

230 Manual Transmission

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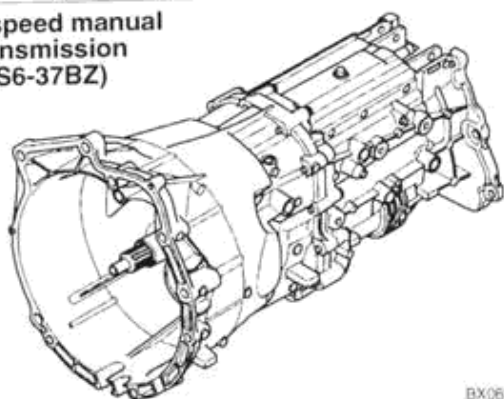
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6-speed manual transmission (GS6-37BZ)



GENERAL

This repair group covers manual transmission external service, including transmission removal and installation. Internal transmission repair is not covered. Special tools and procedures are required to disassemble and service the internal geartrain.

See also:

- 210 Clutch
- 250 Gearshift Linkage
- 260 Driveshafts
- 270 Transfer Case

Manual transmission applications and gear ratios

Several manual transmissions are used in 5 Series models. See Table a. Gear ratios are in Table b.

Table a. Manual transmission applications

Model (engine)	Year	BMW designation	Manufacturer designation
525i (M54)	2004 - 2006	GS6-37BZ / DZ	ZF 6HP19 type H
530i (M54, N52)	2004 - 2007	GS6-37BZ / DZ	ZF 6HP19 type H
525i, 528i (N52)	2006 - 2009	GS6-17BG	Getrag type I
525xi, 528xi, 530xi (N52)	2006 - 2009	GS6X37BZ / DZ	ZF 6HP19 type H
535i (N54)	2008 - 2009	GS6-53BZ / DZ	ZF 6HP26 type G
535xi (N54)	2008 - 2009	GS6X53DZ	ZF 6HP26 type G
545i, 550i (N62, N62TU)	2004 - 2009	GS6-53BZ	ZF 6HP26 type G

Table b. Manual transmission gear ratios

Gear	Getrag GS6-17BG	ZF GS6-37BZ / DZ ZF GS6X37BZ / DZ	ZF GS6-53BZ / DZ ZF GS6X53DZ
1 st	4.32 : 1	4.35 : 1	4.06 : 1
2 nd	2.46 : 1	2.50 : 1	2.40 : 1
3 rd	1.66 : 1	1.66 : 1	1.58 : 1
4 th	1.23 : 1	1.23 : 1	1.19 : 1
5 th	1.00 : 1	1.00 : 1	1.00 : 1
6 th	0.85 : 1	0.85 : 1	0.87 : 1
Reverse	3.94 : 1	3.93 : 1	2004 - 2005: 3.77 : 1 2006 - 2009: 3.68 : 1

Cautions

CAUTION—

- When performing any repair which involves separating the engine and transmission, check that the bell housing dowels are undamaged and properly in place before reassembly. If the alignment of the engine flywheel to the transmission input shaft or torque converter is incorrect any of the following complaints may result: Clutch slipping, shudder, or poor disengagement; noise from transmission input shaft; transmission popping out of gear; difficulty changing gears; or internal damage to the transmission.
- When removing interior trim clips, avoid damaging trim pieces by using a plastic prying tool or a screwdriver with the tip wrapped with masking tape.
- To avoid electrochemical corrosion to engine components made of aluminum-magnesium alloy, do not use steel fasteners. Use aluminum fasteners only.
- The end faces of aluminum fasteners are usually painted blue. For reliable identification, test fasteners for aluminum composition with magnet.
- Replace aluminum fasteners each time they are loosened.
- Follow torque instructions, including angle of rotation specifications, when installing aluminum fasteners.
- Fill manual transmission only with BMW approved synthetic oil. Filling with incorrect lube could cause the following damage:
 - Premature synchromesh ring wear.
 - Reduced service life of bearings.
 - Tooth profile damage.
 - Faster wear of selector forks.
 - Damage to radial shaft oil seals.

TRANSMISSION FLUID SERVICE

Manual transmissions in 5 Series models are provided with lifetime lubrication. No oil change is required for the entire service life of these transmissions. If repairs have to be made to the transmission, use only the recommended lifetime fluid to refill.



- Usually, the transmission fluid sticker near the fill plug identifies the lifetime transmission fluid used at the factory.

Table c. Manual transmission fluids

Transmission	Year range	Fluid type
Getrag GS6-17BG ZF GS6-37BZ ZF GS6X37BZ ZF GS6-53BZ ZF GS6X53BZ	2004 - 2005 from 2006	MTF-LT-2 MTF-LT-3
MTF-LT-2 (Lifetime fluid) BMW part no. 83 22 0 309 031		
MTF-LT-3 (Lifetime fluid) BMW part no. 83 22 0 409 878		

Transmission fluid level, checking

- Drive vehicle for a few miles to warm transmission.
- Raise and safely support vehicle to access transmission filler plug. Make sure vehicle is level.

