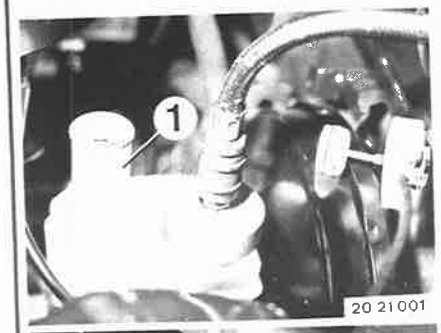
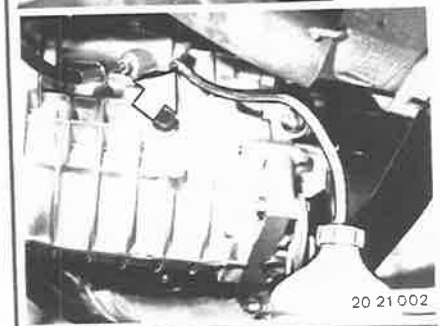
21 Clutch

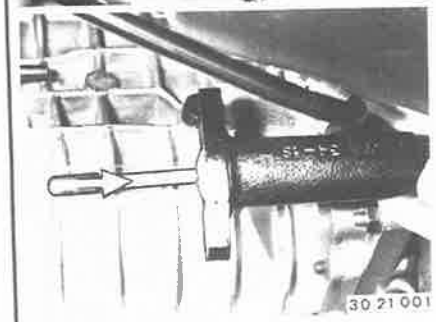


21 00 006 BLEEDING CLUTCH

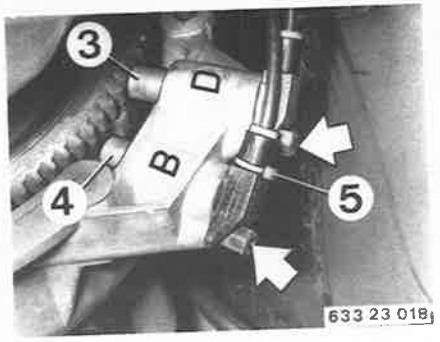
Unscrew cap on brake fluid tank.
Remove float container (1).
Connect bleeder.



Open bleeder screw on clutch slave cylinder until escaping fluid is without air bubbles.
Operate clutch pedal several times during this procedure.

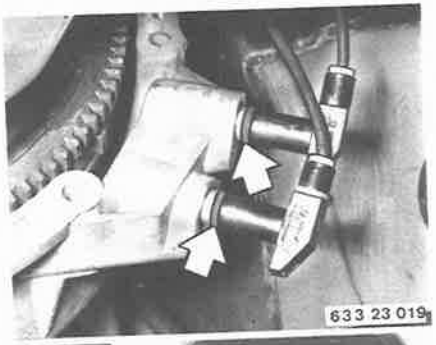


If there is still air in system after repeating the bleeding procedures several times, detach slave cylinder on transmission.
Press push rod against stop in slave cylinder and release slowly.
This will push back any residual air into the tank and guarantee maximum release travel.
Never operate clutch pedal as long as the slave cylinder is removed.

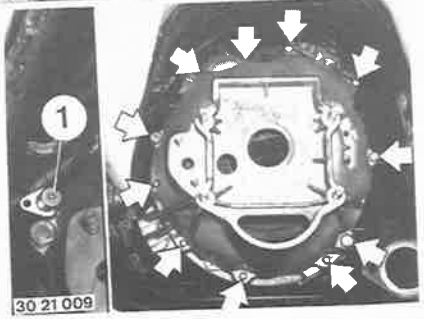


21 11 000 REMOVING AND INSTALLING CLUTCH HOUSING

BMW M 3:
Remove transmission see 23 00 022.
Remove DME senders.
Important! – Installation:
Check installed position.
Plugs must not be mixed up.
Install speed sensor (3) in bore (D) and reference mark sensor (4) with ring (5) in bore (B).
Engine cannot be started, if plugs are mixed up.



Installation:
Check O-rings.
Install sensors with Molykote Longterm 2.
Important!
Face surface of DME senders must be free of grease and dirt.



Remove position sender (1).
Unscrew clutch housing.
Use a Torx wrench** to unscrew Torx bolts.
Important! – Installation:
Torx bolts must be installed with washers to avoid an increase in breaking-loose torque.
Tightening torque*.

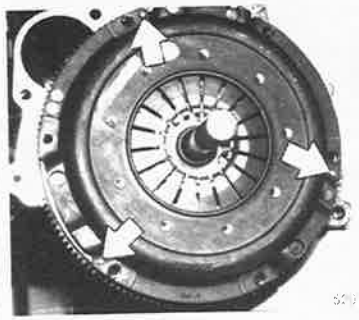
* See Specifications
** Source of Supply: HWB

316 21 013

Visually inspect clutch for cracks, wear and burnt spots.
Pressure contact surface must be level.

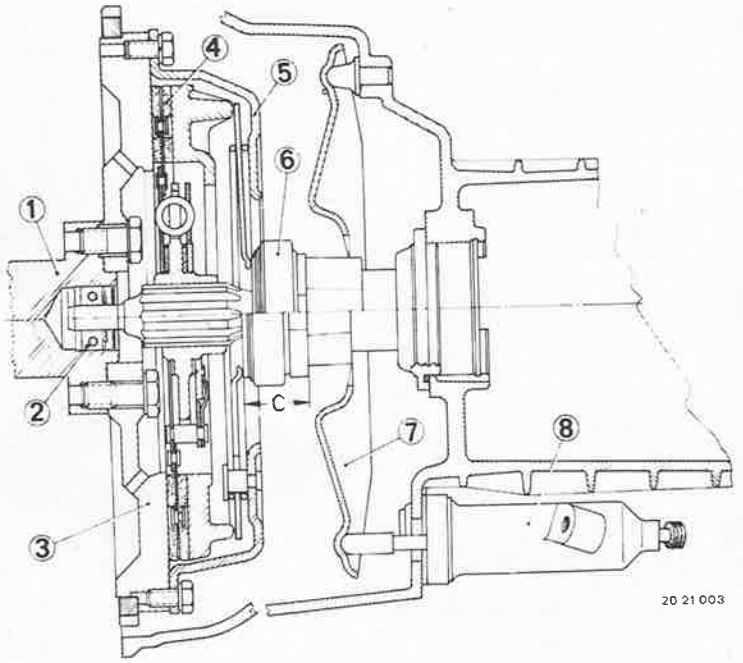
316 21 014

Visually inspect clutch rivets for wear and tight fit.
Replace a clutch with loose or worn rivets.
Important!
Remove all corrosion inhibitor when installing a new clutch disc.
Note:
The clutch for the version with a double mass flywheel is lower in height.



316 21 013

Place clutch disc over dowel pins.
Tighten mounting bolts separately and uniformly to specified torque*.
Give transmission input shaft a light coat of Microlube GL 261** in area of splines and guide pins.

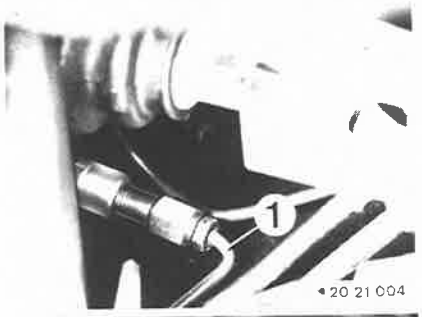


20 21 003

Clutch Assembly:
1 Crankshaft
2 Grooved ball bearing
3 Flywheel
4 Drive plate*
5 Thrust plate*
6 Release*
7 Release lever
8 Clutch slave cylinder

* See Specifications
** Source of Supply: HWB

* See Specifications



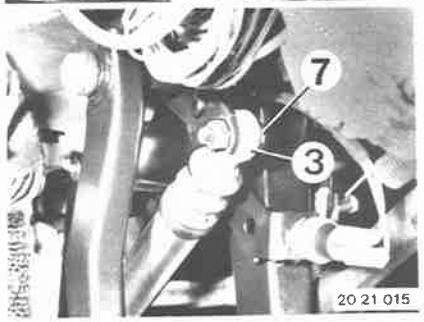
20 21 004

21 52 000 REMOVING AND INSTALLING CLUTCH MASTER CYLINDER

Disconnect pipe (1) to slave cylinder. B6414

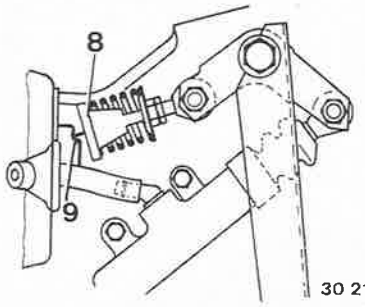
30 21 003

Unscrew cap on brake fluid tank.
Remove float container (2).
Draw off brake fluid in tank to lower level to connection for the filling pipe.



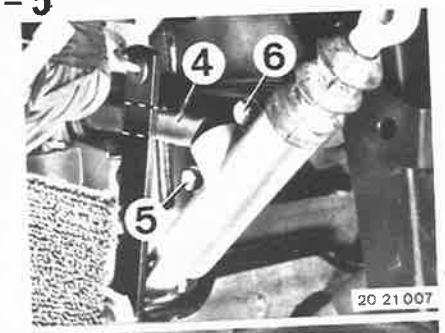
20 21 015

Remove instrument panel trim at bottom left — see 51 45 180.
Disconnect piston rod (3) on the clutch pedal.
Installation:
Adjust the clutch pedal with eccentric bolt (7) — see Group 35.



30 21 007

Important! — Installation:
Engage over-center spring (8) in guide tab (9) on the pedal base prior to installation of the piston rod (3).



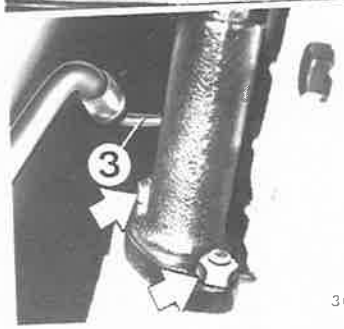
20 21 007

Pull out filling pipe (4).
Unscrew bolts (5 and 6).
Remove master cylinder.
Installation:
Bleed clutch — see 21 00 006.

30 21 003

21 52 010 REMOVING AND INSTALLING CLUTCH SLAVE CYLINDER

Unscrew cap on brake fluid tank.
Remove float container (2).
Draw off brake fluid in tank to lower level to connection for filling pipe.



30 21 002

Unscrew slave cylinder on transmission.
Remove slave cylinder.
Disconnect pipe (3).
Note:
A slave cylinder with a diameter of 22.2 mm (0.874"), instead of 20.64 mm (0.809"), must be installed for the version with a double mass flywheel, to avoid contact of the release lever when the clutch pedal is floored (also refer to Service Information of Group 21).
Installation:
Bleeder screw faces down.
Install front push rod with Molykote Long-term 2.
Bleed clutch — see 21 00 006.

TROUBLESHOOTING CLUTCH

Condition	Cause	Correction
Clutch slips	a) Clutch contact pressure* insufficient b) Liner* seriously worn c) Liner splattered with oil — transmission or crankshaft seal faulty d) Clutch was overheated e) Clutch not an original BMW part	a) Replace clutch 21 21 000 b) Replace drive plate 21 21 000 c) Replace faulty seal and drive plate d) Replace clutch 21 21 000 e) Install original BMW parts
Clutch grabs	a) Liner* not as specified b) Liner splattered with oil c) Release pressure one-sided d) Pressure plate pressing crooked e) Crankshaft not aligned with transmission input shaft f) Engine and transmission suspension faulty g) Drive plate not an original BMW part	a) Replace drive plate 21 21 000 b) Replace drive plate 21 21 000 c) Check release lever d) Replace pressure plate 21 21 000 e) Check centering surfaces on engine and transmission f) Replace engine and transmission suspension g) Install original BMW parts
Clutch does not release	a) Drive plate wrenched excessively or liner broken b) Drive plate has excessive lateral runout* c) Liner rusted on flywheel d) Drive plate seized on transmission input shaft e) Bearing in crankshaft for transmission input shaft faulty f) Air in clutch hydraulic system g) Tangential leaf springs of clutch bent off	a) Replace drive plate 21 21 000 b) Straighten or replace drive plate 21 21 565 c) Clean flywheel, roughen liner surfaces with emery cloth d) Service drive plate on transmission input shaft, replacing damaged parts if necessary e) Replace bearing in crankshaft 11 21 571 f) Bleed clutch 21 00 006 g) Replace clutch 21 21 000
Clutch noise	a) Unbalance* of clutch and drive plate excessive b) Torsional damper defective c) Clutch release faulty d) Bearing in crankshaft for transmission input shaft faulty e) Clutch rivets loose	a) Replace clutch and/or drive plate 21 21 000 b) Replace drive plate 21 21 000 c) Replace clutch release d) Replace bearing in crankshaft 11 21 571 e) Replace clutch 21 21 000

* See Specifications

23 Manual Transmission

Getrag 240 Five Speed Manual Transmission with Overdrive

23 Manual Transmission

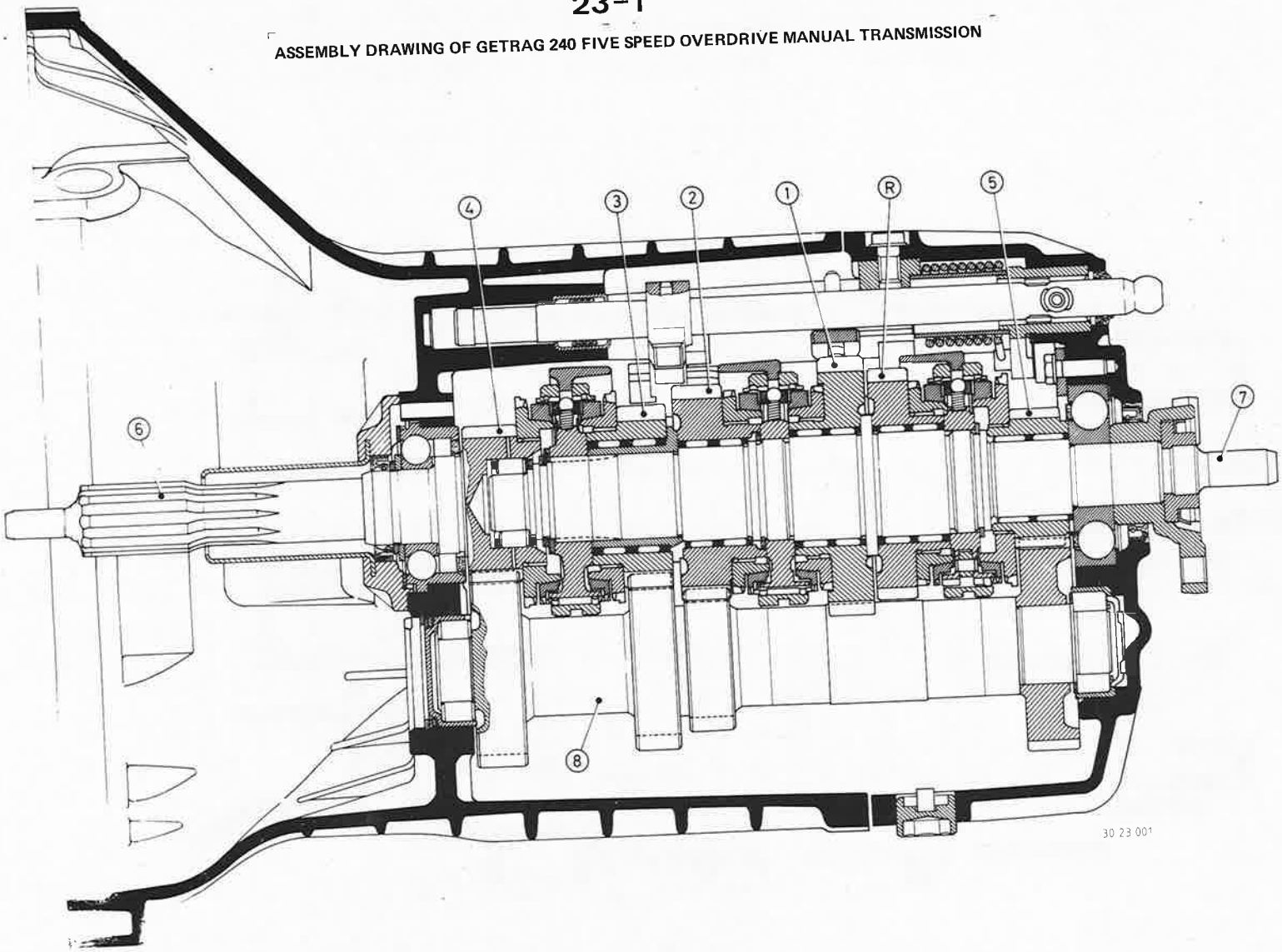
GETRAG 260 Five Speed Manual Transmission with Overdrive

23 Manual Transmission

GETRAG 265/6 Five Speed Manual Transmission with Overdrive

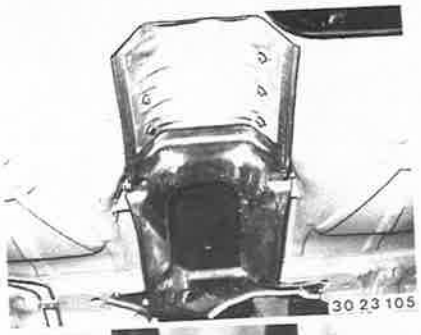
23-1

ASSEMBLY DRAWING OF GETRAG 240 FIVE SPEED OVERDRIVE MANUAL TRANSMISSION

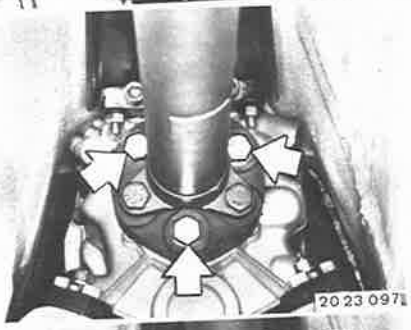


1 First gear
2 Second gear
3 Third gear
4 Fourth gear
5 Fifth gear
R Reverse gear
6 Input shaft
7 Output shaft
8 Layshaft

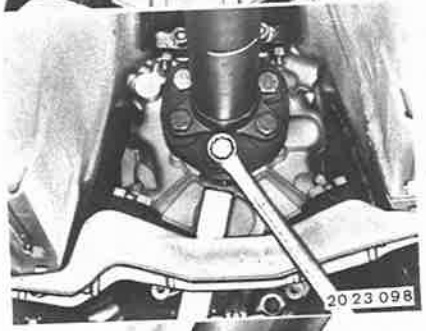
23 00 022 REMOVING AND INSTALLING TRANSMISSION



Remove exhaust assembly – see 18 00 020.
Unscrew heat shield.



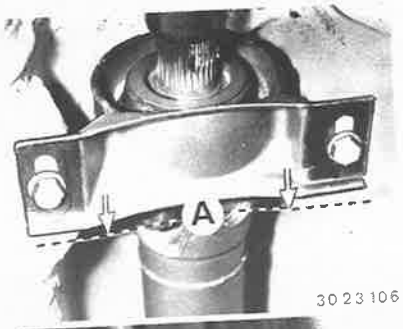
Unscrew bolts.
Replace stop nuts.



Installation:
Tighten nuts with a standard 17 mm socket together with a torque wrench.
Tightening torque*.
Important!
Only tighten nuts (never bolts) to avoid stress in Giubo coupling.

30 23 125

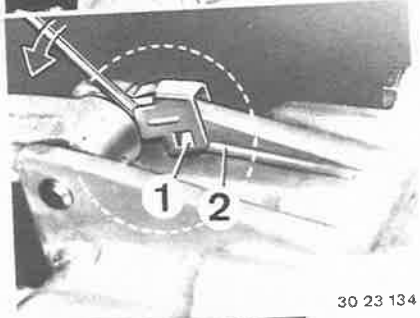
Version with Threaded Ring:
Loosen threaded ring (1) several turns.
Installation:
Tighten threaded ring (1) with Special Tool 26 1 040 after finishing installation.
Tightening torque*.



30 23 106

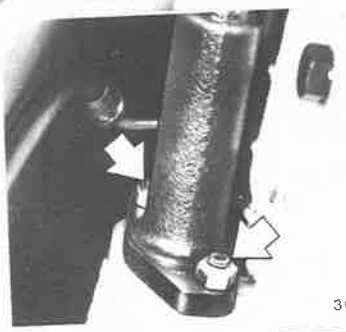
Unscrew center mount.
Installation:
Preload center mount forward by distance (A) = 4 to 6 mm (0.157 to 0.236").
Tightening torque*.
Bend propeller shaft down and pull off of centering pin.
Important!
Don't let the propeller shaft fall into the joints. Suspend propeller shaft from car on a piece of wire.

Lift out circlip (1) and remove washer (2).
Pull out shift rod.
Unscrew shift console on transmission.
Important!
Self-locking bolts – bolts will be hard to unscrew.
Installation:
Always replace bolts.
When tightening make sure brackets are horizontal to the shift console (shift lever noise).
Tightening torque*.
Pull off wires on reverse gear switch.



30 23 134

Version with Shift Arm:
Lift spring (1) out of tab (2) on the case with a screwdriver and swing up.
Pull out bearing pin.
Installation:
Lubricate bearing pin lightly with Molykote Longterm 2.

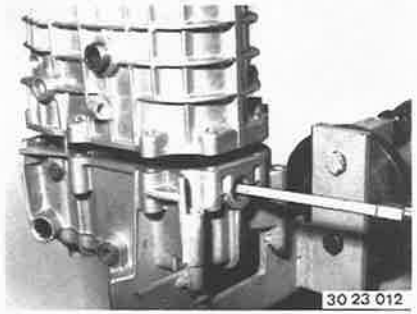


30 23 107

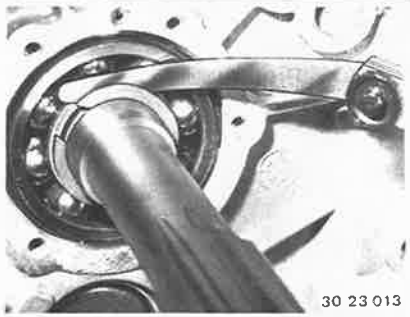
Remove clutch slave cylinder.
Line remains connected.
Installation:
Bleeder screw faces down.

* See Specifications

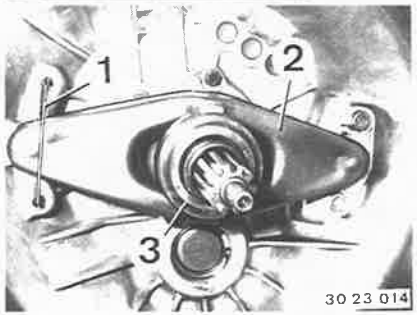
* See Specifications



Unscrew oil drain plug.
Mount case front section.
Align layshaft through bore for oil drain plug that roller bearing of layshaft slides into bearing shell.
Mount case front section.
Tightening torque*.
Install lockpin and reverse gear switch.

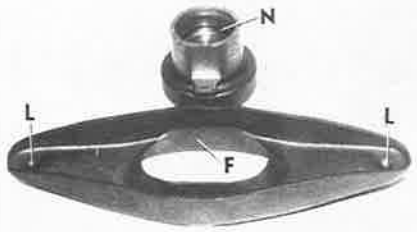


Install spacer and circlip.
Take up play between bearing race and circlip to 0 ... 0.09 mm (0 ... 0.0035").



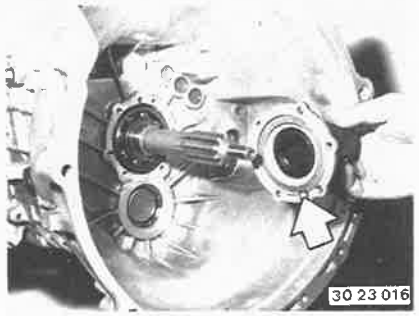
23 11 623 REMOVING AND INSTALLING GUIDE SLEEVE FOR CLUTCH RELEASE
–TRANSMISSION REMOVED--

Lift out spring (1) and remove release lever (2) with thrust bearing (3).

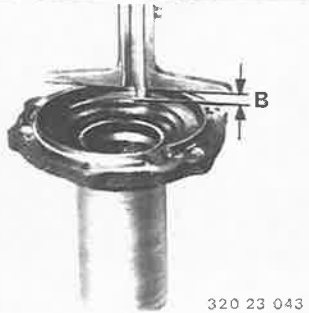


Installation:
Pack lubricating groove N with Molykote Longterm 2.
Coat guides F and bearings L with Molykote Longterm 2.
Non-conformance could cause release bearing to seize on guide sleeve.

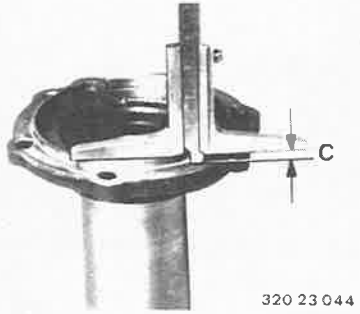
* See Specifications



Detach guide sleeve.
Important!
Spacer.
Installation:
Install guide sleeve with Loctite No. 573.
Sealing surface must be thoroughly clean and dried of oil.



Installation:
Take up play to 0 ... 0.09 mm (0 ... 0.0035").
Determine thickness of spacer.
Measure distance (B) from guide sleeve protrusion to inside surface.



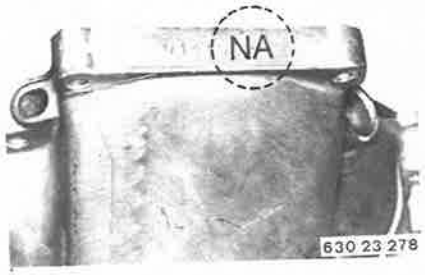
Measure distance (C) from guide sleeve protrusion to outside surface.
Example:

	B	4.0 mm (0.157")
–	C	2.6 mm (0.102")
		1.4 mm (0.055") spacer thickness

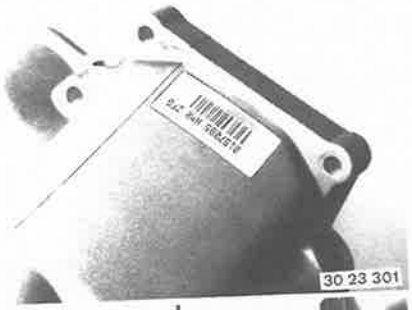
23 00 032 INSTALLING EXCHANGE TRANSMISSION

Remove transmission – see 23 00 022.

Transmission identification:
BMW code* die-stamped on front case section.

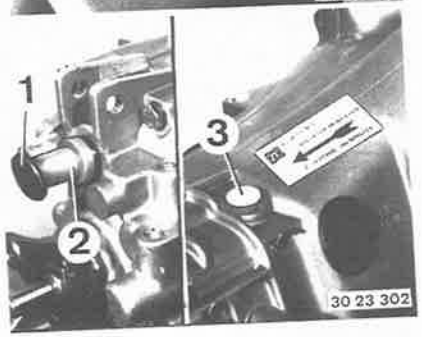


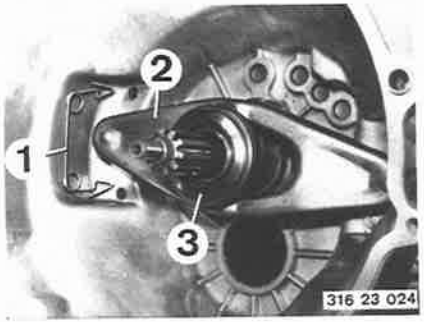
BMW code* marked on front case section (label).



Transmission ZF S 5 - 16:

Important!
Mount vent (1) prior to installation of the transmission (red label).
Pull vent (1) and sleeve (2) off of the shift shaft.
Lift out cap (3) and install vent (1).



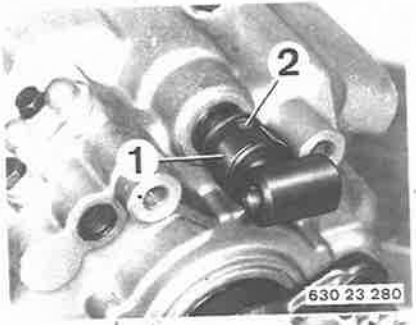


Transfer spring (1) and release lever (2) with release (3).

Note:
Coat transmission input shaft lightly with Microlupe GL 261** in area of splines and guide pins.

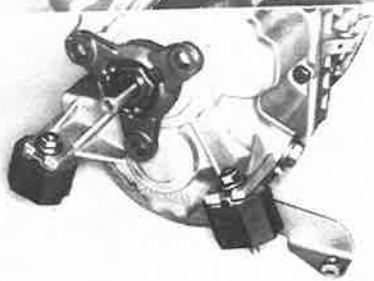
316 23025

Installation:
Fill lubricating groove (N) with Molykote Longterm 2.
Coat guides (F) and bearings (L) lightly with Molykote Longterm 2.
Non-conformance could cause seizure of the bearing on the guide sleeve.



Transfer shift rod joint.
Push back locking sleeve (1).
Drive out dowel pin (2).

Note:
Check installed position of the shift rod joint – the offset end of the shift rod joint must face right as seen looking forward in the car.



630 23 281

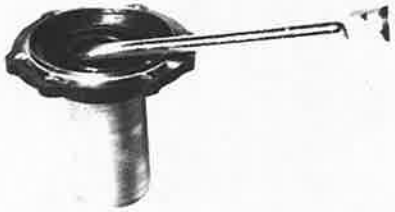
Transfer rubber mounts, exhaust carrier and backup light switch.

Important!
Transmissions are supplied with oil since 1.86. Consequently it is only necessary to check the oil level after installation of a transmission.

* See Parts Microfiche

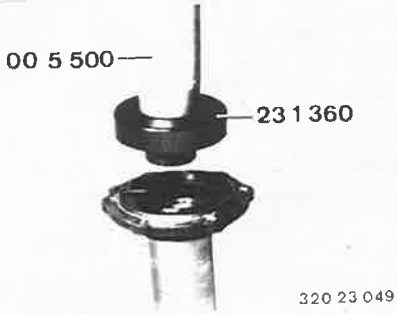
** Source of Supply: HWB

23 12 503 REPLACING RADIAL OIL SEAL FOR INPUT SHAFT –TRANSMISSION REMOVED –



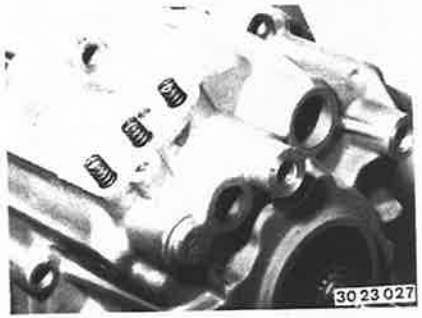
320 23 048

Remove guide sleeve 23 11 623.
Remove radial oil seal.

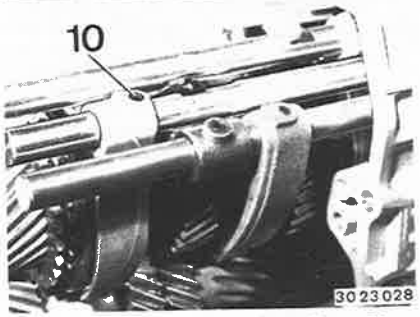


320 23 049

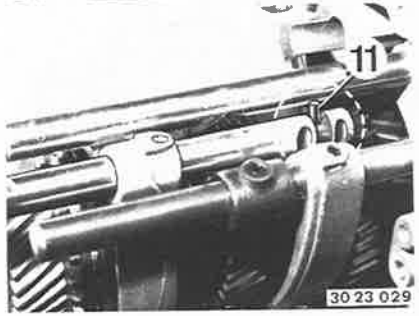
Drive in radial oil seal with Special Tools 23 1 360 and 00 5 500.
Open end faces transmission case.
Lubricate sealing lip with oil.



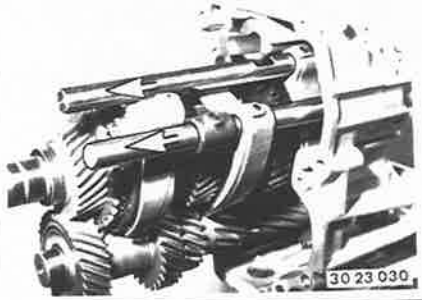
Remove three springs.



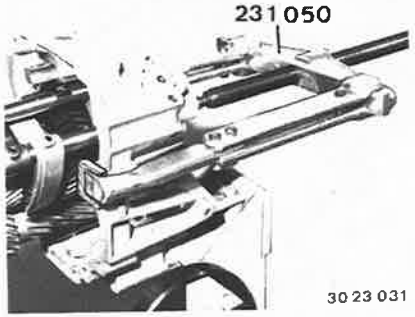
Drive out pin (10) in 3rd/4th gear selector fork.
Installation:
Replace pin.



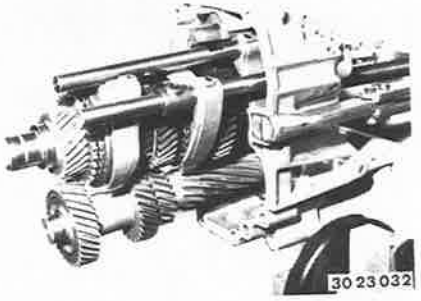
Knock out 3rd/4th gear selector rod forward.
Important!
Lockpin (11) in selector rod.



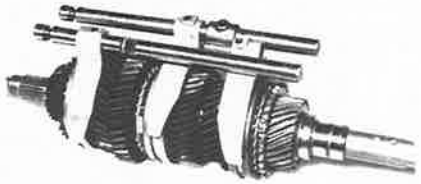
Engage 2nd and reverse gears by pusking 1st/ 2nd and 5th/reverse gear selector rods forward.



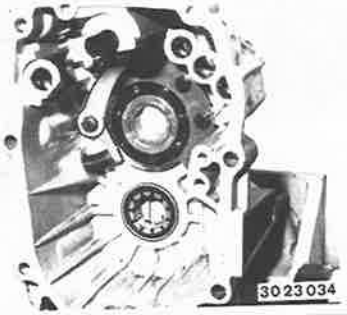
Press input shaft, output shaft and layshaft out of case rear section with Special Tool 23 1 050.
Important!
To avoid damage on sealing surface, use a piece of wood, aluminum or similar material between claws and sealing surface.



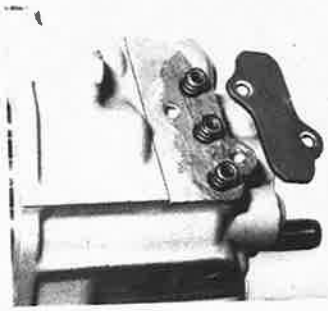
Important!
Be careful not to clamp selector rods and layshaft while pressing out parts.
Layshaft must not tilt off during this step.
Installation:
Check condition of all bearings, replacing if necessary.



Installing:
Install 3rd/4th gear selector fork and 1st/2nd as well as 5th/reverse gear selector rods with selector forks.



Remove all detent and locking balls in case rear section.
Install roller bearings with large diameter end facing out.
Lubricate lockpin and locking lever with oil.

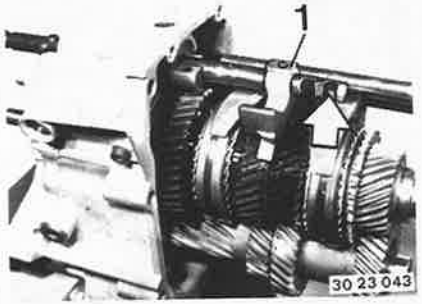


30 23 041

Install end cover after coating with Loctite No. 573
Install end cover with Loctite No. 573

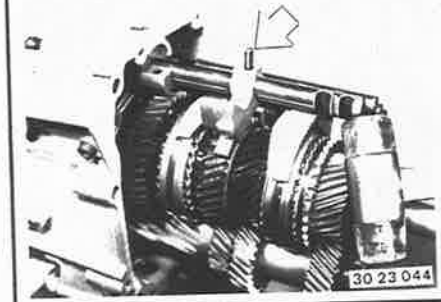
Drive pin out of selector arm.

30 23 042



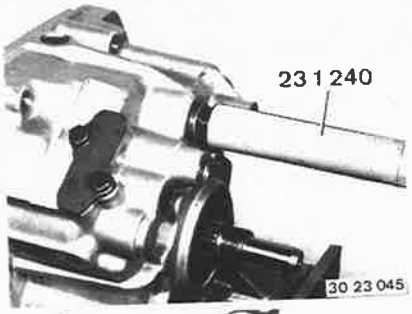
30 23 043

Hold 4 rollers in position with grease.
Slide in selector shaft and install selector arm (1) at same time.
Important!
Opening in selector shaft faces out.



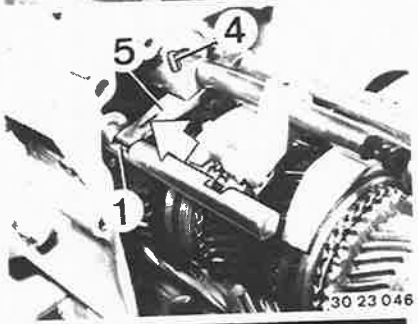
30 23 044

Drive in 6 x 26 mm pin (counterhold).



30 23 045

Lubricate sealing lips of radial oil seal with oil.
Drive in radial oil seal with Special Tool 23 1 240.

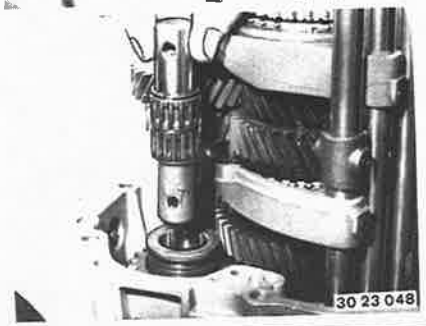


30 23 046

Install selector rail.
Groove (1) in selector rail faces up.
Install operating lever (5) with notch facing up and toward selector rail.
Install pin (4).

30 23 047

Coat case rear section in area of reverse gear shaft with Loctite No. 573 .
Surface must be thoroughly clean and dried of oil.



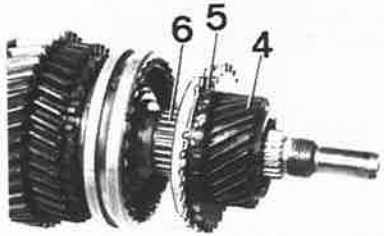
30 23 048

Install shaft with needle bearing and reverse gear.

23 21 554 REPLACING OUTPUT SHAFT
– Output Shaft Removed –

30 23 051

Pull off input shaft (1), brass synchromesh ring (2) and needle bearing (3).
Note:
Synchronization:
It is recommended to mark synchromesh rings and their corresponding gear wheels when disassembling the output shaft, in order to avoid mixing up synchromesh rings.

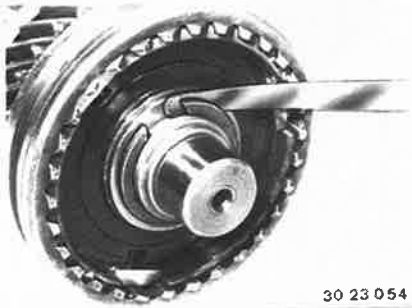


30 23 052

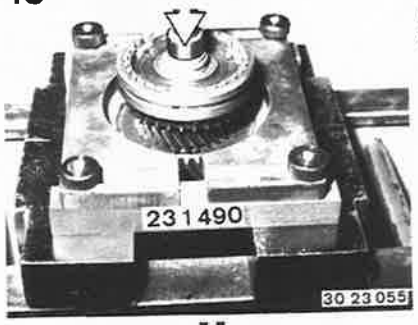
Pull off 5th gear (4), brass synchromesh ring (5) and needle bearing (6).

30 23 053

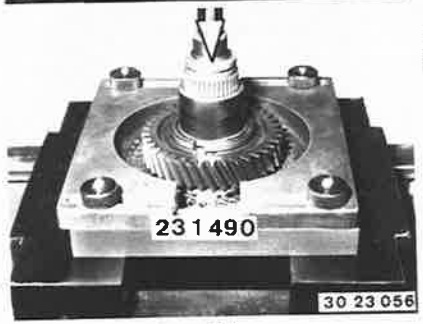
Lift out circlip (7).
Remove spacer (8).
Installation:
Always replace circlip.


30 23 054

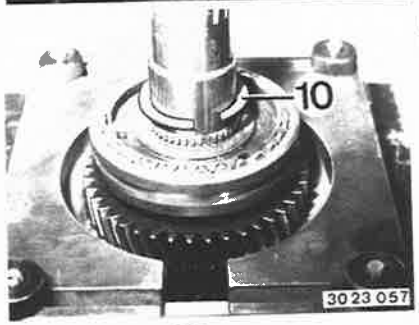
Installation:
Adjust play between circlip and guide sleeve to 0 ... 0.09 mm (0 to 0.0035").



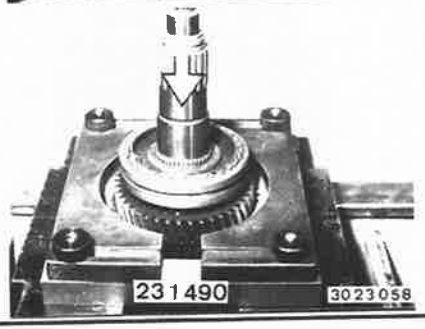
Important!
Operate 3rd/4th gear operating sleeve by hand in direction of 3rd gear.
Press off 3rd gear with guide and operating sleeves, using Special Tool 23 1 490.
Remove needle bearing.
Pressing-off force*.



Press off bearing sleeve and 2nd gear with Special Tool 23 1 490.
Remove nickle-plated synchromesh ring and needle bearing.



Important!
Remove circlip (10) before pressing off 1st gear.
Installation:
Always replace circlip.



Press off 1st gear with guide and operating sleeve, using Special Tool 23 1 490.
Remove needle bearing.
Pressing-off force*.

* See Specifications

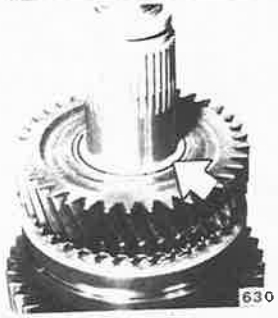
30 23 067

Press on guide sleeve to fit tight with Special Tool 23 1 290.
Pressing-on force*.

Important!
Make sure tabs on synchromesh ring are aligned with openings in guide sleeve while installing.

30 23 068

Move operating sleeve in direction of 1st gear.
Adjust guide sleeve to remove all play.
Circlips are available from Parts in different thicknesses from 1.7 to 2.0 mm (0.067 to 0.079").
Install circlip (10).


630 23 253

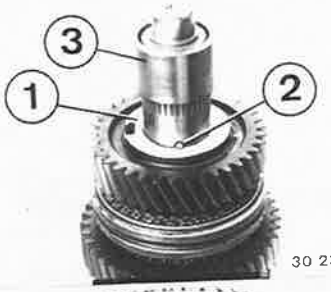
Install needle bearing, nickle-plated synchromesh ring and 2nd gear.

Important!
Collar for bearing sleeve on output shaft must protrude slightly.
If necessary, check circlip (1) for proper fit.


30 23 071

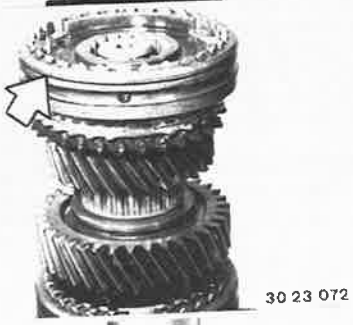
Heat bearing sleeve to approx. 80° C (175° F) and install on output shaft.

* See Specifications



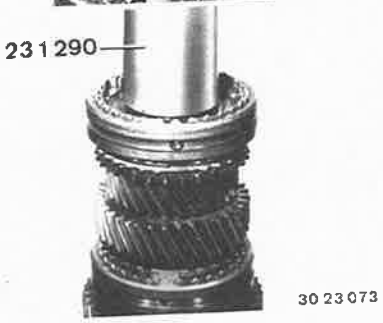
30 23 143

Version with Thrust Washer:
Install thrust washer (1) and ball (2).
Heat bearing sleeve (3) without collar to about 80° C (175° F) with a hot air blower and install on output shaft.


30 23 072

Install needle bearing, 3rd gear and synchromesh ring.
Install guide and operating sleeves on splines with the groove facing 4th gear.

Note:
Version with 2 Grooves:
Grooves face 3rd gear.



