

23 Manual Transmission

Getrag 240 Five Speed Manual Transmission with Overdrive

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23 Manual Transmission

ZF - S5 - 16 Five Speed Manual Transmission with Overdrive

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23 Manual Transmission

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23 Manual Transmission

Getrag 260 Five Speed Manual Transmission with Overdrive

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23 Manual Transmission

GETRAG 265/6 Five Speed Manual Transmission with Overdrive

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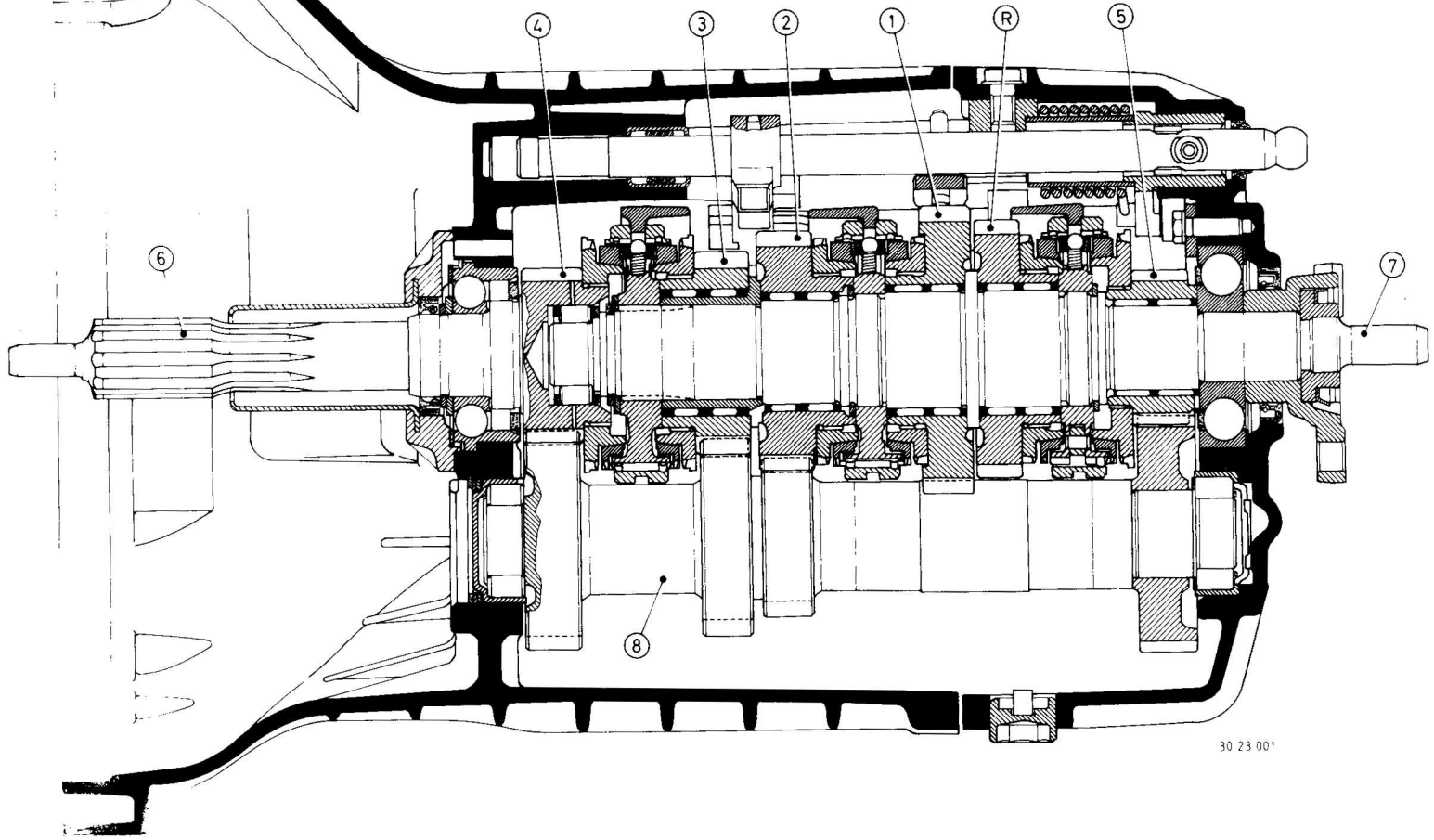
23 Manual Transmission

GETRAG 265/6 Five Speed Manual Transmission with Overdrive

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ASSEMBLY DRAWING OF GETRAG 240 FIVE SPEED OVERDRIVE MANUAL TRANSMISSION



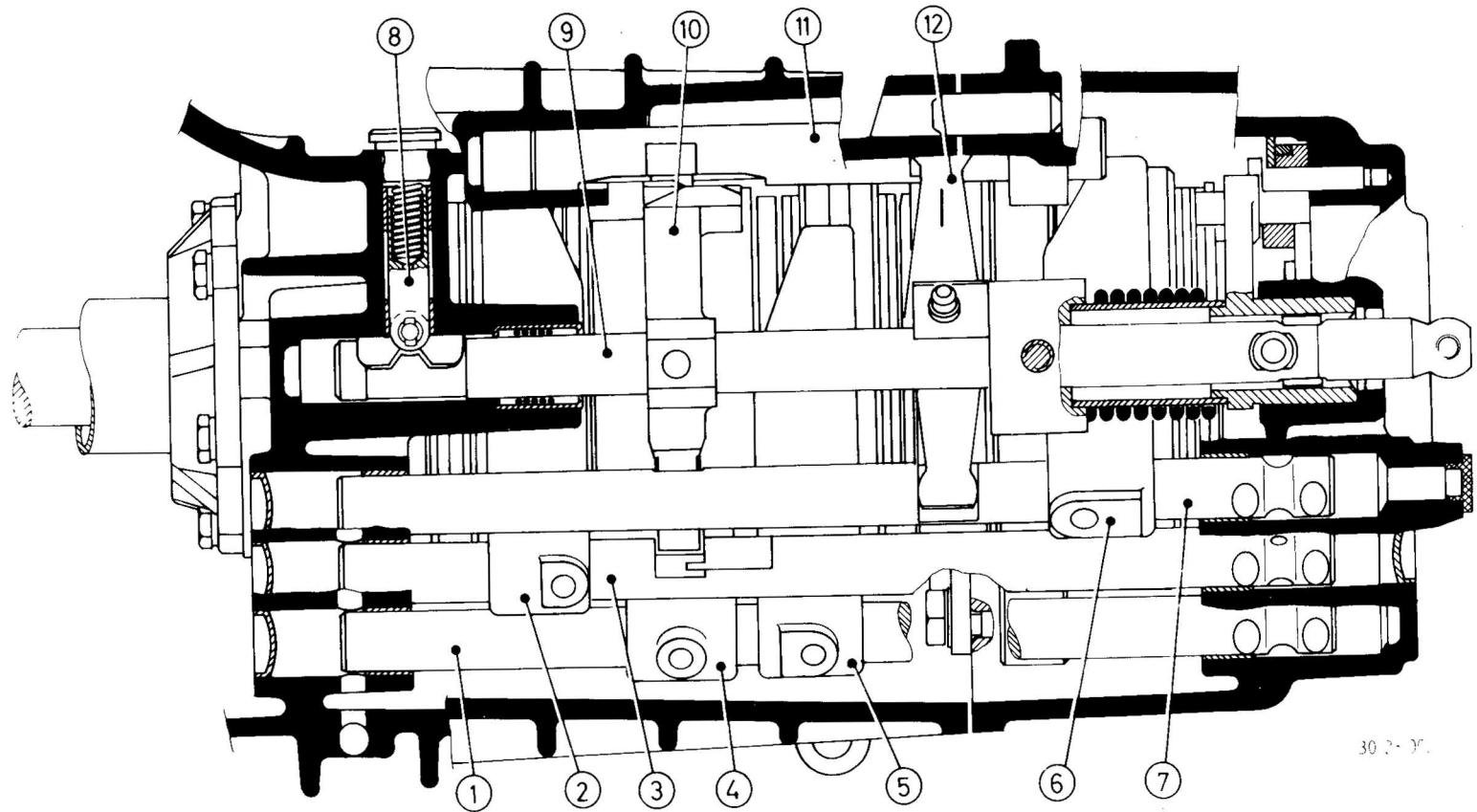
30 23 00*

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

ASSEMBLY DRAWING OF SHIFT PARTS FOR 240 FIVE SPEED OVERDRIVE MANUAL TRANSMISSION



30 2-30

- | | | |
|-------------------------------|-----------------------------------|--------------------|
| 1 Selector rod, 1st/2nd gear | 5 Selector fork, 1st/2nd gear | 9 Selector shaft |
| 2 Selector fork, 3rd/4th gear | 6 Selector fork, reverse/5th gear | 10 Selector arm |
| 3 Selector rod, 3rd/4th gear | 7 Selector rod, reverse/5th gear | 11 Selector rail |
| 4 Dog | 8 Lockpin | 12 Operating lever |

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.

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*.

* See Specifications

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.

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.

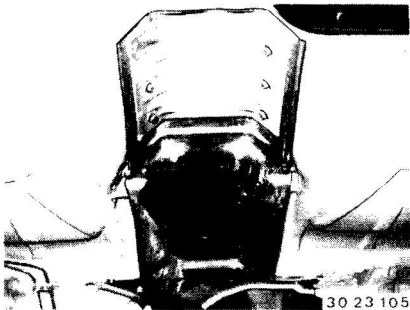
Remove clutch slave cylinder.

Line remains connected.

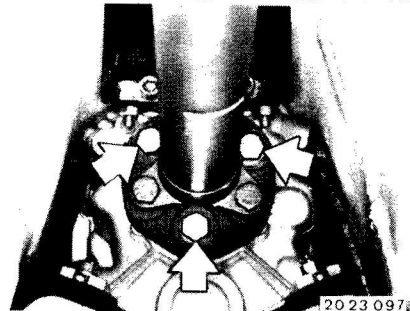
Installation:

Bleeder screw faces down.

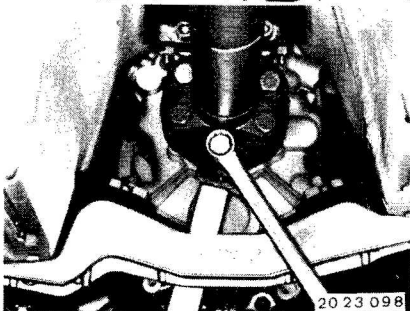
* See Specifications



30 23 105



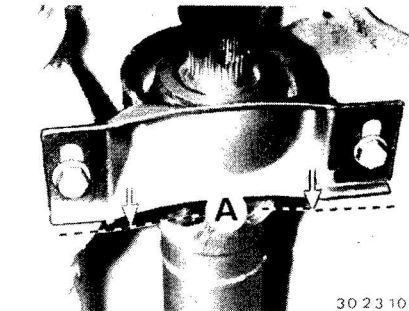
20 23 097



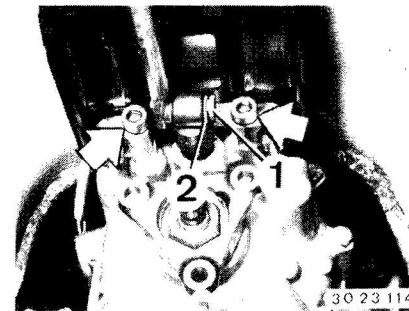
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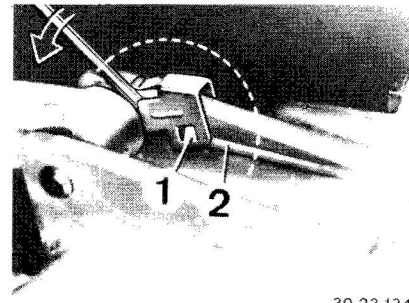
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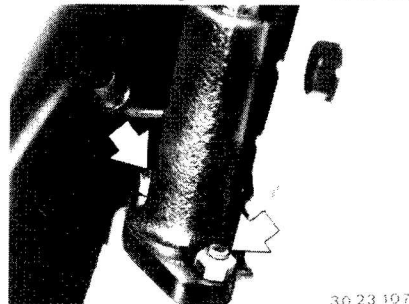
30 23 106



30 23 114

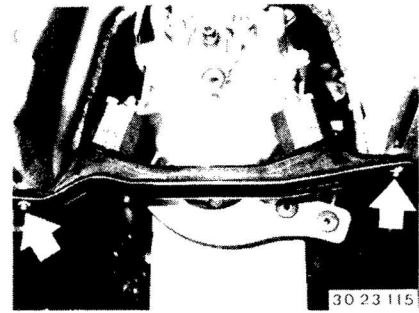


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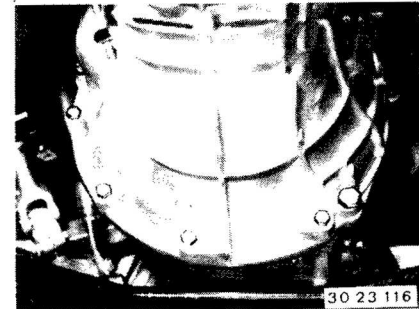


30 23 107

Support transmission.
Unscrew cross member on body.
Lower transmission.
Installation:
Tightening torque*.



Unscrew transmission on engine.
Unscrew Torx bolts with a Torx socket**.
Important!
Installation:
Use washers on version with Torx bolts to
avoid an increase in breaking-loose torque.
Tightening torque*.
Remove transmission toward rear.
Check oil level.



* See Specifications

** Source: HWB

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.

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).

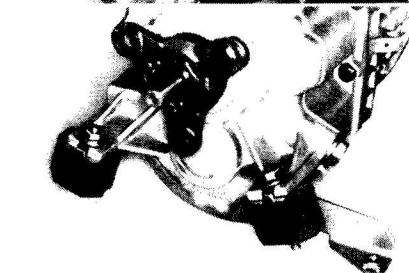
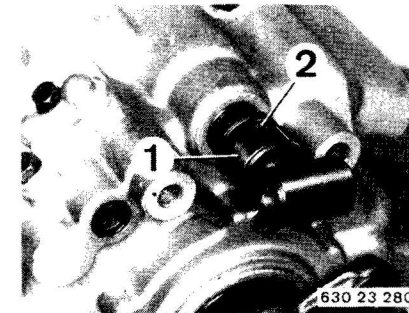
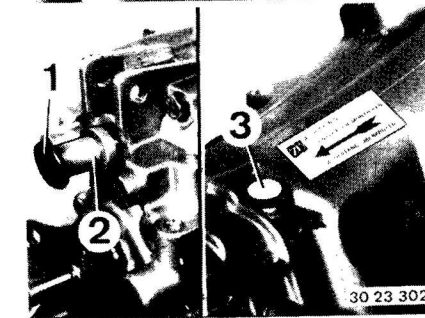
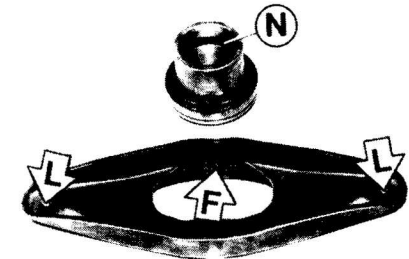
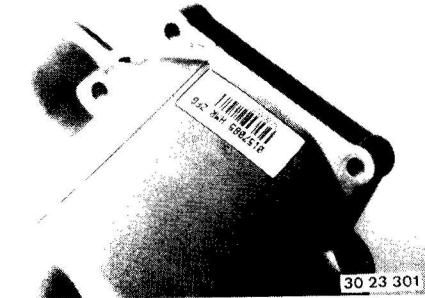
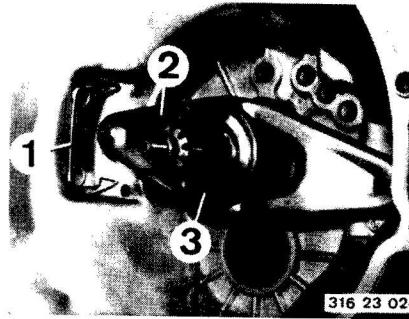
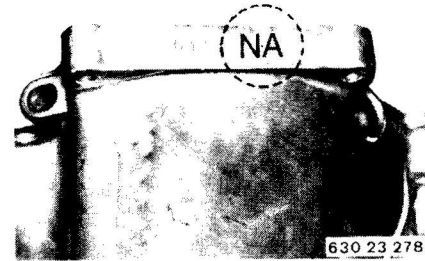
Note:
Check installed position of the shift rod joint – the offset end of the shift rod joint must face right as seen looking forward in the car.

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

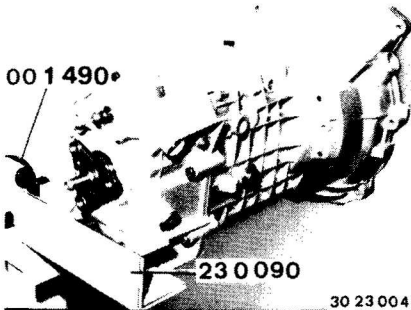
** Source of Supply: HWB



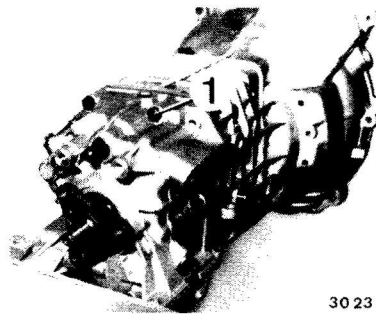
23 11 013 REMOVING AND INSTALLING/
SEALING TRANSMISSION CASE
FRONT SECTION

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

Drive out cylindrical pins.
Unscrew bolts.
Installation:
Check length of bolts.
Bolt (1) = 8 x 60 mm.



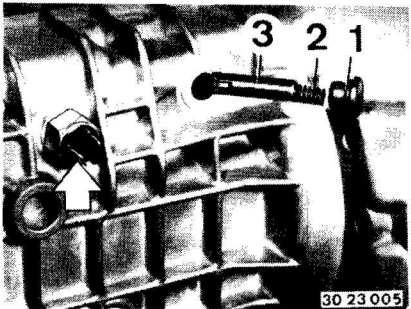
30 23 004



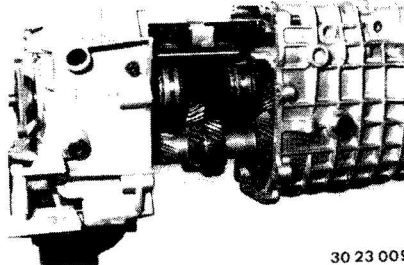
30 23 008

Remove guide sleeve 23 11 623.
Unscrew backup light switch.
Remove cap (1).
Remove spring (2) and lockpin (3).
Check installed position!

Pull off case front section.
Installation:
Coat sealing surface with Loctite No. 573.
Sealing surface must be thoroughly cleaned
and dried of oil.



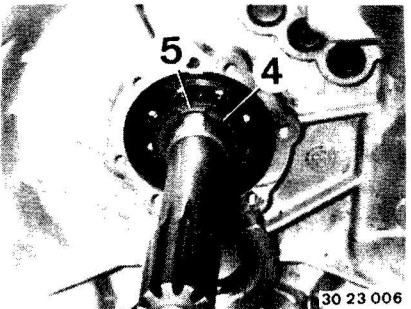
30 23 005



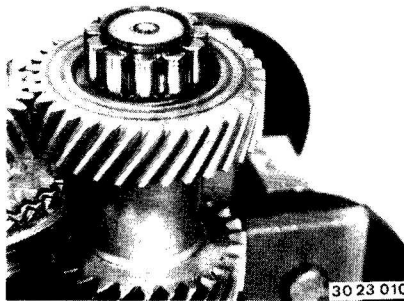
30 23 009

Remove snap ring (4).
Remove washer (5).
Installation:
Always replace snap ring.

Install roller bearing on layshaft that small
diameter end faces up.



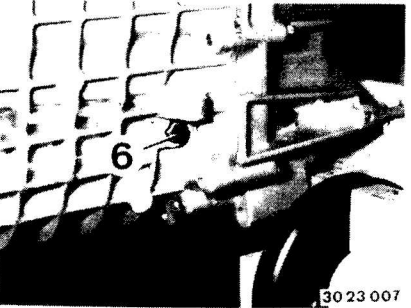
30 23 006



30 23 010

Unscrew bolt (6).
Installation:
Install bolt with a locking compound**.
Tightening torque*.

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

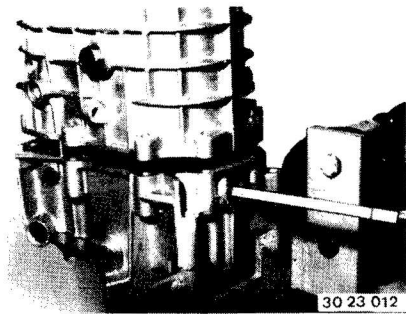


30 23 007



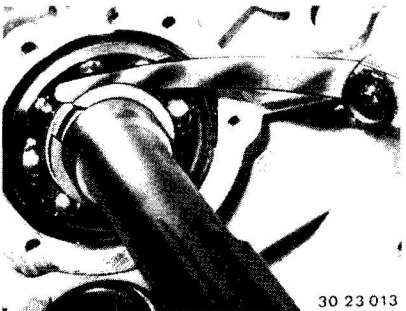
30 23 011

* See Specifications
** Source: HWB



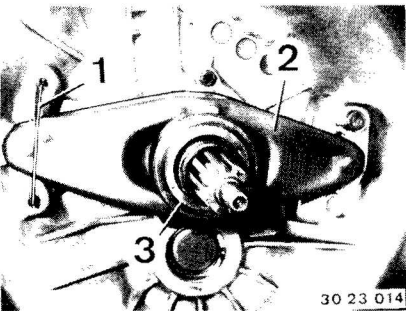
30 23 012

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.



30 23 013

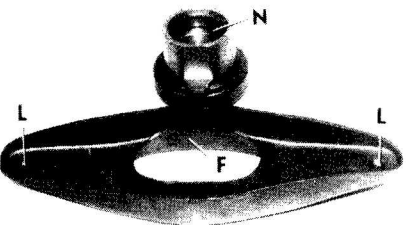
Install spacer and circlip.
Take up play between bearing race and circlip to 0 ... 0.09 mm (0 ... 0.0035").



30 23 014

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

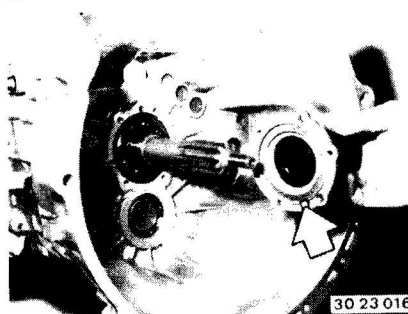
Lift out spring (1) and remove release lever (2) with thrust bearing (3).



316 23 025

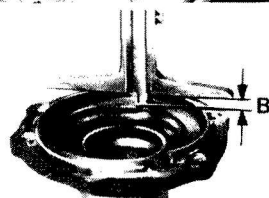
Installation:
Pack lubricating groove N with Molykote Longterm 2.
Coat guides F and bearings L with Molykote Longterm 2.
Non-conformance could cause release bearing to seize on guide sleeve.

* See Specifications



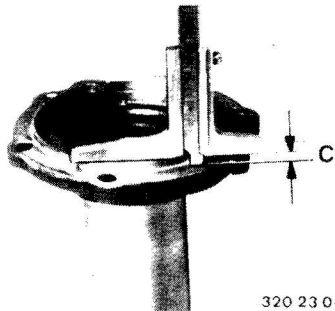
30 23 016

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



320 23 043

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.



320 23 044

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

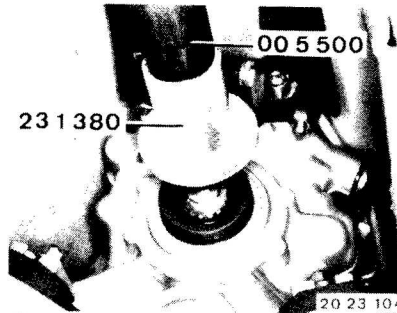
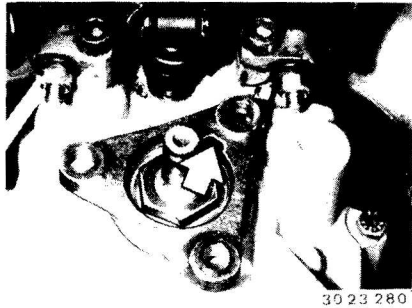
Example:

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

23-6

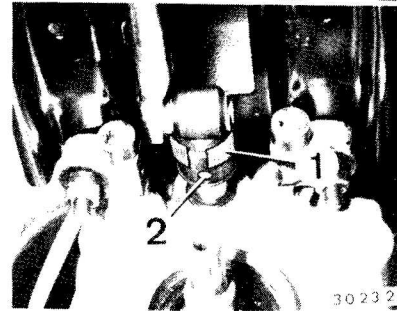
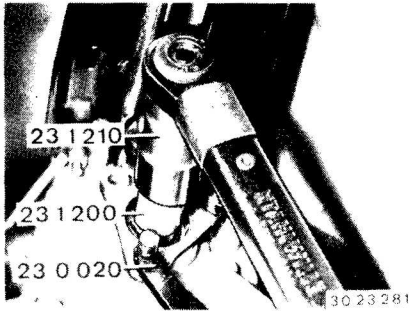
23 12 053 REPLACING RADIAL OIL SEAL FOR OUTPUT FLANGE

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



Remove radial oil seal.
Knock in radial oil seal with Special Tools 23 1 380 and 00 5 500.
Installation:
Lubricate sealing lip with oil.
Bolt output flange.
Install collar nut with a bolt cement**,
Tightening torque*.

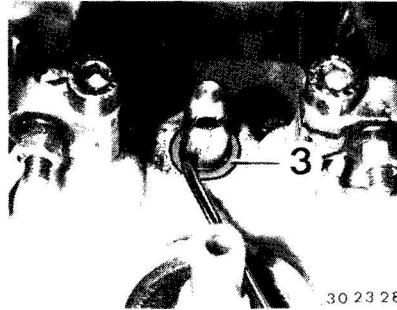
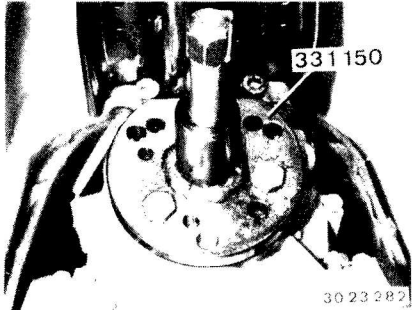
Apply Special Tool 23 1 200.
Hold output flange with Special Tool 23 0 020.
Unscrew collar nut with Special Tool 23 1 210.



23 12 083 REPLACING RADIAL OIL SEAL FOR SELECTOR SHAFT

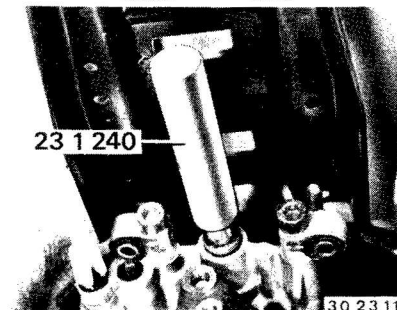
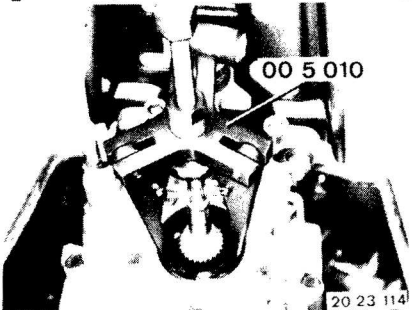
Disconnect propeller shaft at front end and on center mount (see 23 00 022).
Disconnect output flange (see 23 12 053).
Remove locking sleeve (1).
Drive out pin (2) upwards.

Pull off output flange with Special Tool 33 1 150.



Remove radial oil seal (3).

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



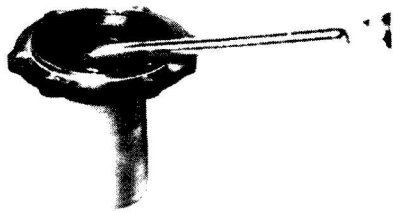
Lubricate sealing lip of radial oil seal with oil.
Drive in radial oil seal with Special Tool 23 1 240.

* See Specifications
** Source: HWB

23-7

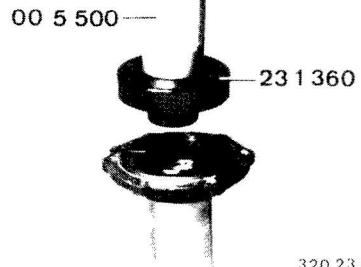
23 12 503 REPLACING RADIAL OIL SEAL FOR INPUT SHAFT —TRANSMISSION REMOVED—

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



320 23 048

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.



320 23 049

23-8

23 21 503 REMOVING AND INSTALLING INPUT AND OUTPUT SHAFT ASSEMBLY —TRANSMISSION REMOVED—

Remove transmission case front section
23 11 013.
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.

Unscrew bolt (1).
Remove holder (2).
Unscrew bolt (3).

Remove shaft with reverse gear and needle
bearing.

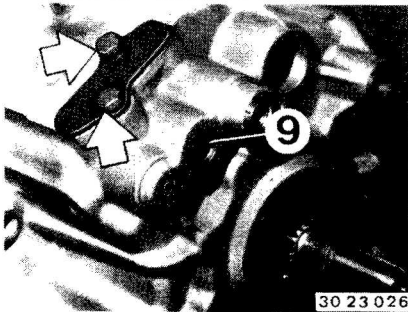
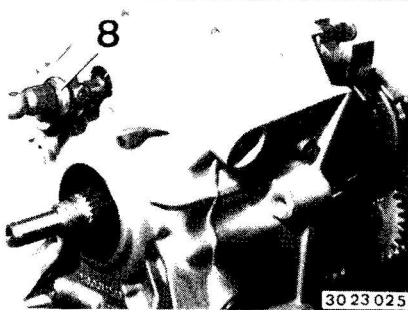
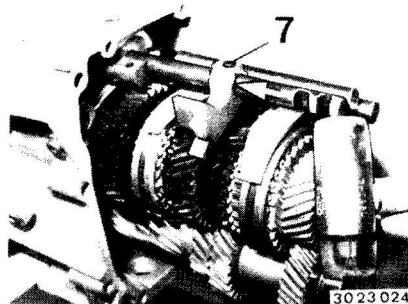
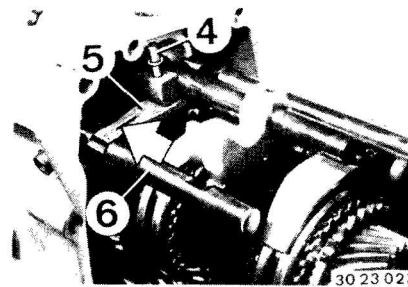
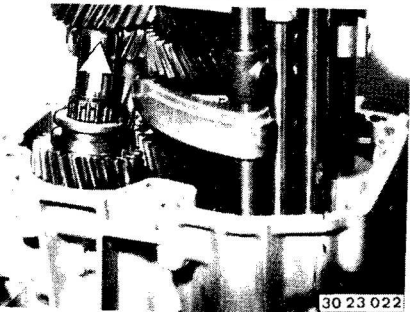
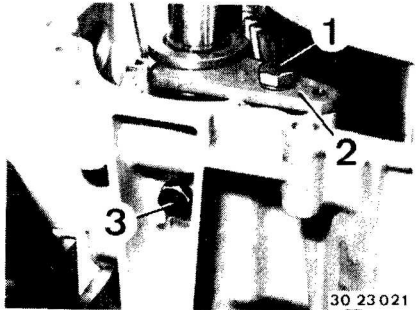
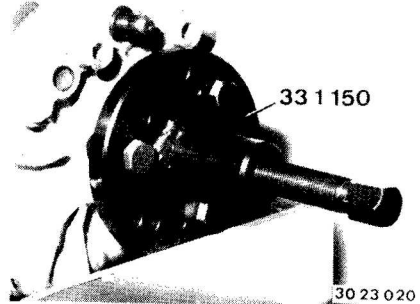
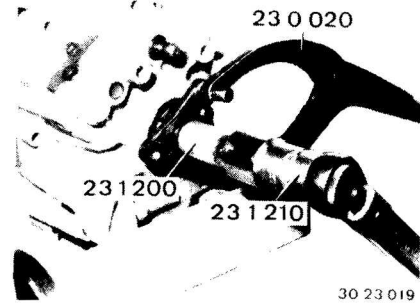
Pull out pin (4) for operating lever (5).
Pull out selector rail (6).
Remove operating lever (5).

Installation:
Install operating lever that notch faces up and in
direction of selector rail.

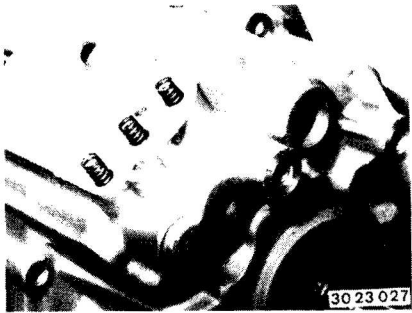
Engage 4th gear.
Drive in pin (7), while counterholding.
Important!
Only drive in pin (7) far enough that selector
shaft can be pulled back and out.

Radial oil seal (8) will also be pulled out.
Important!
Rollers on selector shaft.
Installation:
Replace radial oil seal.
Remove selector arm.

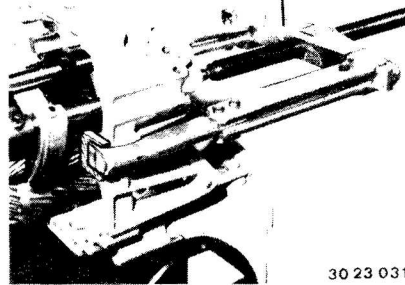
Detach end plate.
Installation:
Install end plate with Loctite No. 573
Sealing surface must be thoroughly clean and
dried of oil.
Remove end plate (9).
Installation:
Replace end plate.



Remove three springs.

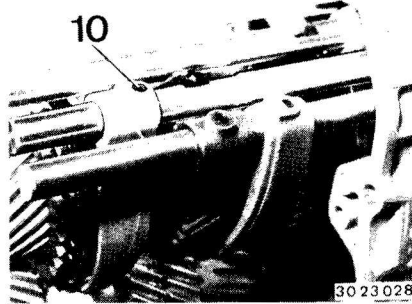


231 050



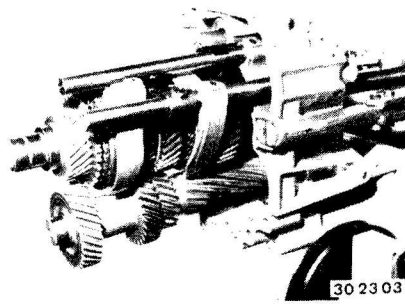
Press input shaft, output shaft and layshaft out of case rear section with Special Tool 23 1 050. *Important!* To avoid damage on sealing surface, use a piece of wood, aluminum or similar material between claws and sealing surface.

10

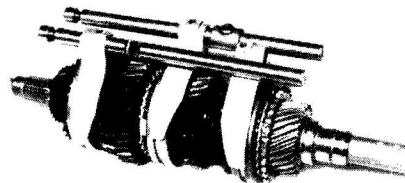
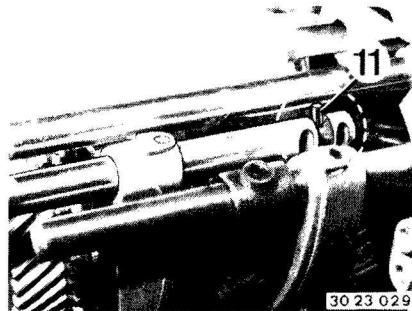


Drive out pin (10) in 3rd/4th gear selector fork. *Installation:* Replace pin.

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.

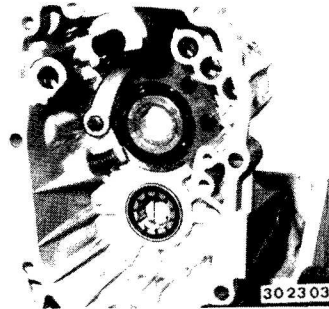
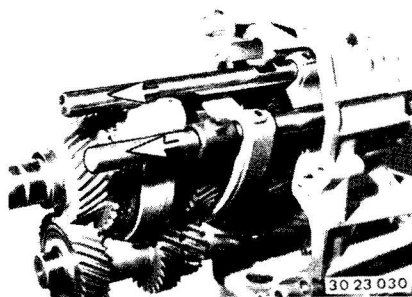


Knock out 3rd/4th gear selector rod forward. *Important!* Lockpin (11) in selector rod.

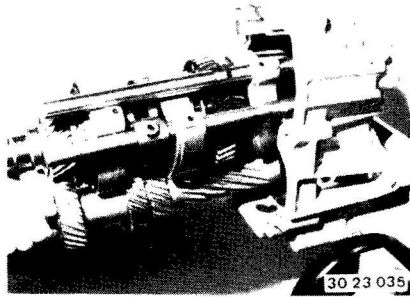


Installing: Install 3rd/4th gear selector fork and 1st/2nd as well as 5th/reverse gear selector rods with selector forks.

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

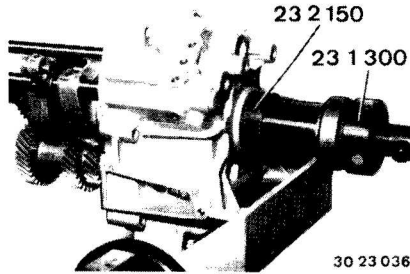


Remove all detent and locking balls in case rear section. Install roller bearings with large diameter end facing out. Lubricate lockpin and locking lever with oil.



Heat grooved ball bearing inner race in case rear section to approx. 80° C (175° F).
Second and reverse gears are engaged.
Insert input shaft, output shaft and layshaft in case rear section.
Align selector rods.

30 23 035

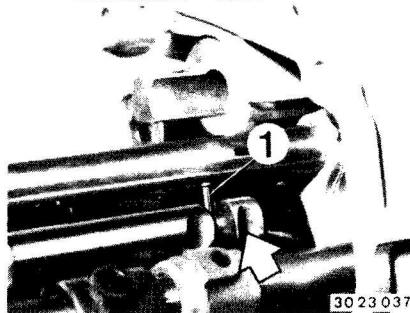


23 2 150
23 1 300

Pull input shaft, output shaft and layshaft into case rear section with Special Tools 23 1 300 and 23 2 150.

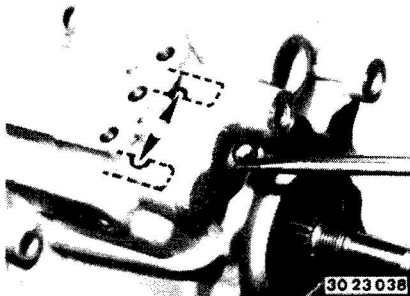
Important!
Make sure selector rods and layshaft are not clamped while pulling in parts.

30 23 036



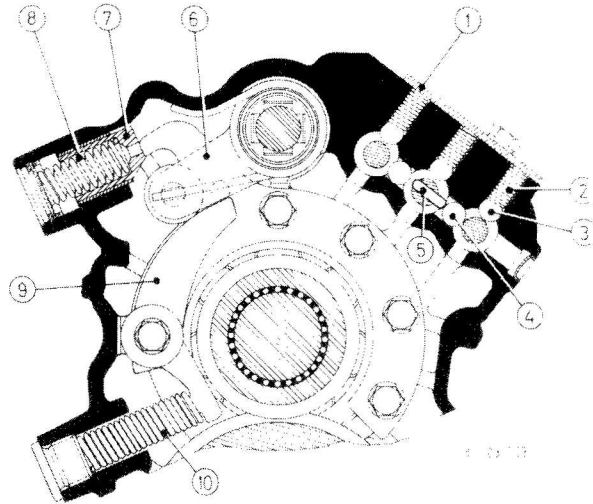
Move selector rods to neutral position.
Slide 3rd/4th gear selector rod through selector forks.
Install lockpin (1) in selector rod with grease.
Push in selector rod up to bore.
Opening in selector rod faces up.

