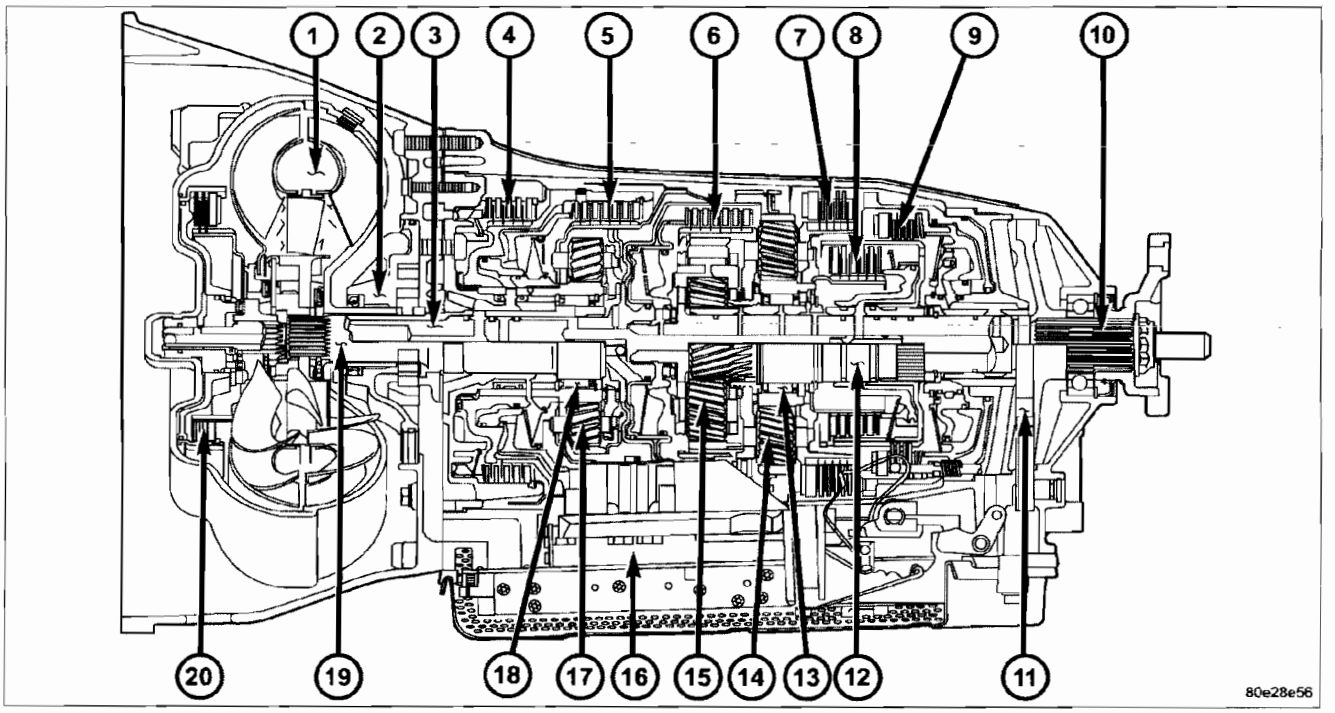

1 - TORQUE CONVERTER
2 - OIL PUMP
3 - DRIVESHAFT
4 - MULTI-DISC HOLDING CLUTCH B1
5 - DRIVING CLUTCH K1
6 - DRIVING CLUTCH K2
7 - MULTI-DISC HOLDING CLUTCH B3
8 - DRIVING CLUTCH K3
9 - MULTI-DISC HOLDING CLUTCH B2
10 - OUTPUT SHAFT
11 - PARKING LOCK GEAR
12 - INTERMEDIATE SHAFT
13 - FREEWHEEL F2
14 - REAR PLANETARY GEAR SET
15 - CENTER PLANETARY GEAR SET
16 - ELECTROHYDRAULIC CONTROL UNIT
17 - FRONT PLANETARY GEAR SET
18 - FREEWHEEL F1
19 - STATOR SHAFT
20 - TORQUE CONVERTER LOCK-UP CLUTCH

TRANSMISSION IDENTIFICATION

The transmission name, NAG1, means New Automatic Gearbox, generation 1.