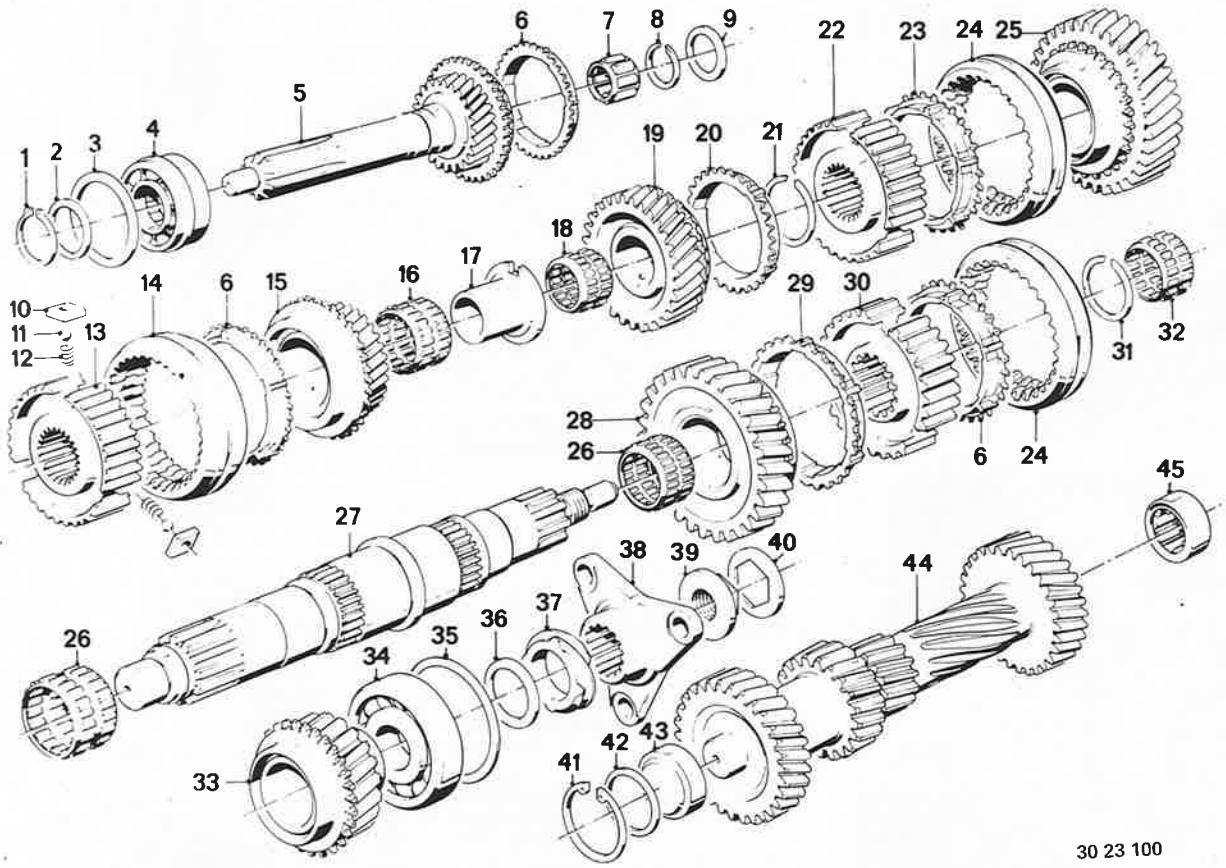
30 23 073

Press on guide sleeve to fit tight with Special Tool 23 1 290.

Important!
Make sure while pressing on that tabs on the synchromesh ring are aligned with openings in the guide sleeve.
Install shim and circlip.
Pressing-on force*.

* See Specifications

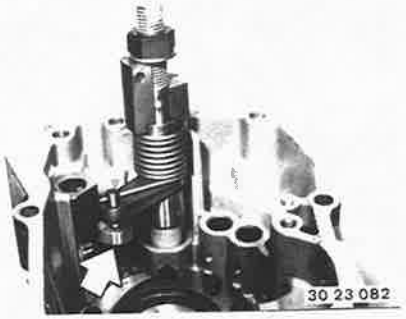
23 -17



30 23 100

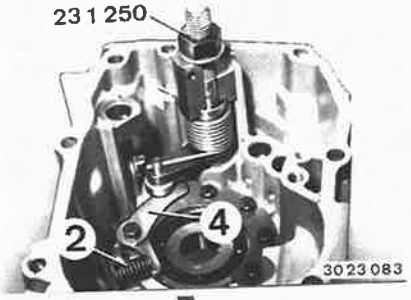
Layout of Gear Set and Bearings

1 Circlip
2 Spacer
3 Spacer
4 Bearing
5 Input shaft with 4th gear
6 Synchromesh ring
7 Needle bearing
8 Circlip
9 Spacer
10 Dog
11 Ball
12 Spring
13 Guide sleeve
14 Operating sleeve
15 3rd gear
16 Needle bearing
17 Spacer
18 Needle bearing
19 2nd gear
20 Synchromesh ring
21 Circlip
22 Guide sleeve
23 Synchromesh ring
24 Operating sleeve
25 1st gear
26 Needle bearing
27 Output shaft
28 Reverse gear
29 Synchromesh ring
30 Guide sleeve
31 Circlip
32 Needle bearing
33 5th gear
34 Bearing
35 Spacer
36 Spacer
37 Speedometer drive gear
38 Output flange
39 Collar nut
40 Lockplate
41 Circlip
42 Spacer
43 Bearing
44 Layshaft
45 Bearing

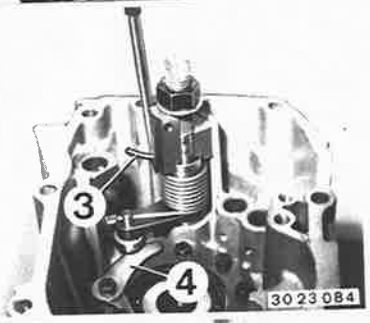


Remove selector arm from above.

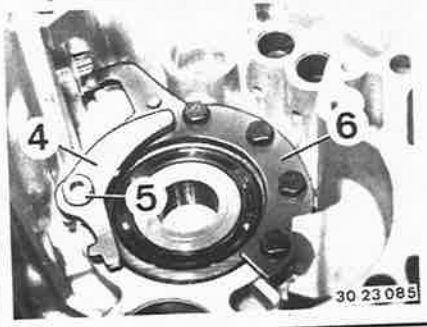
Important!
Roller.



Installation:
Install spring (2).
Install selector arm with Special Tool 23 1 250.
Swing out selector arm with roller over locking lever (4).



Position end of spring (3) above high spot.
In this position push down on selector arm (don't knock down).
Secure selector arm with socket head bolt tightened with correct torque* before removing the special tool.
Install socket head bolt with a locking compound**.



Unscrew bolt.
Remove locking lever (4) and shim (5).
Remove bearing holder (6).

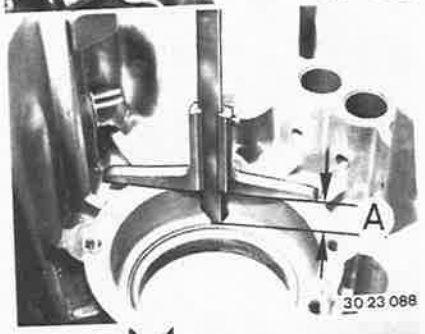
Installation:
Install bolt with a large washer.

* See Specifications
** Source of Supply: HWB

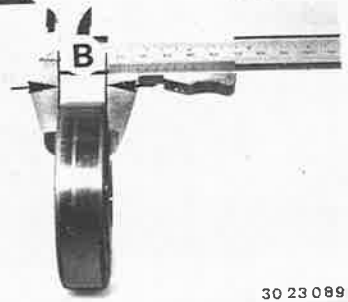
Installation:
Check installed position of locking lever (4) and thrust pin (7).

Lift out radial oil seal.
Drive out grooved ball bearing with Special Tools 23 1 120 and 00 5 500.

Important!
Shim X.



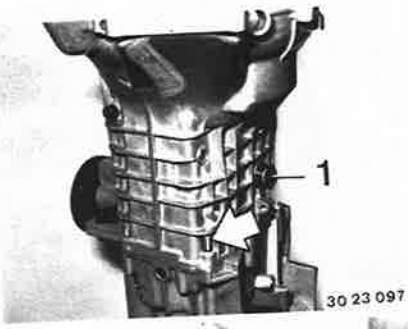
Determine thickness of shim X.
Measure distance (A).



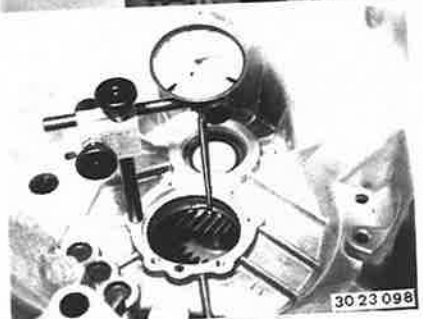
Measure distance (B).

Example:

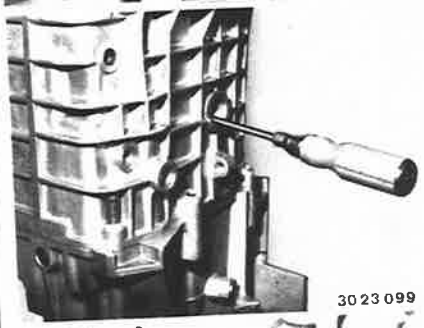
A	17.5 mm (0.689")	
– B	17.0 mm (0.669")	
X	0.5 mm (0.020")	shim thickness



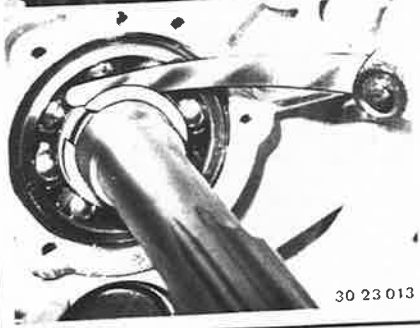
Install front case section and mount with two bolts opposite each other.
Center front case section with dowel pins.
Unscrew oil filler plug (1).



Clamp on holder with dial gage.
Dial gage tip must bear on tooth of layshaft.



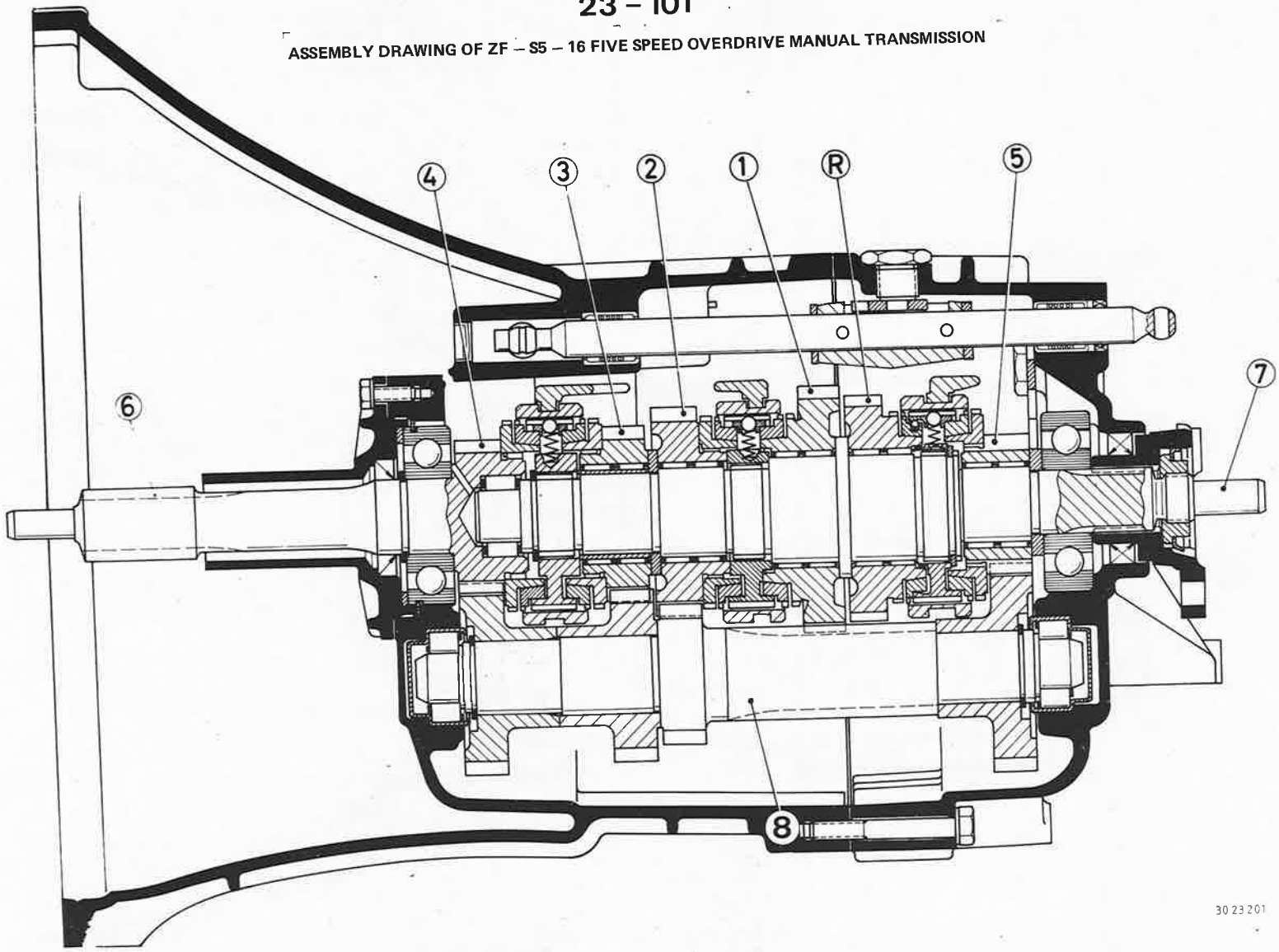
Check layshaft axial play through bore for the oil filler plug.
Axial play = 0.13 to 0.23 mm (0.005 to 0.009").
If correction is necessary, bearing shell must be removed again and a shim of different thickness installed.



Install gear wheel set.
Determine thickness of drive pinion shim.
Install old shim and circlip.
Adjust play to 0 ... 0.09 mm (0 to 0.0035"),
Determine thickness of shim for guide sleeve – see 23 11 623.

23 – 101

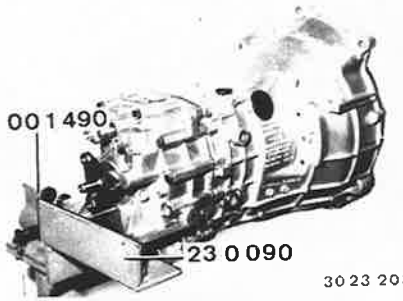
ASSEMBLY DRAWING OF ZF – S5 – 16 FIVE SPEED OVERDRIVE MANUAL TRANSMISSION



1 First gear
2 Second gear
3 Third gear
4 Fourth gear
5 Fifth gear
R Reverse gear
6 Input shaft
7 Output shaft
8 Layshaft

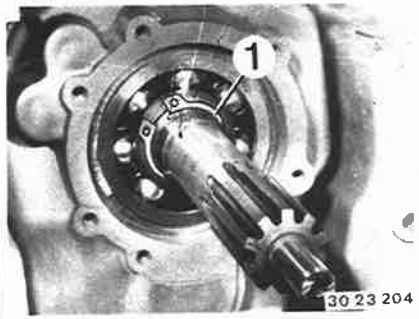
23 11 014 REMOVING AND INSTALLING SEALING TRANSMISSION CASE FRONT SECTION

Remove transmission 23 00 022.
Mount Special Tool 23 0 090 on Special Tool 00 1 490.
Mount transmission on special tool saaembly.
Drain oil.



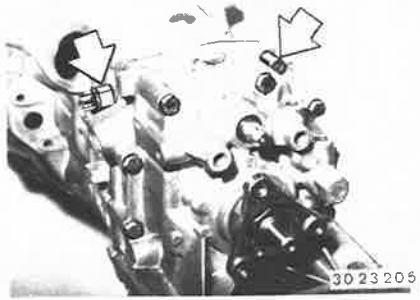
30 23 203

Remove guide sleeve 23 11 624.
Lift out circlip (1).

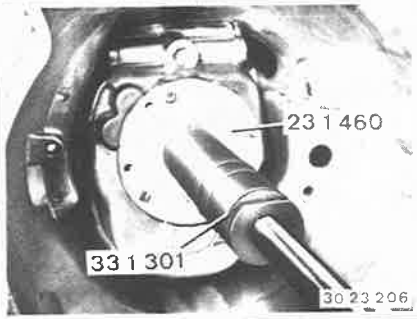


30 23 204

Unscrew backup light switch.
Drive back cylindrical pins.
Unscrew bolts.

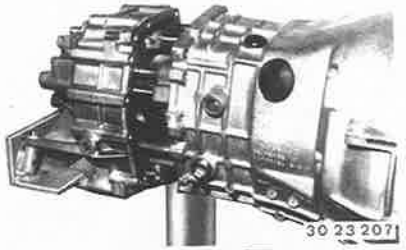

30 23 205

Pull off case front section with Special Tool 23 1 460 and 33 1 301.



30 23 206

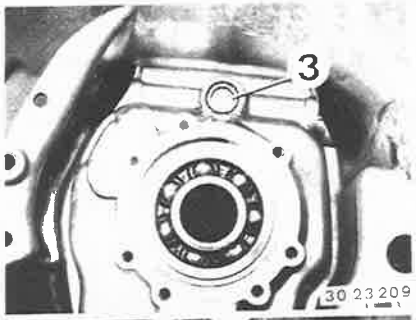
Pull off case front section.
Installation:
Replace gasket.


30 23 207

Important!
Installation:
Magnet (2) in case rear section.
Clean magnet.

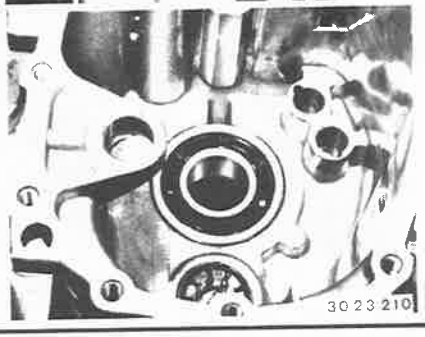
30 23 208

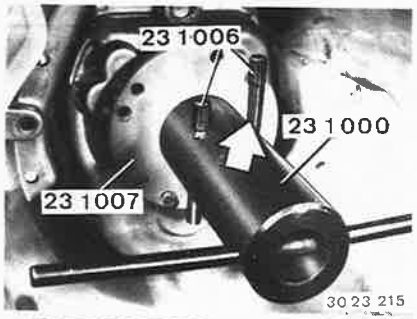
Drive out end cap (3).
Installation:
Replace end cap and insert with Loctite No. 573,



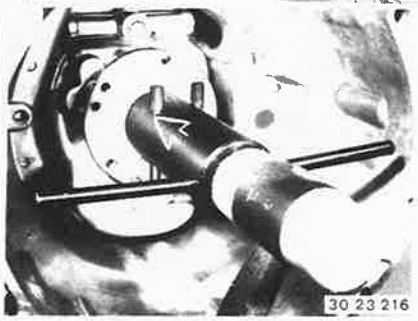
30 23 209

Drive out grooved ball bearing in direction of clutch housing.


30 23 210

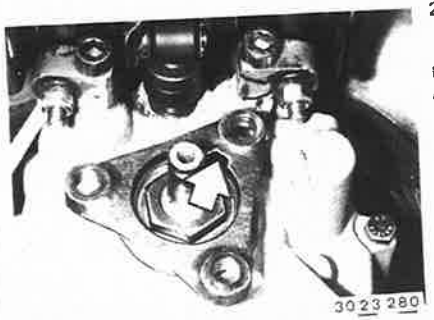


Press grooved ball bearing on to inout shaft and into case front section with Special Tools 23 1 007, 23 1 000 and 23 1 006.
Important!
Insert Special Tools 23 1 006 that flat side faces input shaft.

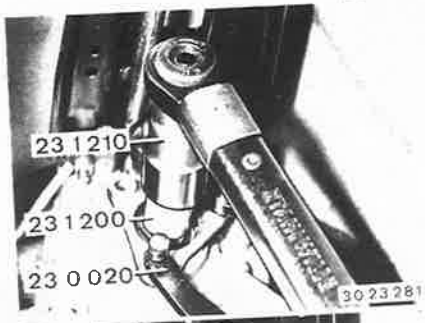


Drive on grooved ball bearing further simultaneously with light hammer knocks.
Install circlip and reverse gear switch.

23 12 054 REPLACING RADIAL OIL SEAL FOR OUTPUT FLANGE

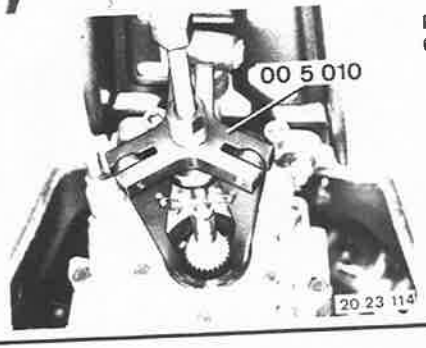


Unscrew propeller shaft at front end and on center mount (see 23 00 022).
Remove lockplate.
Installation:
Lock lockplate in groove.



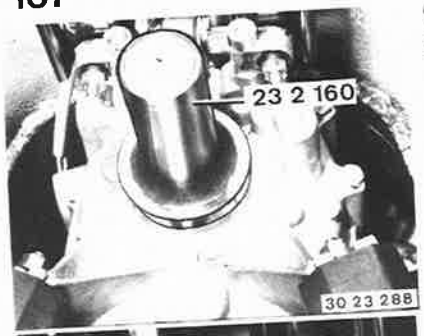
Apply Special Tool 23 1 200.
Hold output flange with Special Tool 23 0 020.
Unscrew collar nut with Special Tool 23 1 210.
Installation:
Tightening torque*.
Install collar nut with a bolt cement**.

Pull off output flange with Special Tool 33 1 150.



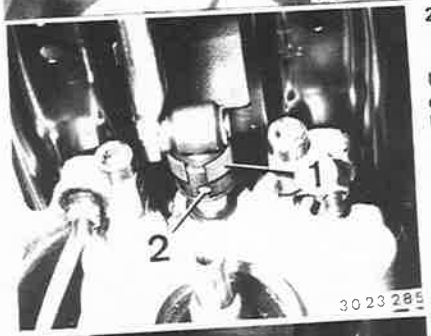
Pull out radial oil seal with Special Tool 00 5 010.

* See Specifications
** Source: HWB



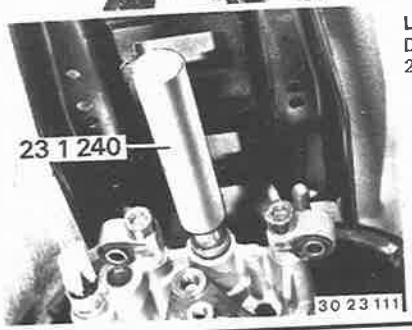
Installation:
Lubricate sealing lip with oil.
Drive in radial oil seal with Special Tool 23 2 160.

23 12 084 REPLACING RADIAL OIL SEAL FOR SELECTOR SHAFT

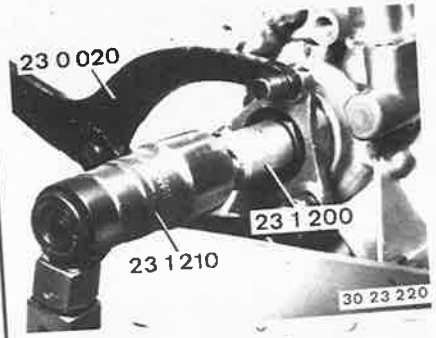


Unscrew propeller shaft at front end and on center mount (see 23 00 022).
Unscrew output flange (see 23 12 054).
Lift out locking sleeve (1).
Drive out pin (2) upwards.

Lift out radial oil seal (3).

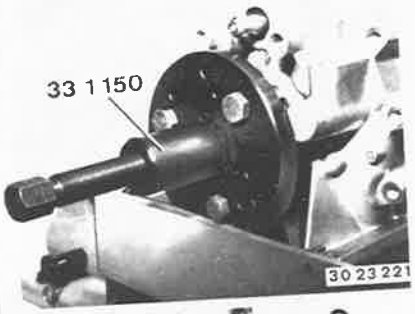


Lubricate sealing lips of radial oil seal with oil.
Drive in radial oil seal with Special Tool 23 1 240.

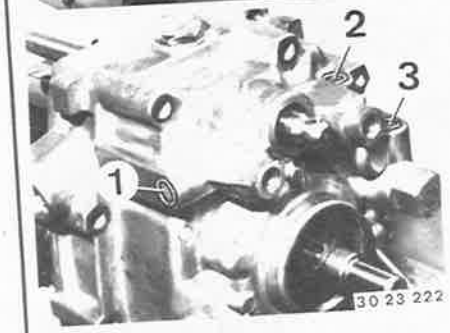


23 21 504 REMOVING AND INSTALLING INPUT AND OUTPUT SHAFT ASSEMBLY

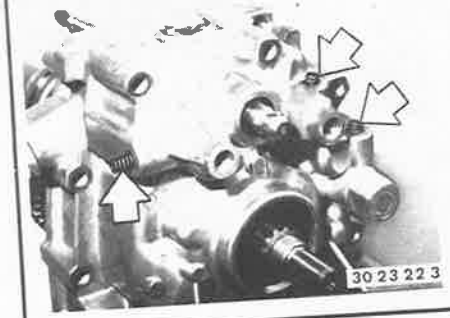
Remove case front section 23 11 014.
Remove lockplate.
Apply Special Tool 23 1 200.
Hold output flange with Special Tool 23 0 020.
Unscrew collar nut with Special Tool 23 1 210.



Pull off output flange with Special Tool 33 1 150.

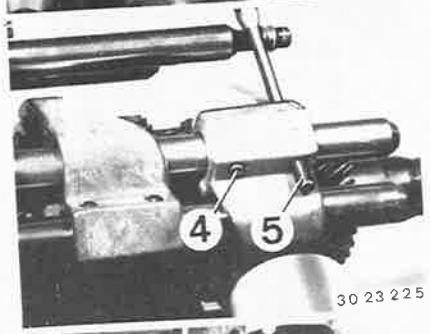


Remove end caps (1 ... 3).
Important!
Spring force.
Installation:
Replace end caps.



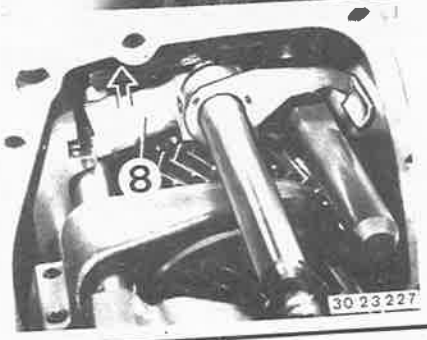
Remove three springs.

Pull out three stop pins with a circlip pliers as far as possible (stem locks would have to be taken off before stop pins could be pulled out completely).

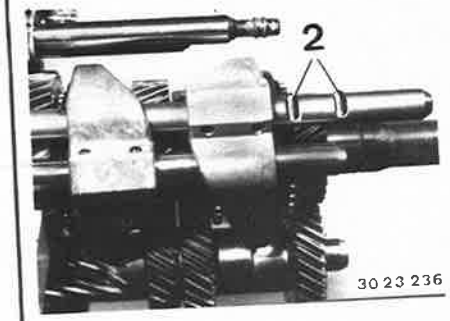


Drive pins (4 and 5) out of selector fork for 3rd/4th gear (counterhold).

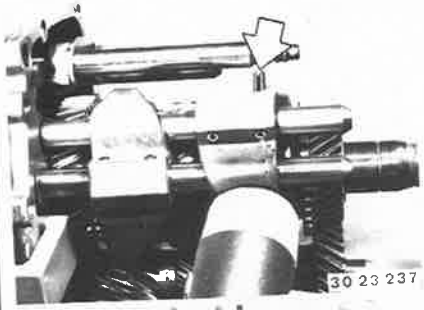
Push back leaf spring (6) for reverse gear far enough with Special Tool 23 2 170 until selector arm (7) is accesible.
It should be possible to move selector shaft back and forth easily.



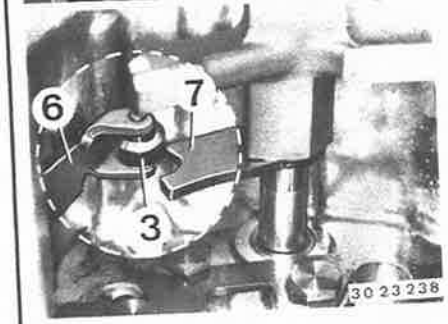
Swing selector arm (8) out of groove in selector rod.



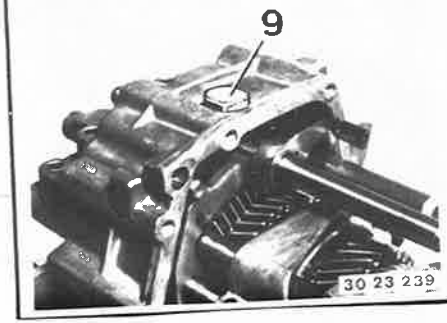
Remove reverse gear.
Slide in 3rd/4th gear selector rod with openings (2) facing up.



Drive in pins for 3rd/4th gear selector forks (counterhold).



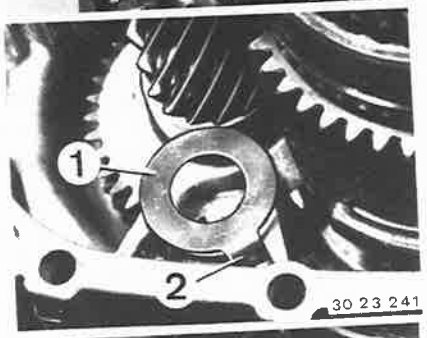
Remove Special Tool 23 2 170 for leaf spring.
Important!
Roller (3) on leaf spring (6) must engage in selector arm (7).



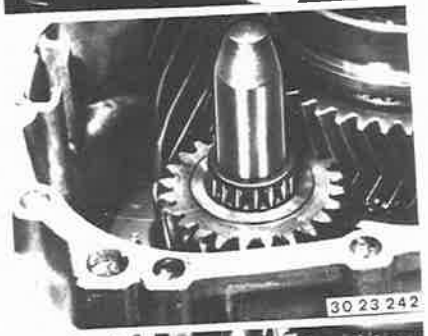
Install bolt (9) for operating lever.
Tip of bolt must engage in bore of operating .
Tightening torque*.

* See Specifications

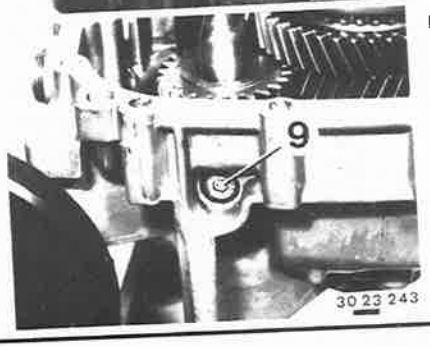
Insert 3 springs for stop pins.
Install and lock new end caps by punching.



Install thrust washer (1) on case with angle (2) in upper opening.



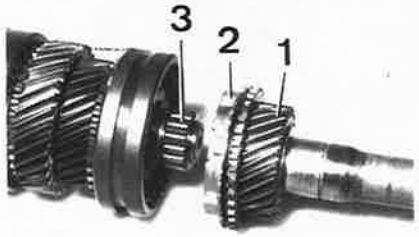
Insert reverse gear with long collar facing case, two needle bearings and shaft.



Place insulator on bolt.
Install bolt (9).
Install new bolt lock.
Tightening torque*.

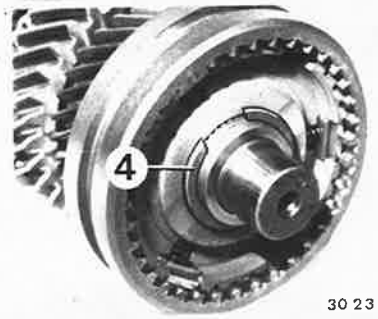
* See Specifications

23 21 555 REPLACING OUTPUT SHAFT
– Output Shaft Removed –



30 23 245

Pull off input shaft (1), synchromesh ring (2) made of brass and needle bearing (3).

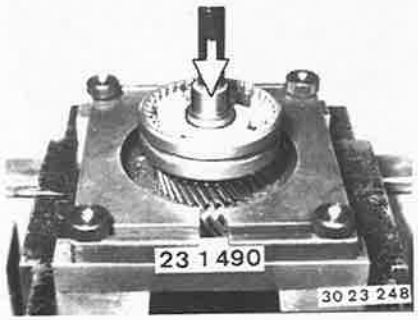


30 23 246

Lift out circlip (4).
Installation:
Always replace circlip.

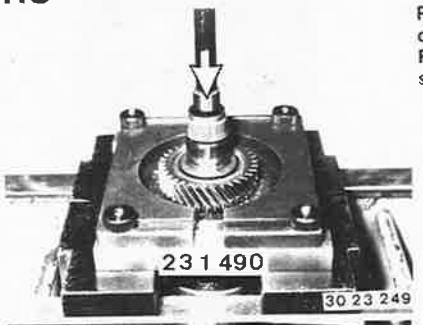
30 23 247

Installation:
Adjust guide sleeve with circlip (4) to take up all play.
Circlips are available from Parts in different thicknesses.



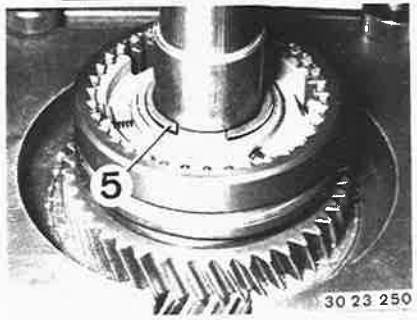
30 23 248

Press 3rd gear with guide and sliding sleeves off of output shaft with Special Tool 23 1 490.
Remove needle bearing.



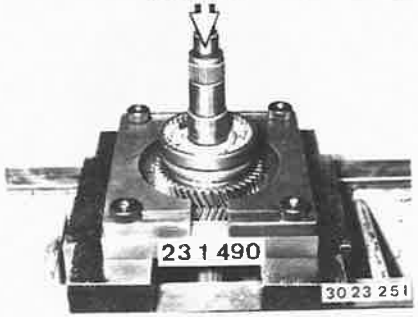
30 23 249

Press bearing sleeve, thrust washer and 2nd gear off of output shaft with Special Tool 23 1 490.
Remove needle bearing and sintered steel synchromesh ring.



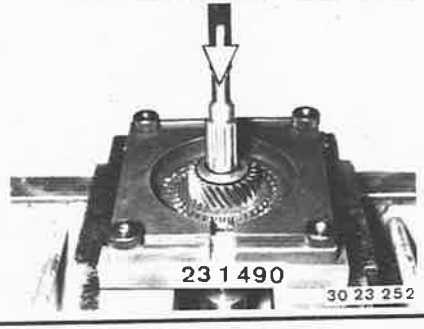
30 23 250

Important!
Circlip (5) must be removed before pressing off 1st gear.
Installation:
Always replace circlip.



30 23 251

Press 1st gear with guide and sliding sleeves off of output shaft with Special Tool 23 1 490.
Remove needle bearing.

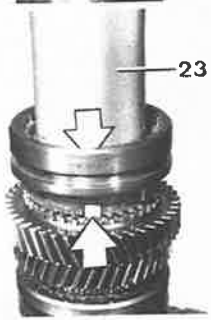


30 23 252

Press thrust washer and 5th gear off of output shaft with Special Tool 23 1 490.
Remove brass synchromesh ring and needle bearing.

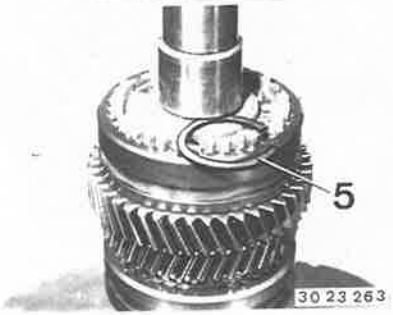

30 23 261

Install needle bearing, 1st gear and sintered steel synchromesh ring.
Install guide sleeve and sliding sleeve with narrow collar facing 1st gear.



30 23 262

Press on guide sleeve to fit tight with Special Tool 23 1 290.
Important!
When pressing on make sure that short tabs of synchromesh ring are aligned with groove in thrust pieces.

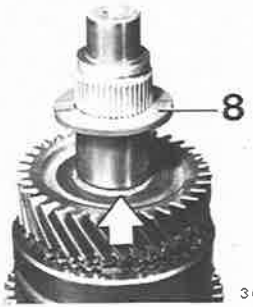


30 23 263

Move sliding sleeve in 1st gear direction.
Adjust guide sleeve to be without play.
Circlips are available from Parts in different thicknesses.
Install circlip (5).


30 23 264

Install sintered steel synchromesh ring with short tabs of synchromesh ring in groove of pressure pieces.
Install needle bearing and 2nd gear.



30 23 265

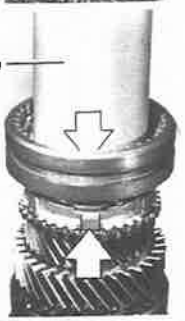
Important!
Output shaft collar for thrust washer must protrude slightly.
If necessary, check circlip (5) for correct fit.
Heat thrust washer (8) to approx. 80° C (175° F) and install on output shaft.

30 23 266

Heat bearing sleeve (9) to approx. 80° C (175° F) and install on output shaft.


30 23 267

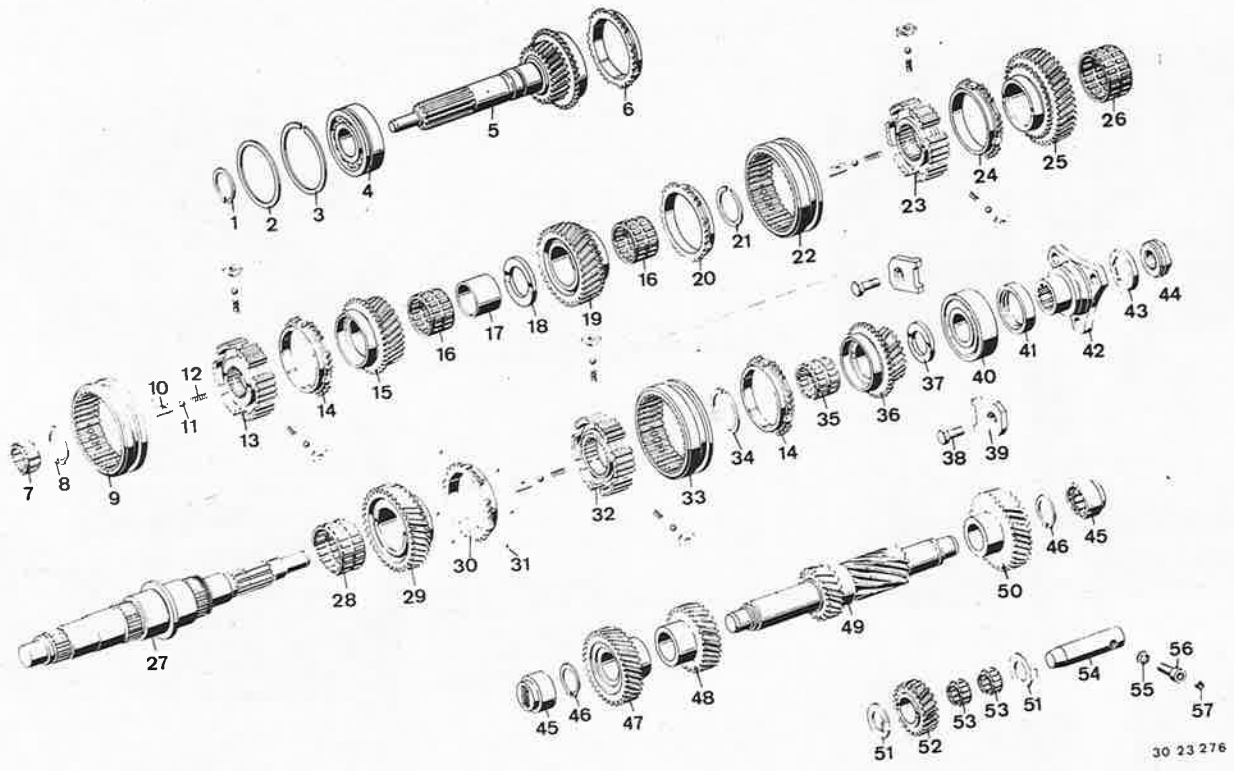
Install needle bearing, 3rd gear and brass synchromesh ring.
Install guide sleeve and sliding sleeve with long collar facing 3rd gear.



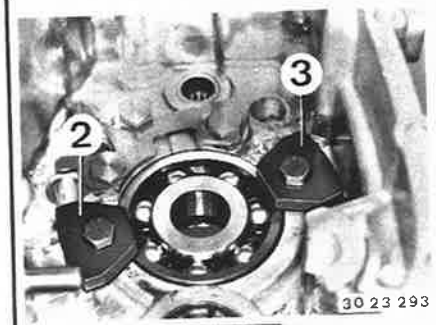
30 23 268

Press on guide sleeve to fit tight with Special Tool 23 1 290.
Important!
When pressing on make sure that short tabs of synchromesh ring are aligned with groove of pressure pieces.
Install circlip.

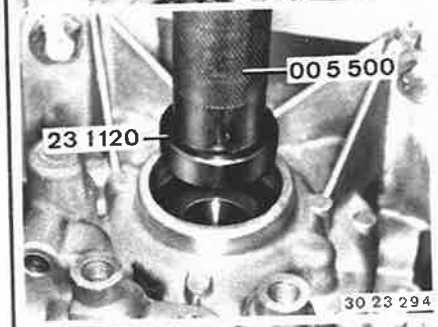
DRAWING OF GEAR SET AND BEARINGS



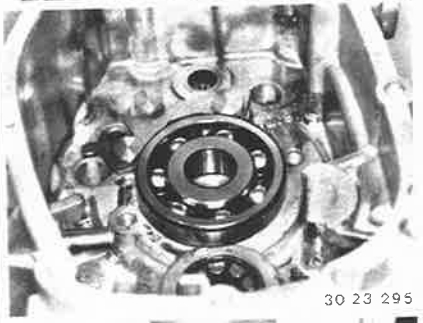
1 Circlip
2 Spacer
3 Circlip
4 Grooved ball bearing
5 Input shaft
6 Synchromesh ring
7 Roller bearing
8 Circlip
9 Sliding sleeve
10 Pressure piece
11 Ball
12 Spring
13 Guide sleeve
14 Synchromesh ring
15 3rd gear
16 Needle bearing
17 Bearing sleeve
18 Thrust washer
19 2nd gear
20 Synchromesh ring
21 Circlip
22 Sliding sleeve
23 Guide sleeve
24 Synchromesh ring
25 1st gear
26 Needle bearing
27 Output shaft
28 Needle bearing
29 Reverse gear
30 Synchromesh ring
31 Balls (six
32 Guide sleeve
33 Sliding sleeve
34 Circlip
35 Needle bearing
36 5th gear
37 Thrust washer
38 Bolt
39 Clamp
40 Grooved ball bearing
41 Radial oil seal
42 Output flange
43 Lockplate
44 Collar nut
45 Roller bearing
46 Circlip
47 4th gear
48 3rd gear
49 Layshaft
50 5th gear
51 Thrust washer
52 Reverse gear
53 Needle bearing
54 Shaft
55 Seal
56 Bolt
57 Bolt lock



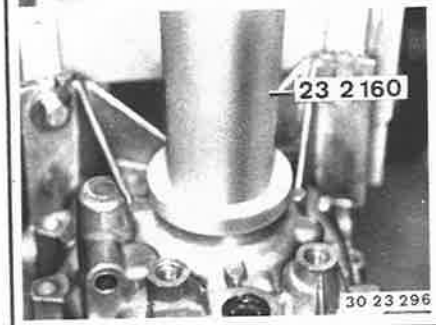
Unscrew bolts.
Remove clamps (2 and 3).
Installation:
Tightening torque*.



Lift out radial oil seal.
Drive out grooved ball bearing with Special Tools 23 1 120 and 00 5 500.

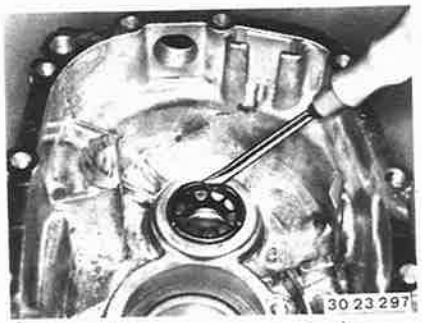


Heat case rear section in area of grooved ball bearing to about 80° C (176° F) with a hot air blower.
Install grooved ball bearing.
If necessary, drive in to fit tight with Special Tool 24 1 100.

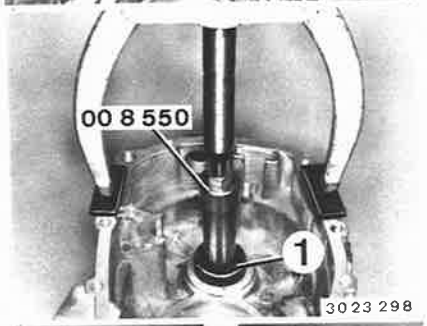


Drive in radial oil seal with Special Tool 23 2 160.
Lubricate sealing lip with oil.

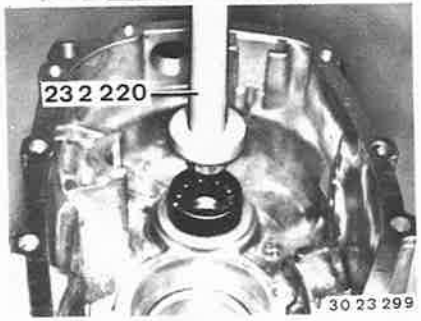
* See Specifications



Layshaft:
Destroy roller cage of bearing.
Remove cage with rollers.



Pull out bearing outer race (1) with Special Tool 00 8 550 and support.
Important!
Use a flat iron bar or similar item between support and sealing surface to avoid damage on sealing surface.



