts in first gear and coasts to a stop in second gear).
- Shift points are increased: While driving up or down mountain passes, with heavily loaded vehicles, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

Downshifts using shift program at full throttle with mode selector in "S" (only from gears 5 → 4 and 4 → 3)

- Upon rapid throttle release; an upshift into the next higher gear is prevented and selected only when vehicle has decreased lateral acceleration rates and appropriate handling characteristics. This prevents skidding of the vehicle in curves.
- At full throttle deployment, the downshift occurs at higher speeds.

Downshifts using shift program at kick down with mode selector in "S"

- The kickdown downshift in transmission mode "S" is lower at ATF temperatures < 40 °C

Hints regarding "D" shift points for **Model 163** follow:

Up - downshifts using shift program ("D" shift points)

Tranmission starts in first gear and shifts into first when coasting to a stop.

Shift points are increased while driving up or down mountain passes, with heavily loaded vehicles, at very high transmission fluid temperatures, with abrupt throttle release, and very sporty driving style.

Downshifts using shift program at full throttle with gear selector lever in "D" (only from gears 5 → 4 and 4 → 3)

- At full throttle deployment, the downshift occurs at higher speeds.

Downshifts using "kickdown" with gear selector lever in "D"

- The kickdown downshift in transmission is lower at ATF temperatures < 40 °C

Diagnosis – Function Test

Transmission selector lever ”D” shift points					129.063	129.067
Upshift in transmission range 1) 2) 4)	1 2	Full throttle	W	approx. mph. (km/h)	≈ 24 (38)	≈ 33 (53)
			S	approx. mph. (km/h)	≈ 35 (56)	≈ 46 (75)
		Kickdown		approx. mph. (km/h)	≈ 35 (56)	≈ 46 (75)
	2 3	Full throttle	W	approx. mph. (km/h)	≈ 41 (66)	≈ 57 (93)
			S	approx. mph. (km/h)	≈ 56 (91)	≈ 77 (124)
		Kickdown		approx. mph. (km/h)	≈ 56 (91)	≈ 77 (124)
	3 4	Full throttle	W	approx. mph. (km/h)	≈ 69 (111)	≈ 94 (152)
			S	approx. mph. (km/h)	≈ 93 (148)	≈ 119 (193)
		Kickdown		approx. mph. (km/h)	≈ 93 (148)	≈ 119 (193)
	4 5	Full throttle	W	approx. mph. (km/h)	≈ 104 (165)	≈ 131 (213)
			S	approx. mph. (km/h)	≈ 137 (218)	–
		Kickdown		approx. mph. (km/h)	≈ 138 (220)	–

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up, transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

4) Shift points are increased: while driving up or down mountain passes, while driving with a heavily loaded vehicle, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					129.063	129.067
Downshift in transmission range 1) 2) 4) 5)	5 4	Full throttle	W	approx. mph. (km/h)	≈ 90 (144)	≈ 115 (187)
			S	approx. mph. (km/h)	≈96 (152) 3)	≈ 115 (191) 3)
		Kickdown		approx. mph. (km/h)	≈ 132 (210)	–
	4 3	Full throttle	W	approx. mph. (km/h)	≈ 54 (87)	≈ 70 (114)
			S	approx. mph. (km/h)	≈ 58 (94) 3)	≈ 75 (122) 3)
		Kickdown		approx. mph. (km/h)	≈ 87 (138)	≈ 112 (181)
	3 2	Full throttle	W	approx. mph. (km/h)	≈ 36 (57)	≈ 38 (63)
			S	approx. mph. (km/h)	≈ 39 (62)	≈ 42 (70)
		Kickdown		approx. mph. (km/h)	≈ 51 (80)	≈ 67 (109)
	2 1	Full throttle	W	approx. mph. (km/h)	≈ 11 (17)	≈ 14 (22)
			S	approx. mph. (km/h)	≈ 17 (26)	≈ 17 (26)
		Kickdown		approx. mph. (km/h)	≈ 24 (39)	≈ 32 (52)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

3) Upon rapid throttle release, an upshift into the next higher gear is prevented and selected only when vehicle has decreased lateral acceleration rates and appropriate handling characteristics. This prevents skidding of the vehicle in curves. When abruptly accelerating, the downshift occurs at a high speed (models 208, 210 only).

4) Shift points are increased: while driving up or down mountain passes, with heavily loaded vehicles, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

5) In models 208 and 210, the kickdown downshift in transmission mode "S" is lower at ATF temperatures < 40 °C.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					129.068/076	
Upshift in transmission range 1) 2) 4)	1 2	Full throttle	W	approx. mph. (km/h)	≈ 33 (53)	
			S	approx. mph. (km/h)	≈ 46 (75)	
		Kickdown		approx. mph. (km/h)	≈ 46 (75)	
	2 3	Full throttle	W	approx. mph. (km/h)	≈ 57 (93)	
			S	approx. mph. (km/h)	≈ 77 (124)	
		Kickdown		approx. mph. (km/h)	≈ 77 (124)	
	3 4	Full throttle	W	approx. mph. (km/h)	≈ 94 (151)	
			S	approx. mph. (km/h)	≈ 119 (193)	
		Kickdown		approx. mph. (km/h)	≈ 119 (193)	
	4 5	Full throttle	W	approx. mph. (km/h)	≈ 131 (212)	
			S	approx. mph. (km/h)	–	
		Kickdown		approx. mph. (km/h)	–	

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up, transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

4) Shift points are increased: while driving up or down mountain passes, while driving with a heavily loaded vehicle, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					129.068/076	
Downshift in transmission range 1) 2) 4) 5)	5 4	Full throttle	W	approx. mph. (km/h)	≈ 114 (186)	
			S	approx. mph. (km/h)	≈115 (190) 3)	
		Kickdown		approx. mph. (km/h)	–	
	4 3	Full throttle	W	approx. mph. (km/h)	≈ 70 (114)	
			S	approx. mph. (km/h)	≈ 75 (122) 3)	
		Kickdown		approx. mph. (km/h)	≈ 112 (180)	
	3 2	Full throttle	W	approx. mph. (km/h)	≈ 38 (63)	
			S	approx. mph. (km/h)	≈ 42 (70)	
		Kickdown		approx. mph. (km/h)	≈ 67 (108)	
	2 1	Full throttle	W	approx. mph. (km/h)	≈ 14 (22)	
			S	approx. mph. (km/h)	≈ 17 (26)	
		Kickdown		approx. mph. (km/h)	≈ 32 (51)	

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

3) Upon rapid throttle release, an upshift into the next higher gear is prevented and selected only when vehicle has decreased lateral acceleration rates and appropriate handling characteristics. This prevents skidding of the vehicle in curves. When abruptly accelerating, the downshift occurs at a high speed (models 208, 210 only).

4) Shift points are increased: while driving up or down mountain passes, with heavily loaded vehicles, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

5) In models 208 and 210, the kickdown downshift in transmission mode "S" is lower at ATF temperatures < 40 °C.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					140.032/033	140.043
Upshift in transmission range 1) 2) 4)	1 2	Full throttle	W	approx. mph. (km/h)	≈ 24 (39)	≈ 32 (52)
			S	approx. mph. (km/h)	≈ 36 (58)	≈ 46 (74)
		Kickdown		approx. mph. (km/h)	≈ 36 (58)	≈ 46 (74)
	2 3	Full throttle	W	approx. mph. (km/h)	≈ 58 (69)	≈ 57 (92)
			S	approx. mph. (km/h)	≈ 59 (95)	≈ 76 (123)
		Kickdown		approx. mph. (km/h)	≈ 59 (95)	≈ 76 (123)
	3 4	Full throttle	W	approx. mph. (km/h)	≈ 71 (115)	≈ 93 (150)
			S	approx. mph. (km/h)	≈ 95 (154)	≈ 118 (191)
		Kickdown		approx. mph. (km/h)	≈ 95 (154)	≈ 118 (191)
	4 5	Full throttle	W	approx. mph. (km/h)	≈ 106 (172)	≈ 130 (210)
			S	approx. mph. (km/h)	≈ 140 (227)	–
		Kickdown		approx. mph. (km/h)	≈ 141 (228)	–

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up, transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

4) Shift points are increased: while driving up or down mountain passes, while driving with a heavily loaded vehicle, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					140.032/033	140.043
Downshift in transmission range 1) 2) 4) 5)	5 4	Full throttle	W	approx. mph. (km/h)	≈ 92 (149)	≈ 114 (184)
			S	approx. mph. (km/h)	≈ 98 (158) 3)	≈ 116 (189) 3)
		Kickdown		approx. mph. (km/h)	≈ 135 (219)	–
	4 3	Full throttle	W	approx. mph. (km/h)	≈ 56 (90)	≈ 70 (113)
			S	approx. mph. (km/h)	≈ 60 (98) 3)	≈ 75 (121) 3)
		Kickdown		approx. mph. (km/h)	≈ 89 (144)	≈ 110 (179)
	3 2	Full throttle	W	approx. mph. (km/h)	≈ 36 (59)	≈ 39 (63)
			S	approx. mph. (km/h)	≈ 40 (65)	≈ 42 (69)
		Kickdown		approx. mph. (km/h)	≈ 52 (84)	≈ 66 (107)
	2 1	Full throttle	W	approx. mph. (km/h)	≈ 10 (17)	≈ 13 (21)
			S	approx. mph. (km/h)	≈ 17 (28)	≈ 16 (26)
		Kickdown		approx. mph. (km/h)	≈ 25 (40)	≈ 31 (51)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

3) Upon rapid throttle release, an upshift into the next higher gear is prevented and selected only when vehicle has decreased lateral acceleration rates and appropriate handling characteristics. This prevents skidding of the vehicle in curves. When abruptly accelerating, the downshift occurs at a high speed (models 208, 210 only).

4) Shift points are increased: while driving up or down mountain passes, with heavily loaded vehicles, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

5) In models 208 and 210, the kickdown downshift in transmission mode "S" is lower at ATF temperatures < 40 °C.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					140.051/070	140.057/076
Upshift in transmission range 1) 2) 4)	1 2	Full throttle	W	approx. mph. (km/h)	≈ 35 (56)	≈ 35 (56)
			S	approx. mph. (km/h)	≈ 49 (79)	≈ 49 (79)
		Kickdown		approx. mph. (km/h)	≈ 49 (79)	≈ 49 (79)
	2 3	Full throttle	W	approx. mph. (km/h)	≈ 60 (98)	≈ 60 (98)
			S	approx. mph. (km/h)	≈ 81 (131)	≈ 81 (131)
		Kickdown		approx. mph. (km/h)	≈ 81 (131)	≈ 81 (131)
	3 4	Full throttle	W	approx. mph. (km/h)	≈ 99 (160)	≈ 99 (160)
			S	approx. mph. (km/h)	≈ 126 (204)	≈ 126 (204)
		Kickdown		approx. mph. (km/h)	≈ 126 (204)	≈ 126 (204)
	4 5	Full throttle	W	approx. mph. (km/h)	≈ 138 (224)	≈ 138 (224)
			S	approx. mph. (km/h)	–	–
		Kickdown		approx. mph. (km/h)	–	–

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up, transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

4) Shift points are increased: while driving up or down mountain passes, while driving with a heavily loaded vehicle, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					140.051/070	140.057/076
Downshift in transmission range 1) 2) 4) 5)	5 4	Full throttle	W	approx. mph. (km/h)	≈ 121 (196)	≈ 121 (196)
			S	approx. mph. (km/h)	≈125 (201) 3)	≈ 125 (201) 3)
		Kickdown		approx. mph. (km/h)	–	–
	4 3	Full throttle	W	approx. mph. (km/h)	≈ 74 (120)	≈ 74 (120)
			S	approx. mph. (km/h)	≈ 78 (129) 3)	≈ 78 (129) 3)
		Kickdown		approx. mph. (km/h)	≈ 117 (190)	≈ 117 (190)
	3 2	Full throttle	W	approx. mph. (km/h)	≈ 41 (67)	≈ 41 (67)
			S	approx. mph. (km/h)	≈ 46 (74)	≈ 46 (74)
		Kickdown		approx. mph. (km/h)	≈ 70 (114)	≈ 70 (114)
	2 1	Full throttle	W	approx. mph. (km/h)	≈ 14 (23)	≈ 14 (23)
			S	approx. mph. (km/h)	≈ 16 (28)	≈ 16 (28)
		Kickdown		approx. mph. (km/h)	≈ 36 (54)	≈ 36 (54)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

3) Upon rapid throttle release, an upshift into the next higher gear is prevented and selected only when vehicle has decreased lateral acceleration rates and appropriate handling characteristics. This prevents skidding of the vehicle in curves. When abruptly accelerating, the downshift occurs at a high speed (models 208, 210 only).

4) Shift points are increased: while driving up or down mountain passes, with heavily loaded vehicles, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

5) In models 208 and 210, the kickdown downshift in transmission mode "S" is lower at ATF temperatures < 40 °C.