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 plastic splash shield under transmission. See **020 Maintenance**.

- Remove fill plug (B). Be prepared to catch dripping fluid.

- Insert gloved finger in fill hole to check fluid level.
 - If fluid level is up to bottom of fill hole (finger is wetted by transmission fluid), level is correct.
 - If level is low, slowly fill transmission with fluid until fluid overflows fill hole.
- Install and torque fill plug.

Tightening torque

Drain or fill plug to transmission case:	
• M12 x 1.5	25 Nm (18 ft-lb)
• M18 x 1.5	35 Nm (26 ft-lb)

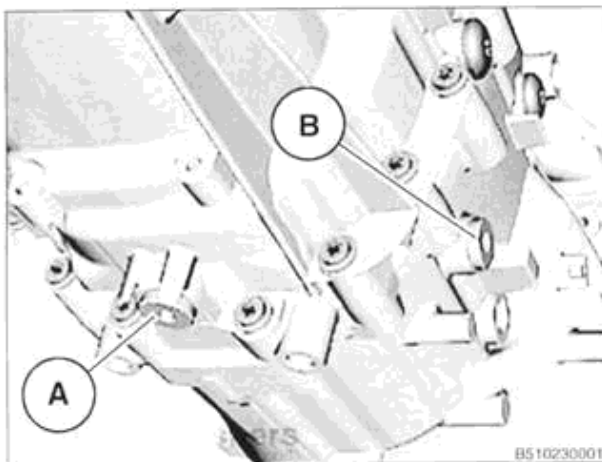
Transmission fluid, replacing

- Drive vehicle for a few miles to warm transmission.
- Raise and safely support vehicle to access transmission drain plug.

WARNING —

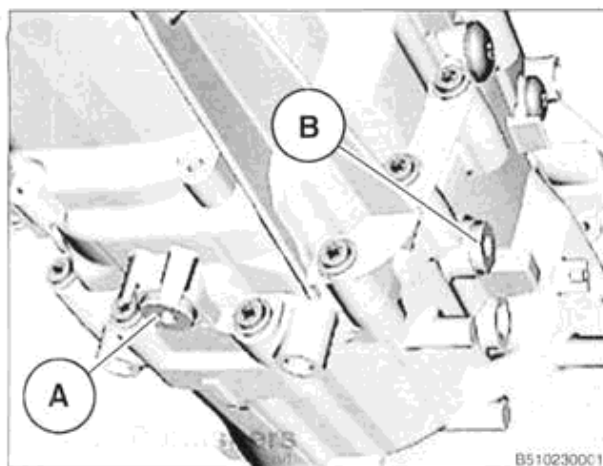
- Make sure the vehicle is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Remove plastic splash shield under transmission. See **020 Maintenance**.



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Back-up light switch, replacing



- Place drain pan under transmission and remove drain plug (A) at bottom of transmission.

- Drain fluid.
- Install and torque drain plug.
- Remove fill plug (B) from side of transmission.
- Slowly fill transmission with fluid until fluid overflows fill hole.

Table d. Manual transmission fluid capacities

Transmission	Initial fill, new or rebuilt unit	Fluid change
Getrag GS6-17BG	1.4 liter (1.5 US qt)	1.3 liter (1.4 US qt)
ZF GS6-37BZ	1.6 liter (1.7 US qt)	1.5 liter (1.6 US qt)
ZF GS6-53DZ	1.6 liter (1.7 US qt)	1.5 liter (1.6 US qt)

- Install and torque fluid fill plug.

Tightening torque

Drain or fill plug to transmission case:

- M12 x 1.5
- M18 x 1.5

25 Nm (18 ft-lb)
35 Nm (26 ft-lb)

TRANSMISSION EXTERNAL SERVICE

Back-up light switch, replacing

Back-up light switch location on manual transmission varies.

- Getrag GS6-17BG or ZF GS6-17BZ / DZ transmission. Back-up light switch (arrow) on right side of transmission toward rear.



- ZF GS6-53BZ / DZ transmission. Back-up light switch (arrow) on right side of transmission toward rear.

- Raise and safely support vehicle to access back-up light switch.

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 plastic splash shield under transmission. See 020 Maintenance.

- Detach back-up light switch harness connector. Unscrew switch from transmission.

- Install new switch and reconnect harness connector.

Tightening torque

Back-up light switch to transmission	16 Nm (13 ft-lb)
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- Check transmission fluid level before lowering vehicle. Top off as necessary. See **Transmission Fluid Service** in this repair group.

Selector shaft seal, replacing

This repair can be performed with transmission installed in vehicle.

- Place transmission into second gear.
- 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 underbody splash shields.
- Remove exhaust system. See **180 Exhaust System**.