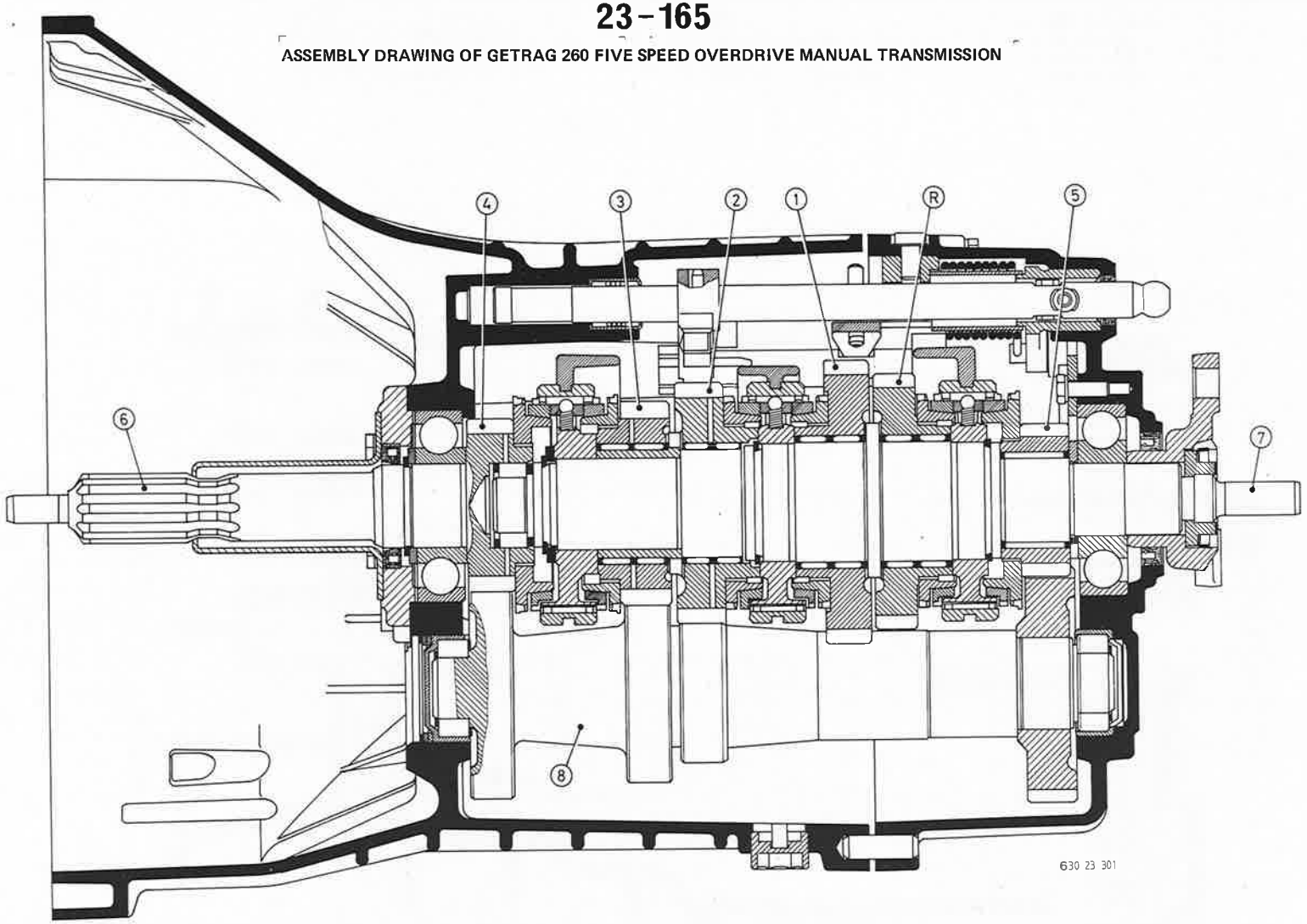
Heat case rear section in area of roller bearing to about 80° C (176° F) with a hot air blower.
Drive in roller bearing with Special Tool 23 2 220.

TROUBLESHOOTING MANUAL TRANSMISSION

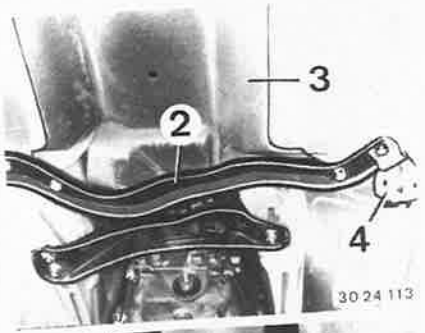
Condition	Cause	Correction
Oil on clutch bell housing	a) O-ring in guide flange leaks b) Radial oil seal for input shaft leaks c) Gasket on end cover (crankcase leaks) d) Radial oil seal for crankshaft leaks	a) Replace O-ring 23 11 590 b) Replace radial oil seal 23 12 521 c) Replace gasket 11 14 611 d) Replace radial oil seal 11 14 611
Oil on output flange	a) Radial oil seal for output shaft leaks b) Radial oil seal for selector shaft leaks	a) Replace radial oil seal 23 12 051 b) Replace radial oil seal 23 12 081
Transmission leaks between front and rear sections	a) Gasket defective	a) Replace gasket 23 11 000
Oil on speedometer drive	a) O-ring defective b) Radial oil seal in bush defective	a) Replace O-ring 23 22 100 b) Replace bush
Oil on vent	a) Oil level too high b) Wrong oil grade (excessive foaming)	a) Correct oil level b) Replace oil
Gear does not stay in — jumps out	a) Sliding sleeve worn, guide rail defective, springs broken b) Sliding sleeves for 1st/2nd and 3rd/4th gear mixed up c) Shift console loose d) Selector forks worn e) Output flange loose	a) Replace damaged parts 23 23 503 b) Install sliding sleeves correctly 23 23 503 c) Tighten shift console d) Replace selector forks 23 31 501 e) Tighten output flange

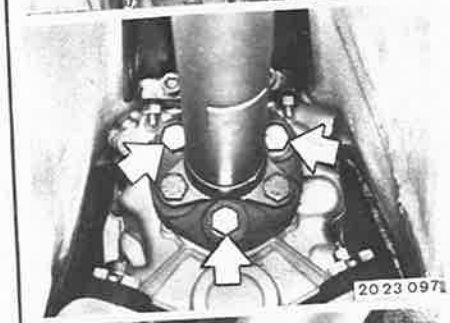
23-165

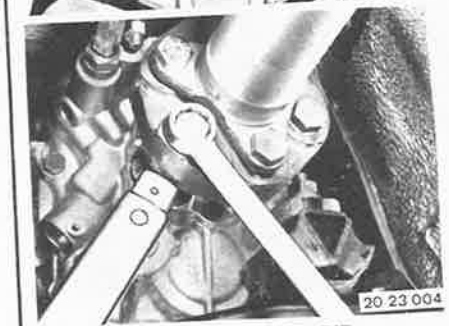
ASSEMBLY DRAWING OF GETRAG 260 FIVE SPEED OVERDRIVE MANUAL TRANSMISSION

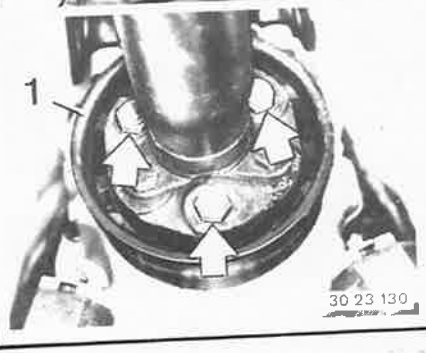


1 First gear
2 Second gear
3 Third gear
4 Fourth gear
5 Fifth gear
6 Reverse gear
6 Input shaft
7 Output shaft
8 Layshaft









23 00 022 REMOVING AND INSTALLING TRANSMISSION

Remove exhaust assembly – see 18 00 020.
Cars with Four Wheel Drive:
Remove transfer box – see 27 10 010.
Unscrew heat shield.
Unscrew connector (2) and heat shield (3).

Installation:
Also mount holder (4).

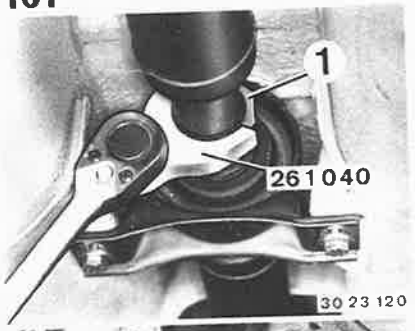
Unscrew joint disc on transmission.
Always replace stop nuts.

Installation:
Tighten nuts with a standard 17 or 19 mm wrench socket together with a torque wrench.
Tightening torque*.

Important!
Only tighten nuts on flange end, whenever possible by design, to avoid tension in the joint disc.

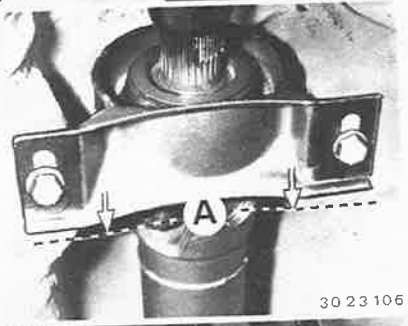
Version with Integrated Vibration Damper (1):
Vibration damper (1) is mounted on the output flange with press-fit bolts.
Unscrew nuts on joint disc.
Pull off joint disc only after lowering the transmission.
Installation:
Tightening torque*.
Note:
BMW 325 i:
The vibration damper is mounted together with the joint disc.

* See Specifications



Loosen threaded ring (1) several turns.

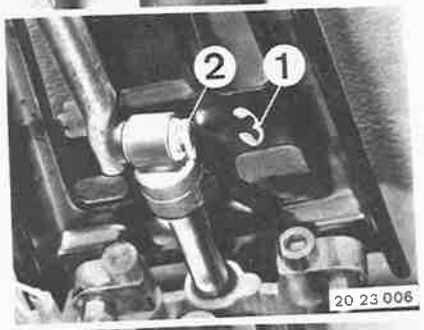
Installation:
Tighten threaded ring (1) with Special Tool 26 1 040 after finishing installation.
Tightening torque*.



Unscrew center mount.

Installation:
Preload center mount forward by distance (A) = 4 to 6 mm (0.157 to 0.236").
Bend propeller shaft down and pull it off of the centering pin.

Important!
Don't let the propeller shaft fall into joints. Suspend propeller shaft from car on pieces of wire.



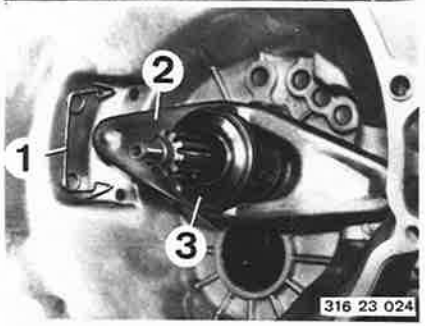
Lift out retainer (1) and take off washer (2).
Pull out shift rod.

Unscrew shift console on transmission.

Important!
Self-locking bolts – they will be hard to unscrew.

Installation:
Always replace bolts.
Make sure consoles are horizontal to the shift console while tightening (shift lever noise).

* See Specifications



316 23025

23 00 032 INSTALLING EXCHANGE TRANSMISSION

Remove transmission – see 23 00 022.

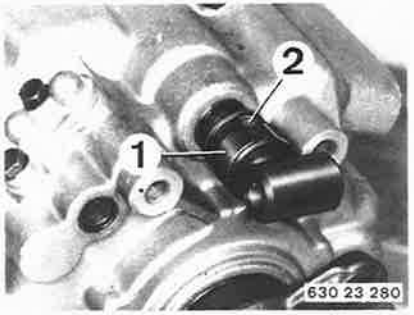
Transmission identification:
BMW code* on front case section (die-stamped or label).

Transmission Type:
Getrag 260.

Transfer spring (1) and release lever (2) with release (3).

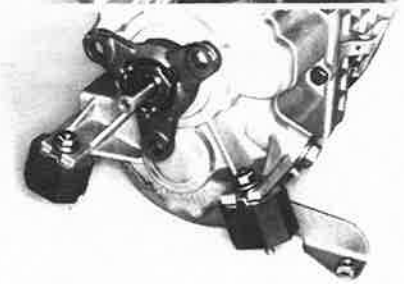
Note:
Give transmission input shaft a light coat of Microlupe GL 261 in area of splines and guide pins.**

Installation:
Fill lubricating groove (N) with Molykote Longterm 2.
Coat guides (F) and bearings (L) lightly with Molykote Longterm 2.
Non-conformance could cause seizure of bearing on the guide sleeve.



Transfer shift rod joint.
Slide back locking sleeve (1).
Drive out cylindrical pin (2).

Note:
Check installed position of shift rod joint – offset end of shift rod joint on the right as seen looking forward in car.



630 23 281

Transfer rubber mounts, exhaust carrier and backup light switch.

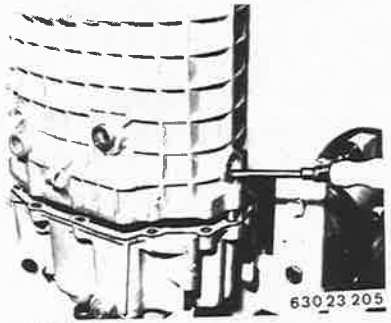
Important!
Transmissions are supplied with oil since 1.86, so that it is only necessary to check the oil level after installation of the transmission.

* See Parts Microfiche
** Source of Supply: HWB

Remove grooved ball bearing for input shaft.
Important!
Inner race of grooved ball bearing has a protrusion.
Protrusion faces gear shaft.

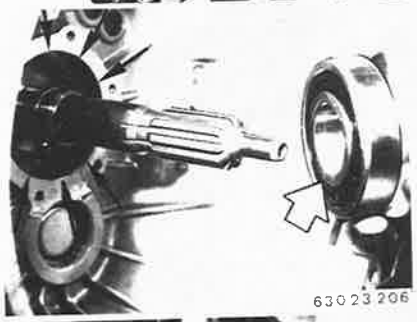
630 23 204

Unscrew oil drain plug.
Coat sealing surface with Loctite No. 573**.
Sealing surface must be thoroughly clean and dried of oil.
Mount case front section.
Align layshaft through bore for oil drain plug that roller bearing of layshaft slides into bearing shell.
Bolt case front section.
Tightening torque*.
Install lockpin and reverse gear switch.



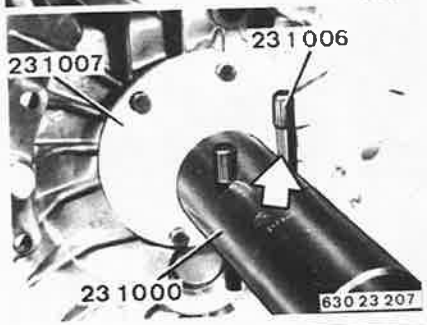
630 23 205

Heat* bearing inner race and case front section in area of grooved ball bearing with a hot air blower.
Push on grooved ball bearing as far as possible.
Inner race protrusion faces gear set.



630 23 206

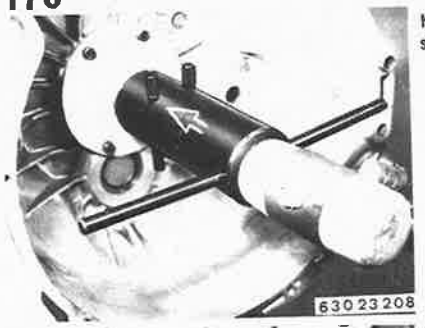
Press grooved ball bearing on to input shaft and into case front section with Special Tools 23 1 007, 23 1 000 and 23 1 006.
Important!
Insert Special Tools 23 1 006 that flat sides face input shaft.



630 23 207

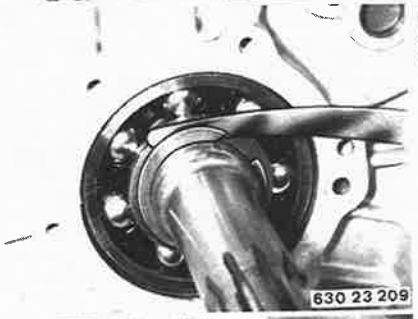
* See Specifications
** Source: HWB

Keep driving on grooved ball bearing simultaneously with light hammer knocks.



630 23 208

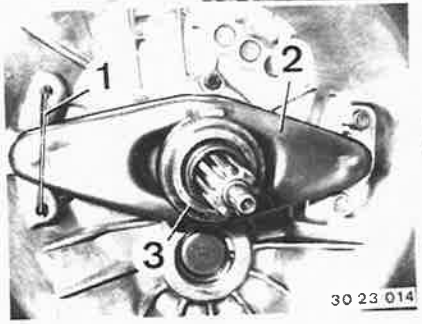
Install spacer and circlip.
Adjust play between bearing inner race and circlip to 0 ... 0.09 mm (0 ... 0.0035").



630 23 209

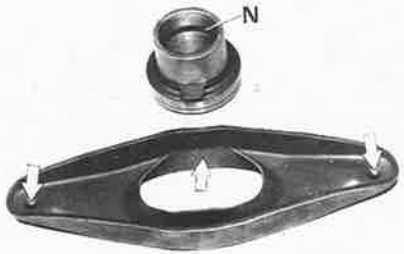
23 11 623 REMOVING AND INSTALLING GUIDE SLEEVE FOR CLUTCH RELEASE
– TRANSMISSION REMOVED –

Lift out spring (1) and remove release lever (2) with thrust bearing (3).



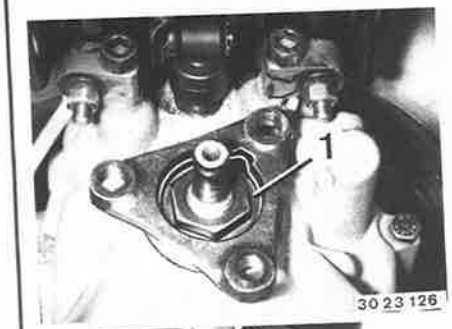
30 23 014

Installation:
Pack lubricating groove N with Molykote Longterm 2.
Coat guides F and bearings L with Molykote Longterm 2.
Non-conformance could cause release bearing to seize on guide sleeve.

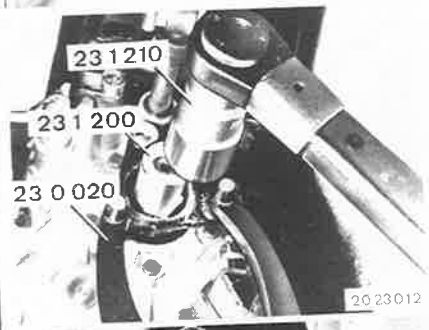


630 21 029

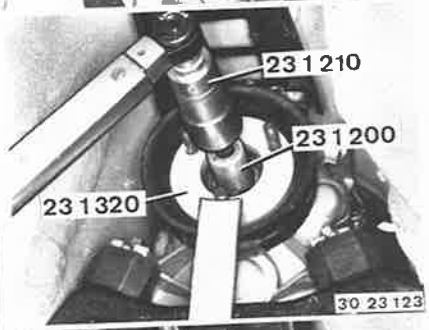
23 12 053 REPLACING RADIAL OIL SEAL FOR OUTPUT FLANGE



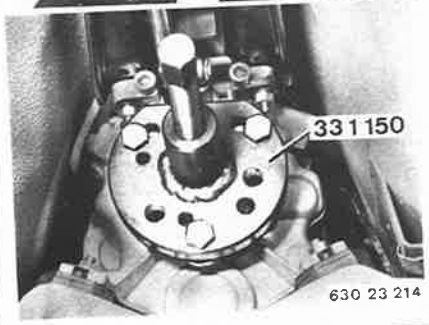
Unscrew propeller shaft – see 23 00 022.
Lift out lockplate (1).
Installation:
Replace lockplate.



Apply Special Tool 23 1 200.
Hold output flange with Special Tool 23 0 020.
Unscrew collar nut with Special Tool 23 1 210.
Installation:
Install collar nut with a bolt cement**.
Tightening torque*.



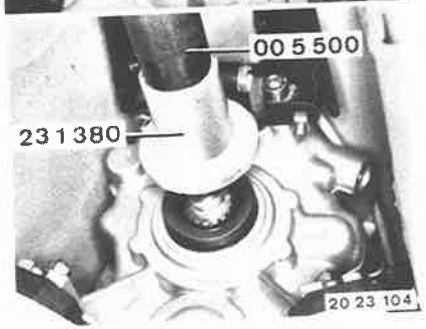
Version with Integrated Vibration Damper:
Hold output flange with Special Tool 23 1 320.



If too difficult, pull off output flange with Special Tool 33 1 150.

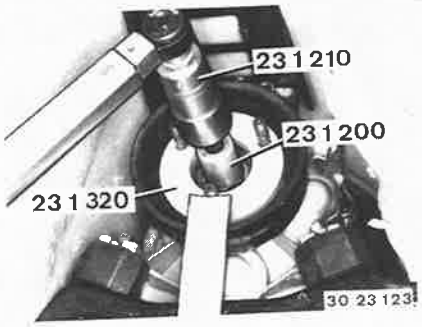
* See Specifications
** Source of Supply: HWB

Pull out radial oil seal with Special Tool 00 5 010.



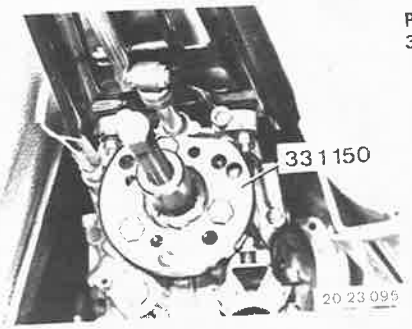
Lift out radial oil seal.
Drive in radial oil seal with Special Tools 23 1 380 and 00 5 500.
Installation:
Lubricate sealing lips with oil.
Bolt on output flange to specified tightening torque*.
Install collar nut with a bolt cement**.

* See Specifications
** Source of Supply: HWB



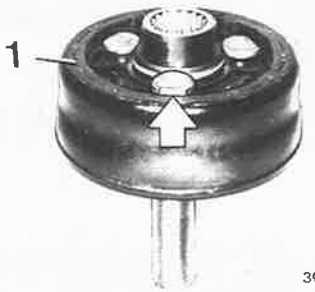
23 13 010 REMOVING AND INSTALLING OR REPLACING VIBRATION DAMPER

Unscrew propeller shaft at front and center mount, see 23 00 022.
Lift out lockplate.
Apply Special Tool 23 1 200.
Hold output flange with Special Tool 23 1 320.
Unscrew collar nut with Special Tool 23 1 210.
Installation:
Tightening torque*.
Install collar nut with a bolt cement, Loctite No. 270.



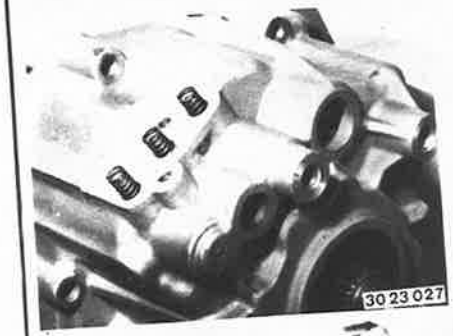
Pull off output flange with Special Tool 33 1 150.

Vibration damper (1) is mounted on the output flange with three staybolts.
Press staybolts out of output flange.
Apply a suitable piece of round iron bar on both sides.
Screw on nuts to avoid damaging the threads.
Press out staybolts.
Take off vibration damper.

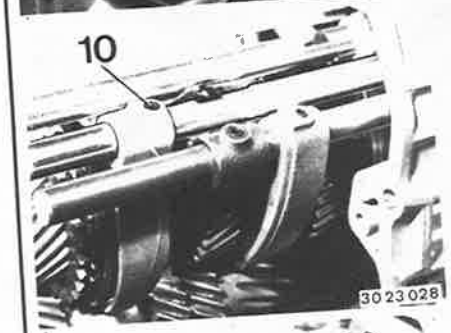


Mount the output flange with its bore on a suitable piece of pipe.
Mount vibration damper (1) with the staybolts.
Press in the staybolts.
Important!
Press in staybolts with the flat side facing the vibration damper.

* See Specifications

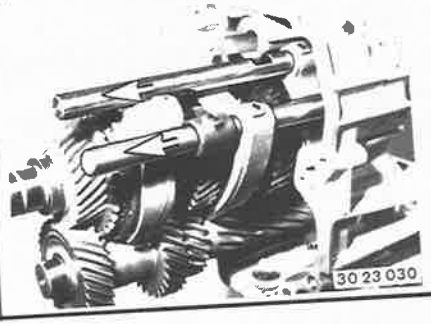


Remove three springs.

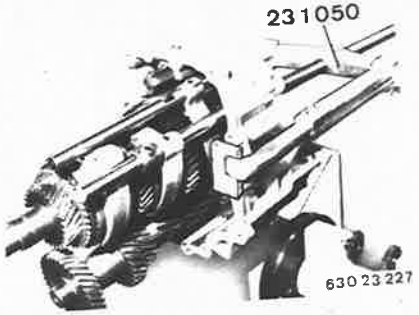


Drive out pin (10) in 3rd/4th gear selector fork.
Installation:
Replace pin.

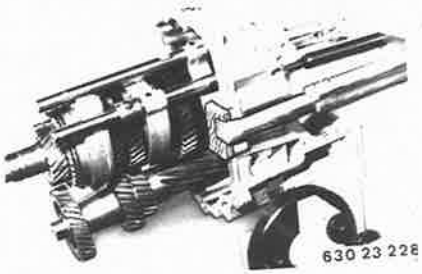
Knock out 3rd/4th gear selector rod forward.
Important!
Lockpin (11) in selector rod.



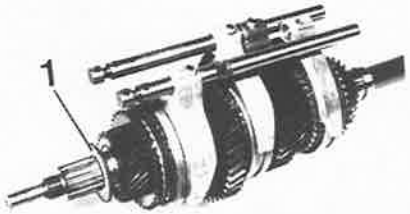
Engage 2nd and reverse gears by pushing 1st/2nd and 5th/reverse gear selector rods forward.



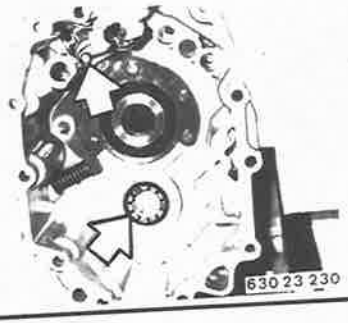
Press input shaft, output shaft and layshaft out of case rear section with Special Tool 23 1 050.
Important!
To avoid sealing surface damage, use a piece of wood, aluminum or similar material between claws and sealing surface.



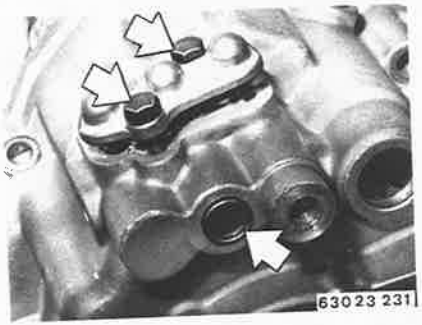
Important!
Be careful not to clamp selector rods and layshaft while pressing out parts.
Installation:
Check condition of all bearings, replacing if necessary.



Installing:
Install 3rd/4th gear selector fork and 1st/2nd as well as 5th/reverse gear selector rods with selector forks.
Check thrust washer (1).



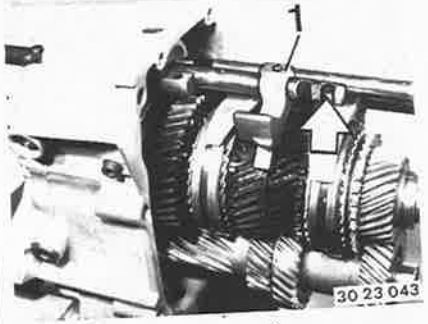
Remove all detent and locking balls in case rear section.
Install roller bearings with large diameter end facing out.
Lubricate lockpin and locking lever with oil.



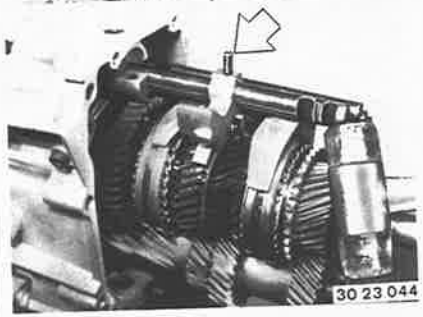
Install end cap after coating with Loctite No. 573*.
Install end cover with Loctite No. 573

Drive pin out of selector arm.

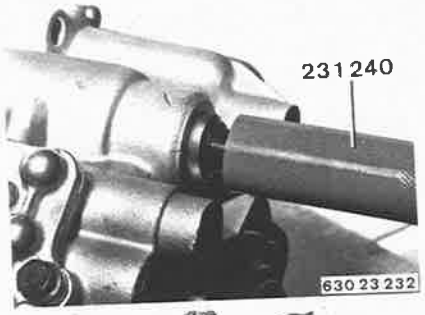
30 23 042



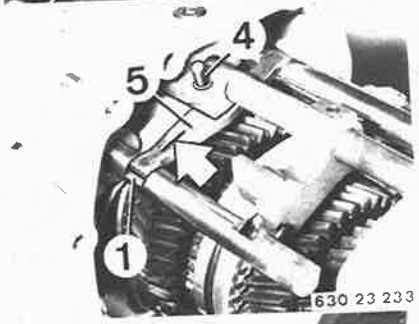
Hold four rollers in position with grease.
Slide in selector shaft and install selector arm (1) at same time.
Important!
Opening in selector shaft faces out.



Drive in 6 x 26 mm pin (counterhold).

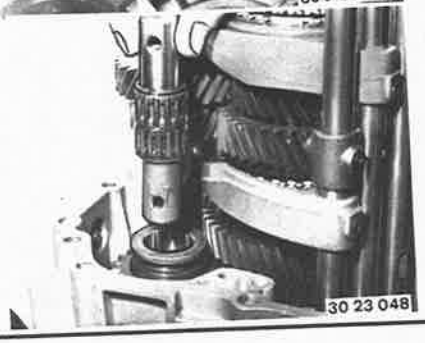


Lubricate sealing lips of radial oil seal with oil.
Drive in radial oil seal with Special Tool 23 1 240.



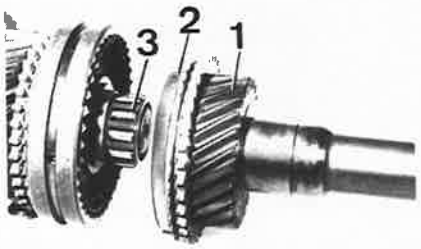
Install selector rail.
Groove (1) in selector rail faces up.
Install operating lever (5) with notch facing up and toward selector rail.
Install pin (4).

Coat case rear section in area of reverse gear shaft with Loctite No. 573
Surface must be thoroughly clean and dried of oil.



Install shaft with needle bearing and reverse gear.

23 21 554 REPLACING OUTPUT SHAFT
— Output Shaft Removed —

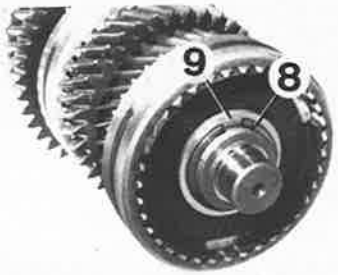


630 23 236

Pull off input shaft (1), brass synchromesh ring (2) and needle bearing (3).
Note:
It is recommended to mark synchromesh rings for a pertinent gear wheel when disassembling the output shaft, in order to avoid mixing up synchromesh rings.

630 23 237

Pull off thrust washer (4), 5th gear (5), brass synchromesh ring (6) and needle bearing (7).

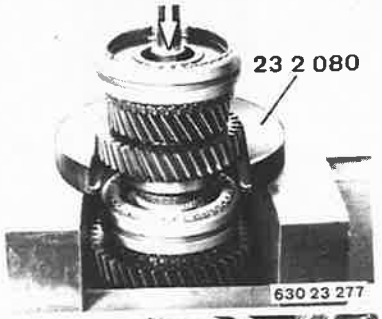


630 23 238

Lift out circlip (8).
Remove spacer (9).
Installation:
Always replace circlip.

630 23 239

Installation:
Adjust play between circlip and guide sleeve to 0 ... 0.09 mm (0 to 0.0035").

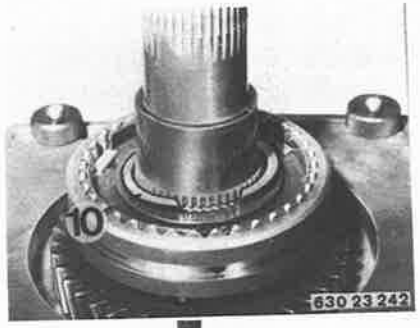


630 23 277

Press second gear, bearing sleeve, third gear, synchromesh ring and guide sleeve with operating sleeve off of output shaft with Special Tool 23 2 080.
Pressing-off force*.

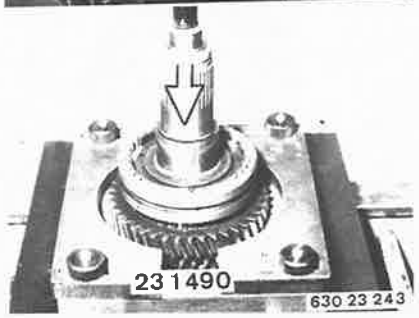
630 23 291

Version with Thrust Washer:
Note thrust washer (2) and ball (3) between 2nd and 3rd gear wheels.



630 23 242

Important!
Snap ring (10) must be removed before pressing off 1st gear.
Installation:
Always replace snap ring.



630 23 243

Press off 1st gear with guide sleeve and sliding sleeve with Special Tool 23 1 490.
Remove needle bearing.
Pressing-off force*.

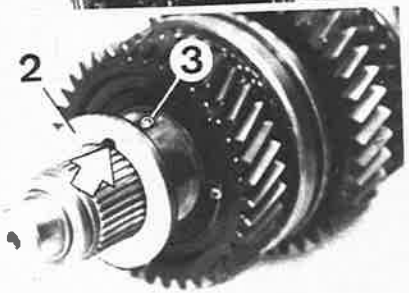
* See Specifications


630 23 253

Install needle bearing, nickle plated synchromesh ring and 2nd gear.
Important!
Collar for bearing sleeve on output shaft must protrude slightly.
If applicable, check circlip (10) for correct fit.


630 23 254

Heat bearing sleeve to approx. 80° C (175° F) with a hot air blower and install on output shaft.



630 23 293

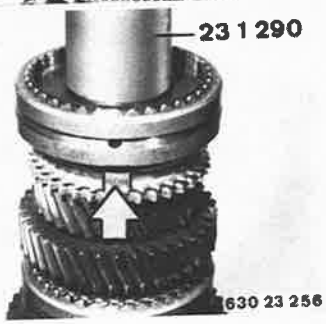
Version with Thrust Washer:
Install ball (3) and thrust washer (2) with opening facing ball (3).

630 23 294

Heat bearing sleeve (4) without collar to approx. 80° C (175° F) with a hot air blower and install on output shaft.


630 23 255

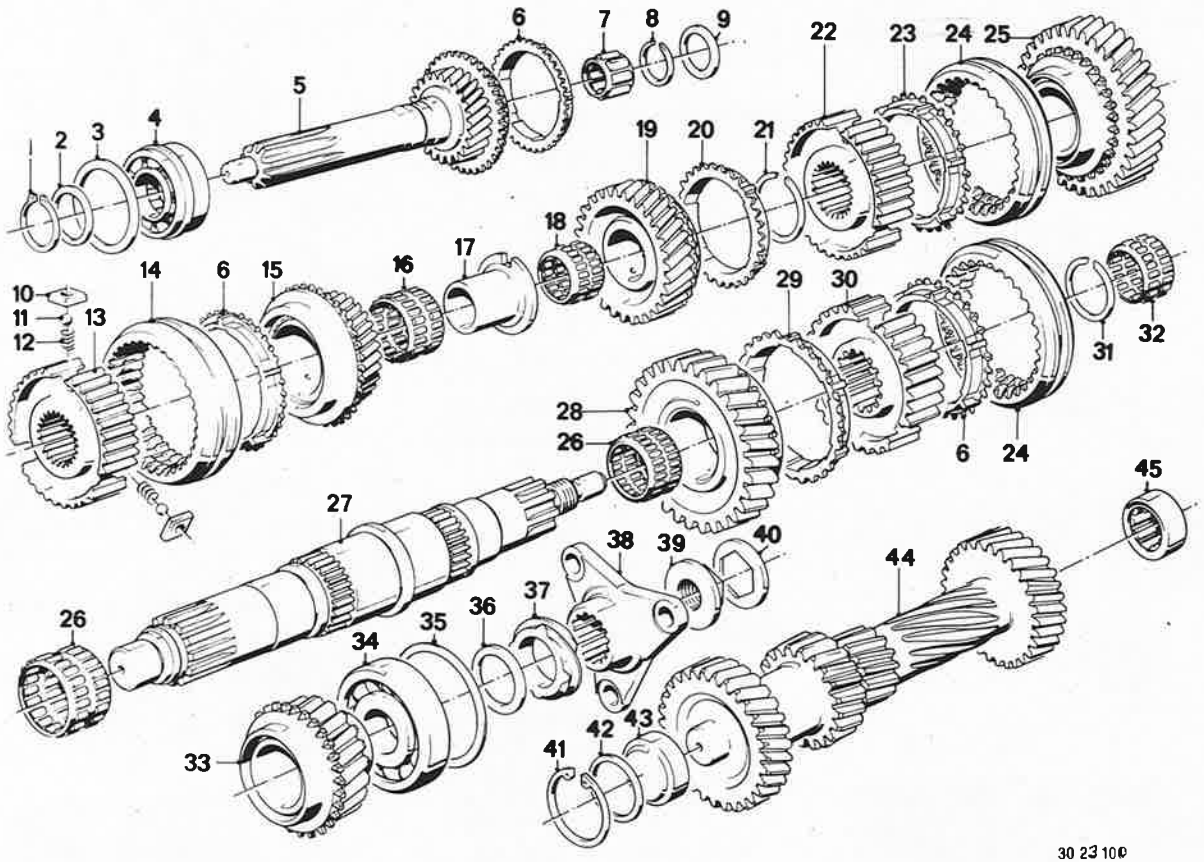
Install needle bearing, 3rd gear and brass synchromesh ring.
Place guide sleeve and operating sleeve on splines with long collar facing 3rd gear.
Since 5.85:
Stepped end of operating sleeve must face the 3rd gear wheel.



630 23 256

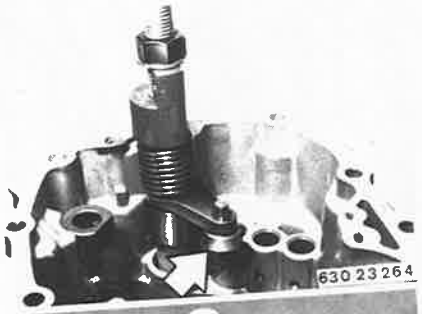
Press on guide sleeve to fit tight with Special Tool 23 1 290.
Important!
When pressing on parts, make sure that tabs on synchromesh ring are aligned with openings in guide sleeve.
Install spacer and circlip.

23-183



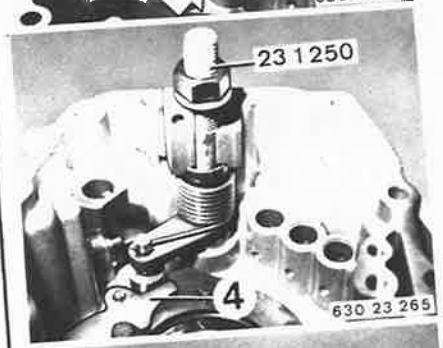
Layout Drawing of Gear Set with Bearings:

1 Circlip
2 Spacer
3 Spacer
4 Bearing
5 Input shaft with 4th gear
6 Synchromesh ring
7 Needle bearing
8 Circlip
9 Spacer
10 Drive dog
11 Ball
12 Spring
13 Guide sleeve
14 Operating sleeve
15 3rd gear
16 Needle bearing
17 Spacer
18 Needle bearing
19 2nd gear
20 Synchromesh ring
21 Circlip
22 Guide sleeve
23 Synchromesh ring
24 Operating sleeve
25 1st gear
26 Needle bearing
27 Output shaft
28 Reverse gear
29 Synchromesh ring
30 Guide sleeve
31 Circlip
32 Needle bearing
33 5th gear
34 Bearing
35 Spacer
36 Spacer
37 Speedometer drive gear
38 Output flange
39 Collar nut
40 Lockplate
41 Circlip
42 Spacer
43 Bearing
44 Layshaft
45 Bearing



Remove selector arm from above.

Important!
Roller.



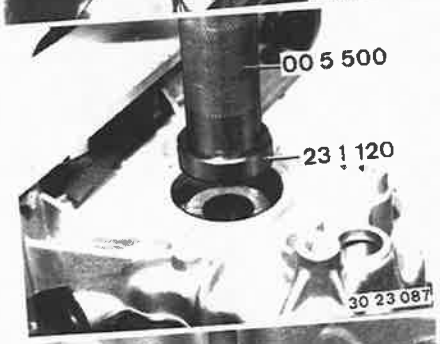
Installation:
Insert selector arm with Special Tool 23 1 250.
Swing out selector arm with roller over locking lever (4).

Position end of spring (3) above high spot.
Oress (don't knock) down selector arm in this position.
Mount selector arm with socket head bolt before removing the special tool.
Install socket head bolt with a bolt cement**.
Tightening torque*.

Remove bearing holder (5).

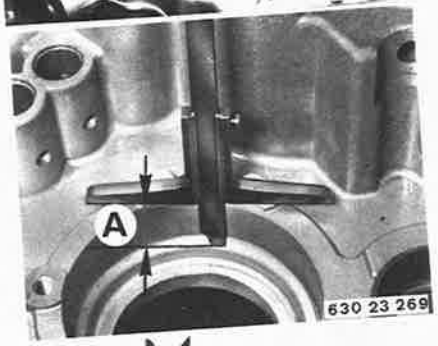
Important!
Don't unscrew bolt (6).
Locking lever (7) remains on the bearing holder.

Installation:
Check installed position of locking lever (7) and thrust pin (8).

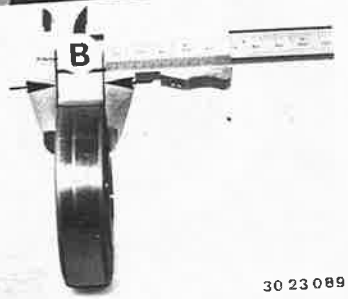


Lift out radial oil seal.
Drive out grooved ball bearing with Special Tools 23 1 120 and 00 5 500.

Important!
Shim X.



Determine thickness of shim X.
Measure distance (A).



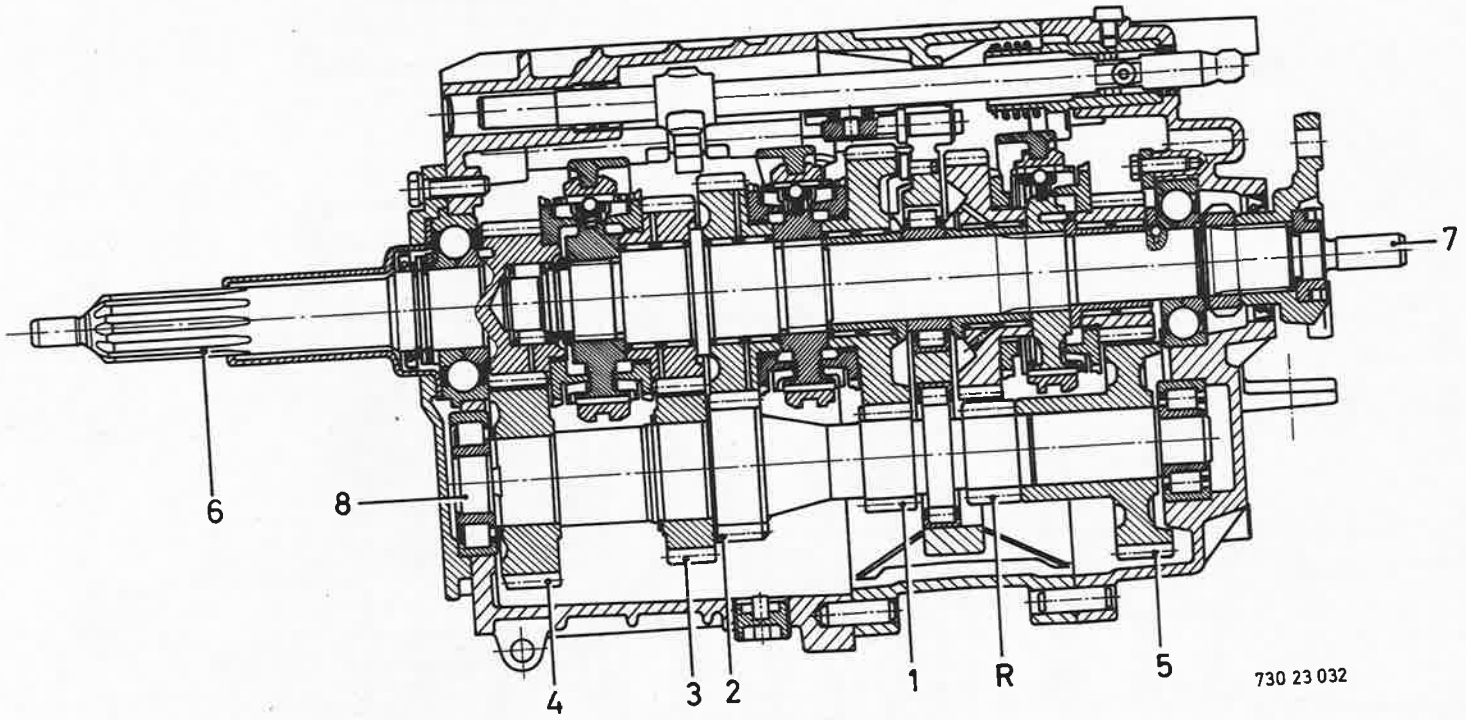
Measure distance (B).