Diagnosis – Function Test

Transmission selector lever "D" shift points				163.154 up to 01.31.00	163.172 up to 01.31.00
Upshift in transmission range 1) 4)	1 2	Full throttle	approx. mph. (km/h)	≈ 35 (56)	≈ 39 (65)
		Kickdown	approx. mph. (km/h)	≈ 35 (56)	≈ 39 (65)
	2 3	Full throttle	approx. mph. (km/h)	≈ 56 (91)	≈ 68 (108)
		Kickdown	approx. mph. (km/h)	≈ 56 (91)	≈ 68 (108)
	3 4	Full throttle	approx. mph. (km/h)	≈ 91 (148)	≈ 105 (168)
		Kickdown	approx. mph. (km/h)	≈ 91 (148)	≈ 105 (168)
	4 5	Full throttle	approx. mph. (km/h)	≈ 111 (179)	≈ 111 (179)
		Kickdown	approx. mph. (km/h)	≈ 136 (220) 6)	≈ 136 (235) 6)

1) Transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

4) Shift points are increased: while driving up or down mountain passes, while driving with a heavily loaded vehicle, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

6) In theory, as vehicle is limited to maximum top speed of 118 mph.

Diagnosis – Function Test

Transmission selector lever "D" shift points				163.154 up to 01.31.00	163.172 up to 01.31.00
Downshift in transmission range 1) 3) 4)	5 4	Full throttle	approx. mph. (km/h)	≈ 94 (152)	≈ 104 (166)
		Kickdown	approx. mph. (km/h)	≈ 110 (176)	≈ 109 (175)
	4 3	Full throttle	approx. mph. (km/h)	≈ 63 (102)	≈ 66 (106)
		Kickdown	approx. mph. (km/h)	≈ 85 (138)	≈ 95 (157)
	3 2	Full throttle	approx. mph. (km/h)	≈ 37 (60)	≈ 37 (61)
		Kickdown	approx. mph. (km/h)	≈ 48 (77)	≈ 58 (94)
	2 1	Full throttle	approx. mph. (km/h)	≈ 17 (28)	≈ 15 (23)
		Kickdown	approx. mph. (km/h)	≈ 23 (38)	≈ 28 (45)

1) Transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

3) Upon rapid throttle release; an upshift into the next higher gear is prevented and selected only when vehicle has decreased lateral acceleration rates and appropriate handling characteristics. This prevents skidding of the vehicle in curves.

4) Shift points are increased: while driving up or down mountain passes, with heavily loaded vehicles, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

Diagnosis – Function Test

Transmission selector lever "D" shift points				163.154 as of 02.01.00	163.172 as of 02.01.00
Upshift in transmission range 1) 4)	1 2	Full throttle	approx. mph. (km/h)	≈ 35 (56)	≈ 39 (65)
		Kickdown	approx. mph. (km/h)	≈ 35 (56)	≈ 39 (65)
	2 3	Full throttle	approx. mph. (km/h)	≈ 56 (91)	≈ 68 (108)
		Kickdown	approx. mph. (km/h)	≈ 56 (91)	≈ 68 (108)
	3 4	Full throttle	approx. mph. (km/h)	≈ 91 (148)	≈ 105 (168)
		Kickdown	approx. mph. (km/h)	≈ 91 (148)	≈ 105 (168)
	4 5	Full throttle	approx. mph. (km/h)	≈ 136 (220) 6)	≈ 136 (235) 6)
		Kickdown	approx. mph. (km/h)	≈ 136 (220) 6)	≈ 136 (235) 6)

1) Transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

4) Shift points are increased: while driving up or down mountain passes, while driving with a heavily loaded vehicle, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

6) In theory, as vehicle is limited to maximum top speed of 118 mph.

Diagnosis – Function Test

Transmission selector lever ”D” shift points				163.154 as of 02.01.00	163.172 as of 02.01.00
Downshift in transmission range 1) 3) 4)	5 4	Full throttle	approx. mph. (km/h)	≈ 94 (152)	≈ 104 (166)
		Kickdown	approx. mph. (km/h)	≈ 131 (211)	≈ 138 (224)
	4 3	Full throttle	approx. mph. (km/h)	≈ 63 (102)	≈ 66 (106)
		Kickdown	approx. mph. (km/h)	≈ 85 (138)	≈ 95 (157)
	3 2	Full throttle	approx. mph. (km/h)	≈ 37 (60)	≈ 37 (61)
		Kickdown	approx. mph. (km/h)	≈ 48 (77)	≈ 58 (94)
	2 1	Full throttle	approx. mph. (km/h)	≈ 17 (28)	≈ 15 (23)
		Kickdown	approx. mph. (km/h)	≈ 23 (38)	≈ 28 (45)

1) Transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

3) Upon rapid throttle release; an upshift into the next higher gear is prevented and selected only when vehicle has decreased lateral acceleration rates and appropriate handling characteristics. This prevents skidding of the vehicle in curves.

4) Shift points are increased: while driving up or down mountain passes, with heavily loaded vehicles, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					170.447 USA	170.449 USA
Upshift in transmission range 1) 2) 4)	1 2	Full throttle	W	approx. mph. (km/h)	≈ 22 (35)	≈ 23 (36)
			S	approx. mph. (km/h)	≈ 33 (52)	≈ 34 (54)
		Kickdown		approx. mph. (km/h)	≈ 33 (52)	≈ 34 (54)
	2 3	Full throttle	W	approx. mph. (km/h)	≈ 38 (61)	≈ 41 (67)
			S	approx. mph. (km/h)	≈ 53 (84)	≈ 54 (88)
		Kickdown		approx. mph. (km/h)	≈ 53 (84)	≈ 54 (88)
	3 4	Full throttle	W	approx. mph. (km/h)	≈ 64 (102)	≈ 72 (118)
			S	approx. mph. (km/h)	≈ 88 (136)	≈ 93 (144)
		Kickdown		approx. mph. (km/h)	≈ 88 (136)	≈ 93 (144)
	4 5	Full throttle	W	approx. mph. (km/h)	≈ 95 (152)	≈ 111 (179)
			S	approx. mph. (km/h)	≈ 126 (202)	≈ 131 (213)
		Kickdown		approx. mph. (km/h)	≈ 126 (202)	≈ 131 (213)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle.
(**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

4) Shift points are increased: while driving up or down mountain passes, while driving with a heavily loaded vehicle, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

Diagnosis – Function Test

Transmission selector lever "D" shift points					170.447 (USA)	170.449 (USA)
Downshift in transmission range 1) 2) 4) 5)	5 4	Full throttle	W	approx. mph. (km/h)	≈ 80 (129)	≈ 90 (139)
			S	approx. mph. (km/h)	≈91 (146) 3)	≈101 (156) 3)
		Kickdown		approx. mph. (km/h)	≈ 121 (194)	≈ 126 (203)
	4 3	Full throttle	W	approx. mph. (km/h)	≈ 47 (75)	≈ 48 (78)
			S	approx. mph. (km/h)	≈ 53 (85) 3)	≈ 57 (92) 3)
		Kickdown		approx. mph. (km/h)	≈ 79 (126)	≈ 87 (134)
	3 2	Full throttle	W	approx. mph. (km/h)	≈ 24 (37)	≈ 25 (39)
			S	approx. mph. (km/h)	≈ 35 (59)	≈ 36 (60)
		Kickdown		approx. mph. (km/h)	≈ 44 (69)	≈ 47 (73)
	2 1	Full throttle	W	approx. mph. (km/h)	≈ 10 (17)	≈ 10 (17)
			S	approx. mph. (km/h)	≈ 16 (25)	≈ 15 (23)
		Kickdown		approx. mph. (km/h)	≈ 19 (30)	≈ 20 (33)

1) Transmission mode switch "S": transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch "W": transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle.
(**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

4) Shift points are increased: while driving up or down mountain passes, while driving with a heavily loaded vehicle, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

5) In models 208 and 210, the kickdown downshift in transmission mode "S" is lower at ATF temperatures < 40 °C.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					170.465 (USA)	
Upshift in transmission range 1) 2) 4)	1 2	Full throttle	W	approx. mph. (km/h)	≈ 22 (35)	
			S	approx. mph. (km/h)	≈ 34 (54)	
		Kickdown		approx. mph. (km/h)	≈ 34 (54)	
	2 3	Full throttle	W	approx. mph. (km/h)	≈ 41 (66)	
			S	approx. mph. (km/h)	≈ 54 (88)	
		Kickdown		approx. mph. (km/h)	≈ 54 (88)	
	3 4	Full throttle	W	approx. mph. (km/h)	≈ 72 (118)	
			S	approx. mph. (km/h)	≈ 93 (144)	
		Kickdown		approx. mph. (km/h)	≈ 93 (144)	
	4 5	Full throttle	W	approx. mph. (km/h)	≈ 111 (179)	
			S	approx. mph. (km/h)	≈ 131 (213)	
		Kickdown		approx. mph. (km/h)	≈ 131 (213)	

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

4) Shift points are increased: while driving up or down mountain passes, while driving with a heavily loaded vehicle, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					170.465 (USA)	
Downshift in transmission range 1) 2) 4) 5)	5 4	Full throttle	W	approx. mph. (km/h)	≈ 88 (140)	
			S	approx. mph. (km/h)	≈92 (147) 3)	
		Kickdown		approx. mph. (km/h)	≈ 128 (205)	
	4 3	Full throttle	W	approx. mph. (km/h)	≈ 55 (93)	
			S	approx. mph. (km/h)	≈ 57 (98) 3)	
		Kickdown		approx. mph. (km/h)	≈ 87 (134)	
	3 2	Full throttle	W	approx. mph. (km/h)	≈ 33 (56)	
			S	approx. mph. (km/h)	≈ 35 (59)	
		Kickdown		approx. mph. (km/h)	≈ 47 (71)	
	2 1	Full throttle	W	approx. mph. (km/h)	≈ 10 (16)	
			S	approx. mph. (km/h)	≈ 15 (23)	
		Kickdown		approx. mph. (km/h)	≈ 19 (31)	

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

4) Shift points are increased: while driving up or down mountain passes, while driving with a heavily loaded vehicle, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

5) In models 208 and 210, the kickdown downshift in transmission mode "S" is lower at ATF temperatures < 40 °C.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					202.023	202.024
Upshift in transmission range 1) 2) 4)	1 2	Full throttle	W	approx. mph. (km/h)	≈ 23 (37)	≈ 22 (35)
			S	approx. mph. (km/h)	≈ 34 (54)	≈ 33 (52)
		Kickdown		approx. mph. (km/h)	≈ 34 (54)	≈ 33 (52)
	2 3	Full throttle	W	approx. mph. (km/h)	≈ 41 (65)	≈ 38 (61)
			S	approx. mph. (km/h)	≈ 55 (88)	≈ 51 (84)
		Kickdown		approx. mph. (km/h)	≈ 55 (88)	≈ 51 (84)
	3 4	Full throttle	W	approx. mph. (km/h)	≈ 69 (110)	≈ 63 (102)
			S	approx. mph. (km/h)	≈ 90 (144)	≈ 82 (136)
		Kickdown		approx. mph. (km/h)	≈ 90 (144)	≈ 82 (136)
	4 5	Full throttle	W	approx. mph. (km/h)	≈ 103 (164)	≈ 94 (152)
			S	approx. mph. (km/h)	≈ 133 (213)	≈ 125 (202)
		Kickdown		approx. mph. (km/h)	≈ 133 (213)	≈ 125 (202)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle.
(**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

4) Shift points are increased: while driving up or down mountain passes, while driving with a heavily loaded vehicle, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					202.023	202.024
Downshift in transmission range 1) 2) 4) 5)	5 4	Full throttle	W	approx. mph. (km/h)	≈ 89 (143)	≈ 81 (129)
			S	approx. mph. (km/h)	≈ 94 (151) 3)	≈ 92 (146) 3)
		Kickdown		approx. mph. (km/h)	≈ 128 (204)	≈ 119 (194)
	4 3	Full throttle	W	approx. mph. (km/h)	≈ 56 (89)	≈ 46 (75)
			S	approx. mph. (km/h)	≈ 59 (94) 3)	≈ 54 (85) 3)
		Kickdown		approx. mph. (km/h)	≈ 84 (134)	≈ 77 (126)
	3 2	Full throttle	W	approx. mph. (km/h)	≈ 33 (52)	≈ 22 (37)
			S	approx. mph. (km/h)	≈ 38 (61)	≈ 37 (59)
		Kickdown		approx. mph. (km/h)	≈ 49 (78)	≈ 43 (69)
	2 1	Full throttle	W	approx. mph. (km/h)	≈ 10 (17)	≈ 8 (17)
			S	approx. mph. (km/h)	≈ 16 (26)	≈ 15 (25)
		Kickdown		approx. mph. (km/h)	≈ 24 (38)	≈ 19 (30)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

3) Upon rapid throttle release; an upshift into the next higher gear is prevented and selected only when vehicle has decreased lateral acceleration rates and appropriate handling characteristics. This prevents skidding of the vehicle in curves.