30 23 037

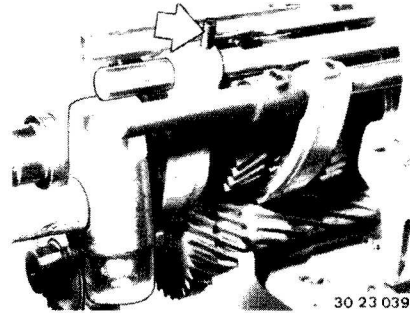


Install two detent balls with grease.
Push in 3rd/4th gear selector rod against lock.

30 23 038

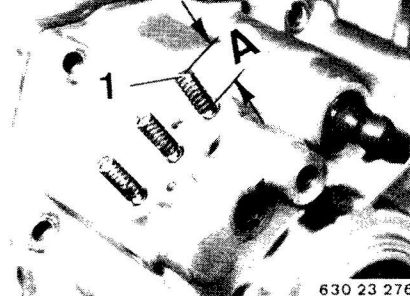


- Arrest Assembly:
- 1 Plug
 - 2 Spring
 - 3 Locking ball
 - 4 Detent ball
 - 5 Lockpin
 - 6 Selector arm
 - 7 Lockpin
 - 8 Spring
 - 9 Locking lever
 - 10 Spring



Drive 6 x 24 mm pin into 3rd/4th gear selector fork (counterhold).

30 23 039

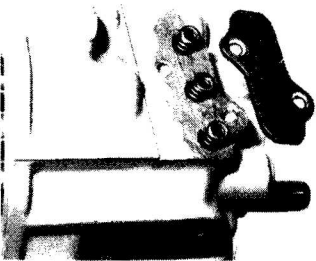


Install three locking balls and three springs.
Important!
Version with Different Length Springs:
Install short spring (1) with a relaxed length (A) of 15.9 mm (0.626") to face the 5th/ reverse gear selector rod.

630 23 276

Install end cover after coating with Loctite No. 573

Install end cover with Loctite No. 573



30 23 041

Drive pin out of selector arm.

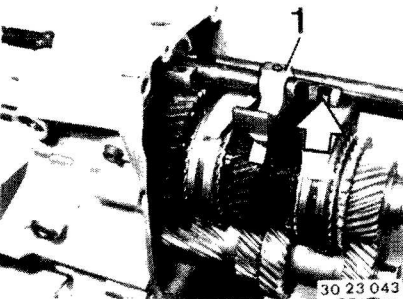


30 23 042

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

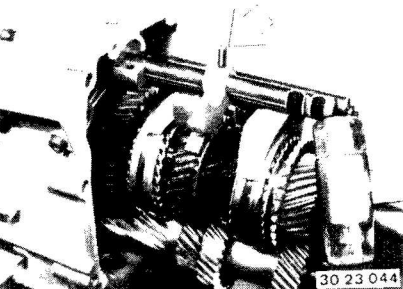
Important!

Opening in selector shaft faces out.

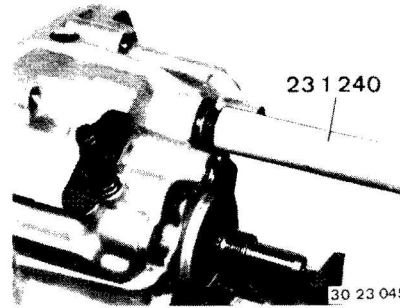


30 23 043

Drive in 6 x 26 mm pin (counterhold).



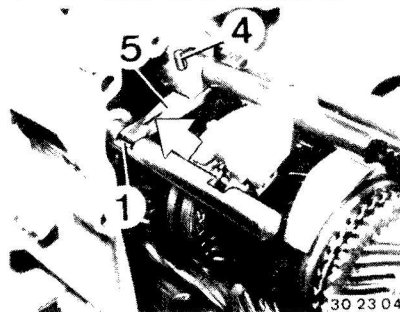
30 23 044



23 1 240

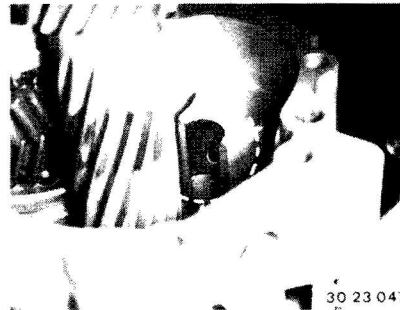
30 23 045

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



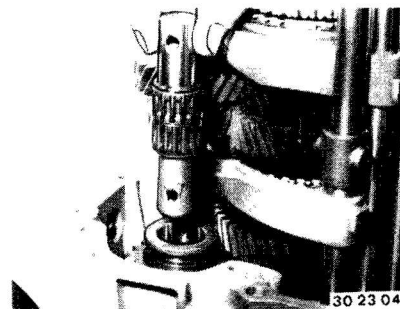
30 23 046

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

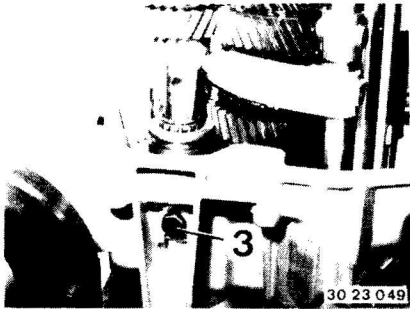
Coat case rear section in area of reverse gear shaft with Loctite No. 573. Surface must be thoroughly clean and dried of oil.



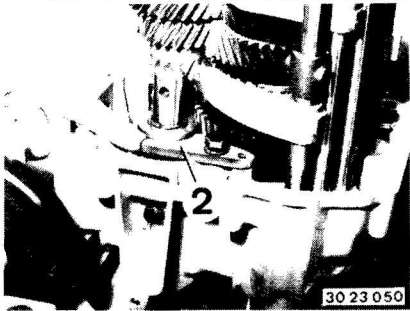
30 23 048

Install shaft with needle bearing and reverse gear.

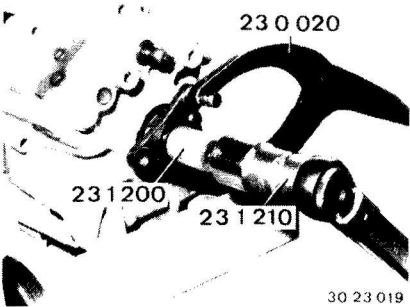
Mount shaft with bolt (3).
Install bolt with a locking compound**.



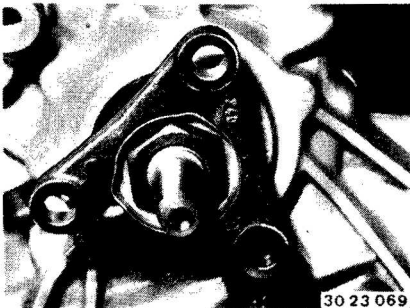
Insert holder (2), press out and secure in this position.



Install output flange.
Install collar nut with a locking compound**.
Apply Special Tool 23 1 200.
Hold output flange with Special Tool 23 0 020.
Tighten* collar nut with Special Tool 23 1 210.

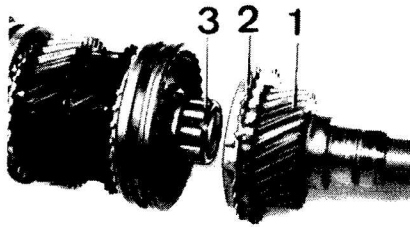


Install and lock lockplate.



* See Specifications for tightening torque
** Source: HWB

23 21 554 REPLACING OUTPUT SHAFT
 - Output Shaft Removed -



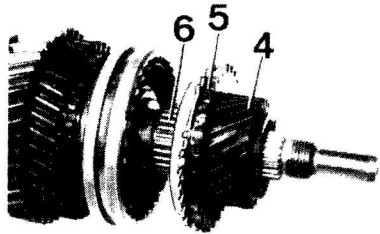
Pull off input shaft (1), brass synchronmesh ring (2) and needle bearing (3).

Note:

Synchronization:

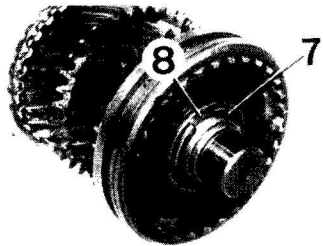
It is recommended to mark synchronmesh rings and their corresponding gear wheels when disassembling the output shaft, in order to avoid mixing up synchronmesh rings.

30 23 051



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

30 23 052

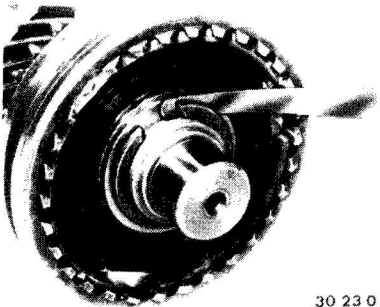


Lift out circlip (7).
 Remove spacer (8).

Installation:

Always replace circlip.

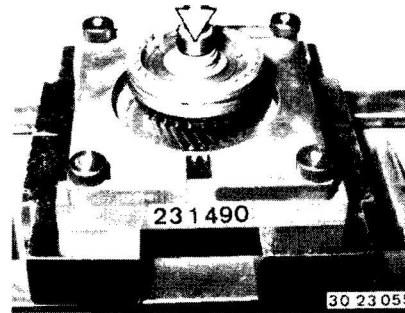
30 23 053



Installation:

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

30 23 054



Important!

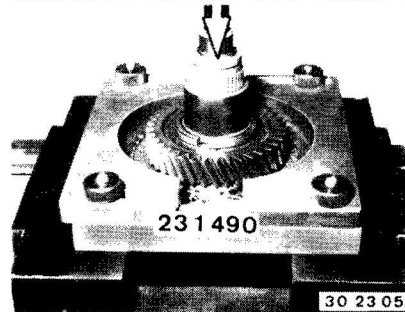
Operate 3rd/4th gear operating sleeve by hand in direction of 3rd gear.

Press off 3rd gear with guide and operating sleeves, using Special Tool 23 1 490.

Remove needle bearing.

Pressing-off force*.

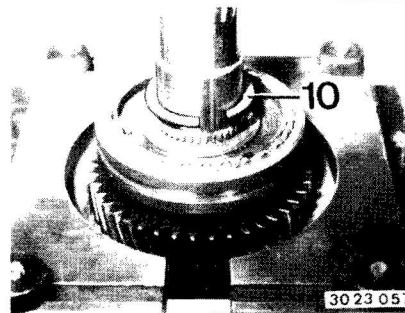
30 23 055



Press off bearing sleeve and 2nd gear with Special Tool 23 1 490.

Remove nickle-plated synchronmesh ring and needle bearing.

30 23 056



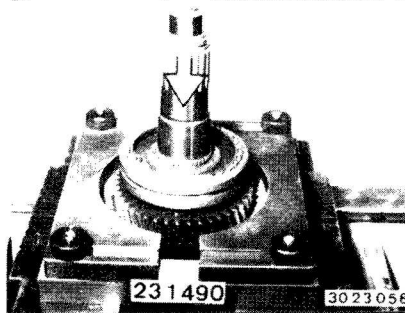
Important!

Remove circlip (10) before pressing off 1st gear.

Installation:

Always replace circlip.

30 23 057



Press off 1st gear with guide and operating sleeve, using Special Tool 23 1 490.

Remove needle bearing.

Pressing-off force*.

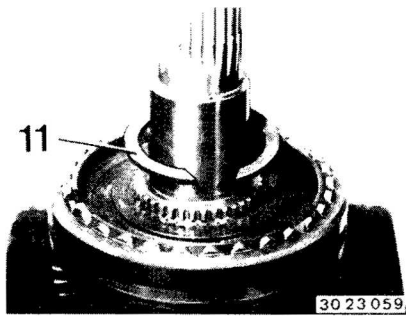
23 1 490

30 23 058

* See Specifications

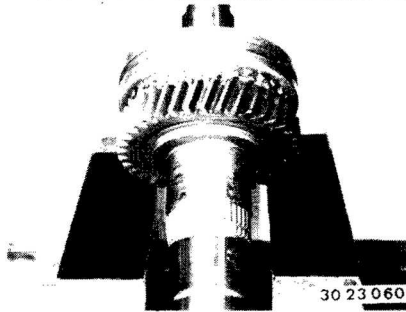
Important!
Remove circlip (11) before pressing off reverse gear.

Installation:
Always replace circlip.



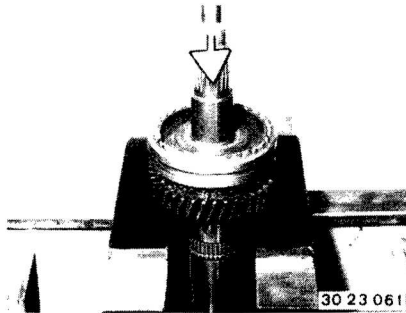
30 23 059

Install output shaft next to collar.



30 23 060

Press guide and operating sleeves as well as reverse gear off of output shaft. Remove needle bearing. Pressing-off force*.

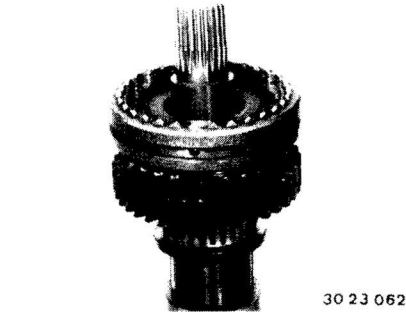


30 23 061

Assembling:

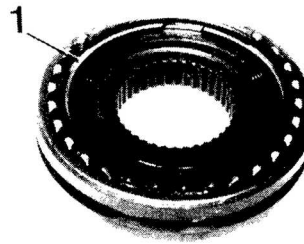
Note:
Check wear of synchromesh rings – see 23 23 505 – prior to assembling. Install needle bearing, reverse gear and synchromesh ring (only for version with synchronized reverse gear). Install guide and operating sleeves on splines of the output shaft.

Important!
Version with 3 Grooves:
Grooves face the 5th gear wheel.



30 23 062

* See Specifications

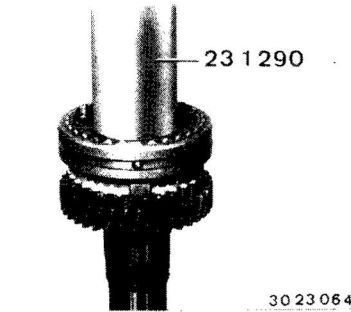


30 23 063

Important!
Version without Synchronized Reverse Gear:
Circlip (1) in guide sleeve must face reverse gear.

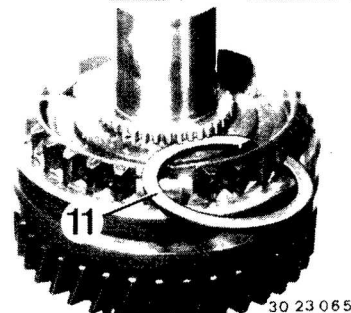
Press on guide sleeve to fit tight with Special Tool 23 1 290. Pressing-on force*.

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



30 23 064

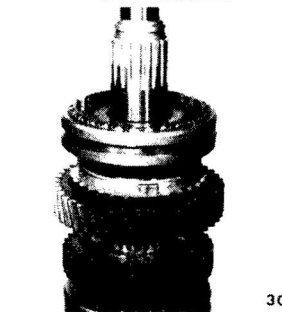
Move operating sleeve in direction of reverse gear. Adjust guide sleeve with circlip (11) to take up all play. Circlips are available from Parts in different thicknesses from 1.7 to 2.0 mm (0.067 to 0.079"). Install circlip (11).



30 23 065

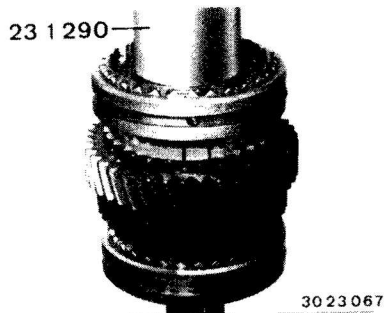
Install needle bearing, 1st gear and nickle-plated synchromesh ring. Install guide and operating sleeves on splines of output shaft.

Note:
Shouldered Operating Sleeve Version:
Shouldered end faces 2nd gear wheel.
Version with Groove:
Groove faces 1st gear wheel.



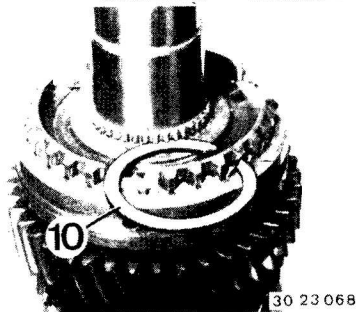
30 23 066

* See Specifications

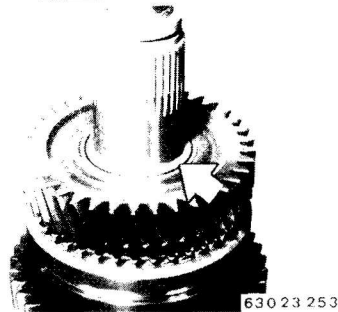


Press on guide sleeve to fit tight with Special Tool 23 1 290. Pressing-on force*.

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

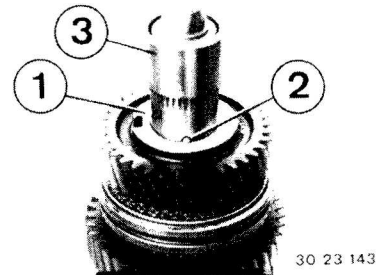


Move operating sleeve in direction of 1st gear. Adjust guide sleeve to remove all play. Circlips are available from Parts In different thicknesses from 1.7 to 2.0 mm (0.067 to 0.079"). Install circlip (10).

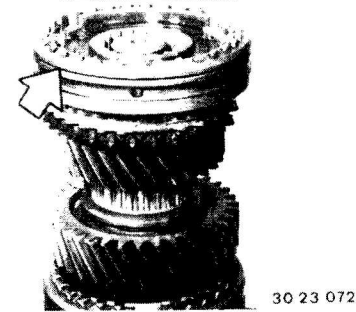


Install needle bearing, nickle-plated synchromesh ring and 2nd gear.

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

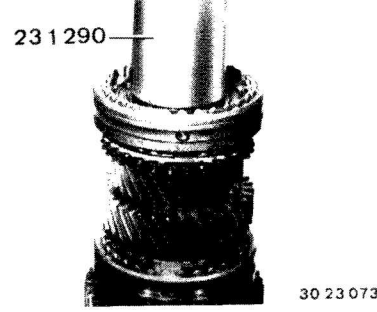


Version with Thrust Washer:
Install thrust washer (1) and ball (2). Heat bearing sleeve (3) without collar to about 80° C (175° F) with a hot air blower and install on output shaft.



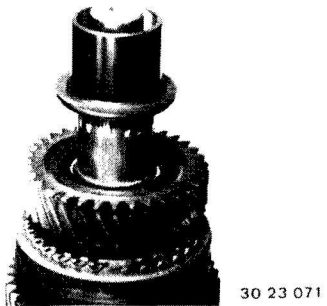
Install needle bearing, 3rd gear and synchromesh ring. Install guide and operating sleeves on splines with the groove facing 4th gear.

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



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

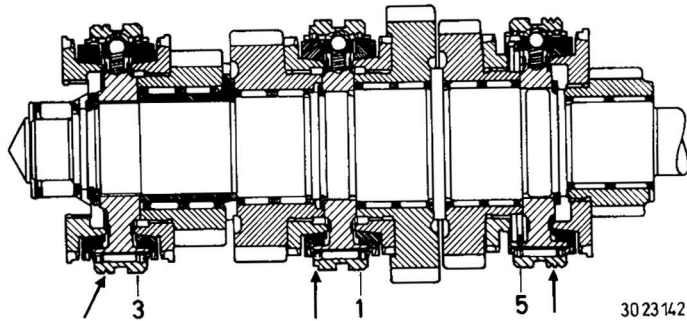
Important!
Make sure while pressing on that tabs on the synchromesh ring are aligned with openings in the guide sleeve. Install shim and circlip. Pressing-on force*.



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

* See Specifications

* See Specifications



Identification and Installed Position of Operating Sleeves:

Introduction date: 8.85

1st/2nd Gear Operating Sleeve (1):

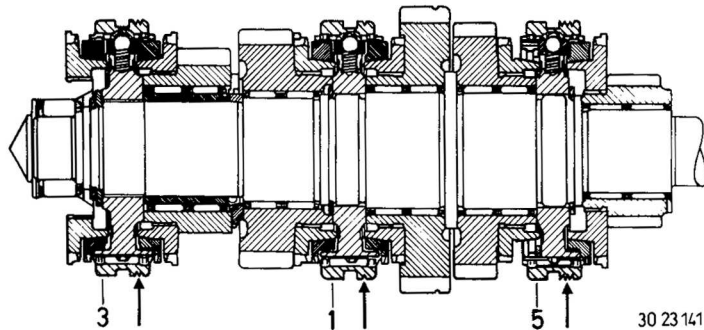
Installed with shouldered end of operating sleeve facing 2nd gear.

3rd/4th Gear Operating Sleeve (3) with One Groove:

Operating sleeve installed with groove facing 4th gear.

5th/Reverse Gear Operating sleeve (5) with Two Grooves:

Operating sleeve installed with grooves facing 5th gear.



Important!

Modified synchronization since 11.87.

New gear wheels, synchronesh rings, guide and operating sleeves, slides, balls and springs.

Note grooves on operating sleeves for correct installed position.

1st/2nd Gear Operating Sleeve with One Groove:

Operating sleeve installed with groove facing 1st gear.

3rd/4th Gear Operating Sleeve (3) with Two Grooves:

Operating sleeve installed with grooves facing 3rd gear.

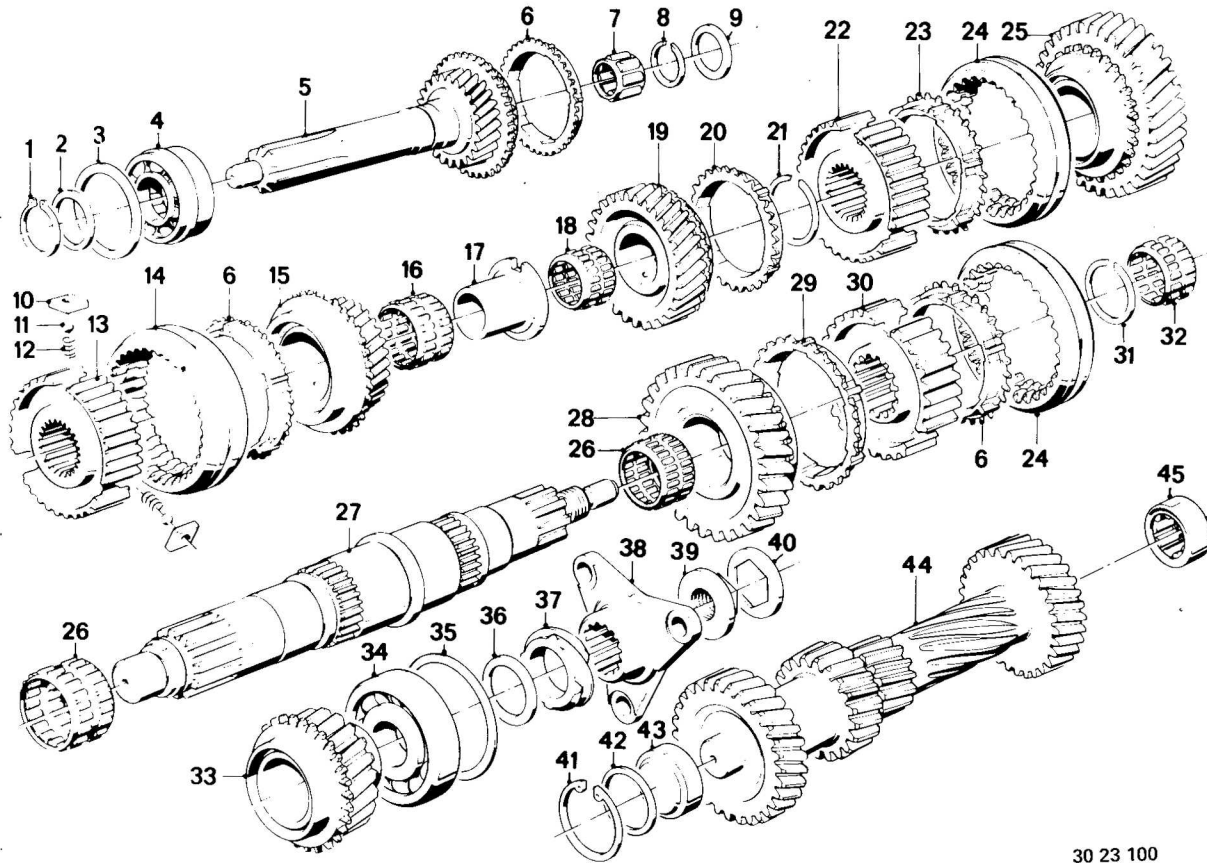
5th/Reverse Gear Operating Sleeve (5) with Three Grooves:

Operating sleeve installed with grooves facing 5th gear.

Important!

Modified shift parts can not be installed in transmissions manufactured earlier (difficult operation).

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

30 23 100

23 21 703 REPLACING BEARINGS OF ALL TRANSMISSION SHAFTS

- Transmission Removed -

Remove input/output shaft assembly - see 23 21 503.

A) Input Shaft, Layshaft in Front Case Section:

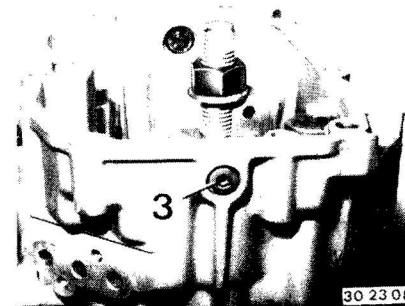
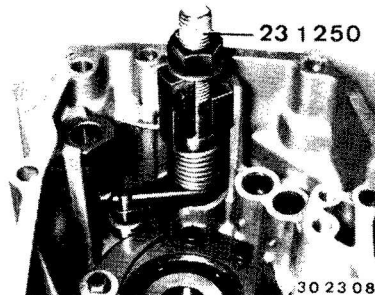
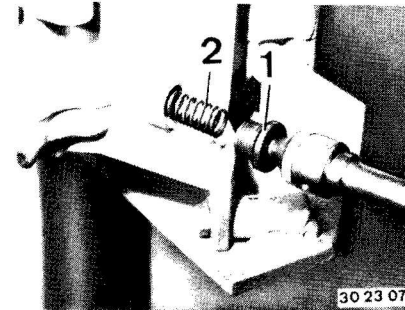
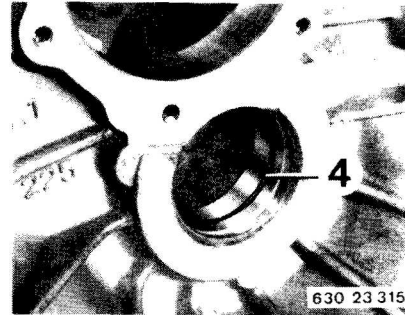
Input Shaft:
Drive out grooved ball bearing with Special Tools 23 1 480 and 00 5 500.

Important!
Collar on clutch end.

Layshaft:
Loosen circlip (1) with one knock from Special Tools 23 1 270 and 00 5 500.

Lift out circlip (2).
Remove spacer (3).

Drive out bearing shell with Special Tools 23 1 270 and 00 5 500.



Version with O-ring:
Lift out O-ring (4) with a feeler gage blade.
Replace it and coat the new O-ring with engine oil prior to installation of the bearing shell in the groove.

B) Output Shaft, Layshaft in Rear Case Section:

Output Shaft:
Unscrew bolt (1).

Caution!
Spring force.

Remove spring (2).

Installation:
Install bolt with locking compound**.

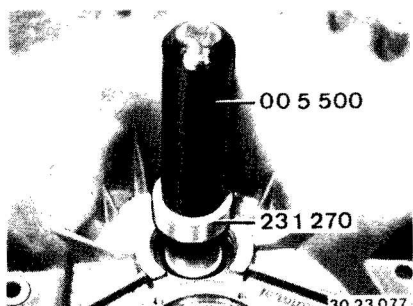
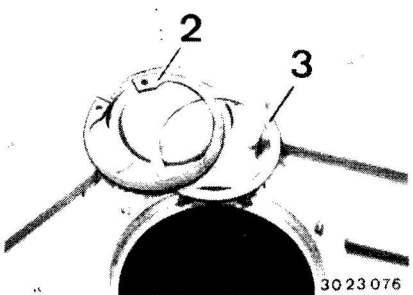
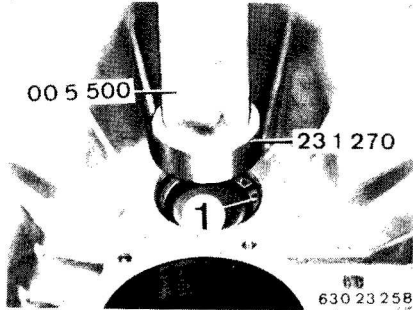
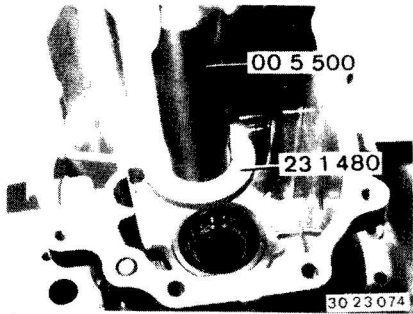
Install Special Tool 23 1 250 to remove selector arm.

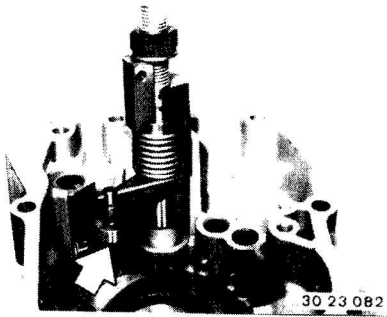
Remove socket head bolt (3).

Installation:
Install bolt with locking compound**. Tightening torque*.

* See Specifications

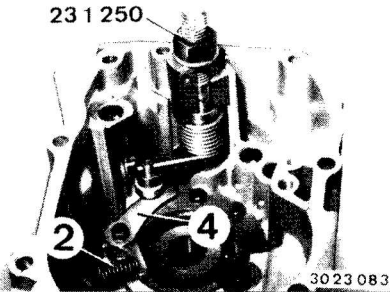
** Source of Supply: HWB



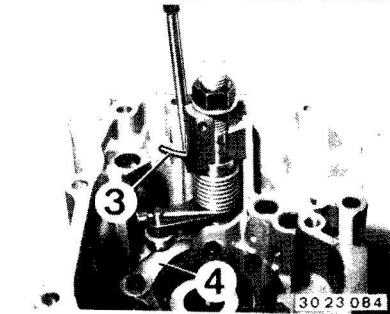


Remove selector arm from above.

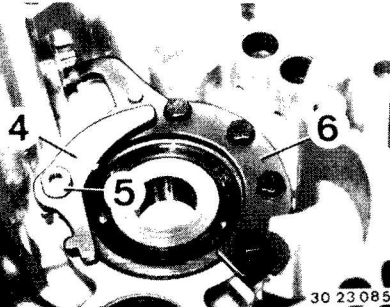
Important!
Roller.



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



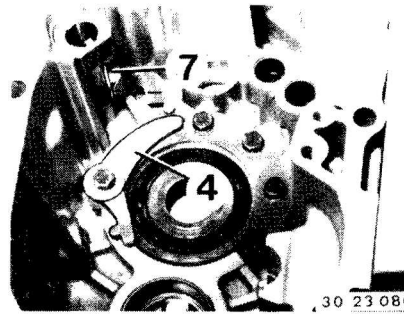
Position end of spring (3) above high spot.
In this position push down on selector arm (don't knock down).
Secure selector arm with socket head bolt tightened with correct torque* before removing the special tool.
Install socket head bolt with a locking compound**.



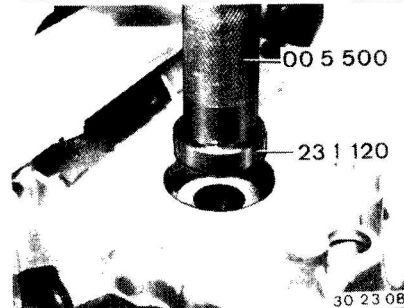
Unscrew bolt.
Remove locking lever (4) and shim (5).
Remove bearing holder (6).

Installation:
Install bolt with a large washer.

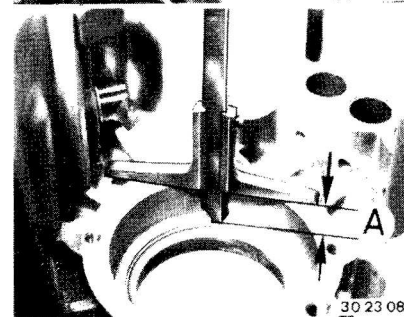
* See Specifications
** Source of Supply: HWB



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

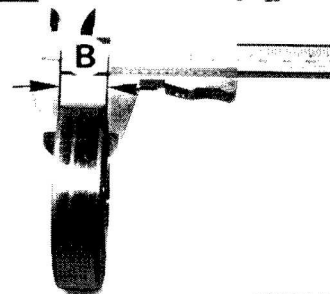


Lift out radial oil seal.
Drive out grooved ball bearing with Special Tools 23 1 120 and 00 5 500.



Important!
Shim X.

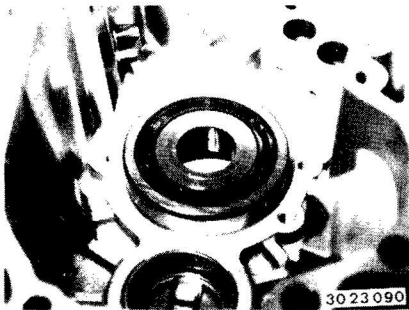
Determine thickness of shim X.
Measure distance (A).



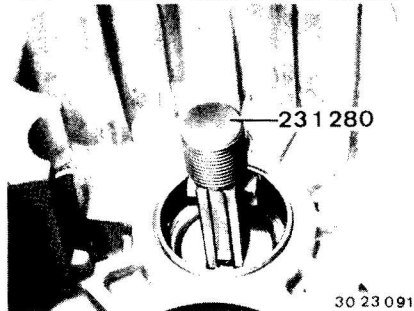
Measure distance (B).

Example:

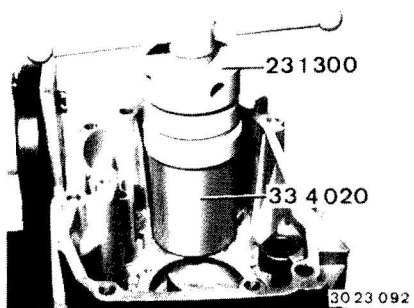
A	17.5 mm (0.689")
- B	17.0 mm (0.669")
X	0.5 mm (0.020") shim thickness



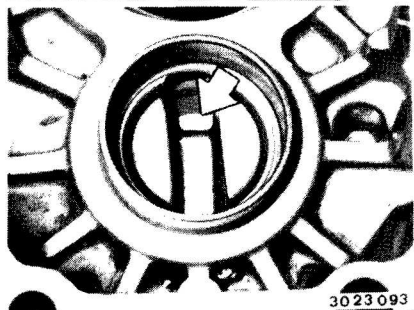
Heat rear case section in area of the grooved ball bearing to about 80° C (175° F).
Install shim X.
Install grooved ball bearing.
Closed cage end faces down.
If necessary, drive in against stop with Special Tool 24 1 060.



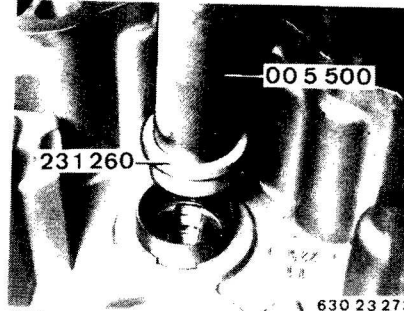
Layshaft:
Insert thicker end of Special Tool 23 1 280 in bearing shell.
If necessary, remove lock on side of the drain plug.



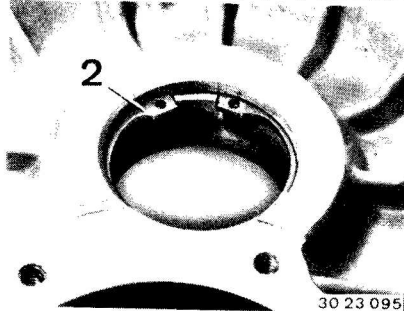
Apply Special Tool 33 4 020.
Screw on Special Tool 23 1 300.
Pull out bearing shell.



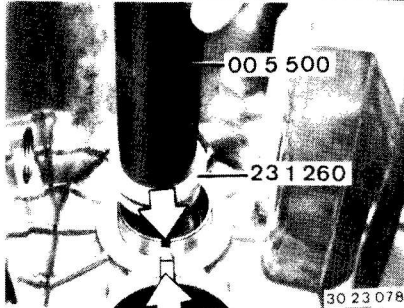
Installation:
Install bearing shell that slot in bearing shell is aligned with turning lock bead in case.



Drive in bearing shell with Special Tools 23 1 260 and 00 5 500.

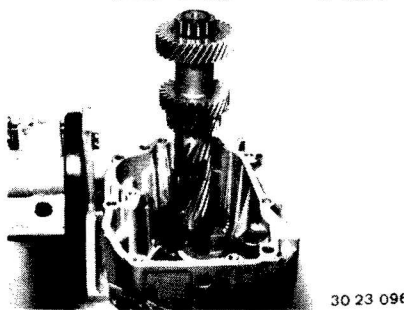


Checking Axial Play of Layshaft:
Install circlip (2).

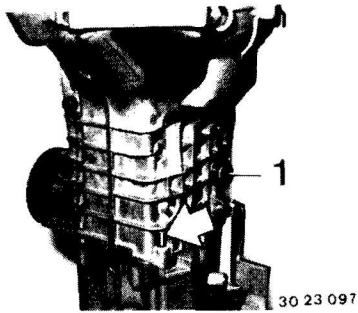


Install old spacers.
Drive bearing shell into front case section to fit tight with Special Tool 23 1 260 and 00 5 500.

Important!
Oil groove must be aligned with groove in case.

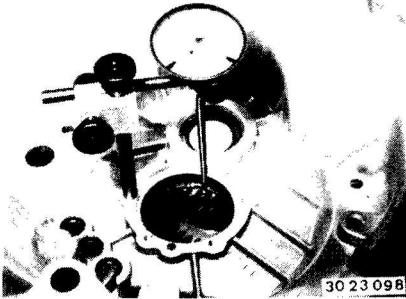


Install layshaft with roller bearings in rear case section.



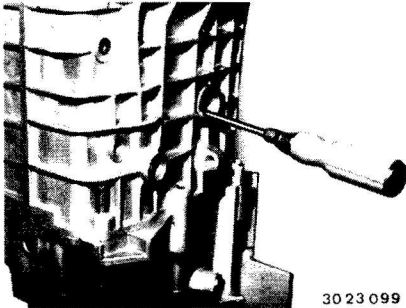
30 23 097

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



30 23 098

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



30 23 099

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.



30 23 013

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

Disassemble output shaft – see 23 21 554.

Note:
Only use molybdenum coated synchronesh rings for repairs.
Check distance* between synchronesh ring and clutch body.
Measure in area of stops.

Note:
The synchronesh ring must be pressed together while twisting for the measurement.
Synchronesh rings should bear uniformly around the entire surface.

