

Getriebe mechanisch

Transmission – manual

Boîte à vitesses – mécanique

Cambio

Caja de cambio

Växellåda, mekanisk

Versnellingsbak, mechanisch

cardiagn.com

23 Manual shift gearbox

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Specifications

Manual gearbox

Model	320/6	323 i
2300 ... Gearbox, general (4-speed manual shift)		
Make	Getrag	
Type	242/7.50	
Type of synchromesh	Borg-Warner (limited slip)	
Gear shift	Central floor-mounted lever	
Oil grade	SAE 80 ¹⁾	
Oil content	I (Imp. pints, US quarts)	1.0 (1.76, 1.05)
Gear ratios		
1st	Ratio	3.7643 : 1
	Number of teeth	$\frac{31 \cdot 34}{20 \cdot 14}$
2nd	Ratio	2.043 : 1
	Number of teeth	$\frac{31 \cdot 29}{20 \cdot 22}$
3rd	Ratio	1.320 : 1
	Number of teeth	$\frac{31 \cdot 23}{20 \cdot 27}$

¹⁾ Use a brand-name gear oil to MIL-L-2105 or API-GL 4 specification, not a hypoid oil. In a emergency, use a brand-name HD single-range or multigrade engine oil for spark-ignition engines as specified for the car's engine (see Service Information).

Specifications

Manual gearbox

Model	320/6	323 i
23 00 . . . Gearbox, general (4-speed manual shift) – (continued)		
Gear ratios (continued) 4th	Ratio	1.0 : 1
	Ratio	4.0964 : 1
Reverse	Number of teeth	$\frac{31 \cdot 17 \cdot 37}{20 \cdot 14 \cdot 17}$
	Ratio	2.5 : 1
Speedometer drive	Ratio	$\frac{10}{4}$
	Number of teeth	
23 11 . . . Gearbox housing with cover		
Heating temperature for bearing installation	°C (°F)	80 (176)
23 12 . . . Bearing in gearbox		
Output shaft bearings	Optional: FAG 6306 C3 700 672 or SKF 6306 C3 VB – 005	
Input shaft bearings	Optional: FAG 6206/E. TNH C3 or SKF 6206 C3/361 781	
Layshaft bearings,	front	Optional: FAG 6304 TNH C3/139 677 or SKF 6304 C3/361 153 A
	rear	Optional: FAG roller bearing NJ 304 C3 DIN 5412 or SKF NJ 304

Specifications

Manual gearbox

Model	320/6	323 i
2321 . . . Gearbox shafts		
Endplay of output/ input shafts	mm (in)	Output shaft 0.14 . . . 0.2 mm (0.0055 . . . 0.0079 in) ¹⁾ Input shaft 0.12 . . . 0.18 mm (0.0047 . . . 0.0071 in) ¹⁾
Output shaft endplay (between reverse gear pinion and speedometer drive worm)	mm (in)	0 . . . 0.09 (0 . . . 0.0035)
Layshaft endplay	mm (in)	0.1 . . . 0.2 (0.0039 . . . 0.0079)
Radial runout at output shaft journal	mm (in)	0.07 (0.0028)
Installed output flange – radial runout	mm (in)	0.07 (0.0028)
– face runout	mm (in)	0.1 (0.0039)
2322 . . . Gearwheels		
Pressure for removing gearwheels N	kp lb.f	app. 98 100 app. 10 000 app. 22 045
Pressure for installing gearwheels N	kp lb.f	max. 58 860 max. 6 000 max. 13 225
Temperature to which gearwheels must be heated	°C (°F)	120 . . . 150 (248 . . . 302)

¹⁾ Axial bearing play

Manual gearbox Specifications

Model	320/6	323 i
23 23 . . . Synchronesh		
Synchronesh ring		
Space between synchro-mesh ring and clutch body – when new	mm (in)	1.0 (0.039)
– wear limit	mm (in)	0.8 (0.031)
23 31 . . . Internal shift mechanism components		
Width of selector fork guide web, 1st . . . 4th gear	mm (in)	5 – 0.030 (0.1968 – 0.0012) – 0.078 – 0.0031)
Selector lever guide width, reverse gear	mm (in)	13.95 ⁰ – 0.1 (0.5492 – 0.0039)

Manual gearbox

Specifications

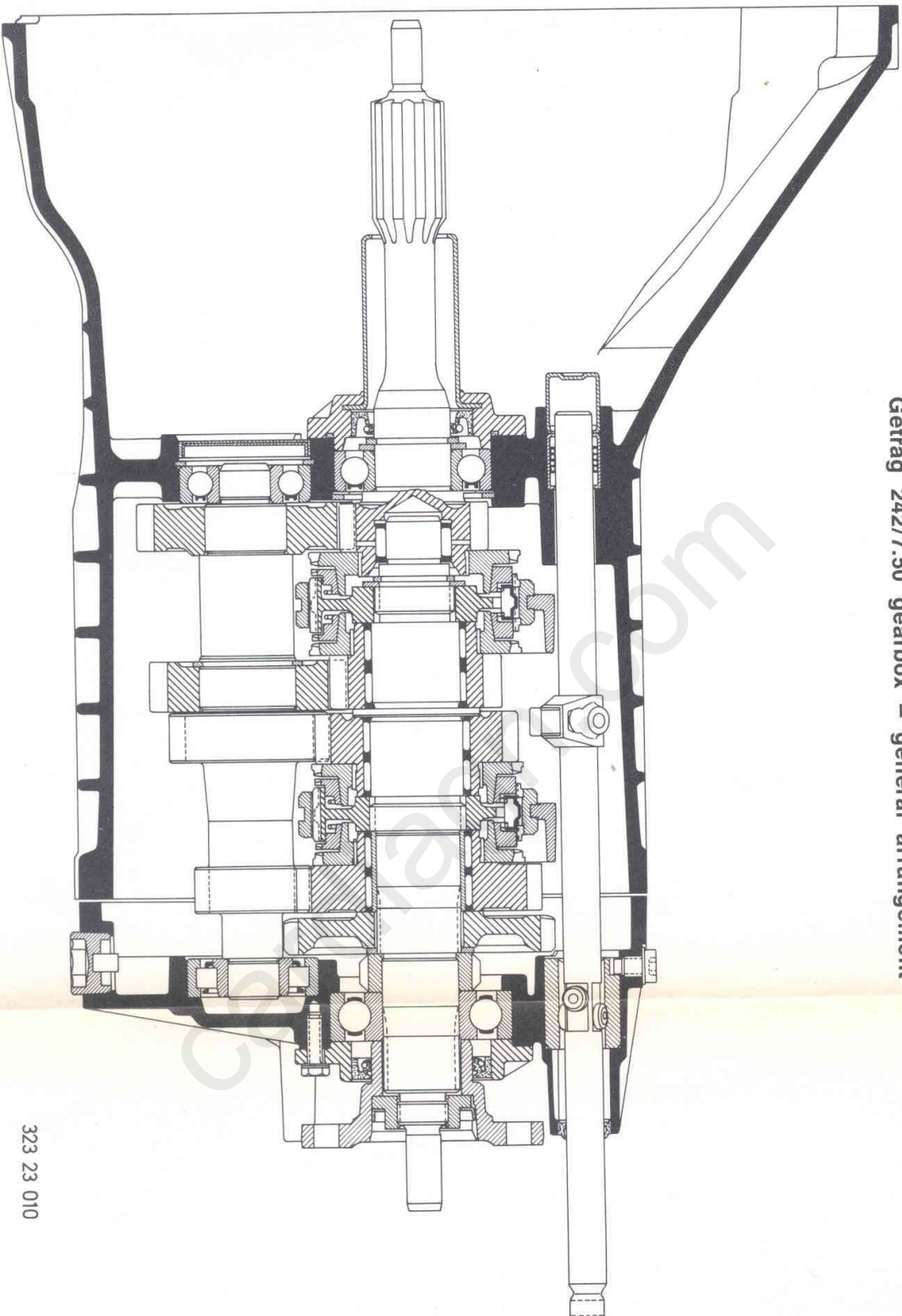
Model		320/6	323 i
Tightening torques			
23 00 . . . Gearbox, general			
Four-speed gearbox to engine M 12 × 60 mm	Nm	78 . . . 86	
	kpm lb.ft	8.0 . . . 8.8 58 . . . 63	
M 12 × 45 mm	Nm	78 . . . 86	
	kpm lb.ft	8.0 . . . 8.8 58 . . . 63	
Screw plugs M 24 × 1.5 mm (oil filter) M 24 × 1.5 mm (oil drain)	Nm	39 . . . 59	
	kpm lb.ft	4.0 . . . 6.0 29 . . . 44	
23 11 . . . Housing with cover			
Gearbox housing cover/ housing (M 8)	Nm	25	
	kpm lb.ft	2.5 18	
Cover with guide sleeve/ housing (M 6)	Nm	10	
	kpm lb.ft	1.0 7.4	
Bearing cap (support ring) – M 6	Nm	10	
	kpm lb.ft	1 7.4	
Reverse gear pin (M 10)	Nm	39 . . . 49	
	kpm lb.ft	4.0 . . . 5.0 29 . . . 44	

Specifications

Manual gearbox

Model	320/6		323 i
Tightening torques – continued			
23 21 . . . Gearbox shafts			
Output flange (shouldered nut, M 20 × 1.5 mm)	Nm kpm lb.ft	98 10 72	
23 71 . . . Gearbox mounting			
Rubber mounting to cross-member (M 10)	Nm kpm lb.ft	43 ... 48 4.4 ... 4.9 32 ... 35	
Rubber mounting to gearbox (M 10)	Nm kpm lb.ft	43 ... 48 4.4 ... 4.9 32 ... 35	
Cross-member to body (M 8)	Nm kpm lb.ft	22 ... 24 2.2 ... 2.4 16 ... 18	

Getrag 242/7.50 gearbox – general arrangement

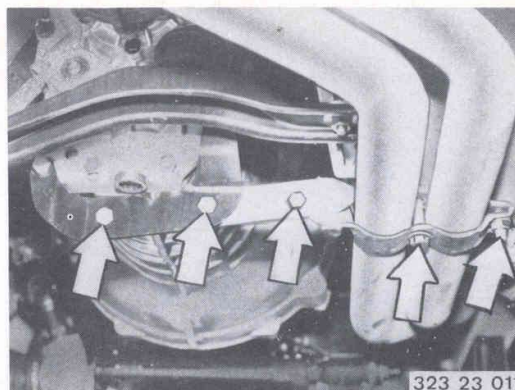


323 23 010

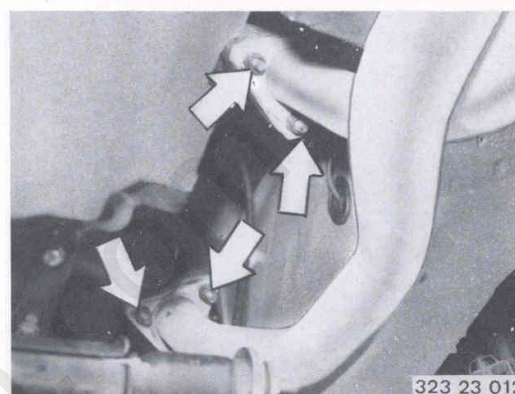
23 00 020 Gearbox – removing and installing

Detach exhaust pipe support.