4) Shift points are increased: while driving up or down mountain passes, with heavily loaded vehicles, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

5) In models 208 and 210, the kickdown downshift in transmission mode "S" is lower at ATF temperatures < 40 °C.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					202.028	202.029
Upshift in transmission range 1) 2) 4)	1 2	Full throttle	W	approx. mph. (km/h)	≈ 26 (41)	≈ 24 (39)
			S	approx. mph. (km/h)	≈ 38 (61)	≈ 37 (58)
		Kickdown		approx. mph. (km/h)	≈ 38 (61)	≈ 37 (58)
	2 3	Full throttle	W	approx. mph. (km/h)	≈ 45 (72)	≈ 42 (68)
			S	approx. mph. (km/h)	≈62 (100)	≈ 57 (94)
		Kickdown		approx. mph. (km/h)	≈ 62 (100)	≈ 57 (94)
	3 4	Full throttle	W	approx. mph. (km/h)	≈ 75 (121)	≈ 70 (115)
			S	approx. mph. (km/h)	≈ 101 (162)	≈ 95 (153)
		Kickdown		approx. mph. (km/h)	≈ 101 (162)	≈ 95 (153)
	4 5	Full throttle	W	approx. mph. (km/h)	≈ 113 (181)	≈ 106 (170)
			S	approx. mph. (km/h)	≈ 149 (239)	≈ 138 (227)
		Kickdown		approx. mph. (km/h)	≈ 151 (241)	≈ 138 (227)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

4) Shift points are increased: while driving up or down mountain passes, while driving with a heavily loaded vehicle, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					202.028	202.029
Downshift in transmission range 1) 2) 4) 5)	5 4	Full throttle	W	approx. mph. (km/h)	≈ 98 (157)	≈ 91 (148)
			S	approx. mph. (km/h)	≈1 04 (167) 3)	≈ 95 (157) 3)
		Kickdown		approx. mph. (km/h)	≈ 144 (230)	≈ 132 (219)
	4 3	Full throttle	W	approx. mph. (km/h)	≈ 59 (95)	≈ 57 (93)
			S	approx. mph. (km/h)	≈ 64 (103) 3)	≈ 64 (105) 3)
		Kickdown		approx. mph. (km/h)	≈ 95 (152)	≈ 89 (143)
	3 2	Full throttle	W	approx. mph. (km/h)	≈ 31 (50)	≈ 31 (49)
			S	approx. mph. (km/h)	≈ 31 (50)	≈ 38 (63)
		Kickdown		approx. mph. (km/h)	≈ 55 (88)	≈ 49 (80)
	2 1	Full throttle	W	approx. mph. (km/h)	≈ 11 (18)	≈ 08 (18)
			S	approx. mph. (km/h)	≈ 18 (29)	≈ 15 (25)
		Kickdown		approx. mph. (km/h)	≈ 27 (43)	≈ 24 (39)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

3) Upon rapid throttle release; an upshift into the next higher gear is prevented and selected only when vehicle has decreased lateral acceleration rates and appropriate handling characteristics. This prevents skidding of the vehicle in curves.

4) Shift points are increased: while driving up or down mountain passes, with heavily loaded vehicles, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

5) In models 208 and 210, the kickdown downshift in transmission mode "S" is lower at ATF temperatures < 40 °C.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					208.365	208.370
Upshift in transmission range 1) 2) 4)	1 2	Full throttle	W	approx. mph. (km/h)	≈ 24 (39)	≈ 30 (47)
			S	approx. mph. (km/h)	≈ 36 (58)	≈ 42 (67)
		Kickdown		approx. mph. (km/h)	≈ 36 (58)	≈ 42 (67)
	2 3	Full throttle	W	approx. mph. (km/h)	≈ 43 (68)	≈ 51 (83)
			S	approx. mph. (km/h)	≈ 59 (94)	≈ 69 (111)
		Kickdown		approx. mph. (km/h)	≈ 59 (94)	≈ 69 (111)
	3 4	Full throttle	W	approx. mph. (km/h)	≈ 72 (114)	≈ 84 (135)
			S	approx. mph. (km/h)	≈ 96 (153)	≈ 107 (172)
		Kickdown		approx. mph. (km/h)	≈ 96 (153)	≈ 107 (172)
	4 5	Full throttle	W	approx. mph. (km/h)	≈ 106 (170)	≈ 118 (190)
			S	approx. mph. (km/h)	≈ 141 (226)	≈ 150 (242)
		Kickdown		approx. mph. (km/h)	≈ 141 (226)	≈ 150 (242)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle.
(**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

4) Shift points are increased: while driving up or down mountain passes, while driving with a heavily loaded vehicle, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					208.365	208.370
Downshift in transmission range 1) 2) 4) 5)	5 4	Full throttle	W	approx. mph. (km/h)	≈ 92 (147)	≈ 104 (166)
			S	approx. mph. (km/h)	≈98 (157) 3)	≈ 106 (170) 3)
		Kickdown		approx. mph. (km/h)	≈ 136 (218)	≈ 141 (230)
	4 3	Full throttle	W	approx. mph. (km/h)	≈ 56 (92)	≈ 64 (102)
			S	approx. mph. (km/h)	≈ 66 (105) 3)	≈ 68 (109) 3)
		Kickdown		approx. mph. (km/h)	≈ 89 (142)	≈ 99 (161)
	3 2	Full throttle	W	approx. mph. (km/h)	≈ 31 (49)	≈ 36 (56)
			S	approx. mph. (km/h)	≈ 38 (62)	≈ 39 (63)
		Kickdown		approx. mph. (km/h)	≈ 49 (79)	≈ 61 (97)
	2 1	Full throttle	W	approx. mph. (km/h)	≈ 11 (18)	≈ 12 (19)
			S	approx. mph. (km/h)	≈ 16 (25)	≈ 15 (24)
		Kickdown		approx. mph. (km/h)	≈ 24 (39)	≈ 30 (46)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

3) Upon rapid throttle release; an upshift into the next higher gear is prevented and selected only when vehicle has decreased lateral acceleration rates and appropriate handling characteristics. This prevents skidding of the vehicle in curves.

4) Shift points are increased: while driving up or down mountain passes, with heavily loaded vehicles, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

5) In models 208 and 210, the kickdown downshift in transmission mode "S" is lower at ATF temperatures < 40 °C.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					210.020	210.025
Upshift in transmission range 1) 2) 4)	1 2	Full throttle	W	approx. mph. (km/h)	≈ 18 (29)	≈ 19 (30)
			S	approx. mph. (km/h)	≈ 28 (44)	≈ 29 (45)
		Kickdown		approx. mph. (km/h)	≈ 28 (44)	≈ 29 (45)
	2 3	Full throttle	W	approx. mph. (km/h)	≈ 37 (59)	≈ 33 (54)
			S	approx. mph. (km/h)	≈ 44 (71)	≈ 44 (73)
		Kickdown		approx. mph. (km/h)	≈ 44 (71)	≈ 44 (73)
	3 4	Full throttle	W	approx. mph. (km/h)	≈ 54 (86)	≈ 57 (94)
			S	approx. mph. (km/h)	≈ 73 (116)	≈ 74 (119)
		Kickdown		approx. mph. (km/h)	≈ 73 (116)	≈ 74 (119)
	4 5	Full throttle	W	approx. mph. (km/h)	≈ 80 (128)	≈ 86 (138)
			S	approx. mph. (km/h)	≈ 107 (171)	≈ 109 (176)
		Kickdown		approx. mph. (km/h)	≈ 107 (171)	≈ 109 (176)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle.
(**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

4) Shift points are increased: while driving up or down mountain passes, while driving with a heavily loaded vehicle, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					210.020	210.025
Downshift in transmission range 1) 2) 4) 5)	5 4	Full throttle	W	approx. mph. (km/h)	≈ 70 (113)	≈ 68 (107)
			S	approx. mph. (km/h)	≈70 (113) 3)	≈ 74 (119) 3)
		Kickdown		approx. mph. (km/h)	≈ 103 (164)	≈ 105 (169)
	4 3	Full throttle	W	approx. mph. (km/h)	≈ 43 (68)	≈ 40 (65)
			S	approx. mph. (km/h)	≈ 43 (68) 3)	≈ 43 (69) 3)
		Kickdown		approx. mph. (km/h)	≈ 68 (109)	≈ 69 (111)
	3 2	Full throttle	W	approx. mph. (km/h)	≈ 28 (45)	≈ 25 (42)
			S	approx. mph. (km/h)	≈ 31 (49)	≈ 32 (47)
		Kickdown		approx. mph. (km/h)	≈ 39 (63)	≈ 38 (61)
	2 1	Full throttle	W	approx. mph. (km/h)	≈ 14 (23)	≈ 11 (17)
			S	approx. mph. (km/h)	≈ 14 (23)	≈ 17 (25)
		Kickdown		approx. mph. (km/h)	≈ 22 (35)	≈ 19 (32)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

3) Upon rapid throttle release; an upshift into the next higher gear is prevented and selected only when vehicle has decreased lateral acceleration rates and appropriate handling characteristics. This prevents skidding of the vehicle in curves.

4) Shift points are increased: while driving up or down mountain passes, with heavily loaded vehicles, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

5) In models 208 and 210, the kickdown downshift in transmission mode "S" is lower at ATF temperatures < 40 °C.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					210.055	210.065/265
Upshift in transmission range 1) 2) 4)	1 2	Full throttle	W	approx. mph. (km/h)	≈ 26 (42)	≈ 25 (40)
			S	approx. mph. (km/h)	≈ 39 (62)	≈ 37 (59)
		Kickdown		approx. mph. (km/h)	≈ 39 (62)	≈ 37 (59)
	2 3	Full throttle	W	approx. mph. (km/h)	≈ 46 (73)	≈ 43 (69)
			S	approx. mph. (km/h)	≈ 63 (101)	≈ 59 (95)
		Kickdown		approx. mph. (km/h)	≈ 63 (101)	≈ 59 (95)
	3 4	Full throttle	W	approx. mph. (km/h)	≈ 77 (123)	≈ 73 (116)
			S	approx. mph. (km/h)	≈ 103 (164)	≈ 97 (155)
		Kickdown		approx. mph. (km/h)	≈ 103 (164)	≈ 97 (155)
	4 5	Full throttle	W	approx. mph. (km/h)	≈ 114 (183)	≈ 108 (172)
			S	approx. mph. (km/h)	≈ 151 (241)	≈ 144 (230)
		Kickdown		approx. mph. (km/h)	≈ 151 (241)	≈ 144 (230)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

4) Shift points are increased: while driving up or down mountain passes, while driving with a heavily loaded vehicle, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					210.055	210.065/265
Downshift in transmission range 1) 2) 4) 5)	5 4	Full throttle	W	approx. mph. (km/h)	≈ 99 (159)	≈ 93 (149)
			S	approx. mph. (km/h)	≈105 (169) 3)	≈ 99 (159) 3)
		Kickdown		approx. mph. (km/h)	≈ 145 (233)	≈ 138 (221)
	4 3	Full throttle	W	approx. mph. (km/h)	≈ 60 (96)	≈ 59 (94)
			S	approx. mph. (km/h)	≈ 65 (104) 3)	≈ 66 (106) 3)
		Kickdown		approx. mph. (km/h)	≈ 96 (153)	≈ 91 (145)
	3 2	Full throttle	W	approx. mph. (km/h)	≈ 31 (50)	≈ 31 (50)
			S	approx. mph. (km/h)	≈ 31 (50)	≈ 31 (63)
		Kickdown		approx. mph. (km/h)	≈ 56 (89)	≈ 50 (80)
	2 1	Full throttle	W	approx. mph. (km/h)	≈ 11 (18)	≈ 11 (18)
			S	approx. mph. (km/h)	≈ 18 (29)	≈ 16 (25)
		Kickdown		approx. mph. (km/h)	≈ 27 (43)	≈ 25 (40)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

3) Upon rapid throttle release; an upshift into the next higher gear is prevented and selected only when vehicle has decreased lateral acceleration rates and appropriate handling characteristics. This prevents skidding of the vehicle in curves.