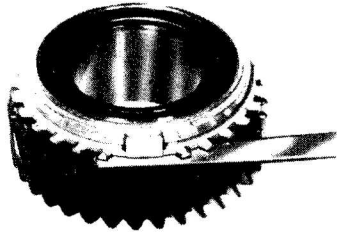
Disassemble synchronizer.
Thrust piece (1), spring (2) and ball (3).

Installation:
Bores (4) or flat teeth of operating sleeve must be aligned with ball (3).

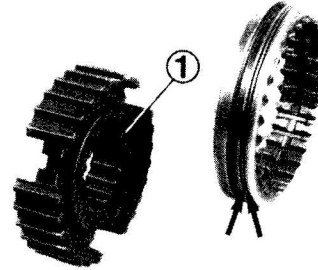
Important!
Only with 3rd/4th Gear Synchronization:

Version with One Groove:
Groove of operating sleeve must be on the narrow collar end.

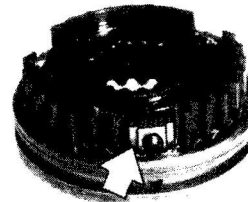
* See Specifications



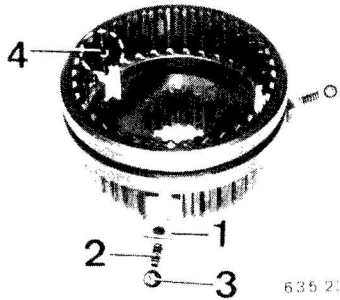
30 23 101



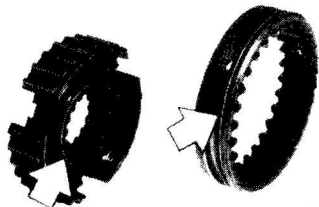
30 23 144



30 23 104



635 23 137



30 23 103

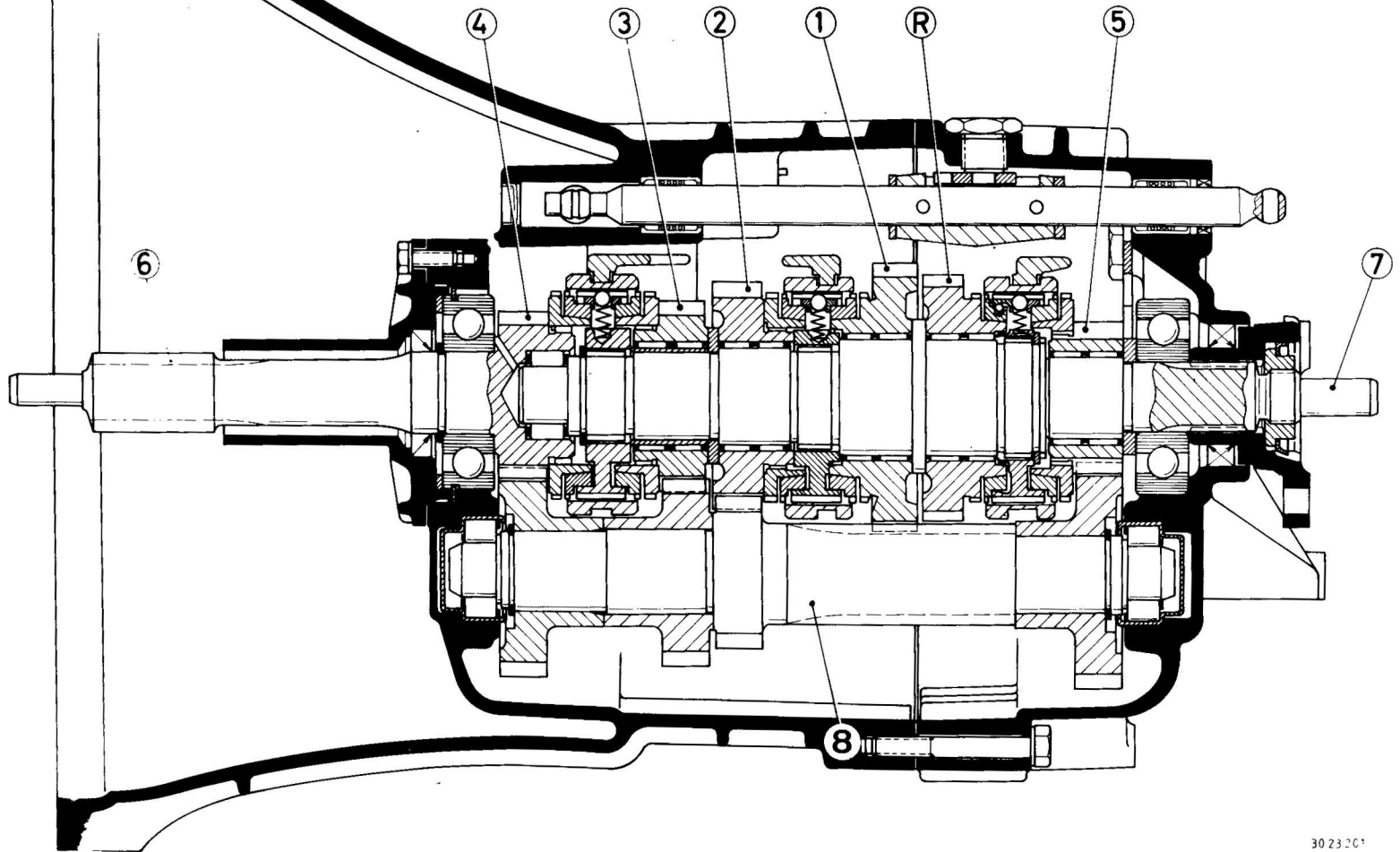
Version with Two Grooves:
Grooves of operating sleeve must be on the wide collar end (1).

Install all springs, thrust pieces and balls.

Important!
The shouldered ends of thrust pieces face the operating sleeve.
Insert guide sleeve in operating sleeve half the distance.
Press in balls so far that the guide sleeve can be pushed into the operating sleeve.

23 - 101

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

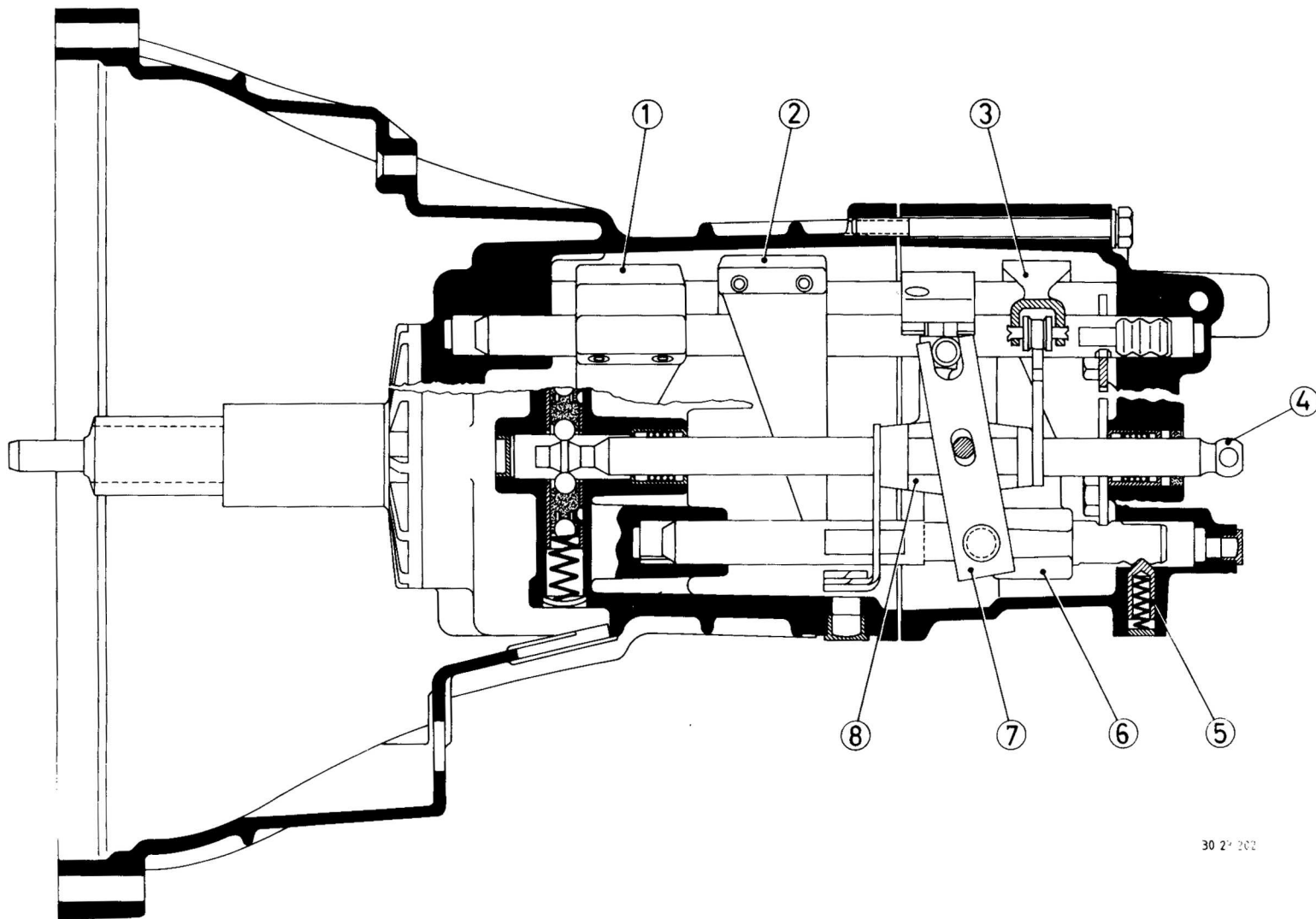


1 First gear
2 Second gear
3 Third gear

4 Fourth gear
5 Fifth gear
R Reverse gear

6 Input shaft
7 Output shaft
8 Layshaft

ASSEMBLY DRAWING OF SHIFT PARTS FOR ZF - S5 - 16 FIVE SPEED OVERDRIVE MANUAL TRANSMISSION

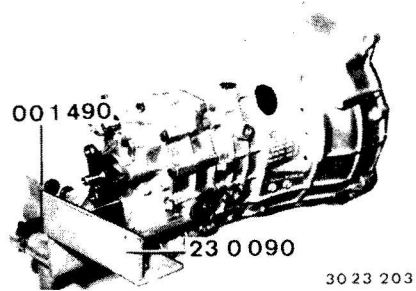


- 1 Selector fork - 3rd/4th gear
- 2 Selector fork - 1st/2nd gear
- 3 Leaf spring
- 4 Selector shaft

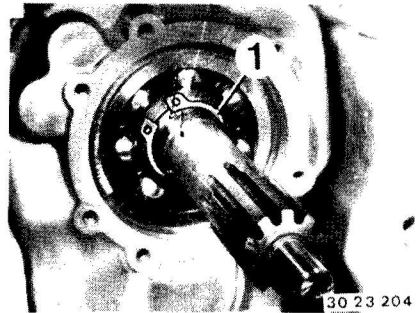
- 5 Stop pin
- 6 Selector fork - reverse/5th gear
- 7 Operating lever
- 8 Selector arm

23 11 014 REMOVING AND INSTALLING SEALING TRANSMISSION CASE FRONT SECTION

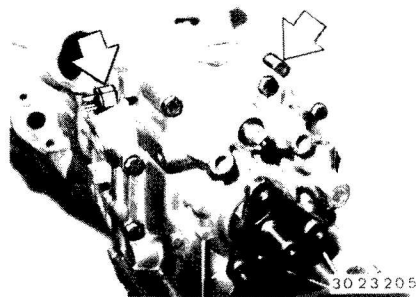
Remove transmission 23 00 022.
Mount Special Tool 23 0 090 on Special Tool 00 1 490.
Mount transmission on special tool sasembly.
Drain oil.



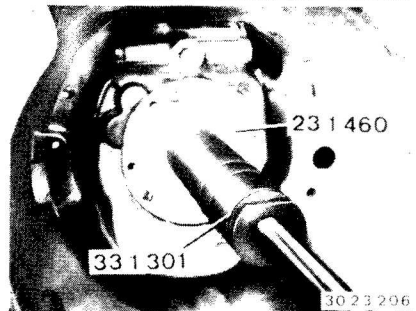
Remove guide sleeve 23 11 624.
Lift out circlip (1).



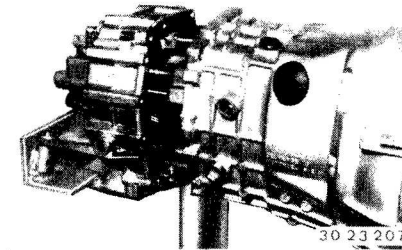
Unscrew backup light switch.
Drive back cylindrical pins.
Unscrew bolts.



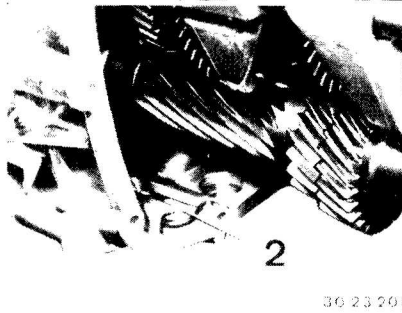
Pull off case front section with Special Tool 23 1 460 and 33 1 301.



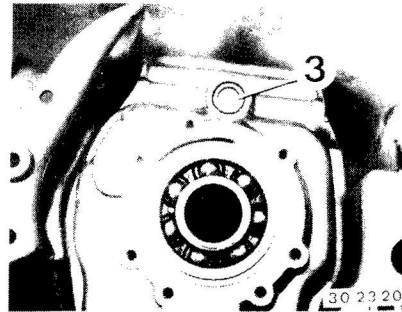
Pull off case front section.
Installation:
Replace gasket.



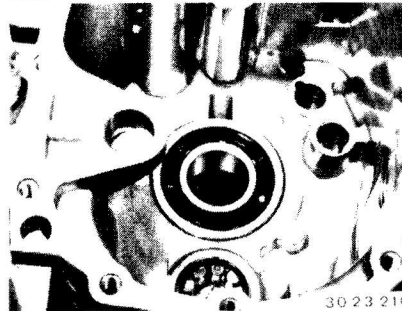
Important!
Installation:
Magnet (2) in case rear section.
Clean magnet.

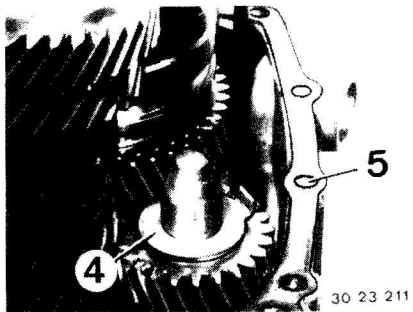


Drive out end cap (3).
Installation:
Replace end cap and insert with Loctite No. 573,

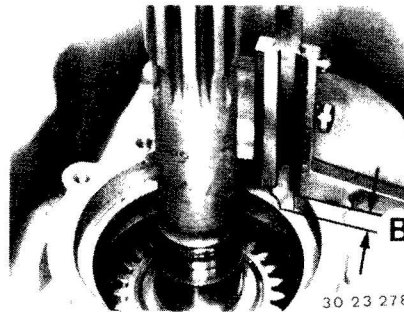


Drive out grooved ball bearing in direction of clutch housing.





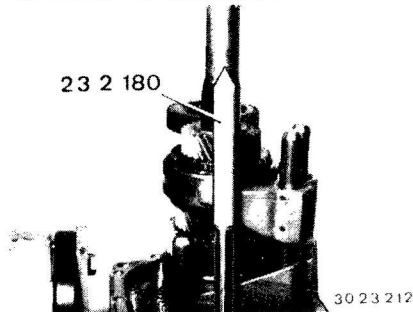
Hold thrust washer (4) with angle facing bore (5) in case rear section on reverse gear shaft with grease.
Install gasket with grease.



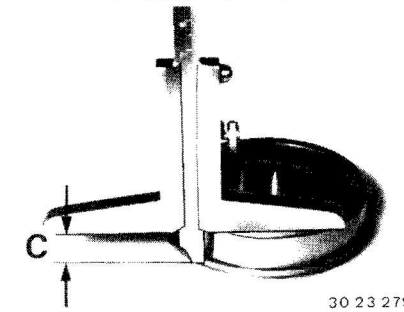
Measure distance (B) from guide sleeve sealing surface to circlip bearing surface.

Important!

If a spacer is found between the circlip and case when removing the bearing, it must be installed again for measuring distance.



Apply Special Tool 23 2 180 on selector shaft.



Measure distance (C) from bearing outer race to circlip.

Note:

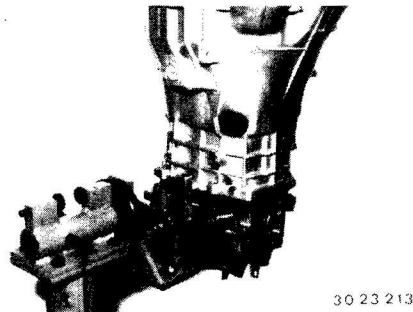
Circlip must fit tight in groove for measuring.

Example:

A	25.3 mm (0.996")
- B	10.1 mm (0.398")
<hr/>	
	15.2 mm (0.598")
- C	14.0 mm (0.551")
<hr/>	
	1.2 mm (0.047")

Axial play required: 1.1 to 1.3 mm (0.043 to 0.051").

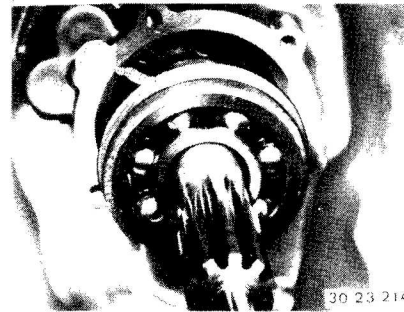
Circlips are available from Parts in different thicknesses for corrections.



Install case front section and bolt* on case rear section.

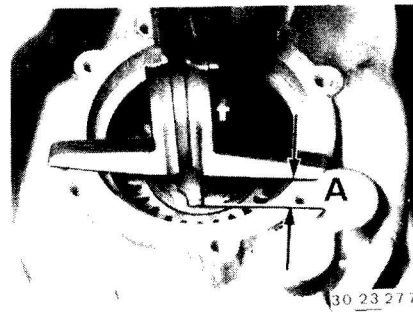
Remove guide sleeve 23 2 180.

Install end cover for selector shaft.



Heat grooved ball bearing inner race and case front section in area of bearing to approx. 80° C (175° F).

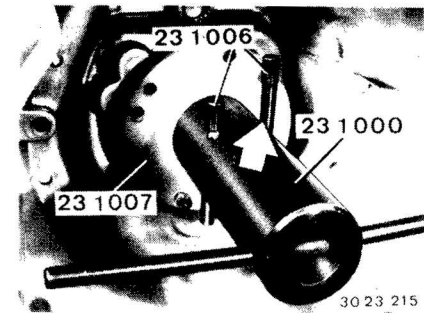
Push grooved ball bearing on to input shaft as far as possible.



Input shaft axial play must be adjusted after replacing case or bearing.
Input shaft must rest on synchromesh ring.
Measure distance (A) from guide sleeve sealing surface to input shaft.

* See Specifications for tightening torque.

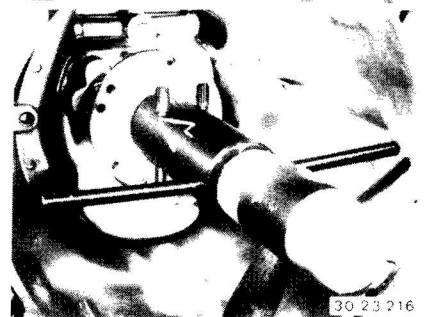
23 -105



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!

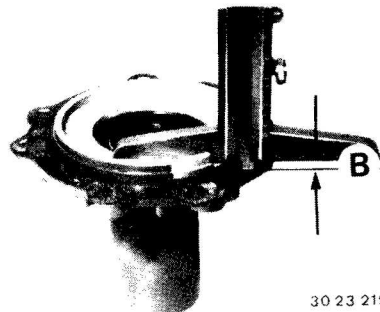
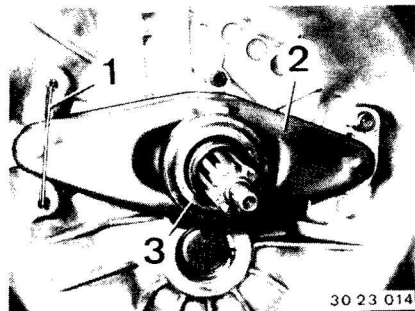
Insert Special Tools 23 1 006 that flat side faces input shaft.



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

23 11 624 REMOVING AND INSTALLING GUIDE SLEEVE FOR CLUTCH RELEASE -TRANSMISSION REMOVED-

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



Measure distance (B) from inside surface to sealing surface through opening in guide sleeve, with gasket installed.

Example:

A	5.2 mm (0.205")
B	3.2 mm (0.126")
<hr/>	
	2.0 mm (0.079") spacer thickness

Installation:

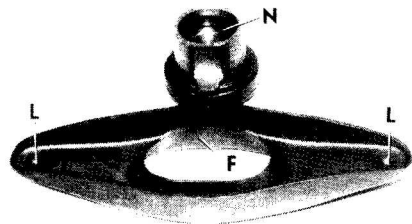
Pack lubricating groove N with Molykote

Longterm 2.

Coat guides F and bearings L with Molykote

Longterm 2.

Non-conformance could cause release bearing to seize on guide sleeve.



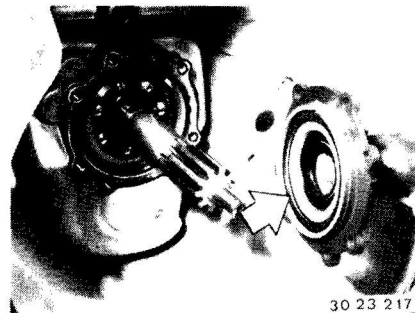
Detach guide sleeve.

Important!

Spacer.

Installation:

Replace gasket.

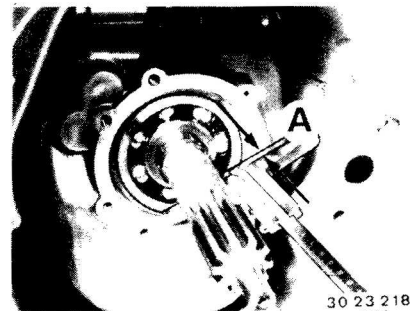


Installation:

Adjust play to 0 ... 0.09 mm (0... 0.0035").

Determine thickness of spacer.

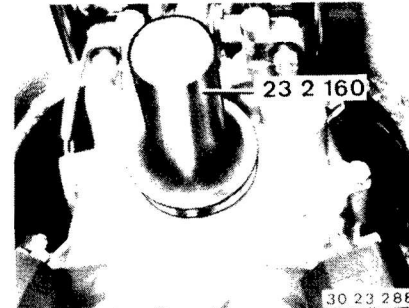
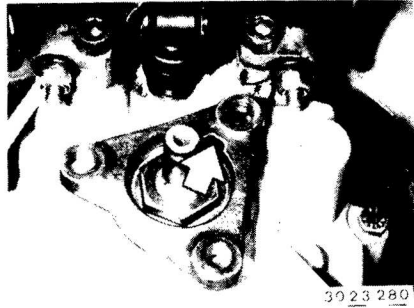
Measure distance (A) from sealing surface to bearing outer race.



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.

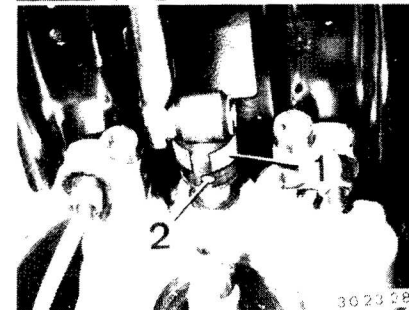
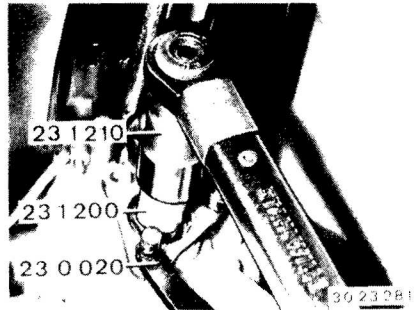
Installation:
Lock lockplate in groove.



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

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

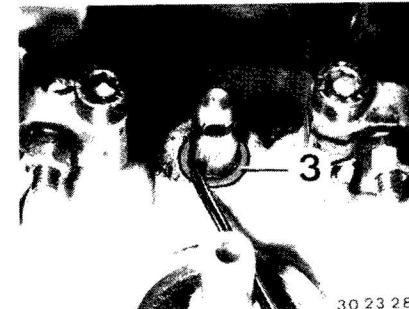
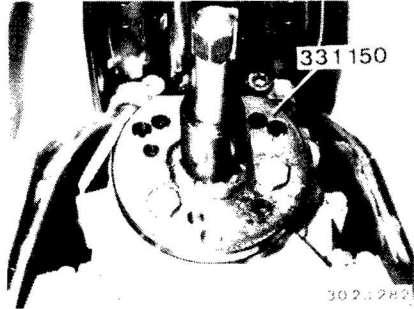
Installation:
Tightening torque*.
Install collar nut with a bolt cement**.



23 12 084 REPLACING RADIAL OIL SEAL FOR SELECTOR SHAFT

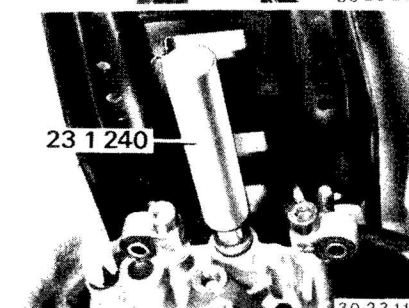
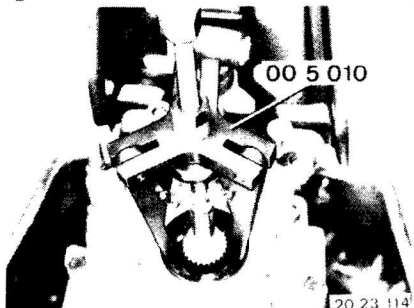
Unscrew propeller shaft at front end and on center mount (see 23 00 022).
Unscrew output flange (see 23 12 054).
Lift out locking sleeve (1).
Drive out pin (2) upwards.

Pull off output flange with Special Tool 33 1 150.



Lift out radial oil seal (3).

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



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

* See Specifications
** Source: HWB

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23 12 504 REPLACING RADIAL OIL SEAL
FOR INPUT SHAFT
—TRANSMISSION REMOVED—

Remove guide sleeve 23 11 624.
Lift out radial oil seal.

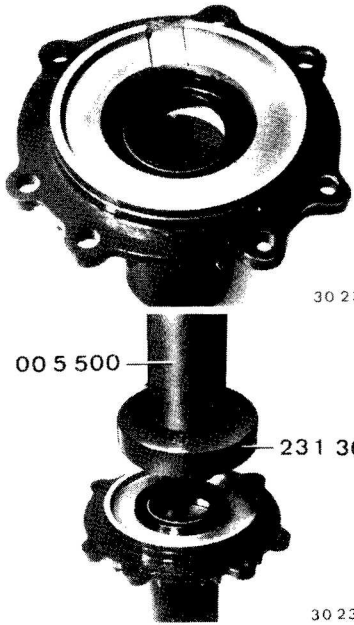
30 23 269

Drive in radial oil seal with Special Tools
23 1 360 and 00 5 500.
Lubricate sealing lips with oil.

00 5 500

23 1 360

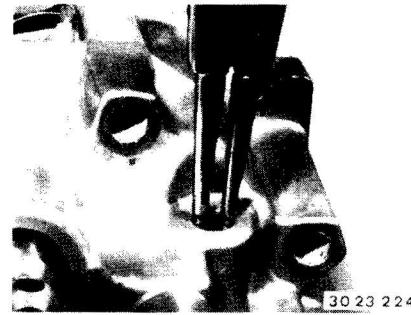
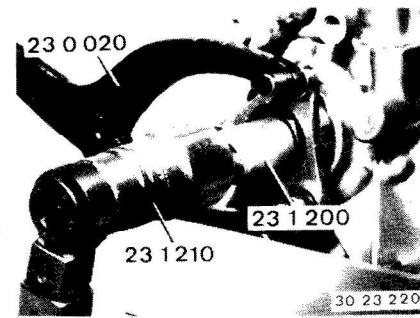
30 23 270



23 21 504 REMOVING AND INSTALLING INPUT AND OUTPUT SHAFT ASSEMBLY

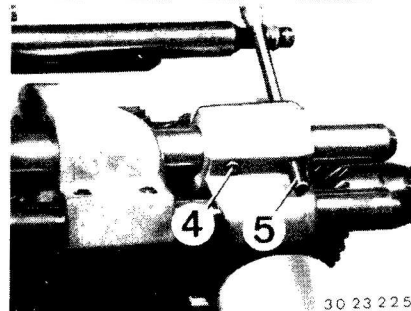
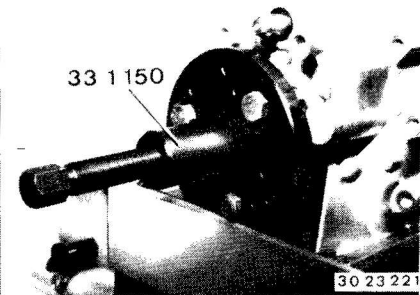
Remove case front section 23 11 014.
 Remove lockplate.
 Apply Special Tool 23 1 200.
 Hold output flange with Special Tool 23 0 020.
 Unscrew collar nut with Special Tool 23 1 210.

Pull 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).



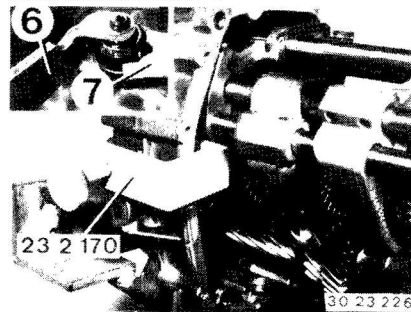
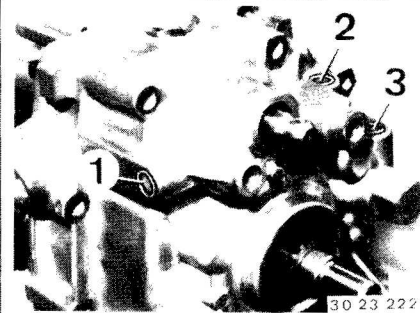
Pull off output flange with Special Tool 33 1 150.

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



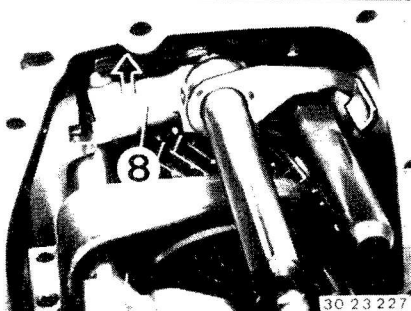
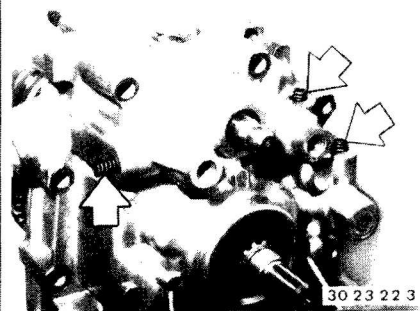
Remove end caps (1 ... 3).
Important!
 Spring force.
Installation:
 Replace end caps.

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

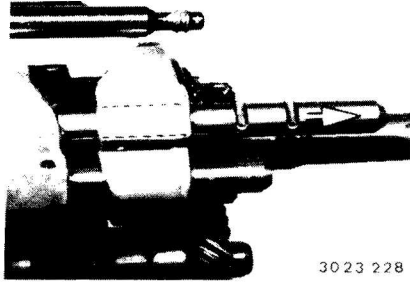


Remove three springs.

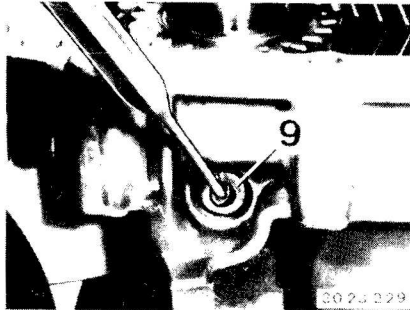
Swing selector arm (8) out of groove in selector rod.



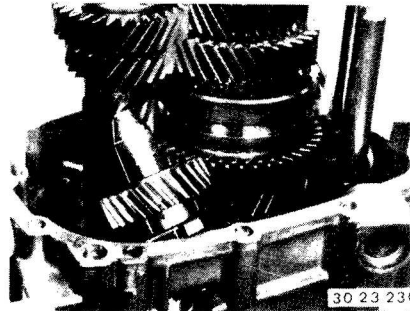
Pull out 3rd/4th gear selector rod.



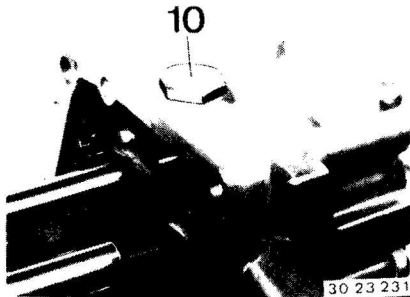
Remove lock in socket of bolt.
Unscrew bolt (9).
Important!
Seal between case and bolt.



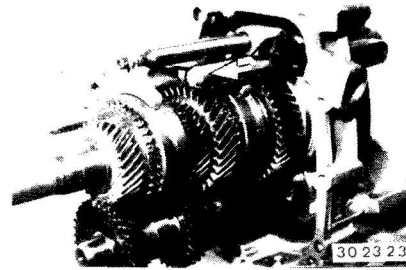
Remove reverse gear shaft, reverse gear, needle bearing and thrust washer.



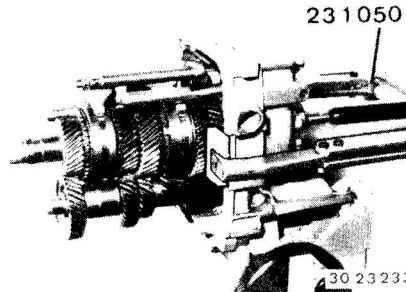
Remove bolt (10) for operating lever.



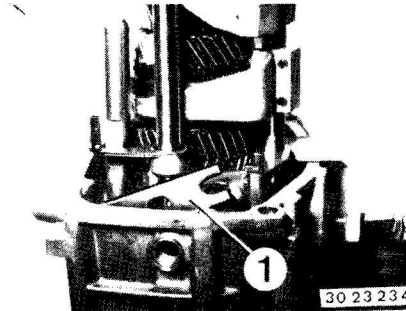
Important!
Engage reverse gear by moving sliding sleeve forward before pressing out gear set.



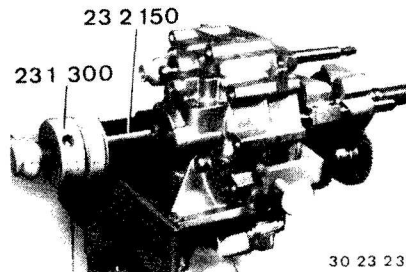
Press input shaft, output shaft and layshaft out of case rear section with Special Tool 23 1 050.
Important!
Use a piece of wood, aluminum or similar material between claws and sealing surface to avoid damage on sealing surface.
Installation:
Check condition of all bearings, replacing if necessary.

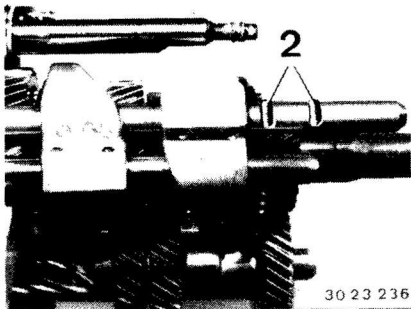


Installing:
Reverse gear engaged.
Place input shaft and output shaft with 1st/2nd gear selector rod, 3rd/4th gear selector fork, 5th/reverse gear selector rod and selector shaft as well as layshaft in case rear section.
Important!
Check installed position of operating lever (1).



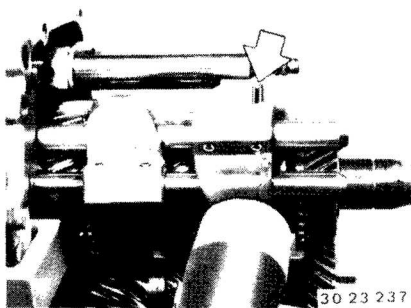
Pull input shaft, output shaft and layshaft into case rear section with Special Tools 23 1 300 and 23 2 150.
Important!
Make sure selector rods, selector shaft and layshaft do not clamp while pulling in.





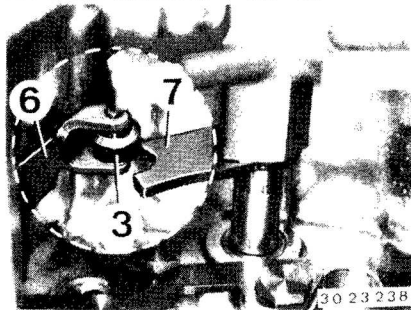
30 23 236

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



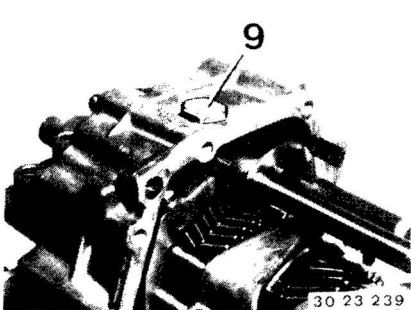
30 23 237

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



30 23 238

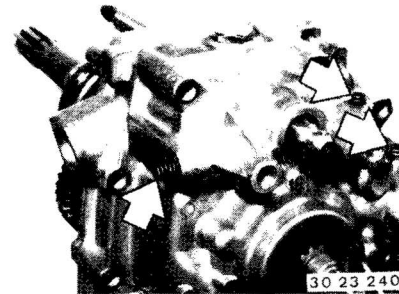
Remove Special Tool 23 2 170 for leaf spring.
Important!
Roller (3) on leaf spring (6) must engage in selector arm (7).



30 23 239

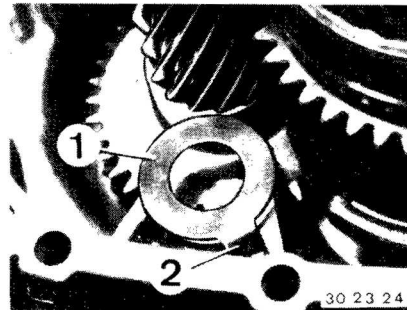
Install bolt (9) for operating lever.
Tip of bolt must engage in bore of operating.
Tightening torque*.

* See Specifications



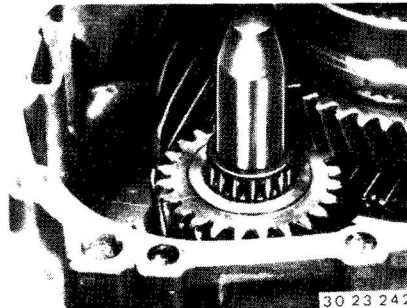
30 23 240

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



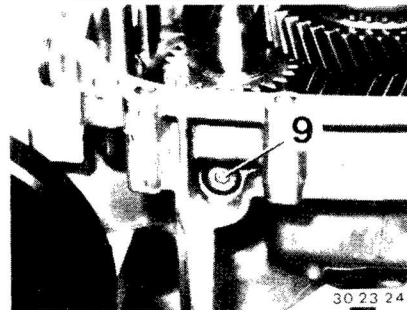
30 23 241

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



30 23 242

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

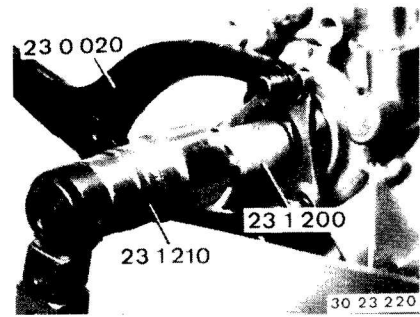


30 23 243

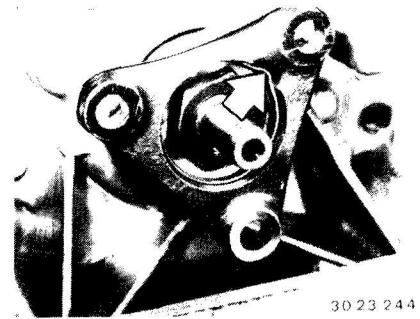
Place insulator on bolt.
Install bolt (9).
Install new bolt lock.
Tightening torque*.