Example:

A	20.3 mm (0.799")
– B	20.0 mm (0.787")
X	0.3 mm (0.012") thick shim

30 23 089

* See Specifications
** Source of Supply: HWB

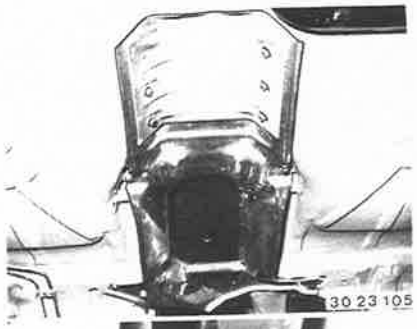


Section Drawing of GETRAG 265/6 Overdrive Manual Transmission

1 First gear
2 Second gear
3 Third gear
4 Fourth gear
5 Fifth gear
R Reverse gear
6 Input shaft
7 Output shaft
8 Layshaft

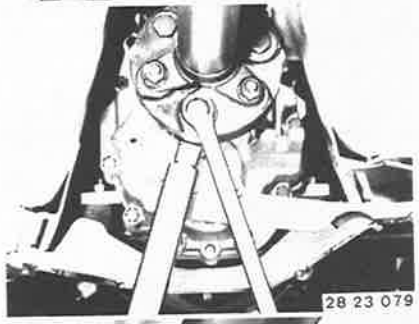
23 00 022 REMOVING AND INSTALLING TRANSMISSION

Remove exhaust assembly – see 18 00 020.
Unscrew heat shield.

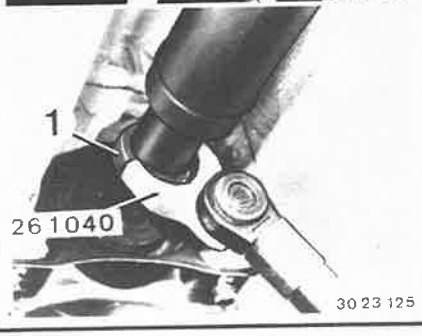


Unscrew joint disc on transmission.
Always replace stop nuts.

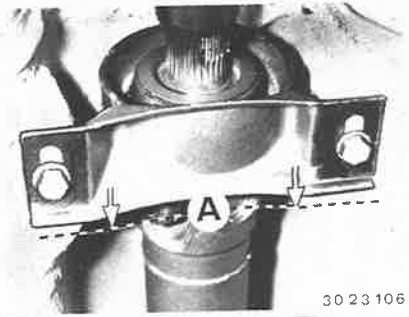
Installation:
Tighten nuts with a standard 19 mm wrench socket and a torque wrench.
Tightening torque*.
Important!
Only tighten nuts on flange end, whenever possible by design, to avoid tension in the joint disc.



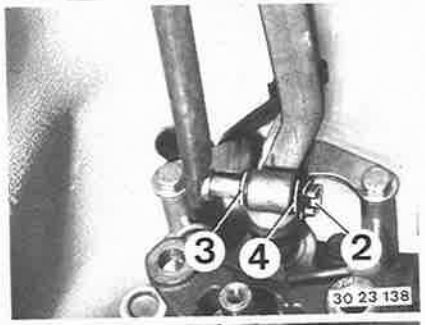
Loosen threaded ring (1) several turns.
Installation:
Tighten threaded ring (1) with Special Tool 26 1 040 after finishing installation.
Tighten torque*.



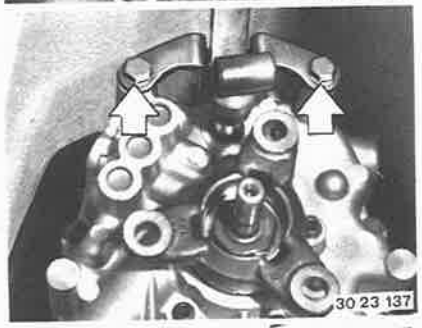
* See Specifications



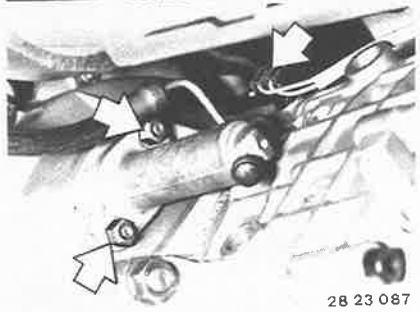
Unscrew center mount.
Installation:
Preload center mount forward by distance (A) = 4 to 6 mm (0.157 to 0.236").
Bend propeller shaft down and pull it off of centering pin.
Important!
Don't let propeller shaft fall into the joints.
Suspend propeller shaft from car on pieces of wire.



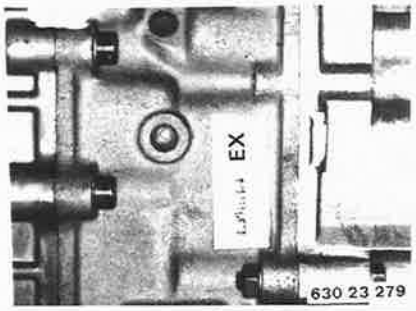
Lift out retainer (2).
Note washers (3 and 4).
Pull out shift rod.



Unscrew holder for shift arm on transmission.

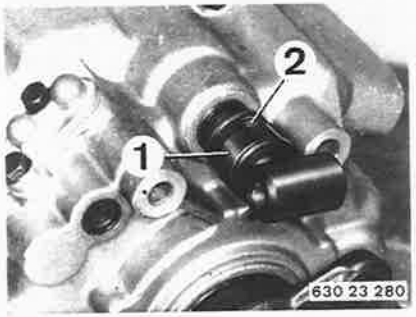


Pull off wires on reverse gear switch.
Unscrew clutch slave cylinder -- pipe remains connected.
Installation:
Bleeder screw faces down.

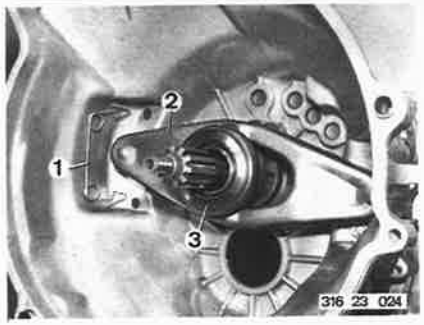


23 00 032 INSTALLING EXCHANGE TRANSMISSION

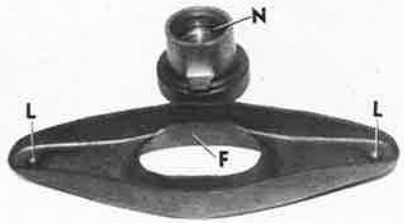
Remove transmission – see 23 00 022.
BMW code* marked on intermediate case section.



Transfer shift rod joint.
Push back locking sleeve (1).
Drive out cylindrical pin (2).



Transfer spring (1) and release lever (2) with release (3).

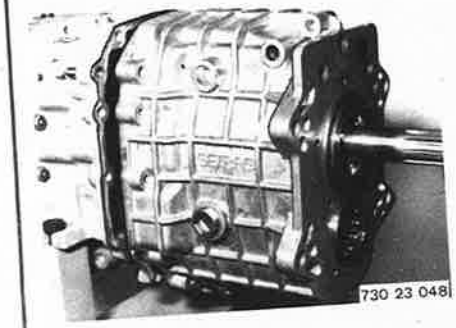


316 23 025

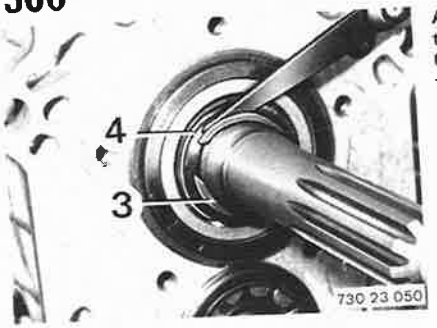
Installation:
Pack lubricating groove (N) with Molykote Longterm 2.
Give guides (F) and bearings (L) a light coat of Molykote Longterm 2.
Non-conformance could cause bearing to seize on the guide sleeve.

Transfer rubber mounts with cross member, exhaust carrier and backup light switch.
Note:
Transmissions are supplied filled with oil, so that it is only necessary to check the oil level after installation of the transmission.

* See Parts Microfiche

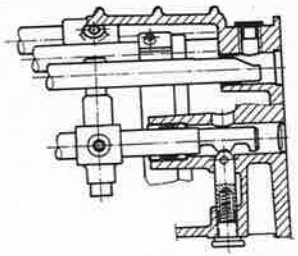

730 23 048

Coat sealing surfaces with Loctite No. 573.
Sealing surfaces must be cleaned thoroughly and dried of oil.
Mount front transmission case section.
Tightening torque*.



730 23 050

Adjust play between washer (4) and circlip (3) to 0 ... 0.09 mm (0 to 0.0035").
Circlips (3) are available from Parts in various thicknesses.
Install grooved washer and circlip.

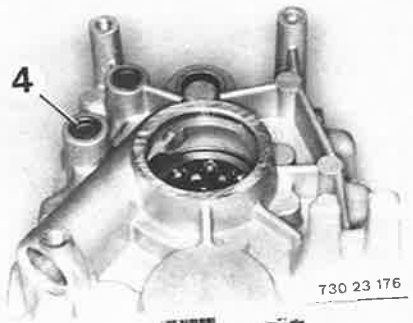

730 23 034

Install lockpin and backup light switch.
Note arrangement of lockpin.

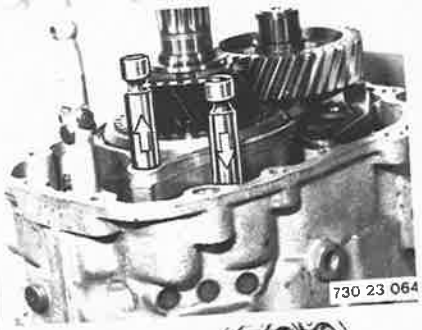
730 23 183

Heat ball bearing inner race (8) to about 80° C (175° F) with a hot air blower and slide on to input shaft.
Pull out input shaft for this purpose.

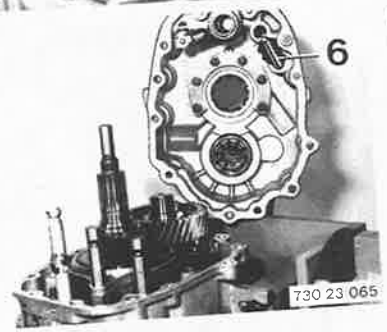
* See Specifications



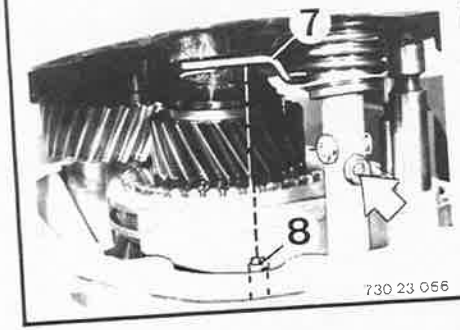
Knock out end cap (4).
Installation:
Replace and install end cap with Loctite No. 573.



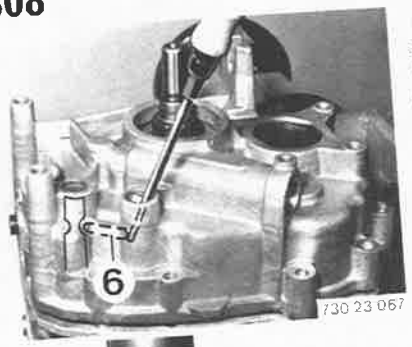
Position output shaft upright.
Second gear is engaged.
Adjust reverse/5th gear selector rod until opening of 5th gear selector rod is aligned with end of 1st/2nd gear selector rod.



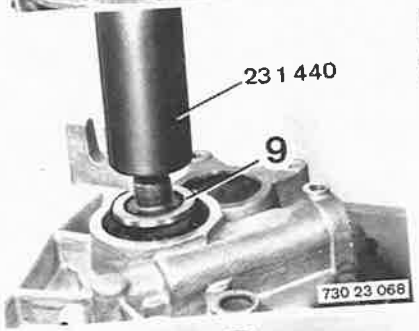
Coat sealing surfaces with Loctite No. 573.
Sealing surfaces must be cleaned thoroughly and dried of oil.
Important!
Lockpin (6) must move easily and face down.



Hold rollers in position with grease.
Mount transmission case rear section.
Make sure spring (7) of selector arm engages on lever (8).

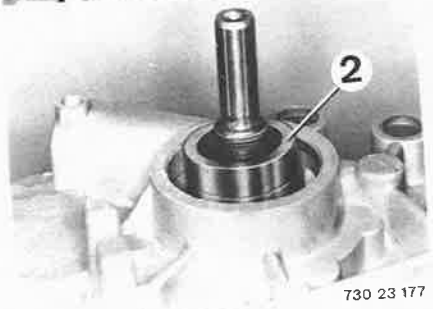


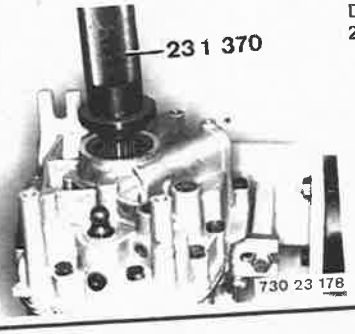
Press lockpin (6) into opening of 1st/2nd gear selector rod.
Push on and bolt down transmission case rear section.
Tightening torque*
Drive in centering pin.
Install end cap (4).



Heat bearing inner race (9) to about 80° C (175° F) with a hot air blower and slide on to output shaft, if necessary knocking on against ball bearing with Special Tool 23 1 440.

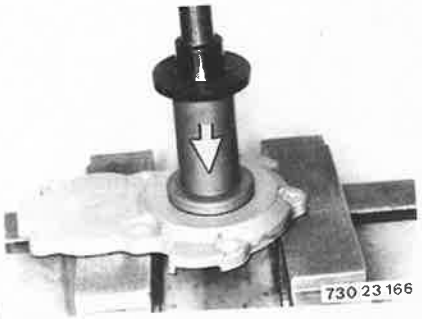
Install spacer (2).





Drive in radial oil seal flush with Special Tool 23 1 370.

* See Specifications

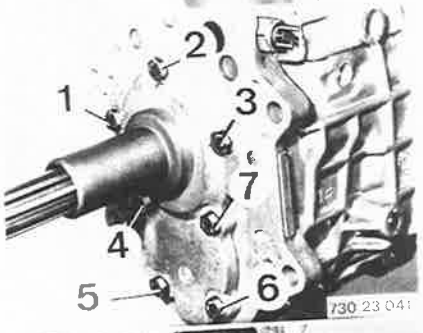

730 23 166

23 11 610 REPLACING CLUTCH RELEASE GUIDE TUBE
— Transmission Removed —

Remove guide flange — see 23 11 623.
Press out guide tube.

Heat guide flange to about 80° C (175° F) with a hot air blower.
Install guide tube.
Note:
Check turning lock (1).
Install radial oil seal.

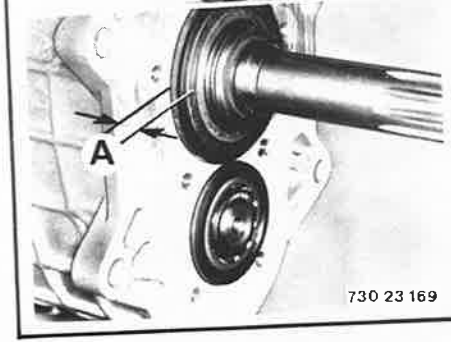
730 23 167



730 23 041

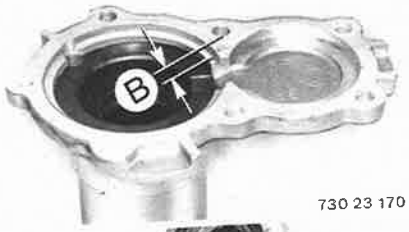
23 11 623 REMOVING AND INSTALLING OR SEALING COVER WITH GUIDE TUBE FOR CLUTCH RELEASE

Unscrew cover.
Important!
Spacers.
Important! — Installation:
Check length of bolts.
Bolts (1 ... 3) = 8 x 30 mm
Bolts (4 ... 7) = 8 x 22 mm



730 23 169

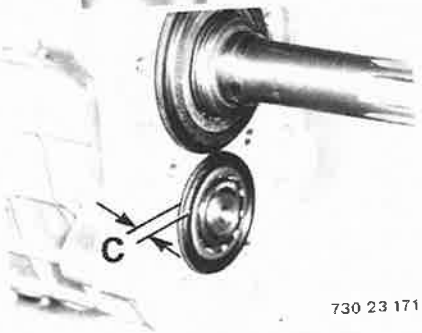
Adjust ball bearing between input shaft and guide flange to 0 ... 0.09 mm (0 to 0.0035").
Measure distance (A) from case to ball bearing.



730 23 170

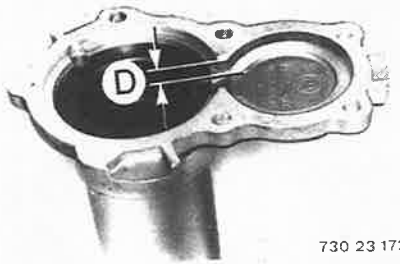
Measure distance (B).
Example:

B	8.1 mm (0.319")
— A	7.8 mm (0.307")
	0.3 mm (0.012") spacer thickness



730 23 171

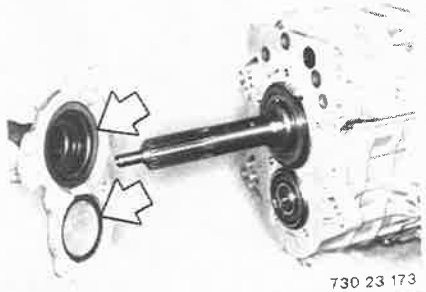
Adjust roller bearing play between layshaft and guide flange.
Measure distance (C) from case to roller bearing outer race.



730 23 172

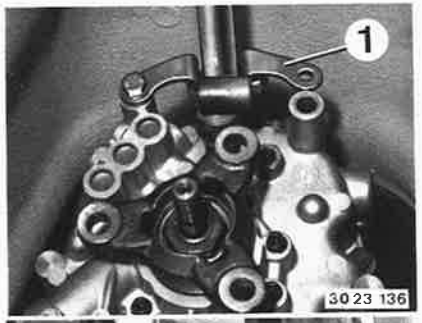
Measure distance (D).
Example:

D	4.8 mm (0.189")
— C	4.3 mm (0.169")
	0.5 mm (0.020")
—	0.1 ... 0.2 mm (0.004 ... 0.008") axial play
	0.3 mm (0.012") spacer thickness


730 23 173

Coat sealing surfaces with Loctite No. 573.
Sealing surfaces must be cleaned thoroughly and dried of oil.
Hold spacers of calculated thickness in position with grease.
Mount cover.
Install bolts with Loctite No. 573.
Tightening torque*.
Threads cleaned to remove old cement.

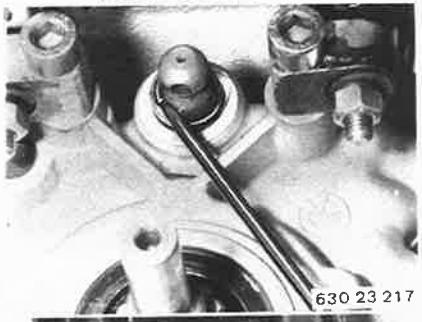
* See Specifications



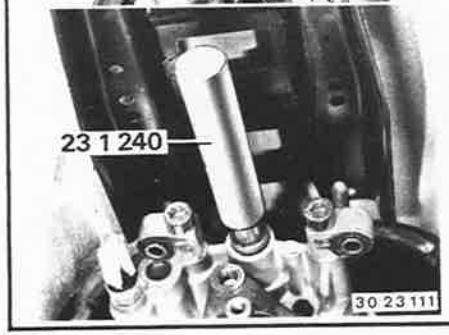
23 12 083 REPLACING RADIAL OIL SEAL SELECTOR SHAFT

Unscrew propeller shaft – see 23 00 022.
Unscrew input flange – see 23 12 053.
Holder (1) must be taken off of the transmission partially, in order to be able to drive out the cylindrical pin for the selector rod joint.

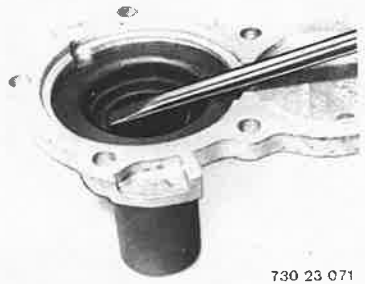
Engage 3rd gear.
Push locking sleeve (1) away and drive out cylindrical pin (2).



Lift out radial oil seal.

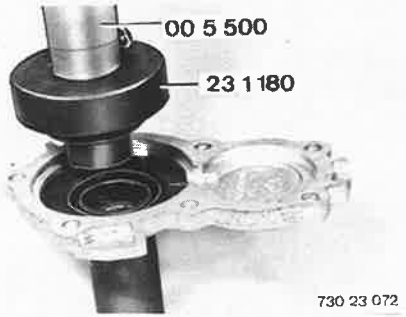


Lubricate sealing lip of radial oil seal with oil.
Drive in radial oil seal with Special Tool 23 1 240.

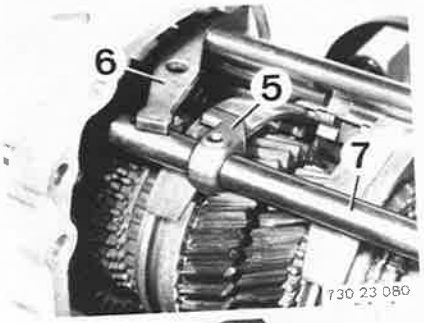


23 12 503 REPLACING RADIAL OIL SEAL FOR INPUT SHAFT – Transmission Removed –

Remove cover with guide tube – see 23 11 623.
Lift out radial oil seal.

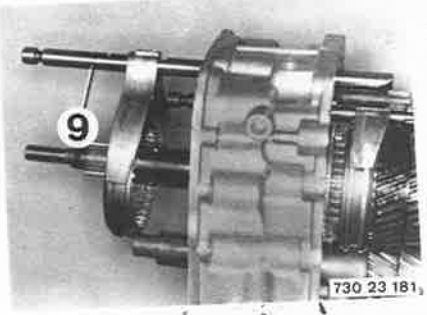


Drive in radial oil seal against stop with Special Tools 23 1 180 and 00 5 500.
Open end faces transmission.
Lubricate sealing lip with oil.

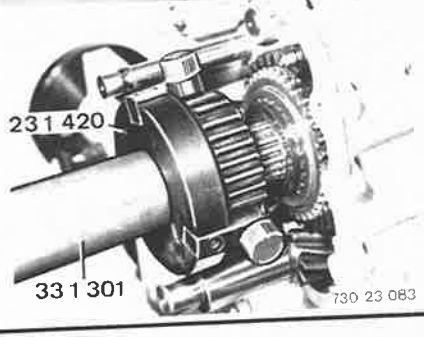


Pull or take off turning lock (5) and reversing lever (6).
Pull out selector rail (7) forward.
Disengage second gear.

Pull out 5th gear selector rod with selector fork and operating sleeve toward rear far enough, that pin (8) can be driven out while counterholding.
Important!
Loose balls, springs and slides.
Installation:
Replace pin.

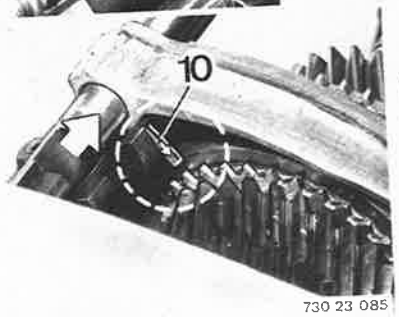


Pull off operating sleeve and fifth gear selector fork.
Pull out selector rod (9) forward.
Important!
Loose balls.

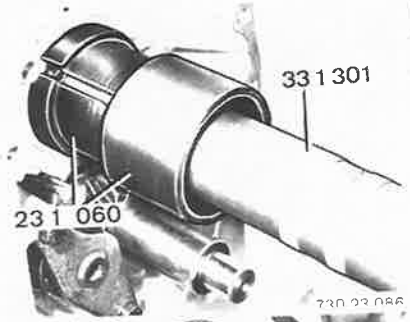


Pull guide sleeve and bearing inner race off of output shaft with Special Tools 23 1 420 and 33 1 301.
Important!
Hold knurled head bolts in recesses of guide sleeve with a pliers.

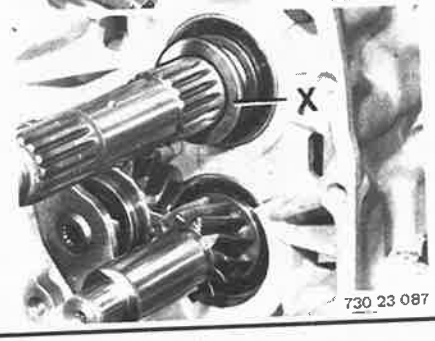
Take off synchromesh ring.
Pull off reverse gear and needle bearing.



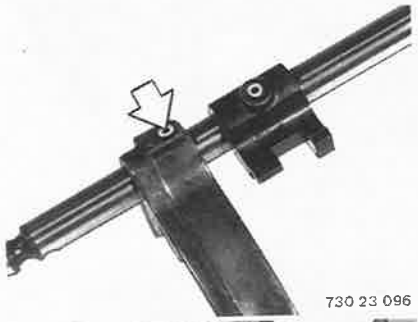
Engage third gear.
Drive out pin (10).
Important!
Drive in pin on to tooth of 3rd gear wheel until selector rod can be pulled out forward.
Remove 3rd/4th gear selector fork.
Loose balls.
Installation:
Replace pin.



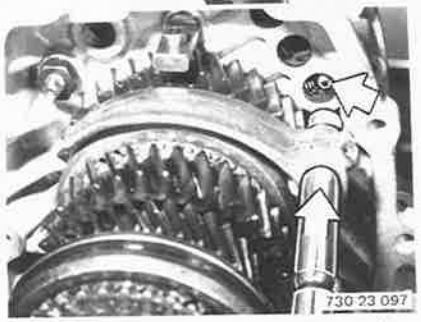
Pull out output shaft toward rear far enough, that bearing inner race can be pulled off with Special Tools 23 1 060 and 33 1 301.



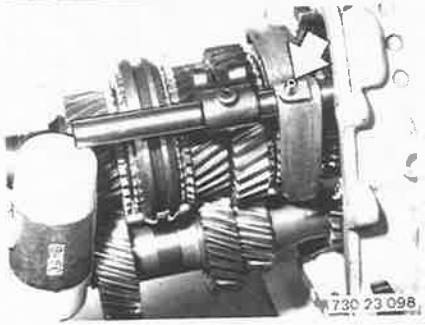
Remove shim X.
Installation:
Determine thickness of shim X (see 23 21 554).


730 23 096

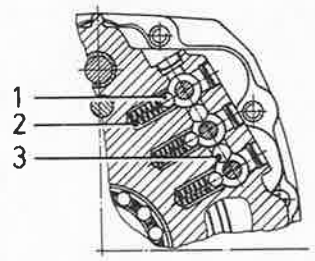
Drive pin out of 1st/2nd gear selector rod.
Installation:
Replace pin.


730 23 097

Mount 1st/2nd gear selector fork.
Push in 1st/2nd gear selector rod up to spring.
Insert locking balls and press down.
Push in selector rod against arrest in this position.

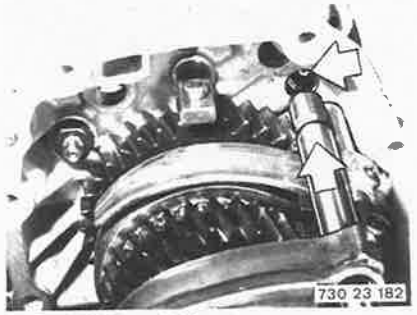

730 23 098

Drive in 6 x 32 mm pin, while counterholding.

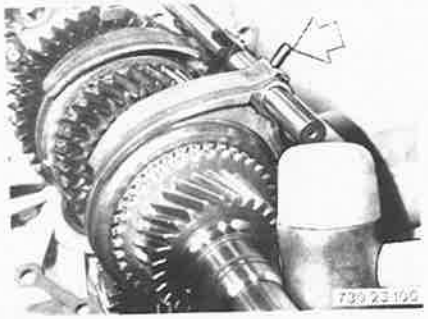


730 23 035

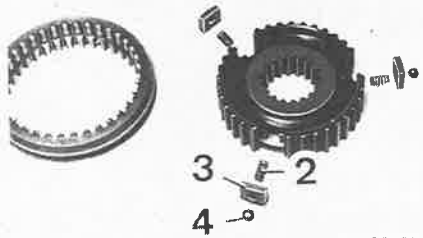
Layout of Selector Arrest:
1 Locking ball
2 Spring
3 Detent ball


730 23 182

Mount 3rd/4th gear selector fork.
Insert detent ball.
Push in selector rod up to spring.
Insert locking balls and press down.
Push in selector rod against arrest in this position.

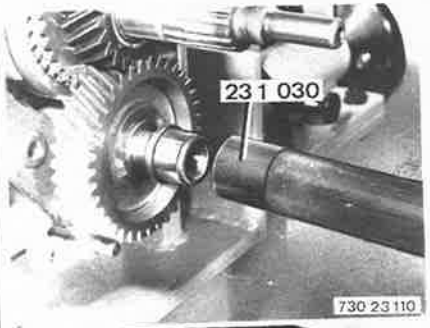

730 23 100

Drive in 6 x 26 mm pin, while counterholding.

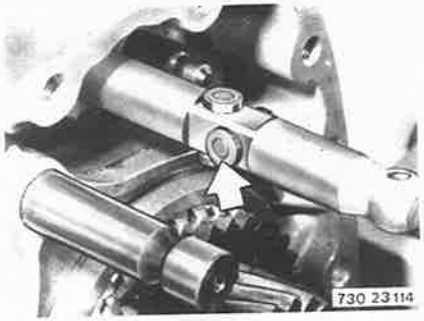


730 23 101

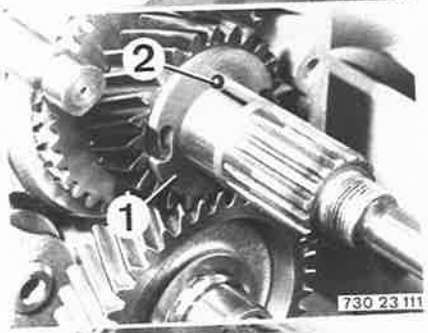
Assemble synchronizer.
Installed Order:
Springs (2), thrust parts (3) and balls (4).
Curved surface of thrust parts (3) faces operating sleeve.



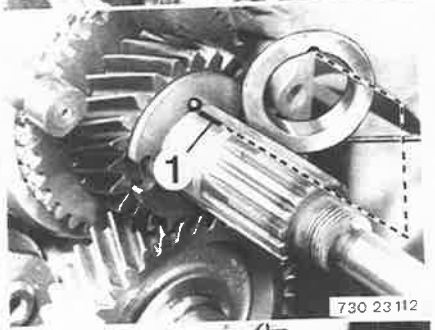
Heat bearing inner race to approx. 80° C (175° F) with a hot air blower and install on layshaft.
If necessary, drive on with Special Tool 23 1 030.
Collar of bearing race faces gear.



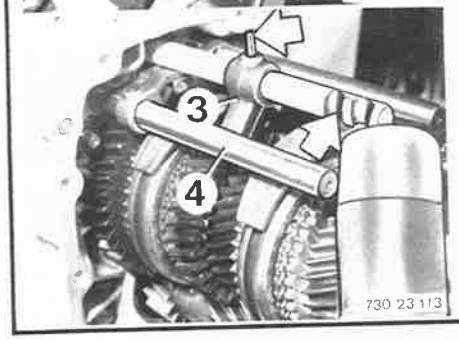
Hold four rollers in position on selector shaft with grease.



Insert ball (2) with grease.
Push on washer (1).

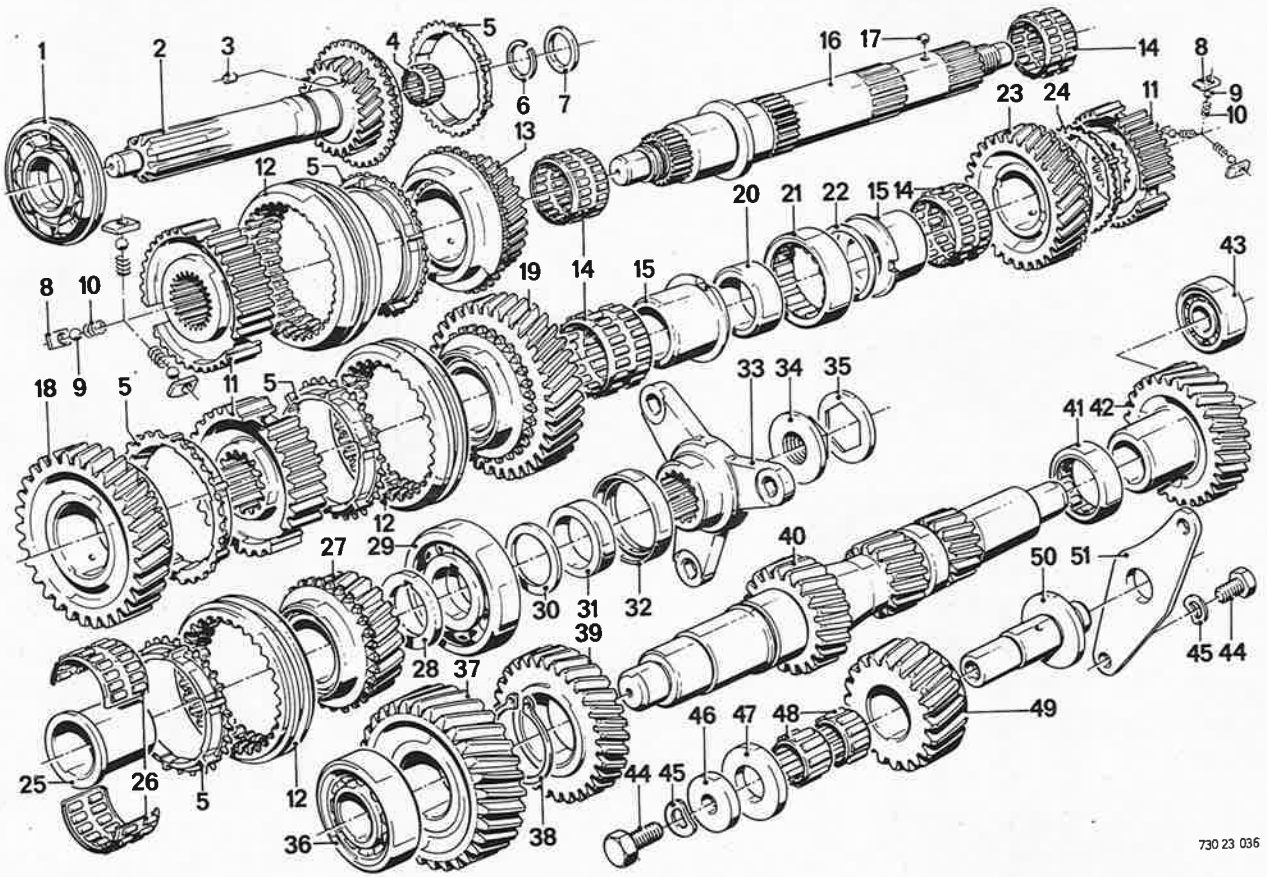


Installation:
Heat ball bearing inner races to approx. 80° C (175° F) with a hot air blower and install on output shaft.
Important!
Turning lock.
Opening in bearing inner race must engage in ball.
Draw line (1) to make installation of bearing race easier.

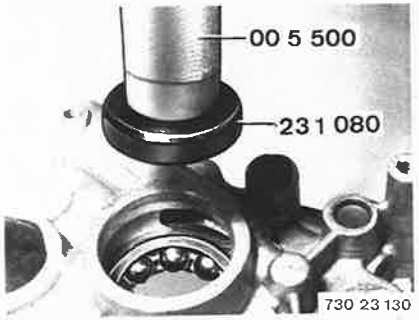


Install selector shaft, while pushing on selector arm (3) with long finger facing 3rd/4th gear selector rod.
Important!
Arrest on selector shaft faces selector rail (4).
Drive in 6 x 32 mm pin, while counterholding.

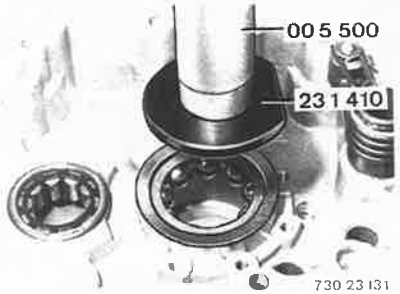
23-320



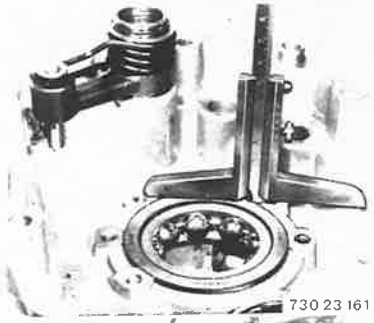
1 Ball bearing
2 Input shaft with 4th gear
3 Turning lock
4 Needle bearing
5 Synchromesh ring
6 Snap ring
7 Washer
8 Thrust part
9 Ball
10 Spring
11 Guide sleeve
12 Sliding sleeve
13 3rd gear
14 Needle bearing
15 Bearing sleeve
16 Output shaft
17 Ball
18 2nd gear
19 1st gear
20 Bearing race
21 Roller bearing
22 Shim X
23 Reverse gear
24 Circlip
25 Bearing sleeve
26 Split needle bearing
27 5th gear
28 Washer
29 Ball bearing
30 Washer
31 Speedometer drive gear
32 Radial oil seal
33 Output flange
34 Collar nut
35 Lockplate
36 Roller bearing
37 4th gear
38 Circlip
39 3rd gear
40 Layshaft
41 Roller bearing
42 5th gear
43 Roller bearing
44 Bolt
45 Washer
46 Washer
47 Thrust washer
48 Needle bearing
49 Reverse gear
50 Bearing shaft
51 Bearing holder



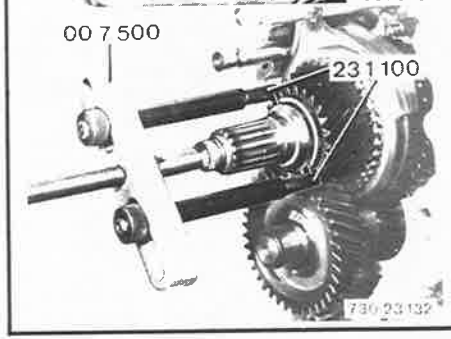
Drive out ball bearing with Special Tools 23 1 080 and 00 5 500.



Drive in ball bearing with Special Tools 23 1 410 and 00 5 500.

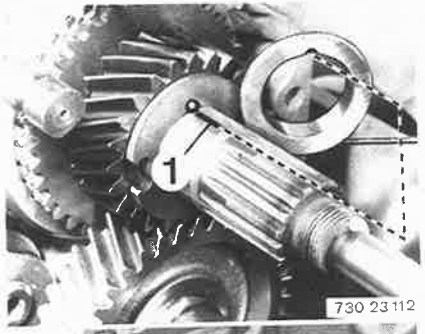


Adjust play between bearing holder and case rear section with shims.
Mount bearing holder.
Tightening torque*.



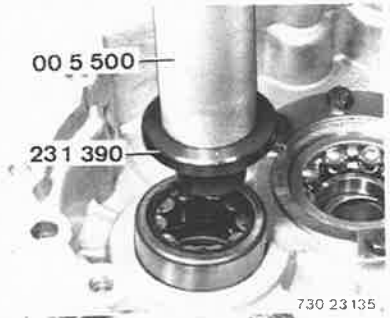
Pull ball bearing inner race off of output shaft with Special Tools 23 1 100 and 00 7 500.

* See Specifications

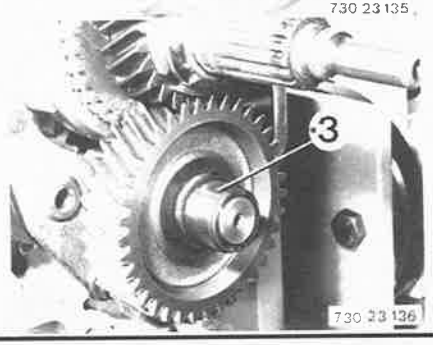


Installation:
Heat ball bearing inner race to approx. 80° C (175° F) with a hot air blower and slide on to output shaft.
Important!
Opening in bearing inner race must engage in ball.
Draw line (1) to make installation of bearing race easier.

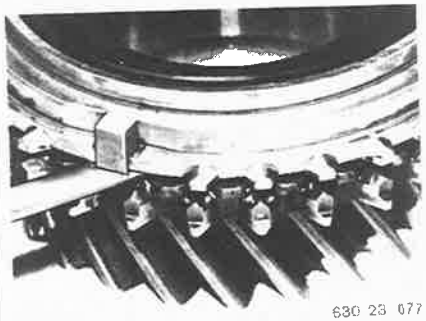
Heat case rear section to approx. 80° C (175° F) with a hot air blower.
Lift out roller bearing (2).
Installation:
Insert bearing that large diameter end of plastic cage faces up.



Heat case rear section to approx. 80° C (175° F) with a hot air blower.
Install roller bearing, driving in with Special Tools 23 1 390 and 00 5 500.



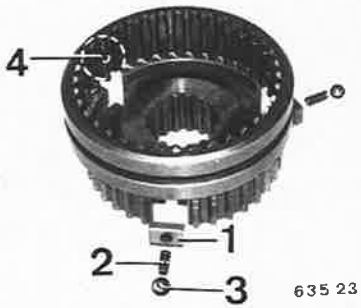
Bearing inner race (3) can only be pulled off together with the 5th gear — see 23 21 503.



630 23 077

23 23 505 DISASSEMBLING AND ASSEMBLING COMPLETE SYNCHRONIZATION
— Output Shaft Removed —

Disassemble output shaft — see 23 21 554.
All synchromesh rings are identical and coated with molybdenum on the inside.
Check distance* between synchromesh ring and clutch.
Measure in area of stops.
Synchromesh rings should bear uniformly all around.



635 23 137

Disassemble synchronization.
Pressure piece (1)
Spring (2)
Ball (3)
Installation:
Bore (4) in operating sleeve must be aligned with ball (3).

630 23 079

Installation:
Install all springs, pressure pieces and balls.
Important!
Curved surface of pressure pieces faces the operating sleeve.
Install guide sleeve that half of it is in the operating sleeve.
Press in balls far enough until the guide sleeve can be pressed into the operating sleeve.

* See Specifications

24 Automatic Transmission

3 HP - 22

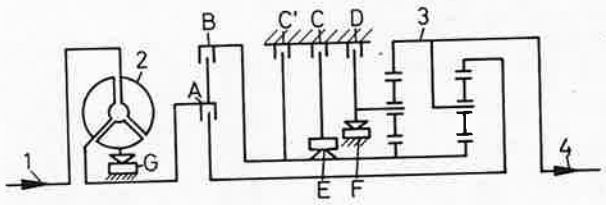
24 Automatic Transmission

4 HP – 22

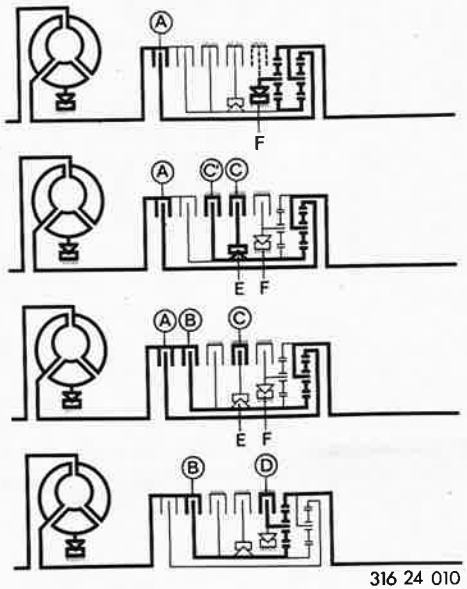
24 Automatic Transmission

4 HP – 22

3 HP – 22 Transmission Layout
1 Input
2 Torque converter
3 Planet gear set
4 Output



530 24 010



316 24 010

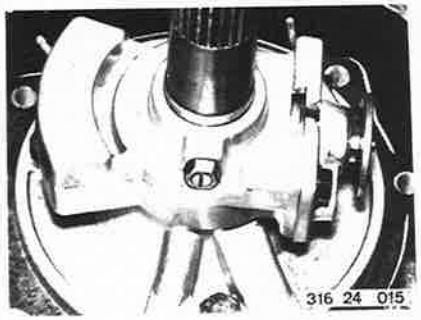
Power Flow Diagrams 3 HP – 22

1st Gear
Clutch A is engaged. Planet gear carrier bears on one-way clutch F during acceleration and is cancelled while coasting.
With the selector lever in position 1 clutch D is also engaged when in 1st gear, to be able to utilize the engine's braking force.

2nd Gear
Clutches A, C' and C are engaged. One-way clutch F is cancelled. The hollow shaft is fixed with the sun gear.

3rd Gear
Clutches A, B and C are engaged. One-way clutches E and F are cancelled. The entire planet gear set turns as a single unit at a ratio of 1 : 1.