4) Shift points are increased: while driving up or down mountain passes, with heavily loaded vehicles, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

5) In models 208 and 210, the kickdown downshift in transmission mode "S" is lower at ATF temperatures < 40 °C.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					210.070 with 722.623/632	210.072
Upshift in transmission range 1) 2) 4)	1 2	Full throttle	W	approx. mph. (km/h)	≈ 30 (49)	≈ 31 (49)
			S	approx. mph. (km/h)	≈ 44 (70)	≈ 43 (69)
		Kickdown		approx. mph. (km/h)	≈ 44 (70)	≈ 43 (69)
	2 3	Full throttle	W	approx. mph. (km/h)	≈ 53 (86)	≈ 52 (86)
			S	approx. mph. (km/h)	≈ 70 (115)	≈ 70 (114)
		Kickdown		approx. mph. (km/h)	≈ 70 (115)	≈ 70 (114)
	3 4	Full throttle	W	approx. mph. (km/h)	≈ 86 (140)	≈ 87 (140)
			S	approx. mph. (km/h)	≈ 110 (179)	≈ 111 (178)
		Kickdown		approx. mph. (km/h)	≈ 110 (179)	≈ 111 (178)
	4 5	Full throttle	W	approx. mph. (km/h)	≈ 121 (197)	≈ 123 (196)
			S	approx. mph. (km/h)	–	≈ 155 (250)
		Kickdown		approx. mph. (km/h)	–	≈ 155 (250)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

4) Shift points are increased: while driving up or down mountain passes, while driving with a heavily loaded vehicle, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					210.070 with 722.623/632	210.072
Downshift in transmission range 1) 2) 4) 5)	5 4	Full throttle	W	approx. mph. (km/h)	≈ 106 (173)	≈ 107 (172)
			S	approx. mph. (km/h)	≈ 109 (177) 3)	≈ 111 (176) 3)
		Kickdown		approx. mph. (km/h)	≈ 147 (238)	≈ 138 (238)
	4 3	Full throttle	W	approx. mph. (km/h)	≈ 65 (106)	≈ 64 (105)
			S	approx. mph. (km/h)	≈ 70 (113) 3)	≈ 70 (113) 3)
		Kickdown		approx. mph. (km/h)	≈ 103 (167)	≈ 102 (167)
	3 2	Full throttle	W	approx. mph. (km/h)	≈ 37 (59)	≈ 37 (58)
			S	approx. mph. (km/h)	≈ 32 (65)	≈ 40 (65)
		Kickdown		approx. mph. (km/h)	≈ 62 (100)	≈ 62 (100)
	2 1	Full throttle	W	approx. mph. (km/h)	≈ 12 (20)	≈ 13 (20)
			S	approx. mph. (km/h)	≈ 15 (24)	≈ 12 (24)
		Kickdown		approx. mph. (km/h)	≈ 30 (48)	≈ 31 (48)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

3) Upon rapid throttle release; an upshift into the next higher gear is prevented and selected only when vehicle has decreased lateral acceleration rates and appropriate handling characteristics. This prevents skidding of the vehicle in curves.

4) Shift points are increased: while driving up or down mountain passes, with heavily loaded vehicles, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

5) In models 208 and 210, the kickdown downshift in transmission mode "S" is lower at ATF temperatures < 40 °C.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					210.082/282	210.083/283
Upshift in transmission range 1) 2) 4)	1 2	Full throttle	W	approx. mph. (km/h)	≈ 25 (40)	≈ 28 (45)
			S	approx. mph. (km/h)	≈ 37 (59)	≈ 40 (64)
		Kickdown		approx. mph. (km/h)	≈ 37 (59)	≈ 40 (64)
	2 3	Full throttle	W	approx. mph. (km/h)	≈ 43 (69)	≈ 49 (79)
			S	approx. mph. (km/h)	≈ 59 (95)	≈ 66 (106)
		Kickdown		approx. mph. (km/h)	≈ 59 (95)	≈ 66 (106)
	3 4	Full throttle	W	approx. mph. (km/h)	≈ 73 (116)	≈ 79 (129)
			S	approx. mph. (km/h)	≈ 97 (155)	≈ 103 (164)
		Kickdown		approx. mph. (km/h)	≈ 97 (155)	≈ 103 (164)
	4 5	Full throttle	W	approx. mph. (km/h)	≈ 108 (172)	≈ 112 (181)
			S	approx. mph. (km/h)	≈ 144 (230)	≈ 144 (231)
		Kickdown		approx. mph. (km/h)	≈ 144 (230)	≈ 144 (231)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

4) Shift points are increased: while driving up or down mountain passes, while driving with a heavily loaded vehicle, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

Diagnosis – Function Test

Transmission selector lever ”D” shift points					210.082/282	210.083/283
Downshift in transmission range 1) 2) 4) 5)	5 4	Full throttle	W	approx. mph. (km/h)	≈ 93 (149)	≈ 99 (159)
			S	approx. mph. (km/h)	≈99 (159) 3)	≈ 102 (163) 3)
		Kickdown		approx. mph. (km/h)	≈ 138 (221)	≈ 136 (219)
	4 3	Full throttle	W	approx. mph. (km/h)	≈ 59 (94)	≈ 61 (97)
			S	approx. mph. (km/h)	≈ 66 (106) 3)	≈ 66 (104) 3)
		Kickdown		approx. mph. (km/h)	≈ 91 (145)	≈ 95 (154)
	3 2	Full throttle	W	approx. mph. (km/h)	≈ 31 (50)	≈ 34 (54)
			S	approx. mph. (km/h)	≈ 39 (63)	≈ 37 (60)
		Kickdown		approx. mph. (km/h)	≈ 50 (80)	≈ 56 (92)
	2 1	Full throttle	W	approx. mph. (km/h)	≈ 11 (18)	≈ 11 (18)
			S	approx. mph. (km/h)	≈ 16 (25)	≈ 14 (23)
		Kickdown		approx. mph. (km/h)	≈ 25 (40)	≈ 27 (44)

1) Transmission mode switch ”S”: transmission starts in 1st gear and shifts into 1st gear when coasting to a stop.

2) Transmission mode switch ”W”: transmission starts in 2nd gear and shifts into 2nd gear when coasting to a stop. 1st gear can be engaged with full throttle. (**Caution:** during engine warm-up transmission starts in 1st gear and shifts into 2nd gear when coasting to a stop).

3) Upon rapid throttle release; an upshift into the next higher gear is prevented and selected only when vehicle has decreased lateral acceleration rates and appropriate handling characteristics. This prevents skidding of the vehicle in curves.

4) Shift points are increased: while driving up or down mountain passes, with heavily loaded vehicles, at very high transmission fluid temperatures, with transmission mode switch in "S", also: with abrupt throttle release, and very sporty driving style.

5) In models 208 and 210, the kickdown downshift in transmission mode "S" is lower at ATF temperatures < 40 °C.

Diagnosis – Function Test

Transmission adaption (adaption of the ETC)

Definition

Transmission adaption optimizes shift comfort through the automatic matching of data.

In order to compensate for tolerances and wear, there is an automatic matching of:

- Shift time
- Fill time
- Fill pressure
- Activation of torque convertor lock-up clutch

The retrieved data is indicated by the HHT via menu selection 07. The data can also be reset using the HHT.
Thereafter, electronic control of the transmission must be re-adapted to the transmission using the adaption procedure.

Requirements

- ATF temperature must be a min of 60 °C to a max. of 105 °C.
- A/C system OFF.
- Connect HHT to data link connector (X11/4) according to connection diagram (see section 0).

General

There are two possibilities to perform the adaption:

- Perform a test drive, using a second technician to observe the data as indicated by the HHT via menu selection 03, or
- Use a vehicle dynamometer.

Re: engine rpm limit:

It is important not to **exceed** the specified engine RPM during the adaption procedure, as in this case, adaption of the transmission will **not** take place.

Engine Torque Values, see Engine Torque Value Table.

Diagnosis – Function Test

Adaption procedure

During the adaption procedure, it is important to maintain the engine torque values as indicated in the Engine Torque Value Table on the following page.

1. **Following the replacement/swap or repair of a transmission, the following shifts must be newly adapted after resetting the values:**

   Acceleration upshifts
   - 4 X the 1 → 2 shift
   - 4 X the 2 → 3 shift

   (Torque values: see Engine Torque Value Table on next page).

Additional note regarding adaption procedure after replacing a transmission:
Print all adaption data as indicated by the HHT and return this data with the returned transmission.

2. **In case of complaints regarding shift quality, the following shifts must be newly adapted:**

   Acceleration upshifts
   - 4 X the 1 → 2 shift
   - 4 X the 2 → 3 shift
   - 3 X the 3 → 4 shift
   - 3 X the 4 → 5 shift

   (Torque values: see Engine Torque Value Table on next page).

   Deceleration downshifts (while coasting)
   - 3 X the 5 → 4 shift
   - 3 X the 4 → 3 shift

   (Torque values are not needed for these shifts).

Upon completion of the adaption procedure, allow the engine to idle for an additional 10 minutes. This is necessary, so that all indicated values from the HHT are transmitted completely into the DTC memory of the transmission control module (N15/3).
If this does not occur, or if only some of the values are stored in the DTC memory, the transmission must be re-evaluated after a subsequent test drive.

Diagnosis – Function Test

Engine Torque Value Table for Adaption Procedure

	Shift	Count	Torque Engine 104.941 104.991 104.994 104.995	Torque Engine 111.973 111.975	Torque Engine 111.974	Torque Engine 112	Torque Engine 113.940 113.941 113.943 without touch shift	Torque Engine 113.940 113.941 113.943 with touch shift
Acceleration upshift	1 2	4 X	14 - 37 Nm	14 - 37 Nm	14 - 28 Nm	14 - 37 Nm	13 - 40 Nm	10 - 45 Nm
	2 3	4 X	17 - 59 Nm	17 - 59 Nm	17 - 59 Nm	17 - 59 Nm	25 - 50 Nm	22 - 50 Nm
	3 4	3 X	17 - 46 Nm	17 - 46 Nm	17 - 46 Nm	17 - 46 Nm	22 - 70 Nm	22 - 65 Nm
	4 5	3 X	0 - 121 Nm	0 - 121 Nm	0 - 82 Nm	0 - 121 Nm	0 - 110 Nm	22 - 900 Nm
max. engine rpm [1)]	–	–	2400 rpm	2400 rpm	2400 rpm	2400 rpm	1800 rpm	1800 rpm

[1)] It is important not to **exceed** the required engine rpm during the adaption procedure, as in this case adaption of the transmission will **not** take place.

Diagnosis – Function Test

Engine Torque Value Table for Adaption Procedure

	Shift	Count	Torque Engine 113.960	Torque Engine 119.980/982	Torque Engine 119.981/985	Torque Engine 120	
Acceleration upshift	1 2	4 X	17 - 50 Nm	17 - 50 Nm	13 - 40 Nm	17 - 50 Nm	
	2 3	4 X	29 - 60 Nm	29 - 60 Nm	25 - 50 Nm	29 - 60 Nm	
	3 4	3 X	29 - 80 Nm	29 - 80 Nm	22 - 70 Nm	29 - 80 Nm	
	4 5	3 X	0 - 140 Nm	0 - 140 Nm	0 - 110 Nm	0 - 140 Nm	
max. engine rpm [1)]	–	–	1800 rpm	1800 rpm	1800 rpm	1800 rpm	

1) It is important not to **exceed** the required engine rpm during the adaption procedure, as in this case adaption of the transmission will **not** take place.

Diagnosis – Function Test

Engine Torque Value Table for Adaption Procedure

	Shift	Count	Torque Engine 606.912	Torque Engine 606.962	
Acceleration upshift	1 2	4 X	14 - 28 Nm	14 - 37 Nm	
	2 3	4 X	20 - 55 Nm	20 - 59 Nm	
	3 4	3 X	15 - 54 Nm	20 - 59 Nm	
	4 5	3 X	0 - 81 Nm	0 - 121 Nm	
max. engine rpm [1)]	–	–	1800 rpm	1800 rpm	

1) It is important not to **exceed** the required engine rpm during the adaption procedure, as in this case adaption of the transmission will **not** take place.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

i

DTC memory tables (for DTC's 002 through 065) for model 129, 140, 163, 170, 202, 208, and 210, follow. If there are **no** DTCs' stored, then continue with 13. Review 13 regardless, for additional information.

Read out DTC's using HHT
The HHT will display only the defective electrical component and will refer to the respective test steps in section 23 of the Diagnostic Manual.

1. Review 11 entirely and this page before continuing diagnosis.
2. Check AFT level and correct as necessary, see document AF27.00-P-0101A
3. Check condition of AFT, see 11/2
4. Connect HHT to data link connector (X11/4) as shown in connection diagram (see section 0).
5. Ignition: **ON**
6. Perform Quick Test with HHT and readout DTC'S.
   Note:
   The HHT, via its display indicates only the defective electrical components or refers to the corresponding Test step.