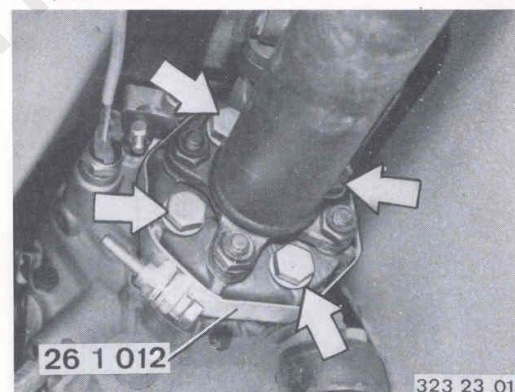
When installing: exhaust pipe support must be free from trapped stresses.



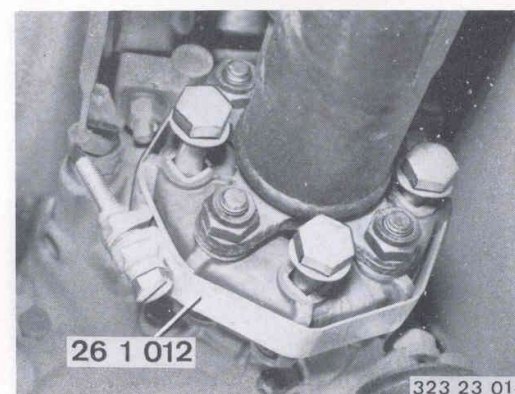
Detach exhaust pipes from exhaust manifold.
When installing: check gaskets and renew if necessary.

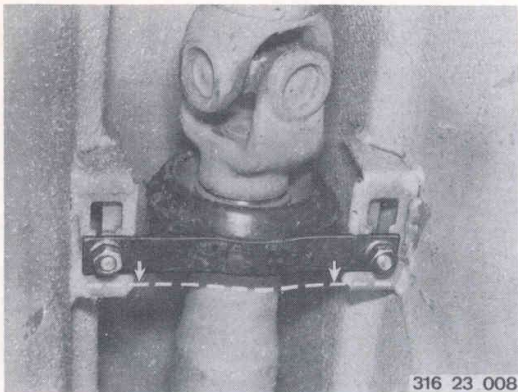


Attach clamp strap 26 1 012.
Unscrew bolts.
Do not re-use the stop nuts.

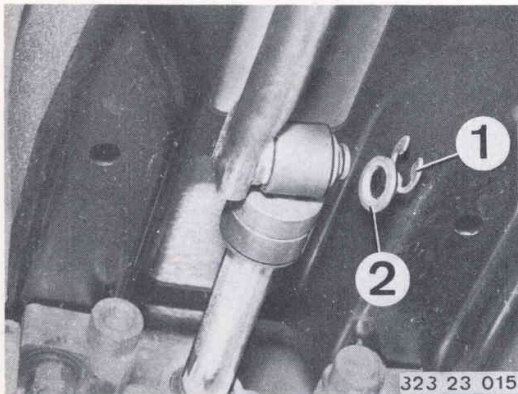


Tighten clamp strap 26 1 012 until the bolts can be taken out.
When installing: to prevent distortion of the 'Giubo' coupling, only tighten the nuts. Do not remove the clamp strap until the nuts have been tightened.

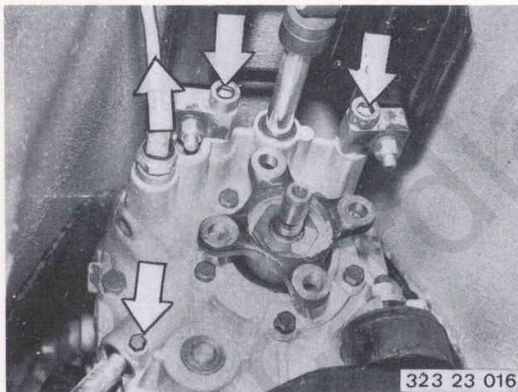




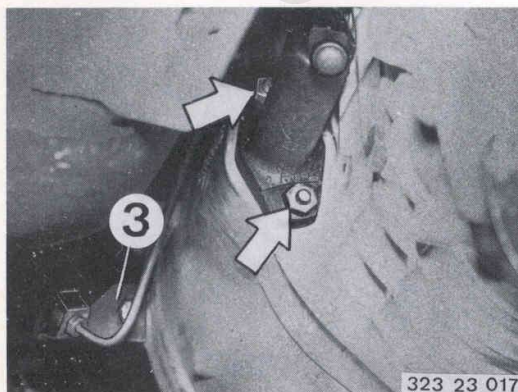
Take off the center bearing.
When installing: preload the center bearing by 2 mm (0.08 in) towards the front of the car.
Hinge the propeller shaft down and pull off the centering journal.



Select reverse gear.
Take out lock washer (1) and take off washer (2).
Pull out the selector rod.

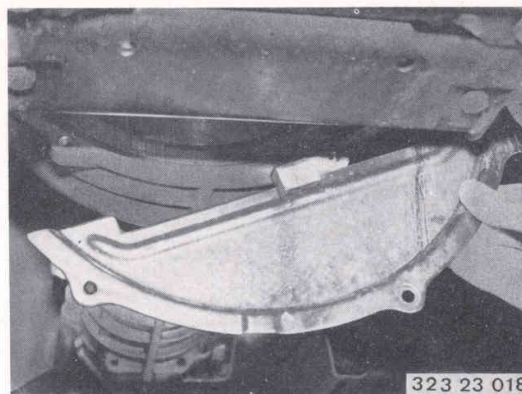


Detach the selector bracket from the gearbox.
Remove the speedometer drive shaft.
Detach the lead from the reversing (backup) light switch.



Remove the clutch slave cylinder.
Take off holder (3).

Remove cover plate.

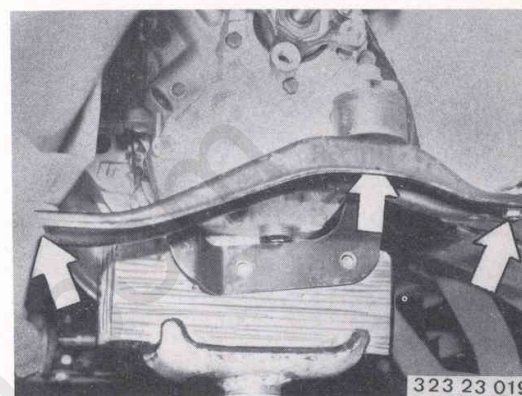


Support the gearbox.

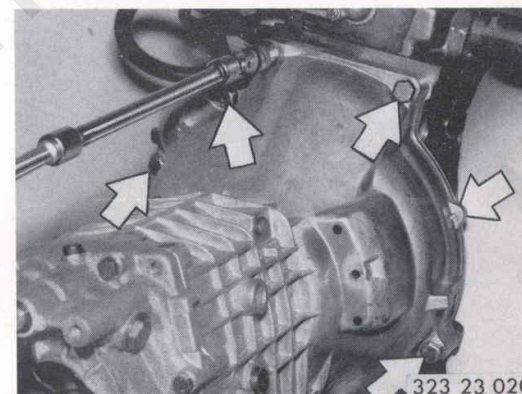
Remove the cross-member.

Warning: if there are shim washers between the cross-member and the body, they must be inserted when re-assembling.

Lower the gearbox as far as the front axle beam.

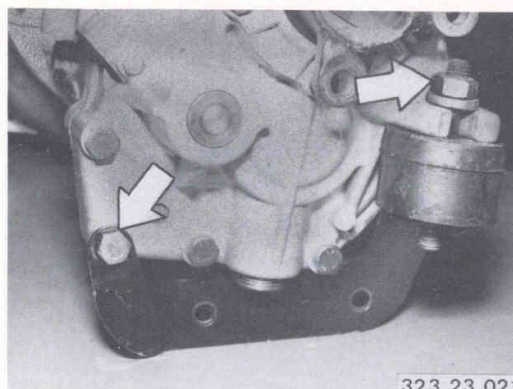


Remove all retaining bolts at the gearbox.
Use an extension wrench as necessary.
Remove the gearbox to the rear.

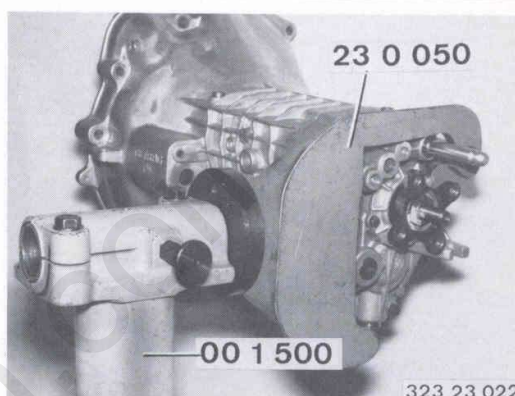


23 11 000 Gearbox housing – detaching and attaching/sealing

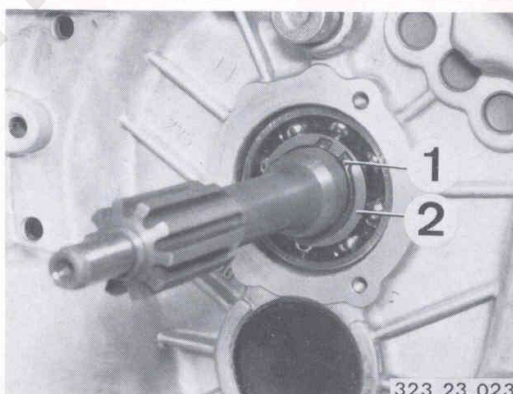
Remove the gearbox – 23 00 020.
Detach the cross member and rubber mounting.



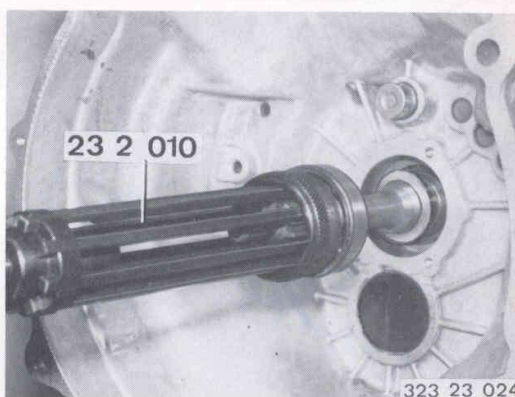
Attach the gearbox to mounting plate 23 0 050
and to repair stand 00 1 500.
Drain the oil.