* See Specifications

23 - 112



Push or drive on output flange.
Install collar nut with locking compound**.
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*.

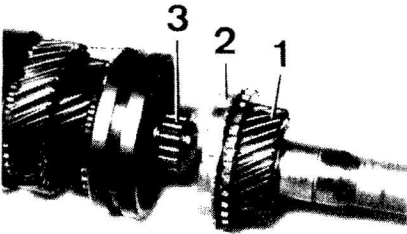


Install lockplate and lock in groove.

* See Specifications
** Source: HWB

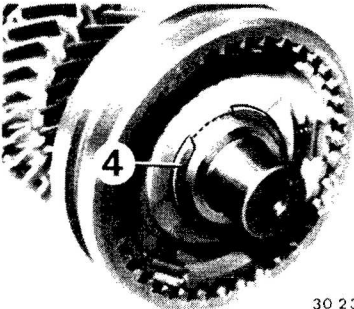
23 21 555 REPLACING OUTPUT SHAFT - Output Shaft Removed -

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



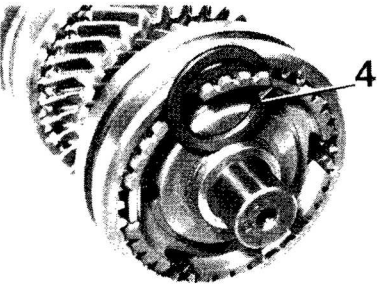
30 23 245

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



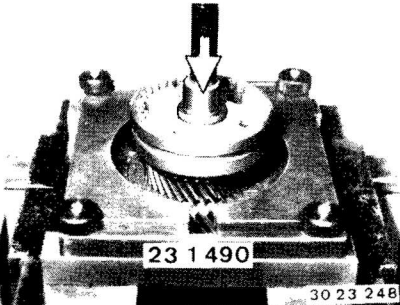
30 23 246

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



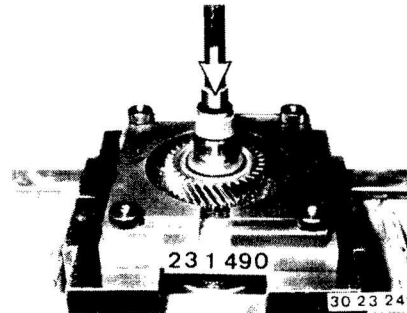
30 23 247

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



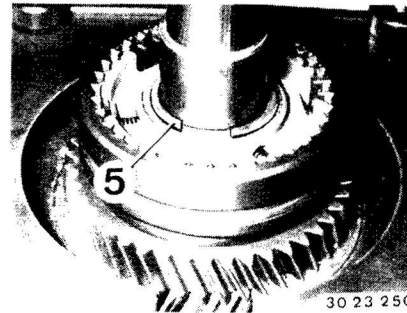
30 23 248

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.



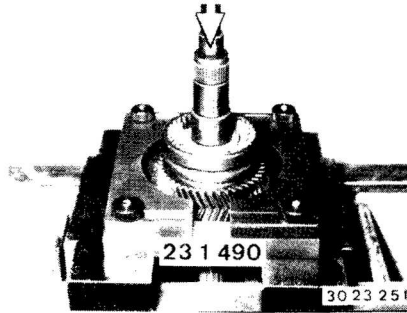
30 23 249

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



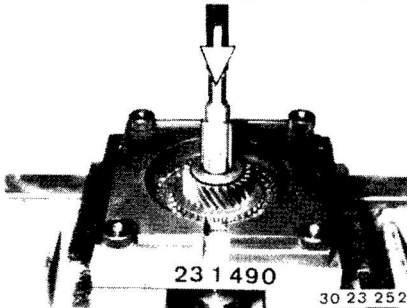
30 23 250

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



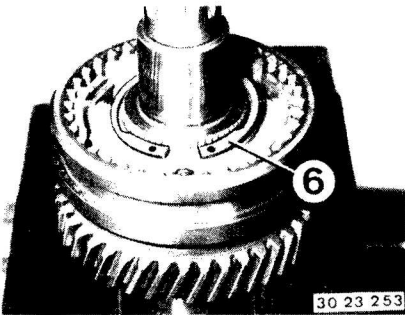
30 23 251

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



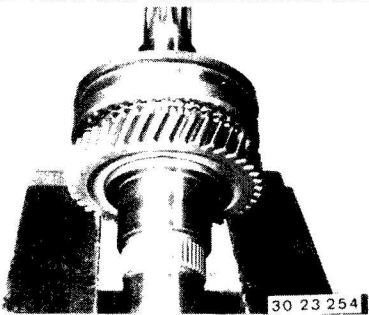
30 23 252

Important!
Circlip (6) must be removed before pressing off reverse gear.
Installation:
Always replace circlip.



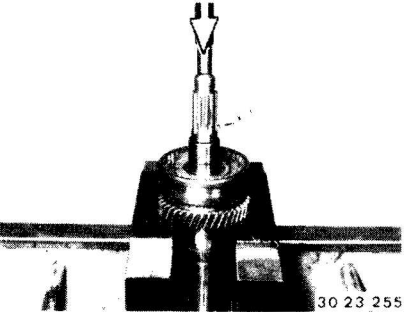
30 23 253

Install output shaft next to collar.



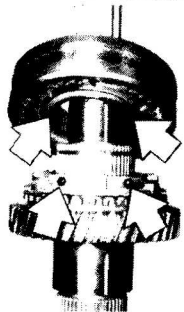
30 23 254

Press guide sleeve with sliding sleeve and reverse gear off of output shaft.
Remove needle bearing.
Only for version with reverse gear synchronization:
Brass synchronesh ring with 6 balls.

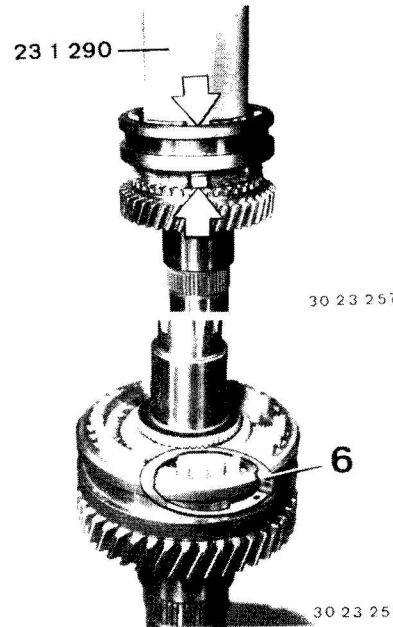


30 23 255

Assembling:
Install needle bearing, reverse gear and brass synchronesh ring with 6 grease held balls (only for version with reverse gear synchronization).
Install guide and sliding sleeve with narrow collar facing reverse gear.



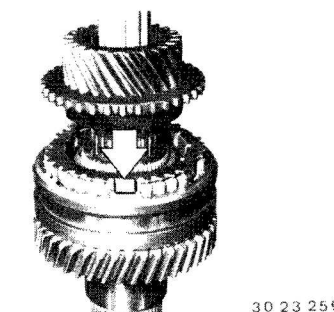
30 23 256



30 23 257

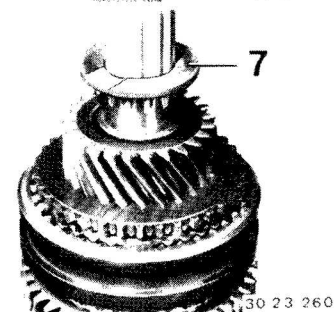
Press on guide sleeve to fit tight with Special Tool 23 1 290.
Important!
Make sure that short tabs of synchronesh ring are aligned with groove in pressure pieces when pressing on guide sleeve.

Move sliding sleeve in reverse gear direction.
Adjust guide sleeve with circlip (6) to take up all play.
Circlips are available from Parts in different thicknesses.
Install circlip (6).



30 23 258

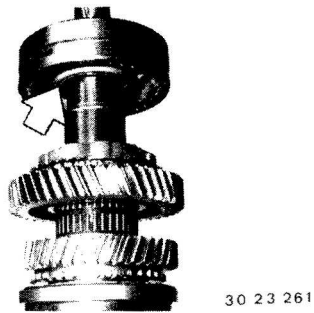
Install brass synchronesh ring with short tabs of synchronesh ring in groove of pressure pieces.
Install needle bearing and 5th gear.



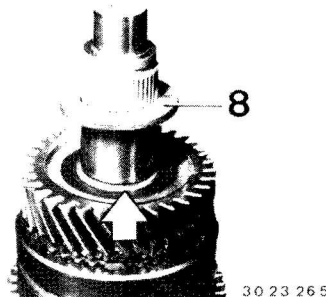
30 23 259

Heat thrust washer (7) to approx. 80° C and install on output shaft.

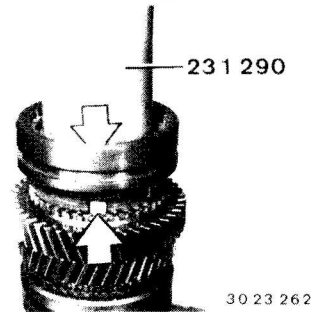
30 23 260



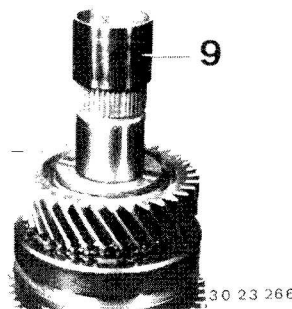
Install needle bearing, 1st gear and sintered steel synchromesh ring.
Install guide sleeve and sliding sleeve with narrow collar facing 1st gear.



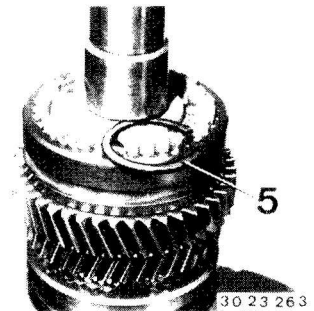
Important!
Output shaft collar for thrust washer must protrude slightly.
If necessary, check circlip (5) for correct fit.
Heat thrust washer (8) to approx. 80° C (175° F) and install on output shaft.



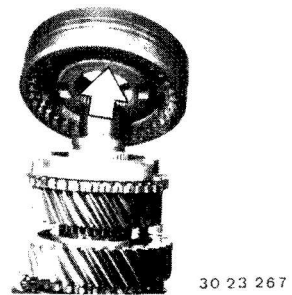
Press on guide sleeve to fit tight with Special Tool 23 1 290.
Important!
When pressing on make sure that short tabs of synchromesh ring are aligned with groove in thrust pieces.



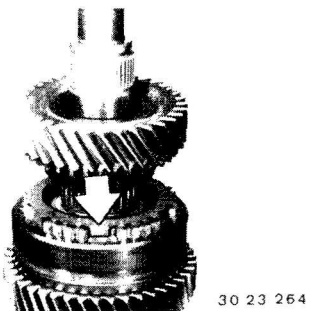
Heat bearing sleeve (9) to approx. 80° C (175° F) and install on output shaft.



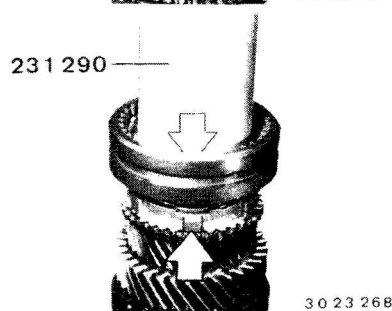
Move sliding sleeve in 1st gear direction.
Adjust guide sleeve to be without play.
Circlips are available from Parts in different thicknesses.
Install circlip (5).



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



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



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.

Adjust axial play of input shaft.
Output shaft and case front section installed.
Input shaft must rest on synchromesh ring.
Measure distance (A) from guide sleeve sealing surface to input shaft.

Measure distance (B) from guide sleeve sealing surface to circlip bearing surface.

Measure distance (C) from bearing outer race to circlip.

Note:

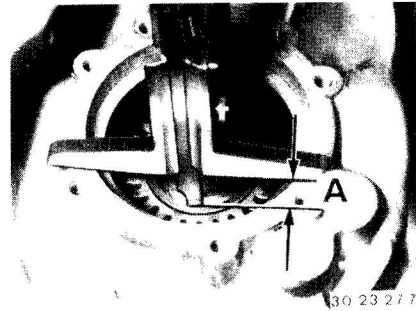
Circlip must be pressed tight in groove for measuring.

Example:

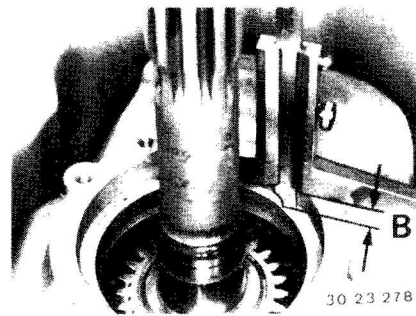
A	25.3 mm (0.996")
- B	10.1 mm (0.398")
	15.2 mm (0.598")
- C	14.0 mm (0.551")
	1.2 mm (0.047")

Axial play required: 1.1 to 1.3 mm (0.043 to 0.051").

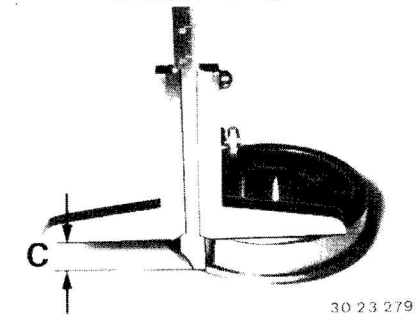
Circlips are available from Parts in different thicknesses for making corrections.
Install grooved ball bearing (see 23 11 014).



30 23 277

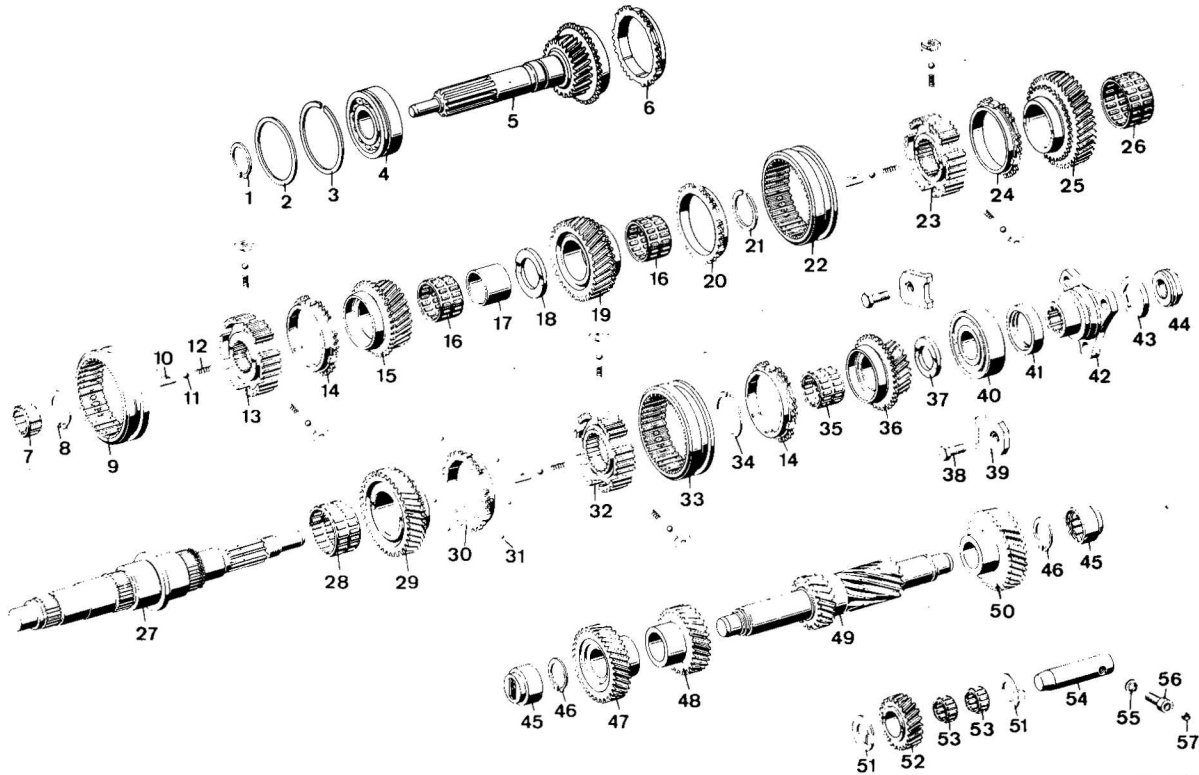


30 23 278



30 23 279

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

23 21 704 REPLACING BEARINGS OF ALL TRANSMISSION SHAFTS —TRANSMISSION REMOVED—

Remove transmission case front section 23 11 014.

A) Input Shaft, Layshaft in Case Front Section: Input Shaft:

Drive out grooved ball bearing in direction of clutch housing.

Adjust axial play of input shaft. Case front section attached.

Input shaft must be on synchromesh ring. Measure distance (A) from guide sleeve sealing surface to input shaft.

Measure distance (B) from guide sleeve sealing surface to circlip bearing surface.

Measure distance (C) from bearing outer race to circlip.

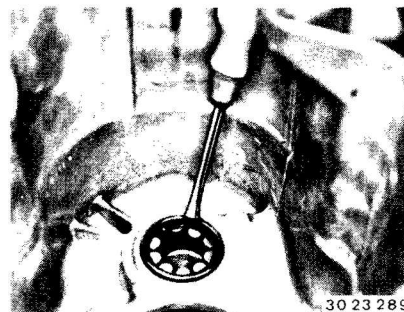
Note:

Circlip must be pressed tight in groove for measuring.

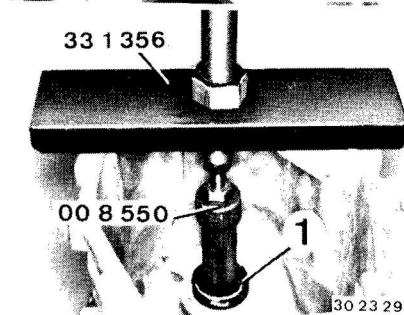
Example:

A	25.3 mm (0.996")
— B	10.1 mm (0.398")
	15.2 mm (0.598")
— C	14.0 mm (0.551")
	1.2 mm (0.047")

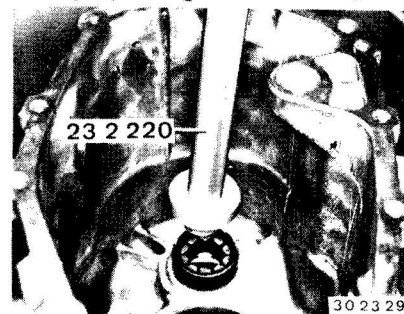
Axial play required: 1.1 to 1.3 mm (0.043 to 0.051"). Correct with different size circlips available from Parts.



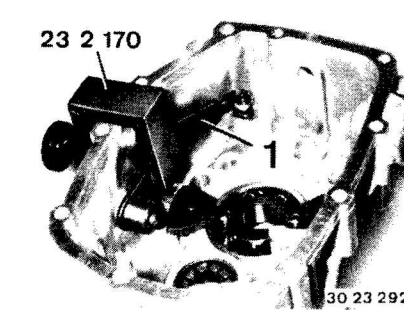
30 23 289



30 23 290



30 23 291



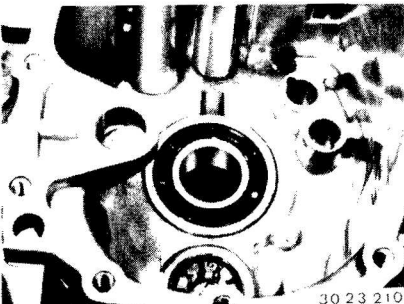
30 23 292

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

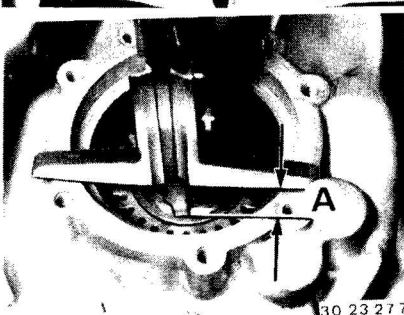
Pull out bearing outer race (1) with Special Tools 00 8 550 (without supports) and 33 1 356.

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

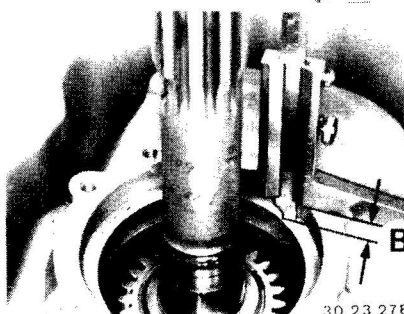
B) Output Shaft, Layshaft in Case Rear Section: Remove input and output shaft assembly 23 21 504. Output Shaft: Remove Special Tool 23 2 170. Pull off leaf spring (1).



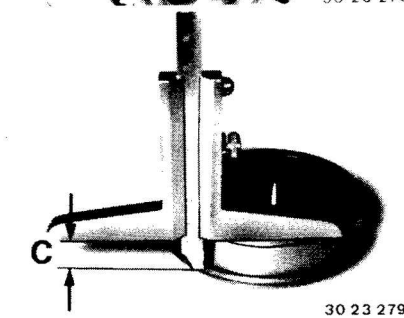
30 23 210



30 23 277

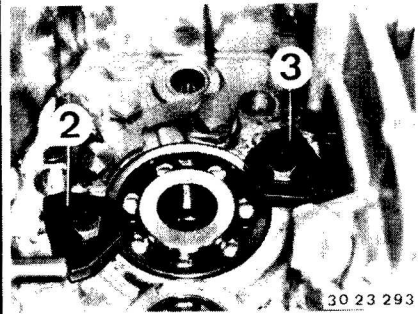


30 23 278



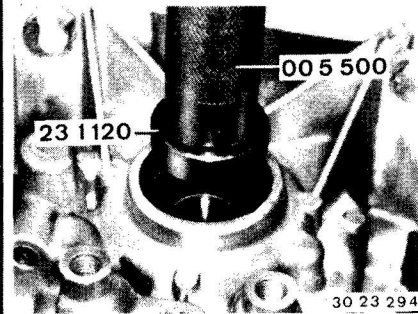
30 23 279

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



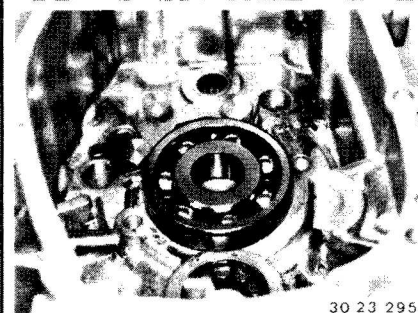
30 23 293

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



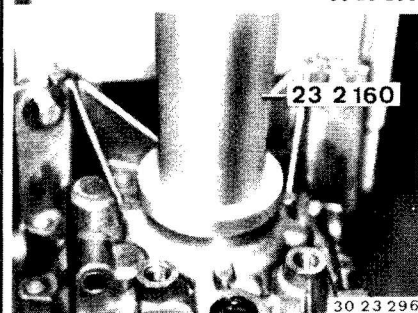
30 23 294

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.



30 23 295

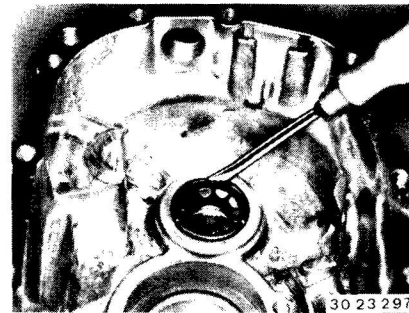
Drive in radial oil seal with Special Tool 23 2 160.
Lubricate sealing lip with oil.



30 23 296

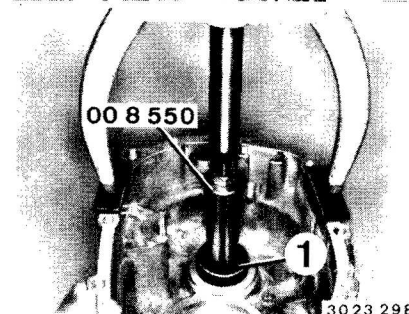
* See Specifications

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



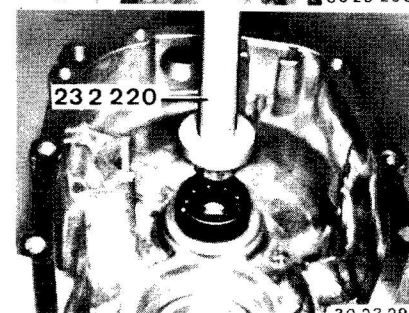
30 23 297

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.



30 23 298

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.



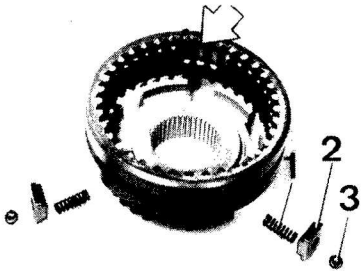
30 23 299

23 23 506 DISASSEMBLING/ASSEMBLING SYNCHRONIZATION -OUTPUT SHAFT REMOVED

Disassemble output shaft (see 23 21 555).
Measure distance* between synchromesh ring
and clutch.
Measure in area of stops.

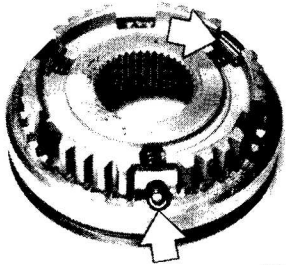
30 23 271

Disassembling Synchronization:
Press sliding sleeve off of guide sleeve.
Spring (1), pressure piece (2) and ball (3).
Installation:
Flat teeth of sliding sleeve must be aligned
with pressure pieces.

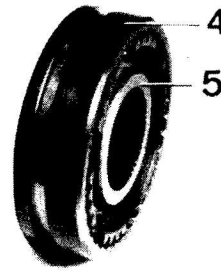


30 23 272

Install all springs, pressure pieces and balls.
Important!
Shouldered end of pressure pieces faces collar.
Press in balls one after the other and into
sliding sleeve.



30 23 273



30 23 274

Synchronization for 1st/2nd Gear:
Check installed position of sliding sleeve.
Wide web (4) of sliding sleeve faces thick collar
(5).



30 23 275

Synchronization for 5th/Reverse Gear:
Check installed position of sliding sleeve.
Wide web (6) of sliding sleeve faces narrow
collar (7).

TROUBLESHOOTING MANUAL TRANSMISSION

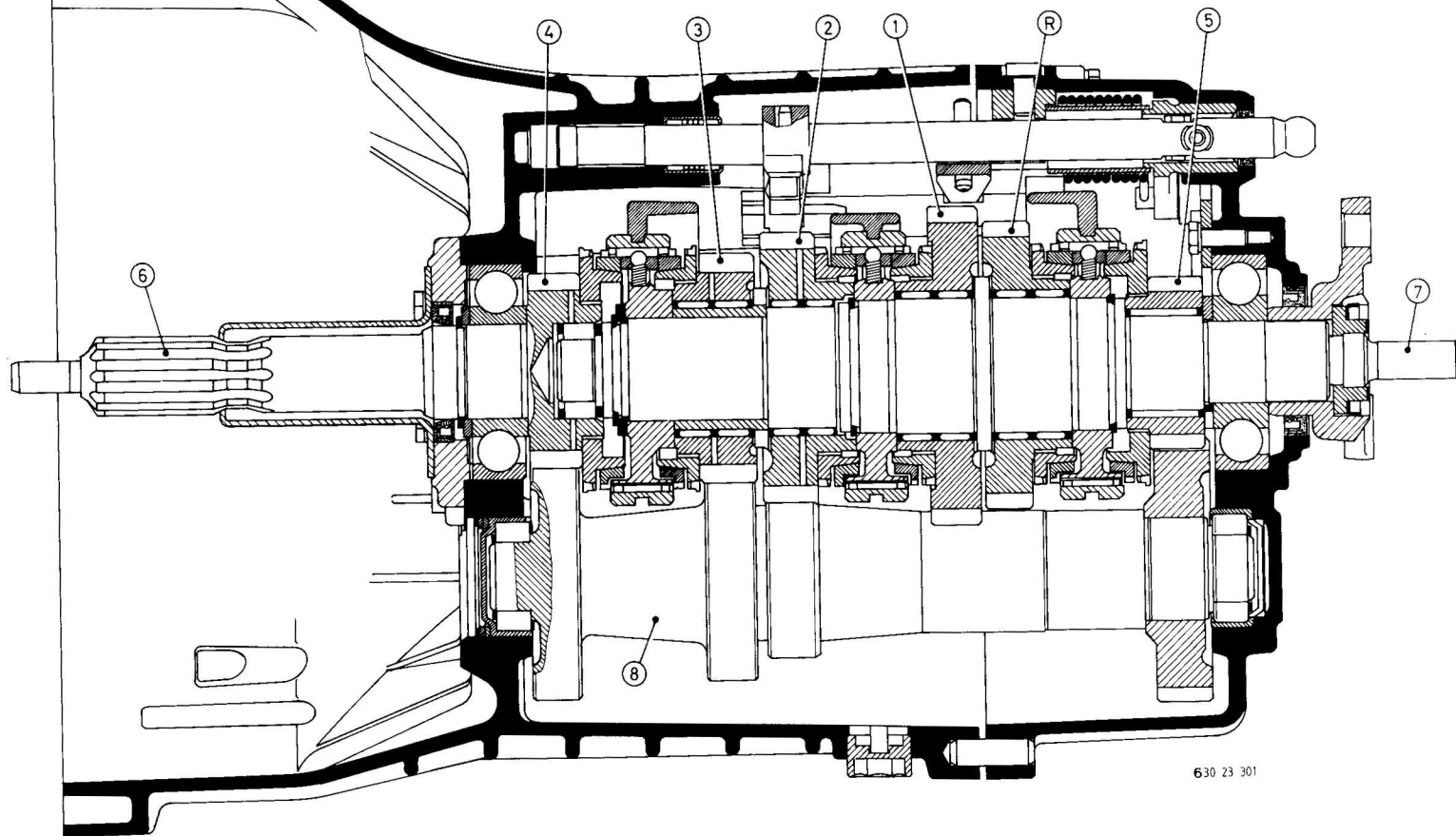
Condition	Cause	Correction
Oil on clutch bell housing	<ul style="list-style-type: none"> a) O-ring in guide flange leaks b) Radial oil seal for input shaft leaks c) Gasket on end cover (crankcase leaks) d) Radial oil seal for crankshaft leaks 	<ul style="list-style-type: none"> a) Replace O-ring 23 11 590 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	<ul style="list-style-type: none"> a) Radial oil seal for output shaft leaks b) Radial oil seal for selector shaft leaks 	<ul style="list-style-type: none"> a) Replace radial oil seal 23 12 051 b) Replace radial oil seal 23 12 081
Transmission leaks between front and rear sections	<ul style="list-style-type: none"> a) Gasket defective 	<ul style="list-style-type: none"> a) Replace gasket 23 11 000
Oil on speedometer drive	<ul style="list-style-type: none"> a) O-ring defective b) Radial oil seal in bush defective 	<ul style="list-style-type: none"> a) Replace O-ring 23 22 100 b) Replace bush
Oil on vent	<ul style="list-style-type: none"> a) Oil level too high b) Wrong oil grade (excessive foaming) 	<ul style="list-style-type: none"> a) Correct oil level b) Replace oil
Gear does not stay in — jumps out	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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

TROUBLESHOOTING MANUAL TRANSMISSION

Condition	Cause	Correction
Shifts hard to make (sticking, scratching)	<ul style="list-style-type: none"> a) Clutch release insufficient <ul style="list-style-type: none"> 1. Pedal travel insufficient 2. Drive plate worn 3. Liner seized on flywheel 4. Drive plate seized on transmission input shaft 5. Bearing for transmission input shaft in crankshaft defective 6. Air in clutch hydraulic system b) Thick, viscous transmission oil c) Bushes for selector rod arrest damaged d) Excessive play in shift lever mount e) Selector forks worn f) Sliding sleeve worn 	<ul style="list-style-type: none"> a) <ul style="list-style-type: none"> 1. Check pedal travel and adjust, if necessary. Remove excessively thick floor mats. Floor clutch pedal when changing gear 35 31 000. 2. Replace drive plate 21 21 000. 3. Clean flywheel. Replace drive plate 21 21 000. 4. Service or replace drive plate 21 21 000 5. Replace bearing in crankshaft 11 21 571 6. Bleed clutch 21 00 006 b) Use 10 W 50 engine oil for cold climates or cold transm. c) Replace bushes d) Check shift lever mount (shift console) and replace worn ball shell plates, if applicable 25 11 041 e) Replace selector forks 23 31 501 f) Replace sliding sleeve 23 23 503
Transmission grabs when shifting	<ul style="list-style-type: none"> a) Clutch release insufficient b) Synchronesh rings or sliding sleeve worn c) Reverse gear: shift break of 3 sec. not made 	<ul style="list-style-type: none"> a) See a) above b) Check synchronization, replace damaged parts 23 23 503 c) Make shift break
Transmission loud	<ul style="list-style-type: none"> a) Oil level too low b) Transmission shaft bearings defective c) Gears damaged d) Needle bearing of output or input shaft defective e) Bearing for transmission input shaft in crankshaft defective 	<ul style="list-style-type: none"> a) Correct oil level b) Replace all bearings 23 21 701 c) Replace gear wheel pair or set 23 21 551 d) Replace needle bearing 23 21 551 e) Replace bearing in crankshaft 11 21 571

23-165

ASSEMBLY DRAWING OF GETRAG 260 FIVE SPEED OVERDRIVE MANUAL TRANSMISSION



630 23 301

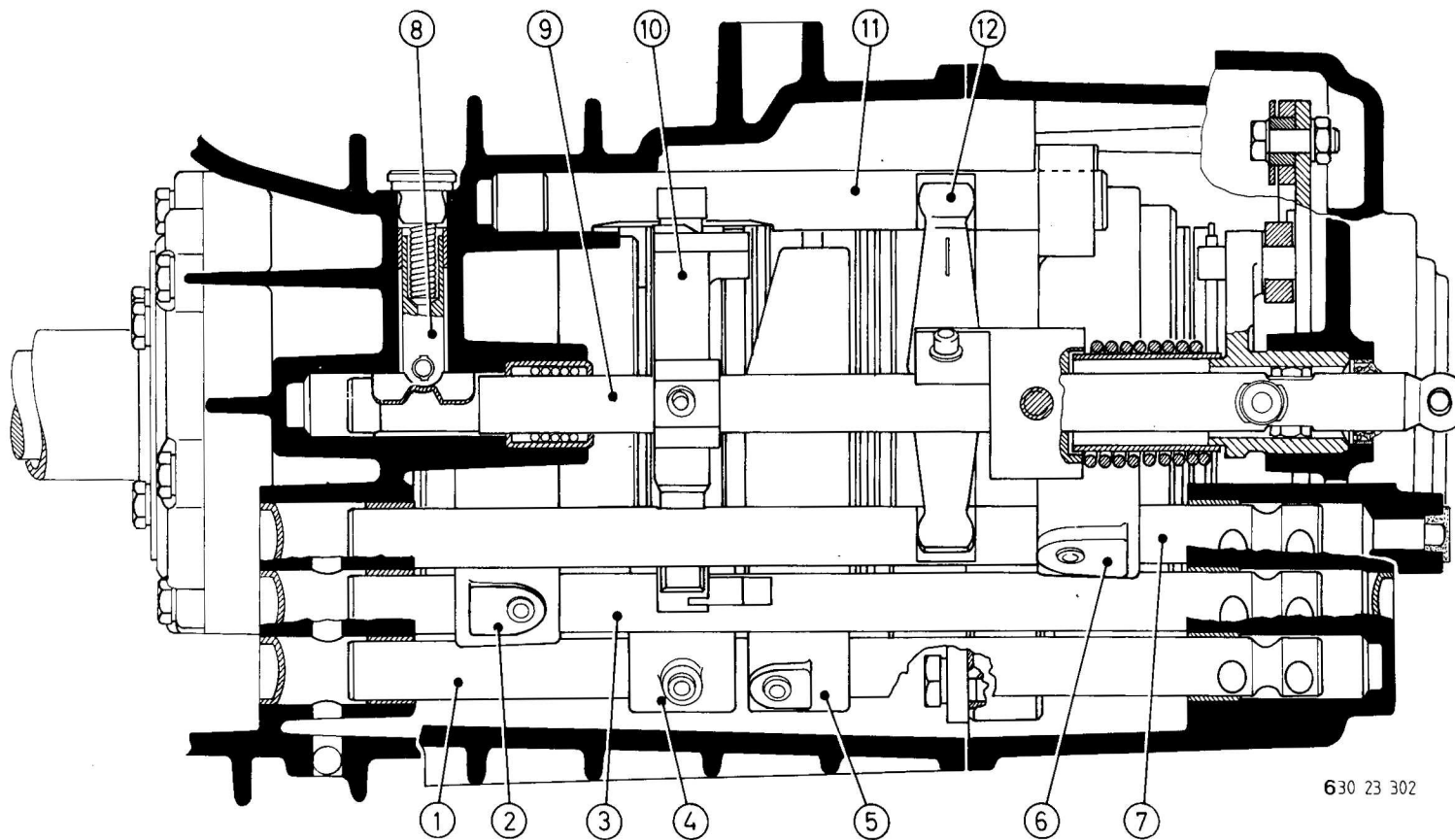
1 First gear
2 Second gear
3 Third gear

4 Fourth gear
5 Fifth gear
6 Reverse gear

6 Input shaft
7 Output shaft
8 Layshaft

23-166

ASSEMBLY DRAWING OF SHIFT PARTS FOR GETRAG 260 FIVE SPEED OVERDRIVE MANUAL TRANSMISSION



630 23 302

1 Selector rod - 1st/2nd gear
2 Selector fork - 3rd/4th gear
3 Selector rod - 3rd/4th gear
4 Dog

5 Selector fork - 1st/2nd gear
6 Selector fork - reverse/5th gear
7 Selector rod - reverse/5th gear
8 Lockpin

9 Selector shaft
10 Selector arm
11 Selector rail
12 Operating lever

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.

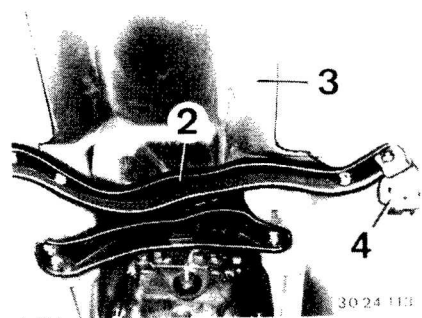
Lift out retainer (1) and take off washer (2).
 Pull out shift rod.

Unscrew shift console on transmission.

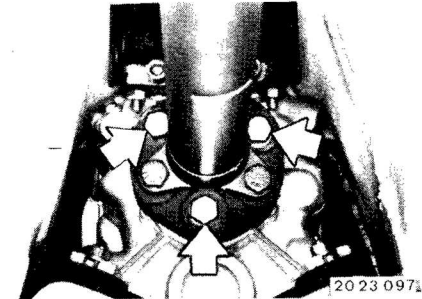
Important!
 Self-locking bolts – they will be hard to unscrew.