WARNING—

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

- Remove exhaust heat shields.
- xDrive models: Remove front drive shaft. See **260 Driveshafts**.
- All models: Remove rear driveshaft from output flange:
 - Remove driveshaft center bearing support fasteners. Support center of driveshaft.
 - Detach rear driveshaft flex-disc from transfer case.
 - Lower center of driveshaft sufficiently to disengage flex-disc from transfer case flange. Tie driveshaft to side.

CAUTION—

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

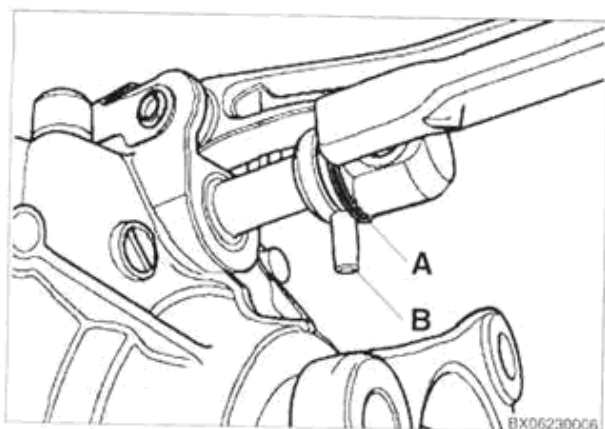
- Free harnesses for oxygen sensors and back-up light switch from rear transmission support.

- Support end of transmission with suitable jack. Remove mounting fasteners (**arrows**) for rear transmission support.

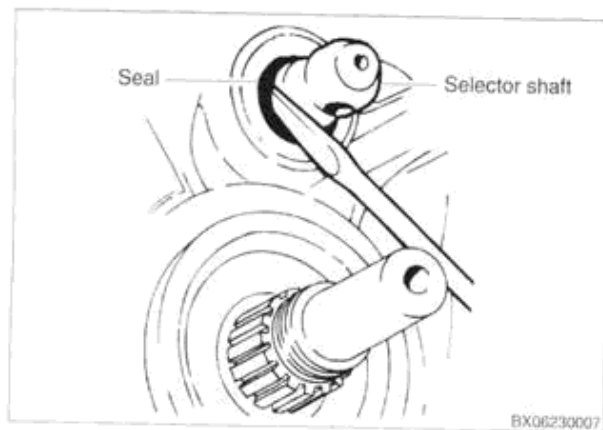


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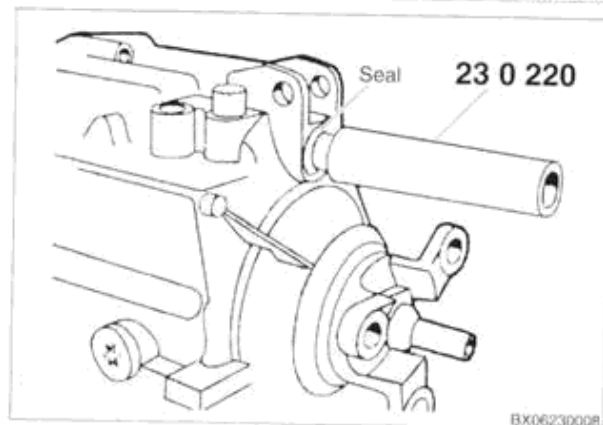
Transmission input shaft seal, replacing



- Working at top rear of transmission at shifter console, pry locking spring (A) out of groove and press pin (B) out of shift coupling.
- Detach shift coupling and shift linkage from selector shaft and tie aside.



- Carefully pry out selector shaft oil seal with BMW special tool 23 0 210, or with a narrow seal remover or small screwdriver.



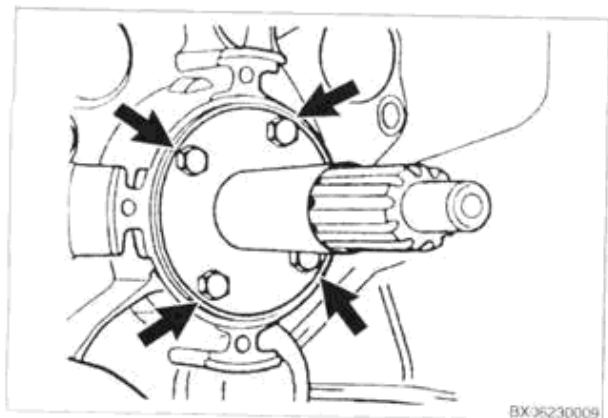
- Coat new selector shaft seal with transmission fluid. Drive new seal in flush with housing. Use BMW special seal installation tool 23 0 220 or equivalent and a soft-faced (plastic) hammer.
- Remainder of installation is reverse of removal. Check transmission and transfer case oil level, topping up as necessary.