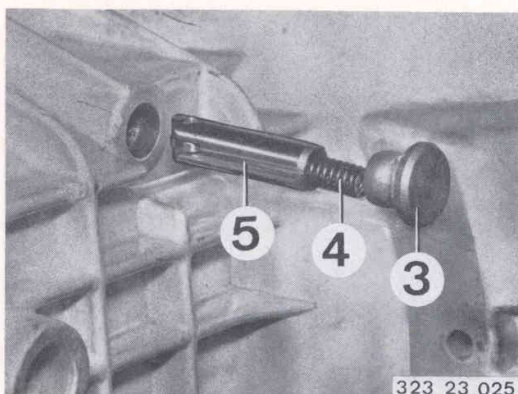


Remove the guide sleeve – 23 11 590.
Extract the circlip (1).
Remove the thrust washer (2).

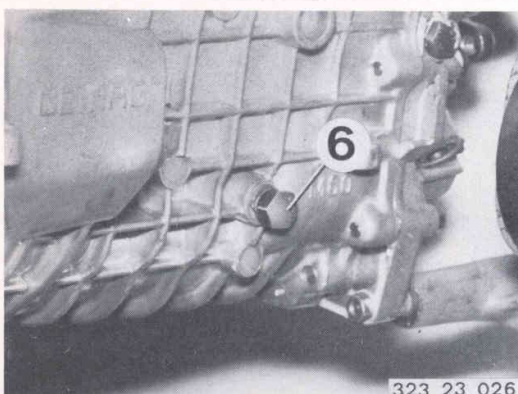


Extract ball bearing with Rillex puller 23 3 010.
Note: shim.

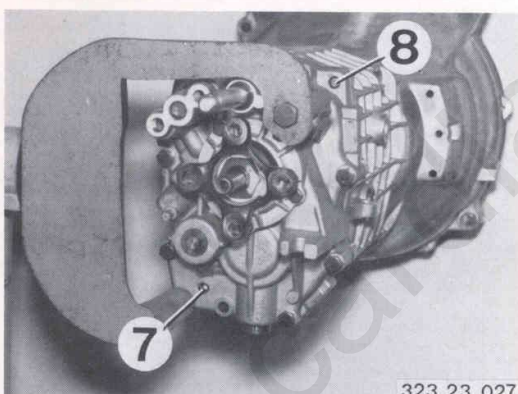




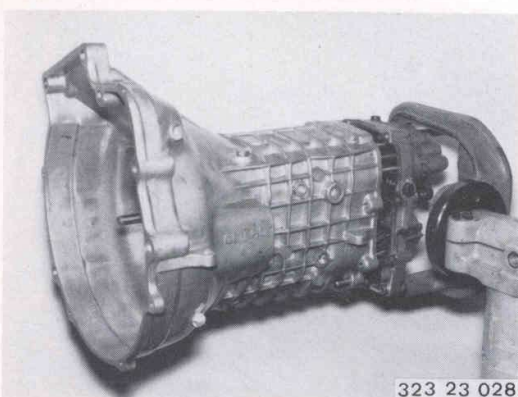
Lift out cover (3).
Remove spring (4) and locking pin (5).



Remove bolt (6).
When installing: coat bolt with Loctite Ref. No.270.

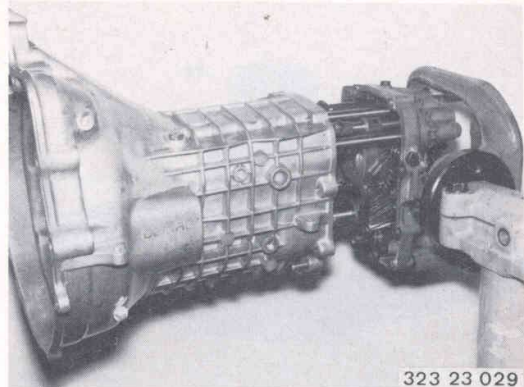


Remove the bolts holding the gearbox cover.
Drive locating pins (7) and (8) out of the cover.



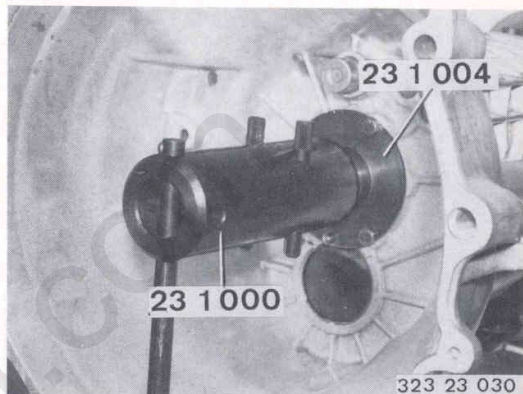
Pull off the gearbox housing.
When installing: use a new gasket.
Warning: note shims on input shaft and layshaft.

Install input shaft ball bearing in gearbox housing.
Press gearbox housing over gear cluster.



323 23 029

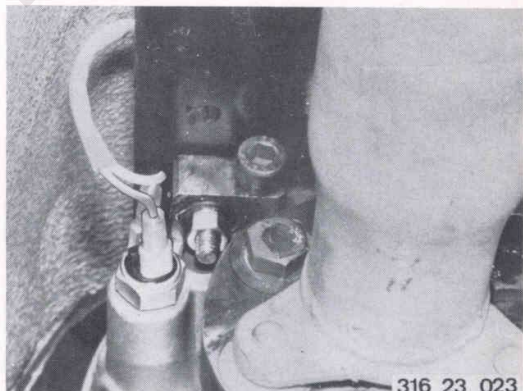
Using thrust piece 23 1 004 with installing tool 23 1 000 press the input shaft into the ball bearing and the housing on to the cover.
Secure the gearbox housing.
Install locking pins, shims and circlip.



323 23 030

23 11 101 Switch for backup (reversing) light – renewing

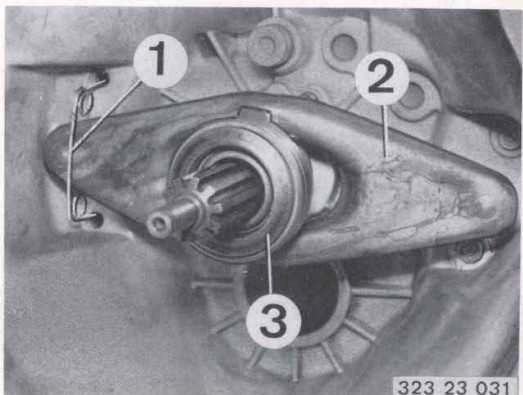
Detach lead from switch.
Unscrew and remove switch.
Renew gasket.



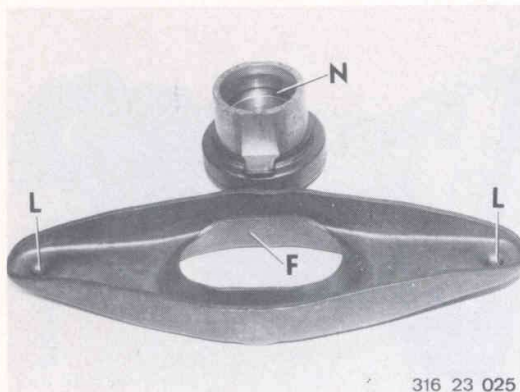
316 23 023

23 11 590 Guide sleeve for clutch withdrawal rod – removing and installing – gearbox removed –

Extract spring (1) and remove withdrawal arm (2) with thrust bearing (3).

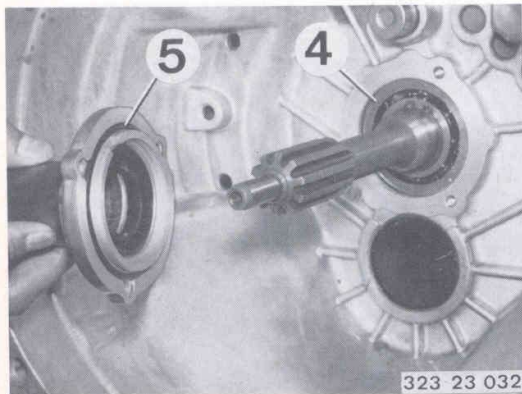


323 23 031



When installing: Pack lubricating groove (N) with 'Molykote Longterm 2'. Coat guides (F) and bearing points (L) with 'Molykote Longterm 2'.

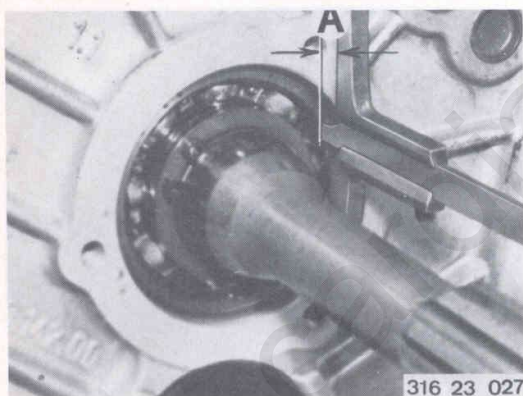
If these precautions are neglected, the withdrawal bearing may seize on the guide sleeve.



Detach the guide sleeve.

Warning: note shims (4)

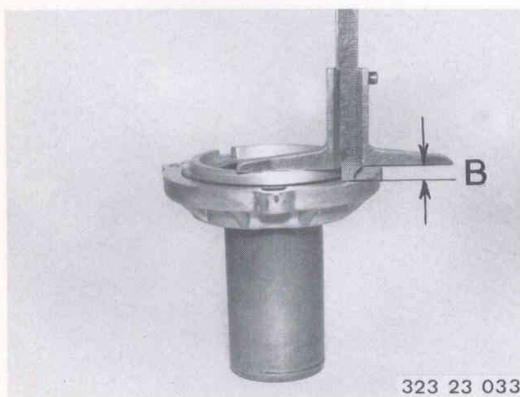
When installing: use a new O-ring (5).



23 11 591 Guide sleeve for clutch withdrawal rod – renewing

Remove the guide sleeve – 23 11 590.

When installing: measure distance A from housing to ball bearing.



Determine height of shoulder B on guide sleeve. Shim to eliminate any play.

Example:

A 5.0 mm (0.197 in)

-B 4.7 mm (0.185 in)

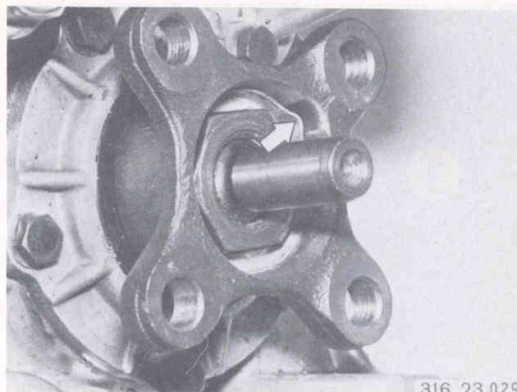
0.3 mm (0.012 in) – shim thickness

**23 12 051 Output flange radial seal – re-
newing**

Detach front propeller shaft and center bearing – 26 11 000.

Lift out the keeper plate.