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

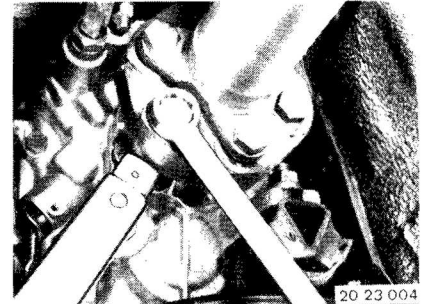
* See Specifications



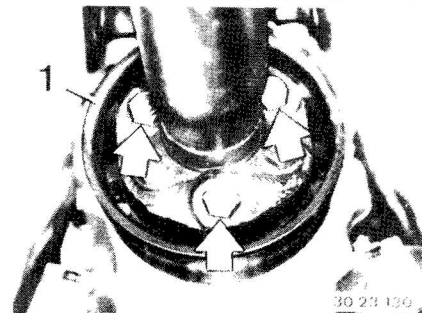
30 24 111



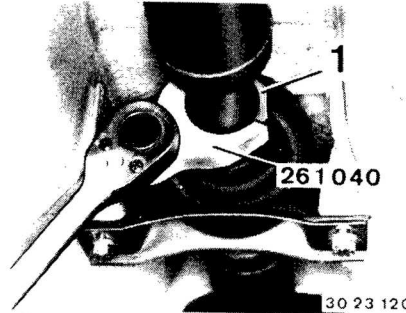
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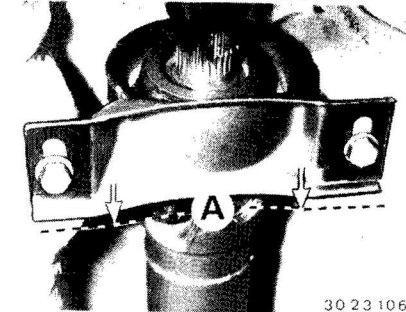
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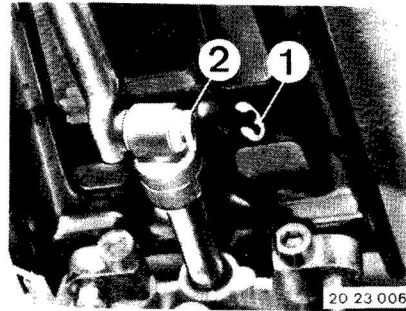
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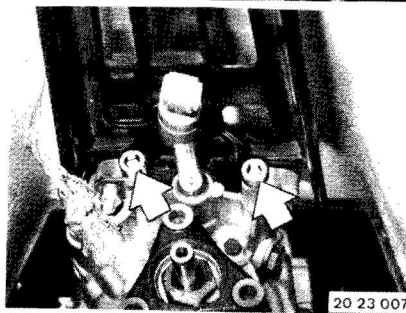
30 23 120



30 23 106

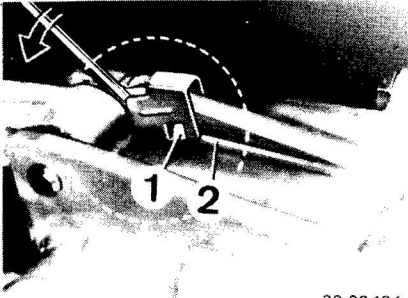


20 23 006



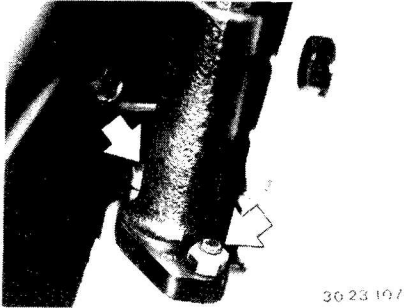
20 23 007

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



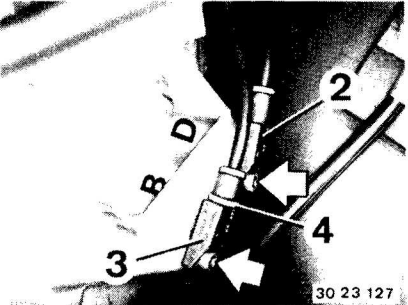
30 23 134

Unscrew clutch slave cylinder — pipe remains connected.
Installation:
 Bleeder screw faces down.



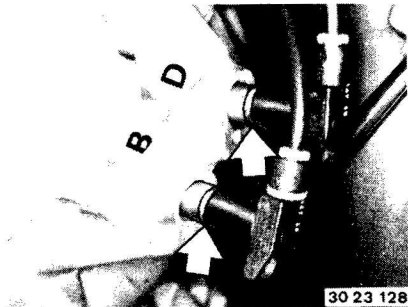
30 23 197

Unscrew heat shield.
 Unscrew bolts.
 Pull out speed sender (2) and reference mark sender (3).
Important! — Installation:
 Check installed position.
 Plugs must not be mixed up.
 Install speed sender (2) without ring in bore (D) and reference mark sender (3) with ring (4) in bore (B).
 Engine cannot be started, if plugs would be mixed up.



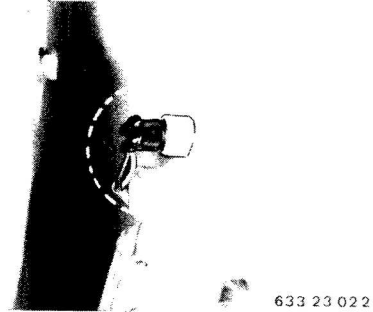
30 23 127

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



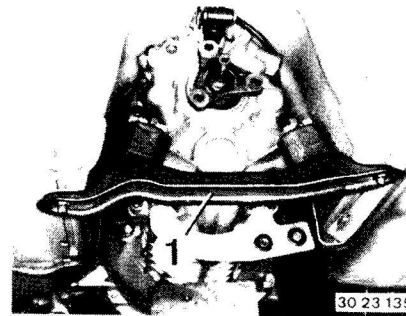
30 23 128

Installation:
 Pull off wires on reverse gear switch and lift wire harness out of holders.



633 23 022

Support transmission from underneath.
 Remove cross member (1).
 Lower transmission to the front axle carrier.



30 23 135

Unscrew transmission on engine.
 Unscrew Torx bolts with a Torx socket**.
 Remove transmission toward rear.
Important! — Installation:
 Washers must be used with Torx bolts to avoid increasing the breaking-loose torque.
 Tightening torque*.
 Give splines and guide pins a light coat of Microlube GL 261** prior to installation of the transmission.
 Check oil level.



633 23 023

* See Specifications
 ** Source of Supply: HWB

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.

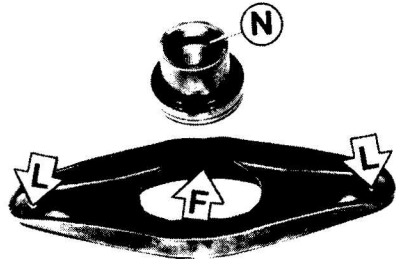
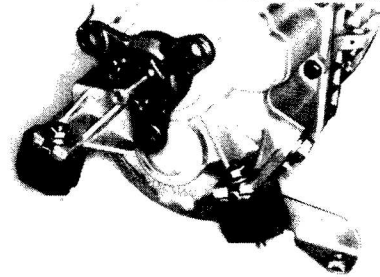
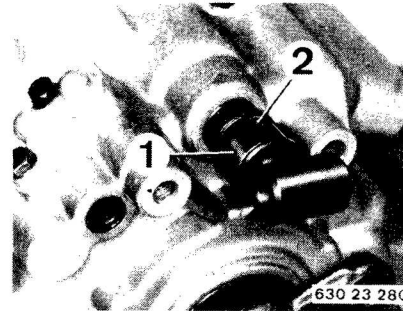
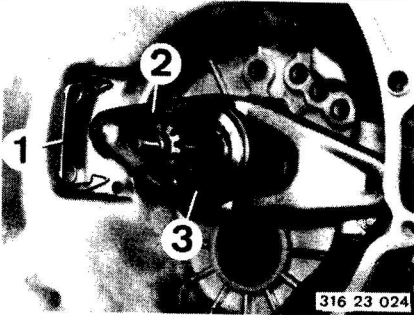
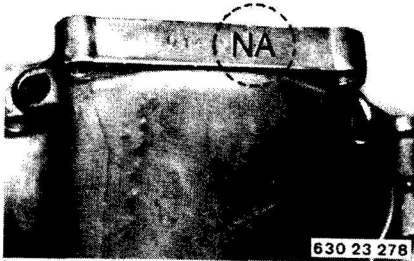
Installation:
Fill lubricating groove (N) with Molykote Longterm 2.
Coat guides (F) and bearings (L) lightly with Molykote Longterm 2.
Non-conformance could cause seizure of bearing on the guide sleeve.

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.

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.



316 23 025

630 23 281

* See Parts Microfiche
** Source of Supply: HWB

23 11 013 REMOVING AND INSTALLING OR SEALING TRANSMISSION CASE FRONT SECTION

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

Remove guide sleeve — see 23 11 623.
Unscrew backup light switch.
Remove cap (1).
Pull out spring (2) and lockpin (3).
Check installed position!

Remove snap ring (4).
Remove washer (5).
Installation:
Always replace snap ring.

Unscrew bolt (6).
Installation:
Install bolt with a bolt cement**.
Tightening torque*.

* See Specifications
** Source of Supply: HWB

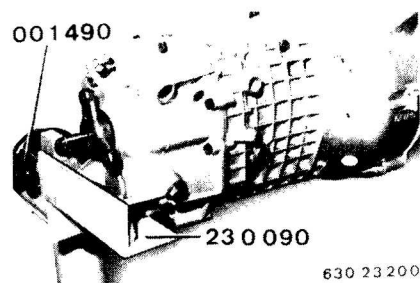
Drive out cylindrical pins.
Unscrew bolts.
Installation:
Check length of bolts.
Bolt (1) = 8 x 60 mm.

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

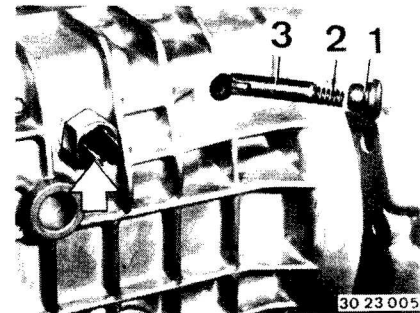
Install roller bearing on layshaft that small diameter end faces up.
Note:
Coat rollers with grease and press in, in order to avoid clamping of rollers while mounting the front case section.

Coat case front section with a surface sealing compound** in area of the reverse gear shaft.
Surface must be cleaned thoroughly and dried of oil.

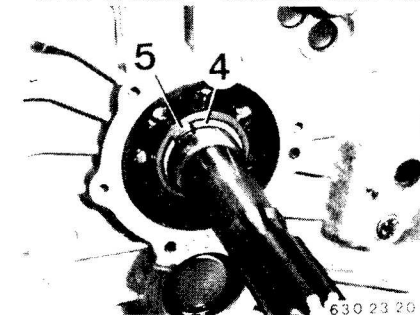
** Source of Supply: HWB



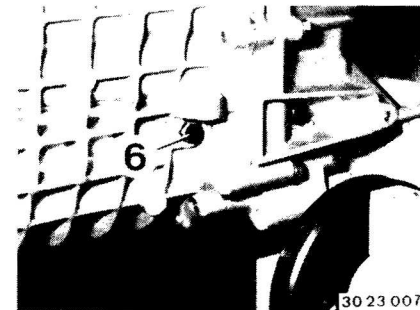
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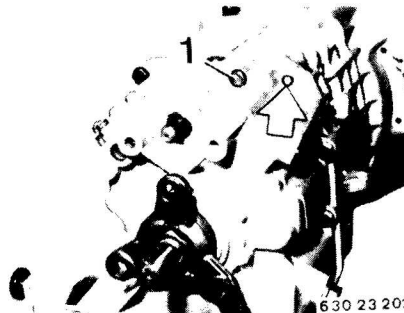
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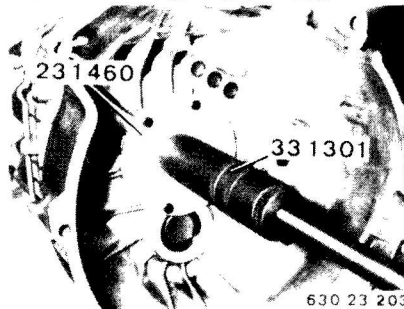
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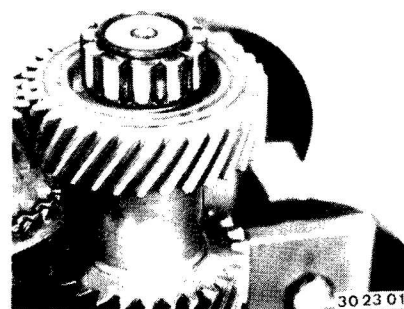
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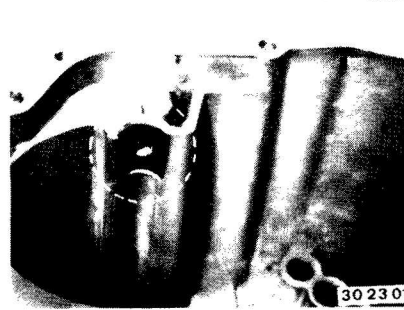
630 23 202



630 23 203



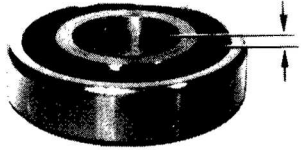
30 23 010



30 23 011

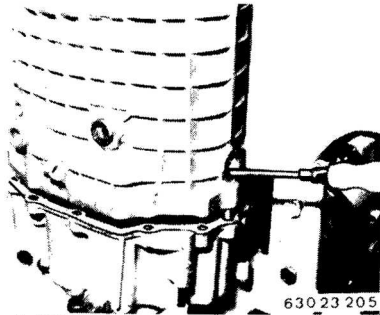
23-170

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



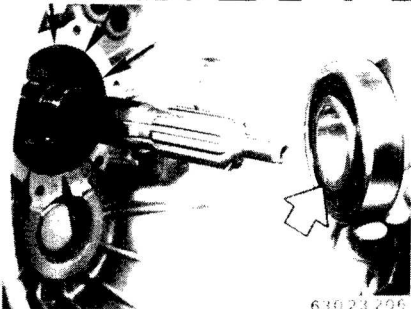
630 23 204

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.



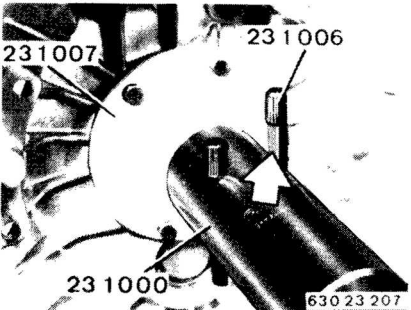
630 23 205

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.



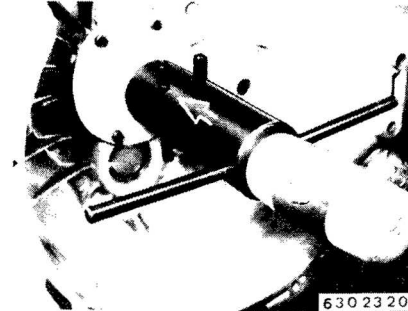
630 23 206

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

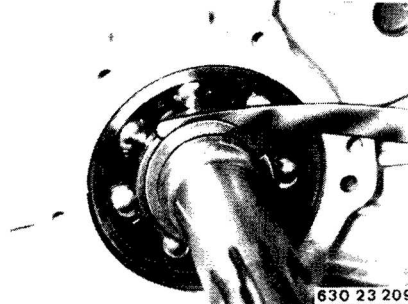
* See Specifications
 ** Source: HWB



630 23 208

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

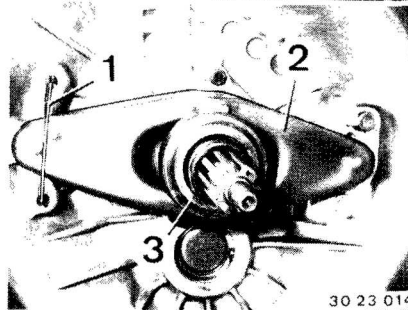
Install spacer and circlip.
 Adjust play between bearing inner race and circlip to 0 ... 0.09 mm (0 ... 0.0035").



630 23 209

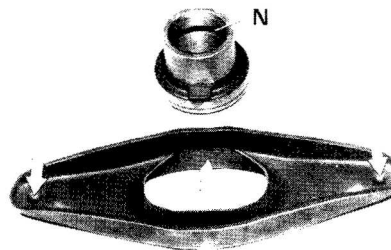
23 11 623 REMOVING AND INSTALLING GUIDE SLEEVE FOR CLUTCH RELEASE — TRANSMISSION REMOVED —

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

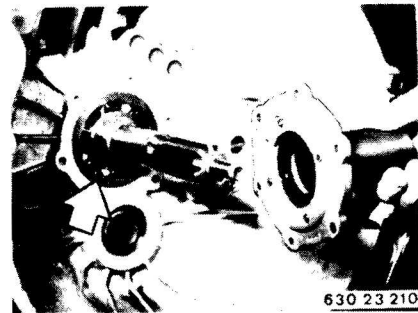


30 23 014

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



Unscrew guide sleeve.

Important!

Spacer.

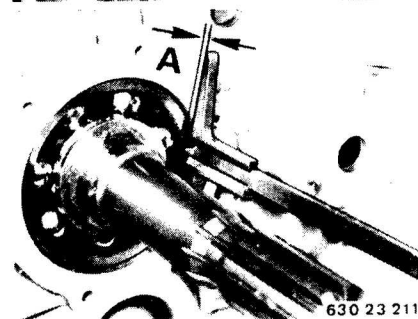
Installation:

Mount guide sleeve in such a manner, that oil groove (1) is aligned with oil bore (2) in the transmission case, or that arrow on face points to middle of layshaft.

Install guide sleeve and bolts with a surface sealing compound**.

Sealing surface and bolts must be cleaned thoroughly and dried of oil.

Tightening torque*.

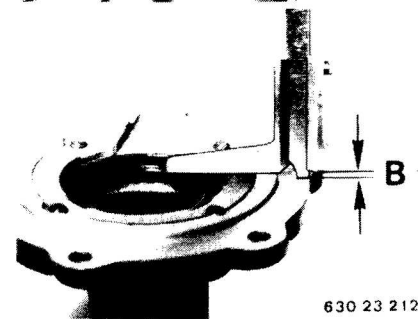


Installation:

Adjust play to 0 ... 0.09 mm (0 to 0.0035").

Determine thickness of spacer.

Measure distance (A).



Measure distance (B).

Example:

A 3.0 mm (0.118")

– B 2.6 mm (0.102")

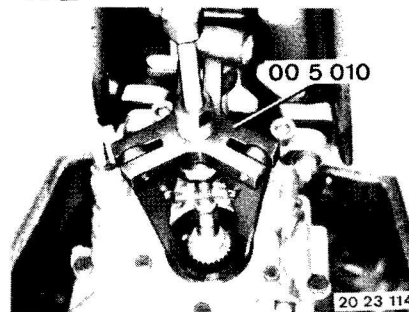
0.4 mm (0.016") spacer thickness

* See Specifications

** Source of Supply: HWB

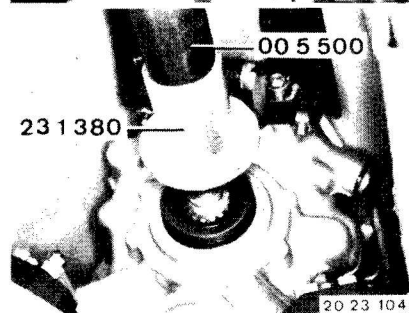
23 12 053 REPLACING RADIAL OIL SEAL FOR OUTPUT FLANGE

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



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

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*.



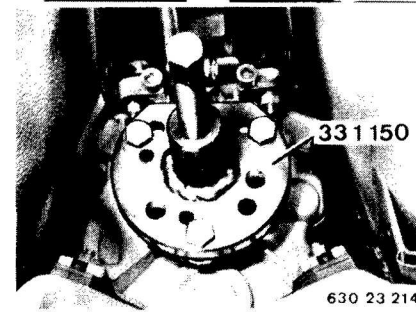
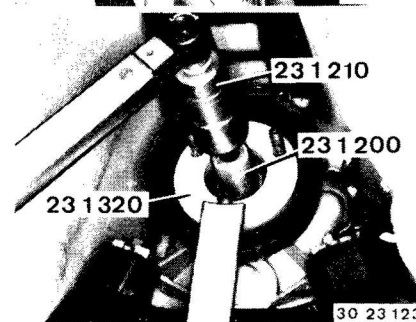
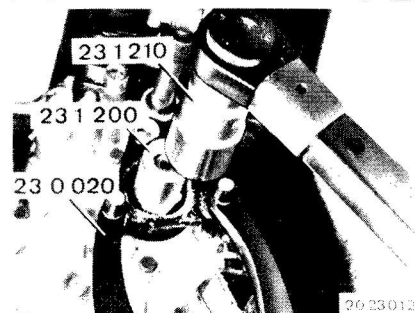
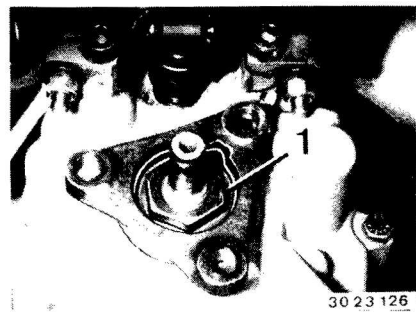
Lift out radial oil seal.
 Drive in radial oil seal with Special Tools 23 1 380 and 00 5 500.
Installation:
 Lubricate sealing lips with oil.
 Bolt on output flange to specified tightening torque*.
 Install collar nut with a bolt cement**.

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

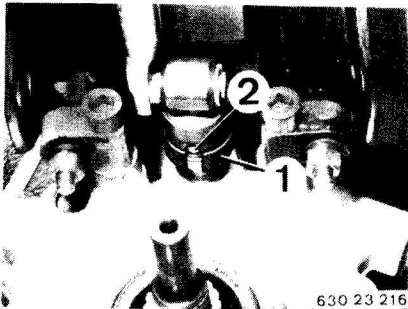
* See Specifications
 ** Source of Supply: HWB



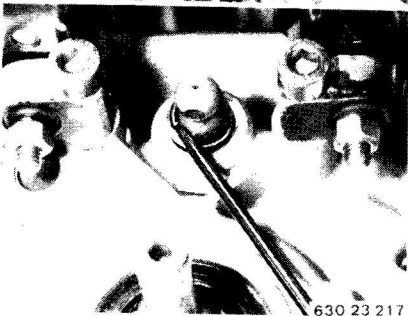
23-173

23 12 083 REPLACING RADIAL OIL SEAL FOR SELECTOR SHAFT

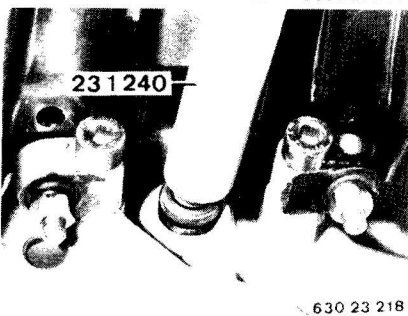
Unscrew propeller shaft — see 23 00 022.
Engage 3rd gear.
Push locking sleeve (1) aside and drive out pin (2).



Lift out radial oil seal.



Lubricate sealing lips 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

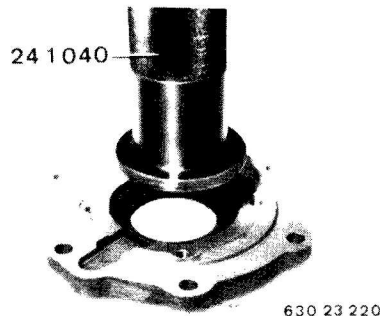
— Transmission Removed

Remove guide sleeve — see 23 11 623.
Unscrew guide tube.

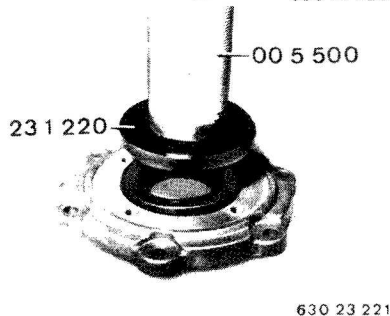
Installation:
Install guide tube and bolts with a surface sealing compound**.
Sealing surface and bolts must be cleaned thoroughly and dried of oil.
Tightening torque*.



Important!
Collar on inside surface of flange.
Drive out radial oil seal in direction of guide tube with Special Tool 24 1 040.



Drive in radial oil seal with Special Tools 23 1 220 and 00 5 500.
Lubricate sealing lips of radial oil seal with oil.



* See Specifications
** Source of Supply: HWB

23-173a

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.

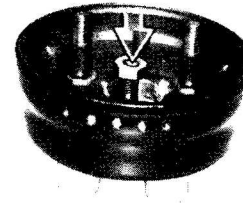
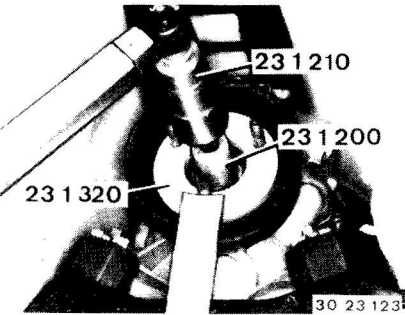
Unscrew collar nut with Special Tool 23 1 210.

Installation:

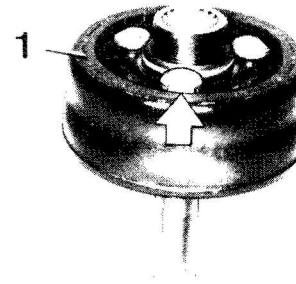
Tightening torque*.

Install collar nut with a bolt cement, Loctite No. 270.

Screw on nuts to avoid damaging the threads. Press out staybolts. Take off vibration damper.



30 23 132



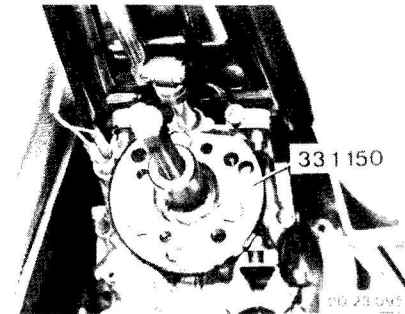
30 23 133

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.

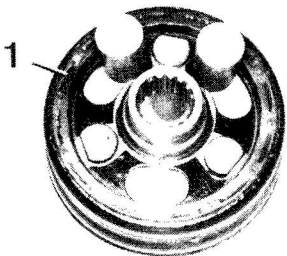


Pull off output flange with Special Tool 33 1 150.

Vibration damper (1) is mounted on the output flange with three staybolts.

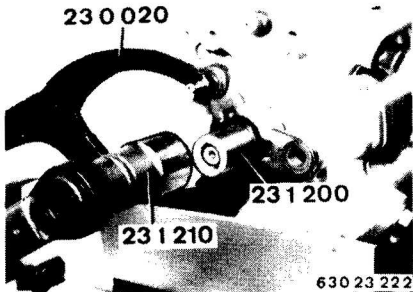
Press staybolts out of output flange.

Apply a suitable piece of round iron bar on both sides.



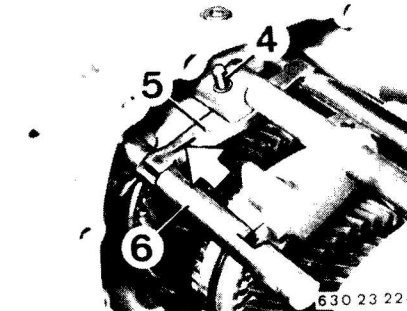
30 23 131

* See Specifications

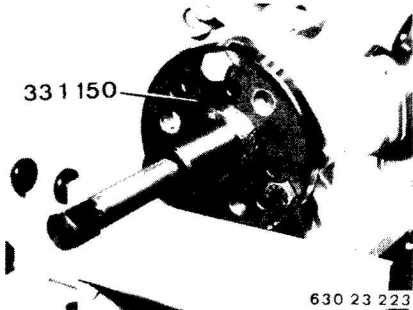


23 21 503 REMOVING AND INSTALLING INPUT AND OUTPUT SHAFT ASSEMBLY
—TRANSMISSION REMOVED—

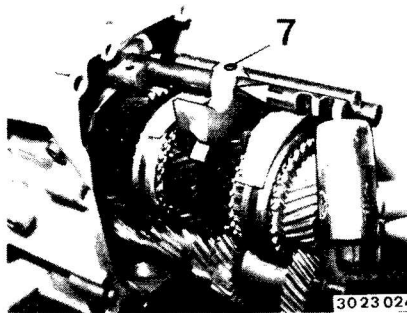
Remove transmission case front section 23 11 013.
 Remove lockplate.
 Apply Special Tool 23 1 200.
 Hold output flange with Special Tool 23 0 020.
 Version with Vibration Damper:
 Hold output flange with Special Tool 23 1 320.
 Unscrew collar nut with Special Tool 23 1 210.



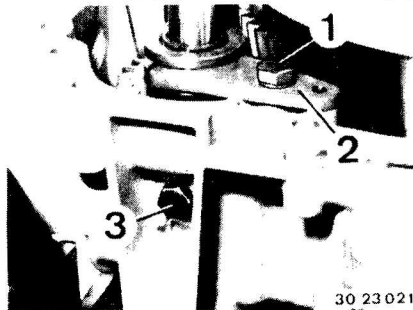
Pull out pin (4) for operating lever (5).
 Pull out selector rail (6).
 Remove operating lever (5).
Installation:
 Install operating lever that notch faces up and in direction of selector rail.



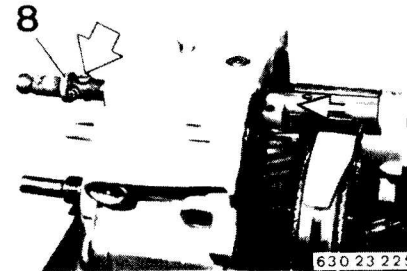
Pull off output flange with Special Tool 33 1 150.



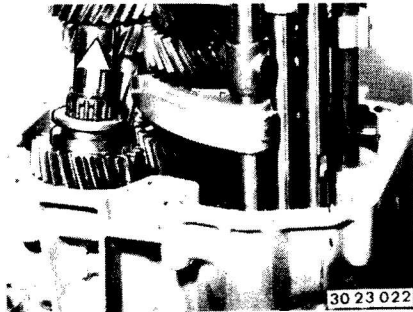
Engage 4th gear.
 Drive in pin (7), while counterholding.
Important!
 Only drive in pin (7) far enough that selector shaft can be pulled back and out.



Unscrew bolt (1).
 Remove holder (2).
 Unscrew bolt (3).



Radial oil seal (8) will also be pulled out.
Important!
 Rollers on selector shaft.
Installation:
 Replace radial oil seal.
 Remove selector arm.

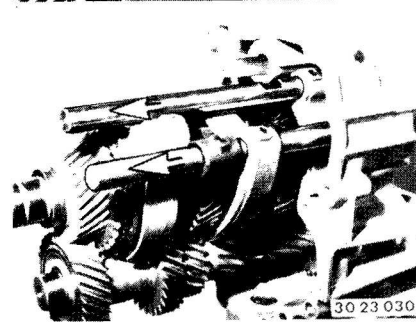
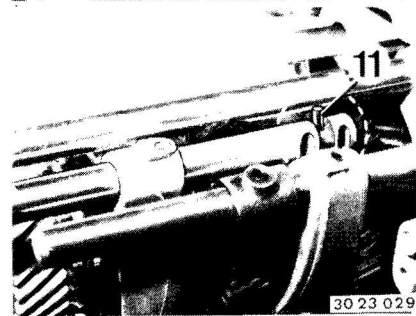
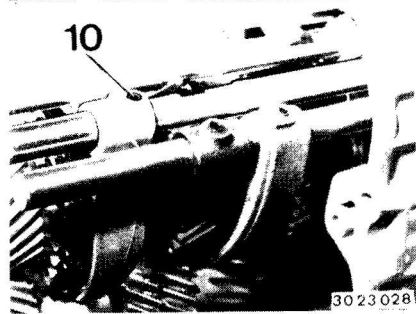
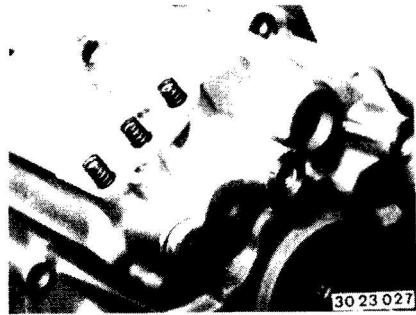


Remove shaft with reverse gear and needle bearing.



Unscrew end plate.
Installation:
 Install end plate with Loctite No. 573
 Sealing surface must be thoroughly clean and dried of oil.
 Remove plug (9).
Installation:
 Replace plug.

Remove three springs.

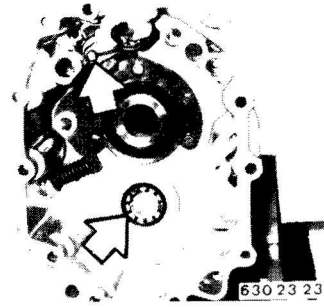
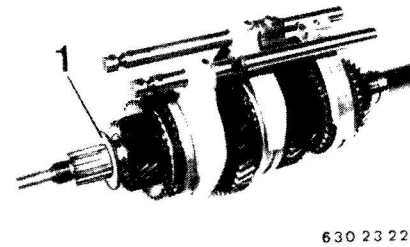
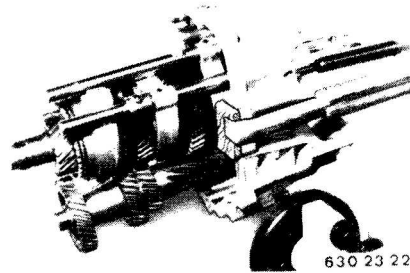
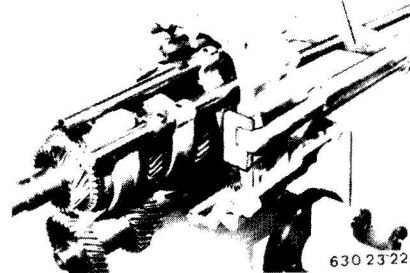


Drive out pin (10) in 3rd/4th gear selector fork.
Installation:
Replace pin.

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.

23 1050



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).

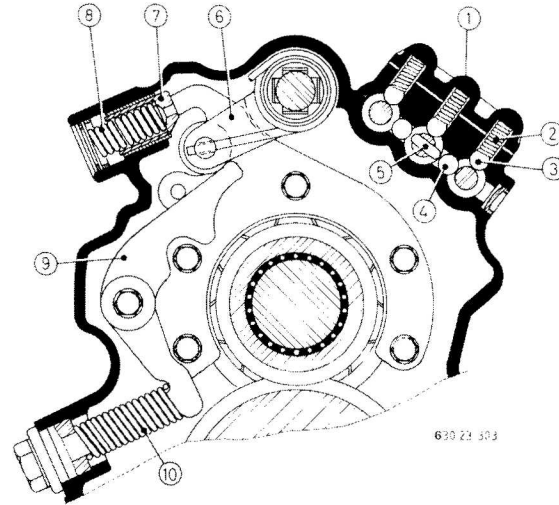
Remove all detent and locking balls in case rear section.

Install roller bearings with large diameter end facing out.

Lubricate lockpin and locking lever with oil.

Heat grooved ball bearing inner race in case rear section to approx. 80° C (175° F) with a hot air blower.
 Second and reverse gears are engaged.
 Insert input shaft, output shaft and layshaft in case rear section.
 Align selector rods.

- Arrest Assembly:
- 1 End cap
 - 2 Spring
 - 3 Locking ball
 - 4 Detent ball
 - 5 Lockpin
 - 6 Selector arm
 - 7 Lockpin
 - 8 Spring
 - 9 Locking lever
 - 10 Spring



630 23 303

Pull input shaft, output shaft and layshaft into case rear section with Special Tools 23 1 300 and 23 2 150.

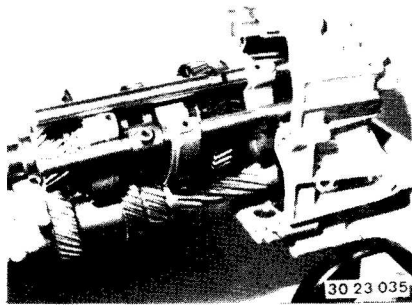
Important!
 Make sure selector rods and layshaft are not clamped while pulling in parts.

Move selector rods to neutral position.
 Slide 3rd/4th gear selector rod through selector forks.
 Install lockpin (1) in selector rod with grease.
 Push in selector rod up to bore.
 Opening in selector rod faces up.

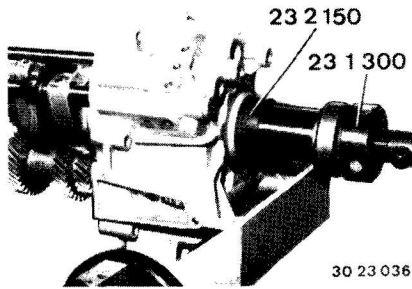
Drive 6 x 26 mm pin into 3rd/4th gear selector fork (counterhold).

Install two detent balls with grease.
 Push in 3rd/4th gear selector rod against lock.

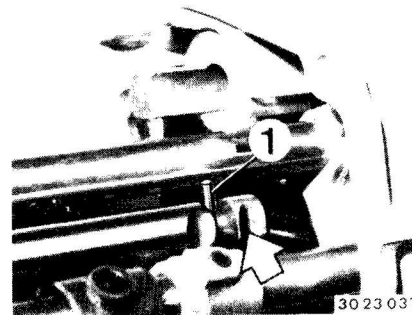
Insert three locking balls and three springs.
Important!
 Version with Different Length Springs:
 Install short spring (1) with a relaxed length (A) of 15.9 mm (0.626") to face 5th/reverse gear selector rod.



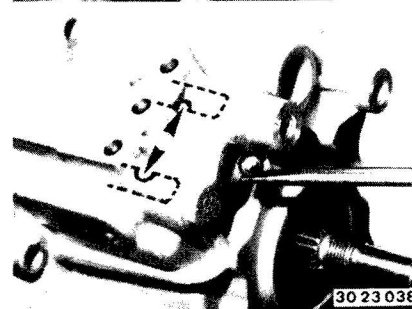
30 23 035



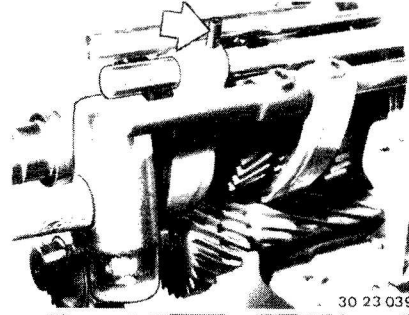
30 23 036



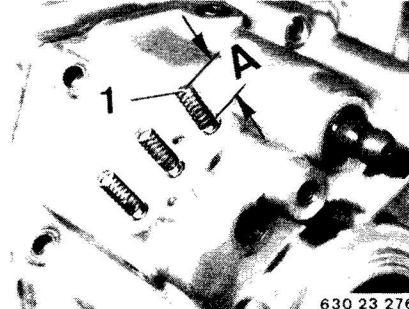
30 23 037



30 23 038

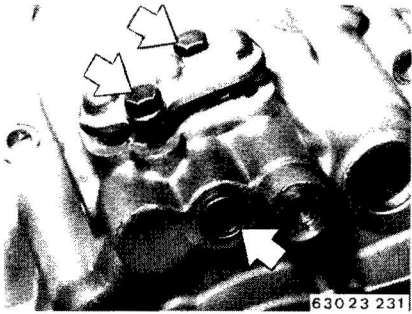


30 23 039



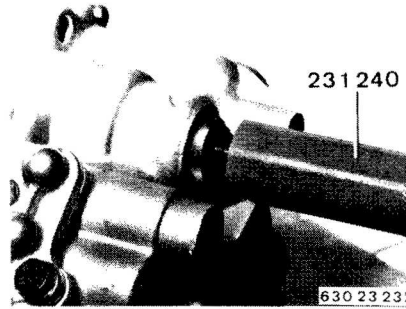
630 23 276

23-177

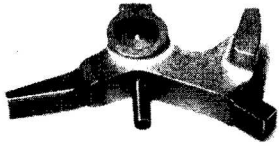


Install end cap after coating with Loctite No. 573*.

