

270 Transfer Case

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GENERAL

This repair group covers the all-wheel drive (xDrive) transfer case. Internal transfer case repair is not covered. Special press tools and procedures are required to disassemble and service the internal geartrain.

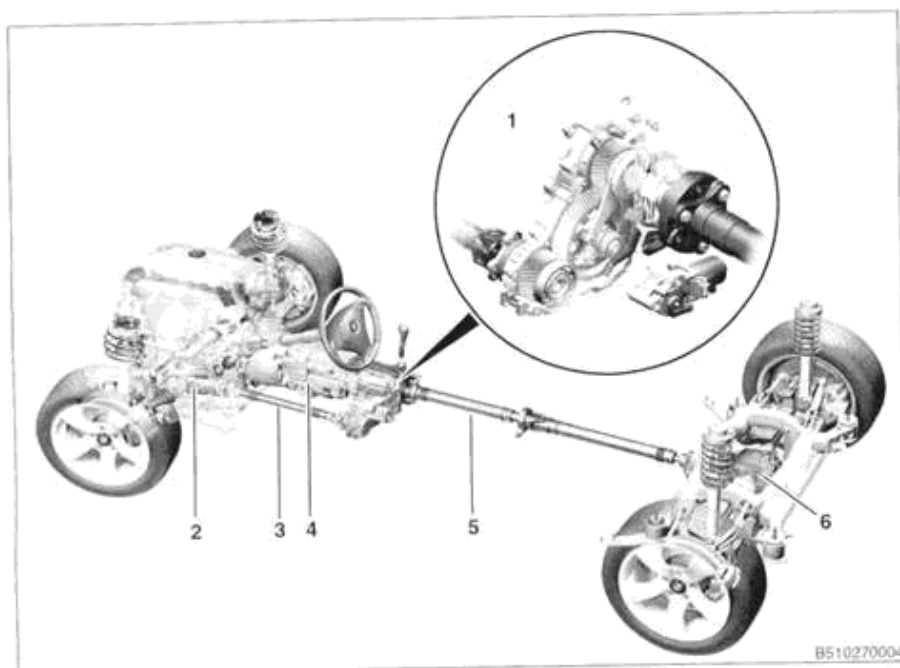
See also:

- 180 Exhaust System
- 200 Transmission-General
- 260 Driveshafts

xDrive overview

The BMW all-wheel drive (xDrive) control system is integrated with dynamic stability control (DSC).

The xDrive transfer case, bolted to the rear of the transmission, directs power from the transmission to both the front and rear differentials via driveshafts. The transfer case is permanently engaged to drive all four wheels all of the time.

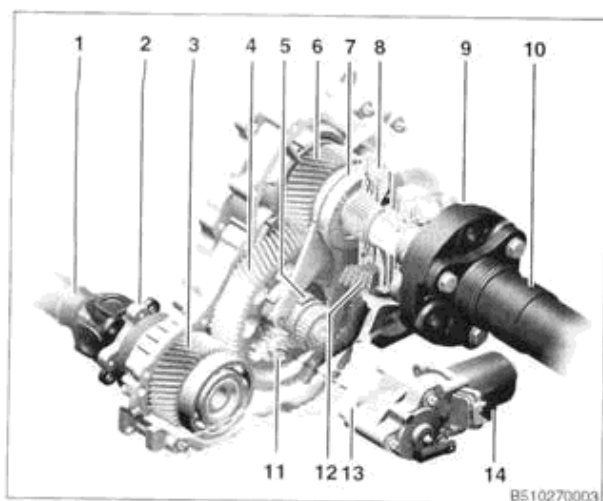


1. xDrive transfer case
 - Active torque control (ATC) 300
2. Front differential
3. Front driveshaft
4. Transmission
5. Rear driveshaft
6. Rear differential

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xDrive overview



Transfer case (ATC 300)

➤ The active torque control (ATC 300) transfer case uses an L-shaped series of spur gears to transfer power to the front driveshaft.

1. Front driveshaft
2. Front output flange
3. Front output gear
4. Idler gear
5. Clutch control cam
6. Drive gear
7. Control lever
8. Multi-disc clutch pack
9. Rear output flange
10. Rear driveshaft
11. Drive pinion
12. Multi-disc clutch disc pack
13. Clutch actuator drive gear
14. Clutch actuator (VTG) servo motor

Principles of operation (power flow)

➤ When the multi-disc clutch in the transfer case is disengaged, no driving torque is transmitted to the front axle. All of the driving torque is distributed to the rear axle. This is because the input shaft is splined to the rear driveshaft output, providing a permanent connection to the rear axle.