When installing: **Drive the keeper plate into the groove.**



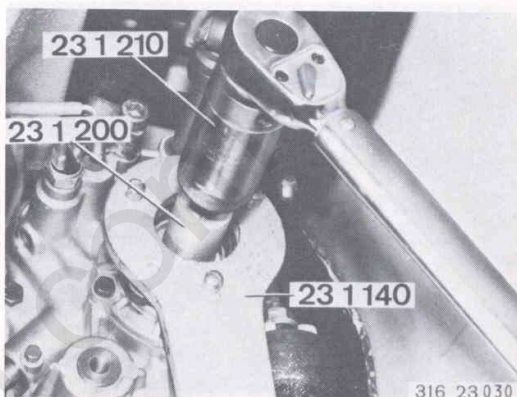
Install guide bushing 23 1 200.

Prevent the output flange from moving with wrench 23 1 140.

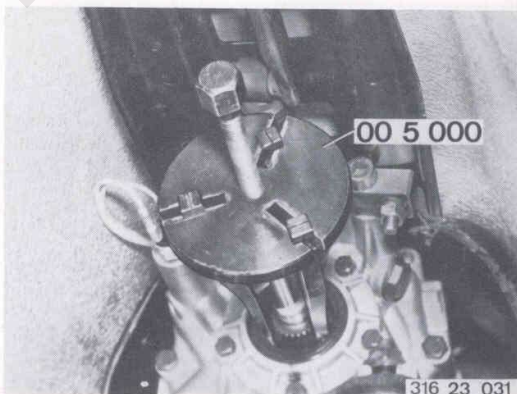
Loosen shouldered nut¹⁾ with socket wrench insert 23 1 210.

Pull off the output flange.

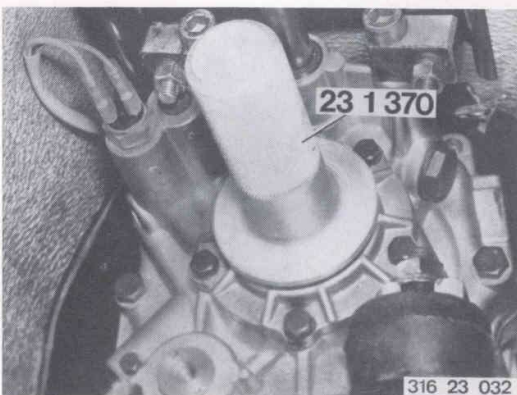
**If difficult to move, use “Kukko” 00 8 500 pul-
ler.**



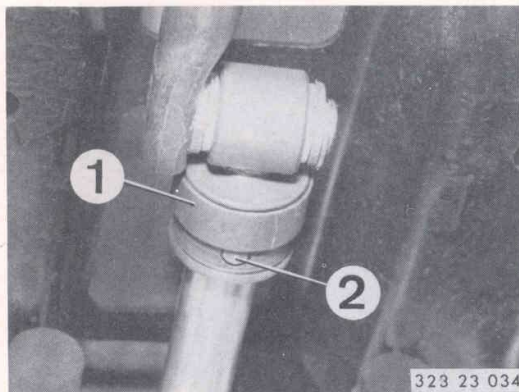
Extract the radial seal with puller 00 5 000.



When installing: **Pack the sealing with grease.**
Drive in the radial seal with tubular drift 23 1 370.



¹⁾ For tightening torque, see specifications

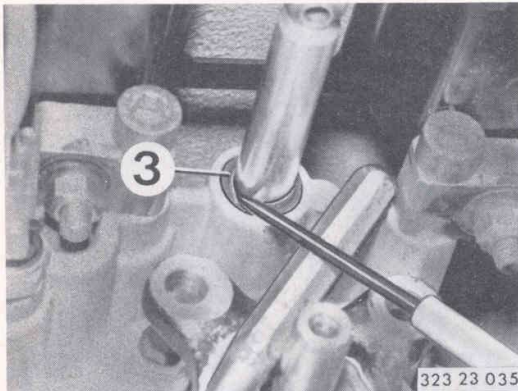


23 12 081 Selector shaft radial seal – re-newing

Remove the front propeller shaft and center bearing 26 11 000.

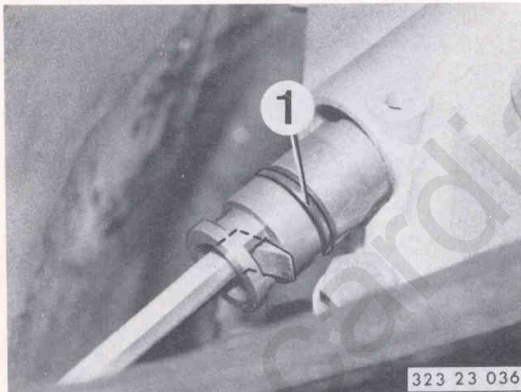
Extract the locating sleeve (1).

Drive pin (2) out upwards.



Extract the radial seal (3).

When installing: Pack the sealing lips with grease and drive the radial seal in until flush with a suitable length of tube.



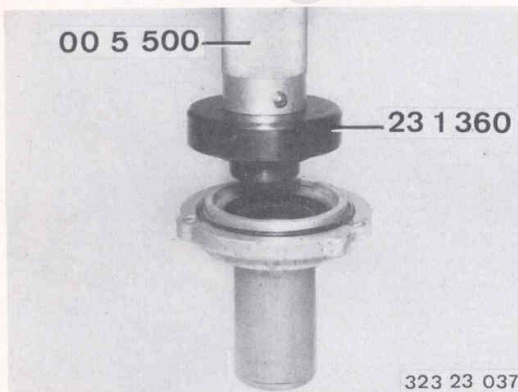
23 12 131 Cord ring seal for speedometer drive pinion socket bushing – re-newing

Take off the speedometer drive shaft.

Drive or pull out the socket bushing with an angled screwdriver.

Install the new cord ring seal (1).

If oil is leaking from the radial seal, the socket bushing must be renewed.



23 12 521 Input shaft radial seal – re-newing – Guide sleeve removed –

Extract the radial seal.

Drive the radial seal in with sleeve 23 1 360 and handgrip 00 5 500.

The open side faces the gearbox housing.

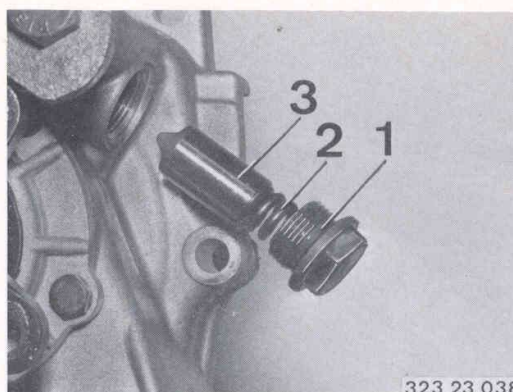
Pack the sealing lips with grease.

Use a new gasket.

23 21 500 Input and output shafts – removing and installing – Gearbox casing removed –

Unscrew the screw plug (1).

Take out the spring (2) and locking pin (3).

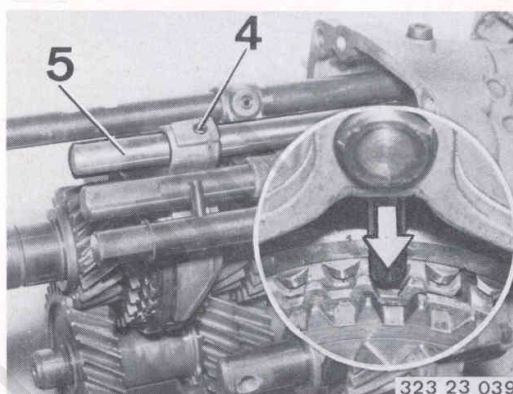


323 23 038

Drive the locating pin (4) carefully downwards until the selector rod (5) can be pulled out.

If necessary, raise the selector rod slightly.

Warning: Drive the locating pin between the teeth of the synchromesh unit. The locating pin remains in the lower part of the selector fork. Note the presence of loose balls.



323 23 039

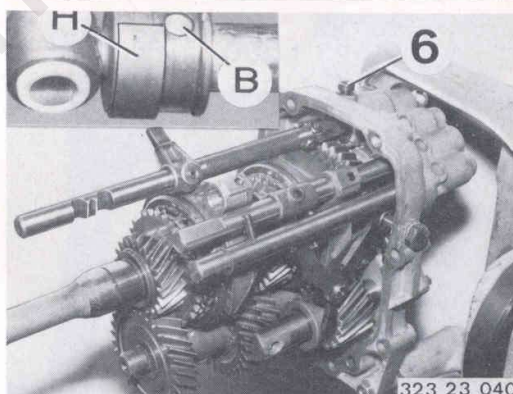
Extract the locking sleeve (H).

Drive out the pin (B).

Slacken bolt (6) until selector shaft can be turned. Selector finger must point upwards.

Press the selector fork firmly into the selector sleeve, and pull the selector shaft out forwards.

Note: rollers.

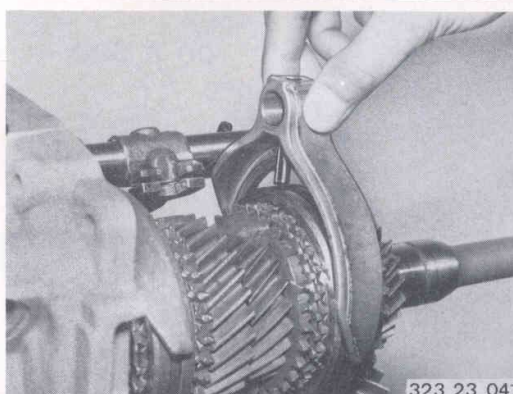


323 23 040

Take off the selector fork.

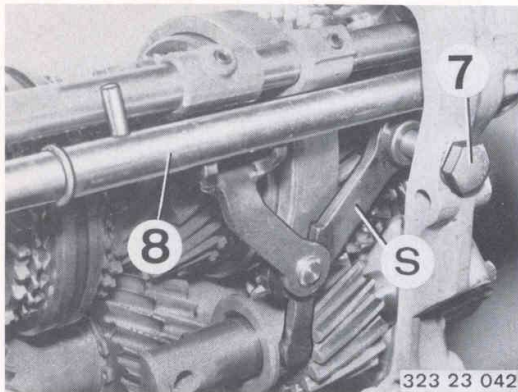
Drive the locating pin out of the selector fork.

When installing: Check selector fork for wear¹⁾ – 23 31 501.