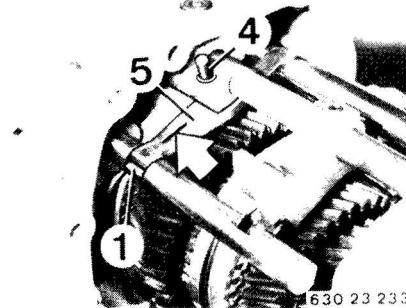
Install end cover with Loctite No. 573



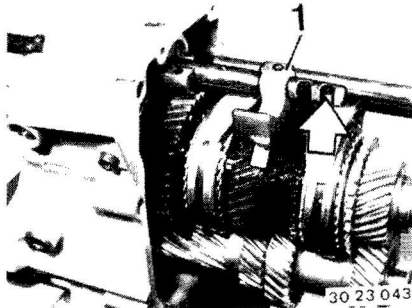
Lubricate sealing lips of radial oil seal with oil.
Drive in radial oil seal with Special Tool 23 1 240.



Drive pin out of selector arm.



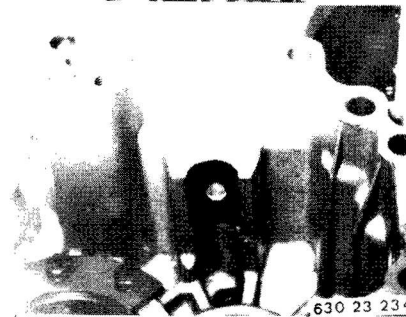
Install selector rail.
Groove (1) in selector rail faces up.
Install operating lever (5) with notch facing up and toward selector rail.
Install pin (4).



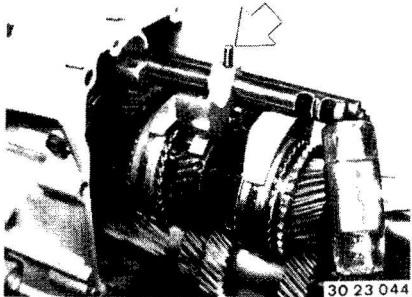
Hold four rollers in position with grease.
Slide in selector shaft and install selector arm (1) at same time.

Important!

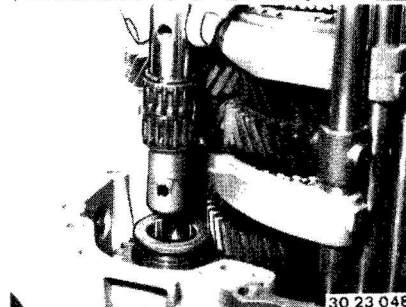
Opening in selector shaft faces out.



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

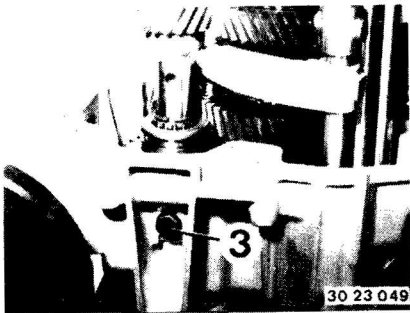


Drive in 6 x 26 mm pin (counterhold).

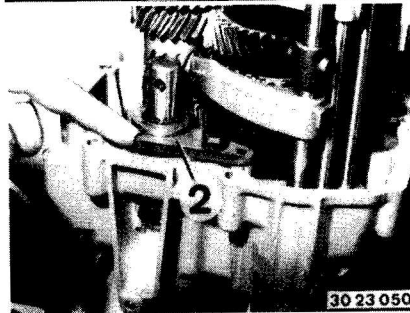


Install shaft with needle bearing and reverse gear.

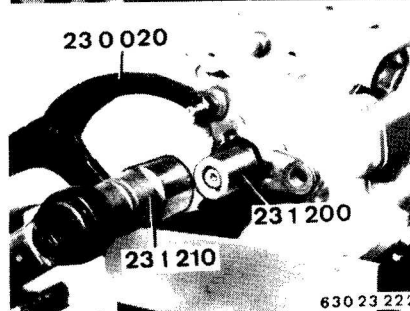
Mount shaft with bolt (3).
Install bolt with a bolt cement**.



Insert holder (2), press out and secure in this position.



Install output flange.
Install collar nut with a bolt cement**.
Apply Special Tool 23 1 200.
Hold output flange with Special Tool 23 0 020.
Tighten collar nut with Special Tool 23 1 210.
Version with Vibration Damper:
Hold output flange with Special Tool 23 1 320.
Tightening torque*.



Install and lock lockplate.



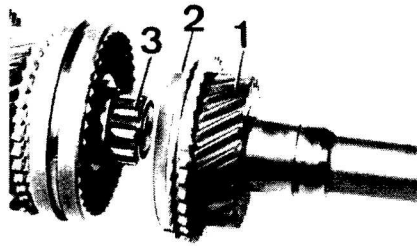
* See Specifications
** Source: HWB

23 21 554 REPLACING OUTPUT SHAFT — Output Shaft Removed —

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

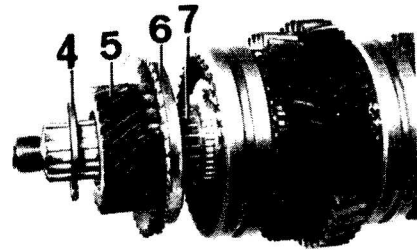
Note:

It is recommended to mark synchronmesh rings for a pertinent gear wheel when disassembling the output shaft, in order to avoid mixing up synchronmesh rings.



630 23 236

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

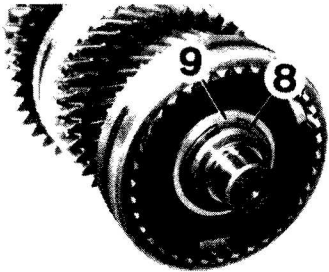


630 23 237

Lift out circlip (8).
Remove spacer (9).

Installation:

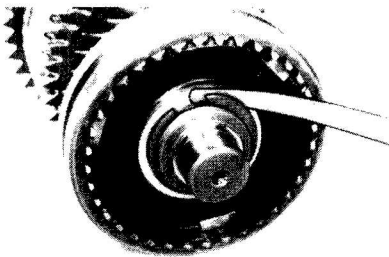
Always replace circlip.



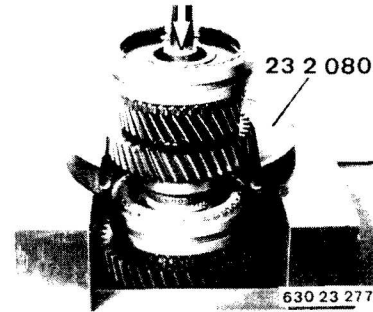
630 23 238

Installation:

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



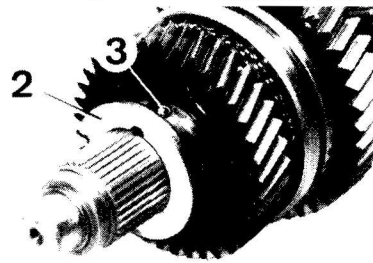
630 23 239



630 23 277

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

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

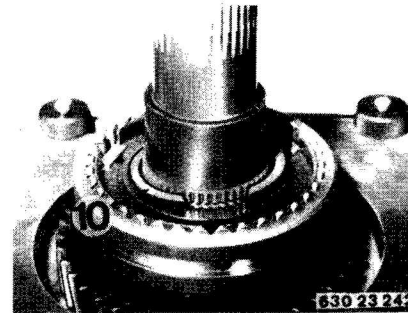


630 23 291

Important!
Snap ring (10) must be removed before pressing off 1st gear.

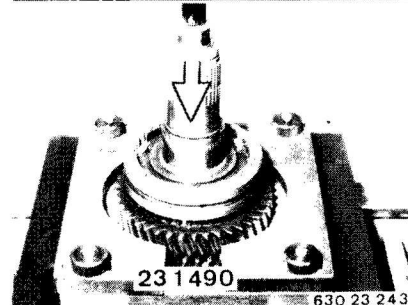
Installation:

Always replace snap ring.



630 23 242

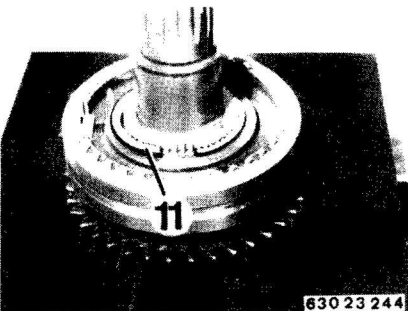
Press off 1st gear with guide sleeve and sliding sleeve with Special Tool 23 1 490.
Remove needle bearing.
Pressing-off force*.



630 23 243

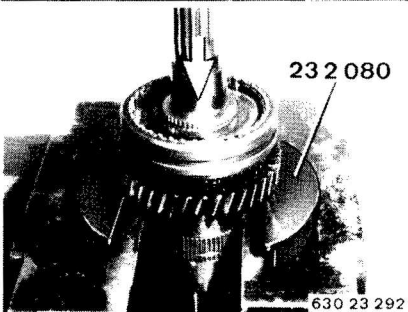
* See Specifications

Important!
Circlip (11) must be removed before pressing off reverse gear.
Installation:
Always replace circlip.



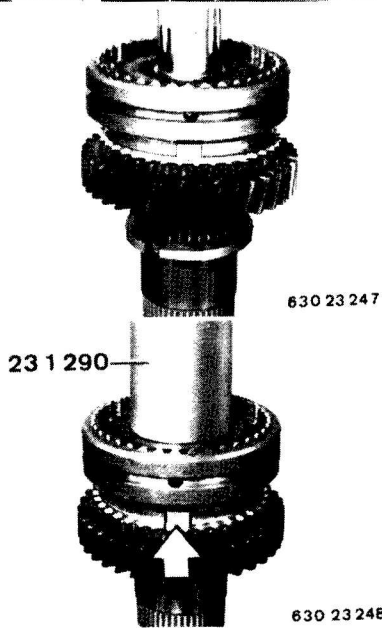
630 23 244

Press off guide sleeve with operating sleeve and reverse gear with Special Tool 23 2 080 that the bottom faces the gear wheel. Remove needle bearing. Pressing-off force*.



630 23 292

Assembling:
Install needle bearing, reverse gear and brass synchromesh ring with molybdenum coat. Place guide sleeve and sliding sleeve on splines of output shaft. Since 5.85: Stepped end of operating sleeve must face the reverse gear.



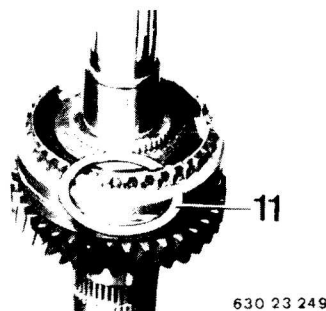
630 23 247

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

630 23 248

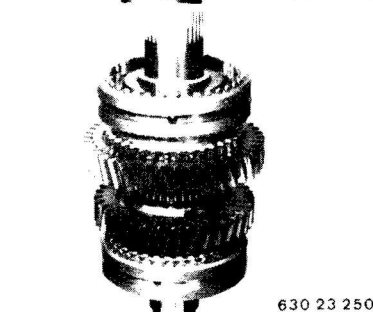
* See Specifications

Move operating sleeve in direction of reverse gear. Adjust guide sleeve with circlip (11) to take up all play. Circlips are available from Parts in different thicknesses from 1.7 to 2.0 mm (0.067 to 0.079"). Install circlip (11).



630 23 249

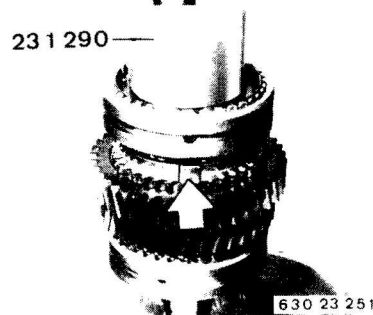
Install needle bearing, 1st gear and nickle plated synchromesh ring. Place guide sleeve and operating sleeve on splines of output shaft. Since 5.85: Stepped end of operating sleeve must face the first gear wheel.



630 23 250

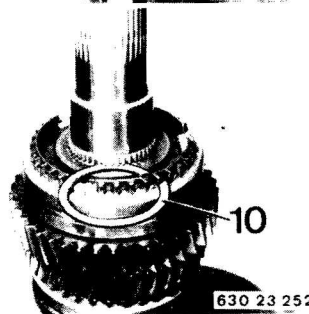
Press on guide sleeve to fit tight with Special Tool 23 1 290. Pressing-on force*.

Important!
When pressing on parts, make sure that tabs on synchromesh ring are aligned with openings in guide sleeve.



630 23 251

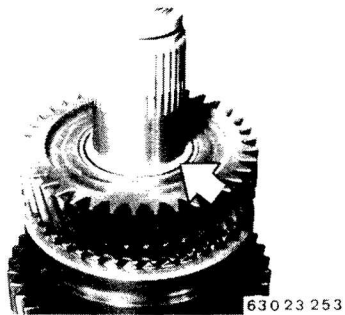
Move sliding sleeve in direction of 1st gear. Adjust guide sleeve to take up all play. Circlips are available from Parts in different thicknesses from 1.7 to 2.0 mm (0.067 to 0.079"). Install circlip (10).



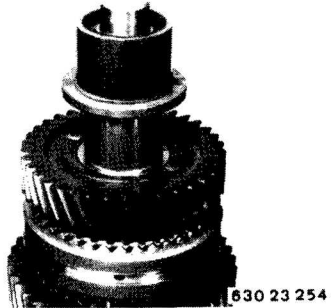
630 23 252

* See Specifications

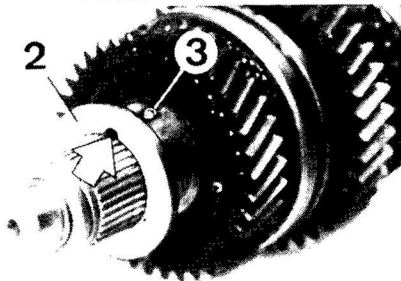
23-181



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

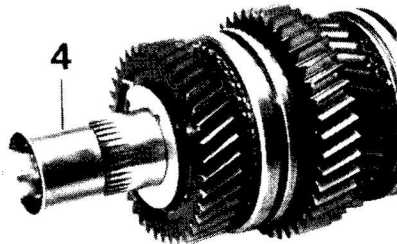


Heat bearing sleeve to approx. 80° C (175° F) with a hot air blower and install on output shaft.



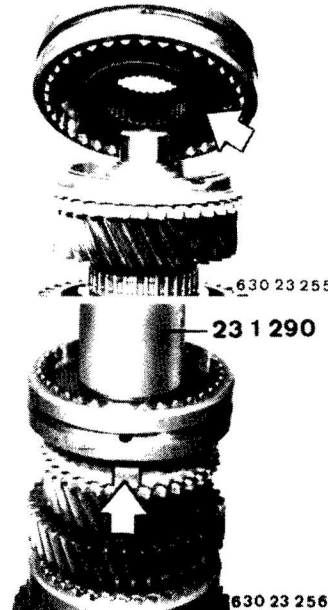
Version with Thrust Washer:
Install ball (3) and thrust washer (2) with opening facing ball (3).

630 23 293



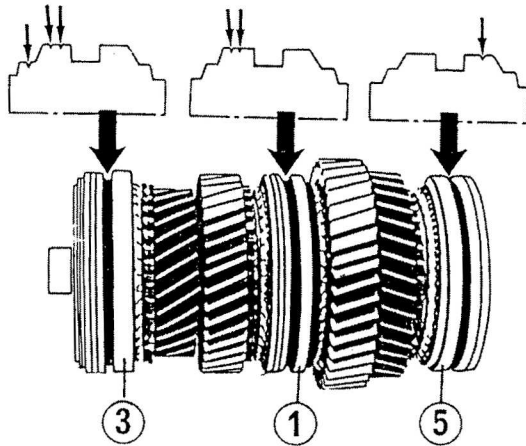
Heat bearing sleeve (4) without collar to approx. 80° C (175° F) with a hot air blower and install on output shaft.

630 23 294

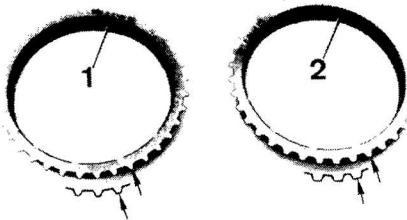


Install needle bearing, 3rd gear and brass synchronmesh ring.
Place guide sleeve and operating sleeve on splines with long collar facing 3rd gear.
Since 5.85:
Stepped end of operating sleeve must face the 3rd gear wheel.

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



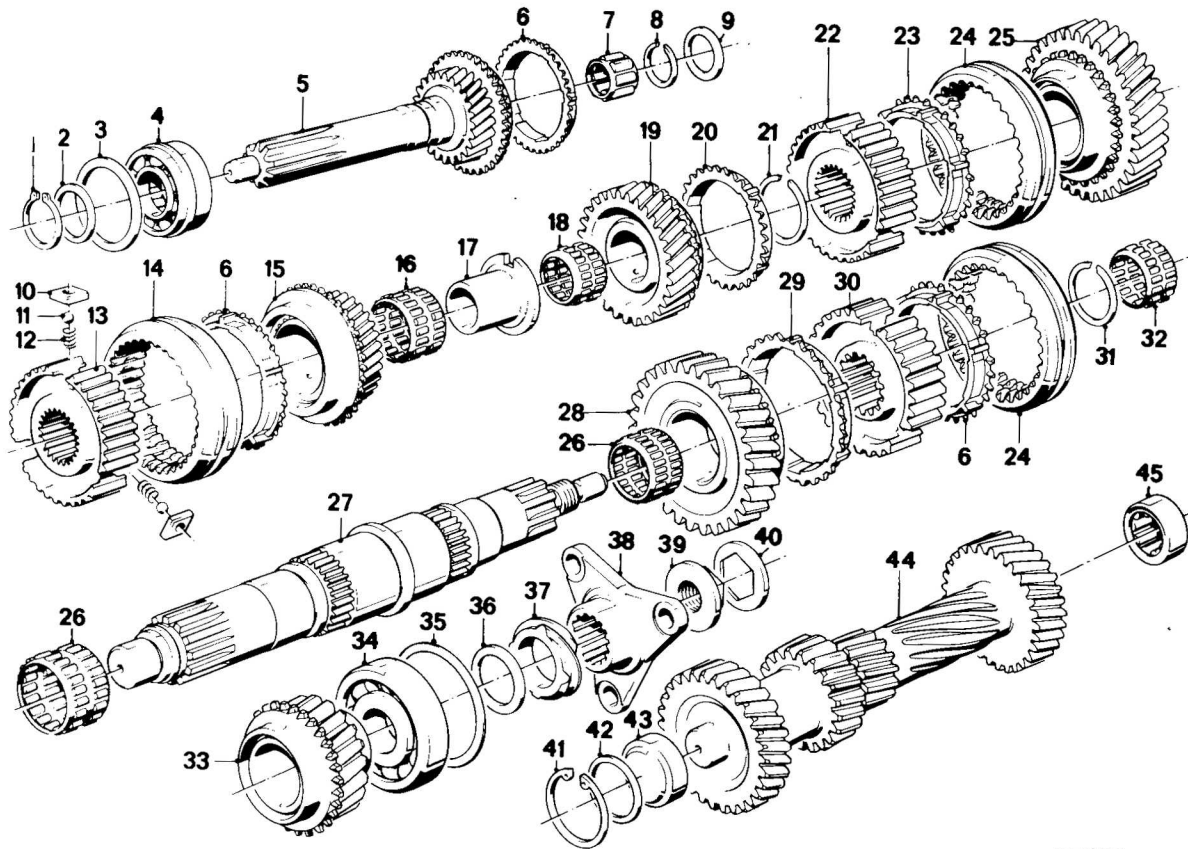
630 23 312



630 23 305

Transmission 260/5:*Note:***Modified synchronization since 5.85.****New gear wheels, synchronesh rings, guide and operating sleeves, slides, balls and springs.****Operating sleeves have grooves for identification (check installed position).****Operating sleeves are machined asymmetrically.****Operating sleeve (1) with Two Grooves:****Installed with shouldered end facing 1st gear or grooves facing 2nd gear.****Operating sleeve (3) with Three Grooves:****Installed with shouldered end facing 3rd gear or grooves facing 4th gear.****Operating Sleeve (5) with One Groove:****Installed with shouldered end facing reverse gear or groove facing 5th gear.****Identification of Synchronesh Rings:****Check the identification or tooth width to avoid mixing up synchronesh rings.****1st/Reverse Gear Synchronesh Ring (1):****Drawing No. 011.8.0241.00 engraved.****Narrow teeth.****2nd to 5th Gear Synchronesh Ring (2):****Drawing No. 011.8.0161.00 engraved.****Wide teeth.***Important!***Modified shift parts can not be installed in transmissions manufactured before 5.85 (hard operation).**

Layout Drawing of Gear Set with Bearings:



30 23 100

- 1 Circlip
- 2 Spacer
- 3 Spacer
- 4 Bearing
- 5 Input shaft with 4th gear
- 6 Synchronesh 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 Synchronesh ring
- 21 Circlip
- 22 Guide sleeve
- 23 Synchronesh ring
- 24 Operating sleeve
- 25 1st gear
- 26 Needle bearing
- 27 Output shaft
- 28 Reverse gear
- 29 Synchronesh 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

23 21 703 REPLACING BEARINGS OF ALL TRANSMISSION SHAFTS

- Transmission Removed -

Remove input/output shaft assembly - see 23 21 503.

A) Input Shaft, Layshaft in Front Case Section

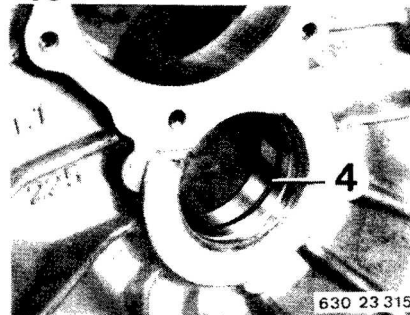
Input Shaft:
Drive out grooved ball bearing with Special Tools 23 1 480 and 00 5 500.

Installation:
See 23 11 013.

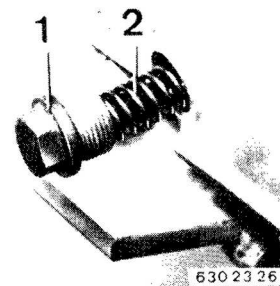
Layshaft:
Loosen circlip (1) with one knock from Special Tools 23 1 270 and 00 5 500.

Lift out circlip (2).
Remove spacer (3).

Drive out bearing shell with Special Tools 23 1 270 and 00 5 500.



Version with O-ring:
Lift out O-ring (4) with a feeler gage blade.
Replace it, install O-ring in groove and coat it with engine oil prior to installation of the bearing shell.



B) Output Shaft, Layshaft in Rear Case Section

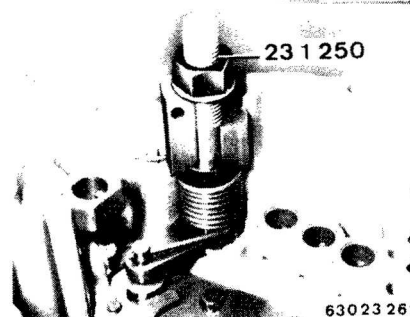
Output Shaft:
Unscrew bolt (1).

Caution!
Spring force.

Remove spring (2).

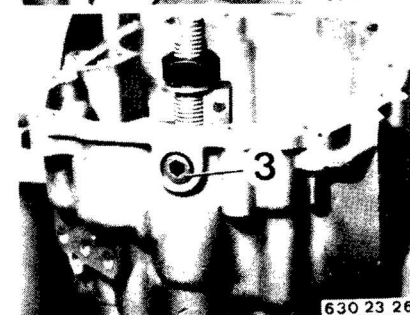
Installation:
Install bolt with a bolt cement**.

Install Special Tool 23 1 250 for removal of the selector arm.

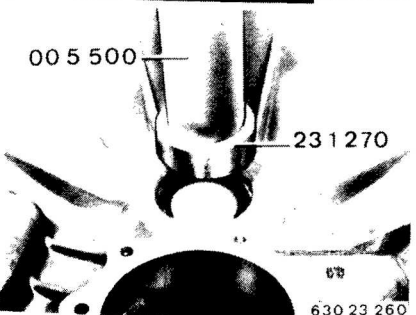
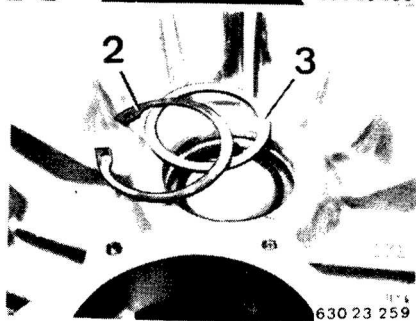
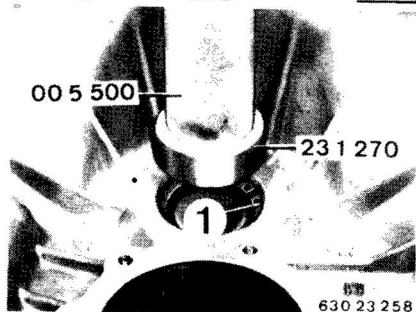
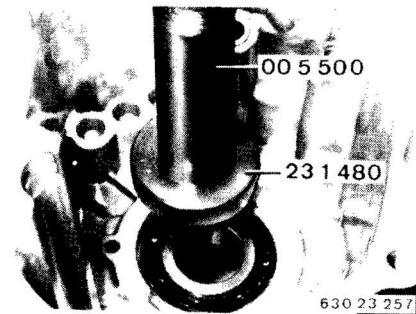


Remove socket head bolt (3).

Installation:
Install bolt with a bolt cement**. Tightening torque*.



* See Specifications
** Source of Supply: HWB



23-185

Remove selector arm from above.

Important!
Roller.

Installation:

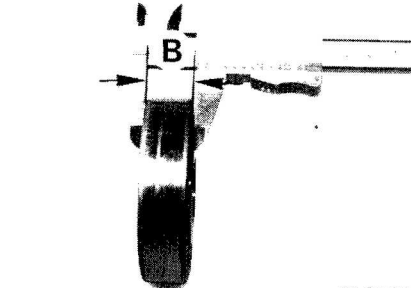
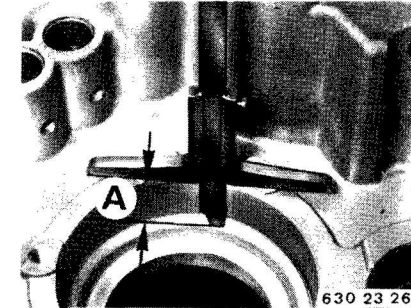
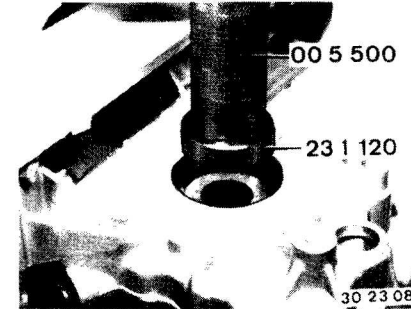
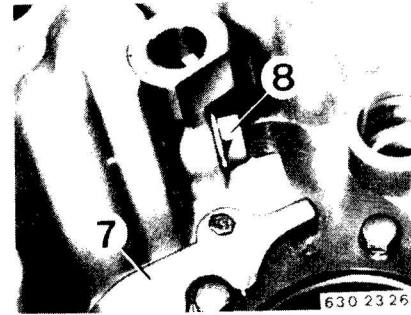
Insert selector arm with Special Tool 23 1 250.
Swing out selector arm with roller over locking lever (4).

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.

* See Specifications
** Source of Supply: HWB



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.

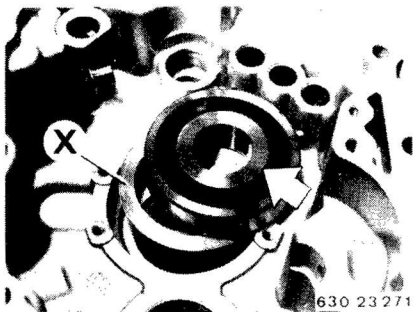
Important!
Shim X.

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

Measure distance (B).

Example:

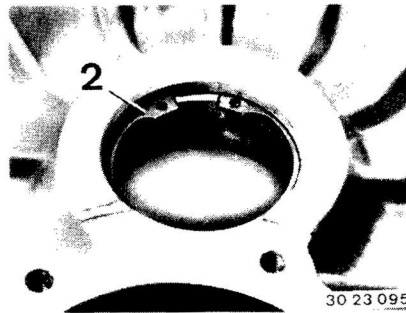
A	20.3 mm (0.799")
- B	20.0 mm (0.787")
X	0.3 mm (0.012") thick shim



630 23 271

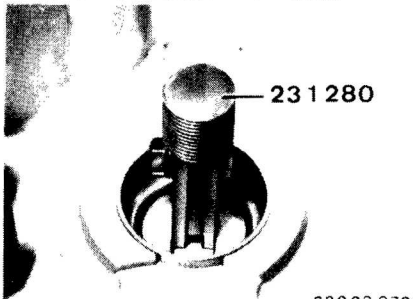
Heat rear case section in area of grooved ball bearing to about 80° C (175° F) with a hot air blower.
Install shim X.
Install grooved ball bearing.

Important!
Inner race of grooved ball bearing has protrusion.
Install bearing race that protrusion faces the gear set.
If necessary, drive in bearing against stop with Special Tool 23 1 470.



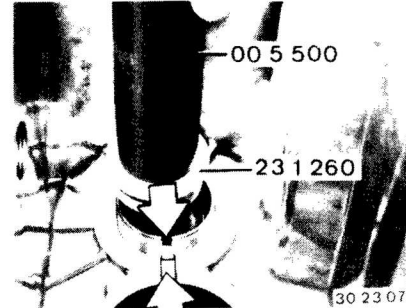
30 23 095

Check axial play of layshaft.
Install circlip (2).



630 23 272

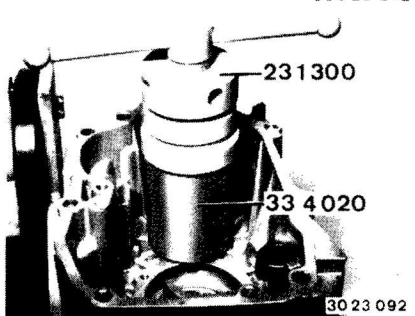
Layshaft:
Apply large end of Special Tool 23 1 280 in bearing shell.



30 23 078

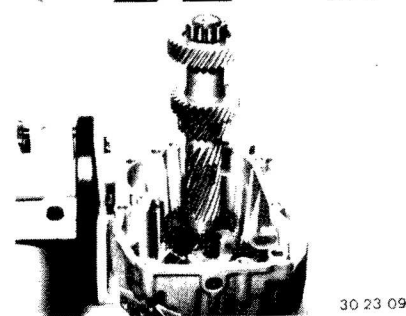
Install old shims.
Drive in bearing shell to fit tight in front case section with Special Tools 23 1 260 and 00 5 500.

Important!
Oil groove must be aligned with groove in case.



30 23 092

Apply Special Tool 33 4 020.
Screw on Special Tool 23 1 300.
Pull out bearing shell.



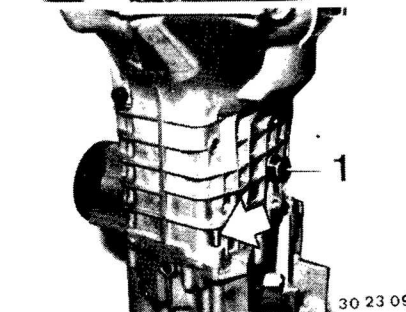
30 23 096

Place layshaft with roller bearings in rear case section.



630 23 273

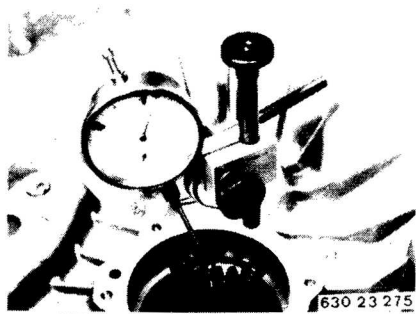
Drive in bearing shell with Special Tools 23 1 260 and 00 5 500.



30 23 097

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

Install holder with dial gage.
Tip of dial gage must bear on tooth of
layshaft.

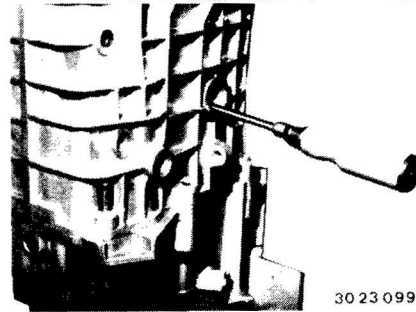


630 23 275

Check layshaft axial play through bore
for oil filler plug.

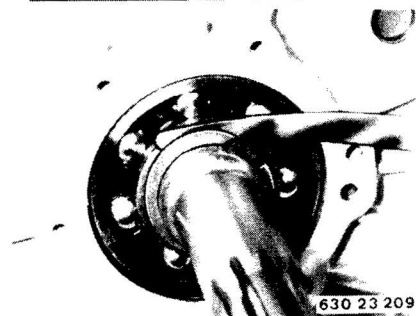
Axial play = 0.13 to 0.23 mm (0.005 to
0.009").

If correction is necessary, bearing shell
must be removed again and a shim of
different thickness installed.

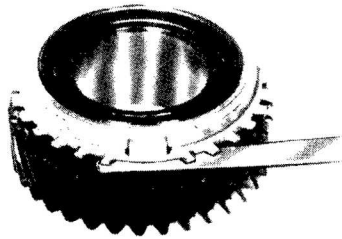


30 23 099

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.



630 23 209



30 23 101

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

Disassemble output shaft - 23 21 554.
Synchronesh Ring for 3rd/4th Gears: brass
Synchronesh Ring for 1st/2nd Gears: brass, hard nickle plated
Synchronesh Ring for Reverse Gear: brass, molybdenum coated

Note:
Only use molybdenum-coated synchronesh rings for repairs.

Check distance* between synchronesh ring and clutch body.
Measure in area of stops.

Important!
Synchronesh ring must be pressed on slightly for measuring.
Synchronesh rings must have uniform contact on entire surface.

Disassemble synchronizer.
Thrust piece (1), spring (2) and ball (3).

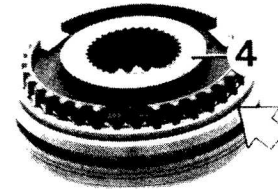
Installation:
Bore (4) in operating sleeve must be aligned with ball (3).

Install all springs, thrust pieces and balls.

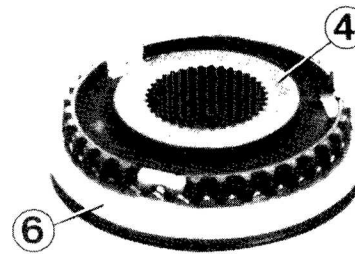
Important!
Stepped end of thrust pieces faces the operating sleeve.

Insert guide sleeve in operating sleeve half the distance. Press in balls far enough that the guide sleeve can be pressed into the operating sleeve.

* See Specifications



630 23 283

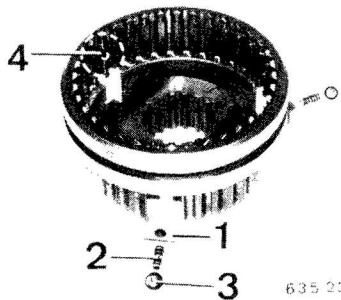


630 23 309

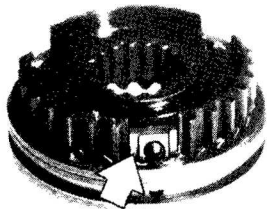
Modified synchronization since 5.85 - operating sleeves with asymmetric teeth.
Thrust pieces (1), springs (2) and balls (3) in weaker version.

Installation:
The bevelled sides of the thrust pieces must face the operating sleeve.
In case of the 3rd/4th gear guide sleeve, make sure that the operating sleeve with the stepped end faces the long collar (4) of the guide sleeve.

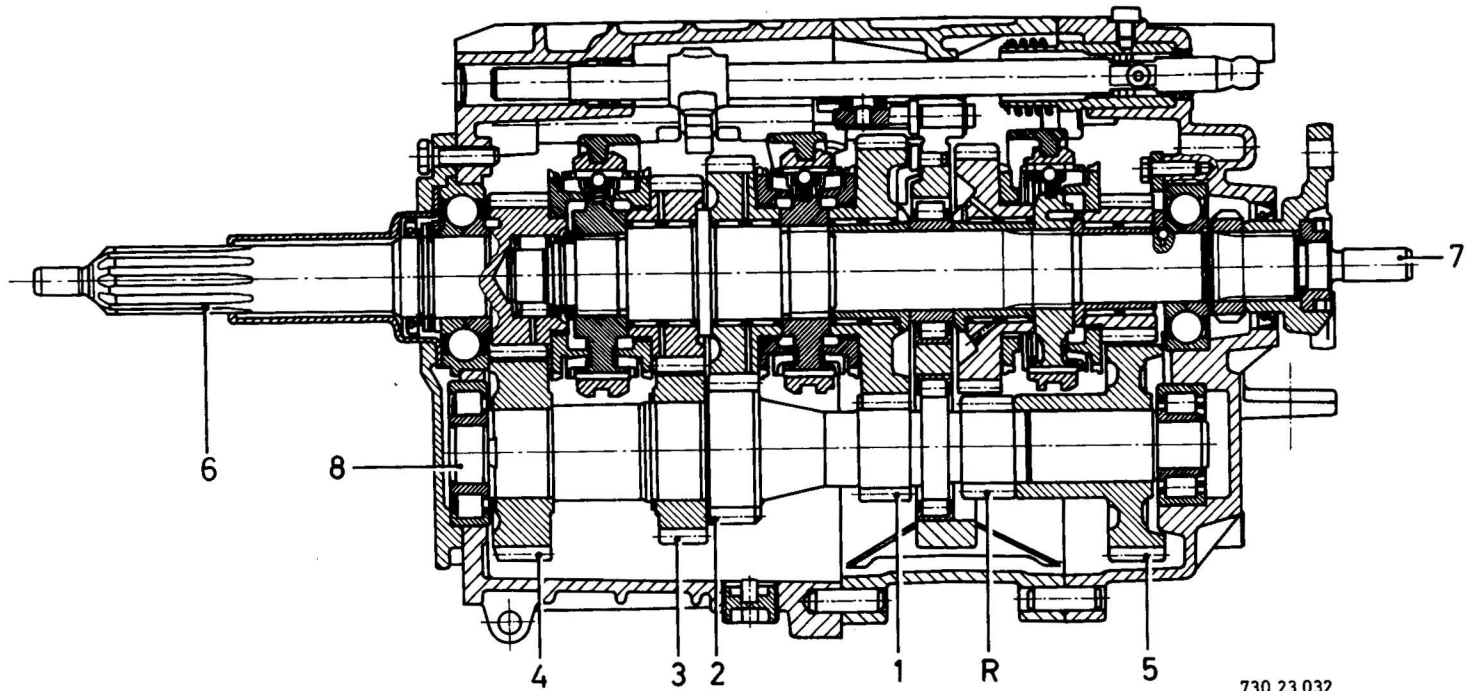
Version with Offcenter Groove for Selector Fork:
Wide land (6) of operating sleeve must face long collar (4) of the guide sleeve.