   In order to further localize and determine the cause of an **intermittent** DTC or find the root DTC, proceed as follows:
   Subtract 96 from the displayed value (098 to 161) to determine the relevant DTC.
7. **Retrieve any additional information** on the displayed DTC by pressing the enter key.

i

1. If additional DTC's are stored in DTC memory of ETC or ME-SFI, further tests can be performed using the HHT (e.g. comparison of Nominal Values/Actual Values, or activation of components).
2. If no DTC'S are stored in DTC memory, the complaint may be of a hydraulic-mechanical nature (e.g. DTC 051 or 055), proceed with the Complaint Related Diagnostic Chart (see 13/1).
3. (USA) **vehicles only:**
   Illumination of the "CHECK ENGINE" MIL (A1e26) will reference corresponding DTC's in the DTC memory of the engine control module.
4. Transmission adaption (adaption of the ETC), see 11

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	DTC **intermittent**	DTC (OBD) (USA) only	Note	Possible cause	Test step/Remedy [1]
002	098	P0 753	Valid for diagnostic version 0 – 6, 13, 20	1-2/4-5 shift solenoid valve (Y3/6y3)	Wiring, plug connectors, 1-2/4-5 shift solenoid valve (Y3/6y3), 23 ⇒ 4.0, see 13/16
003	099	P0 758	Valid for diagnostic version 0 – 6, 13, 20	2-3 shift solenoid valve (Y3/6y5)	Wiring, plug connectors 2-3 shift solenoid valve (Y3/6y5), 23 ⇒ 5.0, see 13/16
004	100	P0 763	Valid for diagnostic version 0 – 6, 13, 20	3-4 shift solenoid valve (Y3/6y4)	Wiring, plug connectors. 3-4 shift solenoid valve (Y3/6y4), 23 ⇒ 6.0, see 13/16
005	101	P0 743	Valid for diagnostic version 0 – 6, 13, 20	PWM solenoid valve (Y3/6y6) (torque converter lock-up)	Wiring, plug connectors. PWM solenoid (Y3/6y6), 23 ⇒ 7.0, see 13/16
006	102	P0 748	Valid for diagnostic version 0 – 6, 13, 20	Modulating pressure regulating solenoid valve (Y3/6y1)	Wiring, plug connectors. Modulating pressure regulating solenoid valve (Y3/6y1), 23 ⇒ 8.0, see 13/16
007	103	P0 748	Valid for diagnostic version 0 – 6, 13, 20	Shift pressure regulating solenoid valve (Y3/6y2)	Wiring, plug connectors. Shift pressure regulating solenoid valve (Y3/6y2), 23 ⇒ 9.0, see 13/16

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	DTC **intermittent**	DTC (OBD) USA only	Note	Possible cause	Test step/Remedy [1]
008	104	—	Valid for diagnostic version 0 – 6	R/P-lock solenoid (Y66/1) 722.6 up to 6/30/99 in models 202, 208, 210 without touch shift. 722.6 in Models 129, 140, 163 without touch shift. 722.602/605 in Model 170 without touch shift.	Wiring, plug connectors. R/P-lock solenoid (Y66/1), 23 ⇒ 10.0
009	105	—	Valid for diagnostic version 0 – 6	Starter lock-out relay module (K38/3) (fault is in the line). 722.6 in Model 129 with engine 104, 112. 722.6 in Model 140 with engine 104, 606. 722.6 in Model 170 up to 6/30/99 with engine 111. 722.6 in Model 202 up to 6/30/99 with engine 104, 111, 112. 722.6 in Model 208 up to 6/30/99 with engine 112. 722.6 in Model 210 up to 6/30/99 with engine 104, 112, 606.	Wiring, plug connectors, Model 140, 129: Starter lock-out relay module (K38/3), Model 210: Pulse module (N65), 23 ⇒ 11.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	DTC **intermittent**	DTC (OBD) (USA) only	Note	Possible cause	Test step/Remedy [1]
010	106	P0 702	Valid for diagnostic version 0 – 6, 13, 20	Voltage supply to solenoid valves	Wiring, plug connectors. 23 ⇒ 3.0
011	107	P0 715	Valid for diagnostic version 0 – 6, 13, 20	Voltage supply to rpm sensors	Wiring, plug connectors. 23 ⇒ 12.0
012	108	P0 715	Valid for diagnostic version 0 – 6, 13, 20	RPM sensor 2 (Y3/6n2)	Wiring, plug connectors. RPM sensor 2 (Y3/6n2), see 13/16
013	109	P0 715	Valid for diagnostic version 0 – 6, 13, 20	RPM sensor 3 (Y3/6n3)	Wiring, plug connectors. RPM sensor 3 (Y3/6n3), see 13/16
014	110	P0 715	Valid for diagnostic version 6, 13, 20	RPM sensor comparison: RPM sensor 2 (Y3/6n2) to RPM sensor 3 (Y3/6n3), implausible	If RPM semsor 2 or 3 are faulty, switch electrical set. If impulse wheel is loose for RPM sensor 2 or 3, repair transmission or replace transmission.
015	111	P0 700	Valid for diagnostic version 6, 13, 20	Excessive RPM: RPM sensor 2 (Y3/6n2) or RPM sensor 3 (Y3/6n3)	See 13/16
017	113	P0 705	Valid for diagnostic version 4, 5, 6	Transmission selector lever coding invalid	Wiring, plug connectors. Transmission range recognition switch (S16/10)

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	DTC **intermittent**	DTC (OBD) (USA) only	Note	Possible cause	Test step/Remedy [1]
018	114	P0 705	Valid for diagnostic version 0, 1, 2, 3	Transmission selector lever implausible	See 13 Wiring, plug connectors.
018	114	— —	Valid for diagnostic version 4, 5, 6	Transmission selector lever between ranges	See 13/17 Wiring, plug connectors.
019	115	— —	Valid for diagnostic version 0, 1, 2	Temperature sensor (Y3/6b1) defective	Wiring, plug connectors. Temperature sensor (Y3/6b1)
020	116	—	Valid for diagnostic version 0, 1, 2	Starter lock-out contact (Y3/6s1) not functioning	Starter lock-out contact (Y3/6s1), 23 ⇒ 13.0, see 13/17
020	116	—	Valid for diagnostic version 3, 4, 5, 6, 13, 20	Temperature sensor (Y3/6b1) faulty, Starter lock-out contact (Y3/6s1) no function	Starter lock-out contact (Y3/6s1), 23 ⇒ 13.0, see 13/17
021	117	—	Valid for diagnostic version 0 – 6, 13, 20	Circuit 87 voltage supply fault (low or overvoltage)	Wiring, plug connectors. 23 ⇒ 1.0
022	118	P0 720	Valid for diagnostic version 0 – 6, 13, 20	CAN: Right rear wheel speed (VSS) from traction system implausible	See DM, Chassis and Drivetrain, Volume 3
023	119	P0 720	Valid for diagnostic version 0 – 6, 13, 20	CAN: Left rear wheel speed (VSS) from traction system implausible	See DM, Chassis and Drivetrain, Volume 3

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC 	DTC **intermittent** 	DTC (OBD)	Note:	Possible cause	Test step/Remedy [1]
024	120	—	Valid for diagnostic version 0, 1	CAN: Pedal value from engine management implausible	See DM, Engines
024	120	—	Valid for diagnostic version 2 – 6, 13, 20	CAN: Right front wheel speed (VSS) from traction system implausible	See DM, Chassis and Drivetrain, Volume 3
025	121	—	Valid for diagnostic version 0, 1	CAN: Engine rpm from engine management implausible	See DM, Engines
025	121	—	Valid for diagnostic version 2 – 6, 13, 20	CAN: Left front wheel speed (VSS) from tracton system implausible	See DM, Chassis and Drivetrain, Volume 3
026	122	—	Valid for diagnostic version 0, 1	CAN: Right engine torque from engine management implauslible	See DM, Engines
026	122	—	Valid for diagnostic version 2, 3, 4, 5, 6, 13, 20	CAN: Pedal value from engine management implausible	See 13/17, see DM, Engines
027	123	—	Valid for diagnostic version 0, 1	Altitude adjustment factor from engine management implausible **(This code can be ignored only if no code was set in ME-SFI)**	See DM, Engines

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC 	DTC **intermittent** 	DTC (OBD)	Note:	Possible cause	Test step/Remedy [1]
027	123	—	Valid for diagnostic version 2, 3, 4, 5, 6, 13	CAN: Adjusted engine torque implausible	See DM, Engines
027	123	—	Valid for diagnostic version 20	CAN: Static engine torque implausible	See DM, Engines
028	124	—	Valid for diagnostic version 0, 1	CAN: Left engine torque from engine management implausible	See 13/17, See DM, Engines
028	124	—	Valid for diagnostic version 2, 3, 4, 5, 6, 13, 20	CAN: Engine rpm from engine management implausible	See 13/17, See DM, Engines
029	125	—	Valid for diagnostic version 2, 3, 4, 5, 6, 13	CAN: Right engine torque from engine management implausible	See 13/17, See DM, Engines
029	125	—	Valid for diagnostic version 20	CAN: Minimal engine torque from engine management implausible	See 13/17, See DM, Engines
030	126	—	Valid for diagnostic version 0, 1	CAN: Communication to traction system faulty	See DM, Chassis and Drivetrain

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	DTC **intermittent**	DTC (OBD)	Note:	Possible cause	Test step/Remedy [1]
030	126	—	Valid for diagnostic version 2 – 6, 13, 20	CAN: Altitude correction factor from engine management implausible **(This code can be ignored only if no code was set in ME-SFI)**	—
031	127	—	Valid for diagnostic version 0,1	CAN: Engine management communication faulty	See DM, Engines
031	127	—	Valid for diagnostic version 3, 13, 20	CAN: Maximum induced engine torque from engine management implausible	See DM, Engines
031	127	—	Valid for diagnostic version 4, 5, 6, **except engines 119 and 120**	CAN: Maximum induced engine torque from engine management implausible	See DM, Engines
032	128	—	Valid for diagnostic version 0, 1	CAN: Engine management communication faulty	See DM, Engines
032	128	—	Valid for diagnostic version 20	CAN: Engine torque requirement for traction system from engine management implausible	See DM, Engines
033	129	—	Valid for diagnostic version 0,1	CAN: Engine management communication faulty	See DM, Engines

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC 	DTC **intermittent** 	DTC (OBD)	Note:	Possible cause	Test step/Remedy [1]
033	129	—	Valid for diagnostic version 3, 4, 5, 6, 13	CAN: Throttle valve actuator actual value from engine management implausible	See DM, Engines
034	130	P0 750	Valid for diagnostic version 0, 1, **For engine 120 only**	CAN: Engine management communication faulty	See DM, Engines
034	130	P0 720	Valid for diagnostic version 13, 20	CAN: Communication with Electronic selector lever module control module (N15/5) faulty Transmission selector lever version coding implausible	See Star Diagnosis, Read out DTC memory for Electronic Selector Lever Module Control Module (N15/5).
035	131	—	Valid for diagnostic version 0 – 6, **For engine 120 only**	CAN: Engine management communication faulty	See DM, Engines
036	132	—	Valid for diagnostic version 0 – 6, 13, 20	CAN: Communication from engine management faulty or engine temperature implausible	See DM, Engines
037	133	—	Valid for diagnostic version 0 – 5	CAN: All communication faulty	See 13/17, See DM, Engines

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC 	DTC **intermittent** 	DTC (OBD)	Note:	Possible cause	Test step/Remedy [1]
037	133	—	Valid for diagnostic version 6, 13, 20	CAN: Line faulty (bus-off)	Check lines from data buse.
038	134	P0 720	Valid for diagnostic version 2, 3, 4, 5, 6, 13, 20	CAN: Traction system communication faulty	See 13/17, See DM, Chassis and Drivetrain
039	135	—	Valid for diagnostic version 2, 3, 4, 5, 6, 13, 20	CAN: Engine management communication faulty	See DM, Engines
040	136	—	Valid for diagnostic version 3	CAN: Instrument cluster communication faulty	See DM, Information/Communication, Volume 1.
040	136	—	Valid for diagnostic version 4, 5, 6, **except engines 119 and 120**	CAN: Instrument cluster communication faulty	See DM, Information/Communication, Volume 1.
040	136	—	Valid for diagnostic version 13, 20	CAN: Instrument cluster communication faulty, CAN: Electronic ignition switch (EIS) communication faulty	See STAR diagnosis, Readout DTCs' for EIS and instrument cluster (A1)
041	137	P0 700	Valid for diagnostic version 3, 4, 5, 6 **Except For engine 119/120**	CAN: Communication with transfer case control module faulty	—

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC 	DTC **intermittent** 	DTC (OBD)	Note:	Possible cause	Test step/Remedy [1]
041	137	P0 700	Valid for diagnostic version 13, 20	CAN: Communication with transfer case control module faulty	—
049	145	P0 700	Valid for diagnostic version 6, 13, 20	Excessive engine RPM	—
050	146	P0 700	Valid for diagnostic version 3, 4, 5	Execessive RPM: RPM sensor 3 (Y3/6n3) or Externally toothed plate gear	See 13/17
051	146	P0 700	Valid for diagnostic version 6, 13, 20	Non-acceptable transmission gear ratio	See 13/18
051	147	P0 700	Valid for diagnostic version 0 – 6, 13, 20	Gear implausible or transmission slips	See 13/18
052	148	P0 700	Valid for diagnostic version 0, 1, 2	Command valve (6, 14 or 25) sticking under pressure	See 13/24
052	148	P0 700	Valid for diagnostic version 3, 4, 5, 6, 13, 20	Torque converter lock-up clutch: unauthorized lock	See 13/18