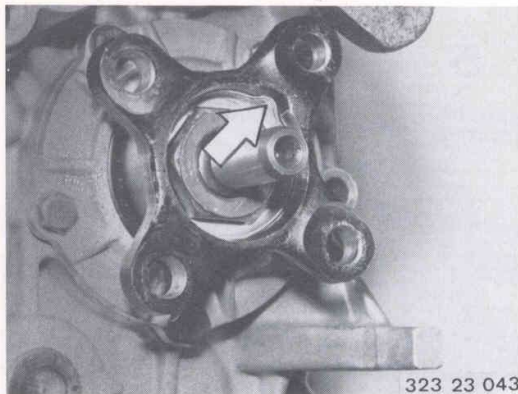


323 23 041

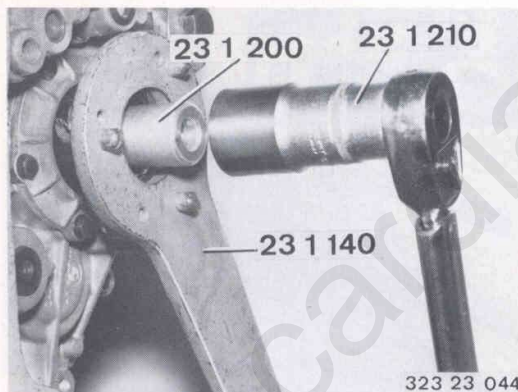
¹⁾ See specifications



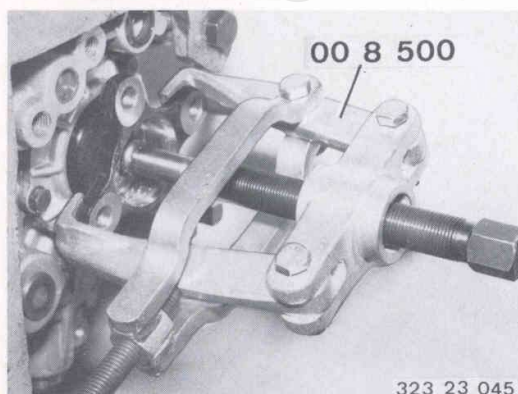
Loosen bolt (7) until reverse gear selector lever (S) can be taken out.
Pull out selector rod (8).
Note that balls may escape.



Remove the keeper plate.
When installing: Drive keeper plate into groove.



Attach guide bushing 23 1 200.
Prevent the output flange from turning with locking wrench 23 1 140.
Loosen the shouldered nut¹⁾ with socket wrench insert 23 1 210.

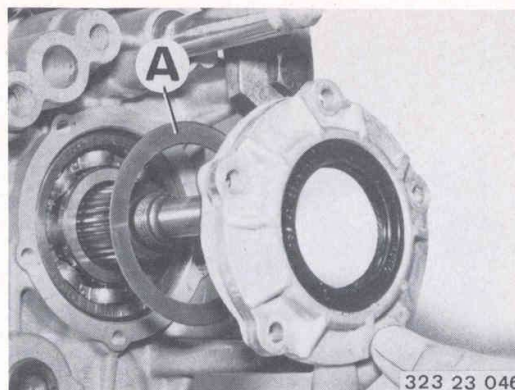


Pull off the output flange.
If flange is difficult to remove, use "Kukko" 00 8 500 puller.

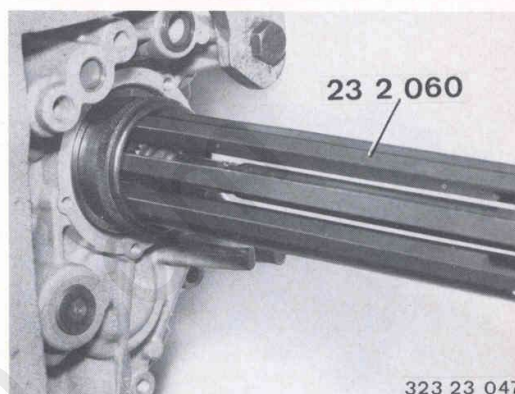
¹⁾ See specifications

Take off the thrust ring.

Warning: Note presence of shims A.
When installing: Use a new gasket.

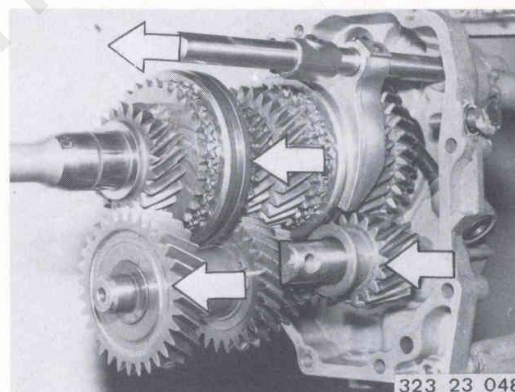


Using the Rillex 23 2 060 puller, remove the ball bearing from the output shaft and extract from the gearbox cover.



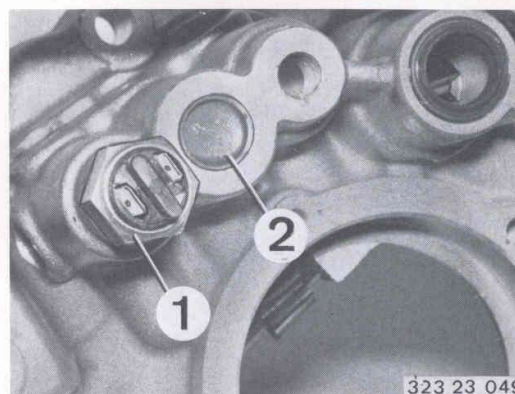
Pull the input and output shafts with selector rod and 1st/2nd gear selector fork, layshaft and reverse gear wheel out of the gearbox cover.

Warning: Note escaping balls.
When installing: Check selector fork for wear¹⁾ – 23 31 501.

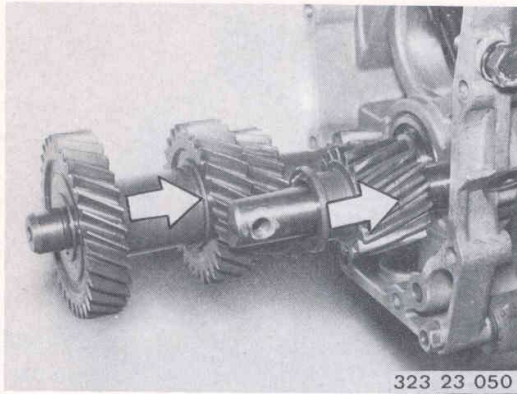


Remove backup (reversing) light switch (1) and end cap (2).

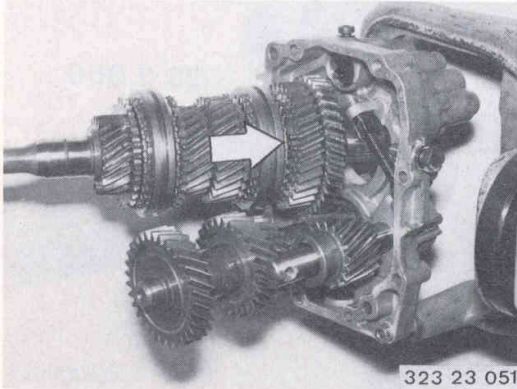
When installing: Press the locking balls down with a screwdriver inserted through the open holes.



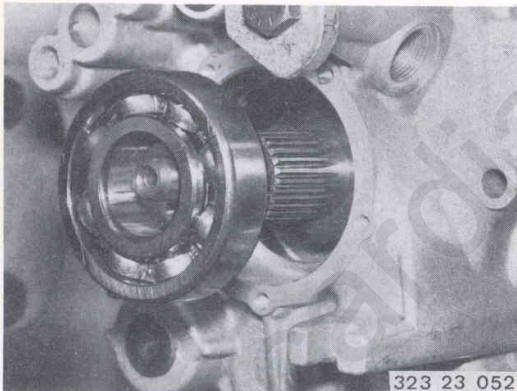
¹⁾ See specifications



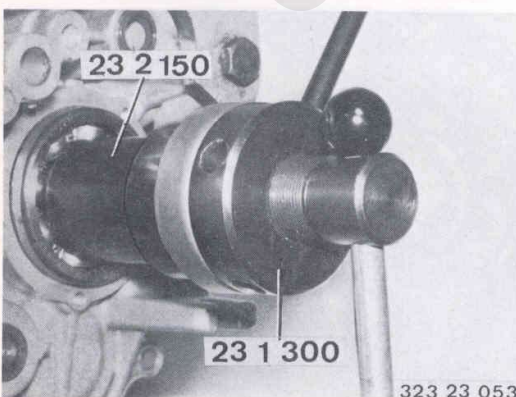
Install layshaft with reverse gear wheel.



Insert the input and output shafts into the gearbox cover.

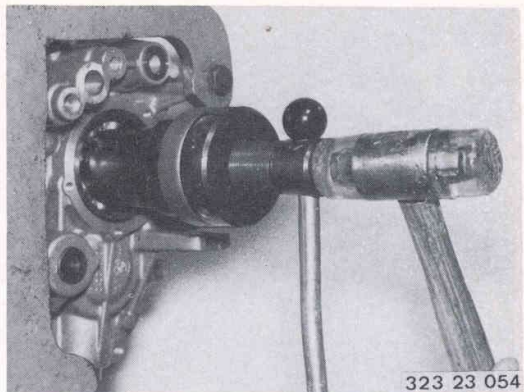


Insert the ball bearing into the gearbox cover, but do not press in.

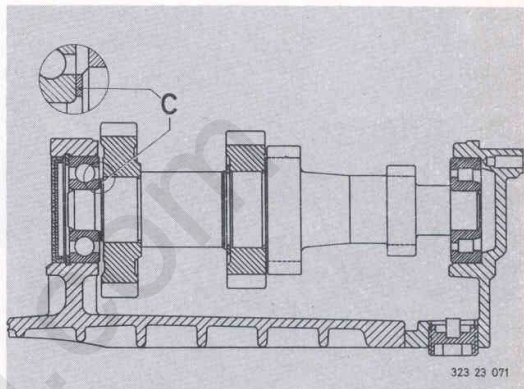


Using bushing 23 2 150 together with installation tool 23 1 300, press the ball bearing on to the output shaft.

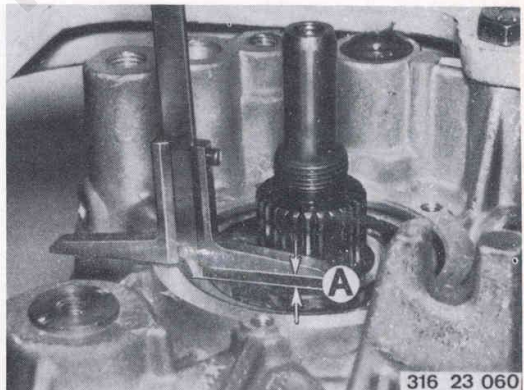
Drive the ball bearing firmly against its seat with light hammer blows.



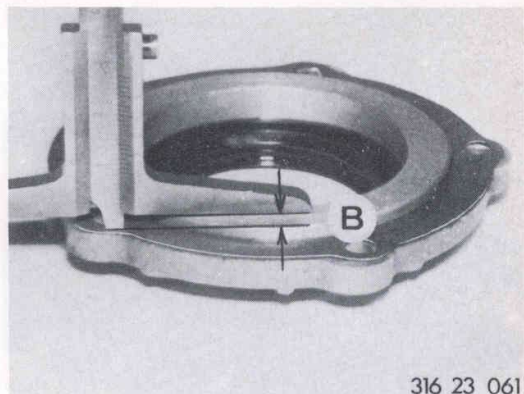
Check tooth engagement: this can be adjusted by means of shims C. Install the speedometer drive bushing and drive shaft.