635 23 137



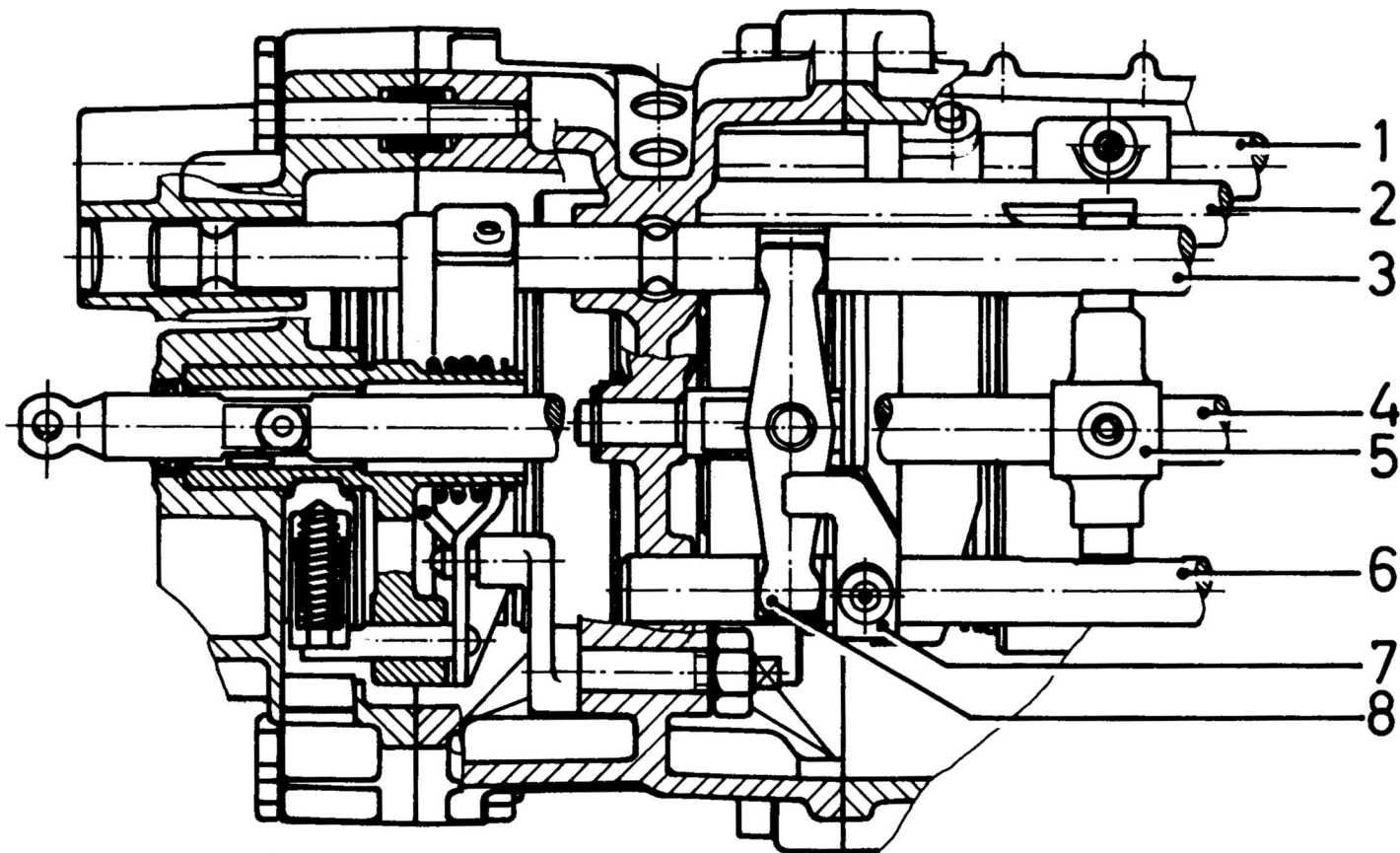
30 23 104



730 23 032

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



730 23 033

Section Drawing of Shift Mechanism for GETRAG 265/6 Overdrive Transmission

- 1 Selector rod - 1st/2nd gear
- 2 Selector rod - 3rd/4th gear
- 3 Selector rod - 5th/rev. gear
- 4 Selector shaft
- 5 Selector arm
- 6 Selector rail
- 7 Dog
- 8 Reversing lever

23 00 022 REMOVING AND INSTALLING TRANSMISSION

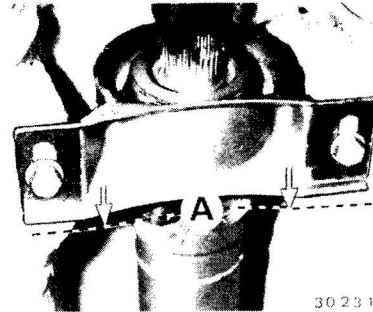
Remove exhaust assembly — see 18 00 020.
Unscrew heat shield.

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.
Tightening torque*.

* See Specifications



30 23 196

Unscrew center mount.

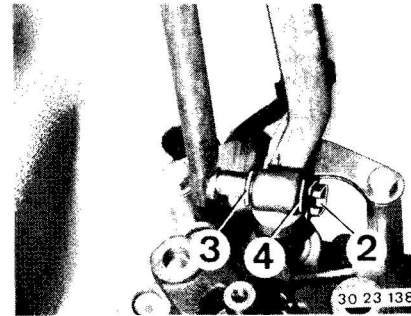
Installation:

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.



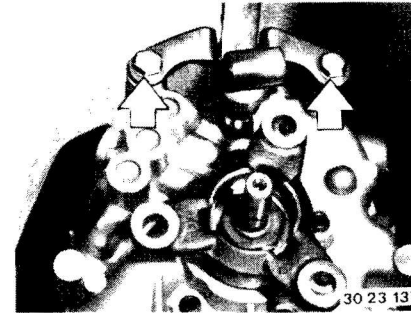
30 23 138

Lift out retainer (2).

Note washers (3 and 4).

Pull out shift rod.

Unscrew holder for shift arm on transmission.



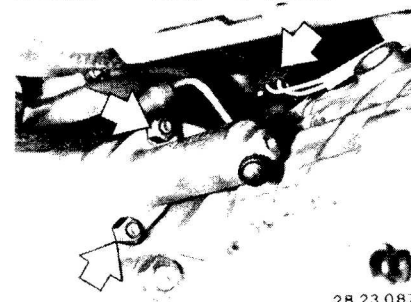
30 23 137

Pull off wires on reverse gear switch.

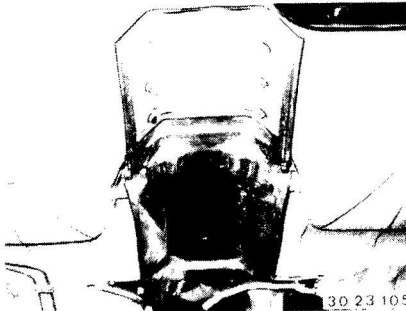
Unscrew clutch slave cylinder — pipe remains connected.

Installation:

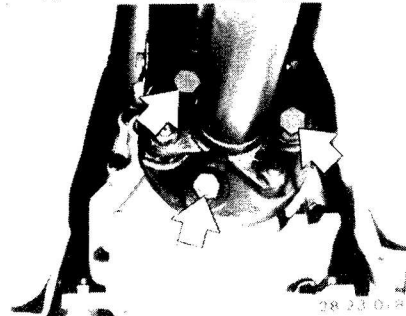
Bleeder screw faces down.



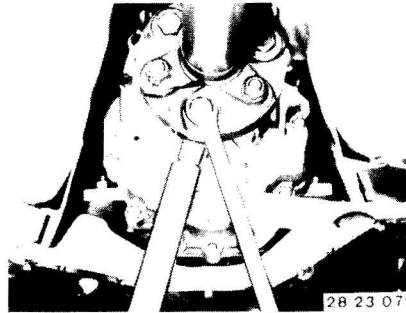
28 23 087



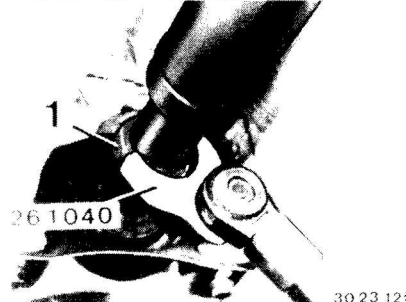
30 23 105



28 23 018

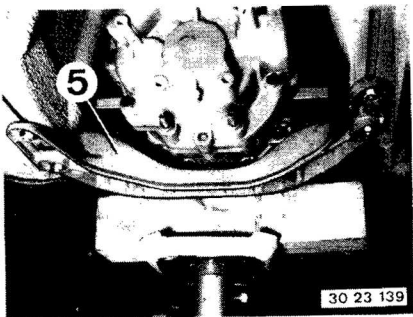


28 23 079

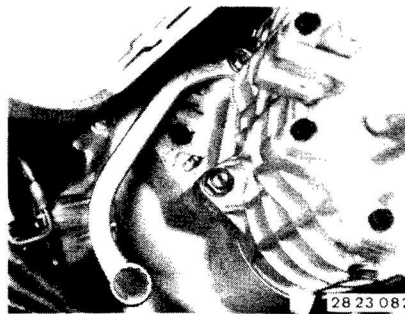


30 23 125

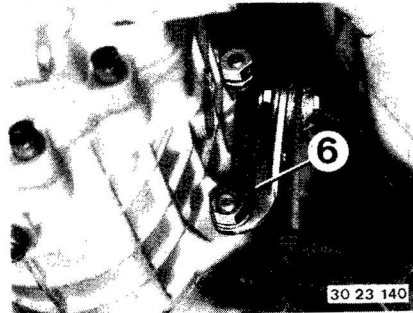
26 1 040



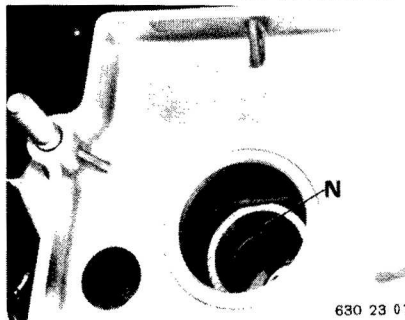
Support transmission from underneath.
Remove cross member (5).
Lower transmission to front axle carrier.



Unscrew transmission on clutch housing and
remove toward rear.
Use special ring wrench** to loosen and tighten
nuts at top left.



Unscrew bracket (6).

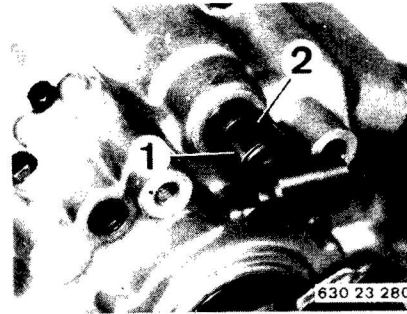
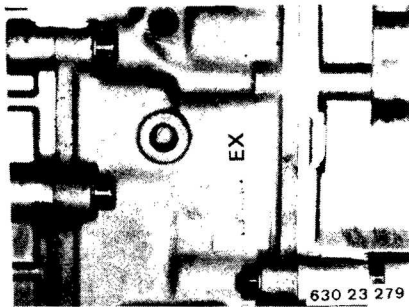


Installation:

Position release lever with the clutch slave
cylinder in installed position.
Align clutch release bearing.
Pack lubricating groove (N) with Molykote
Longterm 2.
Non-conformance could cause bearing to seize
on guide sleeve.
Engage gear before connecting transmission.
Insert guide sleeve of transmission in bearing
carefully.
Turn output flange until input shaft slides
into drive plate.
Remove clutch slave cylinder again.
Mount transmission.
Tightening torque*.
Check oil level.

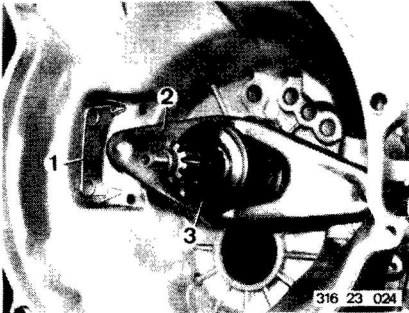
23 00 032 INSTALLING EXCHANGE TRANSMISSION

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).



Transfer rubber mounts with cross member, exhaust carrier and backup light switch.

Note:

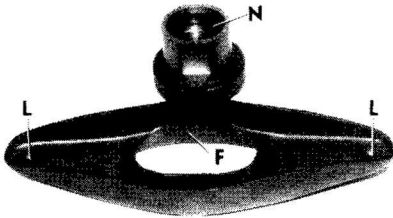
Transmissions are supplied filled with oil, so that it is only necessary to check the oil level after installation of the transmission.

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.



316 23 025

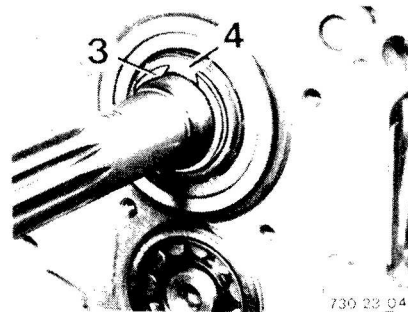
23 11 013 REMOVING AND INSTALLING OR SEALING TRANSMISSION CASE FRONT SECTION

Remove transmission 23 00 022.
Unscrew exhaust bracket (3)
with rubber mounts.

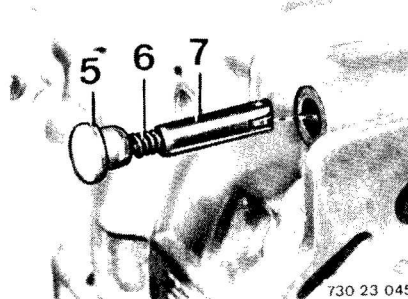
Engage 3rd gear.
Push back spring sleeve (1).
Drive out cylindrical pin (2).
Pull off selector rod.
Pull off selector rod joint.

Mount transmission on Special Tool 23 0 070
in conjunction with Special Tool 00 1 490.
Drain oil.

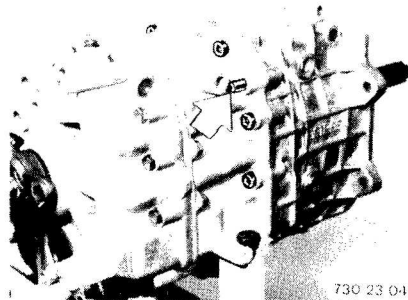
Remove guide flange — see 23 11 622.
Lift out circlip (1).
Take off grooved washer (2).
Installation:
Position grooved washer that groove faces the
circlip.



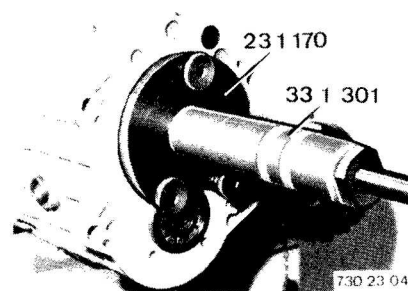
Lift out circlip (3).
Remove washer (4).
Installation:
Always replace circlip.



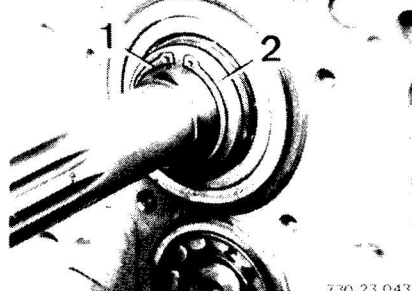
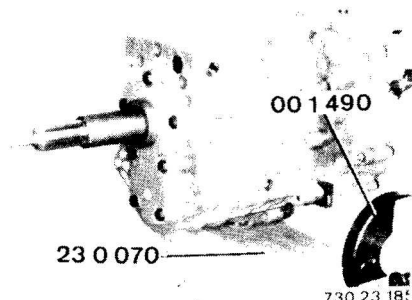
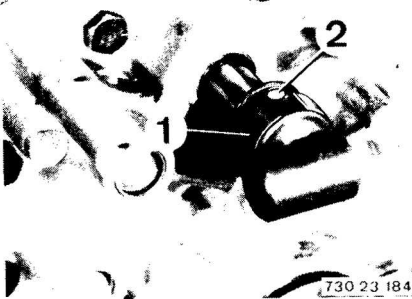
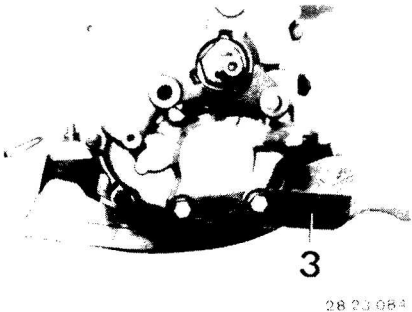
Lift out end cap (5).
Remove spring (6) and lockpin (7).
Installation:
Check installed position.
Remove backup light switch.



Drive out cylindrical pin.
Unscrew bolts.

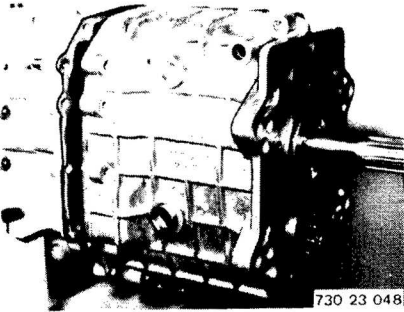


Pull off transmission case front section with
Special Tools 23 1 170 and 33 1 301.

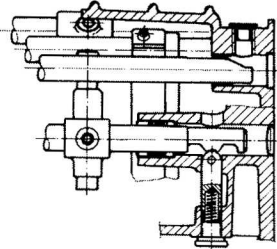


23-306

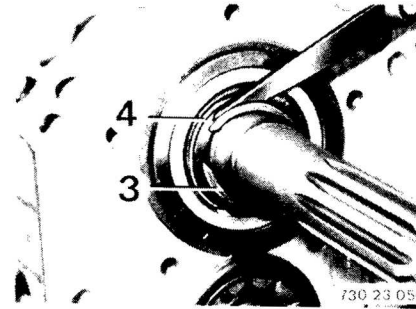
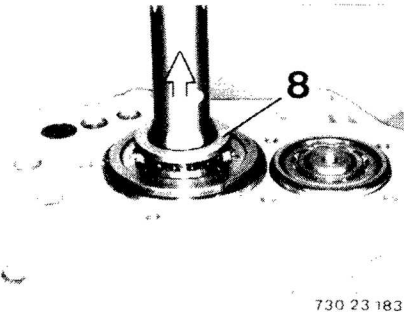
Coat sealing surfaces with Loctite No. 573.
Sealing surfaces must be cleaned thoroughly
and dried of oil.
Mount front transmission case section.
Tightening torque*.



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



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.



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.

23-307

23 11 522 REMOVING AND INSTALLING OR SEALING TRANSMISSION CASE REAR SECTION — Transmission Removed —

Lift out 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 with Special Tool
33 1 150 if necessary.

Caution!
Make sure 2nd gear is engaged before pulling
off cover.
Swing selector shaft to the left against stop
and slide forward.

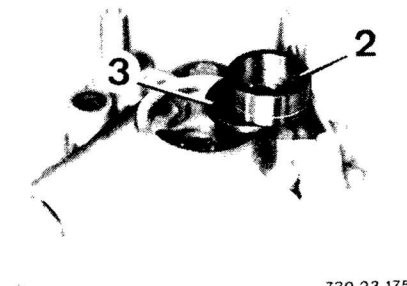
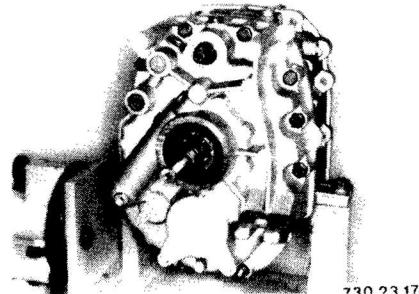
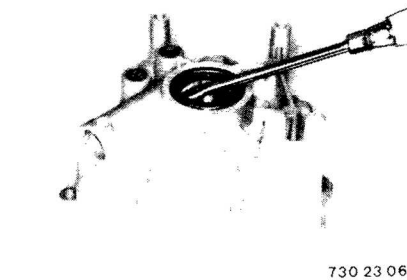
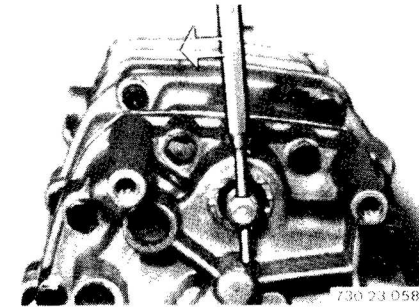
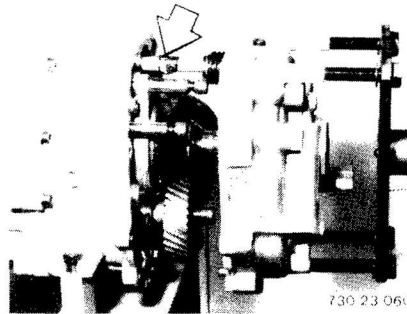
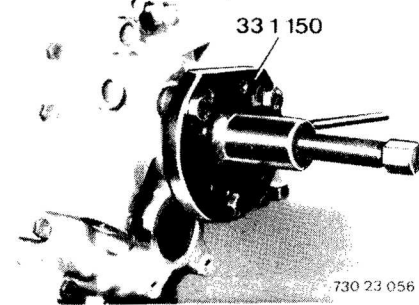
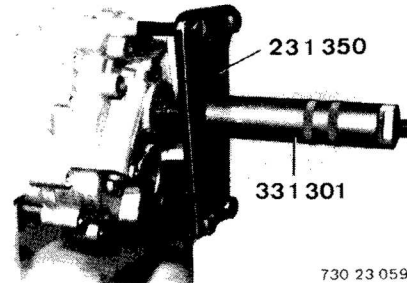
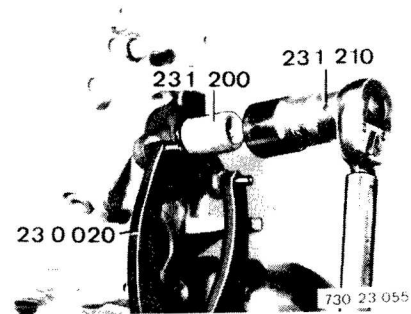
Unscrew rear case section mounting bolts.

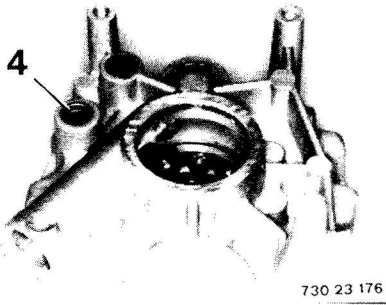
Knock back centering pin.
Pull off transmission case rear section with
Special Tool 23 1 350 used in conjunction with
Special Tool 33 1 301.

Take off rear section.
Important!
Rollers on selector shaft.

Lift out radial oil seal.
Installation:
Replace radial oil seal.

Remove spacer (2) and ball bearing inner
race (3).



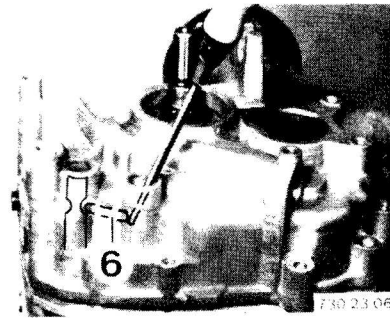


730 23 176

Knock out end cap (4).

Installation:

Replace and install end cap with Loctite No. 573.



730 23 067

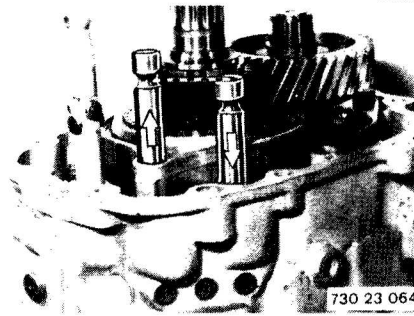
Press lockpin (6) into opening of 1st/2nd gear selector rod.

Push on and bolt down transmission case rear section.

Tightening torque*

Drive in centering pin.

Install end cap (4).

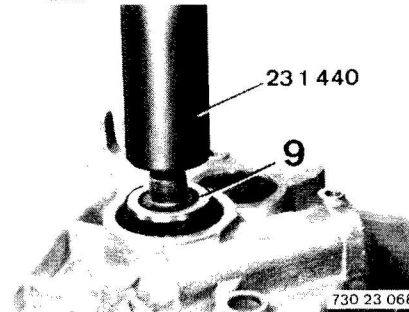


730 23 064

Position output shaft upright.

Second gear is engaged.

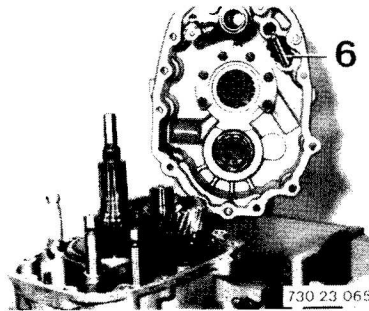
Adjust reverse/5th gear selector rod until opening of 5th gear selector rod is aligned with end of 1st/2nd gear selector rod.



730 23 068

23 1 440

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.

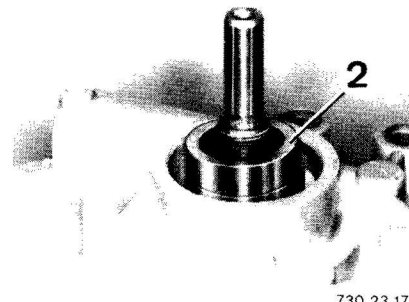


730 23 065

Coat sealing surfaces with Loctite No. 573. Sealing surfaces must be cleaned thoroughly and dried of oil.

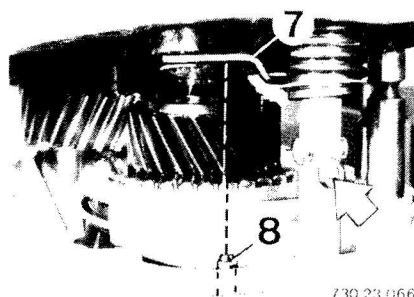
Important!

Lockpin (6) must move easily and face down.



730 23 177

Install spacer (2).

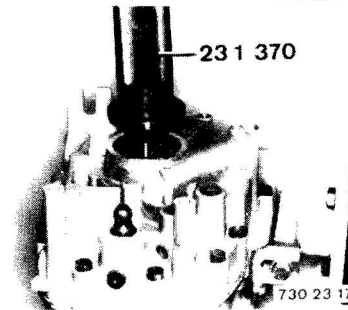


730 23 066

Hold rollers in position with grease.

Mount transmission case rear section.

Make sure spring (7) of selector arm engages on lever (8).



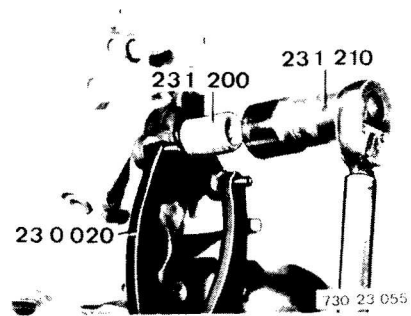
730 23 178

23 1 370

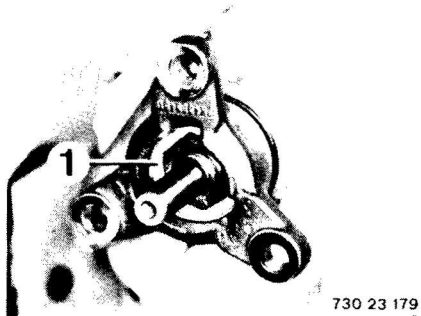
Drive in radial oil seal flush with Special Tool 23 1 370.

* See Specifications

23-309



Mount output flange.
Install collar nut with Loctite No. 270.
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*.



Install lockplate (1).

* See Specifications

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

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

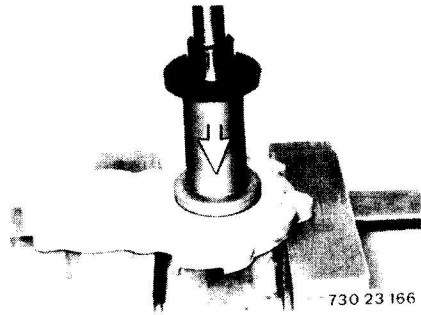
Heat guide flange to about 80° C (175° F)
with a hot air blower.
Install guide tube.
Note:
Check turning lock (1).
Install radial oil seal.

Measure distance (B).

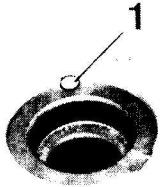
Example:

B	8.1 mm (0.319")
— A	7.8 mm (0.307")

0.3 mm (0.012") spacer thickness



730 23 166



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.

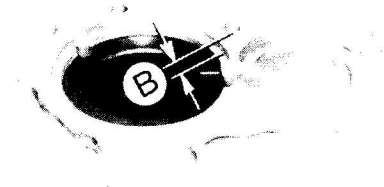
Important! — Installation:

Check length of bolts.

Bolts (1 ... 3) = 8 x 30 mm

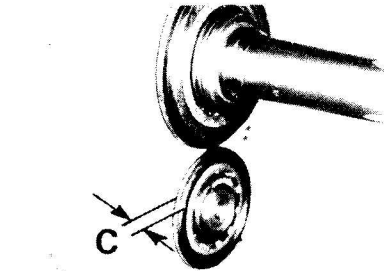
Bolts (4 ... 7) = 8 x 22 mm

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

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



730 23 171

Measure distance (D).

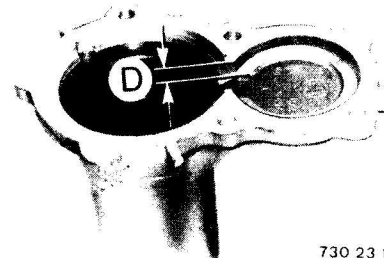
Example:

D	4.8 mm (0.189")
— C	4.3 mm (0.169")

0.5 mm (0.020")

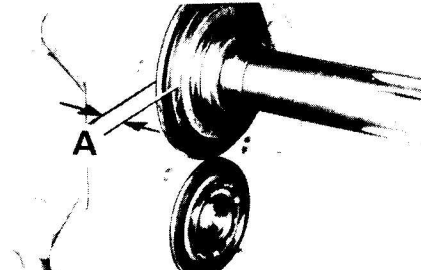
— 0.1 ... 0.2 mm (0.004 ... 0.008") axial play

0.3 mm (0.012") spacer thickness

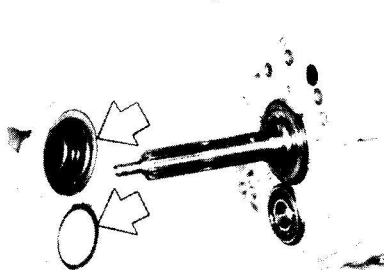


730 23 172

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.



730 23 169



730 23 173

* See Specifications

23-311

23 12 053 REPLACING RADIAL OIL SEAL FOR OUTPUT FLANGE

Unscrew front end of propeller shaft and center mount — see 23 00 022.
Lift out lockplate (1).

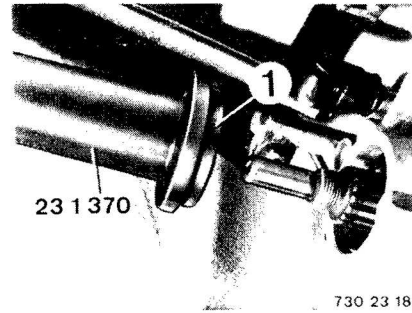
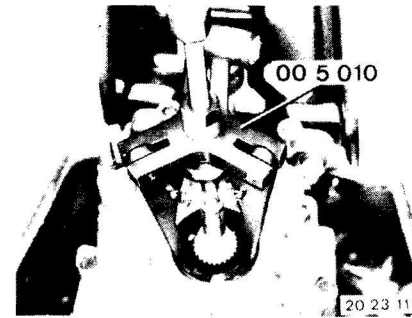
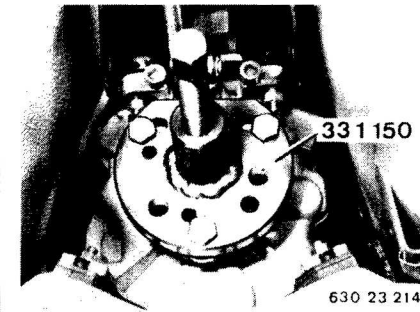
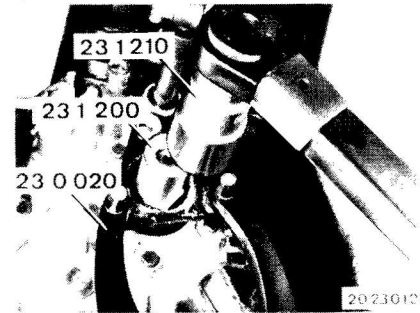
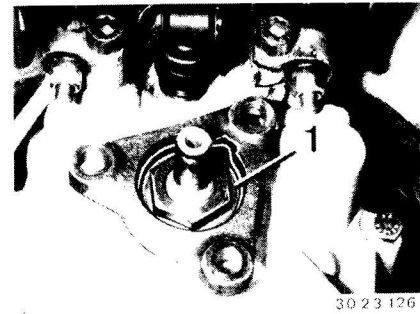
Installation:
Replace lockplate.

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*.

Pull off output flange with Special Tool 33 1 150.

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

Lubricate sealing lip of radial oil seal with oil.
Drive in radial oil seal (1) with Special Tool 23 1 370.



* See Specifications
** Source of Supply: HWB

23-312

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.

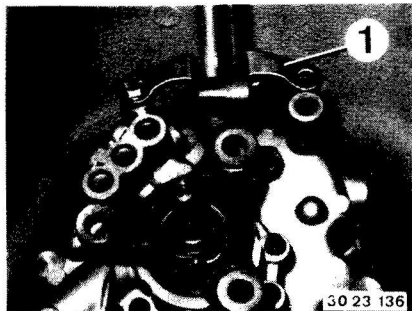
Lubricate sealing lip of radial oil seal with oil.
Drive in radial oil seal with Special Tool 23 1 240.

23 12 503 REPLACING RADIAL OIL SEAL FOR INPUT SHAFT

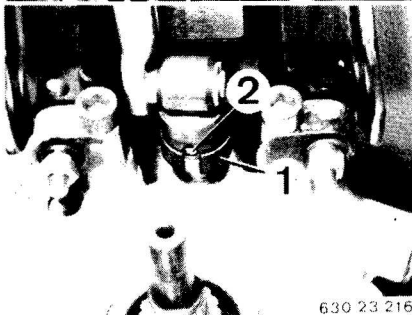
— Transmission Removed —

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

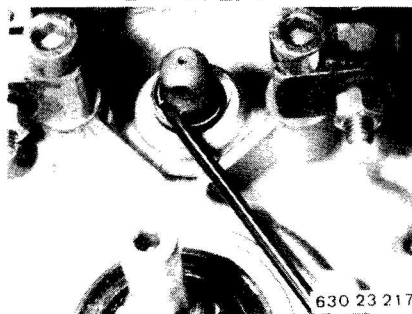
Drive in radial oil seal against stop with Special Tools 23 1 180 and 00 5 500.
Open end faces transmission.
Lubricate sealing lip with oil.



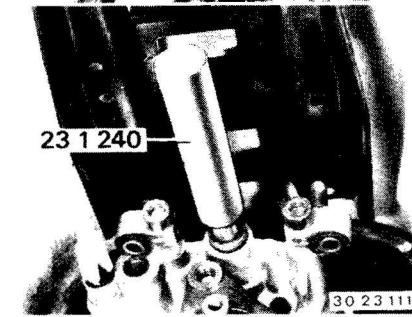
630 23 136



630 23 216



630 23 217

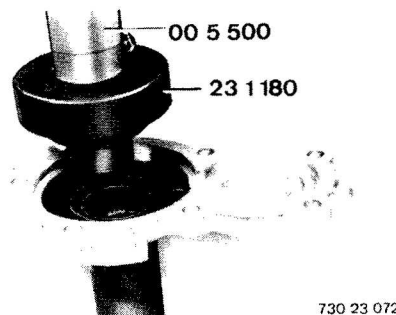


23 1 240

30 23 111



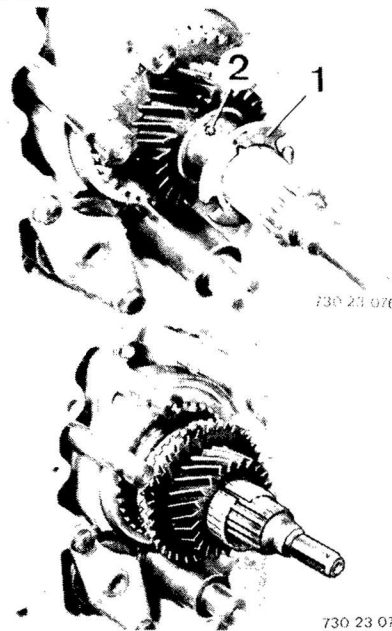
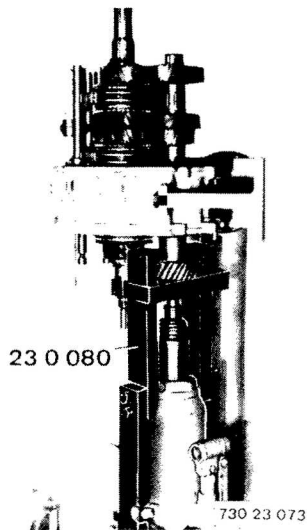
730 23 071



730 23 072

23 21 503 REMOVING AND INSTALLING INPUT AND OUTPUT SHAFT ASSEMBLY
 – Front and Rear Transmission Case Sections Removed –

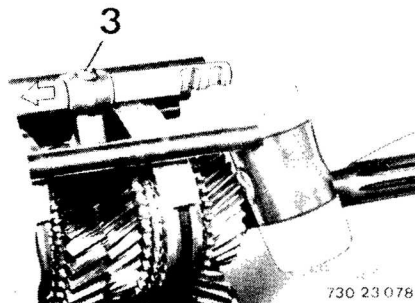
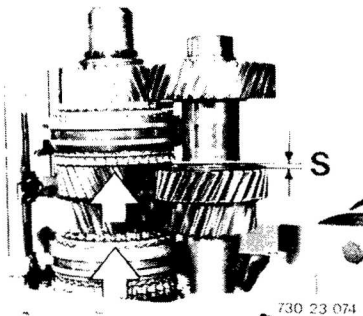
Swing down output shaft.
 Pull 5th gear wheel off of layshaft with Special Tool 23 0 080.
 This also pulls off the bearing inner race.
 Pressing-off force*.
Caution!
 Prevent pulling off tool from falling down and causing injury.



Take off washer (1) and ball (2).

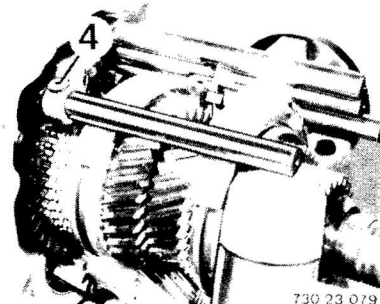
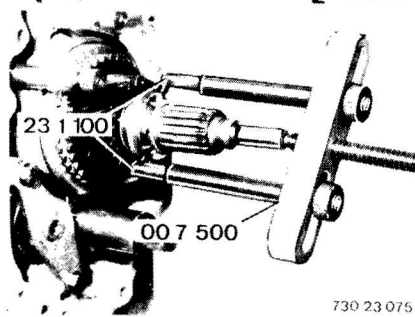
Pull off 5th gear wheel with synchromesh ring and split needle bearing.