Reverse Gear
Clutches B and D are engaged. The output shaft's direction of rotation is reversed by the held planet gear carrier. The power flow 1st, 2nd, 3rd and reverse gears is via the bold parts.



Explanation of Hydraulic Valve Body

The main pressure valve controls the pressure level in the hydraulic valve body. As soon as the valve body is filled with oil, the supply of oil to the torque converter is released. If the delivery rate increases, any excessive oil is returned to the primary pump via the intake port.

The converter pressure valve has been given the task of preventing excessive pressure in the torque converter.

The selector slide valve is operated mechanically by the selector lever. The valve directs the oil pressure in the valve body to the desired driving ranges.

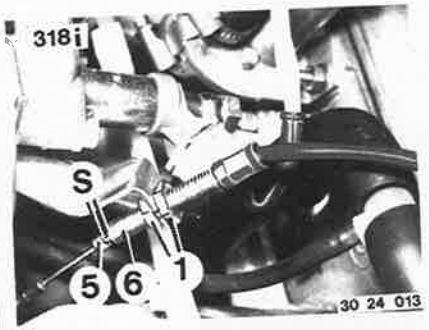
The governor determines in conjunction with the shift valves the shift points depending on the throttle pressure. The governor pressure is produced in accordance with the input shaft's speed.
There will be no upshifts or downshifts when the governor piston and/or governor bush seize due to dirt.
Clean governor (see 24 32 503).

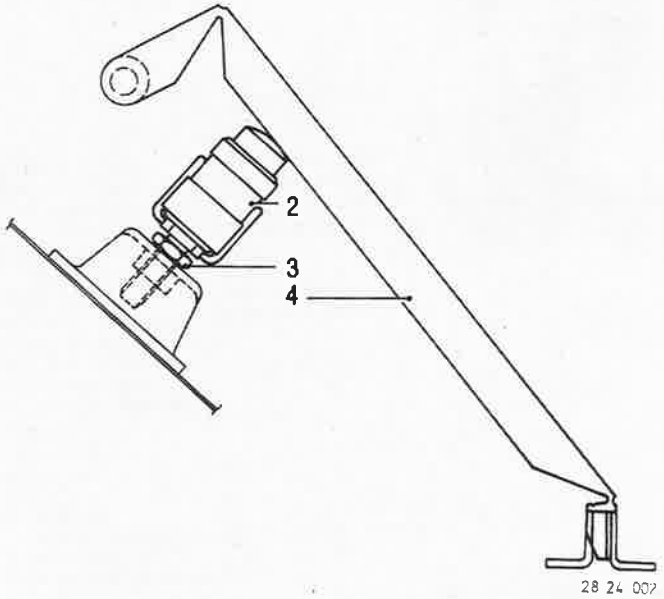
The throttle pressure valve is connected with the accelerator cable and determines with the governor the shift points depending on the throttle valve position.

The locking valves have the task of initiating the downshifts into the different gears regardless of the throttle valve position. Further the locking valves will prevent the other gears from engaging automatically when the selector lever is positioned at 1 or 2.

The shift valves determine which gear is engaged. If the spring pressure in a shift valve is overcome by governor pressure, the oil pressure goes to the clutch valves and shuts the pertinent clutches. When kickdown is operated, the spring pressure receives more support from the throttle pressure. Because of this the engine speed must pick up, so that governor pressure can overcome the spring force and throttle pressure.

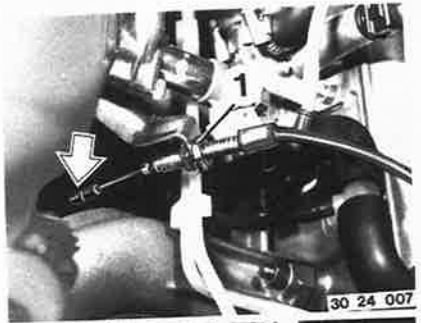
The clutch valves and dampers are meant to make gear shifts as smooth as possible.





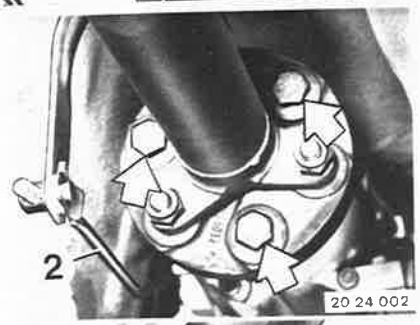
B) Adjusting Throttle Cable:
Requirement: full throttle setting correct.
Adjust play (S) to 0.50 ± 0.25 mm (0.020 ± 0.010") with nuts (1) in neutral position.
Check kickdown stop (2).
Unscrew lock nut (3) and screw in kickdown stop (2).
Depress accelerator pedal (4) to transmission's pressure point.
Unscrew kickdown stop in this position until accelerator pedal touches.
Depress accelerator pedal (4) to kickdown (final position).
Distance (S) from lead seal (5) to end of sleeve (6) should now be at least 44 mm (1.732").

24 00 020 REMOVING AND INSTALLING TRANSMISSION

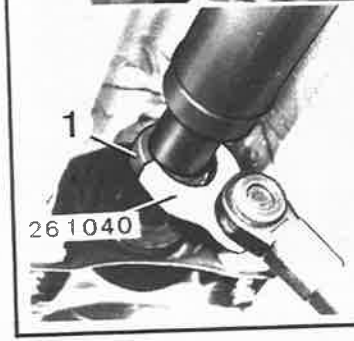


Disconnect battery ground lead.
Unscrew nut (1).
Disconnect throttle cable.
Installation:
Adjust throttle cable (see 24 00 004).

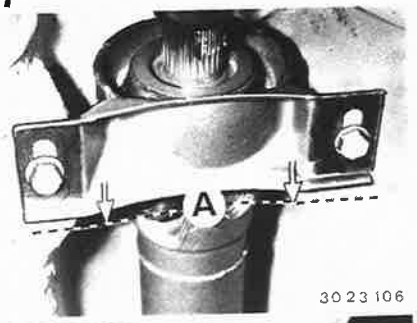
Remove exhaust assembly 18 00 020.
Unscrew heat shield.



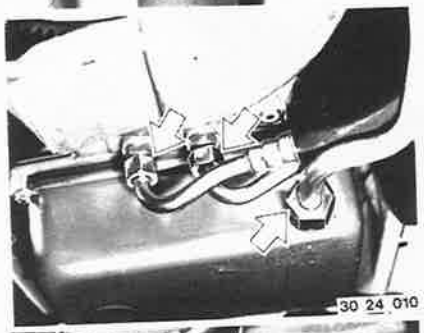
Unscrew joint disc on transmission.
Disconnect selector rod (2).
Installation:
Tighten bolts to correct torque*.
Adjust selector lever 24 00 004.



Loosen threaded ring (1) several turns.
Installation:
Tighten threaded ring (1) with Special Tool 26 1 040 after finishing installation.
Tightening torque*.



Unscrew center mount.
Installation:
Preload center mount forward by distance A = 2 to 4 mm (0.079 to 0.157").
Tightening torque*.
Bend propeller shaft down and pull it off of centering pin.
Important!
Suspend propeller shaft from car on piece of wire.



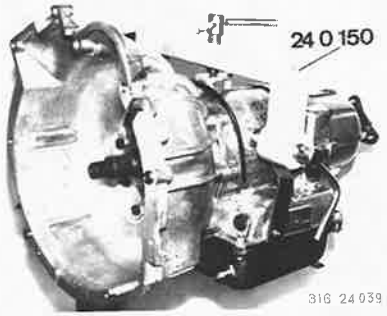
Drain oil.
Important!
Never reuse drained oil.
Installation:
If oil smells burnt and is black, the transmission will have to be disassembled.
Important!
If transmission is defective, clean oil cooler and lines with compressed air and flush twice with ATF.
Remove oil filler tube.
Disconnect oil cooler line on transmission.

Remove reinforcement plate.
Installation:
Tightening torque*.

Unscrew torque converter at four points on drive plate while cranking engine on vibration damper.
Installation:
Tightening torque*.

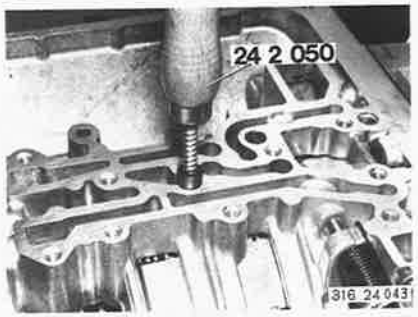
* See Specifications

* See Specifications

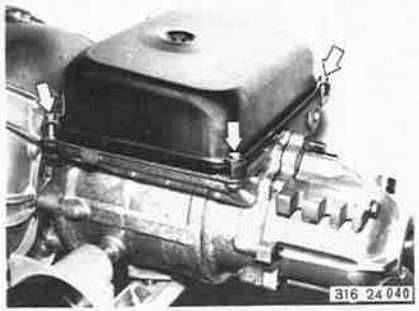


24 00 080 DISASSEMBLING/ASSEMBLING TRANSMISSION

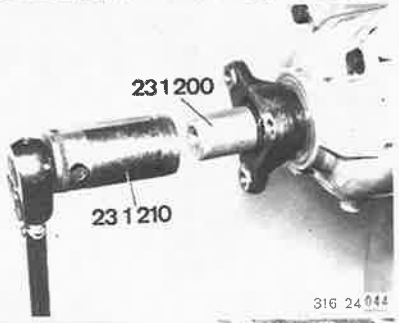
Remove transmission 24 00 020.
Remove torque converter 24 40 000.
Mount transmission on Special Tool 24 0 150 in conjunction with an assembly stand.
Caution!
Screw in bolts only finger tight to avoid transmission case distortion.



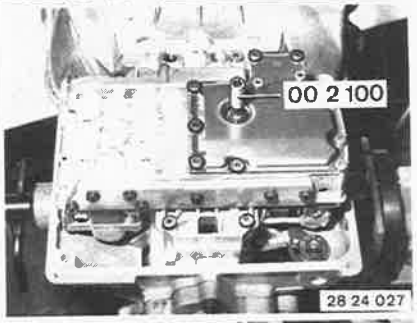
Pull out dowel sleeves with Special Tool 24 2 050.



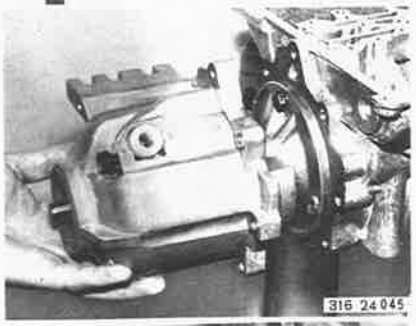
a) Disassembling:
Detach oil sump.



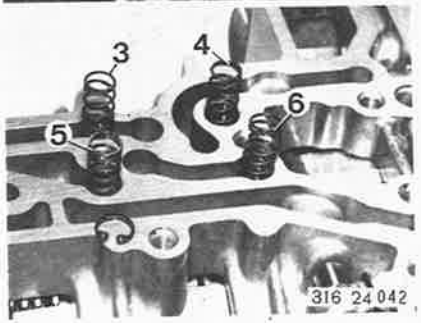
Engage parking lock.
Apply Special Tool 23 1 200.
Unscrew collar nut with Special Tool 23 1 210.
Pull off output flange.



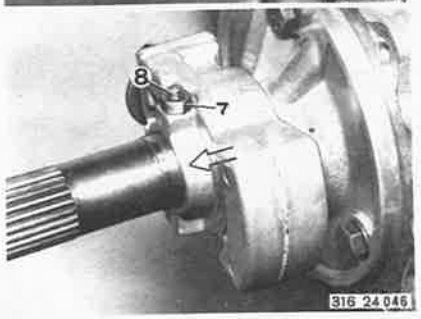
Remove valve body.
Unscrew Torx bolts with Special Tool 00 2 100.



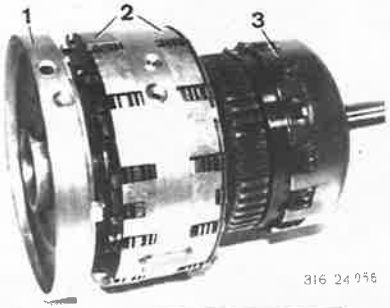
Disconnect exhaust support.
Detach transmission extension.



Remove circlips.
Remove springs (3 ... 6).

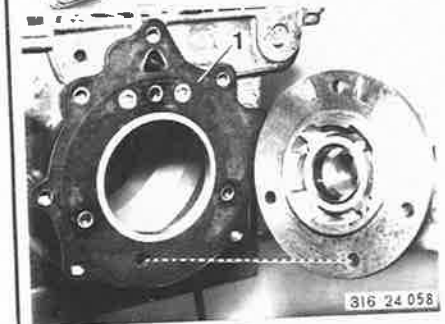


Loosen nut (7) and unscrew stud (8) about 3 turns.
Pull off governor.



Pull centering plate (1) and clutch set (2) with clutches C', C and D off of output shaft (3).

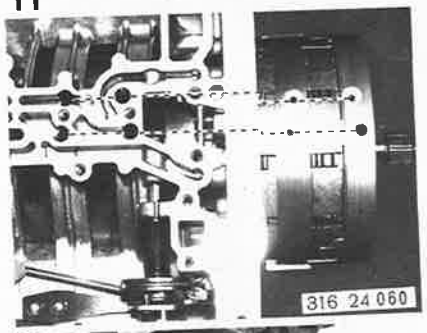
Remove planet gear set with sun gear shaft.
Important!
Needle bearing (22) and thrust washer (23).



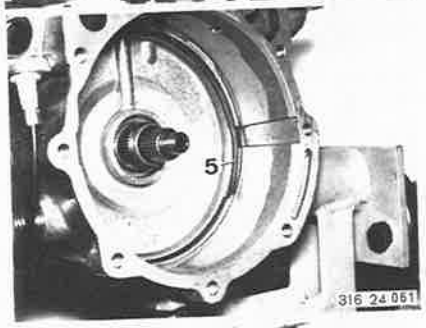
b) Assembling:
Detach governor flange.
Replace gasket (1).
Tightening torque*.

Install angled washer (2) with grease that angled surface is on output shaft.
Install needle bearing and thrust washer on the output shaft.

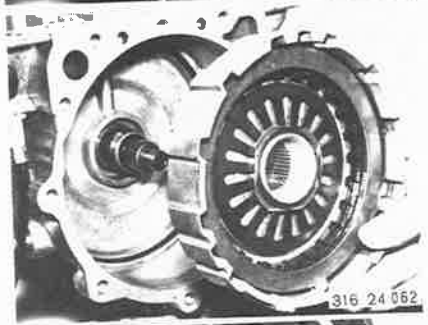
* See Specifications



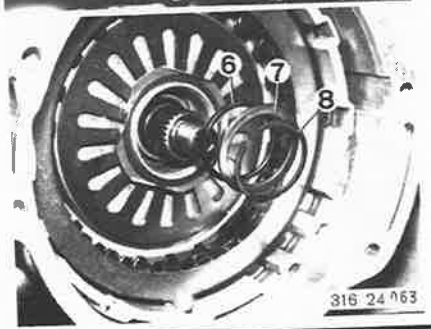
Important!
Woodruff keys must be in center of groove of cylinder.
Parking lock must not be engaged.
Guide complete output set into transmission case that the 4 oil bores in the output set are aligned with bores in the bottom of the transmission case.



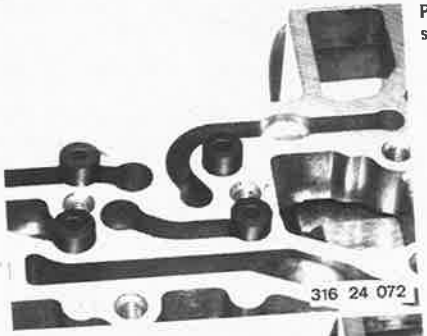
Install snap ring (5).



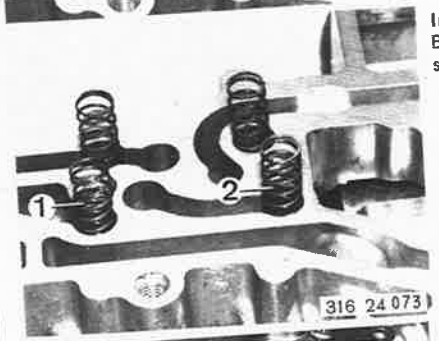
Install clutch B.



Install seal (6) and press in against stop with support (7).
Install snap ring (8).

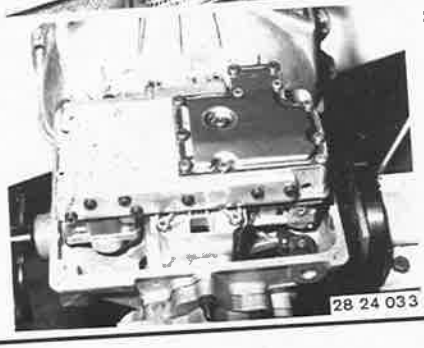


Press in four dowel sleeves against stop with a suitable mandrel.

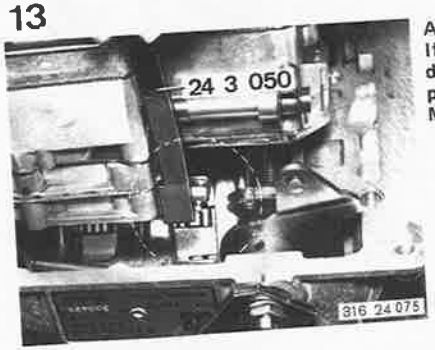


Install and lock springs.
Both short springs (1 and 2) are located on the selector lever side.

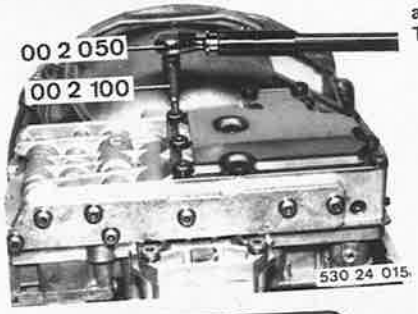
Install valve body that clamp on selector valve can be engaged in operating finger of pawl. Tighten transmission cables slightly for this purpose, so that throttle cams cannot clamp with the throttle pressure valve.



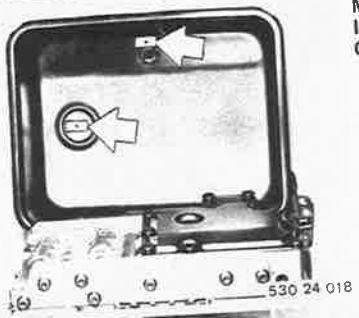
Screw in valve body bolts finger tight.



Align valve body with Special Tool 24 3 050. If special tool gage is not available, make sure distance from valve body case to pin in throttle pressure piston is 11.5 mm (0.453").
Mount valve body.



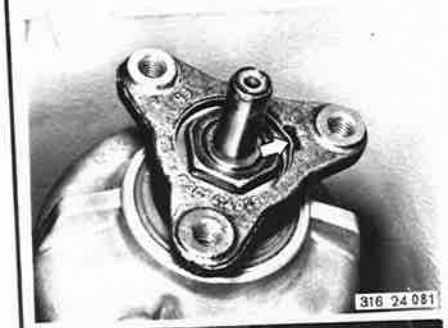
Tighten torx bolts with Special Tools 00 2 100 and 00 2 050.
Tightening torque*.



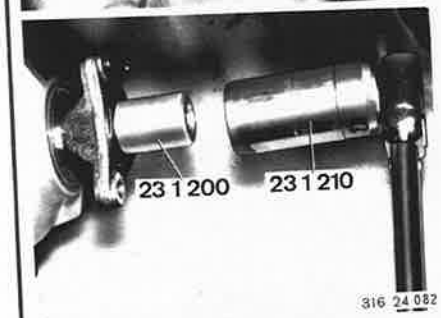
Mount gasket on oil sump.
Install magnets.
Check installed position.

Bolt oil sump with brackets.
Short leg of bracket presses down on oil sump.
Tightening torque*.

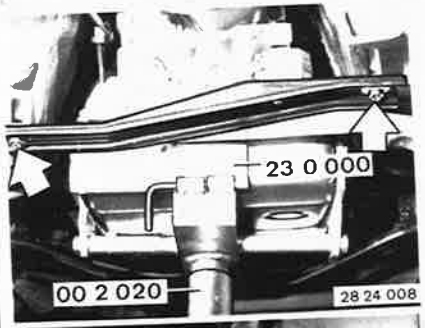
* See Specifications



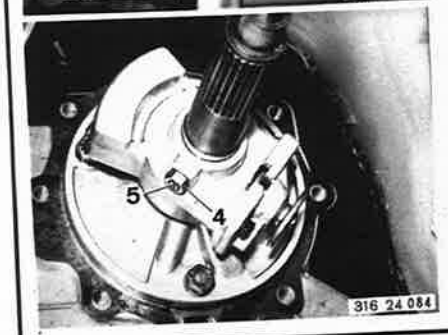
Remove lockplate.
Installation:
Lock lockplate in output flange groove.



Engage parking lock.
Apply Special Tool 23 1 200.
Unscrew* collar nut with Special Tool 23 1 210.
Pull off output flange.
Installation:
Install collar nut with Curil K 2 or Hylomar SQ 32 M**.

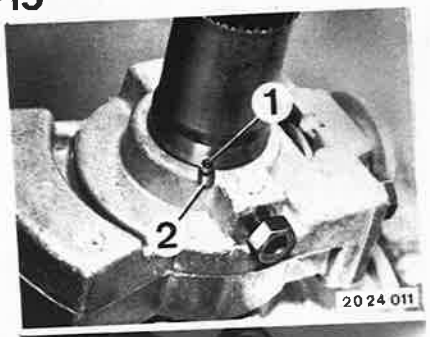


Support transmission with Special Tools 23 0 000 and 00 2 020.
Remove cross member.
Lower transmission.
Detach transmission extension.

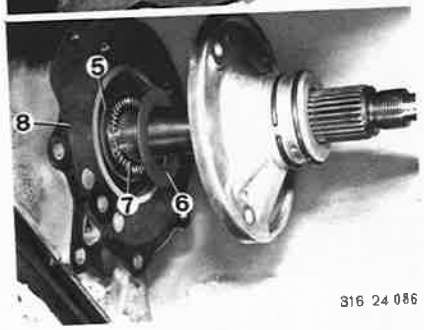


Loosen nut (4) and unscrew stud (5) about 3 turns.
Pull off governor.

* See Specifications for tightening torque
** Source: HWB



Installation:
Compress piston rings lightly and push governor on to governor flange.
Important!
Punch mark (1) on output shaft must be aligned with opening (2) in governor flange.
Bolt governor.



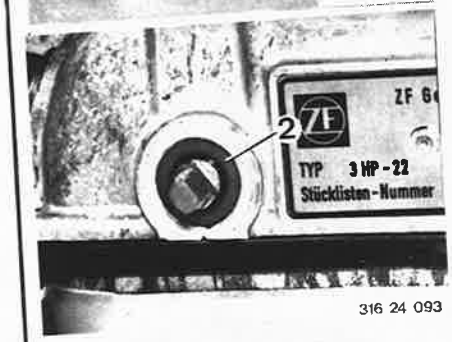
Detach bearing flange.
Important!
Angled washer (5), thrust washer (6) and needle bearing (7).
Replace gasket (8).
Tightening torque*.

* See Specifications

24 12 101 REPLACING RADIAL OIL SEAL FOR MANUAL SHIFT VALVE SHAFT

28 24 215

Detach selector lever (1) on transmission.



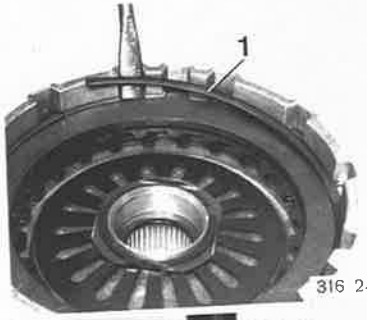
316 24 093

Remove radial oil seal (2).

Installation:

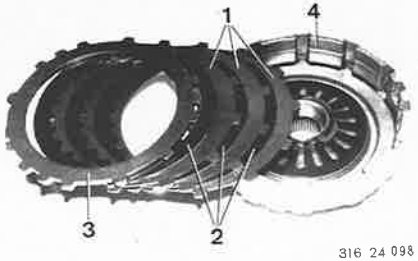
Lubricate sealing lip with oil.

Drive in radial oil seal flush.



316 24 097

Clutch B:
Remove snap ring (1).
Remove outer and lined plates.

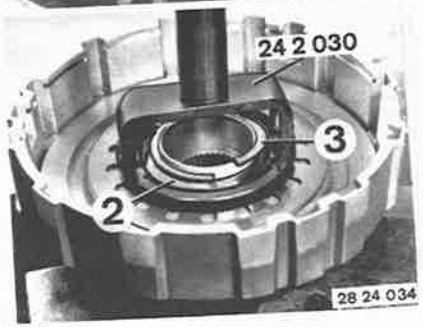


316 24 098

Installed Order:

1 Outer plates 1.8 mm	– three
2 Lined plates	– three
3 End plate 4.5 mm	– one

Important!
Install end plate with ground side facing lined plate.
4 Housing

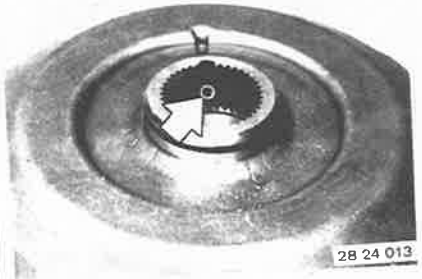


28 24 034

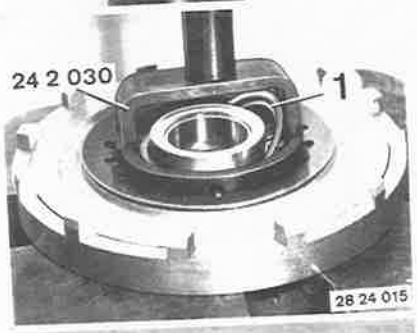
Bend open lockwasher (2).
Press down on diaphragm spring with Special Tool 24 2 030 and lift out snap ring (3).
Installation:
Replace lockwasher.
Install diaphragm spring with curved surface facing up.

316 24 099

Clutch C':
To facilitate operations place entire set in a pipe with an inside diameter of 29 mm (1.142") and clamp in a vise.
Lift off centering plate (5).
Remove outer lined plate and one-way clutch.

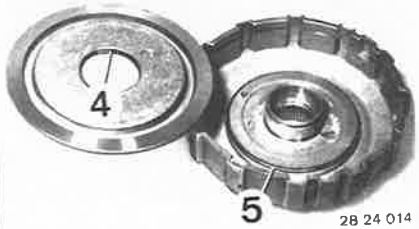

28 24 013

Press out piston for clutch B with compressed air applied through oil bore.



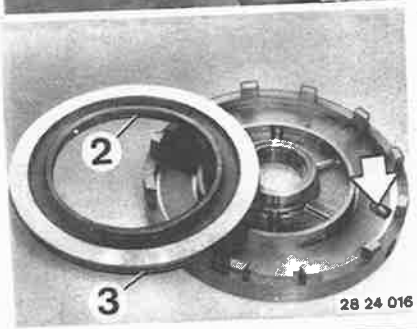
28 24 015

Press down on diaphragm spring with Special Tool 24 2 030 and remove split retainer (1).
Installation:
Insert diaphragm spring with curved surface facing up.



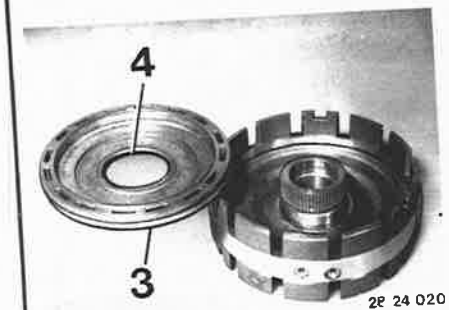
28 24 014

Installation:
Check O-rings (4 and 5), replacing if necessary.



28 24 016

Press out piston for clutch C' with compressed air applied through oil bore.
Installation:
Check O-rings (2 and 3), replacing if necessary.

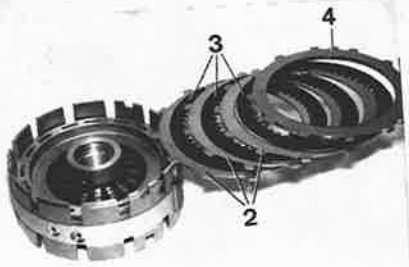


2e 24 020

Press out piston for clutch D with compressed air applied through oil bore.

Installation:

Check O-rings (3 and 4), replacing if necessary.



316 24 105

Remove plates.

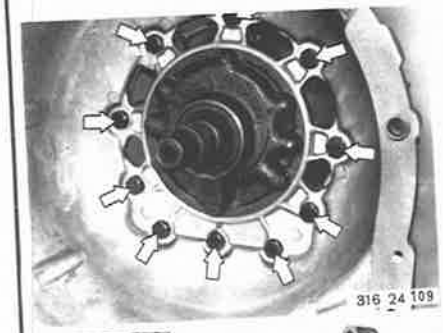
Installed Order:

2	Outer plates 1.8 mm	– three
3	Lined plates	– three
4	End plate 4.5 mm	– one

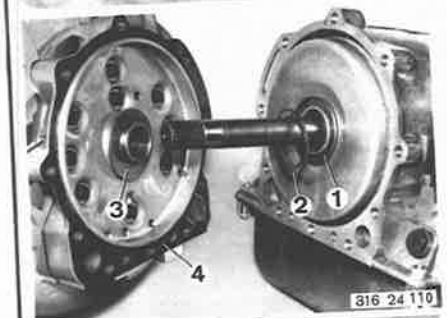
Important!

Insert end plate with ground side facing lined plate.

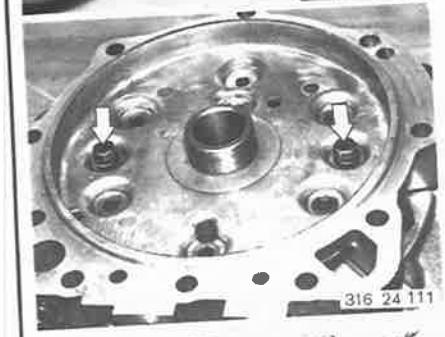
24 31 000 REMOVING AND INSTALLING PRIMARY PUMP



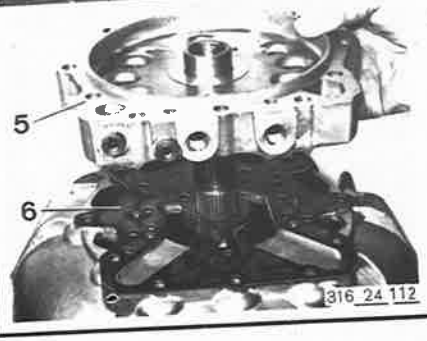
Remove troque converter 24 40 000.
Detach converter bell housing with transfer plate.



Installation:
Install angled washer (1) on input shaft with collar facing needle bearing (2).
Install thrust washer (3) on converter bell housing with grease.
Replace gasket (4).

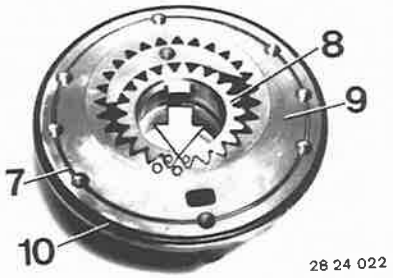


Detach transfer plate on converter bell housing.
Loosen tow bolts opposite each other by only several turns.
Loosen primary pump on converter bell housing by applying light knocks.
Unscrew bolts and take off primary pump.

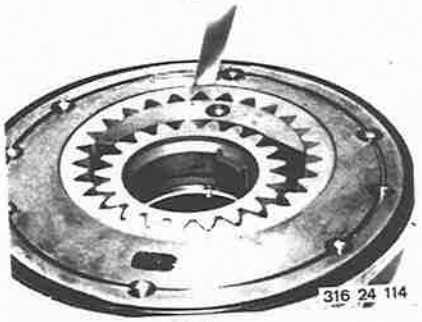


Installation:
Lift off transfer plate (5).
Replace gasket (6).
Tightening torque*.

* See Specifications



Installation:
A primary pump, consisting of pump body (7), hollow gear (8) and impeller (9), may only be replaced as a complete part.
Check O-ring (10), replacing if necessary.
Install hollow gear (8) and impeller (9) that punch marks face up.

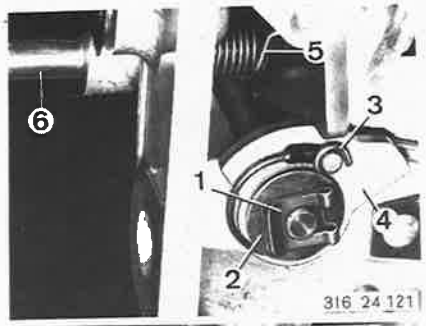


Check radial play* between driven gear and pump body, turning gear 360° for this purpose.

Measure axial play* between both gears and face surface with a depth micrometer.

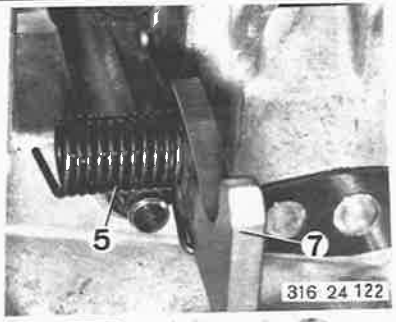
Check primary pump for easy running with Special Tool 24 3 140.
Repeat this test fater installation of the transfer plate.

* See Specifications

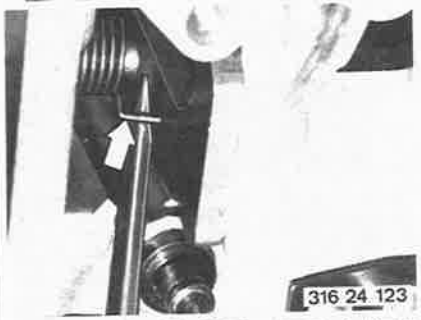


24 34 000 REMOVING AND INSTALLING PARKING LOCK PAWL

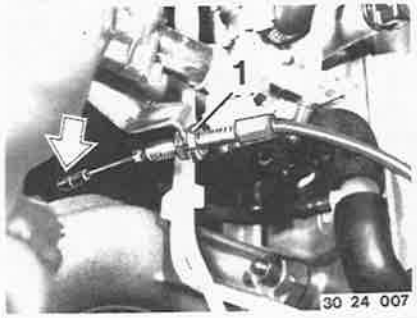
Remove valve body 24 30 000.
Remove transmission extension 24 11 050.
Remove circlip (1).
Take off washer (2).
Disconnect spring (3) and pull off parking lock cam (4).
Disconnect spring (5) and push out pin (6) from inside to outside, or pull out.



Installation:
Press in pin, sliding spring (5) and pawl (7) on to pin.
Straight leg of spring faces up on transmission case.
Front leg of spring is located behind pawl on left side.

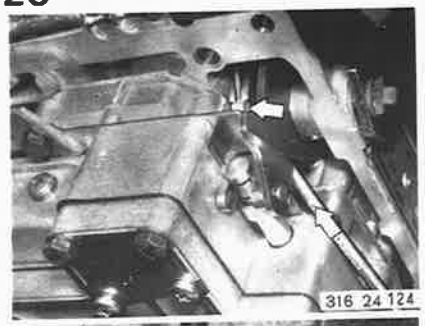


Connect front end of spring on right side of pawl.

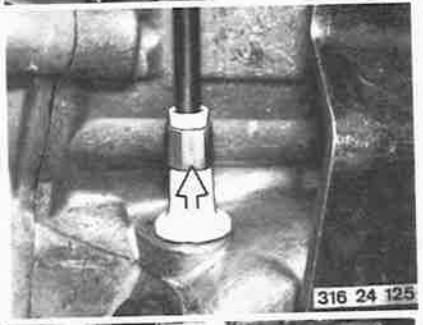


24 34 100 REPLACING THROTTLE CABLE

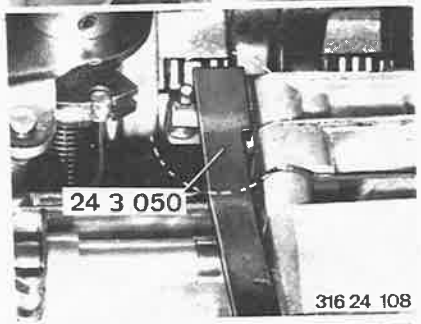
Unscrew nut (1).
Disconnect throttle cable.



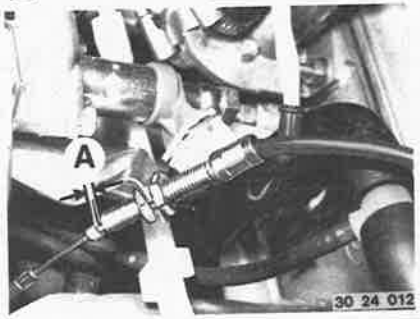
Detach oil sump 24 11 000.
Move selector lever to N.
Push throttle cam forward and disconnect throttle cam cable.



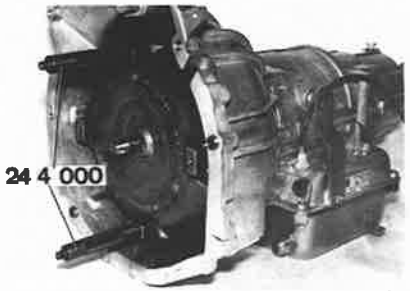
Push throttle cable out of case upwards.



Press new throttle cable into case until retaining tabs engage.
Connect nipple on throttle cam.
Insert Special Tool 24 3 050 between valve body case and throttle pressure valve.
Press throttle cam against throttle pressure valve.



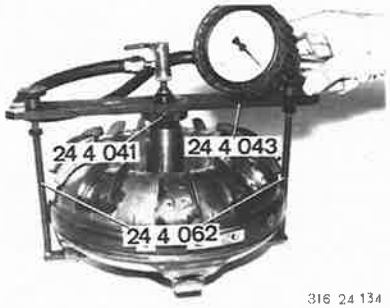
Connect throttle cable in suspension on transmission and holder.
Tighten cable.
Squeeze loose seal on cable at distance (A) of 0.25 to 0.50 mm (0.010 to 0.020").
Adjust throttle cable 24 00 004.



316 24 133

24 40 000 REMOVING AND INSTALLING TORQUE CONVERTER

Remove and install transmission 24 00 020.
Pull torque converter out of primary pump carefully with Special Tools 24 4 000.
Important!
Escaping ATF!

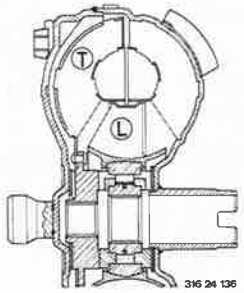


316 24 134

Installation:
Check torque converter for leaks with Special Tools 24 4 041, 24 4 043 and 24 4 062.
Test pressure: 0.5 bar (7 psi).
Important!
Always use Special Tool 24 4 043 to prevent injury.

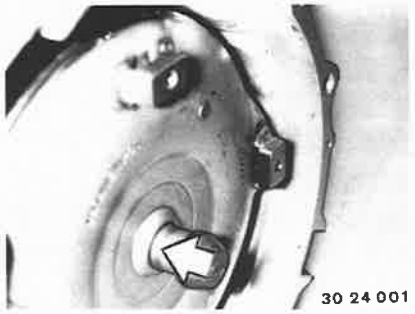

316 24 135

Torque converter must be replaced when bearing surface on converter shaft is damaged.

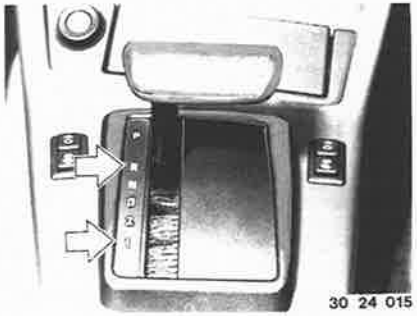


316 24 136

Torque converter must be replaced when stator (L) or turbine (T) cannot be turned by hand.


30 24 001

Turn slightly to guide openings on converter into primary pump carefully, using Special Tool 24 4 000.
Important!
Be careful not to damage converter bearings and seal while guiding in.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24 40 001 REPLACING TORQUE CONVERTER

Check torque converter installed in car.
Engine and transmission oil must have operating temperature.
Engine must produce full rated power.
Start engine.
Pull on parking brake and operate brake pedal firmly.
Move selector lever to R or 1 and press accelerator pedal to full throttle.
Read stall speed* from tachometer.
Important!
Never test stall speed longer than 10 seconds to prevent damage from excessive heat.
Stall Speed Much Above Specified Value*.
a) Converter oil volume insufficient – correct oil level.
b) Slip in clutches – check clutches.
Stall Speed Much Below Specified Value*.
a) Engine power insufficient – check engine.
b) Converter or pump defective – replace converter or check pump.
Torque converters cannot be cleaned with conventional workshop equipment and must be replaced when a transmission had been defective or an oil filter screen torn.
Converter identification*.