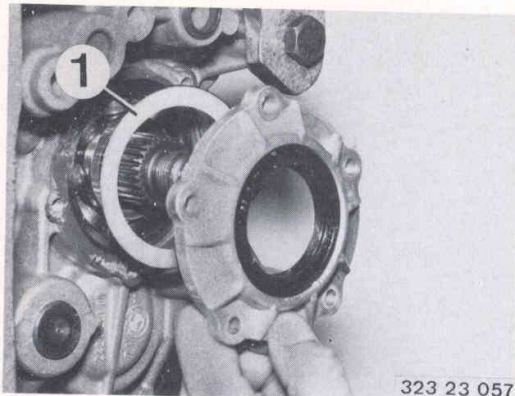


Determine distance A from the gearbox cover to the ball bearing.



Measure shoulder height B of sealing cover with gasket in position.





323 23 057

Warning: There must be no play between the outer race of the ball bearing and the sealing cover.

If play is present, eliminate with the aid of shims (1).

Example:

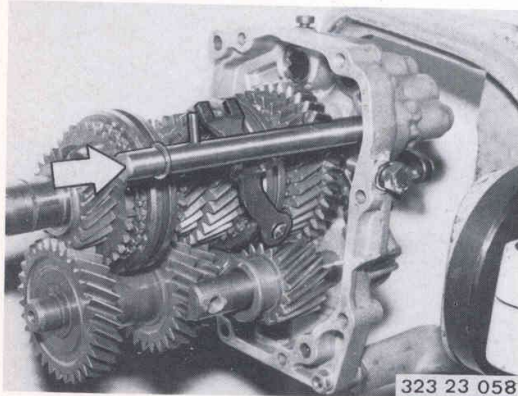
A 3.0 mm (0.118 in)

–B 2.8 mm (0.110 in)

0.2 mm (0.008 in) = shim thickness

Attach the sealing cover.

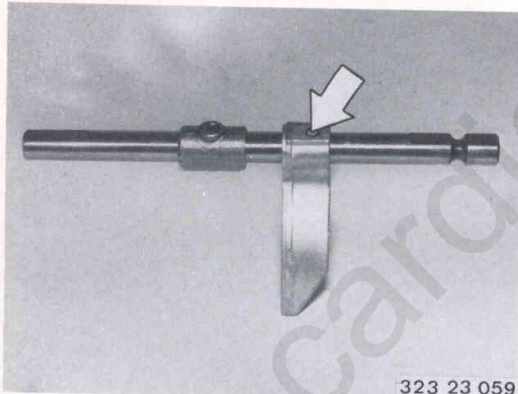
Attach and secure the output flange.



323 23 058

Insert the locking ball.

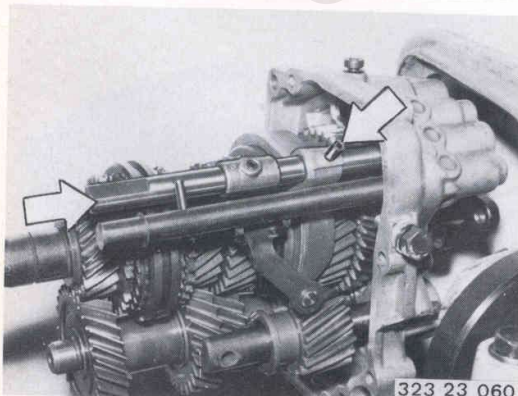
Install the reverse gear selector rod.



323 23 059

Drive out the locking pin.

Pull the selector fork away from the selector rod.



323 23 060

Insert the 1st/2nd gear selector fork into the selector sleeve.

Insert the locking and locating ball.

Install the selector rod.

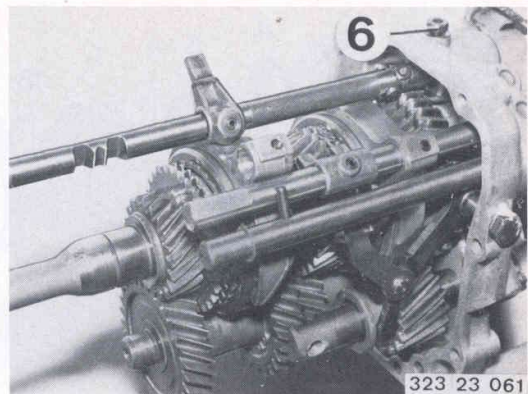
Secure the selector fork with the locating pin.

Insert the 3rd/4th gear selector fork into the selector sleeve.

Install the selector shaft. Swing the selector finger down.

Warning: Note position of taper bushing.

Insert and tighten bolt (6).



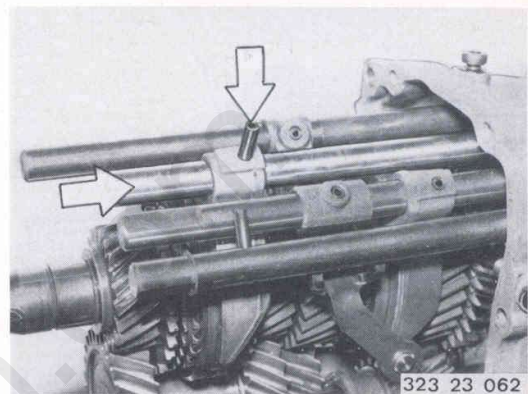
Insert the locking and locating balls.

Install the 3rd/4th gear selector rod.

Secure selector fork with locating peg.

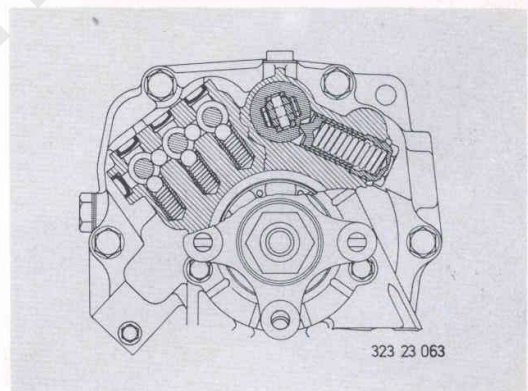
Install end cap and reversing (backup) light switch.

Install the locking pin.



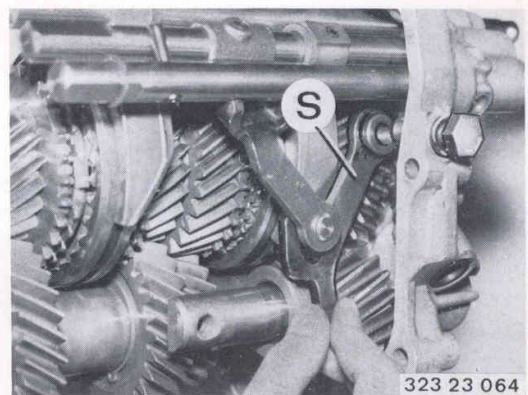
Note installed position of locking pin in taper bushing.

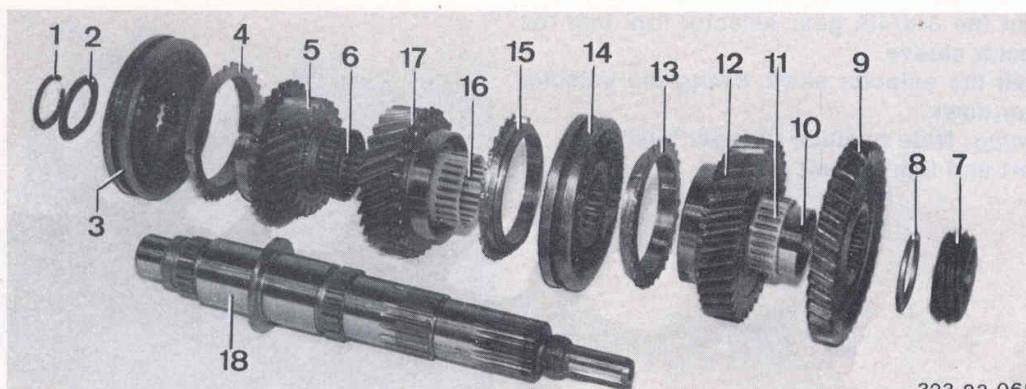
Note correct position of locating and locking balls.



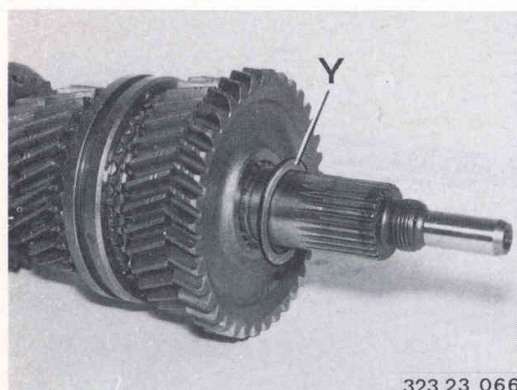
Install selector lever (S) for reverse gear.

Warning: do not offer up the selector lever at an angle.





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323 23 066

23 21 551 Output shaft – renewing – Output shaft removed –

Remove the circlip (1).
Pull off the thrust washer (2), synchromesh unit with sliding sleeve (3), synchromesh ring (4), 3rd gear wheel (5) and needle roller cage (6) from the output shaft. Press the speedometer drive worm (7), washer (8), reverse gear wheel (9), spacing bushing (10), needle roller cage (11), 1st gear wheel (12), synchromesh ring (13), synchromesh unit with sliding sleeve (14), synchromesh ring (15), needle roller cage (16) and 2nd gear wheel (17) off the output shaft (18).

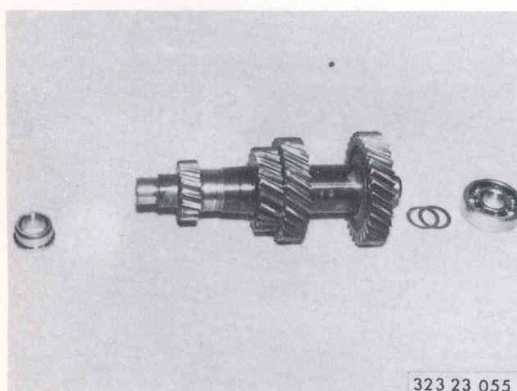
Assembly the output shaft.

Warning: Using shim Y, adjust end play to 0...0.09 mm (0... 0.0035 in).

Insert shim Y ahead of reverse gear wheel.
Press the speedometer drive gear on as far as the shoulder on the output shaft.
Determine end play.



323 23 067



323 23 055

23 21 701 All ball bearings – renewing – gearbox removed –

Remove and install the input and output shafts – 23 21 500.

A) Layshaft

Pull off ball bearing and inner race of roller bearing.