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC 	DTC **intermittent** 	DTC (OBD)	Note:	Possible cause	Test step/Remedy [1]
053	149	P0 740	Valid for diagnostic version 0, 1, 2	Torque converter lock-up clutch: not functioning	See 13/18
053	149	P0 740	Valid for diagnostic version 3, 4, 5, 6, 13, 20	Torque converter lock-up clutch: input too high	See 13/18
054	150	—	Valid for diagnostic version 0 – 6, 13, 20	No transmission overload protection (return signal)	—
055	151	P0 730	Valid for diagnostic version 0 – 6, 13, 20	Gear comparison or selected gear not attained	See 13/19
056 – 059	152 – 155	P0 702	Valid for diagnostic version 0 – 6, 13, 20	Fault in transmission control module (N15/3)	Wiring, plug connections. N15/3
060 – 061	156 – 157	—	Valid for diagnostic version 0 – 6, 13, 20	Fault in transmission control module (N15/3)	Wiring, plug connections. N15/3
062 – 064	158 – 160	P0 702	Valid for diagnostic version 0 – 6, 13, 20	Fault in transmission control module (N15/3)	Wiring, plug connections. N15/3
065	161	—	Valid for diagnostic version 0 – 6, 13, 20	Fault in transmission control module (N15/3)	Wiring, plug connections. N15/3, see 13/19

[1] Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – Overall Function

Prior to Test

1. Review sections 11, 12, 21, 22 entirely.
2. Check transmission ATF oil level. See document AR27.00-P-0101A
3. Review this section (13) completely, prior to making any repairs.

The following Diagnosis – Complaint Related Diagnostic Charts in this section contain complaints regarding:

- Noise Complaints
- Power Transfer Complaints
- Individual Complaints
- ATF Leak Complaints
- DTC Related Complaints

	Complaint/Problem	Possible cause	Test step/Remedy [1]
—	**Engine quits after selecting a drive gear and noise from transmission in position "N" or "P" (no DTC's are stored in DTC memory)**	1. PWM solenoid valve (Y3/6y6) (torque converter lock-up) locked-up, (due to foreign matter). 2. Torque converter lock-up clutch control valve (22) locked up, (due to foreign matter). (applies up to transmission number 22890 only, thereafter screen installed in oil passage).	1. Replace PWM solenoid valve (Y3/6y6). 2. Clean out torque converter lock-up clutch control valve.

[1] Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – Noise Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
—	Rumbling, droning or possible shuttering with torque converter lock-up.	Insuffient torque converter slippage rpm	Using the HHT, turn off the torque converter lock-up. If the complaint can not be duplicated thereafter replace the PWM solenoid valve (Y3/6y6) and reset the adaption values, using the HHT.
—	Howling, whistle noises at **(> 4000rpm)** in all gears.	Transmission ATF filter clogged. Transmission AFT oil pump	Replace ATF oil filter. Replace ATF oil pump.
—	Howling, singing noises	Gear set noises: 1st, 2nd, 5th gears Sealing ring at propeller shaft intermediate bearing is touching bearing inner race.	Currently no solution, please contact regional office and advise of VIN and mileage. Replace propeller shaft intermediate bearing with bearing that uses a black colored seal.
—	Load reversal noise (cracking noise)	Shear noise between output flange and collar nut. **i** Up to transmission number 30332, there after collared nut and tightening torque value changed, see Remedy.	Use collar nut with Dacromet coating (silver color). (Tightening torque: 200Nm)
—	Ticking noises from center console shift gate while driving at slow speeds.	Loose connection at R/P lock valve (Y66/1) connector.	Check and or replace R/P lock valve (Y66/1) connector.

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – Power Transfer Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
—	Harsh 2 → 1 deceleration downshift	Transmission adaption (adaption of ETC). ETC software date Free-wheeling unit (F1)	See 11/36, See 13/7
—	Harsh 3 → 2 deceleration downshift (reappears also after preforming transmission adaption.	Clutch K3 Applies to all models with engine 119, 120 up to transmission number 27083	See 13/8
—	No or late upshift of transmission	Different size tires mounted on the front axle. Wrong factor attained shortly after starting to drive.	Mount proper size tires on front axle.
—	No upshift from 3 → 4 and 4 → 5 when releasing accelerator pedal quickly, only works if transmission is in "S" program.	Upshift prevention due to dynamic-sporty driving style of client.	Educate/advise client.
—	No upshift into 5th gear with WOT or kick-down.	The upshift 4 → 5 occurs with WOT or kick-down if the rev-limiter rpm is reached. High power vehicles will shift into 5th gear only when attaining the rev-limiter rpm (250 km) in 5th gear.	Educate/advise client.

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – Power Transfer Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
—	No upshift out of 1st gear (program "S" selected) and out of 2nd gear (program "W" selected) at 1,500 rpm with engine "cold". Fault can not be duplicated every time.	Transmission range recognition switch (S16/10) and/or Electronic Transmission Control (ETC).	Remove parts and contact regional office.
—	Engine revs up during 2 → 3 shift and /or has harsh downshift during 3 → 2 shift.	ATF level in transmission AFT oil filter Free-wheeling unit (F2) i Check ATF level in transmission or fill to correct level.	See 13/8 See document AR27.00-P-0101A
—	Shudder in 2 → 3 power upshift or 3 → 2 downshift (engine braking)	ATF level in transmission AFT oil filter Command or Regulating, Shift Control Valves Clutch K3 i Check ATF level in transmission or fill to correct level.	See 13/9 See document AR27.00-P-0101A

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – Power Transfer Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
—	No downshift via kick-down function	Required pedal value < 95% (Test using HHT) i All models with engine 111	Check engine management, if necessary readjust, see DM Engines.
—	Delayed engagement/no transmission of power in "R" and/or "D", at times intermittent.	**Possible causes regarding intermittent complaints:** ATF oil level in transmission. i Check ATF level in transmission or fill to correct level. Transmission range recognition switch (S16/10) ATF oil filter i Disassemble/check center console shift gate Delayed pressure build-up at piston B2/B3 Allocation of ETC/Electro-hydraulic control unit (EHS)	See 13/10 See document AR27.00-P-0101A See document AR27.60-P-0920B

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – Power Transfer Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
—	Delayed engagement/no transmission of power with gear selector lever in "R" and/or "D", at times intermittent.	**Possible causes regarding duplicatable complaints:** Collared nut loose. Brake B2/B3. Remove and replace: Brake B2, Brake B3, and parking lock wheel Disassemble and reassemble Brake B2 Shift pressure regulating solenoid valve (Y3/6y2). Modulating pressure regulating solenoid valve (Y3/6y1). Command or Regulating, Shift control valves. Transmission circlips	 See document AR27.50-P-0781A See document AR27.50-P-0880A

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – Individual Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
—	Harsh coasting downshift 4 → 3, just before vehicle comes to a stop.	Separator plate in the Electro-hydraulic control unit i Occurs only with gear selector lever in "D" or 4th gear, not if gear selector lever is in: 3rd or 2nd gear. Applies up to transmission number 0527574, thereafter a modified separator plate was introduced into production.	Replace separator plate, P/N 140 277 39 14
—	Harsh 2 → 1 coasting downshift	ETC software version i Software versions optimised as of April 15, 1998 Free-wheeling unit (F1) faulty i Since it is possible that the free-wheeling unit F2 will be damaged as well, replace F2 (P/N 140 270 05 31) the hollow shaft, rear sun gear/clutch K3 as well.	Replace ETC software version Replace Free-wheeling unit (F1)

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – Individual Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
—	Harsh 3 → 2 coasting downshift (occurs after transmission adaption process as well)	Clutch K3 runs empty i Applies to all models using engine 119, 120 up to transmission number 27083, thereafter electro-hydraulic control unit optimised. Disc spring for piston in Clutch K3 is missing.	Install ETC repair set, P/N 140 540 08 45 Install missing disc spring for piston in Clutch K3
—	Engine revs up during 2 → 3 shift and /or has harsh downshift during 3 → 2 shift.	ATF oil filter not installed. Free-wheeling unit F2 faulty	Install missing ATF oil filter. Replace F2 (P/N 140 270 05 31) the hollow shaft, rear sun gear/clutch K3. i Applies up to transmission number 981435 only. P/N 140 270 05 31 applies to W5A330 and W5A580 only.

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – Individual Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
—	Shudder in 2 → 3 power upshift or 3 → 2 downshift (engine braking)	ATF oil filter not installed.	Install missing ATF oil filter.
		Command or Regulating, Shift Control Valves stuck due to foreign matter	Check valves for full travel and ease of movement, if necessary free up valves as needed.
		Clutch plates of clutch K3 are either burnt, have hot-spots or are worn down.	Replace inner and outer clutch plates of clutch K3. i Applies up to transmission number 331159 only, thereafter the thickness of the clutch plates changed. Additionally replace torque converter lock-up clutch control valve (22). i Applies up to transmission number 221668 only.

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – Individual Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
—	Delayed engagement/no transmission of power with gear selector lever in "R" and/or "D" **Note:** **Possible causes where fault CAN NOT be reproduced each time.**	Transmission range recognition switch (S16/10)	Replace the Transmission range recognition switch (S16/10), only if upon testing with the HHT, the HHT display shows "Between Selections" or "Fault". i A fault code for the above is no longer set in memory as of software version e03/f08
		ATF oil filter not installed.	Install ATF oil filter.
		Older engagement process, therefore delayed pressure build up at piston B2 and B3	New engagement process (replace ETC, electro-hydraulic control unit, use repair set) i Applies only up to transmission number 23104 with software: e00, e01, f04, f06, r00, thereafter the piston B2 was optimized.
		False allocation ETC/Electo-hydraulic control unit.	Determine proper allocation (swap ETC or Electro-hydraulic control unit). i **Applies up to 07.96 only**, there after allocation changed in production.

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – Individual Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
—	Delayed engagement/no transmission of power with gear selector lever in "R" and/or "D" **Note:** **Possible causes where fault CAN BE reproduced each time.**	Torx screws (M8X60) loose or missing for piston guide on piston B2/B3	Tighten loose torx screws or replace missing torx screws.
		Shift pressure regulating solenoid valve (Y3/6y2), stuck due to foreign matter.	Replace (Y3/6y2)
		Modulating pressure regulating solenoid valve (Y3/6y1), stuck due to foreign matter.	Replace (Y3/6y1) i Applies up to transmission number 538312 only, thereafter screen installed in oil passage.
		Command or Regulating, Shift Control Valves stuck due to foreign matter.	Check valves for full travel and ease of movement, if necessary free up valves as needed.
		Seal rings for piston B2 or B3 damaged.	Replace seal rings.
		Circlip for disc spring for piston B2/B3 is not installed in groove.	Replace transmission, flush transmission oil cooler and all lines. Replace torque converter only if upon flushing there are metal shavings present.

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – ATF Leak Complaints (Overall)

Prior to Test

1. Review 11 entirely.

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
—	Continued from 13/11	Circlip for output shaft ball bearing is missing or not in the groove.	Replace transmission, flush transmission oil cooler and all lines. Replace torque converter only if upon flushing there are metal shavings present.
		Circlip for outer disc spring for Brake B3 is not in the groove.	Replace transmission, flush transmission oil cooler and all lines. Replace torque converter only if upon flushing there are metal shavings present.
		Circlip for rear planetary sun gear shaft is missing or not in the groove.	Replace transmission, flush transmission oil cooler and all lines. Replace torque converter only if upon flushing there are metal shavings present.
—	ATF oil leak near electro-hydraulic control unit connector	Electro-hydraulic control unit connector Electrical conductor plate of electro-hydraulic control unit Electro-hydraulic control unit O-rings	See 13/13
—	ATF oil leaks near torque converter housing	Transmission over filled with ATF (ATF is escaping via transmission breather hole) Outer brake carrier B1 Torque converter ATF oil pump	See 13/15 Check ATF fluid level, fill up as necessary, see document AF27.00-P-0101A

1) Observe Preparation for Test, see 22.