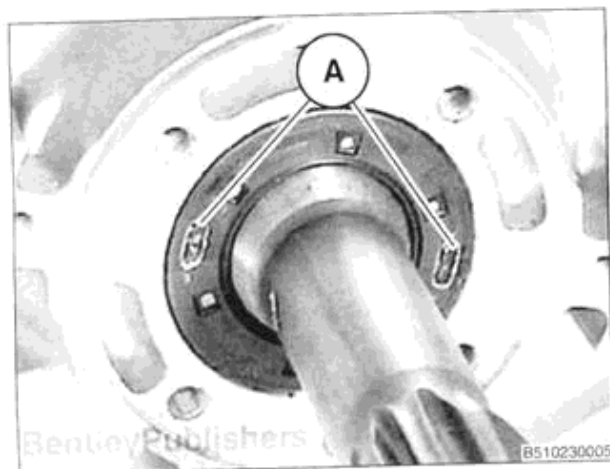
Tightening torques

Transfer case to transmission	43 Nm (31 ft-lb)
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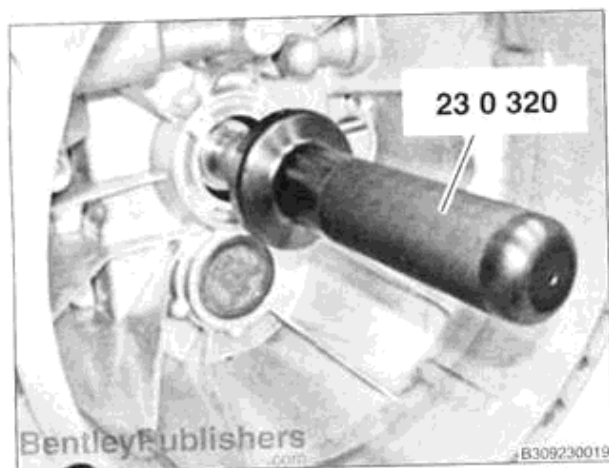
Transmission input shaft seal, replacing

- Remove transmission from vehicle. See **Transmission, removing and installing** in this repair group.
- Remove clutch release bearing / release lever module from inside bell housing. See **210 Clutch**.
- Remove bolts (arrows) for clutch release-bearing guide sleeve. Remove guide sleeve.





- Two covered removal holes (1) are present in seal. Thread BMW special tool 23 0 490 or equivalent slide hammer seal puller into one hole and remove seal.



- To install new seal:
- Push radial seal on BMW special tool 23 0 320.
 - Coat sealing lip of new seal with transmission oil.
 - Slide tool onto input shaft.
 - Use plastic hammer to drive in seal until fully seated.

- Thoroughly clean clutch release bearing guide sleeve mounting bolts, sealing surfaces, and threads. Apply Loctite®243 or equivalent thread locking compound to guide sleeve bolts. Reinstall guide sleeve and spacer (if equipped).

Tightening torque

Guide sleeve to transmission housing	25 Nm (18 ft-lb)
• M8 X 30	18 Nm (13 ft-lb)
• M8 X 22	10 Nm (7 ft-lb)
• M6	

- Replace clutch release bearing / release lever module. See **210 Clutch**.
- Reinstall transmission.

Transmission output shaft seal, replacing

- Disconnect negative (-) cable from battery.

CAUTION—

- Prior to disconnecting the battery, read the battery disconnection cautions given in **001 Warnings and Cautions**.

- Raise and safely support vehicle.

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 underbody splash shields.

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Transmission output shaft seal, replacing

- Remove complete exhaust system. See **180 Exhaust System**.

WARNING—

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

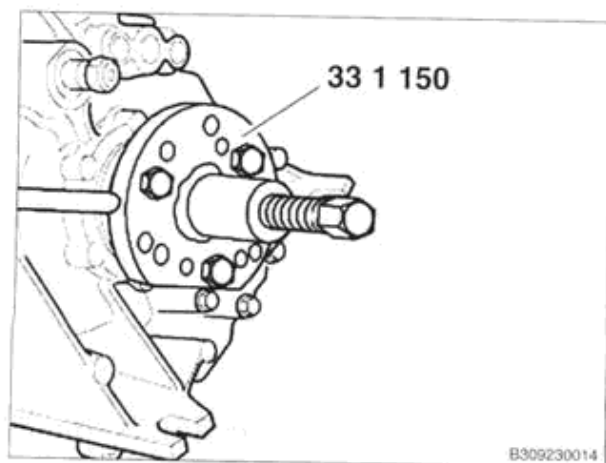
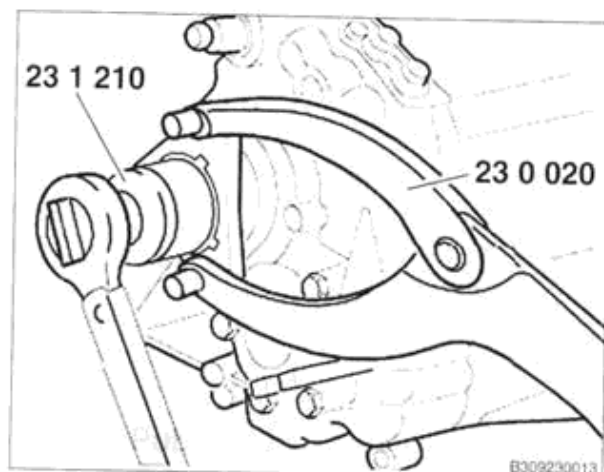
- Remove exhaust system heat shields.
- Remove rear driveshaft from output shaft:
 - Remove driveshaft center bearing support fasteners. Support center of driveshaft.
 - Detach rear driveshaft flex-disc from transfer case.
 - Lower center of driveshaft sufficiently to disengage flex-disc from transfer case flange. Tie driveshaft to side.