Note: shims

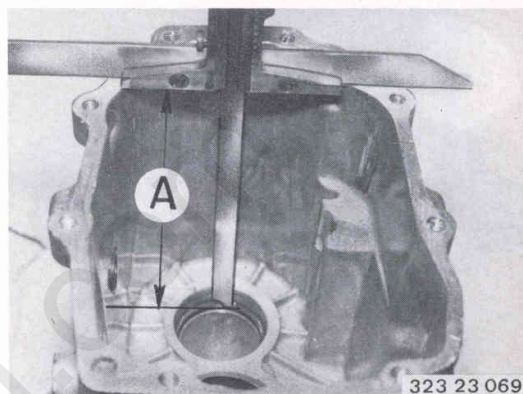
Pull the roller bearing out of the gearbox cover; heat the gearbox cover if necessary.

Warning: Note shims.

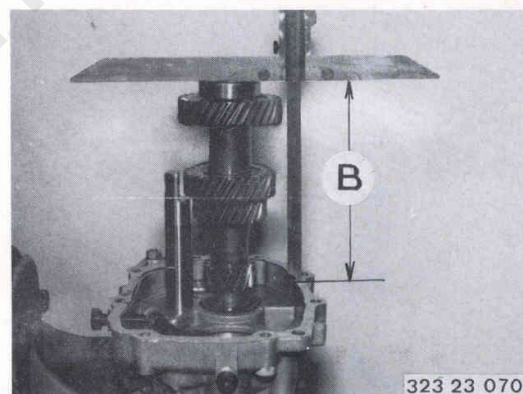
When installing: The smaller diameter on the roller cage faces towards the gearbox cover.



Determine distance A from housing joint face to circlip.



**Install layshaft in gearbox cover.
Measure height B of layshaft with gasket in position.
Remove layshaft.**

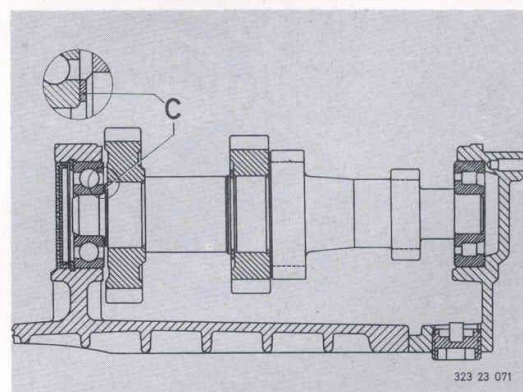


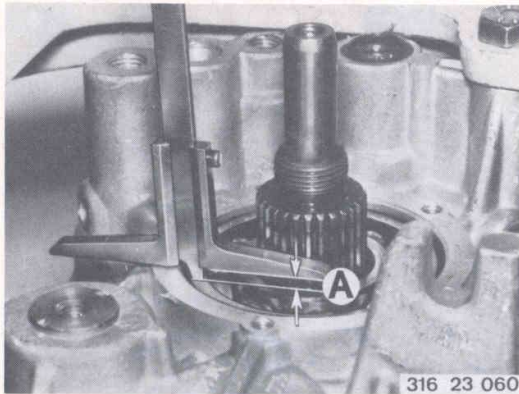
Determine thickness of shims C.

Example:

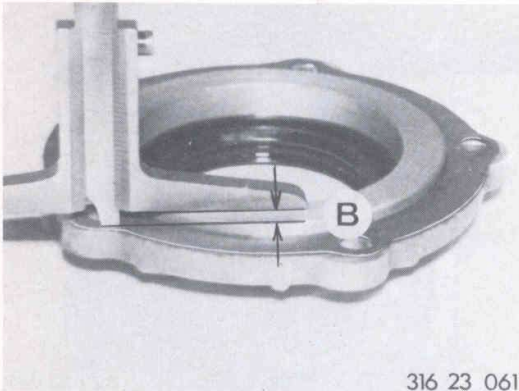
A	165.3 mm (6.5079 in)
– B	165.0 mm (6.4961 in)
C	0.3 mm (0.0118 in)

Shims C can be used to adjust tooth engagement.

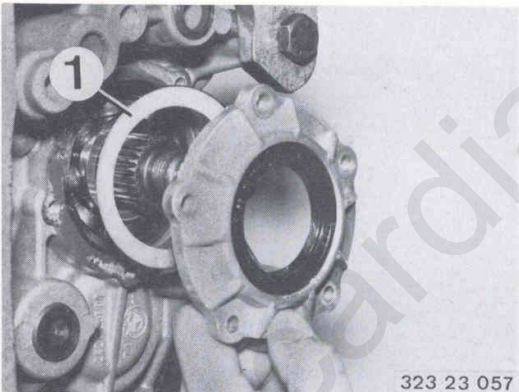




B) Output shaft
Determine distance A from housing cover to ball bearing.



Measure height of shoulder B on sealing cover with gasket in place.

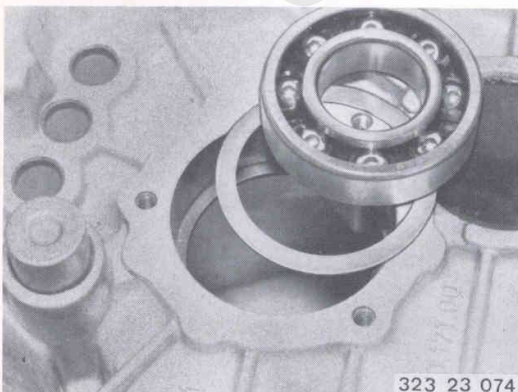


Warning: There must be no play between the ball bearing outer race and the sealing cover. Any play must be shimmed to zero (1).

Example:

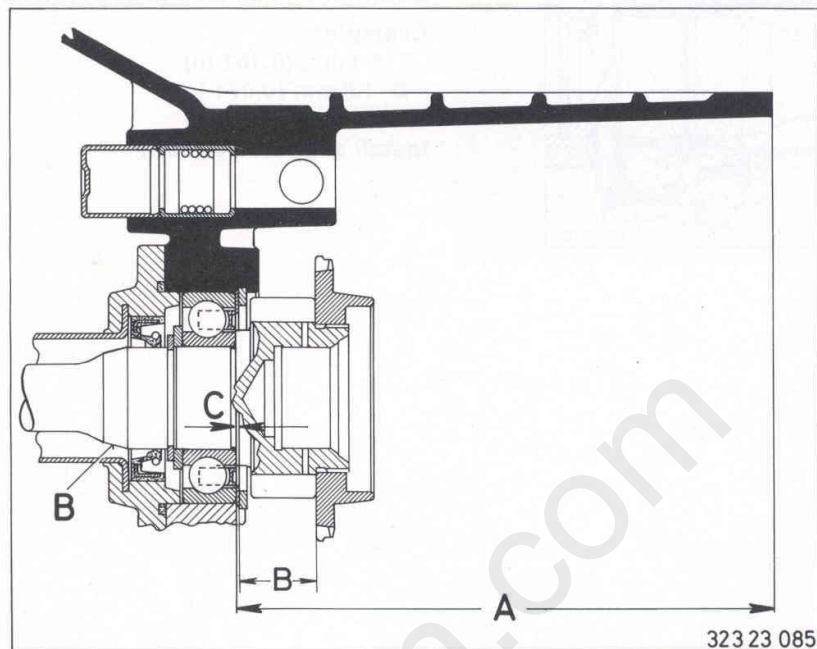
A 3.0 mm (0.118 in)
-B 2.8 mm (0.110 in)
0.2 mm (0.008 in) = shim thickness

Attach the sealing cover.
Attach and secure the output flange.



C) Input shaft
Install a 1 mm (0.04 in) shim and the ball bearing in the housing.

A from sealing face on housing to deep-groove ball bearing
 Actual dimension B is engraved on input shaft
 C = shim thickness required.

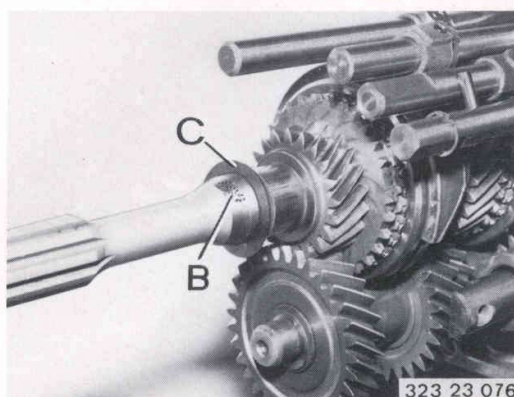
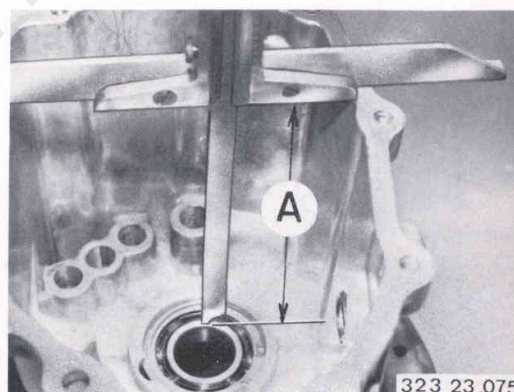


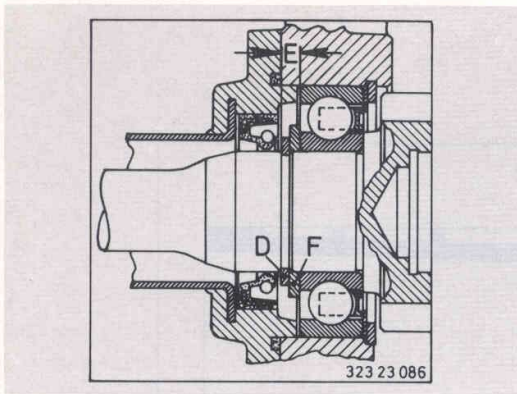
A – determine from housing joint face to ball bearing.

After establishing the actual values for A and B, the thickness of shim C can be taken from column C in the table below.

A mm (in)	mm (in)	B	C mm (in)
159.9 (6.295)	23.5 (0.925) 23.4 (0.921)	100 90	0.5 (0.020) 0.6 (0.024)
159.8 (6.291)	23.5 (0.925) 23.4 (0.921)	100 90	0.4 (0.016) 0.5 (0.020)
159.7 (6.287)	23.5 (0.925) 23.4 (0.921)	100 90	0.3 (0.012) 0.4 (0.016)
159.6 (6.283)	23.5 (0.925) 23.4 (0.921)	100 90	0.3 (0.012) 0.3 (0.012)

Place the correct shim C on the input shaft.