The transmission can be generically identified visually by the presence of a round 13-way connector located near the front corner of the transmission oil pan, on the right side. Specific transmission information can be found stamped into a pad on the left side of the transmission, above the oil pan rail.

TRANSMISSION GEAR RATIOS

The gear ratios for the NAG1 automatic transmission are as follows:

1st Gear	3.59:1
2nd Gear	2.19:1
3rd Gear	1.41:1
4th Gear	1.00:1
5th Gear	0.83:1
Reverse	3.16:1

TRANSMISSION HOUSING

The converter housing and transmission are made from a light alloy. These are bolted together and centered via the outer multi-disc carrier of multi-disc holding clutch, B1 (4). A coated intermediate plate provides the sealing. The oil pump (2) and the outer multi-disc carrier of the multi-disc holding clutch, B1 (4), are bolted to the converter housing. The stator shaft (19) is pressed into it and prevented from rotating by splines. The electrohydraulic control unit (16) is bolted to the transmission housing from underneath. A sheet metal steel oil pan forms the closure.

MECHANICAL SECTION

The mechanical section consists of a driveshaft (3), output shaft (10), a sun gear shaft, and three planetary gear sets (14, 15 and 17) which are coupled to each other. The planetary gear sets each have four planetary pinion gears. The oil pressure for the torque converter lock-up clutch (20) and driving clutch K2 (6) is supplied through bores in the drive shaft (3). The oil pressure to driving clutch K3 (8) is transmitted through the output shaft (10). The lubricating oil is distributed through additional bores in both shafts. All the bearing points of the gear sets, as well as the freewheeling clutches and actuators, are supplied with lubricating oil. The parking lock gear (11) is connected to the output shaft (10) via splines.

Freewheel F1 (18) and F2 (13) are used to optimize the shifts. The front freewheel, F1 (18), is supported on the extension of the stator shaft (19) on the transmission side and, in the locking direction, connects the sun gear of the front planetary gear set (17) to the transmission housing. In the locking direction, the rear freewheel, F2 (13), connects the sun gear of the center planetary gear set (15) to the sun gear of the rear planetary gear set (14).

ELECTROHYDRAULIC CONTROL UNIT

The electrohydraulic control unit (16) comprises the shift plate made from light alloy for the hydraulic control and an electrical control unit. The electrical control unit comprises of a supporting body made of plastic, into which the electrical components are assembled. The supporting body is mounted on the shift plate and screwed to it.

Strip conductors inserted into the supporting body make the connection between the electrical components and a plug connector. The connection to the wiring harness on the vehicle and the transmission control module (TCM) is produced via this 13-pin plug connector with a bayonet lock.

SHIFT GROUPS

The hydraulic control components (including actuators), which are responsible for the pressure distribution before, during, and after a gear change are described as a shift group. Each shift group contains a command valve, a holding pressure shift valve, a shift pressure shift valve, overlap regulating valve, and a solenoid.

The hydraulic system contains three shift groups: 1-2/4-5, 2-3, and 3-4. Each shift group can also be described as being in one of two possible states. The active shift group is described as being in the shift phase when it is actively engaging/disengaging a clutch combination. The 1-2/4-5 shift group control the B1 (4) and K1 (5) clutches. The 2-3 shift group controls the K2 (6) and K3 (8) clutches. The 3-4 shift group controls the K3 (8) and B2 (9) clutches.