CAUTION—

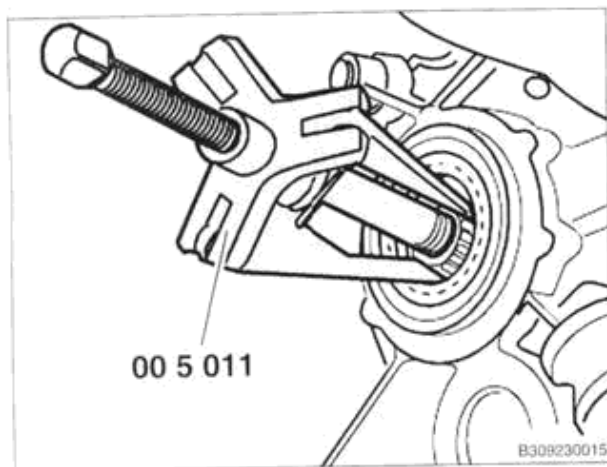
- To prevent damage to rear driveshaft CV joint, do not allow driveshaft to hang down unsupported.

- xDrive models: Remove transfer case. See **270 Transfer Case**.

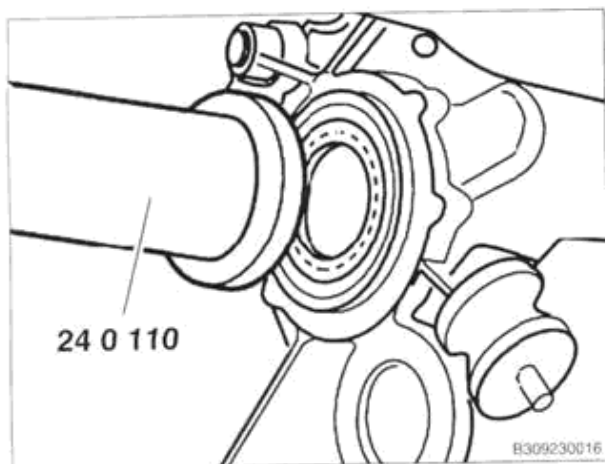
- ◀ Counterhold output flange with BMW special tool 23 0 020 and release flange collar nut using BMW special tool 23 1 210.



- ◀ Remove output flange using BMW special tool 33 1 150 or suitable puller.



- Remove output shaft seal using BMW special tool 00 5 011 or suitable seal puller.



- When installing new seal, coat seal lips with transmission fluid. Use BMW special tool 24 0 110 and plastic hammer to drive seal in flush.

- Remainder of installation is reverse of removal. Remember to:
 - Replace collar nut with new.
 - Use Loctite® 431 on output shaft threads when installing collar nut.
 - Follow 3 step tightening procedure (tighten, release, tighten down).
 - Check transmission fluid level and check system for leaks.

Tightening torque

Transmission output flange to transmission (GS6-17BG and GS6-37BZ transmission)	
• Pretension	170 Nm (125 ft-lb)
• Release	Release tension
• Tighten down	120 Nm (89 ft-lb)
Transmission output flange to transmission (GS6-53DZ transmission)	
• Pretension	200 Nm (148 ft-lb)
• Release	Release tension
• Tighten down	140 Nm (103 ft-lb)

230-10 Manual Transmission

Transmission, removing and installing

TRANSMISSION REMOVAL AND INSTALLATION

Removal and installation of the transmission is best accomplished with the vehicle on a lift and using a transmission jack. Support engine using equipment which allows the engine to pivot on its mounts to access the upper bolts at the transmission bell housing.

WARNING—

- The removal of the transmission may upset the balance of the vehicle on a lift.

Transmission, removing and installing

- Disconnect negative (-) cable from battery.

CAUTION—

- Prior to disconnecting the battery, read the battery disconnection cautions given in **001 Warnings and Cautions**.

- Raise and safely support vehicle.

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.