316 24 143

* See Specifications

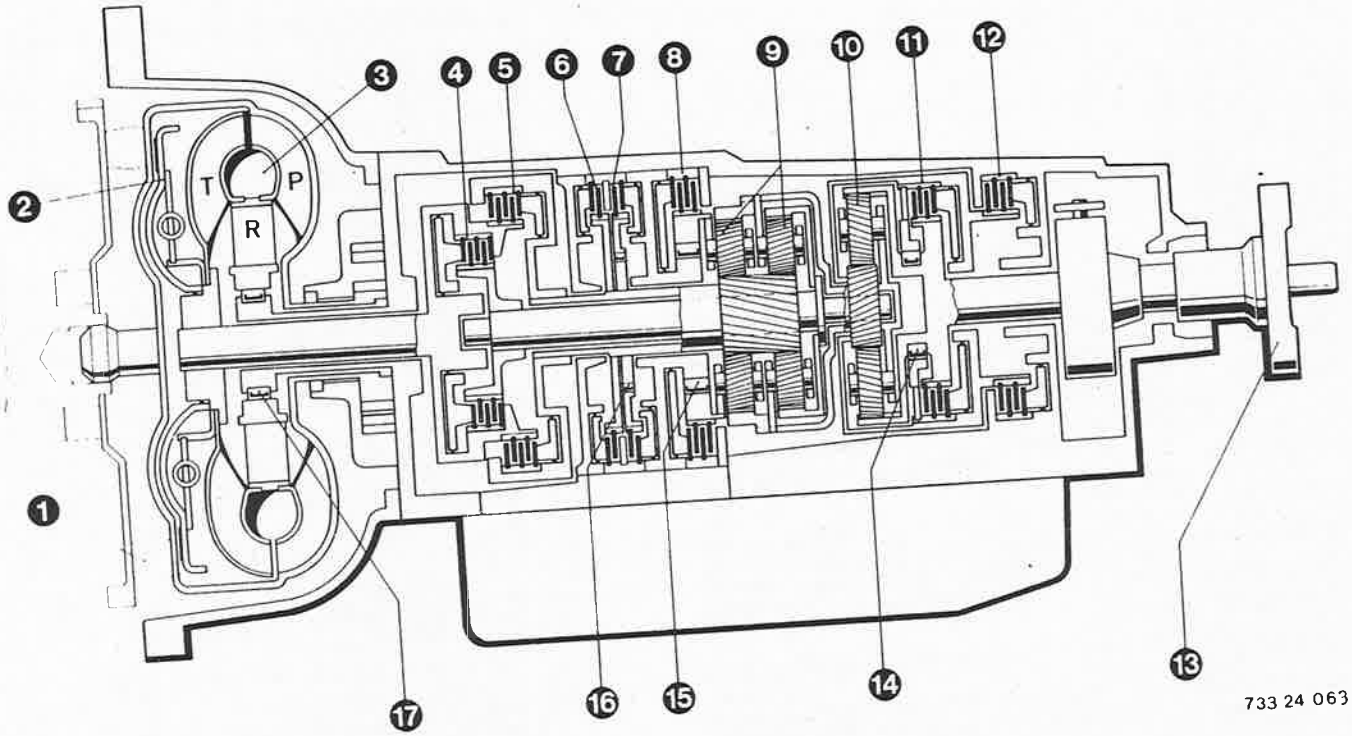
TROUBLESHOOTING AUTOMATIC TRANSMISSION 3 HP – 22

Condition	Cause	Correction
Slipping or shaking when moving off in reverse gear	a) Clutch B or D damaged b) Strong leak in feed line to B or D	a) Replace clutches B and D 24 23 020 b) Disassemble transmission 24 00 080
No drive in reverse and 2nd gear	a) Shift valve seized in 3rd gear position	a) Replace valve body 24 30 000 and disassemble transmission if oil pan has abrasion
Hard engaging jolt or definite double knock when engaging reverse gear	a) Damper B defective or wrong plate b) Accelerator cable maladjusted	a) Replace valve body 24 30 000 b) Adjust accelerator cable 24 00 004
Car cannot be started in N or P	a) Transmission switch defective	a) Replace transmission switch 61 31 260
Car creeps or moves in N	a) Selector linkage maladjusted b) Clutch A discharges too slowly c) Clutch A defective (bonded)	a) Selector linkage adjustment 24 00 004 b) Disassemble transmission 24 00 080 c) Disassemble transmission 24 00 080
No power flow in D or R	a) Oil filter screen clogged	a) Replace oil filter screen 24 31 150
Drive only in reverse gear	a) Clutch A defective b) One-way clutch for 1st gear slips	a) Replace clutch A 24 23 020 b) Disassemble transmission 24 00 080
Drive only in 1st gear when in D	a) Shift valve 1–2 seized b) Governor bushing seized	a) Replace valve body 24 30 000 b) Clean or replace governor 24 32 000
Drive only in 1st and 2nd gears when in D	a) Shift valve 2–3 seized	a) Replace valve body 24 30 000
Drive only in 2nd gear	a) Shift valves 1–2 and 2–3 seized	a) Replace valve body 24 30 000
Drive only in 3rd gear	a) Shift valves 1–2 and 2–3 seized b) Governor bushing seized	a) Replace valve body 24 30 000 b) Clean or replace governor 24 32 000
Drive in "N"	a) Selector linkage maladjusted or disconnected b) Clutch A (forward) bonded c) Clutch B (reverse) bonded	a) Adjust or connect selector linkage 24 00 004 b) Disassemble transmission 24 00 080 c) Disassemble transmission 24 00 080
No braking effect from 1st gear in 2 or 1	a) Clutch valve and damper D defective b) Clutch D defective	a) Replace valve body 24 30 000 b) Clutch D replacement 24 23 020
No braking effect from 2nd gear in 2 or 1	a) Clutch C' defective b) Circlip C + C' broken (if applicable)	a) Replace clutch C' 24 23 020 b) Replace circlip 24 23 020
No reverse gear (forward positions okay)	a) Selector linkage maladjusted b) Oil level too low c) Clutch B or D defective	a) Adjust selector linkage 24 00 004 b) Correct oil level c) Replace clutches B and D 24 23 020

TROUBLESHOOTING AUTOMATIC TRANSMISSION 3 HP – 22

Condition	Cause	Correction
Howl, depending on speed and load	a) Center mount of propeller shaft defective b) Needle bearing in transmission extension defective	a) Replace center mount 26 11 501 b) Replace needle bearing 24 11 050
Rattling noise in idle	a) Drive plate broken b) Welded tabs on converter torn off	a) Replace drive plate 11 22 051 b) Replace converter 24 40 000
Grinding noise in idle which disappears when accelerating in position N	a) Valves rattling in valve body b) Oil pump drawing in air	a) Correct oil level b) Tighten* valve body mounting bolts
High pitch noise in all positions, especially when oil is cold	a) Intake noise of oil pump, b) Intake noise on valve body	a) Check tightness of valve body, tightening torque* b) Replace valve body 24 30 000
Scratching or screeching noise in all positions, especially when oil is warm, occurring after long drive	a) Oil level too low b) Intake noise on valve body c) Oil filter screen dirty	a) Correct oil level b) Replace valve body 24 30 000 c) Replace oil filter screen 24 31 150 and disassemble transmission when oil is contaminated
Oil on converter bell housing	a) Shaft seal defective b) O-ring on primary pump housing defective or mounted incorrectly c) Converter leaking at welded seams d) Plug leaks e) O-ring on accelerator cable defective	a) Replace shaft seal 24 12 001 b) Replace O-ring 24 31 000 c) Replace converter 24 40 000 d) Replace seal e) Replace O-ring or accelerator cable 24 34 100
Oil on output flange	a) Shaft seal defective b) Output flange leaks at threads	a) Replace shaft seal 24 12 011 b) Install collar nut with Curil K 2 or Hylomar SQ 32
Vent leaks	a) Oil level too high b) Wrong oil (strong foaming) c) Vent defective d) Vent mounted incorrectly e) O-ring on vent leaks f) Lockwasher preload excessive	a) Correct oil level b) Replace oil c) Replace vent d) Remove transmission extension and insert vent correctly (opening faces left looking forward) 24 11 050 e) Replace O-ring f) Replace lockwasher 24 11 050
Oil on speedometer drive	a) O-ring defective b) Seal in speedometer bushing defective	a) Replace O-ring b) Replace speedometer bushing

* See Specifications

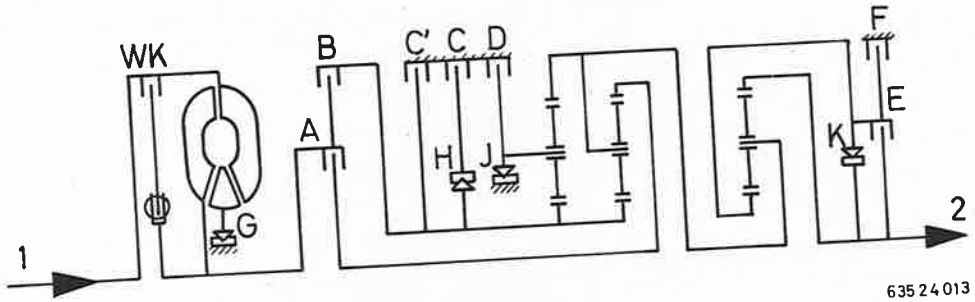


ZF 4 HP 22 Layout Drawing

1 Input
2 Converter lockup clutch
3 Hydrodynamic torque converter
P = Impeller
R = Stator
T = Turbine
4 Clutch A
5 Clutch B
6 Clutch C'
7 Clutch C
8 Clutch D
9 Planet gear set
10 Planet gear set – 4th gear
11 Clutch E
12 Clutch F
13 Output
14 One-way clutch
15 One-way clutch
16 One-way clutch
17 One-way clutch

4 – HP – 22 Transmission Layout

1	Input
2	Output
WK	Converter lockup clutch
A . . . F	Clutches
G . . . K	One-way clutches

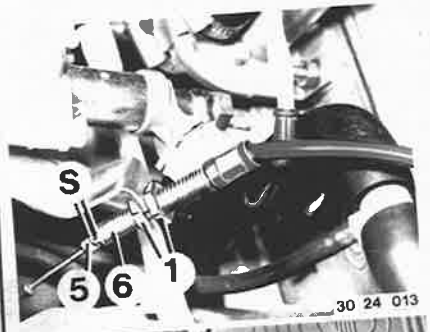


635 24 013

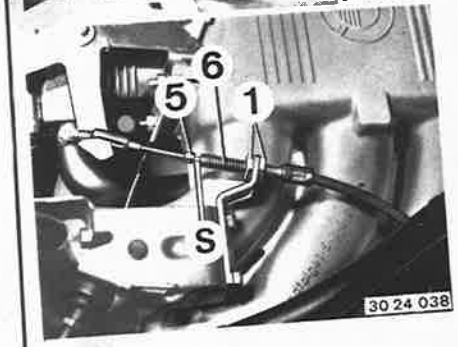
4 – HP – 22 / H + EH Closed Shift Elements

WK	Converter lockup clutch
RS	Reverse gear lock
X	Activated clutches and brakes
(X)	Depending on operating state
*)	Only with EH
+	Activated solenoid valve
(+)	Depending on operating state
/	Solenoid valve without current

Gear	Clutch			Brake				One-way Clutch				WK	Solenoid Valve *)			
	A	B	E	C'	C	D	F	G	H	J	K		WK	RS	1	2
1st	X		X			(X)		(X)		X	X				+	+
2nd	X		X	X	X			(X)	X		X				/	+
3rd	X	X	X		X			(X)			X	(X)	(+)		/	/
4th	X	X			X		X	(X)				(X)	(+)		+	/
R		X	X			X		(X)						+	+	+

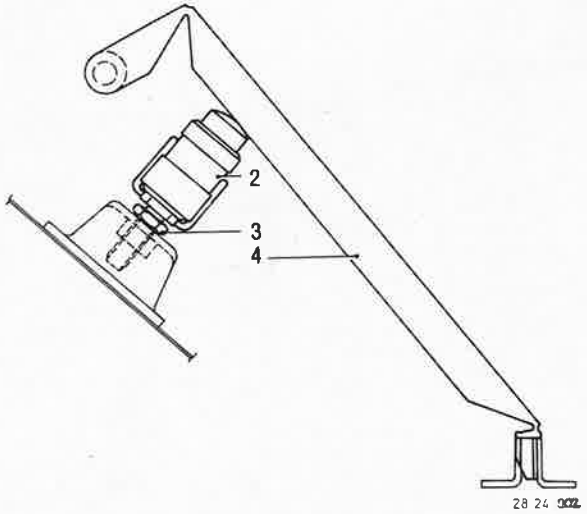


Engine M 10:

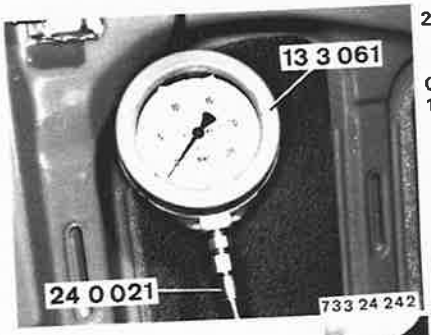


Engine M 20:

B) Adjusting Throttle Cable:
Requirement: full throttle adjustment correct.
Adjust play (S) to 0.50 ± 0.25 mm (0.020 ± 0.010") with nuts (1) in idle position.
Check kickdown stop (2).
Loosen lock nut (3) and screw in kickdown stop (2).
Push down accelerator pedal (4) to transmission pressure point.
Unscrew kickdown stop in this position, until it contacts the accelerator pedal.
Push down accelerator pedal (4) to kickdown (final position).
Now distance (S) from lead seal (5) to end of sleeve (6) must be at least 44 mm (1.732").

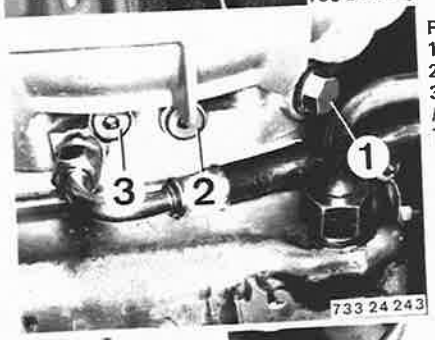


24 00 011 CHECKING HYDRAULIC PRESSURE VALUES

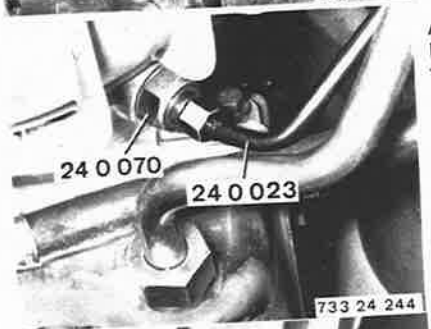


Connect hose 24 0 021 with pressure tester 13 3 061.

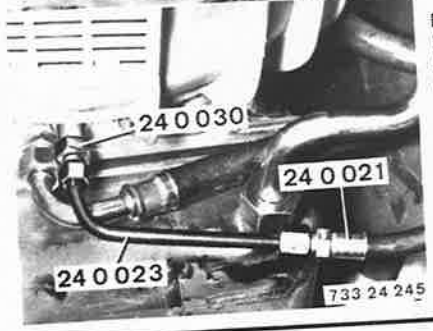
Test:	Pos.	Gear	Speed (rpm)	Pressure in bar (psi)
Pump pressure	D	1st 2nd/3rd/4th	700 ... 1000 approx. 4000	6.0 ... 7.5 (86 ... 106) 4.6 ... 5.8 (66 ... 82)
	R	reverse	700 ... 1000	11 ... 13 (157 ... 184)
Converter pressure	D	4th	converter locked	max. 0.7 (10)



Remove pertinent plugs for testing.
1 Pump pressure
2 Clutch A
3 Converter pressure
Installation:
Tightening torque*.

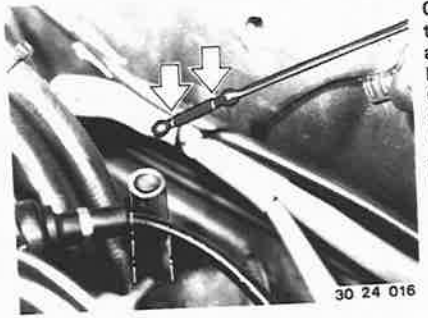


A) Pump Pressure:
Install adapter 24 0 070 with seal on transmission.
Connect elbow pipe 24 0 023 in conjunction with hose 24 0 021.



B) Converter Pressure:
Install adapter 24 0 030 on transmission.
Connect elbow pipe 24 0 023 in conjunction with hose 24 0 021.

* See Specifications



Correct oil level with selector lever in P, transmission having operating temperature and engine running at idle speed.
Park car on level floor or ground.
Oil level of transmission having operating temperature should be between both marks.
Amount of oil between min. and max. marks = approx. 0.3 liter (0.6 pint).
Never wipe off dipstick with a cloth losing lint.

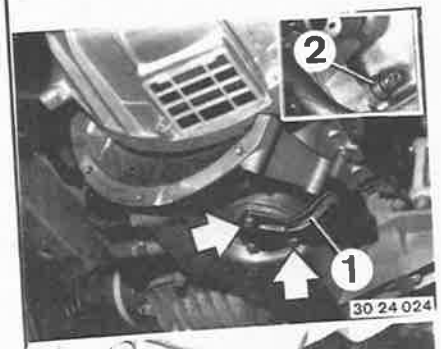
An oil dipstick with a longer measuring tip (1) is standard since 2.85.
This makes it possible to report the oil level in the transmission earlier.
The oil level should not be below ball (2) after a test drive and an oil temperature of 40° C (104° F).
The oil level should be between the min. and max. marks with an oil temperature of approx. 80° C (175° F).
Note:
The new oil dipstick can be installed retroactively.
Important!

733 24 280

Oil Level Too High:
Strong foaming, oil splash loss, high temperature when driving fast, oil lost through vent.

Oil Level Too Low:
Valves rattling, foaming, engine slipping in curves, general operating disturbances.

Always only pour in ATF through funnel 24 0 080.

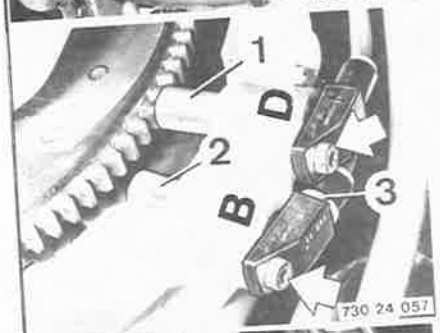


BMW 325 iX:
Unscrew propeller shaft at front end – see 26 20 000.
Unscrew reinforcement plate on engine and transmission and loosen 2 screws of oil level switch enough until the reinforcement plate can be removed after bending holder (1).

Important!
Use spacer (2) between the bolt and case to prevent scraping of the Torx bolt on the front propeller shaft section.

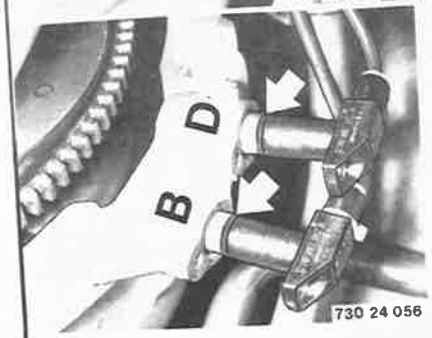
Unscrew torque converter on drive plate at three points.
Turn flywheel for this step.

Important! – Installation:
Tightening torque*.
Only use size M 10 x 16 mm bolts together with spring washers.
Non-conformance will lead to destruction of the transmission.



Only Version with DME:
Unscrew bolts.
Pull out speed sensor (1) and reference mark sensor (2).

Important! – Installation:
Check installed position.
Plugs must not be mixed up. Install speed sensor (1) in bore (D) and reference mark sensor (2) with ring (3) in bore (B).
Engine can not be started if plugs are mixed up.



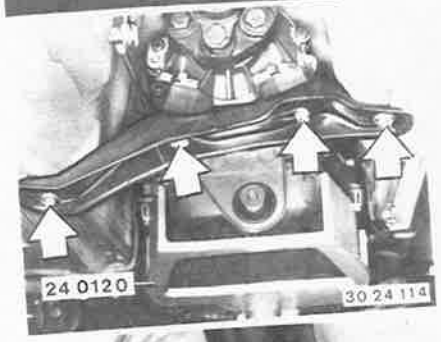
Installation:
Check O-rings.
Install sensors with Molykote Long-term 2.

Important!
Keep grease and dirt off of face of DME sensors.

*** See Specifications**

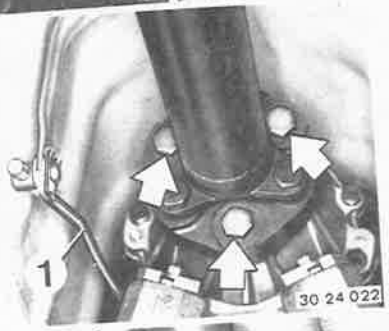
Only for Cars with EH Transmission:
Turn bayonet fastener (1) to the left.
Pull off plug (2).
Lift wire harness out of holders.

Installation:
Connect plug (2) in such a manner that marking lines are aligned.



Support transmission with Special Tools 24 0 120 and 00 2 020.
Remove cross member.

Installation:
Center transmission – see Group 26.
Tightening torque*.



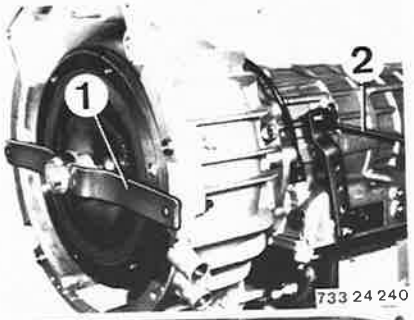
Unscrew joint disc on transmission.
Disconnect shift rod (1).

Installation:
Adjust shift – see 24 00 006.

Installation:
Replace stop nuts.
Tighten nuts with a standard 17 mm socket and torque wrench.
Tightening torque*.

Important!
Only tighten nuts (never bolts) to avoid stress in the joint disc.

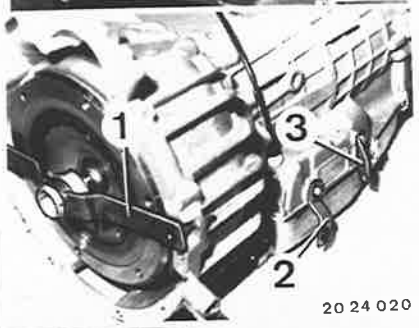
*** See Specifications**



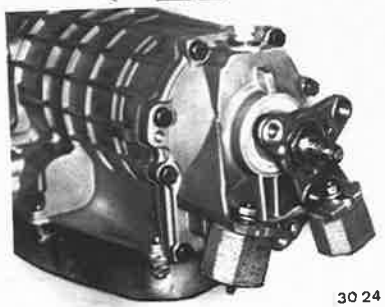
24 00 042 INSTALLING EXCHANGE TRANSMISSION

Remove transmission – see 24 00 022.
Important!
Always clean oil cooler and lines with compressed air and flush twice with ATF prior to installation of an exchange transmission.
Transmission identification* is on data plate.
Version with Shift Linkage:
Transfer transport holder (1) and linkage (2) with lever.

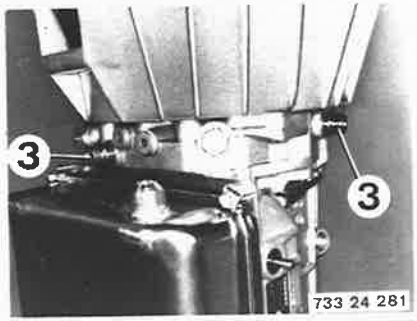
Mount spring clamp from top to bottom.
Important!
Bearing sleeve.



Version with Shift Cable:
Transfer transport holder (1), lever (2) and bracket (3).



Transfer rubber mounts and exhaust holders.



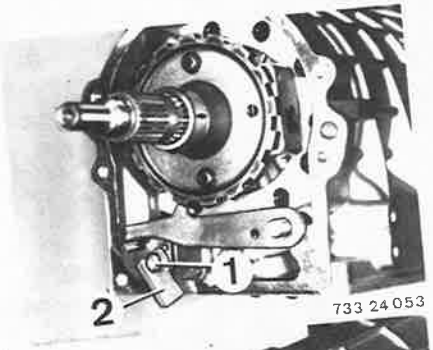
Transfer screwed adapters (3).
Version with Multiple Internal Teeth:
Unscrew threaded adapters with a 12 mm multiple tooth socket or T 55 Torx socket.
Replace seals.
Tightening torque*.

Important! – Installation:
Automatic transmissions are supplied filled with oil since 1.86.
Remove plug in oil sump prior to installation of the oil filler pipe.
Catch escaping ATF in a clean container.
Pour ATF into transmission through a funnel (Special Tool 24 0 080) after installation of transmission.

Check oil level.
The oil dipstick installed standard since 2.85 has a longer measuring tip.
This means displaying the oil level in the transmission earlier.
The oil level should not be below ball (2) after a test drive and with an oil temperature of approx. 40° C (105° F).
The oil level should be between the min. and max. marks with an oil temperature of about 80° C (175° F).
Correct oil level, if necessary.
Note:
The new oil dipstick can be installed retroactively.
Oil Level Too High:
Excessive foaming, splash loss, high temperature when driving fast and oil lost via the vent.
Oil Level Too Low:
Valves rattling, foaming and engine slipping.
Also general disturbances.

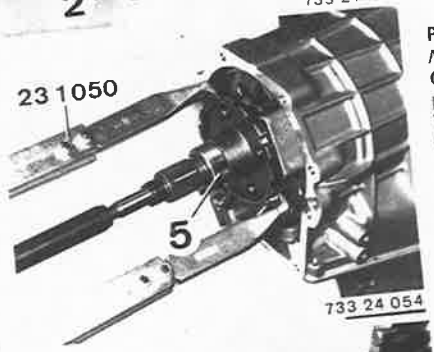
* See Specifications

* See Specifications



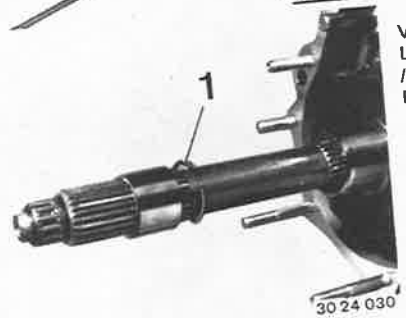
733 24 053

Loosen bolt (1) with Special Tool 00 2 100 enough, that bracket (2) can be folded down.
Remove parking lock pawl, spring and shaft.
Caution!
Spring force.



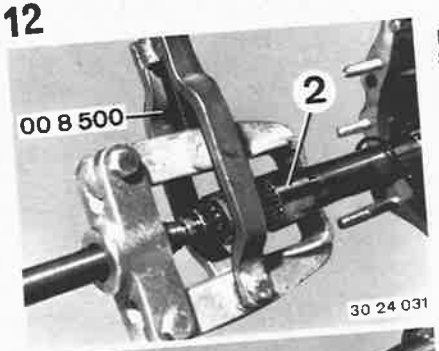
733 24 054

Pull off parking lock gear and governor.
Note:
Check for spacer between output flange and parking lock gear.
The parking lock gear of version with spacer (5) has to be pulled off with Special Tool 23 1 050.



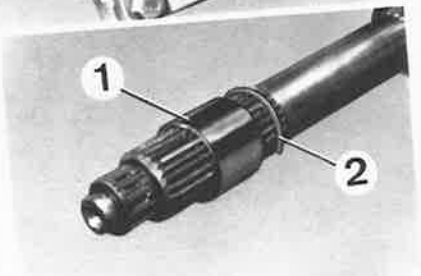
30 24 030

Version with Transfer Box:
Lift out snap ring (1) and slide forward.
Installation:
Replace snap ring.



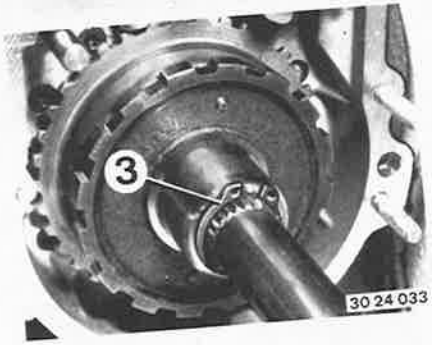
30 24 031

Pull bearing sleeve (2) off of input shaft with Special Tool 00 8 500.



30 24 032

Installation:
Install snap ring (1) in groove of output shaft.
Heat bearing sleeve (2) to about 80° C (175° F) with a hot air blower and slide on to output shaft against stop ring (1).

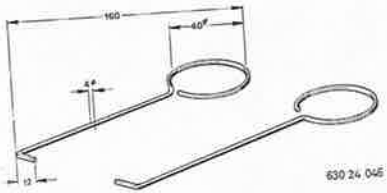


30 24 033

Lift out circlip (3).
Pull off parking lock gear and governor.

Remove snap ring (8) with help of two screwdrivers.
Installation:
Replace snap ring (8).

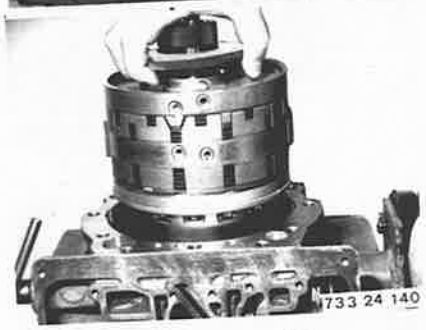
Pull out clutch B with two locally made hooks.
Installation:
Lift clutch until resistance is noticed and push back again.
Pull out clutch with one firm pull.
This will also pull out support (9) and seal (10).



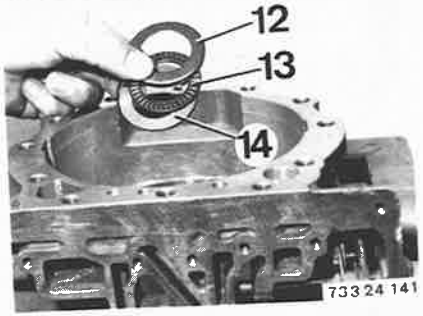
Sketch to make up hooks locally.
Dimensions in mm.

Lift out snap ring (11).

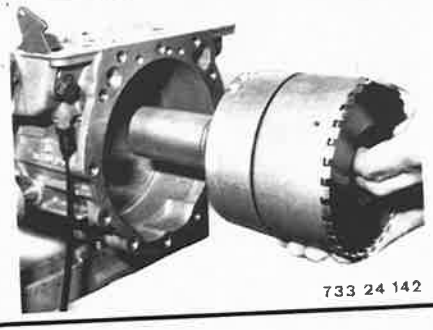
Apply Special Tool 24 0 040 on intermediate shaft.



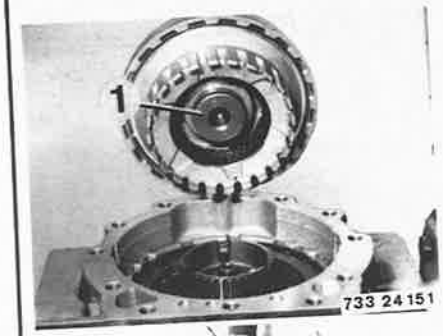
Pull out entire set.



Remove angled washer (12), axial bearing (13) and thrust washer (14).



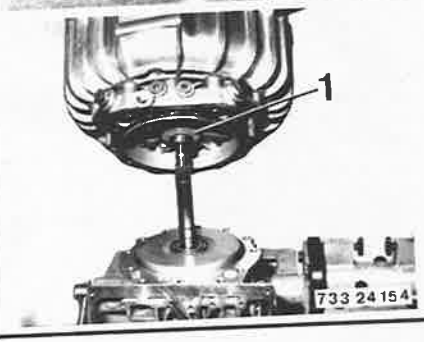
Remove 4th gear clutch set.



Hold angled washer (1) on cylinder A with grease (vaseline).

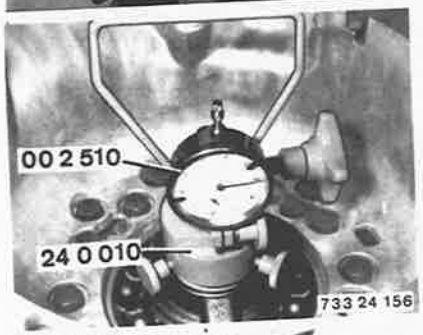
Insert and move clutch A back and forth, until teeth of plate carrier and plates mesh.
Note:
Clutch A is in correct installed position, if distance (B) from cylinder A to the case sealing surface is approx. 8 mm (0.315").

Install angled washer (3) with its collar facing up and axial bearing (2).

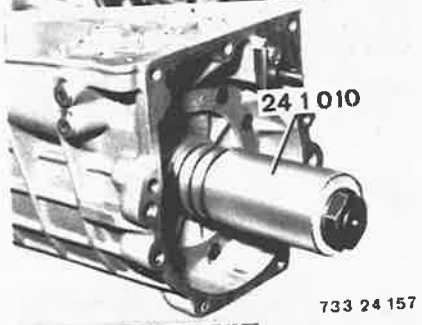


Hold gasket and thrust washer (1) in position with grease (vaseline).

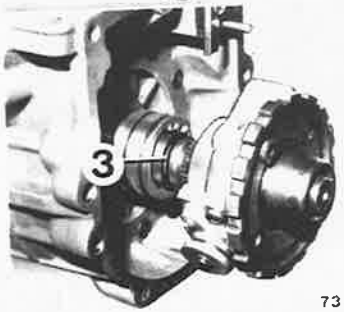
Mount converter bell housing and tighten all bolts.
Tightening torque*.



Check axial play of input shaft.
Mount Special Tool 24 0 010 to locate the input shaft.
Install Special Tool 00 2 510 (dial gage).
Measure axial play by pulling the input shaft.
Specifications: 0.2 to 0.4 mm (0.008 to 0.016").
If play deviates, remove converter bell housing again and replace the thrust washer with a thicker or thinner one.
Recheck axial play.
Bolt down converter bell housing.
Tightening torque*.

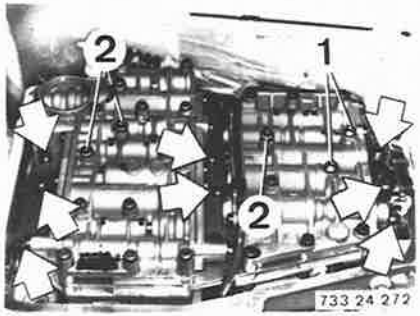


Remove Special Tool 24 1 010.

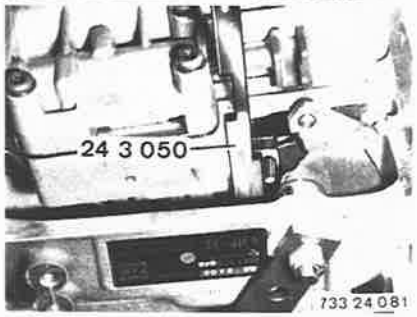


Lubricate O-ring (3) with ATF.
Slide on parking lock gear and governor.
Note:
Use shim between governor and output flange – for version without spacer.

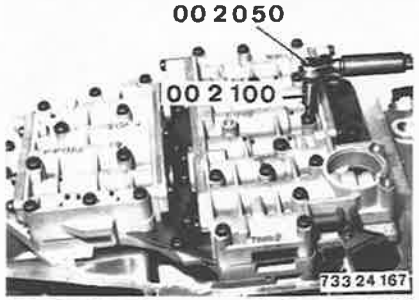
* See Specifications



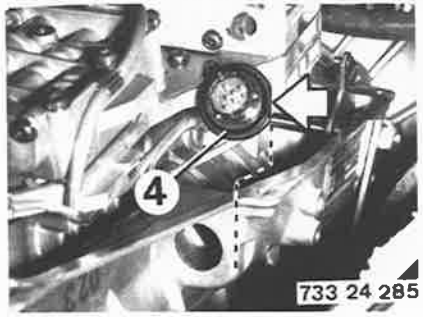
Screw in valve body mounting bolts.
Important!
Bolts differ in length.
Bolts (1) = 65 mm (2.559").
Bolts (2) = 60 mm (2.362").



Tighten valve body bolts only finger tight.
Align valve body with Special Tool 24 3 050.
Distance between valve body case and throttle pressure piston must be 11.5 mm (0.453").

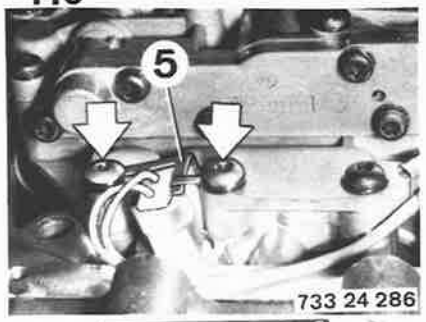


Tighten valve body bolts.
Tightening torque*.
Tighten bolts with Special Tools 00 2 100 and 00 2 050.



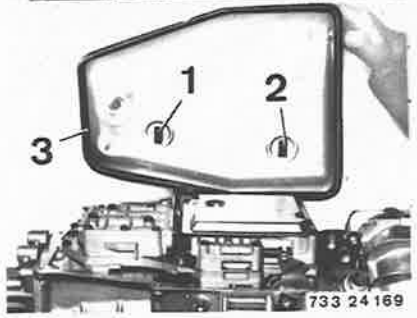
EH Transmission:
Check O-ring (4), replacing if necessary.
Install socket with the flat side facing out and bolt.
Tightening torque*.

* See Specifications



Note:
Also mount pulse transmitter on valve body.
Engage tabs of holder (5) in grooves of plug.

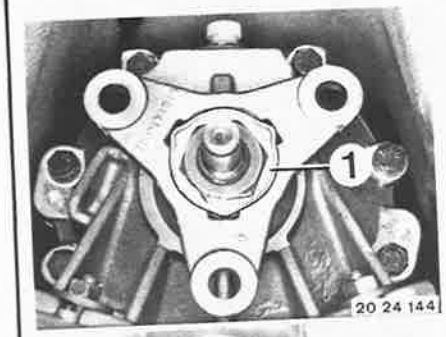
Install O-ring (1) between valve body and oil filter screen.
Install and bolt down oil filter screen.
Tightening torque*.
Check length of bolts.
Length = 65 mm (2.559").



Place magnets (1 and 2) in oil sump.
Install gasket (3).

Install oil sump and tighten bolts with brackets.
Tightening torque*.
Important!
Both brackets with straight, short legs must be mounted on straight side of the oil sump.

* See Specifications



24 11 052 REMOVING AND INSTALLING OR SEALING TRANSMISSION EXTENSION

Unscrew propeller shaft – 24 00 022.
Lift out lockplate (1).

Installation:
Replace lockplate.

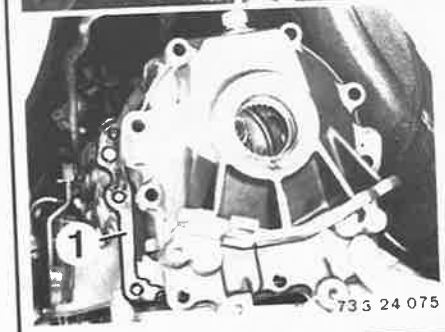
Apply Special Tool 23 1 200.
Hold output flange with Special Tool 23 0 020.
Unscrew collar nut with Special Tool 23 1 210.

Installation:
Tightening torque*.

Pull off output flange.

Support transmission with Special Tools 24 0 120 and 00 2 020.
Remove cross member with rubber mounts.
Lower transmission.

Installation:
Center transmission – see Group 26.
Tightening torque*.



Unscrew transmission extension.

Installation:
Replace gasket (1).
Tightening torque*.

* See Specifications

24 12 103 REPLACING RADIAL OIL SEAL FOR MANUAL SHIFT VALVE SHAFT

Detach selector lever (1) at transmission.

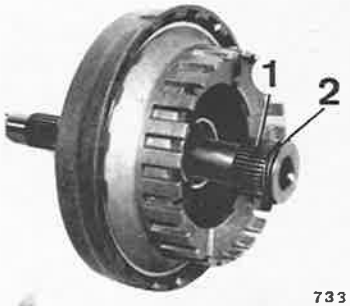
Remove radial oil seal (2).

Installation:

Lubricate sealing lip with ATF.

Knock in radial oil seal.

24 23 022 REPLACING MULTIPLE PLATE CLUTCHES AND BRAKES



733 24 171

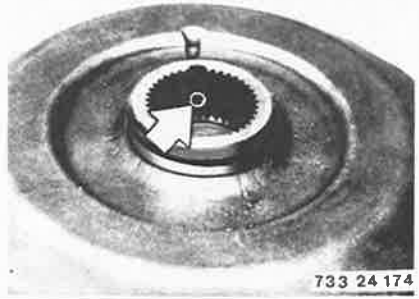
Disassemble transmission 24 00 082.
Important!
Check whether the transfer plate has a venting valve when repairing clutch A (see 24 16 502).
If applicable, install a transfer plate with a venting valve.
Clutch A:
Press out input shaft (1).
Check O-ring (2), replacing if necessary.

733 24 172

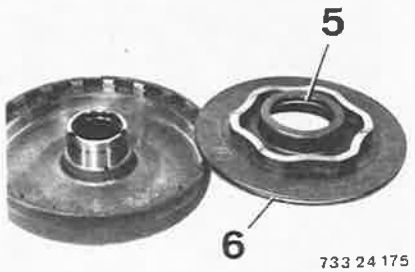
Compress clutch set and remove snap ring (3).
Remove plate carrier (4).


733 24 173

Lift out plate set and diaphragm spring.
Note:
Note quantity of steel and lined plates.

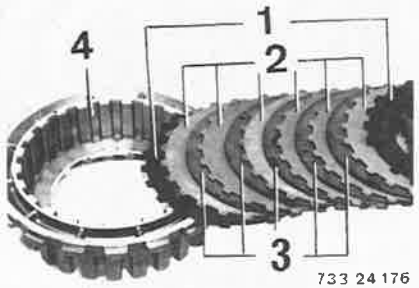

733 24 174

Press out clutch A piston with compressed air applied through oil bore.



733 24 175

Installation:
Replace O-rings (5 and 6).
Lubricate O-rings with light coat of ATF to make installation easier.



733 24 176

Installed Order of Plates:
Note number of removed steel and lined plates, and install same plates beginning with a spring and steel plate.
1 Spring plates
2 Steel plates (1.8 mm)
3 Lined plates
4 Plate carrier.


733 24 177

Place diaphragm spring in input shaft case with curved surface facing down.
Insert plate set with plate carrier.
Compress clutch set and insert snap ring.

Disassemble planet gear set.
Remove support ring (1).
Installation:
Mount support ring with fins facing down.

733 24 199

Take off planet gear set (2).

733 24 200

Pull out sun gear shaft (3).

733 24 201

Remove axial bearing (4) and thrust washer (5).

733 24 202

Lift out snap ring (6).

733 24 203

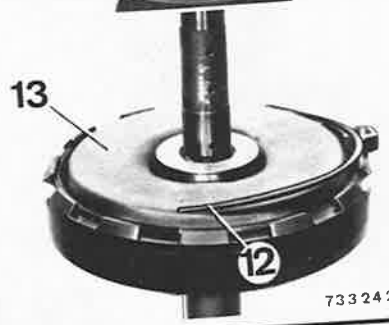
Remove hollow gear (7) and planet plate (8).

733 24 204

Remove thrust washers (9) and axial bearing (10).
Take off spacer (11).

733 24 205

Lift out snap ring (12).
Take off hollow gear (13).



733 24 206

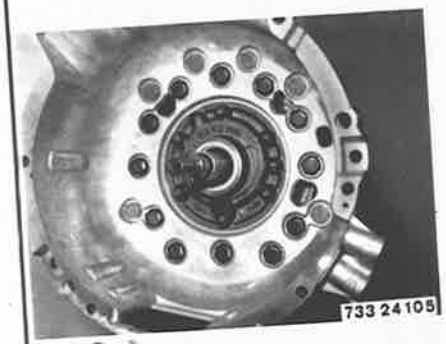
733 24 231

Use plate carrier (3) to turn one-way clutch outer race clockwise and mount race on inner race.

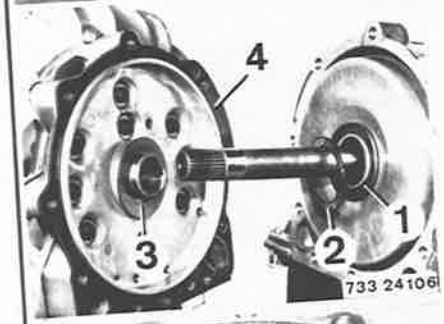
733 24 232

Clearance between one-way clutch inner race and outer race should be at least 0.1 mm (0.004").

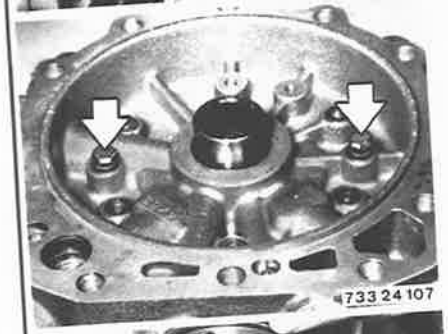
24 31 002 REMOVING AND INSTALLING PRIMARY PUMP



Remove torque converter 24 40 003.
Take off converter bell housing with connecting plate.
Installation:
Tightening torque*.



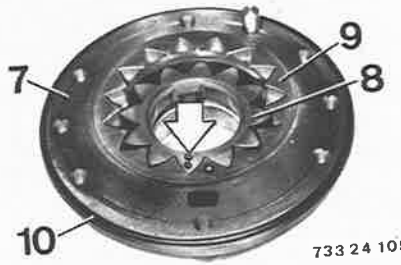
Installation:
Mount angled washer (1) with collar facing needle bearing (2) on input shaft.
Hold thrust washer (3) on converter bell housing with grease.
Replace gasket (4).



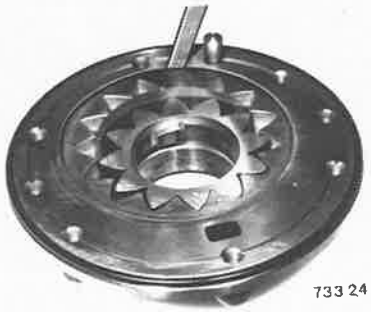
Unscrew primary pump on converter bell housing.
Loosen two bolts opposite each other by only several turns.
Loosen primary pump on converter bell housing with several light knocks.

Remove primary pump.
Installation:
Centering pin (5) must engage in bore (6).

* See Specifications

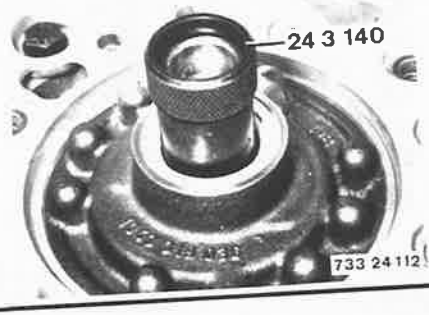


Installation:
Primary pump, consisting of pump body (7), hollow gear (8) and impeller (9), may only be replaced as an assembly.
Check O-ring (10), replacing if necessary.
Important!
Install hollow gear (8) and impeller (9) that punch marks face up.



Check radial play* between driven gear and pump body, while turning gear 360°.

Check axial play* of both gears to face surface with a precision depth micrometer.

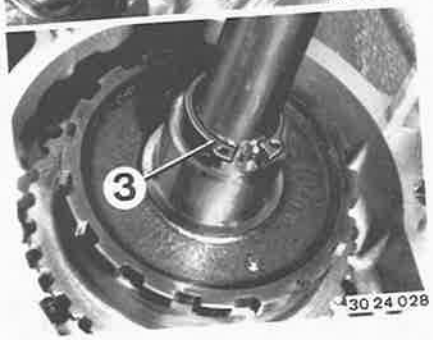


Check running of primary pump with Special Tool 24 3 140.

* See Specifications

30 24 027

Installation:
Install snap ring (1) in groove of output shaft.
Heat bearing sleeve (2) to approx. 80° C (175° F) with a hot air blower and push on to output shaft against the snap ring.



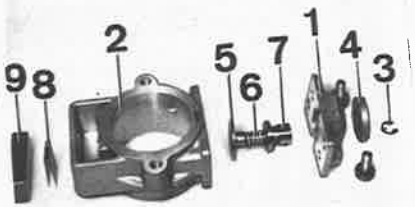
30 24 028

Lift out circlip (3).
Pull off parking lock gear.
EH Transmission:
Remove parking lock pawl – see 24 34 002.

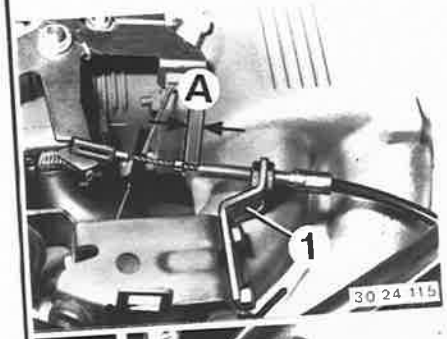
24 32 505 DISASSEMBLING AND ASSEMBLING CENTRIFUGAL GOVERNOR
– Centrifugal Governor Removed–

Unscrew parking lock gear on centrifugal governor.
Installation:
Tightening torque*.

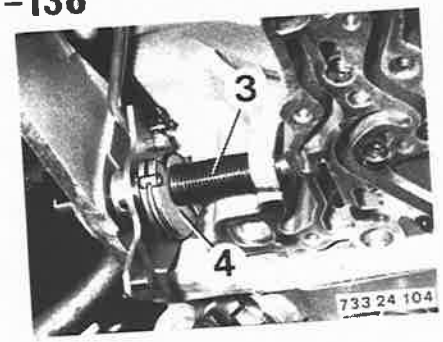
20 24 031



Unscrew cover (1) on housing (2).
Lift out retainer (3) and take off washer (4).
Remove governor plunger (5), spring (6) and governor sleeve (7).
Installation:
Governor plunger must slide easily in the governor sleeve.
Remove spring retainer (8) and balance weight (9).