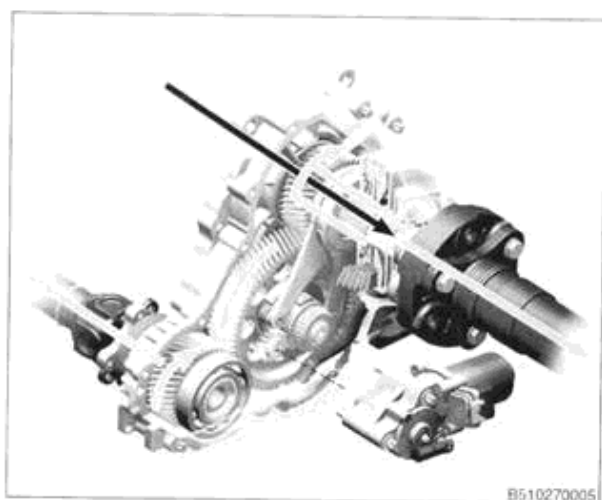
The multi-disc clutch couples the drive gear to the front driveshaft output flange. Torque to the front axle is increased or decreased by regulating locking pressure of the multi-disc clutch, providing a stepless coupling of the front axle to the drivetrain. This depends on DSC assessment of driving situations and road conditions.

When the multi-disc clutch is fully engaged, the front and rear axles turn at the same speed. Torque distribution front to rear is based on available traction at each axle. For example, when traction is identical on the front and rear axles and the driver accelerates from a stop in first gear at full throttle, the rear axle is capable of transferring greater torque to the road wheels without slipping, as vehicle weight shifts from front to rear. The clutches disengage, transferring most of the power to the rear axle.

Another example: If the front axle is on a high traction surface and the rear axle is on ice, virtually 100% of the available driving torque is transmitted to the front axle. Based on available traction, virtually no driving torque can be transferred to the driving wheels by the rear axle. When more torque is transmitted to the front axle, torque to the rear axle is proportionally reduced due to lack of traction.

The advantages of variable distribution of drive torque at front and rear axles are:

- Optimum utilization of lateral cornering and wheel peripheral forces applied at front and rear axles.
- Brake interventions by DSC reduced, thus increasing overall comfort.
- Torque distribution front to rear wheels more closely matched to differing friction values at the front and rear axles.



Even when DSC is switched OFF, transfer case control is active to ensure maximum traction and vehicle dynamics.

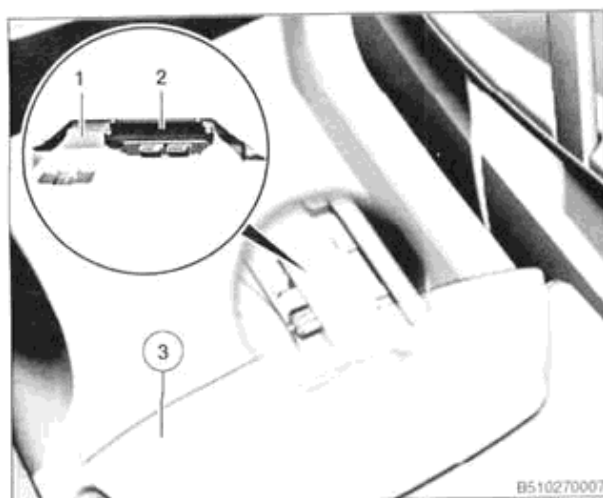
Permanent all-wheel drive is cancelled to a large extent or completely in three situations:

- When negotiating extremely tight corners with little engine torque, in order to allow speed equalization between the front and rear axle (e.g., when parking).
- At speeds in excess of 180 kph (112 mph).
- In extreme understeer driving situations.

Transfer case control module

- ◀ The transfer case (xDrive) control module is installed under the rug forward of the passenger front seat.

1. Kick guard
2. Transfer case control module
3. Passenger seat



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The control module is connected via powertrain CAN-bus (PT-CAN) to the DSC control module, engine control module (ECM), transmission control module (TCM) and body gateway module (KGM).