OPERATION

The transmission control is divided into the electronic and hydraulic transmission control functions. While the electronic transmission control is responsible for gear selection and for matching the pressures to the torque to be transmitted, the transmission's power supply control occurs via hydraulic elements in the electrohydraulic control module. The oil supply to the hydraulic elements, such as the hydrodynamic torque converter, the shift elements and the hydraulic transmission control, is provided by way of an oil pump connected with the torque converter.

The Transmission Control Module (TCM) allows for the precise adaptation of pressures to the corresponding operating conditions and to the engine output during the gearshift phase, resulting in a noticeable improvement in shift quality. The engine speed limit can be reached in the individual gears at full throttle and kickdown. The shift range can be changed in the forward gears while driving, but the TCM employs a downshift safeguard to prevent overrevving the engine. The system offers the additional advantage of flexible adaptation to different vehicle and engine variants.

DIAGNOSIS AND TESTING

AUTOMATIC TRANSMISSION

CAUTION: Before attempting any repair on a NAG1 automatic transmission, check for Diagnostic Trouble Codes with the DRBIII® scan tool.

Transmission malfunctions may be caused by these general conditions:

- Poor engine performance.
- Improper adjustments.
- Hydraulic malfunctions.
- Mechanical malfunctions.
- Electronic malfunctions.
- Transfer case performance.

Diagnosis of these problems should always begin by checking the easily accessible variables: fluid level and condition, gearshift cable adjustment. Then perform a road test to determine if the problem has been corrected or if more diagnosis is necessary.

DIAGNOSIS AND TESTING - PRELIMINARY

IF VEHICLE IS DRIVEABLE

1. Check for transmission fault codes using the DRBIII® scan tool.
2. Check the fluid level and its condition.
3. Adjust the gearshift cable if the complaint was based on delayed, erratic, or harsh shifts.
4. Road test the vehicle and note how the transmission upshifts, downshifts, and engages.

IF VEHICLE IS DISABLED

1. Check the fluid level and its condition.
2. Check for a broken or disconnected gearshift cable.
3. Check for a cracked or leaking cooler line, loose or missing pressure-port plugs.
4. Raise and support the vehicle on safety stands, start the engine, shift the transmission into gear, and note the following:
   a. If the propeller shaft turns but the wheels do not, inspect the differential and axle shafts.
   b. If the propeller shaft does not turn and the transmission is noisy, stop the engine. Remove the transmission oil pan, and check for debris. If the pan is clear, remove the transmission and check for a damaged flexplate, torque converter, oil pump, or input shaft.
   c. If the propeller shaft does not turn and the transmission is not noisy, perform the hydraulic-pressure test to determine if the concern is hydraulic or mechanical.

DIAGNOSIS AND TESTING - ROAD TESTING

Before road testing the vehicle, be sure that the fluid level and the control cable adjustments have been checked and adjusted if necessary. Verify that all the diagnostic trouble codes have been resolved.

Observe the engine's performance during the road test. A poorly tuned engine will not allow an accurate analysis of the transmission's operation.

Operate the transmission in all gear ranges. Check for shift variations and engine flare which indicates slippage. Note if shifts are harsh, spongy, delayed, early, or if part throttle downshifts are sensitive.

Slippage is indicated by engine flare, this usually means that the transmission has a clutch concern an overrunning clutch or a possible line pressure problem.

A slipping clutch can often be determined by comparing which internal units are applied in various gear ranges. The clutch application chart provides a basis for analyzing road test results.

CLUTCH APPLICATION

GEAR	RATIO	B1	B2	B3	K1	K2	K3	F1	F2
1	3.59	X*	X				X*	X	X
2	2.19		X		X		X*		X
3	1.41		X		X	X			
4	1.00				X	X	X		
5	0.83	X				X	X	X*	
N	X						X		
R	3.16	X*		X			X	X	
* = The shift components required during coast.									