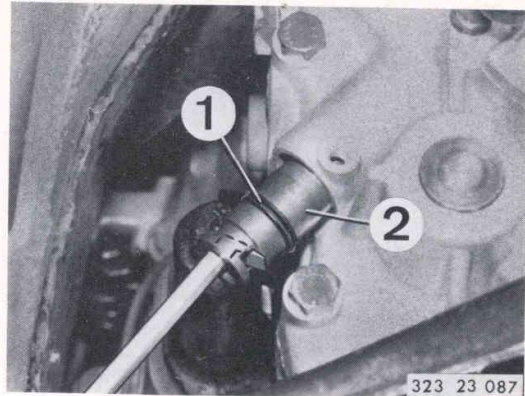
D – measure thickness of Seeger circlip.
 Install Seeger circlip in slot on input shaft.
 E – measure distance from Seeger circlip to
 ball bearing.
 Determine thickness of support washer.

Example:

E 4.1 mm (0.161 in)
 –D 1.8 mm (0.071 in)
 F 2.3 mm (0.091 in)
 Install support washer F.

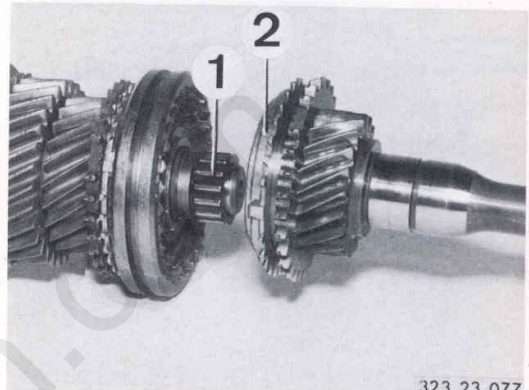
23 22 100 Speedometer drive pinion – removing and installing

Take off the speedometer drive shaft.
Carefully pull or drive out the speedometer drive shaft bushing with an angled screwdriver.
Renew cord ring seal (1). If the radial seal is defective, the bushing (2) must be renewed.

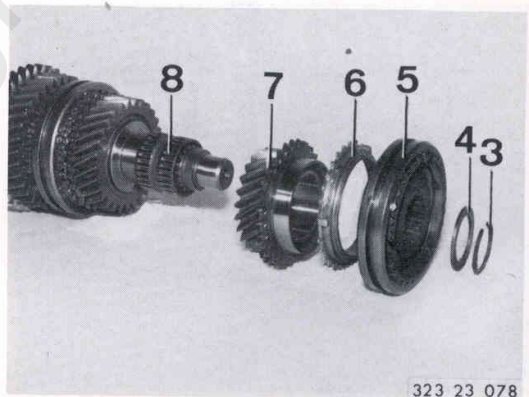


23 22 551 3rd and 4th gear clusters – renewing – Output shaft removed –

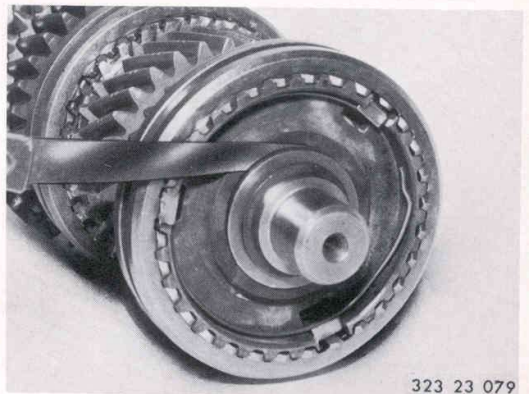
Pull the input shaft with needle roller cage (1) and synchromesh ring (2) away from the output shaft.

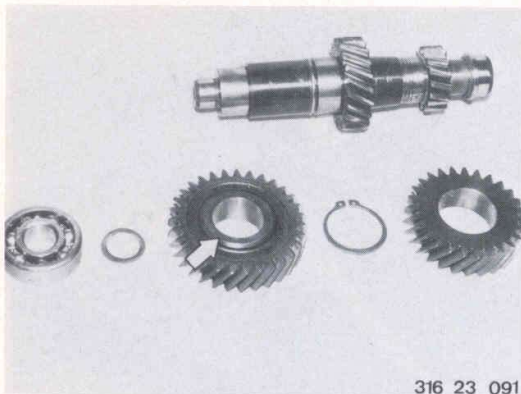


Remove the snap ring (3).
Pull off the thrust washer (4), guide sleeve (5), synchromesh ring (6) and 3rd gear wheel (7) with needle roller cage (8).



When installing: If the needle roller bearing with spacing bushing is also renewed, any play which develops must be eliminated again with shims.





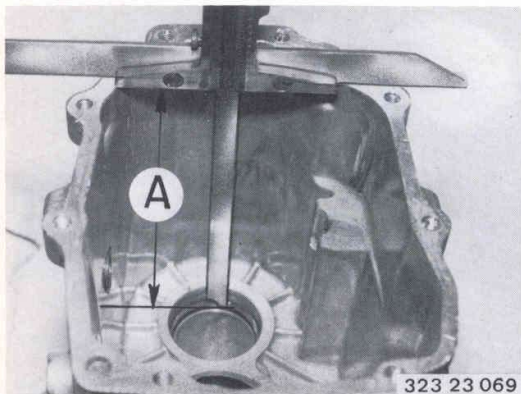
Press off the 4th gear wheel with ball bearing from the layshaft.

Warning: Note shims

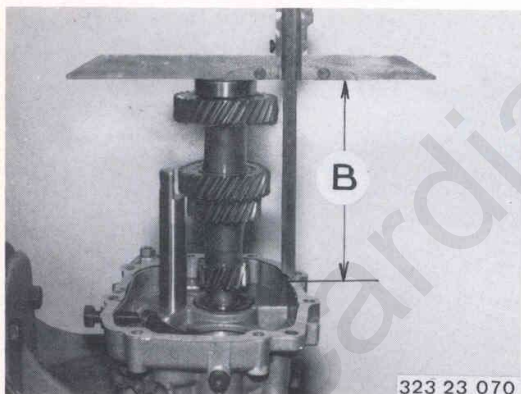
Extract the circlip and press off the 3rd gear wheel. Removal pressure approx. 10 t, installation pressure approx. 7t.

When installing: Heat gear wheels to 120... 150°C (250... 300°F).

Warning: The raised shoulder on the 3rd and 4th gear wheel bore must face towards the 2nd gear wheel.



Determine distance A from housing joint face to circlip.



Install the layshaft in the gearbox cover.

Measure height B of layshaft with gasket in position.

Remove the layshaft.

Determine thickness of shims.

Example

A 165.3 mm (6.5079 in)

– B 165.0 mm (6.4961 in)

Shim thickness

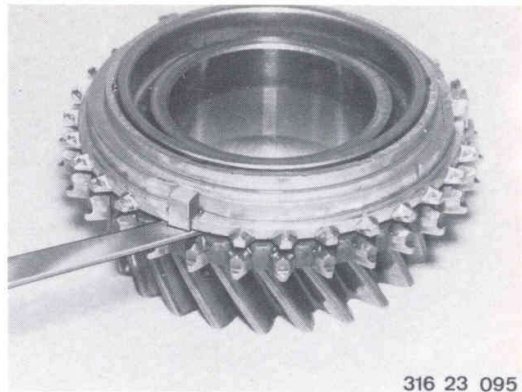
0.3 mm (0.0118 in)

23 23 503 Synchromesh rings – renewing

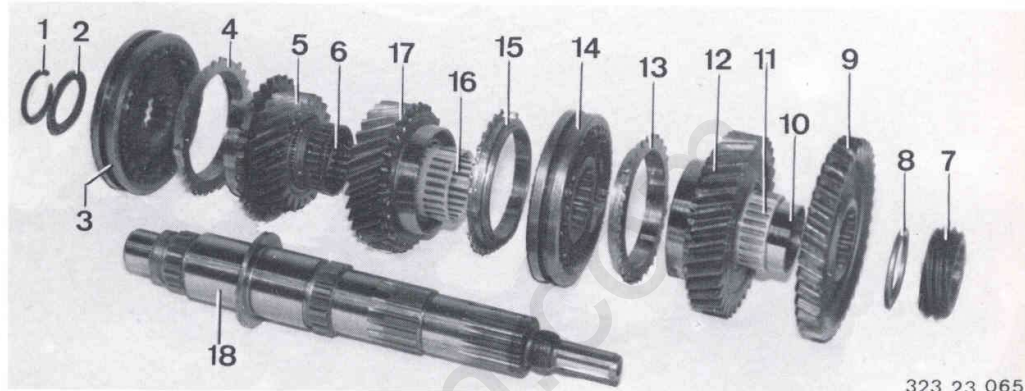
Remove input and output shafts – 23 21 500.
The synchromesh rings must be renewed when the gap between the ring and the clutch body is less than 0.8 mm (0.031 in).

Warning: Measure the gap next to the stop blocks.

When the synchromesh rings are new, the gap should be 1.0 mm (0.039 in).



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323 23 065

Extract circlip (1).

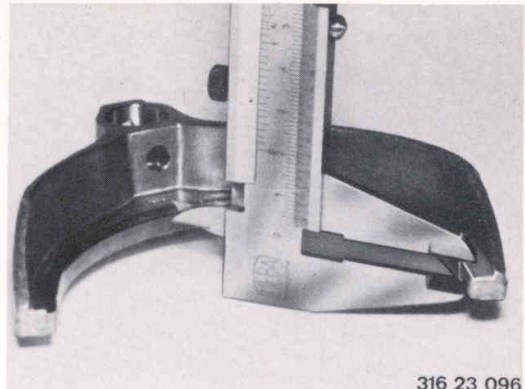
Pull off the thrust washer (2), synchromesh unit with sliding sleeve (3), synchromesh ring (4), and needle roller cage (6) from the output shaft.

Press off the speedometer drive worm (7), washer (8), reverse gear wheel (9), spacing bush (10), needle roller cage (11), 1st gear wheel (12), synchromesh ring (13), synchromesh unit with sliding sleeve (14), synchromesh ring (15), needle roller cage (16) and 2nd gear wheel (17) from the output shaft (18).

23 31 501 1st/2nd and 3rd/4th gear selector forks – renewing

Remove and install the input and output shafts – 23 21 500.

Measure wear¹⁾ at the selector fork.



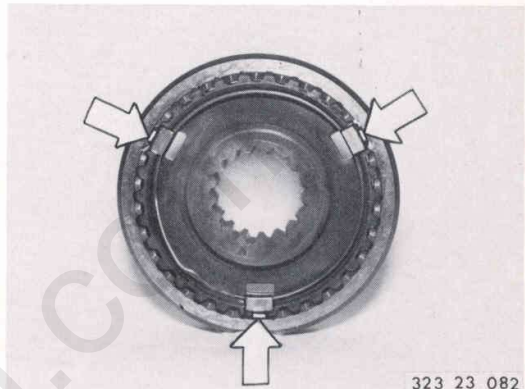
23 31 721 All sliding pads –renewing

Remove input and output shafts – 23 21 500.

Strip the output shaft – 23 23 503.

Press the sliding sleeve away from the synchromesh unit.

When installing: Push the flat teeth on the sliding sleeve over the pressure pads.



Engage the hooked ends of the synchromesh springs in a longitudinal groove.

Attach the pressure pads to the synchromesh springs.



¹⁾ See specifications