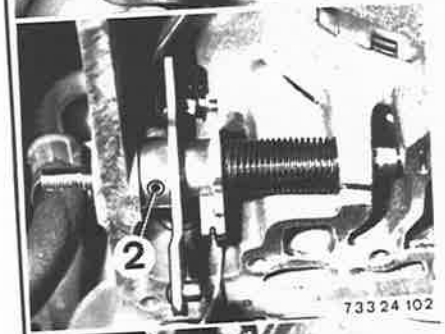
Connect throttle cable in suspension on transmission and holder (1).
Tighten cable.
Squeeze loose lead seal on cable at distance (A) = 0.25 to 0.50 mm (0.010 to 0.020").
Adjust throttle cable 24 00 006.



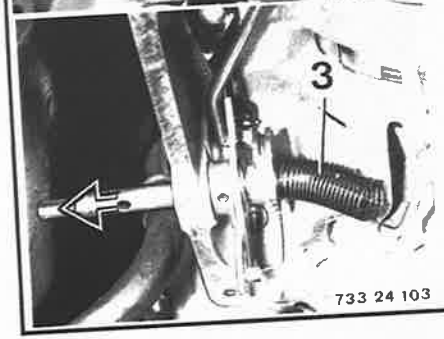
Installation:
Install selector shaft.
Preload spring (3) by one turn anticlockwise with throttle cam (4).
Connect nipple on throttle cam.

24 34 702 REPLACING SPRING FOR THROTTLE CABLE

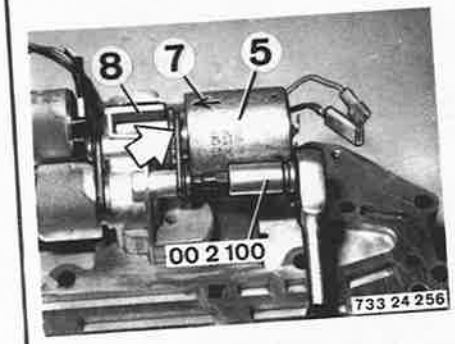
Remove valve body 24 30 002.
Disconnect selector lever (1) on transmission.
Disconnect throttle cable.



Drive out pin (2) in position N.

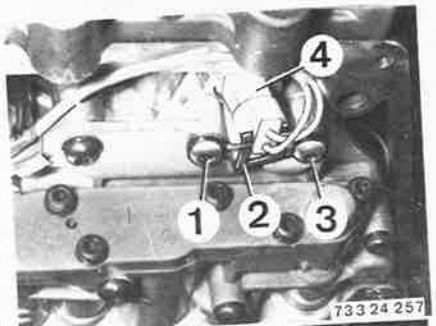


Pull out selector shaft far enough that spring (3) can be removed.



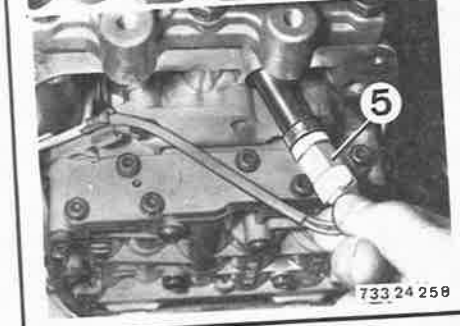
24 34 860 REPLACING PRESSURE REGULATOR
— Valve Body Removed —

Pull off wire plug.
Unscrew Torx bolt with Special Tool 00 2 100.
Take off holder.
Pull out pressure regulator (5).
Important! — Installation:
Arrow (7) on pressure regulator must be aligned with rib (8).
Install holder with tabs facing collar on pressure regulator.
Tightening torque*.



24 34 870 REPLACING PULSE TRANSMITTER
— Oil Sump Removed —

Unscrew Torx bolts (1 and 3) with Special Tool 00 2 100.
Take off holder (2).
Installation:
Engage tabs on holder (2) in grooves of plug (4).



Pull out pulse transmitter.
Pull off plug (5).
Installation:
Tightening torque*.

* See Specifications

TROUBLESHOOTING AUTOMATIC TRANSMISSION 4 HP 22 / H

Condition	Cause	Correction
Position P Park will not engage	Selector linkage or cable between selector lever and transmission maladjusted	Adjust selector lever 24 00 006
	Excessive friction in parking lock mechanism	Replace parking lock parts (connecting rod, pawl) 24 34 002
Park does not hold (slips out)	Selector linkage or cable between selector lever and transmission maladjusted	Adjust selector lever 24 00 006
Engine cannot be started in N or P	Transmission switch defective	Replace transmission switch 25 16 080
Position R No reverse gear	Selector linkage or cable between selector lever and transmission maladjusted	Adjust selector lever 24 00 006
	Oil filter screen dirty	Replace oil filter screen Replace transmission if liner bits are found in oil sump
	Clutch B destroyed – in this case also no 3rd gear	Disassemble clutches 24 23 022
	Brake D destroyed – in this case also no engine braking in 1st gear of position 1	Disassemble clutches 24 23 022
	Clutch E destroyed – in this case also no engine braking in 2nd and 3rd gears as well as 1st gear in position 1	Disassemble clutches 24 23 022
	Reverse gear arrest does not cancel	Replace valve body 24 30 002
Slipping or shaking when moving off	Clutch B or E or brake D damaged	Disassemble clutches 24 23 022
Hard engaging jolt P–R or N–R or definite double knock for P–R or N–R shifts (engine speed < 1500 rpm)	Damper B defective – in this case shift 2–3 also not correct	Replace valve body 24 30 002

Condition	Cause	Correction
Car drives in 2nd gear	Governor bushing seized	Clean or replace governor 24 32 002
	Shift valve 1–2 seized	Replace valve body 24 30 002
Car drives in 3rd gear	Governor bushing seized	Clean or replace governor 24 32 002
	Shift valves 1–2 and 2–3 seized	Replace valve body 24 30 002
Car shifts 1–3	Shift valve 2–3 seized	Replace valve body 24 30 002
Shift Points*		
Zero load shift not correct	Governor dirty	Clean or replace governor 24 32 002
	Shift valve sticks	Replace valve body 24 30 002
Full load shift points not correct	Throttle cable maladjusted	Adjust throttle cable 24 00 006
No kickdown shift		
1–2/2–1	Throttle cable maladjusted	Adjust throttle cable 24 00 006
2–3/3–2	Throttle cable maladjusted	Adjust throttle cable 24 00 006
4–3	4–3 kickdown valve seized	Replace valve body 24 30 002
Shift Transitions		
Zero load shifts too hard	Damper defective	Replace valve body 24 30 002
	Modulation pressure too high	Replace valve body 24 30 002
	Plates damaged	Disassemble transmission 24 00 082
Full load and kickdown shifts too long	Damper defective	Replace valve body 24 30 002
	Modulation pressure too low	Replace valve body 24 30 002
	Plates damaged	Disassemble transmission 24 00 082
Full load and kickdown shifts too hard	Modulation pressure deviates	Replace valve body 24 30 002
	Damper defective	Replace valve body 24 30 002

* See Specifications

Condition	Cause	Correction
Throttle cable sticks	Nipple disconnected on throttle cam	Replace throttle cable 24 34 102
	Excessive friction in throttle cable sleeve	Replace throttle cable 24 34 102
Throttle pressure piston seized	Throttle pressure piston clamped	Replace valve body 24 30 002
Noises and power flow interruption after long drive	Oil filter screen on valve body dirty	Replace oil filter screen and, if burnt clutch liner bits are found in oil sump, also replace transmission
No forward or reverse drive, loud noise	Drive plate between converter and engine torn off	Replace drive plate or converter 11 22 051 or 24 40 003
Noises		
Loud noise in all positions, especially with cold oil. Oil pump intake noise.	Oil level too low	Correct oil level
	Valve body leaks	Replace valve body 24 30 002
Loud, screeching noise depending on speed in all positions, especially with warm oil; occurring after long drive, sometimes accompanied by breaks in power flow	Oil filter screen dirty	Replace oil filter screen and, if burnt clutch liner bits are found in oil sump, also replace transmission
Loud noise when converter closes	Torsion damper defective	Replace converter 24 40 003
Loud engine grumble when converter closes	Engine speed too low, converter shift point not correct	Replace valve body 24 30 002
Leaks		
Oil dripping out of converter bell housing	Seal in pump body damaged	Replace seal 24 31 002
	Pump body leaks	Replace pump assy. 24 31 002
	Converter leaks on welded seam	Replace converter 24 40 003
	Radial oil seal for converter leaks	Replace radial oil seal 24 12 003
Leak between transmission case and oil sump	Oil sump mounting bolts not tightened correctly	Tighten bolts to specified torque*
	Oil sump gasket damaged	Replace gasket 24 11 002
Leak between transfer plate and transmission case (especially in area of pump pressure bore)	Mounting bolts on converter bell housing loose	Tighten bolts to specified torque*
Oil lost through throttle cable connection	O-ring on connection damaged	Replace O-ring or, if necessary, entire throttle cable 24 34 102

* See Specifications

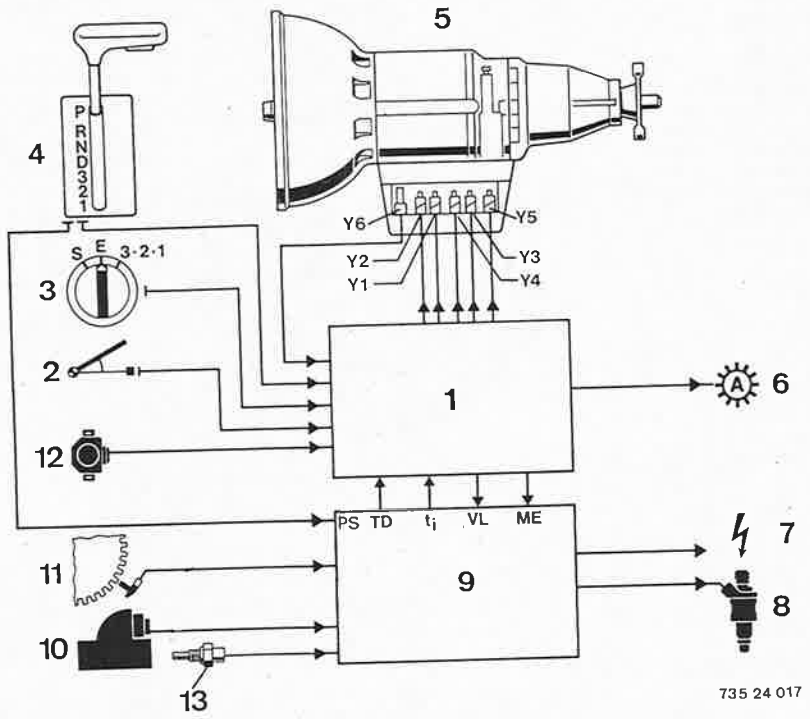
Condition	Cause	Correction
Position D No power flow	Oil filter screen dirty	Replace oil filter screen 24 31 152 Exchange transmission, if liner bits are found in oil sump
	Clutch A faulty	Replace clutch A 24 23 022
	1st gear one-way clutch slips	Disassemble transmission 24 00 082
	Linkage between selector lever and transmission maladjusted	Adjust selector linkage 24 00 006
Slipping or shaking while moving off	Clutch A damaged	Replace clutch A 24 23 022
Hard engaging jolt N–D (engine speed 1500 rpm)	Clutch A damaged	Replace clutch A 24 23 022
	Damper A faulty	Replace valve body 24 30 002
No shift (warm or cold state)	Kickdown switch faulty (only kickdown shifts)	Replace kickdown switch
– Shift 1–2 / 2–1	Transmission electronics faulty	Check transmission electronics (see test plan)
	Solenoid (1) faulty (see test plan)	Replace solenoid 24 34 851
	Control valve 1–2 / 3–4 seized	Replace valve body 24 30 002
	Shift valve 1–2 seized	Replace valve body 24 30 002
– Shift 1–2	Brake C' and/or C faulty	Disassemble clutches 24 23 022
– Shift 2–3 / 3–2	Solenoid (2) faulty (see test plan)	Replace solenoid 24 34 851
	Shift valve 2–3 seized	Replace valve body 24 30 002
– Shift 2–3	Clutch B faulty	Replace clutch B 24 23 022
– Shift 3–4 / 4–3	Solenoid (1) defective (see test plan)	Replace solenoid 24 34 851
	Control valve 1–2 / 3–4 seized	Replace valve body 24 30 002
	Shift valve 3–4 seized	Replace valve body 24 30 002
– Shift 3–4	Brake F faulty	Disassemble clutches 24 23 022
	Program switch faulty (see test plan)	Replace program switch
– Shift 1–2 Engine speed does not go beyond stall speed in drive and full load	Pulse transmitter faulty (see test plan)	Replace pulse transmitter 24 34 870

Condition	Cause	Correction
– Full load and kickdown shifts too hard	Modulation pressure not okay	Replace valve body 24 30 002
	Damper faulty	Replace valve body 24 30 002
	Control unit faulty	Replace control unit 24 61 000
Position 3 – 3rd Gear		
No engine braking effect	Clutch E damaged	Disassemble clutches 24 23 022
Position 2		
Manual downshift 3–2 not okay	Transmission electronics faulty	Check transmission electronics (see test plan)
	Solenoid (2) faulty (see test plan)	Replace solenoid valve 24 34 851
No engine braking effect	Brake C' or clutch E damaged	Disassemble clutches 24 23 022
Position 1		
Manual downshift 2–1 not okay	Transmission electronics faulty	Check transmission electronics (see test plan)
	Solenoid (1) faulty (see test plan)	Replace solenoid valve 24 34 851
No engine braking effect	Brake D or clutch E damaged	Disassemble clutches 24 23 022
Converter Clutch		
Shift speed not okay	Control unit faulty	Replace control unit 24 61 000
Shift transition too hard	Converter clutch damper defective	Replace valve body 24 30 002
	Converter not okay	Replace converter 24 40 003
No shift	Transmission electronics defective	Check transmission electronics (see test plan)
	Solenoid (3) faulty (see test plan)	Replace solenoid valve 24 34 851
	Converter faulty	Replace converter 24 40 003
Converter clutch always locked (engine stops in drive position)	Transmission electronics faulty	Check transmission electronics (see test plan)
	Solenoid (3) faulty (see test plan)	Replace solenoid valve 24 34 851

Condition	Cause	Correction
Leakage		
Oil dripping out of converter bell housing	Seal in pump body damaged	Replace seal 24 31 002
	Pump body leaks	Replace complete pump 24 31 002
	Converter leaks on welded seam	Replace converter 24 40 003
	Radial oil seal for converter leaks	Replace radial oil seal 24 12 003
Leak between transmission case and oil sump	Oil sump mounting bolts not tightened with correct torque	Tighten bolts with correct torque*
	Oil sump gasket damaged	Replace gasket 24 11 002
Leak between transfer plate and transmission case (especially in area of pump pressure bore)	Converter bell housing mounting bolts loose	Tighten bolts to correct torque*
Oil loss on transmission plug	O-ring faulty	Replace O-ring 24 30 002
Oil loss on output	Radial oil seal on output damaged	Replace radial oil seal 24 12 013
Oil loss through or on vent	Oil level too high	Correct oil level
	Wrong type of oil (strong foaming)	Replace oil, if necessary remove transmission and drain entire oil including that in converter
	Vent cover missing	Mount cover or replace vent
	O-ring on vent damaged	Unscrew transmission extension, replace O-ring
	Circlip pre-load insufficient	Replace circlip
Oil loss on cooler line	Loose connection	Tighten bolts to correct torque*
	Cooler line damaged	Replace cooler line
	Cooler leaks	Replace cooler 17 11 000
Oil loss on transfer plate	Plug on transfer plate leaks	Tighten plug with correct torque*
		Replace seal
Leak between transmission case and transmission extension	Mounting bolts loose	Tighten bolts with correct torque*
	Gasket damaged	Replace gasket 24 11 052

* See Specifications

Condition	Cause	Correction
Position D		
No shift function 2–3 / 3–2	Solenoid (2) faulty (see test plan)	Replace solenoid valve 24 34 851
	Wire to solenoid (2) grounded out (see test plan)	Replace wire harness
	Shift valve 2–3 seized	Replace valve body 24 30 002
No shift function 3–4 / 4–3	Solenoid (1) faulty (see test plan)	Replace solenoid valve 24 34 851
	Control valve 1–2 / 3–4 seized	Replace valve body 24 30 002
Shifts 1–2 / 2–3 / 3–4 too long	Pressure regulator faulty (see test plan)	Replace pressure regulator 24 34 860
	Wire to pressure regulator grounded out (see test plan)	Replace wire harness
	Damper faulty	Replace valve body 24 30 002
	Modulation valve, pressure reducing valves 1 and 2 seized	Replace valve body 24 30 002
Upshifts 1–2 / 2–3 / 3–4 too hard	Pressure regulator faulty (see test plan)	Replace pressure regulator 24 34 860
	Modulation valve sticks	Replace valve body 24 30 002
	Damper faulty	Replace valve body 24 30 002
Downshift 4–3 too hard	Plate F dirty	Replace valve body 24 30 002
Manual downshifts 4–3 / 3–2 too hard	Damper E or C' faulty	Replace valve body 24 30 002



AEGS LAYOUT DRAWING

1 AEGS control unit
2 Kickdown switch
3 Program switch
4 Position switch
5 Transmission
6 Fault indicator
7 Ignition
8 Fuel injection
9 DME control unit
10 Air flow sensor
11 Engine speed sensor
12 Throttle valve sensor
13 Temperature sensor
Y1 Solenoid – 1st/2nd and 3rd/4th gears
Y2 Solenoid – 2nd/3rd gears
Y3 Solenoid – converter lockup clutch
Y4 Solenoid – reverse gear lock
Y5 Pressure regulator
Y6 Pulse transmitter
tD Speed signal
ti Load signal
VL Full load
ME Engine tap
PS Position switch

Explanations for Independent Electronic Transmission Control (AEGS):
There is a comprehensive test of the entire AEGS each time the engine is started.
Turn on ignition.
The yellow fault indicator lamp in the instrument panel will flash twice briefly, stay on while starting and go out at an engine speed above 450 rpm.

Test Position: Fault Indicator	Cause	Correction
Fault indicator does NOT flash and remains on after starting.	Break in ground wire 5/19. Check voltage between wires 5/19 and 24 with ignition on. Nominal value: 5 V. AEGS control unit faulty.	Repair to wiring diagram. Repair wire to wiring diagram. Replace control unit 24 61 000.
Fault indicator flashes, but remains on after starting.	Power supply to AEGS control unit insufficient. Check voltage between wires 5/19 and 35 with ignition on. Nominal value: > 10 volts. Wires to solenoid 1 (Y1), 2 (Y2), reverse gear (Y4) or converter lockup clutch (Y3) have a break or are grounded out. See test plan for checking. No TD signal from DME control unit. No ti signal from DME control unit.	Repair wire to wiring diagram. Repair wires to wiring diagram. Check plug connection (X) and power supply lead to AEGS control unit.
Fault indicator comes on while driving.	Power supply between wires 5/19 and 35 insufficient (drops below 10 V). TD signals stop suddenly. Break in positive wires to solenoids.	Repair wires to wiring diagram. Repair wires to wiring diagram.

Troubleshooting – also refer to Service Information 24 02 85 (422).

Solenoid valve (Y4) – reverse gear lock. — no → Wire to solenoid valve damaged /grounded out. → Repair wire.
Insulation test (M 06). Check plug connections. Repair plug connections.
Measure resistance between wires 5/19 and 1/20. Solenoid valve grounded out. Replace solenoid valve 24 34 851.
Nominal value: > 500 k-ohms.

d) Solenoid valve (Y3) – converter lockup clutch. — no → Wire to solenoid valve damaged/shorted. → Repair wire.
Resistance test (M 06). Check plug connections. Repair plug connections.
Measure resistance between wires 1 and 25. Solenoid valve faulty. Replace solenoid valve 24 34 851.
Nominal value: approx. 22 ... 60 ohms.

Insulation test (M 06). — no → Wire to solenoid valve damaged/grounded out. → Repair wire.
Measure resistance between wires 5/19 and 1/25. Solenoid valve grounded out. Replace solenoid valve 24 34 851.
Nominal value: > 500 k-ohms.

Test Position 3

Pressure regulator (Y5). — no → Wire to pressure regulator damaged/shorted. → Repair wire.
Resistance test (M 06). Check plug connections. Repair plug connections.
Measure resistance between wires 1 and 22. Pressure regulator faulty. Replace pressure regulator 24 34 860.
Nominal value: 1.7 ... 4.5 ohms.

Insulation test (M 06). — no → Wire to pressure regulator damaged/grounded. → Repair wire.
Measure resistance between wires 5/19 and 1/22.
Nominal value: > 500 k-ohms.

Test Position 7

Pulse transmitter (Y6).
Resistance test (M 06).
Measure resistance between wires 8 and 27.
Nominal value: 0.7ohms ... 1.8 k-ohms.

no → Wire to pulse transmitter damaged/shorted.
Check plug connections.
Pulse transmitter faulty.

→ Repair wire.
Repair plug connections.
Replace pulse transmitter 24 34 870.

↓

Insulation test (M 06).
Measure resistance between wires 5/19 and 8/27.
Nominal value: > 500 k-ohms.

no → Wire to pulse transmitter damaged/grounded out.
Pulse transmitter grounded out.

→ Repair wire.
Replace pulse transmitter 24 34 870.

↓

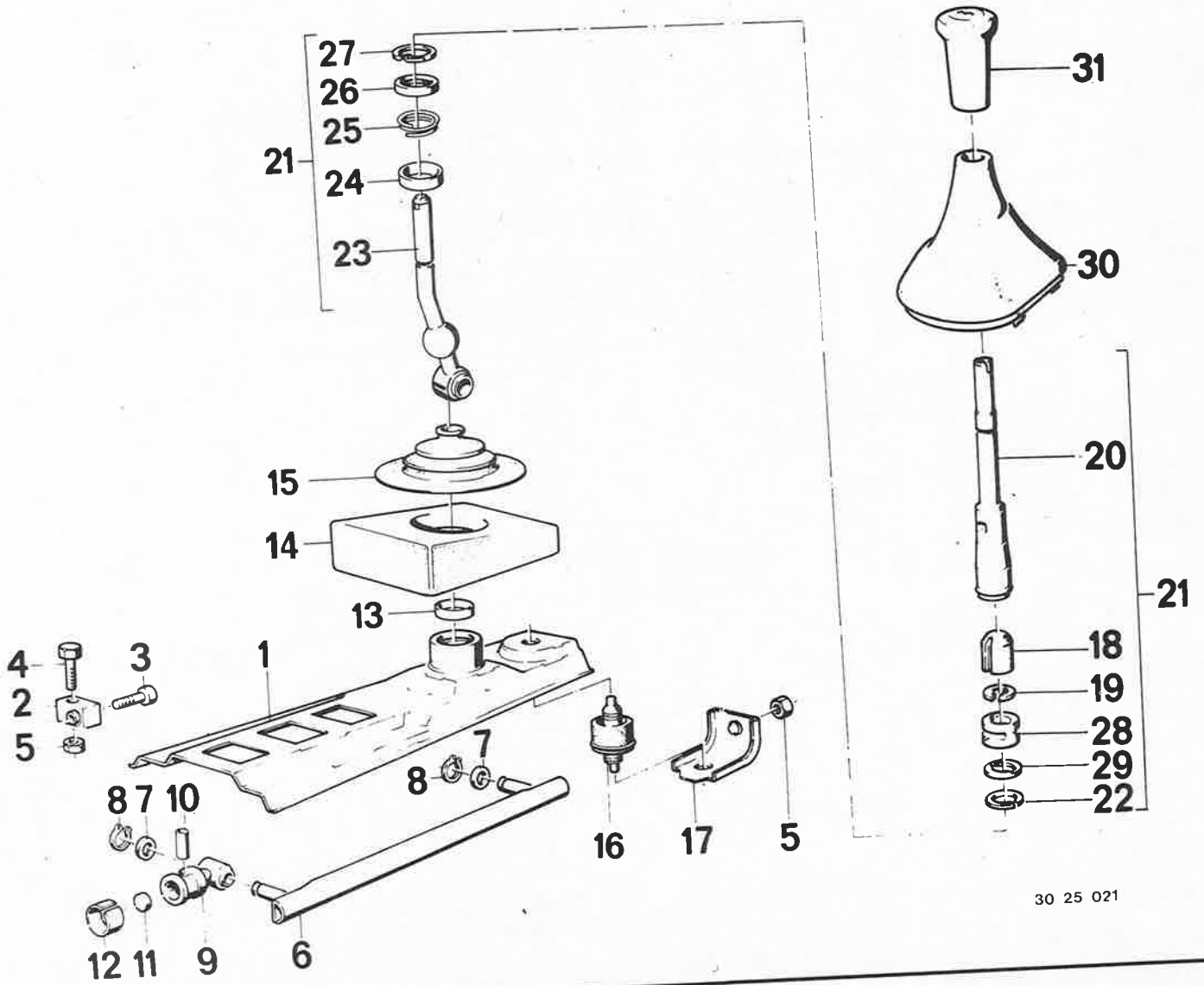
Dynamic test (M 22).
Scope test.
Connect test lead between wires 8 and 27 (see operating instructions for BMW Service Tester).
Support car underneath the trailing arms.
It should be possible to turn the rear wheels easily.
Start engine.
Selector position D.
Speed approx. 30 km/h (25 mph).
All sine curves must be uniformly larger than 0 ... 10 (left screen scale).

no → Pulse transmitter faulty.
Wire to pulse transmitter damaged/grounded out.

→ Replace pulse transmitter 24 34 870.
Repair wire.

25 Gear Shift Mechanism

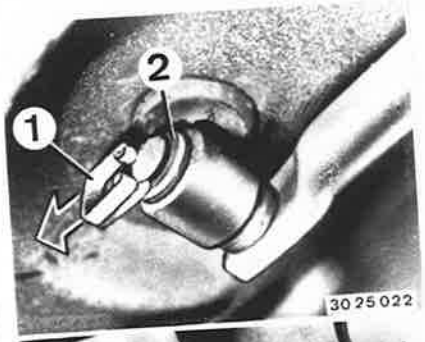
SHIFT LAYOUT FOR MANUAL TRANSMISSION
– Sheet Metal Shift Console –



1 Selector arm
2 Console
3 Bolt
4 Bolt
5 Nut
6 Selector rod
7 Spacer
8 Circlip
9 Selector rod joint
10 Pin
11 Lubricating felt
12 Spring sleeve
13 Lower plate
14 Damper plate
15 Rubber cover
16 Rubber mount
17 Holder
18 Cap
19 Circlip
20 Shift lever upper section
21 Shift lever assembly
22 Circlip
23 Shift lever lower section
24 Upper plate
25 Spring
26 Spacer
27 Circlip
28 Rubber ring
29 Washer
30 Dust cover
31 Shift lever knob

30 25 021

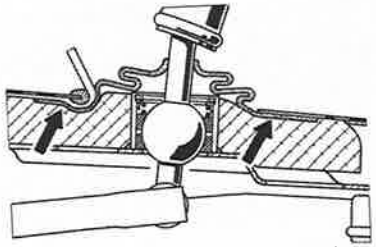
25 11 000 REMOVING AND INSTALLING SHIFT LEVER
– Sheet Metal Shift Console –



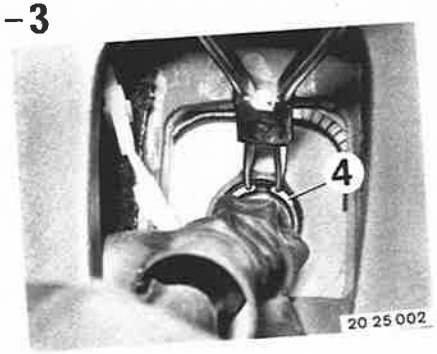
Remove retainer (1).
Take off washer (2).
Pull out selector rod (3).

Remove dust cover.

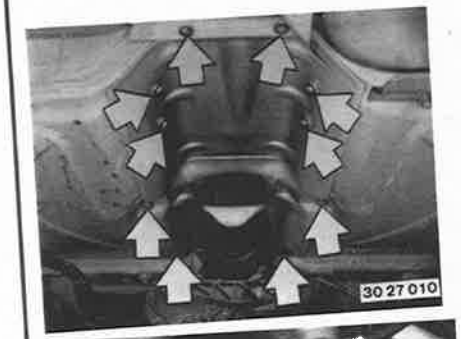
Remove insulating felt.
Pull out cover between body and shift console.



Installation:
Check for correct fit of cover.



Lift out circlip (4).
Remove shift lever.
Installation:
Lubricate spherical plates with Molykote Longterm 2.



25 11 000 REMOVING AND INSTALLING SHIFT LEVER
– All Wheel Drive –

Remove exhaust assembly 18 00 020.
Unscrew heat shields.

Loosen threaded sleeve several turns with Special Tool 26 1 060 or 26 1 040.
Installation:
Tighten threaded sleeve with Special Tool 26 1 060 or 26 1 040 after finishing installation.
Tightening torque*.

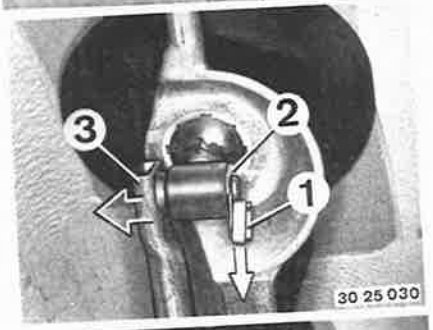
Support transmission.
Unscrew cross member.
Lower transmission to front axle carrier.
Installation:
Check length of bolts.

Pull off shift lever knob.

* See Specifications

Lift out dust cover.

Remove felt.
Disconnect plug on wires for backup lights.
Unclip dust cover (1) on body and pull off of shift lever.
Disconnect dust cover (2) on shift console.
Installation:
Inspect dust covers.
Check for correct seating.

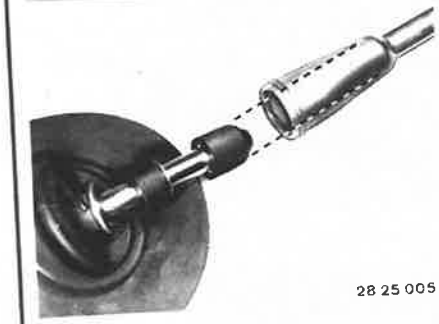


Lift out circlip (1).
Take off washer (2).
Pull out selector rod (3).

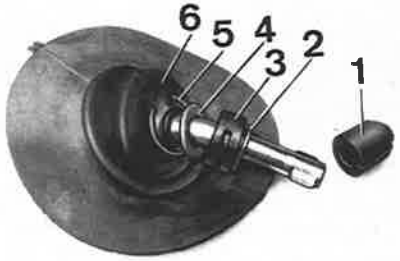
Apply Special Tool 25 1 100.
Turn counterclockwise 90°.
Push up spherical plate.
Remove shift lever from above.

25 11 003 DISASSEMBLING/ASSEMBLING SHIFT LEVER
— Sheet Metal Shift Console —

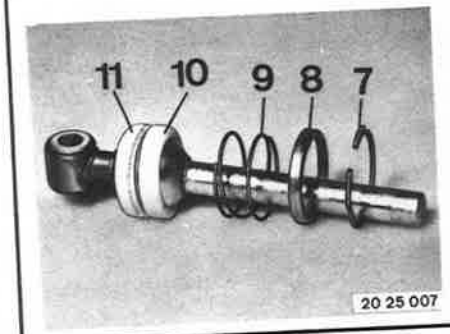
Remove shift lever 25 11 000.
Lift out wire snap ring.



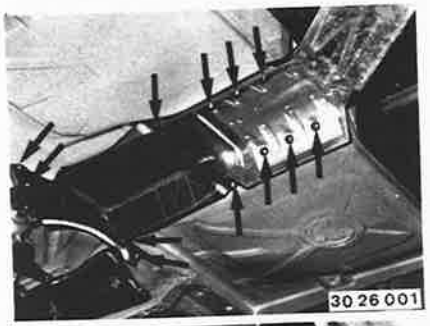
Pull off shift lever upper section.
Installation:
Check installed position.



Pull off cap (1).
Remove circlip (2).
Remove rubber ring (3), washer (4), snap ring (5) and rubber part (6).



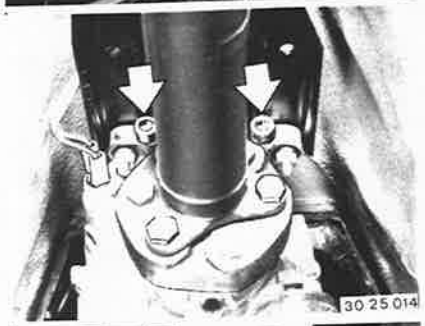
Remove circlip (7), spring retainer (8), spring (9), upper plate (10) and lower (ribbed) plate (11).
Installation:
Lubricate upper and lower plates with Molykote Longterm 2.



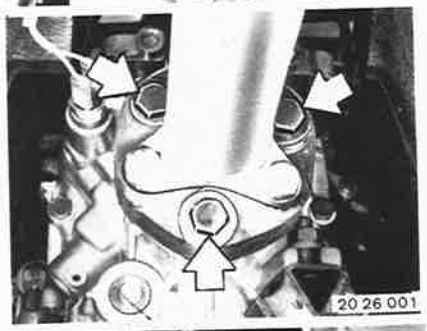
25 11 111 REPLACING SELECTOR ROD JOINT

— Sheet Metal Shift Console —

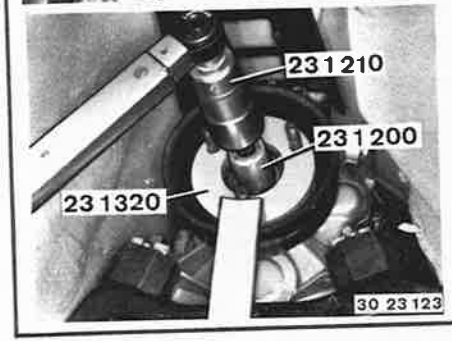
Access to the selector rod joint differs in accordance with the different transmission and propeller shaft versions.
Remove exhaust assembly 18 00 020.
Remove heat shield with reinforcement carrier.



Version with 4 Speed Transmission:
Unscrew console mounting bolts.
Important!
Self-locking bolts — will be difficult to unscrew.
Installation:
Use new bolts coated with micro-encapsulating adhesive.
Tightening torque*.

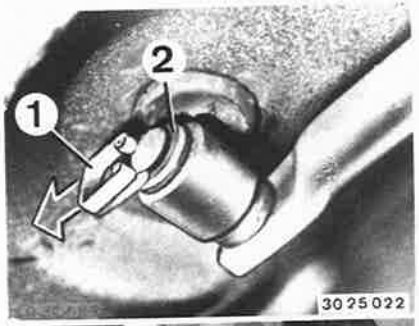


Version with 5 Speed Transmission:
Unscrew propeller shaft on transmission, see 26 11 000.

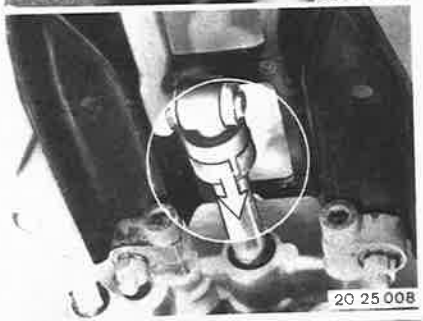


Version with 5 Speed Transmission and Vibration Damper:
Unscrew propeller shaft on transmission, see 26 11 000.
Unscrew output flange with vibration damper on transmission, see 23 12 053.

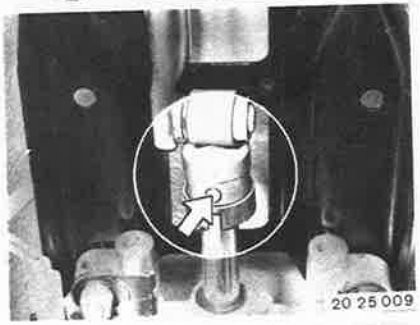
* See Specifications



Engage reverse gear.
Lift out circlip (1).
Take off washer (2).
Pull out selector rod (3).



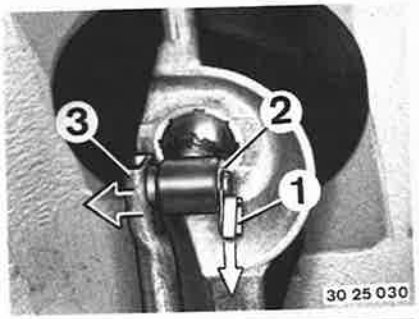
Push back locking sleeve.



Move selector shaft to 3rd or 5th gear position.
Drive out pin.
Remove selector rod with joint.
Note:
If selector rod joint has an offset bearing sleeve, install the bearing sleeve offset to the right as seen locking forward in car.
Cars with Vibration Damper:
Install bent selector rod offset to the left.

Installation:
Lubricate bearing sleeve and joint with Molykote Longterm 2.

20 25 010

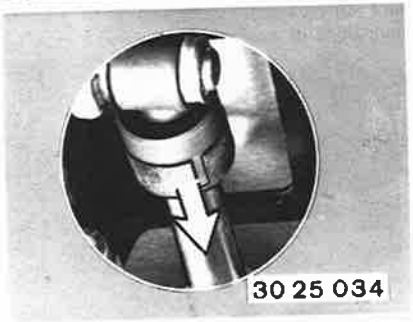


25 11 111 REPLACING SHIFT ROD JOINT
– All Wheel Drive –

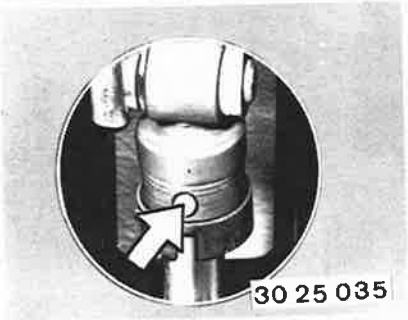
Remove and install transfer box – see 27 10 010.
Lift out retainer (1).
Take off washer (2).
Pull out shift rod (3).

30 25 047

Lift out retainer (1).
Take off washer (2).
Pull out shift rod.
Installation:
Check rubber rings (3), replacing if necessary.
Lubricate bearing surfaces with Molykote Longterm 2.



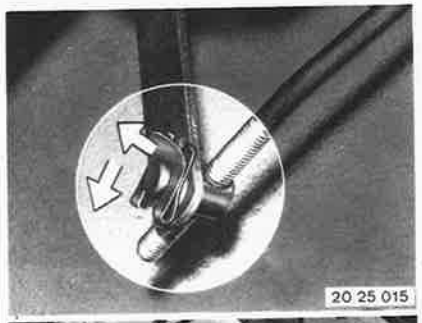
Push back locking sleeve.



Drive out pin.
Remove shift rod with joint.
Note:
Bearing sleeve is offset to the right as seen looking forward in car.

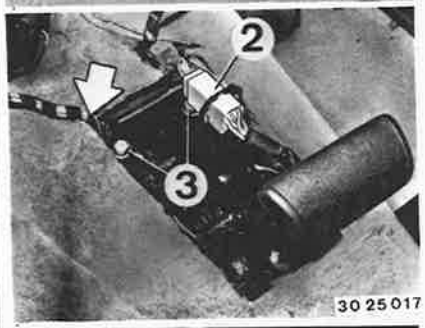
Installation:
Check damper in joint, replacing if necessary.

32 25 053

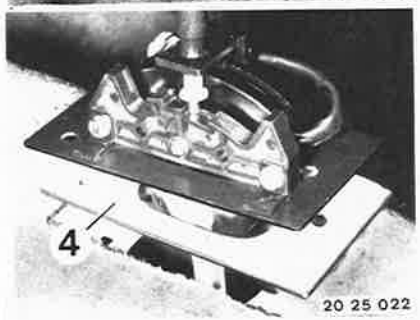


25 16 050 REMOVING AND INSTALLING SELECTOR LEVER COMPLETE WITH BASE
– Version with Shift Rod –

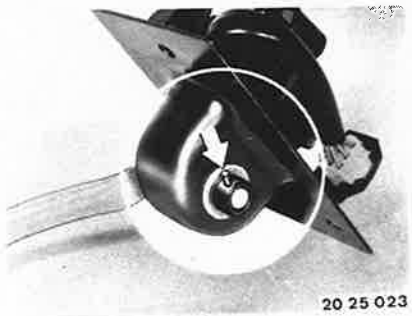
Remove center console – see 51 16 200.
Lift out retainer.
Disengage shift rod.
Installation:
Adjust shift rod – see 24 00 004.



Disconnect plug (2).
Remove bolts (3).
Remove base.
Installation:
Be careful not to pinch the wire harness.



Installation:
Insert insulator (4).



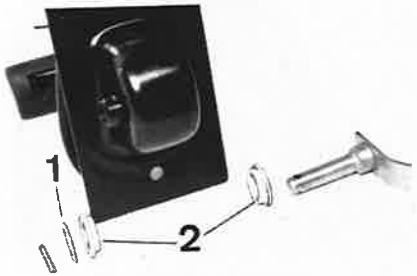
20 25 023

25 16 080 REMOVING AND INSTALLING SELECTOR LEVER
– Version with Shift Rod –

Remove selector lever complete with base – see 25 16 050.
Drive out pin.

30 25 019

Unscrew screw on handle.
Pull off handle.

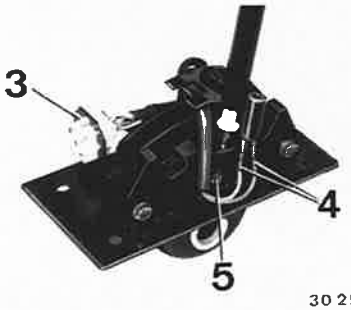


20 25 024

Pull out selector lever lower section.
Remove washer (1) and bearing sleeves (2).
Installation:
Check bearing sleeves, replacing if necessary and lubricating with Molykote Longterm 2.

20 25 028

Installation:
Guide pin of push button into pull rod hole.

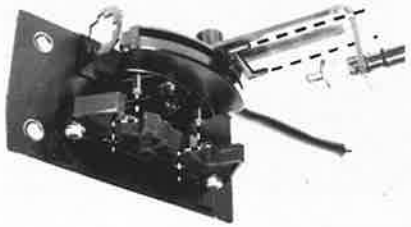


30 25 018

Pull off plug (3).
Disconnect scale light wire (4).
Unscrew screw (5).
Remove transmission switch together with the upper selector lever section.

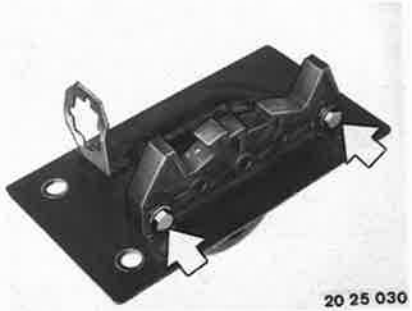
30 25 020

Take pull rod out of selector lever upper section.



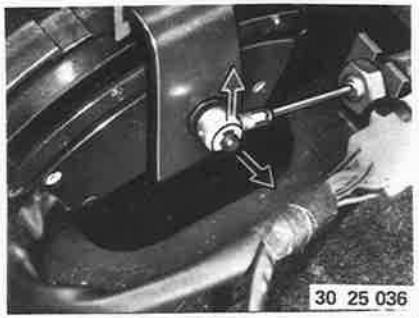
20 25 026

Installation:
Check installed position of transmission switch and drive.



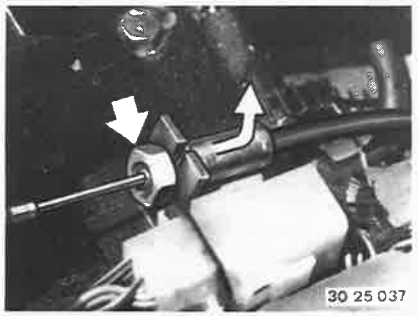
20 25 030

Installation:
Check gate, replacing if necessary.



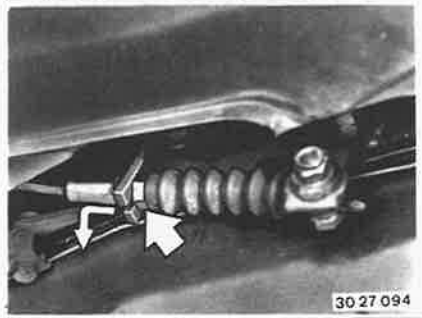
25 16 202 REPLACING CABLE FOR SELECTOR LEVER

Remove center console – see 51 16 200.
Lift out retainer.
Unscrew eye on pin.
Important!
Don't bend the steel wire.

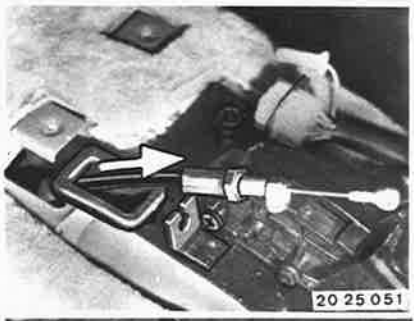


Unscrew nut.
Disconnect cable sleeve in holder.

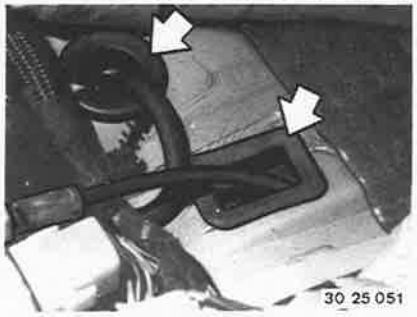
Loosen nuts.
Important!
Don't bend the steel wire.