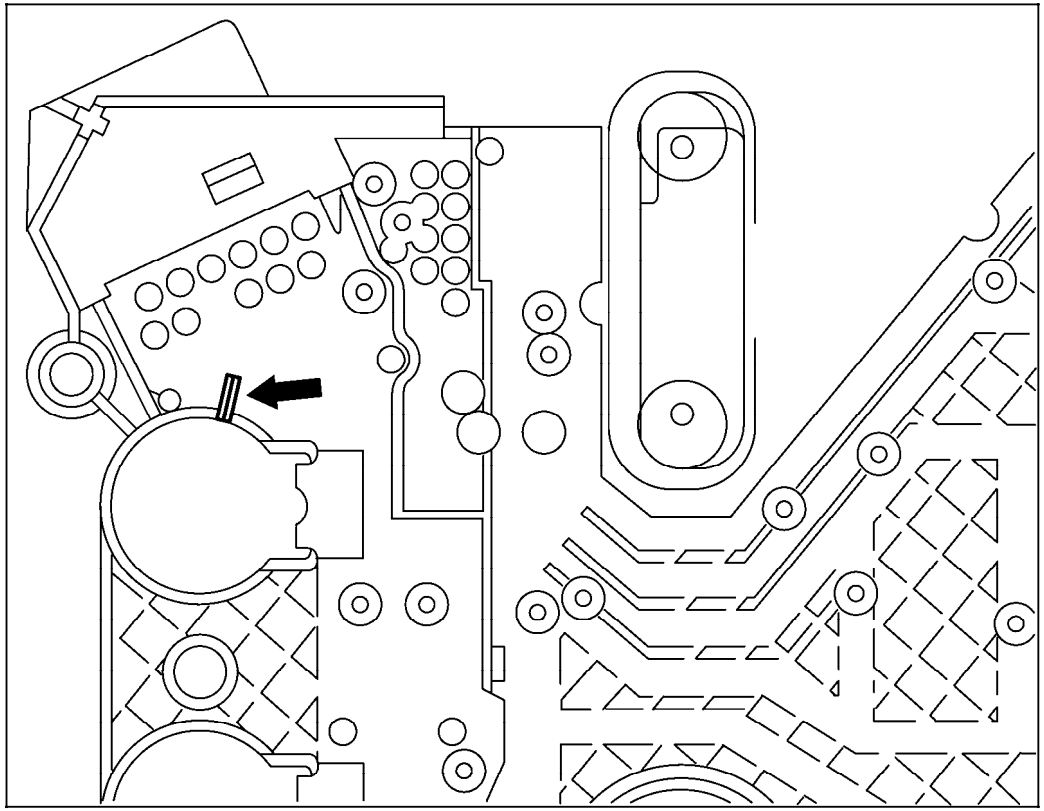
Diagnosis – Complaint Related Diagnostic Chart – ATF Leak Complaints (Individual)

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
—	ATF oil leak near electro-hydraulic control unit connector **Prior to starting any repairs, check the ATF fluid level.**	Distorted O-rings	Replace O-rings Applies up to transmission number 1211278 only, thereafter modified material used (color: red/brown).
		Distorted connector	Replace connector. Applies up to transmission number 1309692 only, thereafter modified material used.
		The electrical conductor plate is not resting properly on the valve body housing. Therefore, the connector is not properly centered in the bore of the support plate and does not seal completely around its circumference.	Carefully remove boss on the electrical conductor plate (Figure 1, next page, **arrow**), to allow proper seating. Applies only between 09/97 and 02/98, up to transmission number 77692 only.
		Electrical connections at the electrical conductor plate are leaking ATF. Therefore, ATF leaks into in harness, at times to ETC control module (N15/3).	Replace the following components: electrical conductor plate, connector and O-rings.

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – ATF Leak Complaints (Individual)

Valve unit (Y3/6)
(sectional, as seen from below)
(**arrow**, remove boss in electrical conductor plate)



P27.19-2024-11

Figure 1

Diagnosis – Complaint Related Diagnostic Chart – ATF Leak Complaints (Individual)

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
—	ATF oil leaks near torque converter **Prior to starting any repairs, check the ATF fluid level.**	Outer brake carrier B1 mounting screws (Torx M6)	Clean out mount screw (Torx) threads and reinstall mount screws with Locktite 574 (P/N 001 989 89 20). Applies up to transmission number 981619, thereafter coated mount screws used in production.
		Lower 6 mounting screws on torque converter housing.	Clean out mount screw threads and reinstall mount screws with Locktite 574 (P/N 001 989 89 20).
		Torque converter leaks at its welding seam.	Replace torque converter.
		Radial sealing ring of ATF oil pump damaged.	Replace radial seal ring.
		O-ring for ATF oil pump damaged/missing.	Replace O-ring.

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – DTC Related Complaints

Prior to Test

1. Review sections 11 12, 21, 22 entirely, especially page 11/4 (Limp-home modes).
2. Follow all "Test step/Remedy" remarks in following chart, for additional information (noted in charts in specific pages of this section) regarding specific DTCs.

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
002 098 P0 753 003 099 P0 758 004 100 P0 763 005 101 P0 743 006 102 P0 748 007 103 P0 748	Transmission is in electrical limp-home-mode	Solenoid valves Harness is damaged from ETC control module to each individual solenoid valve. End stage fault in ETC control module	See 13/20 as well.
012 108 P0 715	Transmission is in electrical limp-home-mode	Harness is damaged from ETC control module to each RPM sensor. RPM sensors are faulty	See 13/21 as well.
013 109 P0 715	Transmission is in electrical limp-home-mode	Harness is damaged from ETC control module to each RPM sensor. RPM sensors are faulty. Vehicles with less than 600 miles: Impulse wheel window misaligned, due to manufacture, loose or axially misaligned.	See 13/21 as well. Replace clutch K1
015 111 P0 700	Transmission does not transmit engine power.	Harness is damaged from ETC control module to each RPM sensor. RPM sensors are faulty.	See 13/21 as well.

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – DTC Related Complaints

			Complaint/Problem	Possible cause	Test step/Remedy[1)]
018	114	—	Transmission gear selector lever in "Between Selections", transmission is in electrical limp-home-mode	i Applies to all models without "Touch Shift" feature. Shift linkage, Transmission range recognition switch (S16/10)	See 13/22 as well,
020	116	—	Engine starts with a delay	Shift linkage adjusted incorrectly. Plunger of starter lock-out is stuck.	Adjust shift linkage. Replace electrical conductor plate
026 028 029	122 124 125	— — —	Background fault noted	i Non-USA vehicles only, continue to next test step.	—
037	133	—	Transmission is in electrical limp-home-mode	Fault in software: 21/96 status	Replace ETC
038	134	P0 720	Transmission is in electrical limp-home-mode	ETC control module (N15/3) Traction system control module (N47)	Replace N15/3 only if no DTCs arestored in N47
050	146	P0 700	Transmission is in mechanical-hydraulic limp-home-mode	ATF oil level Piston B2/B3: piston guide Harness If the fault reappears after the test drive, and after all causes have been eliminated, then contact the regional office for help.	See 13/23 as well, Check ATF fliud level, fill up as necessary, see document AF27.00-P-0101A, Remove, install brake B2, brake B3 and parking lock wheel, see document AR27.50-P-0781A

1) Observerve Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – DTC Related Complaints

			Complaint/Problem	Possible cause	Test step/Remedy[1)]
051	147	P0 700	Gear implausible, transmission slips, transmission is in mechanical-hydraulic limp-home-mode	ATF oil level ATF oil filter Version coding Rear axle ratio Modulating pressure regulating solenoid valve (Y3/6y1) Command or Regulating, Shift Control Valves Clutch K3 Free-wheeling units F1/F2 Circlips Plain bushing at input/outpshaft worn out Actuator motor at transfer case (Model 163)	See 13/24 as well, Check ATF fliud level, fill up as necessary, see document AF27.00-P-0101A
052	148	—	Unwanted actuation of torque converter lock-up function		Advise regional office
053	149	P0 740	Torque converter lock-up does not function or requires to much power		Advise regional office

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – DTC Related Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
055 151 P0 730	Selected gear not attained, transmission is in electrical limp-home-mode	ATF oil level Harness ATF oil filter not installed Shift pressure regulating solenoid valve (Y3/6y2) Command or Regulating, Shift Control Valves	See 13/27 as well, Check ATF fliud level, fill up as necessary, see document AF27.00-P-0101A
065 161 —	Fault in ETC control module (N15/3), however not critical for function of transmission.	ETC control module (N15/3) i With DTC 161, erase DTC and replace ETC control module only if the fault can be reproduced during a test drive.	Replace ETC

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – DTC Related Complaints

The following charts contain specific DTCs with additional information.

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
002 098 P0 753 003 099 P0 758 004 100 P0 763 005 101 P0 743 006 102 P0 748 007 103 P0 748	Transmission is in electrical limp-home-mode	Connector connection between ETC control module and transmission is loose or has no electrical contact.	Check and verify proper electrical connection.
		Harness is damaged, has abrasion damage, or is short circuited.	Test harness for short circuits to ground (–).
		Solenoid valve(s) has bent contact finger.	Re-bend contact finger for proper contact.
		Solenoid valve faulty.	Replace solenoid valve.
		Short circuit on the electrical conductor plate of the electro-hydraulic control unit due to deposited metal shavings	Remove metal shavings.
		Applies up to transmission number 393328, thereafter the electrical conductor plate has been modified.	
		Endstage fault in ETC control module.	Replace ETC control module.

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – DTC Related Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
012 108 P0 715 013 109 P0 715 015 111 P0 700	Transmission is in electrical limp-home-mode, or does not transmit engine power.	Connector connection between ETC control module and transmission is loose or has no electrical contact.	Check and verify proper electrical connection.
		Harness is damaged, has abrasion damage, or is short circuited.	Test harness for short circuits to ground (–).
		Short circuit on the electrical conductor plate of the electro-hydraulic control unit due to deposited metal shavings	Remove metal shavings.
		i Applies up to transmission number 393328, thereafter the electrical conductor plate has been modified.	
		RPM sensors are faulty.	Replace conductor plate.
		Pressure plate below RPM sensors not installed.	Replace conductor plate.

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – DTC Related Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
018 114 —	Transmission gear selector lever in "Between Selections", transmission is in electrical limp-home-mode.	Applies to all models without "Touch Shift" feature. Shift linkage improperly adjusted. Transmission range recognition switch (S16/10). A fault code for the above is no longer set in memory as of software version e03/f08	Re-adjust shift linkage properly. Replace the Transmission range recognition switch (S16/10), only if upon testing with the HHT, the HHT display shows "Between Selections" or "Fault".

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – DTC Related Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
050 146 P0 700	Transmission is in mechanical-hydraulic limp-home-mode	Torx screws (M8X60) loose or missing for piston guide on piston B2/B3 Harness is damaged, has abrasion damage, or is short circuited.	Tighten loose torx screws or replace missing torx screws. Test harness for short circuits to ground (–).

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – DTC Related Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
051 147 P0 700	Transmission is in mechanical-hydraulic limp-home-mode	Wrong version code in ETC control module.	Check/Re-program ETC control module using HHT.
		Wrong rear axle ratio.	Check rear axle ratio, replace rear drive with proper rear axle for model
		ATF oil filter not installed.	Install ATF oil filter.
		Torx screws (M8X60) loose or missing for piston guide on piston B2/B3	Tighten loose torx screws or replace missing torx screws.
		Modulating pressure regulating solenoid valve (Y3/6y1) i Applies up to transmission number 538312 only, thereafter screen installed in oil passage.	Replace Y3/6y1
		Command or Regulating, Shift Control Valves stuck due to foreign matter.	Check valves for full travel and ease of movement, if necessary free up valves as needed.

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – DTC Related Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
051 147 P0 700	Continued from 13/24	Clutch plates of clutch K3 are either burnt, have hot-spots or are worn down.	Replace inner and outer clutch plates of clutch K3. i Applies up to transmission number 331159 only, thereafter the thickness of the clutch plates changed. Additionally replace torque converter lock-up clutch control valve (22). i Applies up to transmission number 221668 only.
		Free-wheeling unit (F1) faulty i Since it is possible that the free-wheeling unit F2 will be damaged as well, replace F2 (P/N 140 270 05 31) the hollow shaft, rear sun gear/clutch K3 as well.	Replace Free-wheeling unit (F1)
		Free-wheeling unit (F2) faulty	Replace F2 (P/N 140 270 05 31) the hollow shaft, rear sun gear/clutch K3.

1) Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – DTC Related Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
051 147 P0 700	Continued from 13/25	Circlip for outputshaft ball bearing is missing	Replace transmission, flush transmission oil cooler and all lines. Replace torque converter only if upon flushing there are metal shavings present.
		Circlip for outer disc spring for Brake B3 is missing.	Replace transmission, flush transmission oil cooler and all lines. Replace torque converter only if upon flushing there are metal shavings present.
		Circlip for disc spring for piston B2/B3 is not installed in groove.	Replace transmission, flush transmission oil cooler and all lines. Replace torque converter only if upon flushing there are metal shavings present.
		Plain bushing at input/outpshaft worn out i Applies up to transmission number 1324240, exchange transmissions up to 346607. Thereafter plain bearing replaced with needle bearing	Swap inputshaft/outputshaft
		Actuator motor at transfer case (Model 163)	Replace actuator motor.

1) Observe Preparation for Test, see 22.