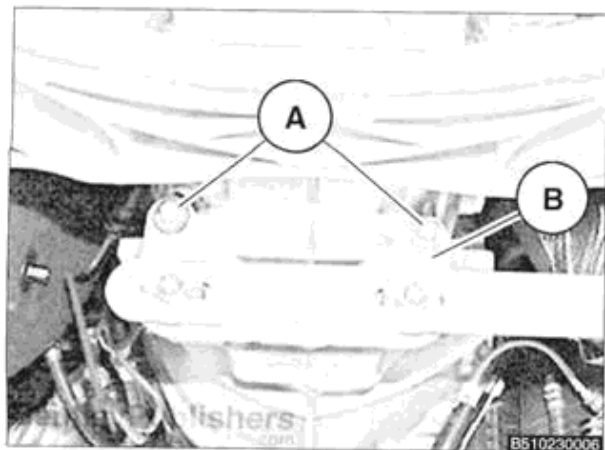
- Remove underbody splash shields. See **020 Maintenance**.
- Remove front end reinforcement plate.
- Remove complete exhaust system. See **180 Exhaust System**.

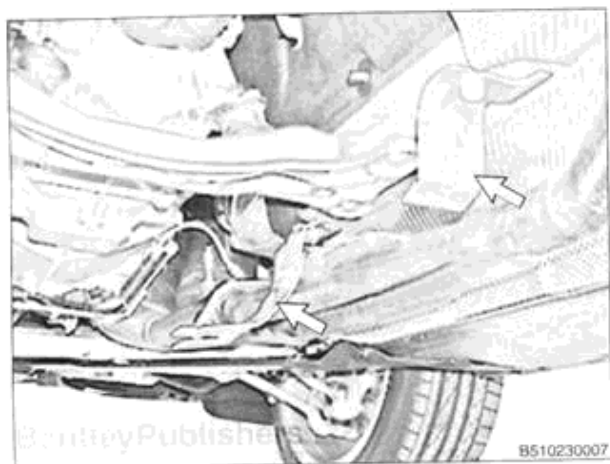
WARNING—

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

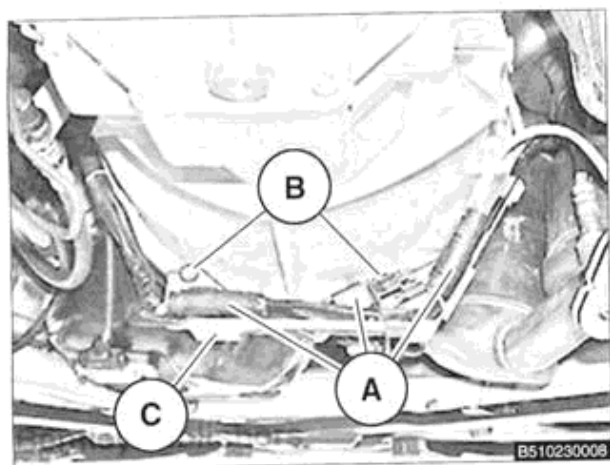
- Remove exhaust system heat shields.
- xDrive models: Remove front drive shaft. See **260 Driveshafts**.
- Disconnect harness connector from back-up light switch on transmission. See **Back-up light switch, replacing** in this repair group.

- Remove fasteners (A) and remove exhaust bracket (B).

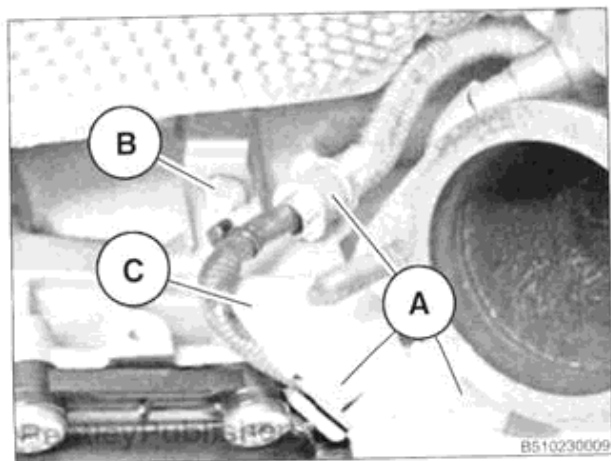




- Remove underbody splash shields brackets (arrows).



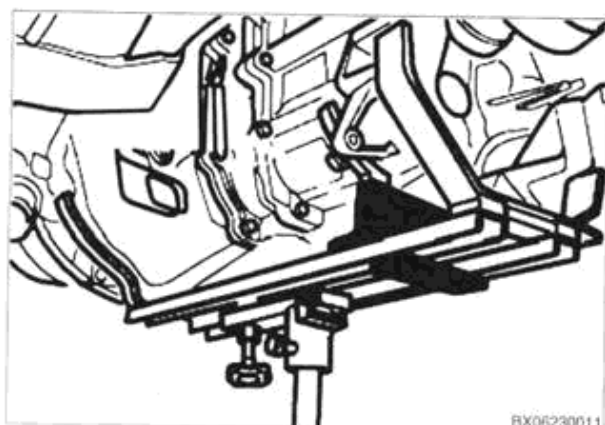
- Disconnect oxygen sensor harness connectors (A) and remove fasteners (B) from connector bracket (C).