DIAGNOSIS AND TESTING - AUTOMATIC TRANSMISSION

CONDITION	POSSIBLE CAUSES	CORRECTION
MAXIMUM SPEED 30 km/h	1. Speed Control 30 Actuated.	1. Instruct Customer.
ENGINE DIES WHEN TRANSMISSION IS SHIFTED INTO GEAR, ALSO NOISES IN N AND/OR P	1. PWM Valve Blocked. 2. Torque Converter Lock Up Control Valve Locked.	1. Replace Valve. 2. Enable Movement of Valve, Remove Particle.
LEVER IN "P" POSITION BLOCKED (BRAKE ACTIVATED)	1. No Vacuum Brake Booster After Long Immobilization, Brake Pedal Not Fully Applied/Hard Pedal. 2. No Stoplamp Switch Signal (no DTC IN PCM).	1. Check Vacuum/ Tightness of Brake Booster. 2. Check Contact to Stoplamp Switch. Replace Switch if Necessary.
GRUMBLING, DRONING, JERKING WHEN TCC IS ENGAGED	1. Slip Speed TCC too Low.	1. Switch Off Torque Converter Lock Up Using DRBIII®. If Complaint is Not Reproduced Afterwards, Replace PWM Valve, Set Adaption Values to Zero.
HOWLING, HUMMING ABOVE 4000 RPM IN EACH GEAR	1. Oil Filter Blocked. 2. Oil Pump.	1. Replace Oil Filter. 2. Replace Oil Pump.
WHINING, SINGING	1. Gear Set Noises in 1st, 2nd and 5th Gear. 2. Intermediate Bearing of the Drive Shaft at 0 km/h, Only When Cold.	1. Replace Transmission. 2. Replace Intermediate Bearing of the Drive Shaft.
"CLACK" NOISE FROM CENTER SHIFT AREA WHEN STOPPING OR STARTING	1. Park Lock Solenoid.	1. Replace Shift Lever Assembly.
CRACKING NOISE WHEN LOAD CYCLE	1. Stick - Slip Between Joint Flange and Collar Nut.	1. Install Zinc Coated Collar Nut Together with Washer.

CONDITION	POSSIBLE CAUSES	CORRECTION
CHATTERING IN CENTER CONSOLE SHIFT WHILE ACCELERATING	1. Bushing Shift Shaft has too Much Clearance.	1. Replace Shifter Lever and Cover Plate.
HARD 2-3 UPSHIFT WHEN STEPPING OFF THE ACCELERATOR PEDAL	1. Response Characteristic Control Loop.	1. Install K2 Disc Spring.
UPSHIFT 2-3, 3-4 SLIPPING	1. Spring of Regulating Valve Pressure control Valve Broken.	1. Replace Spring.
HARD 2-1 DOWNSHIFT WHEN COMING TO A STOP	1. Transmission (2-1 downshift) not Adapted. 2. TCM Software Data. 3. Freewheel F1 Defective.	1. Re-adapt Transmission. 2. Flash TCM. 3. Replace Freewheel F1.
HARD 3-2 DOWNSHIFT WHEN DECELERATION EVEN AFTER READAPTION	1. K3 Idles.	1. Install TCM and/or Electrohydraulic Control Unit.
NO RESP. DELAYED UPSHIFT, NO DTC	1. Different Tire Sizes are Mounted on the Front Axle.	1. Mount Uniform Tire Sizes on the Front Axle.
NO UPSHIFT 3-4, 4-5 AFTER FAST OFF (ACCELERATOR)	1. Upshift Prevention to Realize Dynamical Drivestyle.	1. Instruct Customer.
NO UPSHIFT OF 1ST GEAR BELOW 5000 RPM	1. Gear Recognition Switch.	1. Replace Gear Recognition Switch.
NO UPSHIFT INTO 5TH GEAR WHEN FULL THROTTLE OR KICK DOWN ACTIVATION	1. The Upshift 4-5 at Full Throttle or Kick Down Never Occurs Until Reaching Cut Off Speed. Under These Conditions, the High Powered Vehicle Will Never Shift Into 5th Gear Below 250 km/h.	1. Instruct Customer.
NO KICK DOWN SHIFTING	1. Accelerator Pedal Value < 95%.	1. Check Engine Control. Adjust as Necessary.
ENGINE TURNS UP WHILE 2-3 UPSHIFT AND/OR HARD 3-2 DOWNSHIFT	1. Oil Level too Low. 2. Oil Filter not Installed. 3. Freewheel F2 Defective.	1. Check Oil Level. Add if Necessary. 2. Install Oil Filter. 3. Replace Freewheel F2, Hollow Shaft, and Rear Sun Gear/Inner Disc Carrier K3.
GRABBING 2-3 COASTING UPSHIFT AND/OR BRAKE DOWNSHIFT	1. Oil Level too Low. 2. Oil Filter not Installed. 3. Control Shift or Command Valve Blocked. 4. K3 Disc Burnt, Hot Spots or Rubbed Down.	1. Check Oil Level. Add if Necessary. 2. Install Oil Filter. 3. Check Each Slide Valve for Base Position and Ease of Movement, Remove Particle. 4. Replace Inner and Outer Disc Carrier K3 and Control Valve.