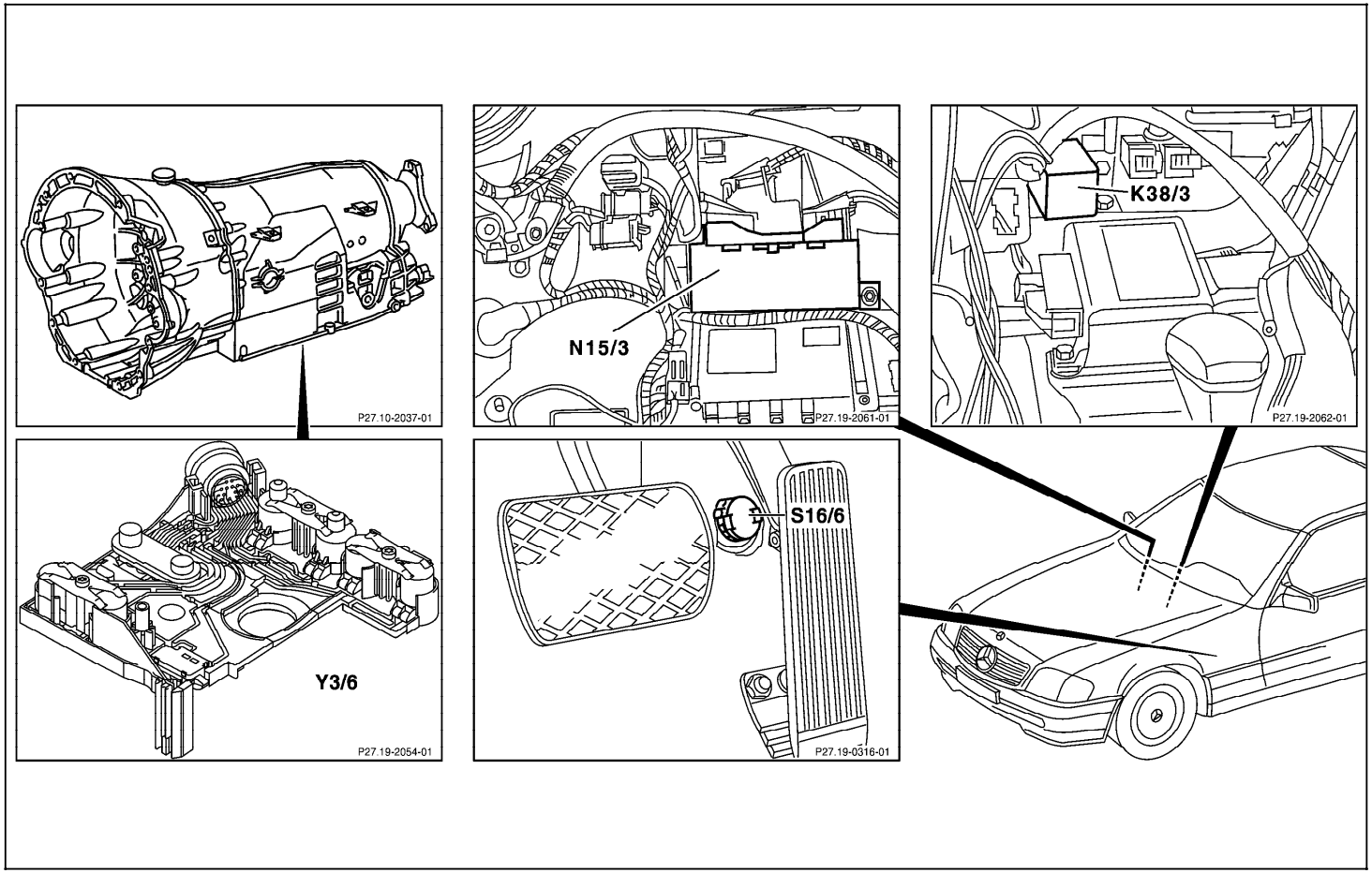
Diagnosis – Complaint Related Diagnostic Chart – DTC Related Complaints

	Complaint/Problem	Possible cause	Test step/Remedy[1)]
055 151 P0 730	Selected gear not attained, transmission is in electrical limp-home-mode.	ATF oil filter not installed.	Install ATF oil filter
		Harness is damaged, has abrasion damage, or is short circuited.	Test harness for short circuits to ground (–).
		Shift pressure regulating solenoid valve (Y3/6y2) stuck due to foreign matter.	Replace (Y3/6y2).
		Command or Regulating, Shift Control Valves stuck due to foreign matter.	Check valves for full travel and ease of movement, if necessary free up valves as needed.
		Spring for regulating valve pressure control valve i Up to transmission number 6341191097	Replace spring with P/N 140 993 58 01

1) Observe Preparation for Test, see 22.

Electrical Test Program – Component Locations

Model 129

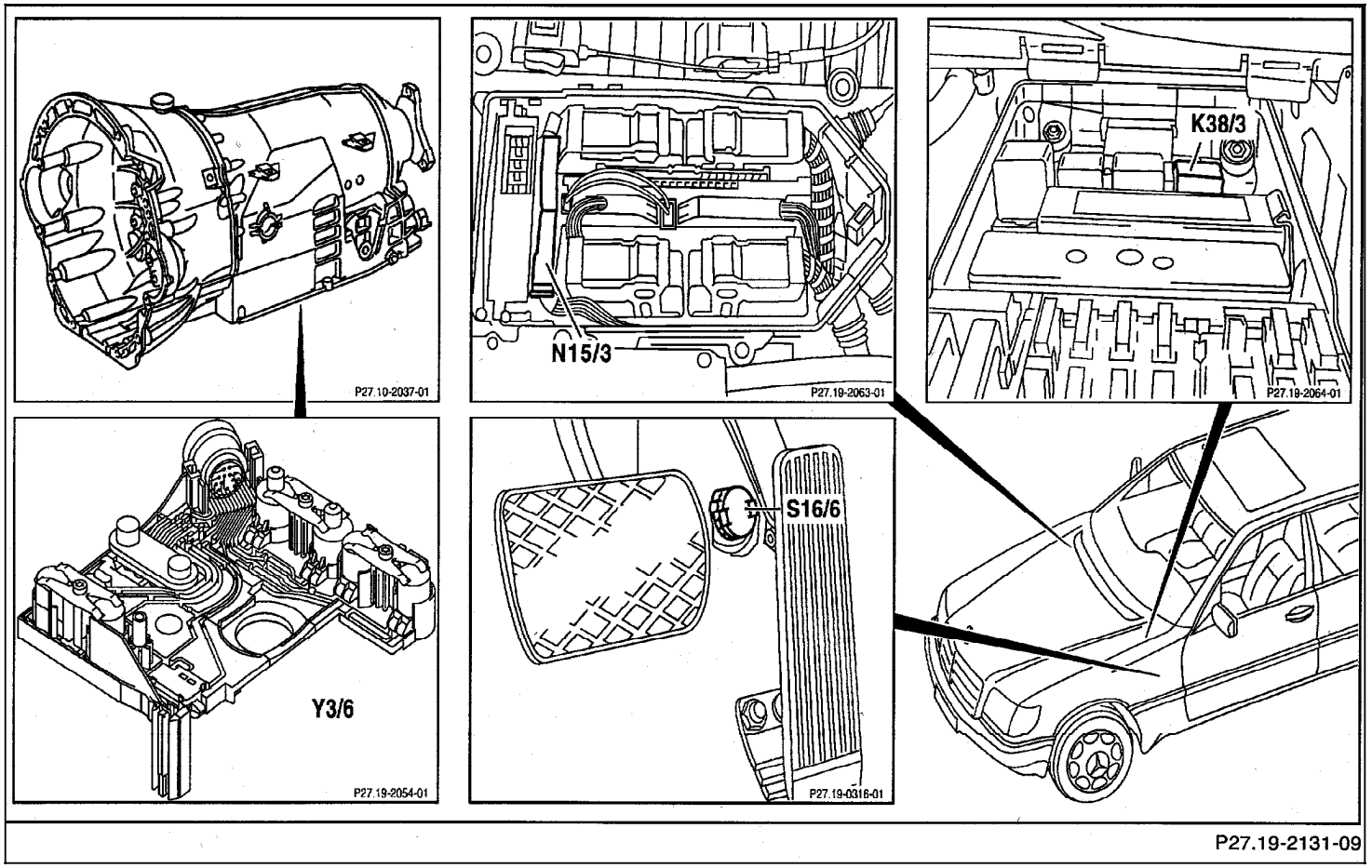


P27.19-2053-09

K38/3	Starter lock-out relay module
N15/3	ETC control module
S16/6	Kick-down switch
Y3/6	Valve unit (ETC)

Electrical Test Program – Component Locations

Model 140

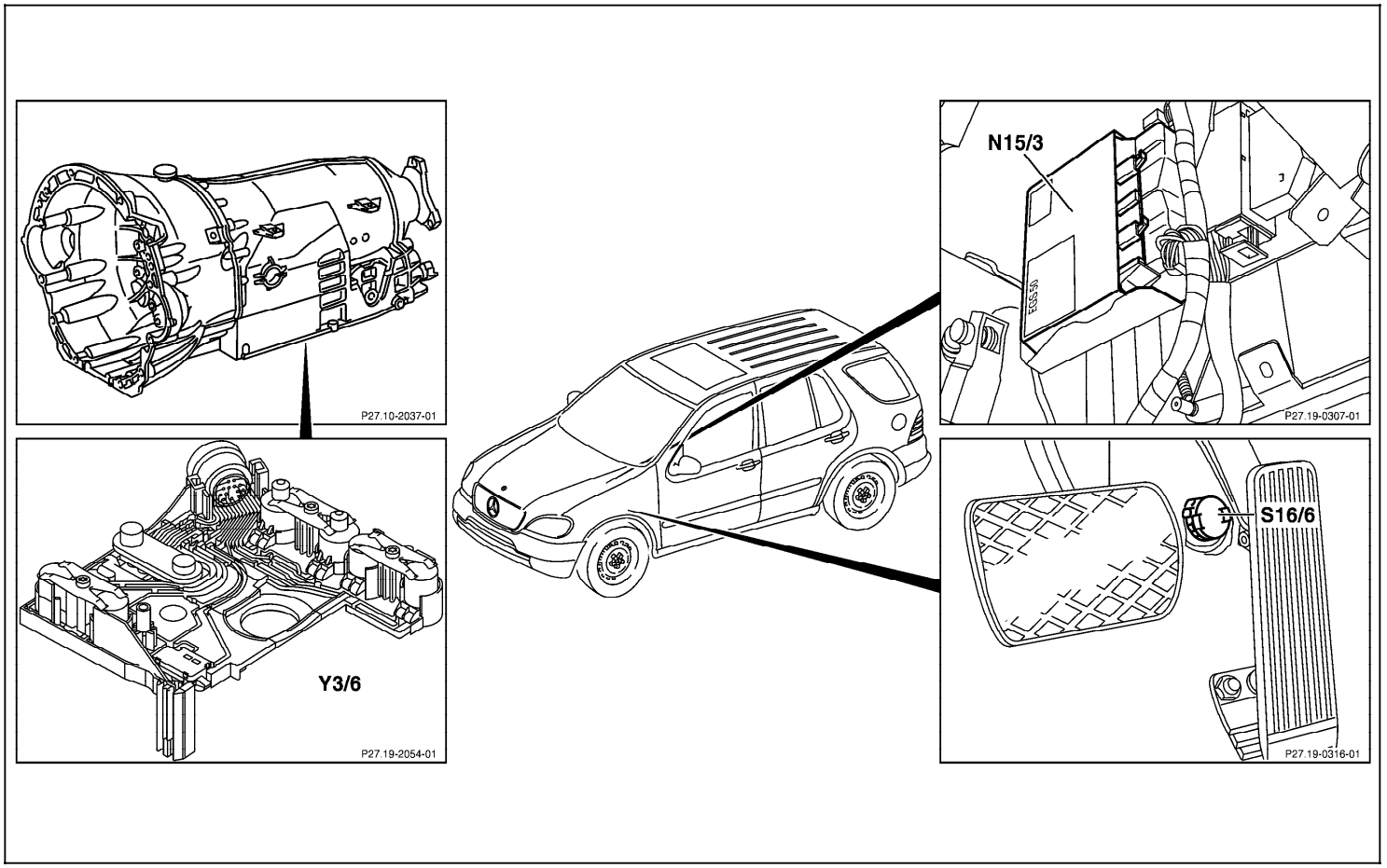


K38/3	Starter lock-out relay module
N15/3	ETC control module
S16/6	Kick-down switch
Y3/6	Valve unit (ETC)

P27.19-2131-09

Electrical Test Program – Component Locations

Model 163



N15/3	ETC control module
S16/6	Kick-down switch
Y3/6	Valve unit (ETC)

P27.19-2056-09