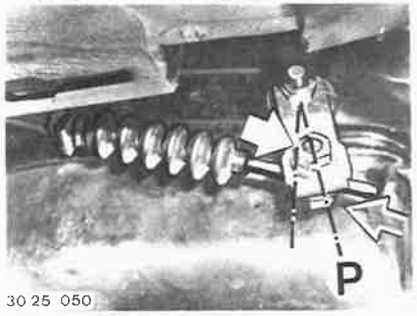
Unscrew nuts.
Push back cable sleeve and disconnect in holder.
Pull cable out of operating lever.



Pull out rubber grommet with cable upwards.



Installation:
Check for correct seating of rubber seals after finishing installation.



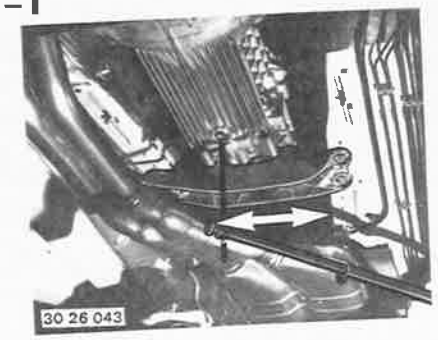
Installation:
Adjust cable.
Shift lever in "P" (most forward position).
Press shift lever opposite forward direction.
Clamp cable rod without tension.
Important!
Tightening torque = 10 to 12 Nm (7 to 9 ft. lbs.).
Don't bend the cable.

26 Propeller Shaft

ELIMINATING PROPELLER SHAFT VIBRATION AND NOISE

Requirements:
Elimination of disturbances from faulty engine and transmission mounts, tension in exhaust assembly, etc..
Propeller shaft in perfect optical and mechanical condition.
Balance or replace propeller shaft, if balance plates are missing or propeller shaft is suspected to have imbalance (refer to instructions supplied with balancing equipment).

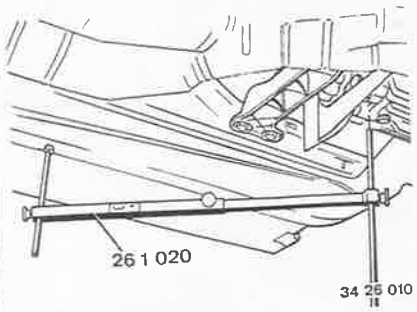
Caution!
A jacked up car may only be tested operated when the suspension of driven wheels is supported (deflection angle of output shafts).
Never exceed the maximum speed specified for a car jacked up or on a dynamometer.
Conform with safety regulations!



Move transmission to the side until the special tool gage shows equal spacing on left and right sides.

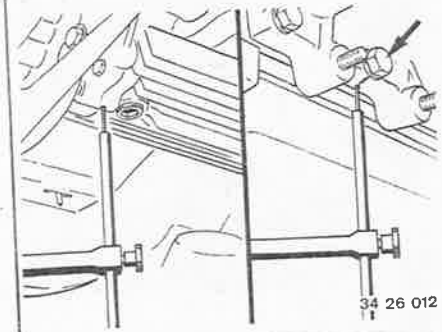
Checking Propeller Shaft Deflection Angle:

Remove exhaust assembly, heat shield and, if applicable, splash guard.

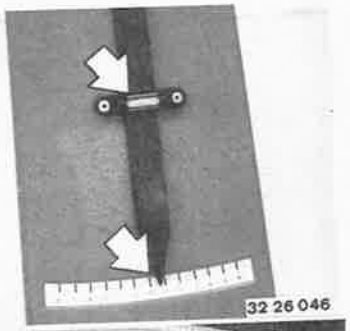


Centering Propeller Shaft:

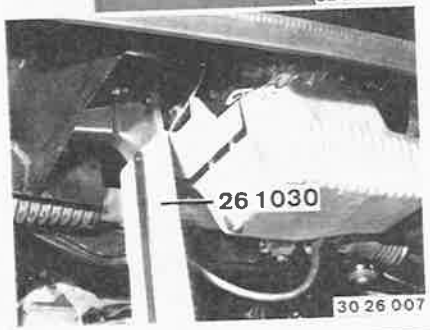
Loosen the exhaust assembly, engine mounts and transmission cross member.
Apply Special Tool 26 1 020.



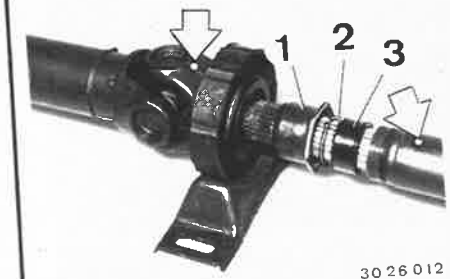
Application Points:
Checkpoints on engine carrier at rear.
With manual transmission - middle of cast rib.
With automatic transmission - middle bolt of transmission extension.
(Punch mark the pertinent checkpoint.)



Place Special Tool 26 1 030 on an engine surface running perpendicular or parallel to the crankshaft.
Set the indicator perpendicular with help of the water scale.
Read degrees.
Note:
Always apply the gage with the scale in the same direction (e.g. scale right).
One graduation = 5'.
The position of the car is not important, since only separate angles are compared.



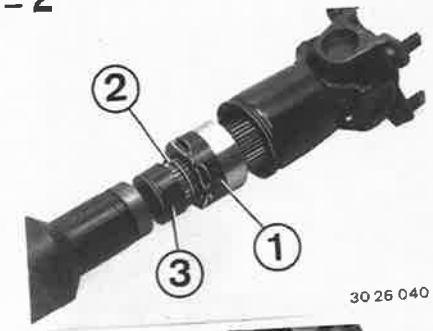
The following bearing surfaces are applicable depending on engine type and version.
Place Special Tool 26 1 030 on the oil pan flange and determine the angle of engine inclination.



30 26 012

Hard Movement on Slide:
– Slide on Center Mount –

Important!
The propeller shaft was balanced in assembled state and must not be turned in the slide.
Mark position of propeller shaft sections to each other.
Remove threaded sleeve (1), washer (2) and rubber ring (3).
Check rubber ring, replacing if necessary.
Disconnect propeller shaft on slide.
Clean and lubricate keyway with Molykote Longterm 2.**
Assemble propeller shaft that marks are in one plane.

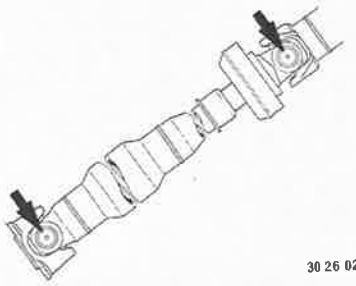


30 26 040

Hard Movement on Slide:
– Propeller Shaft for All Wheel Drive –

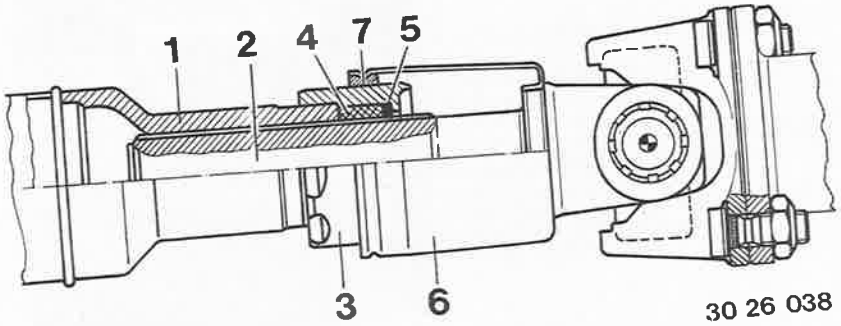
Important!
The propeller shaft was balanced in assembled state and must not be turned in the slide.
Mark position of propeller shaft sections to each other.
Remove threaded sleeve (1), washer (2) and rubber ring (3).
Check rubber ring, replacing if necessary.
Disconnect propeller shaft on slide.
Clean and lubricate keyway with Molykote Longterm 2.**
Assemble propeller shaft that marks are in one plane.
Installation:
Check seal in dust cap, replacing if necessary.

30 26 039



30 26 025

Note:
Propeller shaft sections are mounted in such a manner that universal joints are in one plane.
If the slide had been disassembled by mistake without marking, it will only mean the possibility of installing the propeller shaft wrong by 180° because of balancing.



30 26 038

30 26 005

After finishing installation:
Tighten threaded sleeve with Special Tool 26 1 040.
Tightening torque*.

1 Front propeller shaft section
2 Rear propeller shaft section
3 Clamping nut
4 Clamp
5 Washer
6 Dust cap
7 Seal

* See Specifications
** Source of Supply: HWB

** Source of Supply: HWB

TROUBLESHOOTING PROPELLER SHAFT

Condition	Cause	Correction
Drumming from 60 km/h (35 mph) on	Propeller shaft not aligned precisely or installed with stress – axial compensator	Align propeller shaft or check movement of axial compensator, lubricating slide with Molykote Longterm 2 and tightening screw-on bushing to correct torque* if necessary
	Center damaged	Replace center – 26 11 501
	Runout on centering pin, transmission or final drive flanges	Check centering pin and flanges for runout with dial gage – see Specifications; offset or replace final drive flange
	Centering error due to worn flange bores (loose bolts)	Replace transmission or final drive flange
	Excessive propeller shaft imbalance; balance plate missing	Balance or replace propeller shaft – see 26 11 000
	Universal joints worn or seized	Check clearance and movement, replacing propeller shaft if necessary
Center mount noise while driving	Center mount not peroendicular to propeller shaft; no or insufficient preload	Preload center mount 4 to 6 mm (0.157 to 0.236") in forward direction at right angle to propeller shaft
	Center mount grooved ball bearing not okay	Replace grooved ball bearing – 26 12 001

* See Specifications

27 Transfer Box

27 10 000 CHECKING CENTRAL LOCK IN CAR

The condition of a central lock can be checked on a brake test stand with help of the BMW service tester.

Caution!

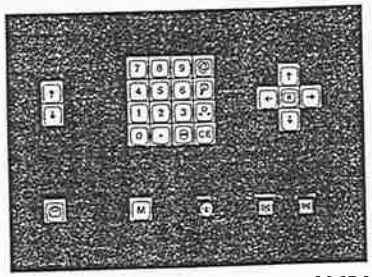
If only one axle turns in a test on the brake test stand, the central lock will be subjected to strong loads and could be destroyed from excessive heat.

Never exceed the total running time = warm-up time + test time of 60 seconds on the brake test stand.

Make a break of at least 30 minutes after each test cycle. These times are applicable to cold and warm operated cars.

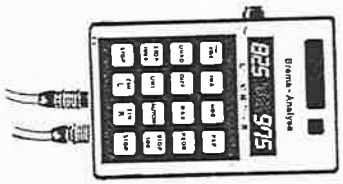
The roller speed of the brake test stand must not exceed 7.5 km/h (4.5 mph).

If the roller speed of the brake test stand without load is not known, it can be determined with a '3' series car with ABS, but without all wheel drive, to the methods described in the testing procedures. In so doing the warm-up phase and measuring the braking force are omitted.



30 27 004

Select test program 03 ABS on BMW service tester.
Select ABS test step 03.
Turn on ignition.

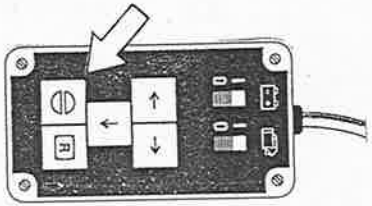


30 27 005

Switch on both rollers of brake test stand.
Run brake test stand approx. 40 seconds (warm-up phase).

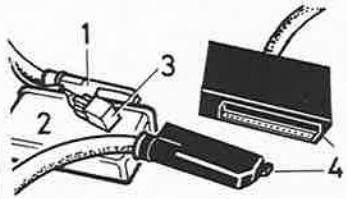
30 27 002

Check tire inflation pressure and tire size.
Park rear wheels of car in test stand rollers.
Front wheels are on floor.
Shift lever in neutral.



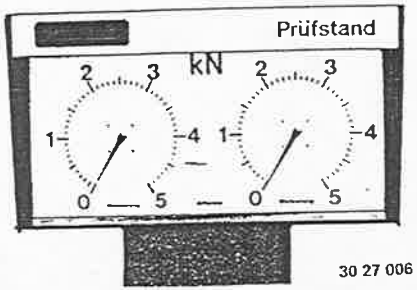
30 27 008

Press reset button on BMW service tester after the warm-up time.
The value in ms now appearing at rear left or right is equal to the roller speed.
See diagram.



30 27 003

Car must be connected on the BMW service tester, to determine test stand speed (wheel speed) under load.
Swith off electric equipment and ignition.
Connect T-plug (4) between ABS control unit (2) and ABS wire harness (1).



30 27 006

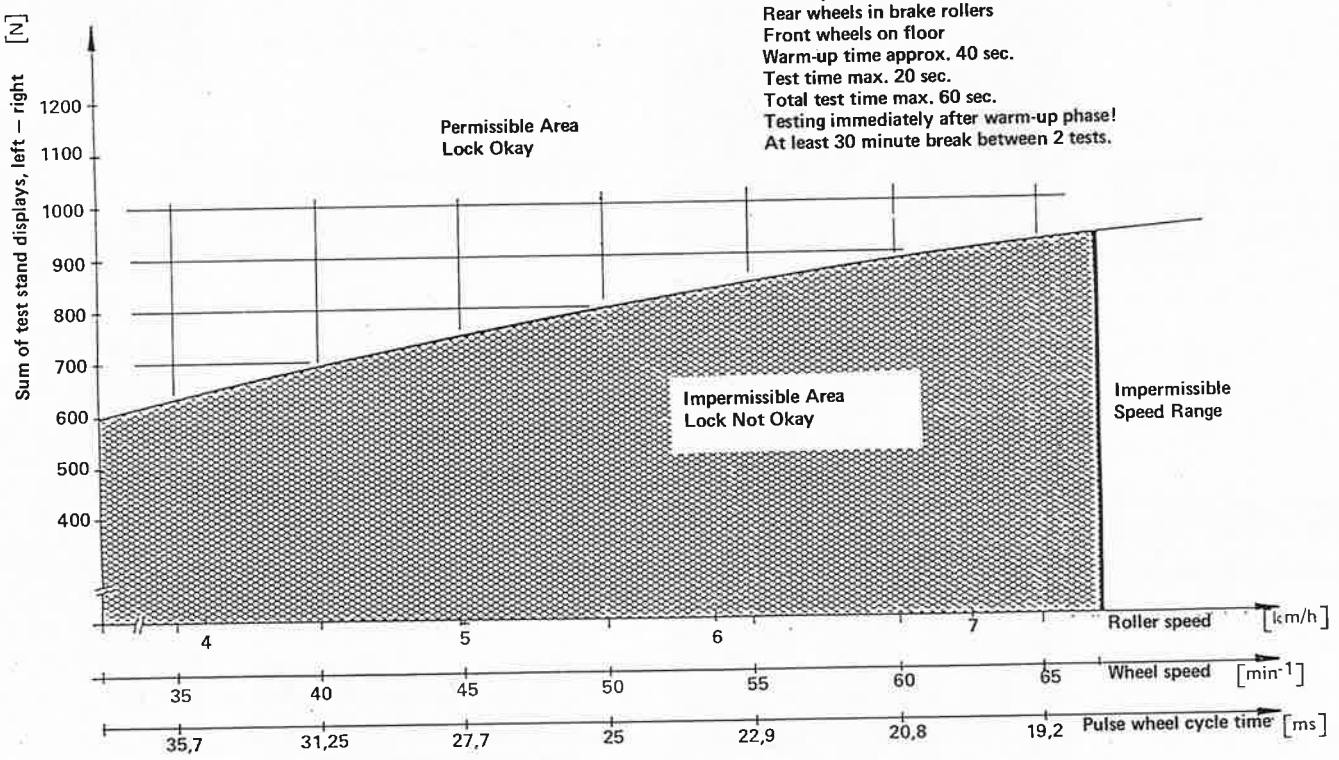
Read braking force of both wheels on brake test stand and add.

Caution!

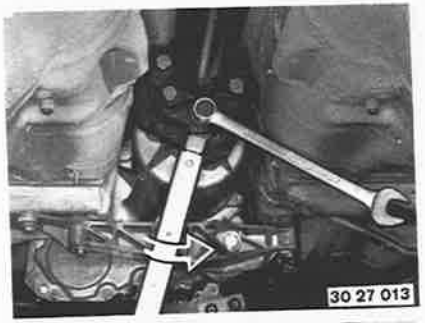
Total running time: max. 60 seconds.

VISCO CENTRAL LOCKS
DIAGNOSIS

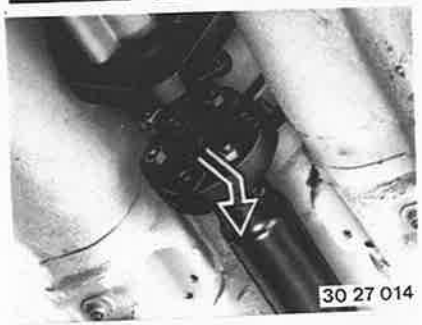
Number of pulse wheel teeth: 48.
Rear axle in brake cylinder.
Front axle standing.
Warm-up time: approx. 40 sec..
Testing time: max. 20 sec..
Total testing time: max. 60 sec..
Test immediately after warm-up phase!
Time between 2 tests: at least 30 minutes.



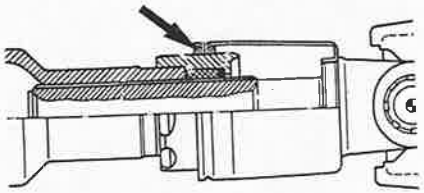
30 27 001



Installation:
Replace stop nuts.
Tightening torque*.
Important!
Only tighten nuts or bolts on the flange end, whenever possible by design, to avoid tension in the joint disc.

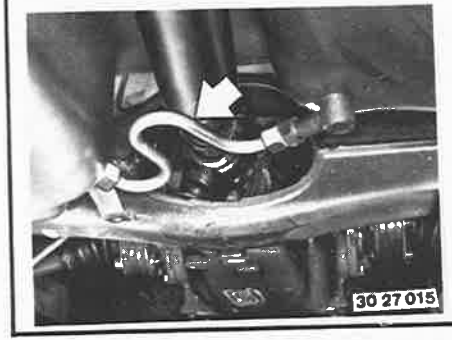


Push propeller shaft together and pull out of centering pin on the transfer box.
Note:
Propeller shaft was balanced in assembled state and therefore may only be replaced complete.
Never unscrew propeller shaft on the slide.



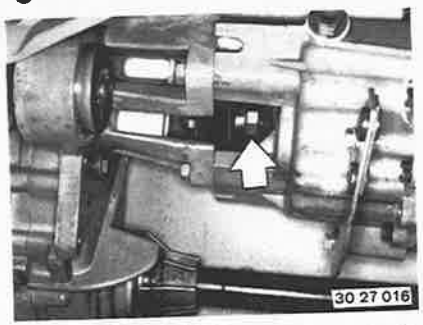
30 27 101

Installation:
The seal could slip out of the protective cap while pulling the propeller shaft apart.
Prevent this by holding the seal on the bearing surface of the screwed-on sleeve with grease.

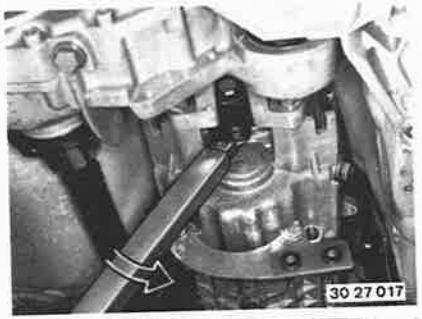


Important!
Don't let the propeller shaft bear on the fuel tank connecting pipe.

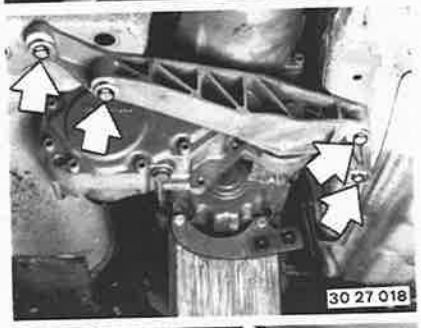
* See Specifications



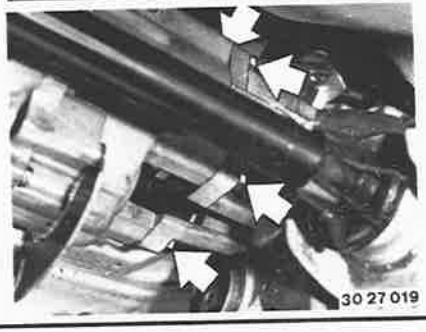
Unscrew joint disc between manual transmission and transfer box on the output flange of the manual transmission.



Installation:
Replace stop nuts.
Tightening torque*.
Important!
Only tighten nuts or bolts on the flange end, whenever possible by design, to avoid tension in the joint disc.



Support transmission from underneath.
Unscrew cross member.
Note:
Bolts differ in length.



Lower transmission.
Unscrew bolts.
Note:
The upper bolts are accessible with a 17 mm wrench socket, joint and extension in 3/8" version.

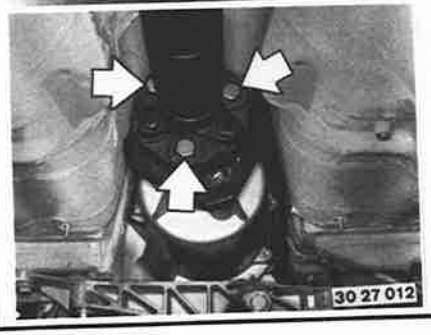
* See Specifications

27 10 010 REMOVING AND INSTALLING TRANSFER BOX
– All Wheel Drive Cars with Automatic Transmission –

Remove exhaust assembly – see 18 00 020.
Unscrew heat shields.

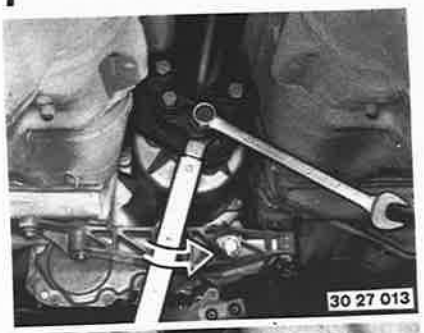
Unscrewing Rear Propeller Shaft Section:
Loosen screwed-on sleeve several turns with Special Tool 26 1 060.

Installation:
Tighten screwed-on sleeve with Special Tool 26 1 060 after finishing installation.
Tightening torque*.

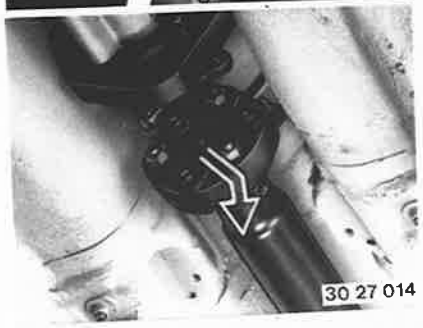


Unscrew propeller shaft on transfer box.

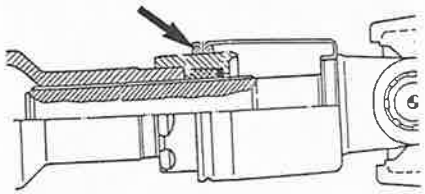
* See Specifications



Installation:
Replace stop nuts.
Tightening torque*.
Important!
Only tighten nuts or bolts on the flange end, whenever possible by design, to avoid tension in the joint disc.

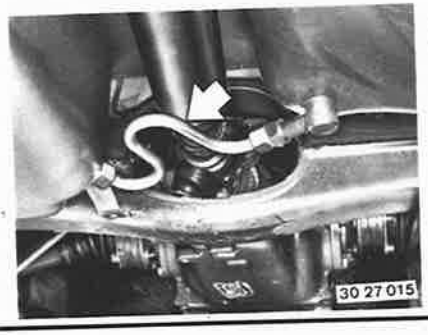


Push propeller shaft together and pull out of centering pin on the transfer box.
Note:
Propeller shaft is balanced in assembled state and therefore may only be replaced complete. Never unscrew propeller shaft on the slide.



30 27 101

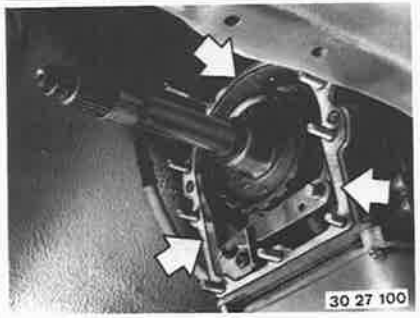
Installation:
The seal could slip out of the protective cap while pulling propeller shaft sections apart. Prevent this by holding the seal on the bearing surface of the screwed-on sleeve with grease.



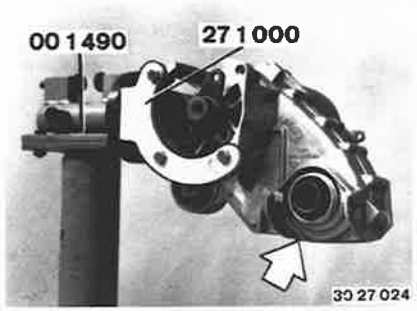
Caution!
Don't let the propeller shaft bear on the fuel tank connecting pipe.

* See Specifications

Pull off transfer box toward rear.
Installation:
Mesh splines of front propeller shaft section by turning.



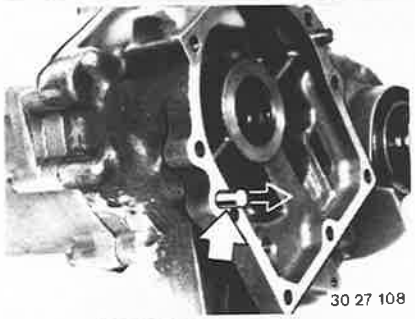
Installation:
Check sealing surfaces.
Replace gasket.
Check dowel pins in transfer box.
Check oil level after finishing installation, correcting if necessary.
Fill automatic transmission with ATF.



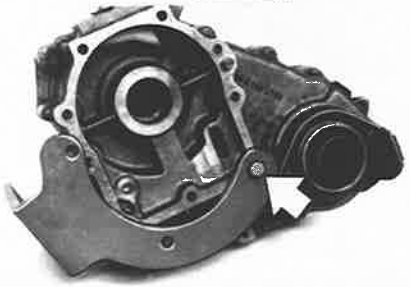
27 10 ... DISASSEMBLING AND ASSEMBLING TRANSFER BOX

Disassembling Transfer Box:

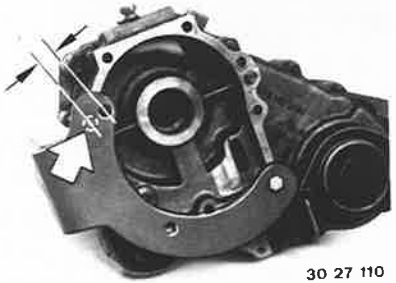
Mount Special Tool 27 1 000 on Special Tool 00 1 490.
Bolt transfer box on Special Tool 27 1 000.
Manual Transmission:
Three M 10 x 4 bolts with nuts.
Automatic Transmission:
Two M 8 x 40 bolts with nuts.
Drain oil.
Old Special Tool 27 1 000 has to be machined for automatic transmission versions.



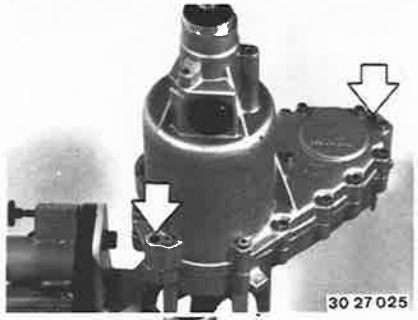
Drive out the dowel pin.



Screw special tool holder on shown bore with a M 8 x 40 bolt only finger tight.

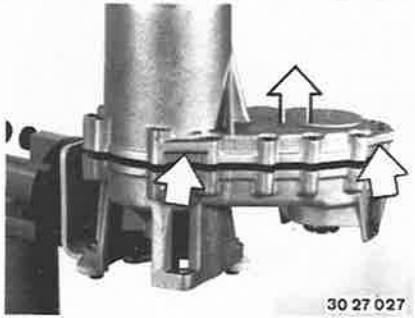


Position holder in such a manner, that a new 10 mm (0.394") dia. hole can be drilled about 5 mm (0.197") away from the old hole.
Mark center point, drill 10 mm (0.394") dia. hole and deburr edges of hole.

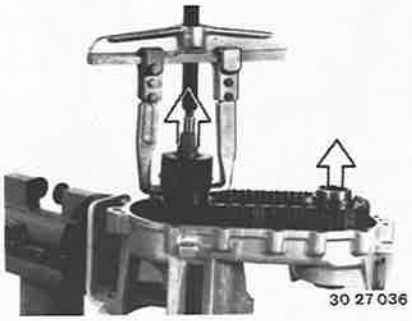


Drive dowel pins out of case at rear.

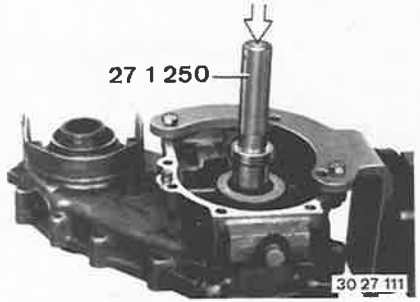
Unscrew all bolts.



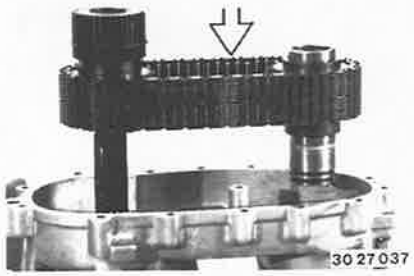
Knock off rear case with uniform knocks from a nylon hammer on the webs.
Lift off rear case.
Remove gasket.



Pull off sprocket, driving off the front drive sprocket with a plastic hammer at the same time.
Important!
Don't cant the chain.

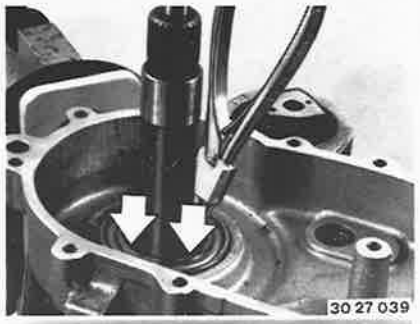


Automatic Transmission:
Insert Special Tool 27 1 250 in the sprocket main shaft.
Drive out both shafts uniformly with a plastic hammer.
Important!
Don't cant the chain.

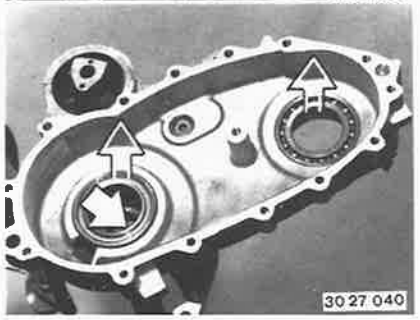


Lift off sprockets with chain.
Note:
Mark running direction of chain, if it can be reused.

Note:
Grooved ball bearing will remain on the sprocket or in the case, depending on tolerances.
Pull off grooved ball bearing, if necessary.

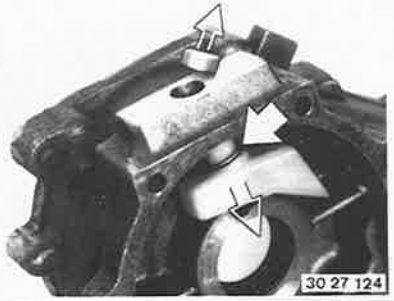


Manual Transmission:
Lift out circlip.
Pull out drive shaft.

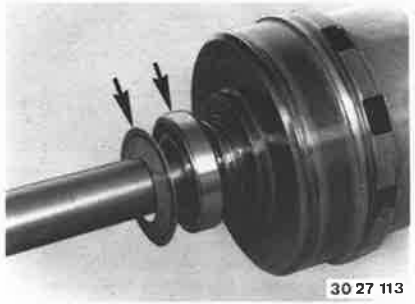


Pull out grooved ball bearing, if applicable.
Remove shaft seal (two for automatic transmissions).

Automatic Transmission:
Pull off clamp.



Pull off cap.
Remove vent.
Check O-ring.


30 27 113

Note:
Grooved ball bearing remains on shaft or in case, depending on tolerances.
Lift off washer, if applicable.
Pull off grooved ball bearing.
Curved surface of washer faces the output flange.


30 27 047

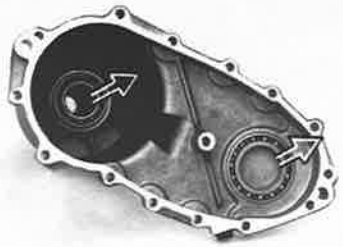
Lift off washer and visco clutch.


30 27 048

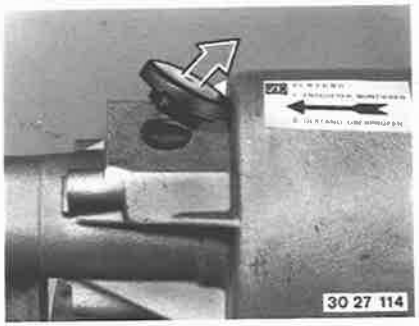
Lift out circlip.


30 27 049

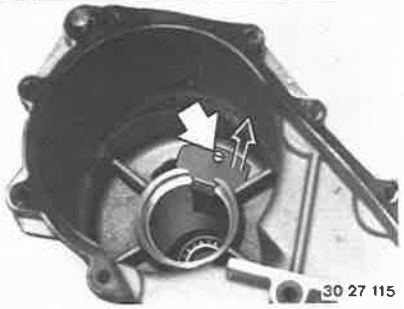
Lift output shaft off of hollow gear wheel.


30 27 050

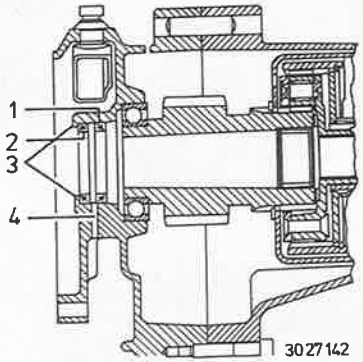
Remove both grooved ball bearings in case.


30 27 114

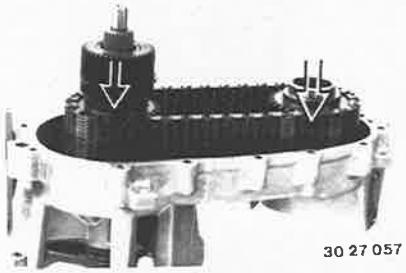
Lift out vent.


30 27 115

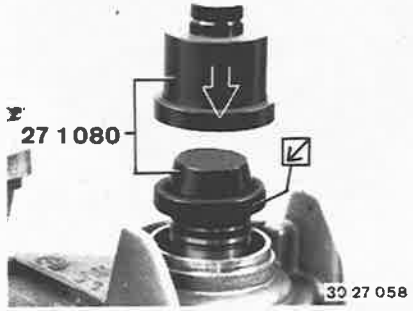
Unscrew oil baffle plate.



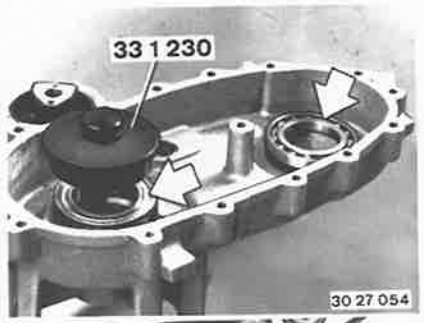
Automatic Transmission:
Bearing collar (3) is omitted on the case since 11.87 for assembling reasons.
Radial oil seals can be installed from the outside.
Check installed position.
Drive in radial oil seal (1) with Special Tools 27 1 270 and 27 1 271 - sealing lip facing IN.
Drive in radial oil seal (2) with Special Tool 27 1 270 - sealing lip faces OUT.
Leak oil bore (4) must not be covered.



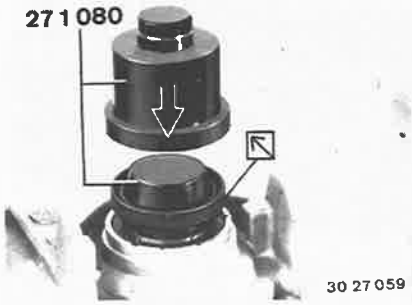
Mount sprockets complete with chain (check running direction if applicable).
Drive both sprockets into bearings with a plastic hammer at the same time.
Important!
Don't cant the chain.



Apply slip sleeve of Special Tool 27 1 080.
Install the first radial oil seal with the sealing lip facing in.
Drive in radial oil seal with Special Tool 27 1 080.

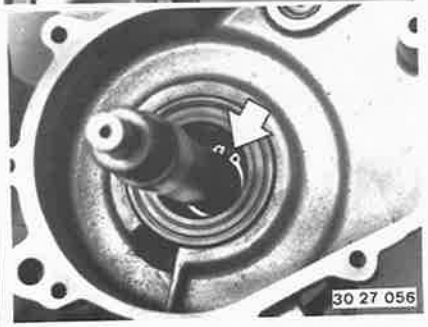


Heat case.
Install both grooved ball bearings with Special Tool 33 1 230.

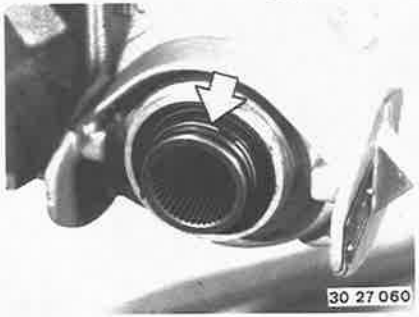


Install the second radial oil seal with the sealing lip facing out.
Drive in both radial oil seals with Special Tool 27 1 080.

Note:
The second radial oil seal is installed without a spiral spring. Parts only supplies radial oil seals with spiral springs. When replacing, it is therefore necessary to remove the spiral spring for the outside radial oil seal.



Manual Transmission:
Place input shaft in case.
Install circlip.
Note:
Input shaft is guided only by the radial oil seal or guide pin on the manual transmission.



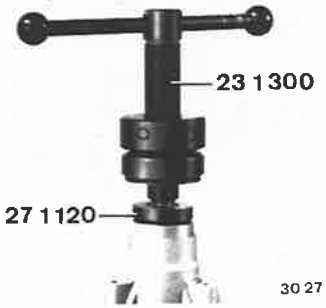
Install circlip and O-ring.

30 27 067

Insert output shaft in hollow gear wheel.
Install circlip.

30 27 068

Mount visco clutch and washer.

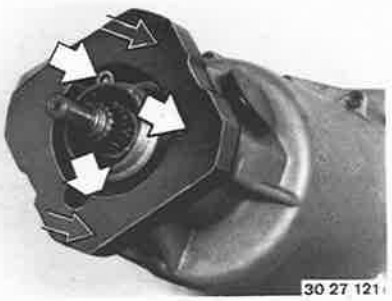


30 27 069

Insert output shaft in case.
Apply Special Tools 27 1 120 and 23 1 300.
Pull output shaft into case.

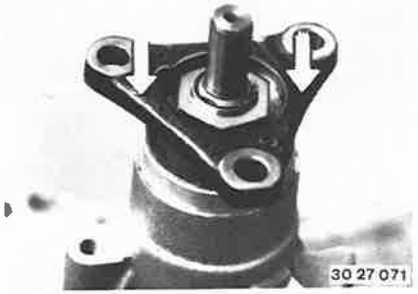
30 27 070

Install radial oil seal with Special Tool 27 1 090.



30 27 121

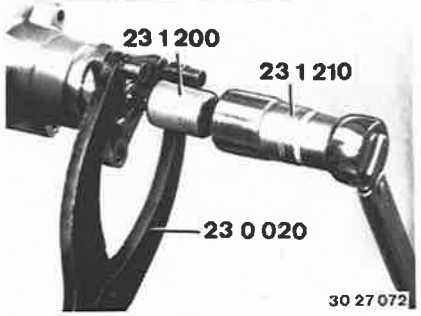
Mount and screw on damper.



30 27 071

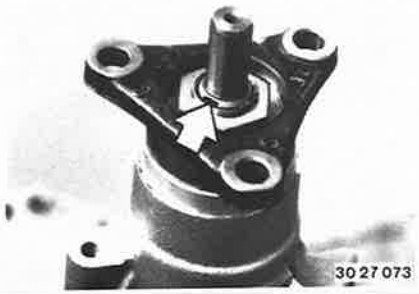
Mount output flange.
Coat threads with a bolt cement**.
Important!
Use a new collar nut.

Screw on new collar nut.



30 27 072

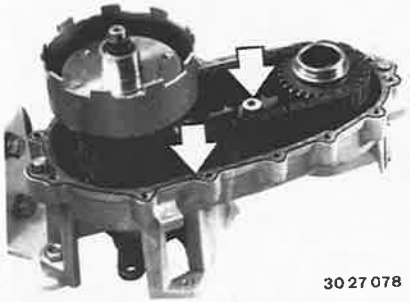
Apply Special Tool 23 1 200.
Hold output flange with Special Tool 23 0 020.
Tighten collar nut with Special Tool 23 1 210.
Tightening torque*.



30 27 073

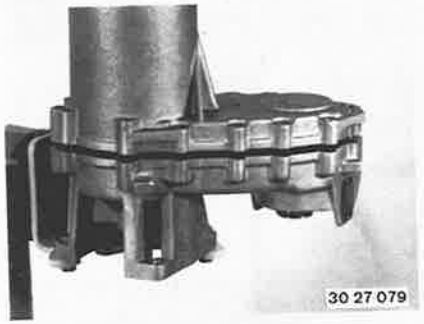
Lock collar nut in the provided recess.

* See Specifications
** Source of Supply: HWB



30 27 078

Install gasket and seal.

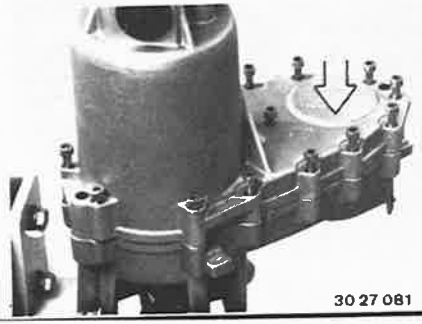


30 27 079

Mount rear case on front case section.

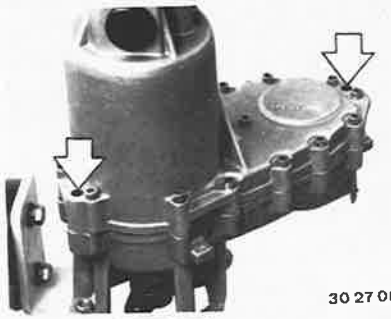
30 27 080

Turn the output flange (while holding the input flange) to have the planet gear set mesh.
Pins on the drive shell must engage in recesses of the visco clutch.



30 27 081

Insert bolts (bolts have different lengths). Drive the case sections together by applying light knocks with a plastic hammer in the front output shaft end area.

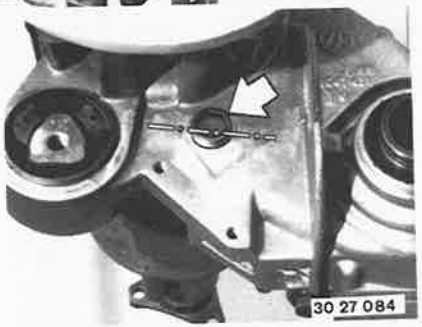


30 27 082

Drive in dowel pins.

30 27 083

Tighten bolts in several steps.
Tightening torque*.

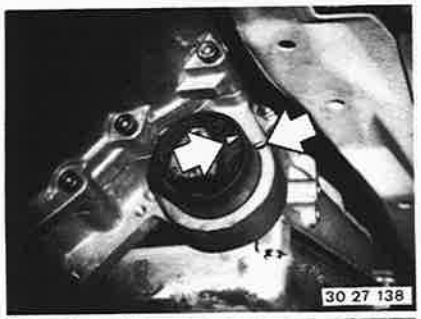


30 27 084

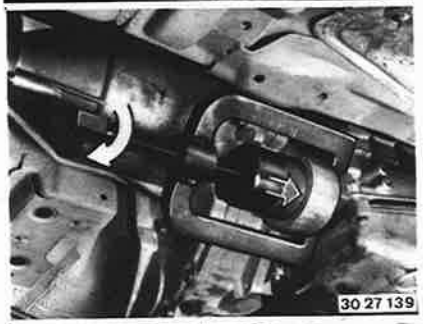
Pour in oil*.

Pour part of the oil (0.06 dm^3) into the vent bore after removing the vent of a removed transmission in case of a completely drained transmission, e.g. after disassembling a transmission. This will guarantee the supply of oil to the rear transmission section when operated initially. The remaining amount of oil should be poured in through the filler neck after installation of the transmission. If too much oil is poured in through the vent, it will flow via the baffle plate to the front axle drive and does not have to be compensated there. Always replace a vent, which has been removed.

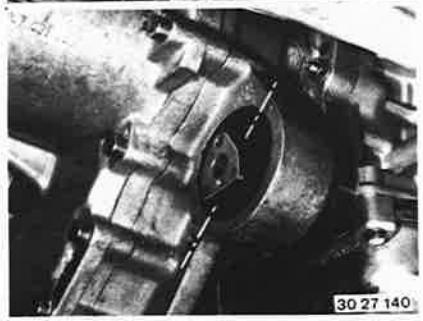
* See Specifications



Installation:
Mount new rubber mount.
Arrow on case must be aligned with mark (bead) on rubber mount.
Protruding inner bushing faces toward rear.



Apply Special Tool 27 1 190.



Press in rubber mount flush with transmission case.