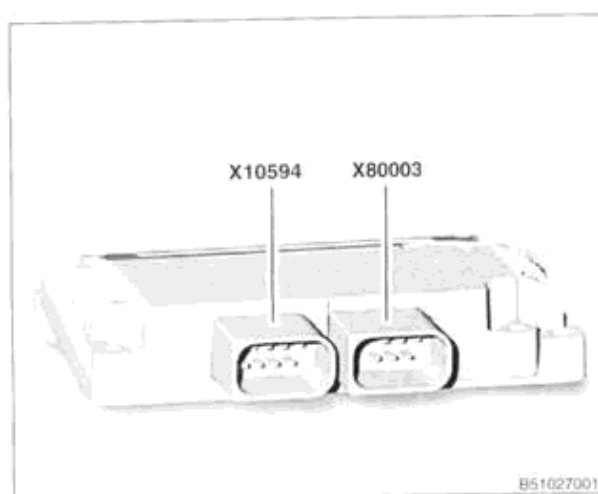
The control module regulates transfer case multi-disc clutch engagement to control the distribution of torque between front and rear axles. Torque adjustment requests are received from the DSC control module and trigger the power electronics circuitry required for the clutch actuator drive. Control module pin assignments are in **Table a** and **Table b**.

In case of DSC failure, an emergency program (limp-home mode) for locking up transfer case clutches allows all-wheel drive vehicle operation to be continued.

Transfer case control module pin assignments

Table a. Pin assignments for connector X10594 to vehicle electrical system via PT-CAN

Pin	Type	Description
1	Power	Terminal 30
2	Ground	Terminal 31
3	Input	Terminal 15 wake-up wire
4		not used
5		not used
6	Input / output	PT-CAN high
7	Input / output	PT-CAN low
8	Power	Terminal 30



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xDrive overview

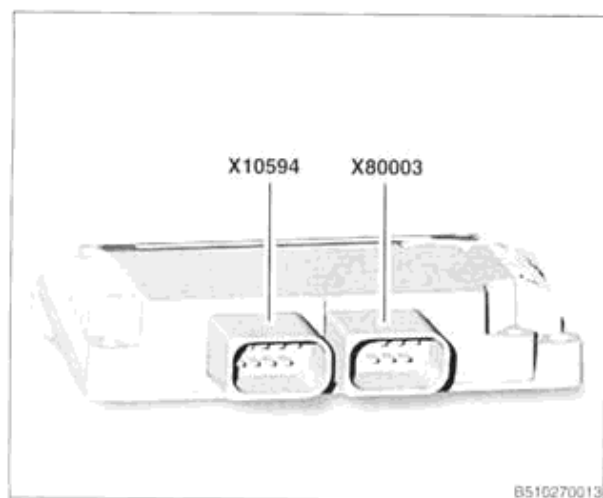


Table b. Pin assignments for connector X8003 to clutch actuator (VTG) motor

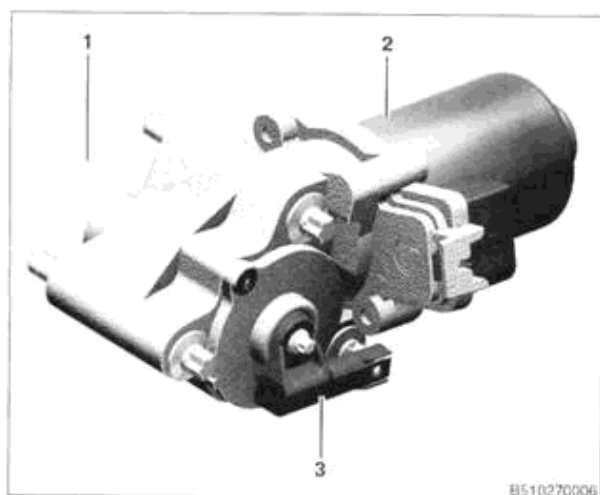
Pin	Type	Description
1	Input	Classification resistor
2	Input	Temperature sensor in VTG motor
3	Input	Negative wire from VTG motor
4	Output	Positive wire to VTG motor
5	Input	Negative lead from incremental sensor and classification resistor
6	Input	Positive lead for incremental sensor
7	Input	Incremental sensor (indicates direction of VTG motor rotation)
8	Input	Incremental sensor (indicates VTG motor position)

Classification resistor

Because of mechanical tolerances in production, the characteristic curve of the multi-disc clutch locking torque varies slightly. At the factory, once the actual locking torque is measured on the clutch test bench, a resistor is attached to the clutch actuator. The resistor value (classification) determines clutch locking torque characteristics.