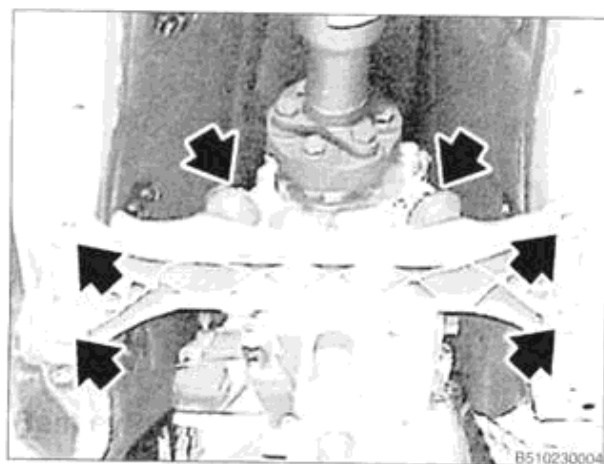
- Unclip oxygen sensor harness (A) from bracket (B). Remove fastener and remove bracket (C) from transmission.

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Transmission, removing and installing



- Support transmission on transmission jack. Secure transmission to jack.



- Remove mounting fasteners (**arrows**) for rear transmission support.
- xDrive models: Detach xDrive servomotor harness connectors at transfer case.
 - Lower transmission jack slowly, allowing engine and transmission assembly to tilt back and down slightly.

CAUTION—

- Tilting the engine to lower the transmission can lead to damage to engine compartment components due to lack of clearance at rear of engine. Lower transmission carefully while checking engine rear clearance.

- All models: Remove rear driveshaft from output flange:
 - Remove driveshaft center bearing support fasteners. Support center of driveshaft.
 - Detach rear driveshaft flex-disc from transmission or transfer case output flange.
 - Lower center of driveshaft sufficiently to disengage flex-disc from output flange. Tie driveshaft to side.

CAUTION—

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

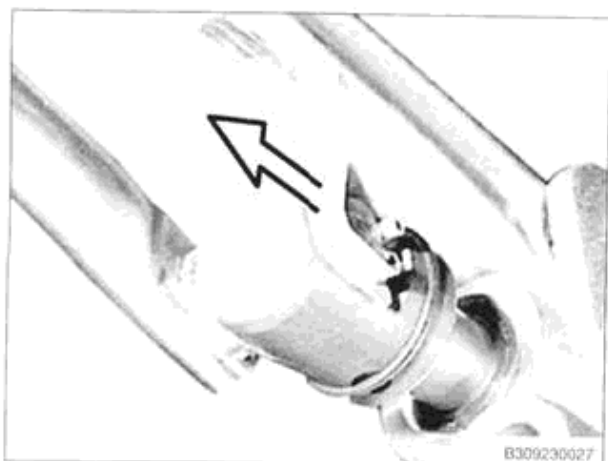
- Unbolt clutch slave cylinder from side of transmission. Do not disconnect fluid hose. Suspend slave cylinder from chassis using stiff wire.

CAUTION—

- Unbolt clutch slave cylinder slowly to prevent air being drawn into hydraulic system.
- Do not operate clutch pedal with slave cylinder removed from transmission.

Manual Transmission 230-13

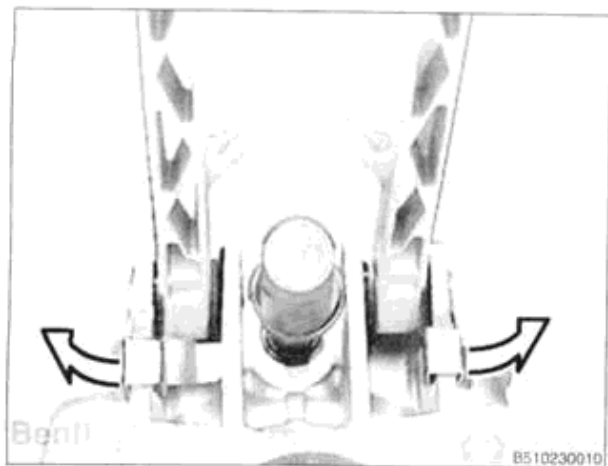
Transmission, removing and installing



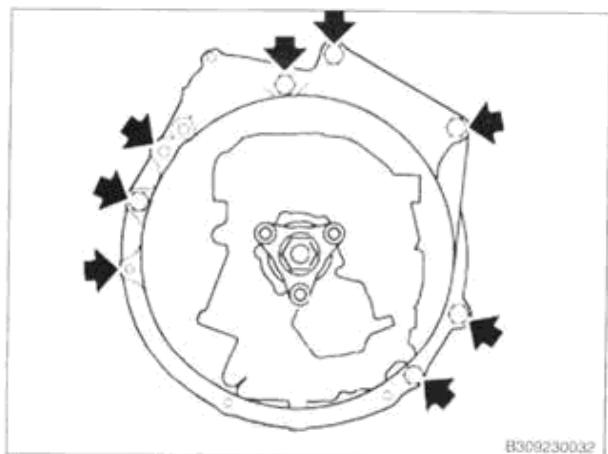
- Remove shift rod clip (**arrow**) and disconnect shift linkage from selector shaft coupling.