CONDITION	POSSIBLE CAUSES	CORRECTION
DELAYED ENGAGEMENT, NO TRANSFER OF POWER IN R AND/OR D, ALSO AT TIMES	1. Oil Level too Low.	1. Check Oil Level. Add if Necessary.
	2. Recognition Switch - Selector Lever Position.	2. Replace Recognition Switch Only When Intermediate Position or Fault is Indicated.
	3. Oil Filter not Installed.	3. Install Oil Filter.
	4. AEV, Delayed Pressure Build Up on Piston B2/B3.	4. Install New Shifting Procedure (TCM, Electrohydraulic Control Unit or Repair Set).
	5. Wrong Combination TCM/ Electrohydraulic Control Unit.	5. Check Combination TCM/Electrohydraulic Control Unit. Replace TCM Resp. Electrohydraulic Control Unit, if necessary.
NO UPSHIFT OF 1ST GEAR AT TIMES	1. Connector Ballast Unit. Output Speed Sensor Loose, Incorrectly Contacted.	1. Check Connectors, Replace Output Speed Sensor if Necessary.
	2. Output Speed Sensor Defective	2. Replace Output Speed Sensor.
LEAKAGE AT THE AREA OF THE ELECTRICAL PLUG TO THE CONDUCTOR PLATE	1. Deformation O-rings.	1. Replace O-rings.
	2. Deformation Adapter.	2. Replace Adaptor.
	3. The Conductor Plate is not Fitted Surface to Surface on the Valve Body in One Corner, the Plug Is not Centered in the Socket and the O-ring Will Not Seal.	3. Remove Nose of Conductor Plate.
	4. Contacting At The Conductor Plate Leaky. Oil In Harness, Sometimes In The Control Module.	4. Replace Conductor Plate.
LEAKAGE AT THE AREA OF BELL HOUSING/ TORQUE CONVERTER	1. Bolts (Torx M6) Outer Disc Carrier B1.	1. Clean Thread and Install the Bolts Using Sealer.
OIL LEAKS	1. 6 Lower Bolts (TorxM8) Converter Housing.	1. Clean Thread and Install the Bolts Using Sealer.
	2. Oil Drain Plug Converter Loose Resp. No Seal Ring Installed.	2. Install Drain Plug Correctly.
	3. Weld Seam of Torque Converter Leaky.	3. Replace Torque Converter.
	4. Radial Sealing Ring Oil Pump Defective.	4. Replace Sealing Ring.
	5. O-ring Oil Pump Defective or not Installed.	5. Install O-ring.
	6. Bushing of Oil Pump Loose, caused by Missing Fit Bolt at Transmission/Engine Flange.	6. Install Fit Bolt if Necessary.