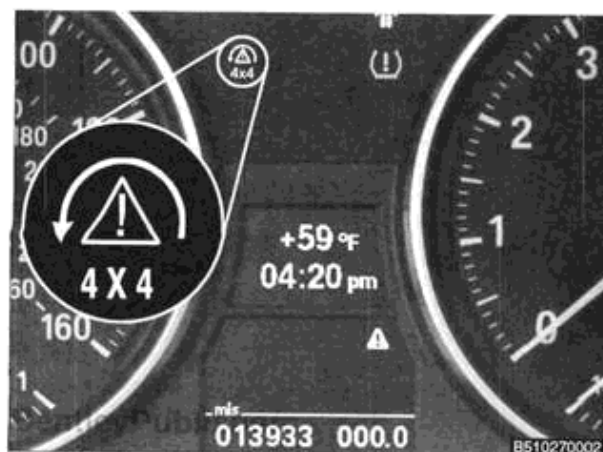
1. Clutch actuator drive gear
2. Clutch actuator (servo motor)
3. Classification resistor

Each time the engine is started, the transfer case control module measures the resistor value once and selects the optimum program map for transfer case engagement.



Warning lights

In case of DSC or xDrive system failure, instrument cluster warning lights and a gong warn the driver of malfunction(s). Use BMW scan tool to read out and diagnose faults.

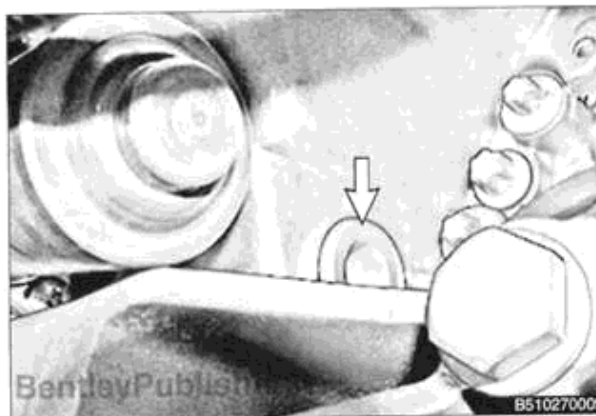
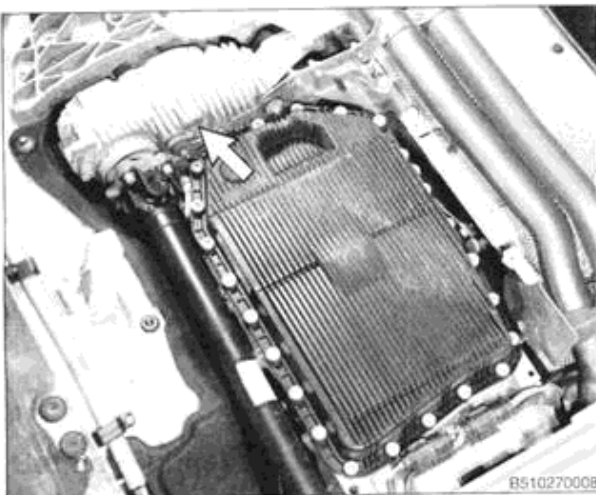


TRANSFER CASE SERVICE

Transfer case fluid service

xDrive transfer case oil monitoring is performed by the transfer case control module to determine when oil change is due.

- After performing work on transfer case, check fluid level. Be sure to use correct specification fluid.
- Remove drain plug (arrow) to drain transfer case.



Tightening torque

Drain plug to transfer case (M22)	60 Nm (44 ft-lb)
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- Fill case to lower edge of filler plug (arrow).

Transfer case fluid

Capacity	0.52 liter (0.55 US qt)
Fluid specification	BMW part no. 83 22 0 397 244

CAUTION—

- In order to prevent serious damage to transfer case, use only the recommended fluid.