Important!
 When installing 5th gear always remember to provide play (S) between 3rd gear and layshaft, to avoid damaging the 3rd gear wheel.
 Push up output shaft, if necessary.



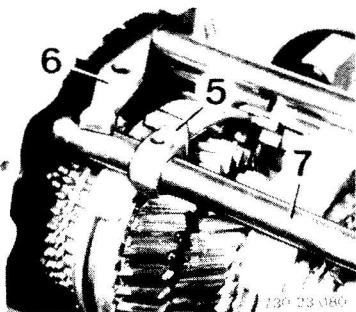
Remove needles on selector shaft.
 Drive out pin (3) in selector shaft, while counterholding.
 Pull out selector shaft toward rear.
 Remove selector arm.
Installation:
 Replace pin.

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

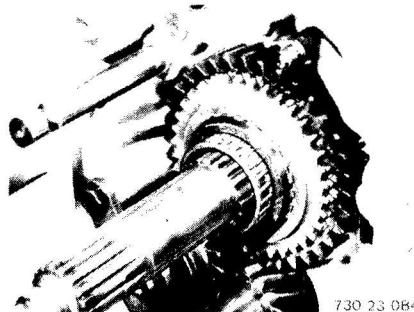


Engage 2nd gear.
 Drive out pin (4), while counterholding.
Installation:
 Replace pin.

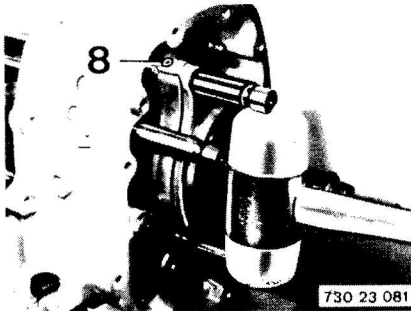
* See Specifications



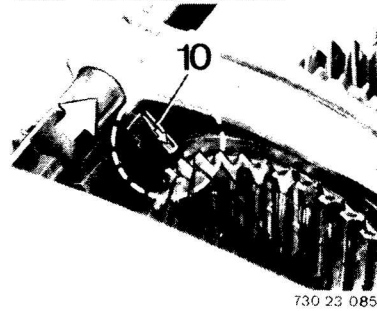
Pull or take off turning lock (5) and reversing lever (6).
Pull out selector rail (7) forward.
Disengage second gear.



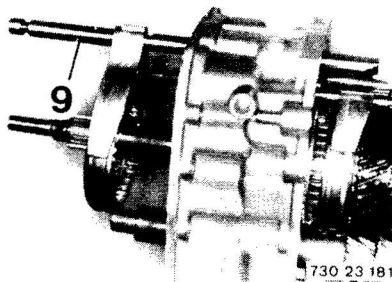
Take off synchromesh ring.
Pull off reverse gear and needle bearing.



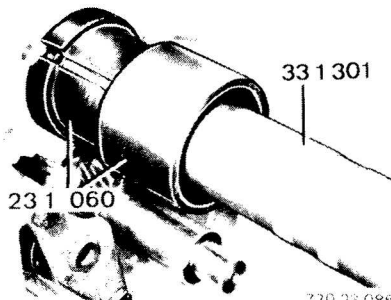
Pull out 5th gear selector rod with selector fork and operating sleeve toward rear far enough, that pin (8) can be driven out while counterholding.
Important!
Loose balls, springs and slides.
Installation:
Replace pin.



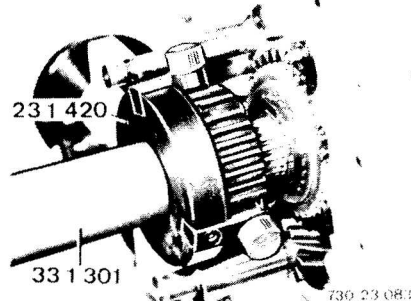
Engage third gear.
Drive out pin (10).
Important!
Drive in pin on to tooth of 3rd gear wheel until selector rod can be pulled out forward.
Remove 3rd/4th gear selector fork.
Loose balls.
Installation:
Replace pin.



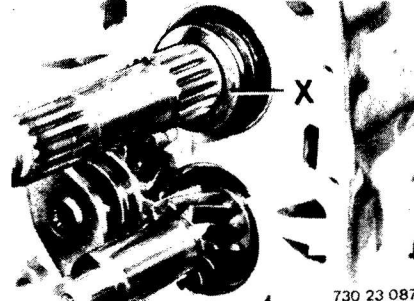
Pull off operating sleeve and fifth gear selector fork.
Pull out selector rod (9) forward.
Important!
Loose balls.



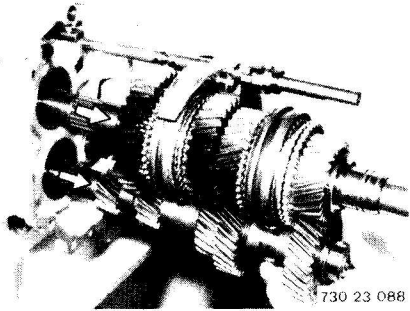
Pull out output shaft toward rear far enough, that bearing inner race can be pulled off with Special Tools 23 1 060 and 33 1 301.



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.

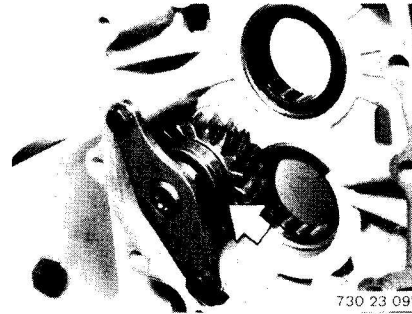


Remove shim X.
Installation:
Determine thickness of shim X (see 23 21 554).



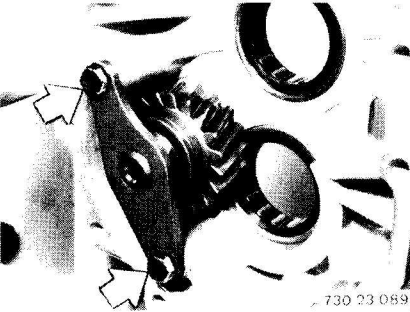
730 23 088

Pull out input and output shaft assembly with layshaft and 1st/2nd gear selector rod in intermediate case.
Important!
Loose balls.



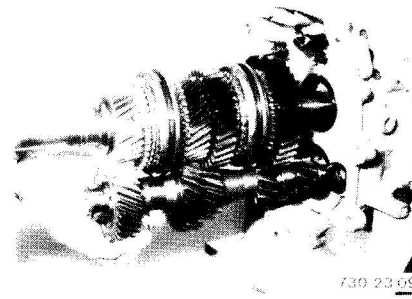
730 23 092

Installation:
Install and mount reverse gear.
Stepped collar of reverse gear faces out.
Tightening torque*.



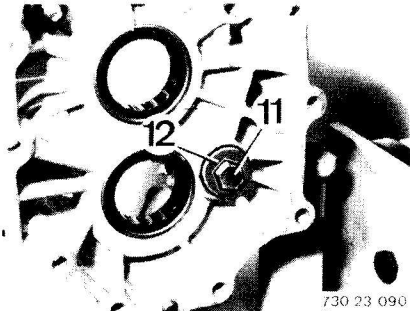
730 23 089

Unscrew holder.



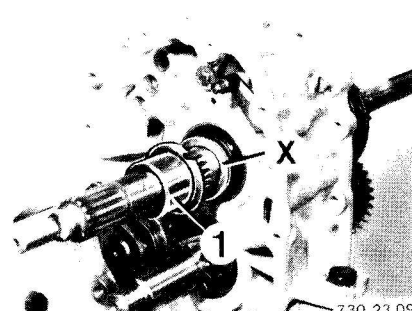
730 23 091

Install input shaft, output shaft and layshaft in intermediate case.



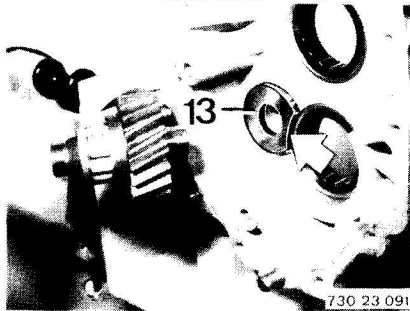
730 23 090

Unscrew bolt (11), while counterholding on front of shaft.
Installation:
Install bolt with Loctite No. 270.
Tightening torque*.
Remove washer (12).



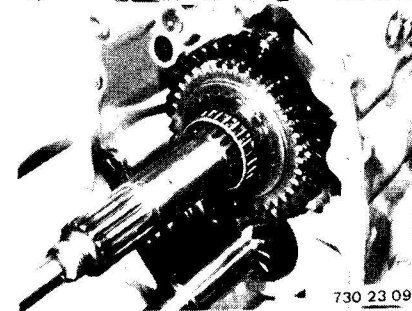
730 23 094

Install shim X.
Heat bearing sleeve (1) with a hot air blower to approx. 80° C (175° F) and install on output shaft.



730 23 091

Knock out reverse gear shaft.
Installation:
Check installed position of thrust washer (13).
Check needle bearing, replacing if necessary.
Check condition of all bearings, replacing if necessary — see 23 21 703.



730 23 095

Install needle bearing and reverse gear.
Push on synchronesh ring.

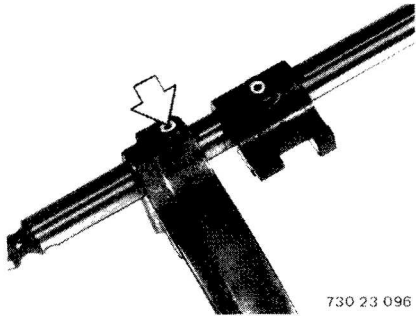
* See Specifications

* See Specifications

23-316

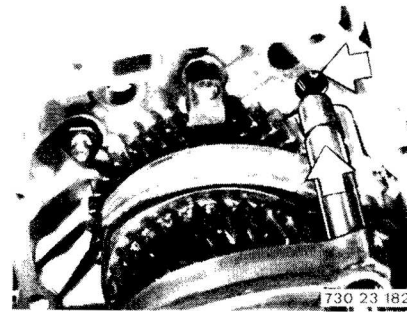
Drive pin out of 1st/2nd gear selector rod.

Installation:
Replace pin.



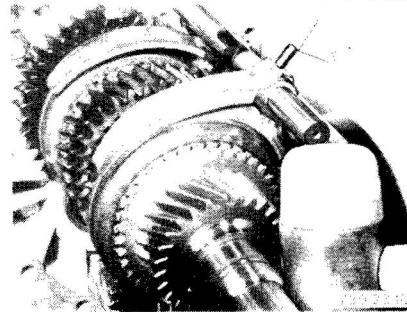
730 23 096

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.



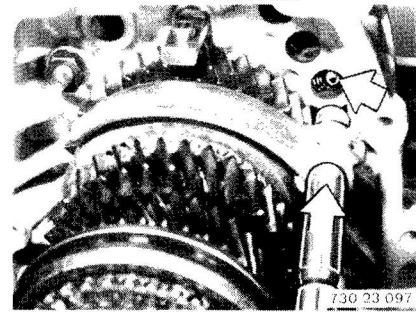
730 23 182

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.



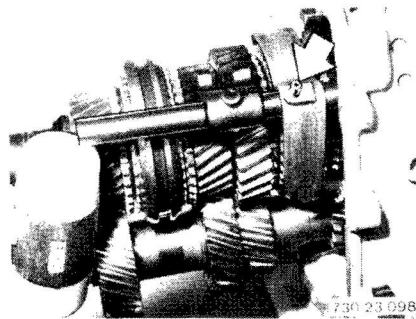
730 23 182

Drive in 6 x 26 mm pin, while counterholding.



730 23 097

Drive in 6 x 32 mm pin, while counterholding.

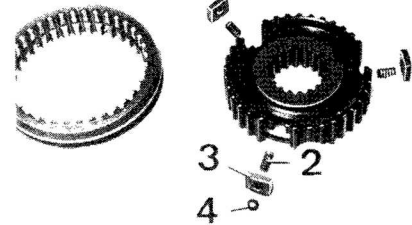


730 23 098

Assemble synchronizer.

Installed Order:

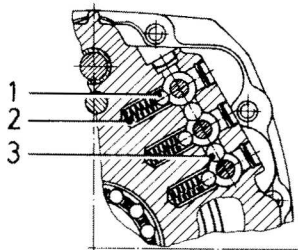
Springs (2), thrust parts (3) and balls (4).
Curved surface of thrust parts (3) faces operating sleeve.



730 23 101

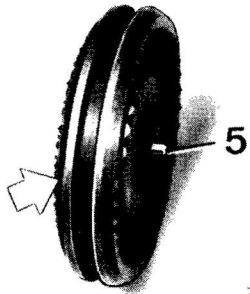
Layout of Selector Arrest:

- 1 Locking ball
- 2 Spring
- 3 Detent ball



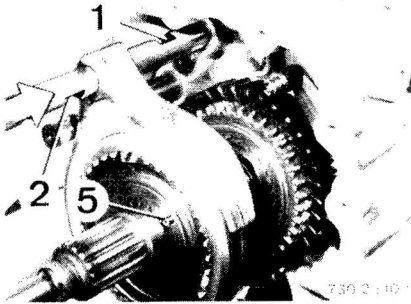
730 23 035

Important!
Stepped end of sliding sleeve must be opposite centering pin (5).



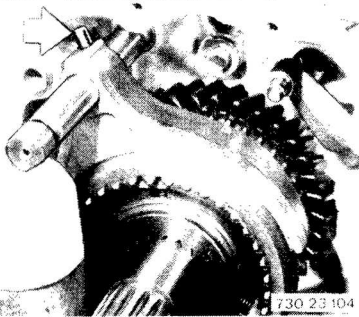
730 23 102

Install guide sleeve.
Centering pin (5) faces 5th gear.
Install 5th/reverse gear selector fork.
Install detent ball.
Push in selector rod up to spring.
Insert locking balls and press down.
Push in and turn selector rod that openings (1 and 2) are always opposite locking balls.



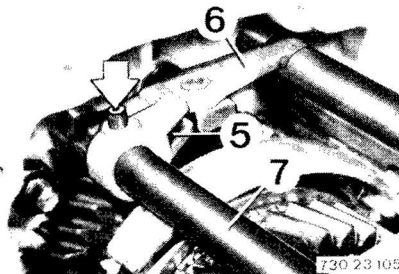
730 23 103

Push in selector rod far enough that 6 x 26 mm pin can be driven in, while counterholding.
Push in selector rod and guide sleeve against arrest.

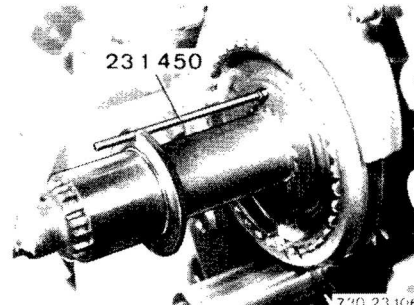


730 23 104

Install reversing lever (6).
Smooth side faces down.
Insert selector rail (7).
Push on turning lock (5).
Lock with 6 x 26 mm pin.



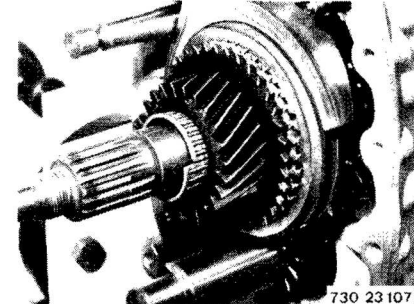
730 23 105



23 1 450

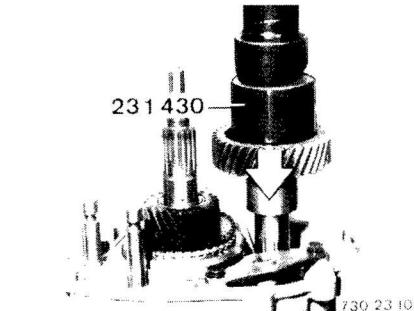
730 23 106

Place Special Tool 23 1 450 in centering pin.
Heat bearing sleeve to approx. 80° C (175° F) with a hot air blower and push on to output shaft.



730 23 107

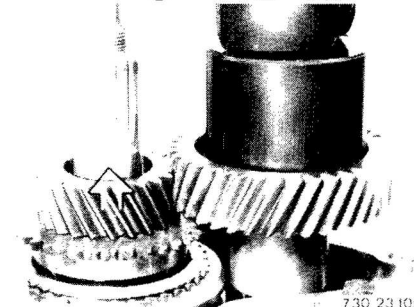
Install split needle bearing, synchromesh ring and fifth gear.



23 1 430

730 23 108

Unscrew intermediate case on mounting bracket and set up on a press.
Lubricate pressing surface of layshaft with oil.
Heat 5th gear uniformly to correct temperature* with a hot air blower.
Press on 5th gear to fit tight with Special Tool 23 1 430.
Pressing on force*.

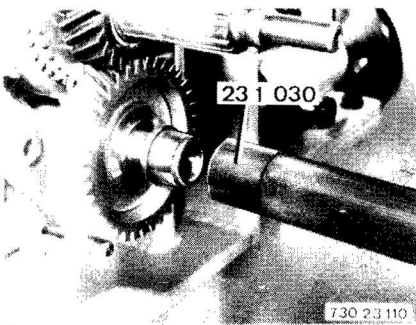


730 23 109

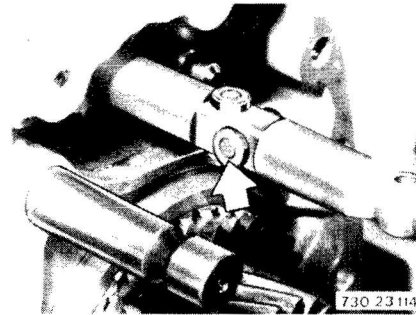
Important!
Lift and turn 5th gear until teeth mesh.

* See Specifications

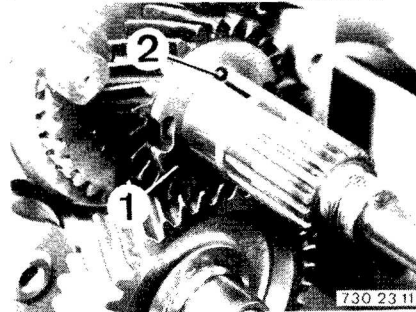
23-318



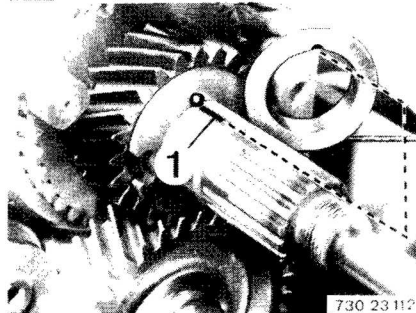
Heat bearing inner race to approx. 80° C (175° F) with a hot air blower and install on layshaft.
If necessary, drive on with Special Tool 23 1 030.
Collar of bearing race faces gear.



Hold four rollers in position on selector shaft with grease.



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



Installation:

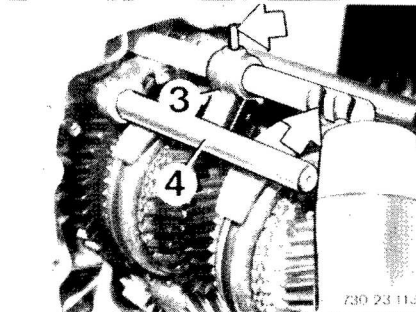
Heat ball bearing inner races to approx. 80° C (175° F) with a hot air blower and install on output shaft.

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.

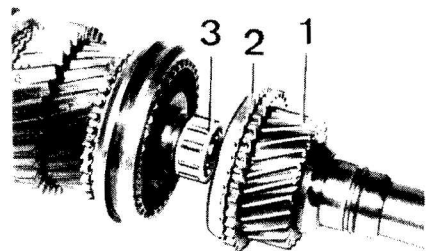
Important!

Arrest on selector shaft faces selector rail (4).

Drive in 6 x 32 mm pin, while counterholding.

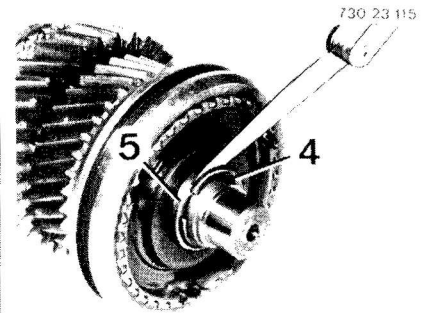
23 21 554 REPLACING OUTPUT SHAFT — Output Shaft Removed —

Pull off input shaft (1), synchronesh ring (2) and needle bearing (3).



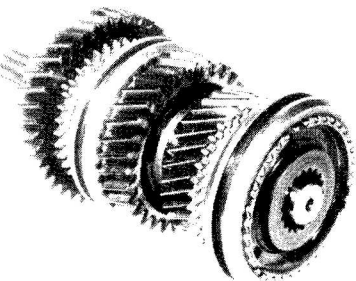
Remove snap ring (4).
Remove washer (5).

Installation:
Adjust play between snap ring and guide sleeve to 0 ... 0.09 mm (0 to 0.0035").
Always replace snap ring.



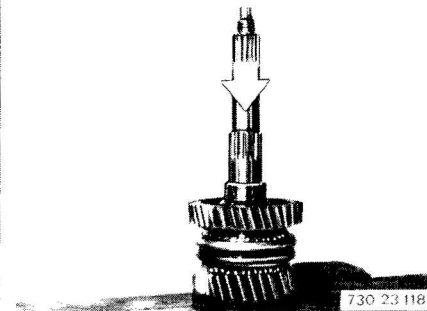
730 23 116

Pull off guide sleeve, synchronesh ring, 3rd gear and needle bearing.

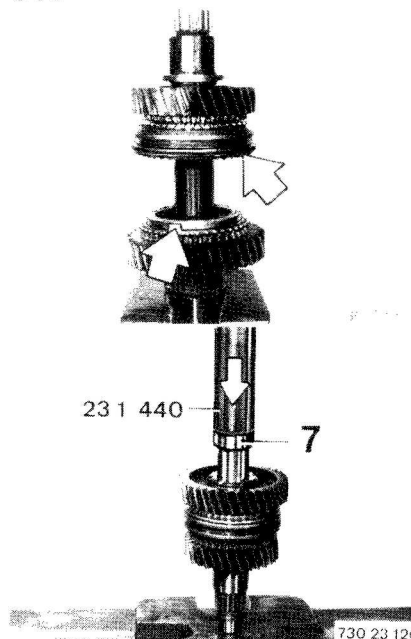


730 23 117

Press 2nd gear, needle bearing, synchronesh ring, guide sleeve, synchronesh ring, 1st gear, needle bearing with bearing sleeve and bearing inner race off of output shaft.
Check condition of all bearings, replacing if necessary.
Check synchronesh rings — see 23 23 505.

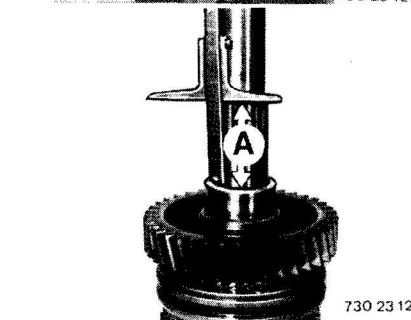


730 23 118

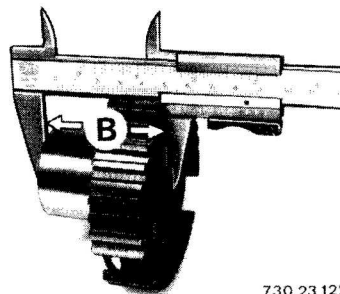


Install needle bearing, 2nd gear, synchronesh ring and guide sleeve with offset groove facing 1st gear.
Install bearing sleeve and needle bearing in 1st gear.
Install synchronesh ring.
Press in output shaft.
Important!
Guide in synchronesh ring with tabs in sliding sleeve.

Heat bearing inner race (7) to approx. 80° C (175° F) with a hot air blower and install on output shaft, pressing on with Special Tool 23 1 440 if necessary.



Determine thickness of shim X.
Measure distance (A) from collar of output shaft to bearing inner race.



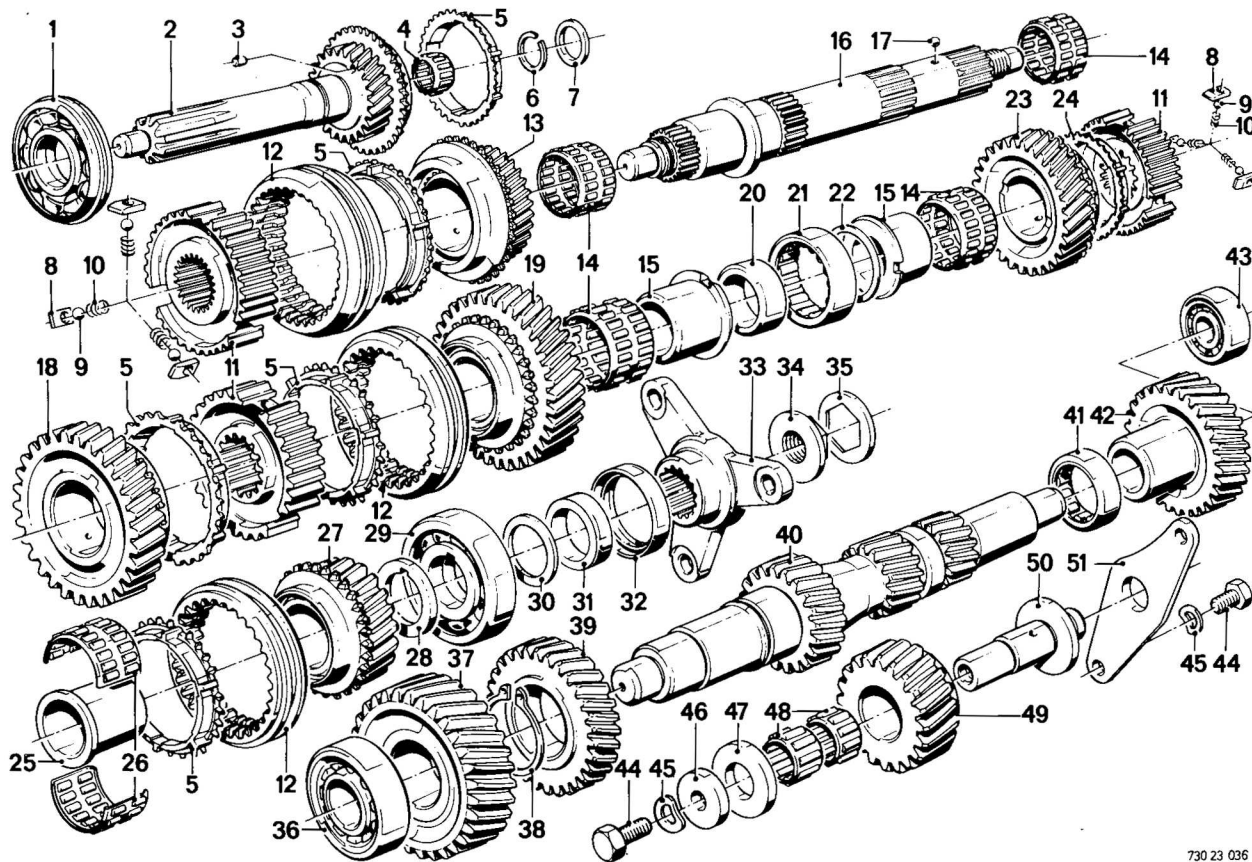
Place bearing sleeve for reverse gear in guide sleeve.
Measure distance (B) from collar of guide sleeve to bearing sleeve.

Example:

A	52.2 mm (2.056")
— B	52.0 mm (2.056")

X 0.2 mm (0.008") shim thickness

730 23 122



- 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

23 21 703 REPLACING BEARINGS OF ALL TRANSMISSION SHAFTS - Transmission Removed -

A) Input Shaft, Layshaft in Front Case Section:

Remove case front section - see 23 11 013.
Drive ball bearing out of and into case with Special Tools 23 1 190 and 00 5 500.

Important!

Install ball bearing that collar faces out.

Pull bearing inner race (1) off of input shaft with Special Tools 23 1 230 and 00 7 500.

Installation:

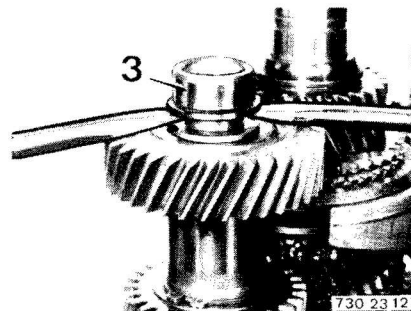
Heat bearing inner race to approx. 80° C (175° F) with a hot air blower and install on input shaft.

Important!

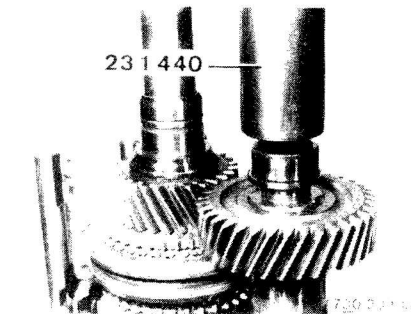
Turning lock.

Pin (2) must be in opening of bearing inner race.

Drive layshaft roller bearing out and in with Special Tools 23 1 220 and 00 5 500. Protrusion A = approx. 5 mm (0.197"). Install roller bearing that open end faces in.

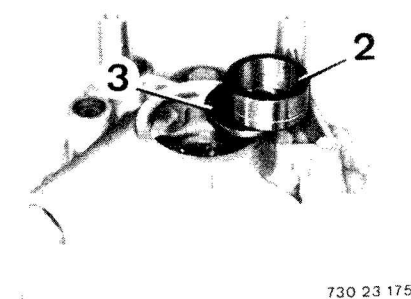


Press bearing inner race (3) off of layshaft with a screwdriver.



Installation:

Heat bearing inner race to approx. 80° C (175° F) with a hot air blower and install on layshaft, driving on to fit tight with Special Tool 23 1 440 if necessary. Collar of bearing inner race faces gear.

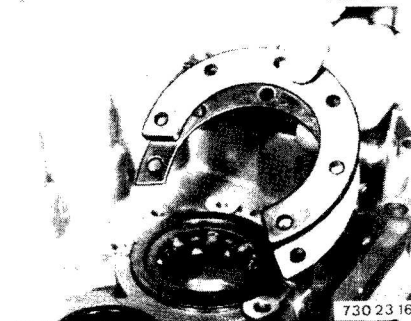


B) Output Shaft, Layshaft in Rear Case Section:

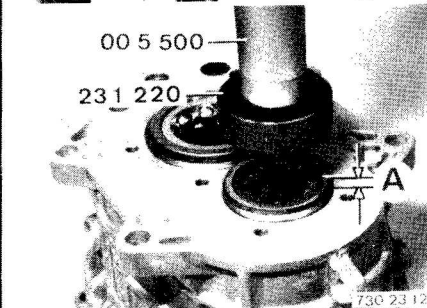
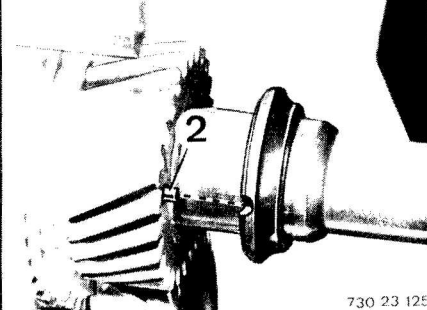
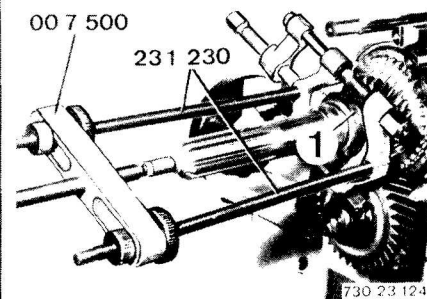
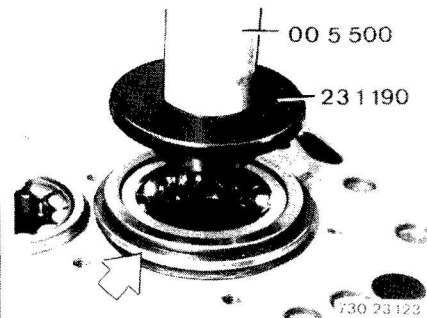
Remove rear case section - see 23 11 022.

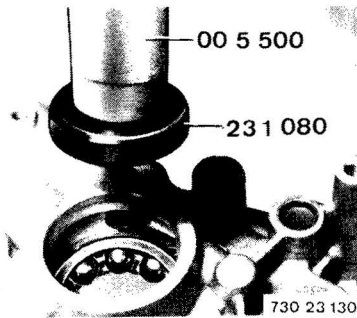
Lift out radial oil seal.

Remove spacer (2) and bearing inner race (3).

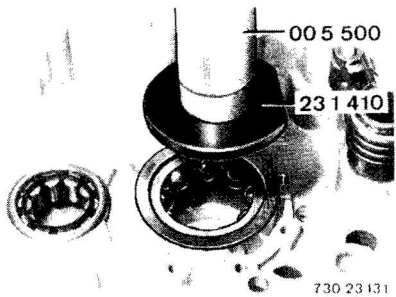


Unscrew bolts.
Remove bearing holder.

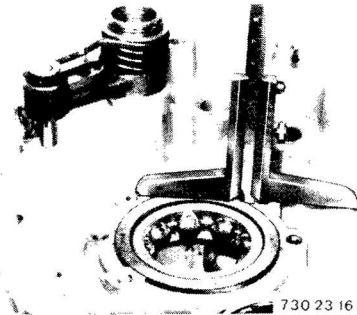




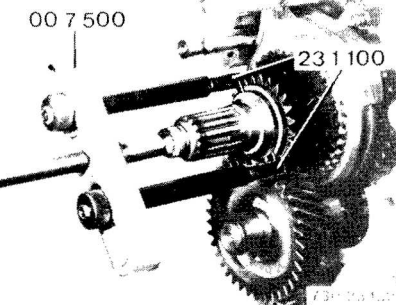
Drive out ball bearing with Special Tools 23 1 080 and 00 5 500.



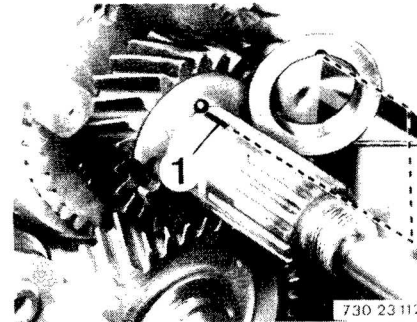
Drive in ball bearing with Special Tools 23 1 410 and 00 5 500.



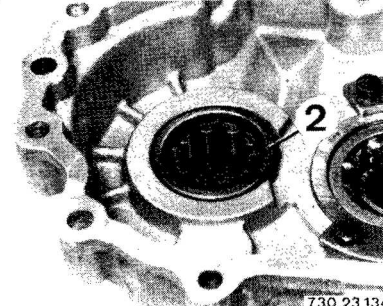
Adjust play between bearing holder and case rear section with shims. Mount bearing holder. Tightening torque*.



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

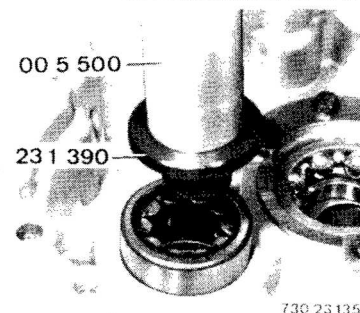


Installation:
Heat ball bearing inner race to approx. 80° C (175° F) with a hot air blower and slide on to output shaft.
Important!
Opening in bearing inner race must engage in ball.
Draw line (1) to make installation of bearing race easier.

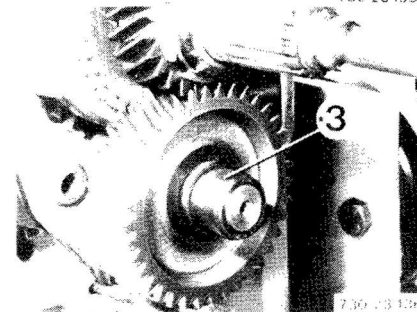


Heat case rear section to approx. 80° C (175° F) with a hot air blower.
Lift out roller bearing (2).

Installation:
Insert bearing that large diameter end of plastic cage faces up.



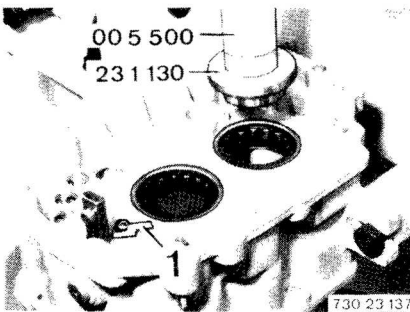
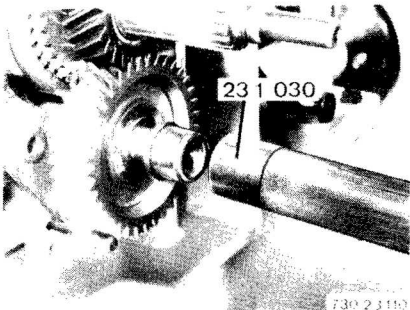
Heat case rear section to approx. 80° C (175° F) with a hot air blower.
Install roller bearing, driving in with Special Tools 23 1 390 and 00 5 500.



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

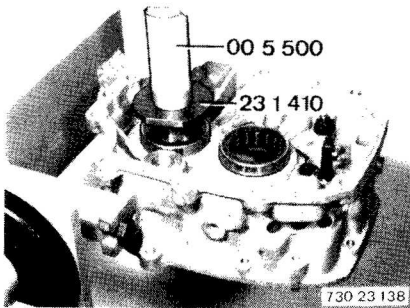
23-323

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



C) Output Shaft, Layshaft in Intermediate Case:

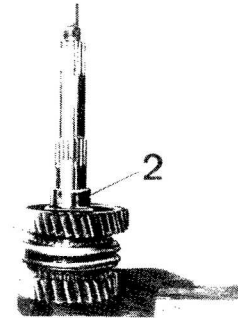
Remove input and output shaft assembly — see 23 21 503.
Drive roller bearings for input shaft and layshaft out of intermediate case with Special Tools 23 1 130 and 00 5 500.
Important!
Unscrew and turn oil plate (1) in case of roller bearing for output shaft.



Drive roller bearings for output shaft and layshaft into intermediate case with Special Tools 23 1 410 and 00 5 500.
Drive in roller bearings flush.



Bolt down oil plate (1) in vertical installed position.



Check condition of bearing inner race (2) on output shaft, replacing if necessary.
If replacement is necessary, press gear set off of output shaft - see 23 21 554.

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.

630 23 077

Disassemble synchronization.

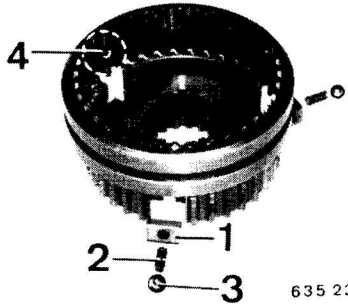
Pressure piece (1)

Spring (2)

Ball (3)

Installation:

Bore (4) in operating sleeve must be aligned
with ball (3).



635 23 137

Installation:

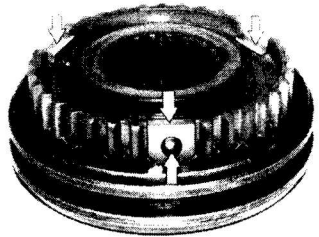
Install all springs, pressure pieces and balls.

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.



630 23 079