NOTE—

- A new, more secure, shift rod clip is fitted as of 04 / 2008. Use new specification shift rod clip when reassembling.
- Disconnect shift console from top of transmission. See 250 Gearshift Linkage.
- Support front of engine with tall jack stand or hydraulic jack.



- Release locking clips (**arrows**) and lift out shift arms.



- Remove transmission mounting Torx-head bolts (**arrows**). Note length and location of bolts.

CAUTION—

- Number, size and location of fasteners varies with transmission installed.

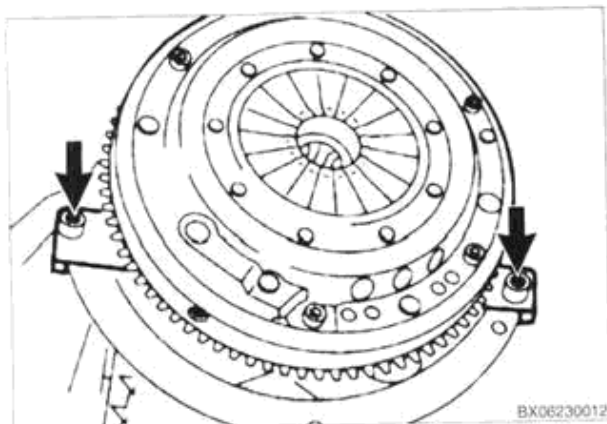
- Remove transmission by pulling backward until transmission input shaft clears clutch disc splines, then pull downwards. Lower transmission jack to remove transmission.

CAUTION—

- Do not allow transmission to hang from input shaft.

230-14 Manual Transmission

Transmission, removing and installing



◀ Be sure bell housing alignment dowel sleeves (**arrows**) are located correctly. Replace damaged sleeves.

- Inspect clutch, clutch release bearing and flywheel. See **210 Clutch**. Repair as necessary.
- Check and repair transmission seals. See **Transmission External Service** in this repair group.
- Reinstall transmission and xDrive transfer case (if equipped), keeping in mind the following:
 - If installing a new transmission, be sure to transfer parts from old transmission.
 - Thoroughly clean input shaft and clutch disc splines. Lightly lubricate transmission input shaft splines before installing.

CAUTION—

- Replace aluminum bolts each time they are loosened.
- Follow torque instructions, including angle of rotation specifications, when installing aluminum fasteners.

Tightening torques

Front end reinforcement to front end (use new fasteners): • Stage 1 • Stage 2	56 Nm (41 ft-lb) additional 90°
Slave cylinder to transmission	22 Nm (16 ft-lb)
Transmission rear support to body (M8)	19 Nm (14 ft-lb)
Transmission mount to rear support (M8)	19 Nm (14 ft-lb)
Transmission to engine (use new aluminum bolts): • M10 x 30 mm - Stage 1 - Stage 2 • M10 x 85 mm - Stage 1 - Stage 2 • M12 - Stage 1 - Stage 2	20 Nm additional 90° - 110° 20 Nm additional 180° - 200° 25 Nm additional 130° + 20°
Vibration damper to transmission rear support (M10)	38 Nm (28 ft-lb)



- Reinstall transmission support. Center rear of transmission in driveshaft tunnel before tightening support bracket bolts (arrows).

Tightening torques

Transfer case to transmission	43 Nm (31 ft-lb)
Transfer case support	42 Nm (30 ft-lb)
• To chassis (M10)	74 Nm (55 ft-lb)
• To transfer case rubber mount (M12)	

- Reinstall driveshafts using new self-locking nuts. See **260 Driveshafts**.

CAUTION—

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

Tightening torques

Front driveshaft flex-disc to front differential flange (replace fasteners) (M10 10.9)	60 Nm (44 ft-lb)
Rear driveshaft flex-disc to transfer case output flange	100 Nm (74 ft-lb)

- xDrive models: Refill transfer case. See **270 Transfer Case**.

Tightening torque

Fill plug to transfer case	33 Nm (24 ft-lb)
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- Refill transmission before starting or towing vehicle. See **Transmission Fluid Service** in this repair group.

Tightening torque

Drain or fill plug to transmission case:	
• M12 x 1.5	25 Nm (18 ft-lb)
• M18 x 1.5	35 Nm (26 ft-lb)