Tightening torque

Fill plug to transfer case (M22)	60 Nm (44 ft-lb)
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270-6 Transfer Case

Transfer case, removing and installing

Transfer case, removing and installing

CAUTION—

- If replacing transfer case with new or used unit, be sure to also replace classification resistor corresponding to replacement case.

- Raise vehicle and support safely.

WARNING—

- Make sure the vehicle is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Remove splash shields underneath engine and transmission.
- Remove front end reinforcement plate. Discard fasteners.
- Remove exhaust system and exhaust heat shield. See **180 Exhaust System**.

WARNING—

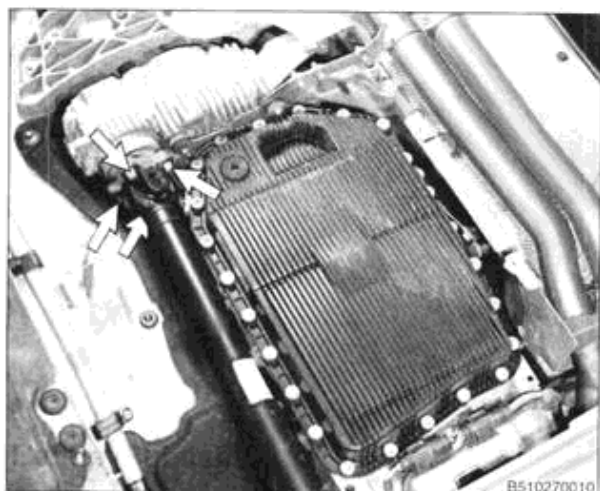
- Make sure exhaust system is fully cooled off before removing.

- Remove support brackets for heat and splash shields as needed.
- Use paint to match mark front and rear driveshaft mounting flanges to preserve original orientation.
- Remove front driveshaft fasteners (**arrows**) at transfer case output flange. Tie driveshaft to side.
- N54 engine: Support transmission with transmission jack, then remove transmission rear support.
- Match mark rear driveshaft mounting flange with paint to preserve original orientation.

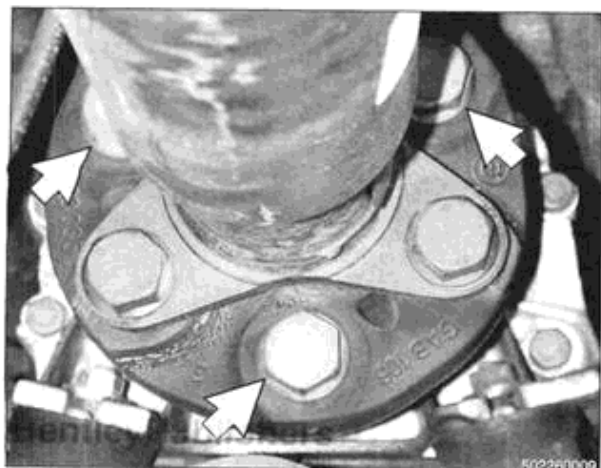
- Working at rear driveshaft front flex-disc, counterhold bolt heads (**arrows**) and remove nuts at transfer case output flange. Discard old fasteners.

CAUTION—

- To avoid damaging flex-disc rubber, be sure to hold bolts stationary while loosening nuts.



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Transfer case, removing and installing

- Remove driveshaft center bearing support fasteners. Support center of driveshaft.

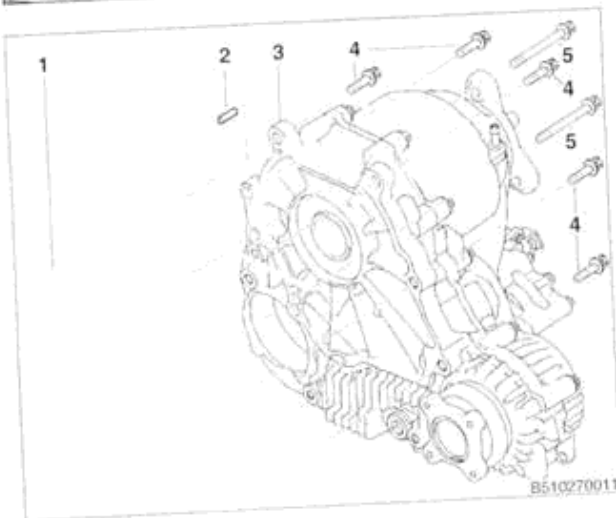
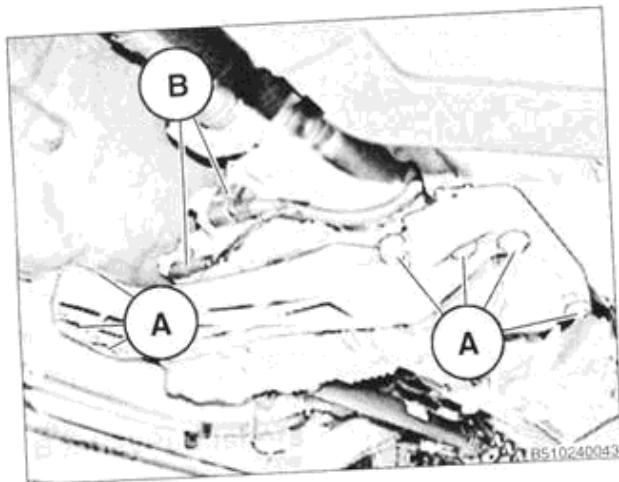
CAUTION—

- To prevent damage to rear driveshaft CV joint boot, do not allow driveshaft to hang down unsupported.

- Detach rear driveshaft flex-disc from transfer case. Hang driveshaft front section from body using stiff wire.

- ◀ With transmission supported on transmission jack:

- Remove transmission rear support mounting bolts (A). Remove support.
- Detach transfer case electrical connectors (B).



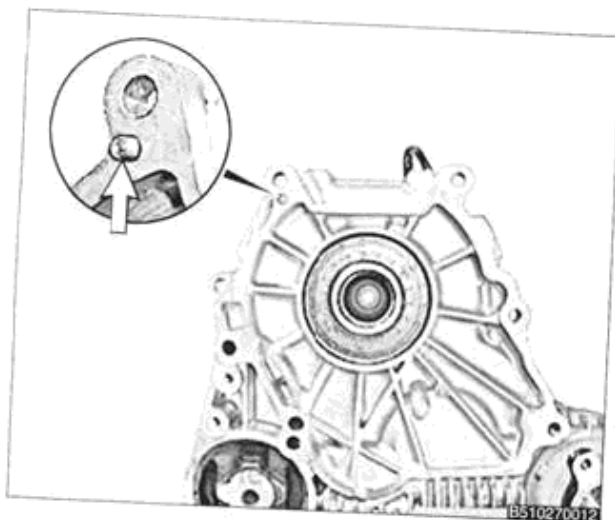
- ◀ While supporting transfer case, remove transfer case mounting bolts from transmission housing.

1. Transmission housing
2. Dowel pin
3. Transfer case ATC 300
4. M10 x 35 mm ZNS 8.8 grade bolt
 - Tighten to 43 Nm (32 ft-lb)
5. M10 x 80 mm ZNS 8.8 grade bolt
 - Tighten to 43 Nm (32 ft-lb)

- Lower transfer case. Check carefully to make sure no lines, hoses or wires become snagged.

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Transfer case, removing and installing



When installing:

- Inspect dowel pin (**arrow**) and replace if damaged.
- Transfer vents hose, covers and protective caps to new transfer case
- Replace transfer case input shaft sealing O-ring, if applicable.
- Apply thin coat of Weicon® antiseize grease to dowel pin and input shaft splines.

Tightening torques

Front driveshaft to transfer case or differential: Replace new M8 ZNS bolts with new	20 Nm (15 ft-lb) + additional 45°
Rear driveshaft flex-disc to transfer case: Replace M10 x 47 mm 10.9 grade ZNS fasteners with new	20 Nm (15 ft-lb) + additional 90°
Transfer case to transmission (M10 x 35 mm or M10 x 80 mm ZNS 8.8 grade bolt)	43 Nm (32 ft-lb)
Transmission rear support to body (M8)	19 Nm (14 ft-lb)
Transmission rear support to transmission	19 Nm (14 ft-lb)

- After completion of work, check and top off fluid level. See **Transfer case fluid service** in this repair group.
- When installing front end reinforcement plate, use new bolts. See **310 Front Suspension**.
- After filling transfer case, drive vehicle approximately 200 meters (600 ft) and recheck fluid level.
- Use BMW scan tool to carry out "Repair" service function and complete transfer case programming and coding. See **600 Electrical System-General**.

