

Gearbox Assembly

General

Technical parameters

Tightening torque

Gearbox disassembling

Inspection and repair

Gearbox reassembling

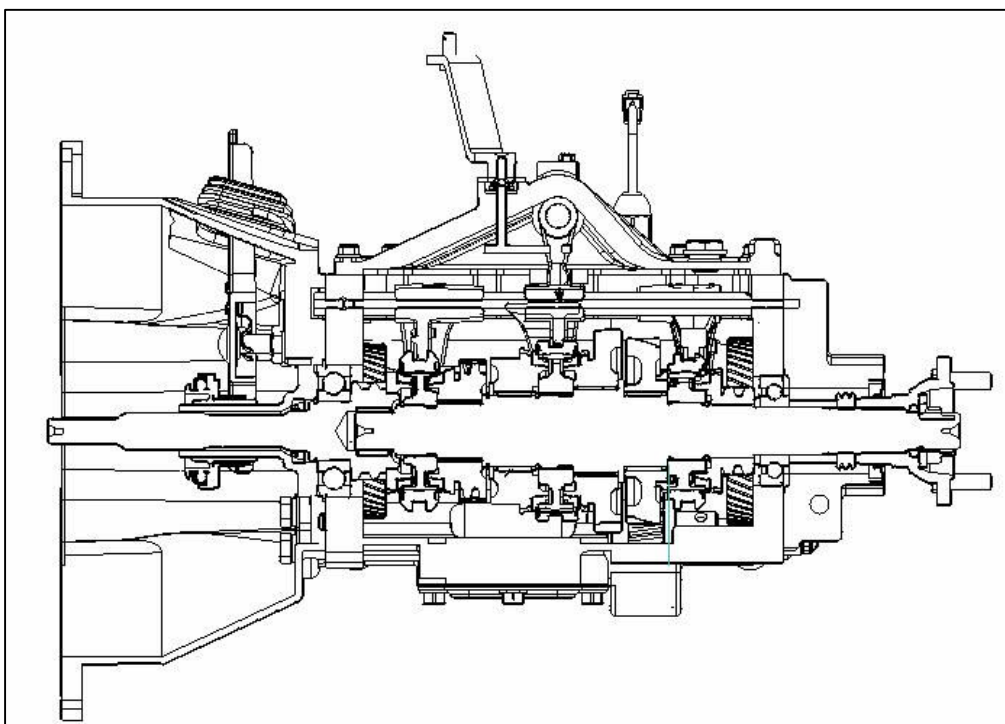
Trouble shooting

General

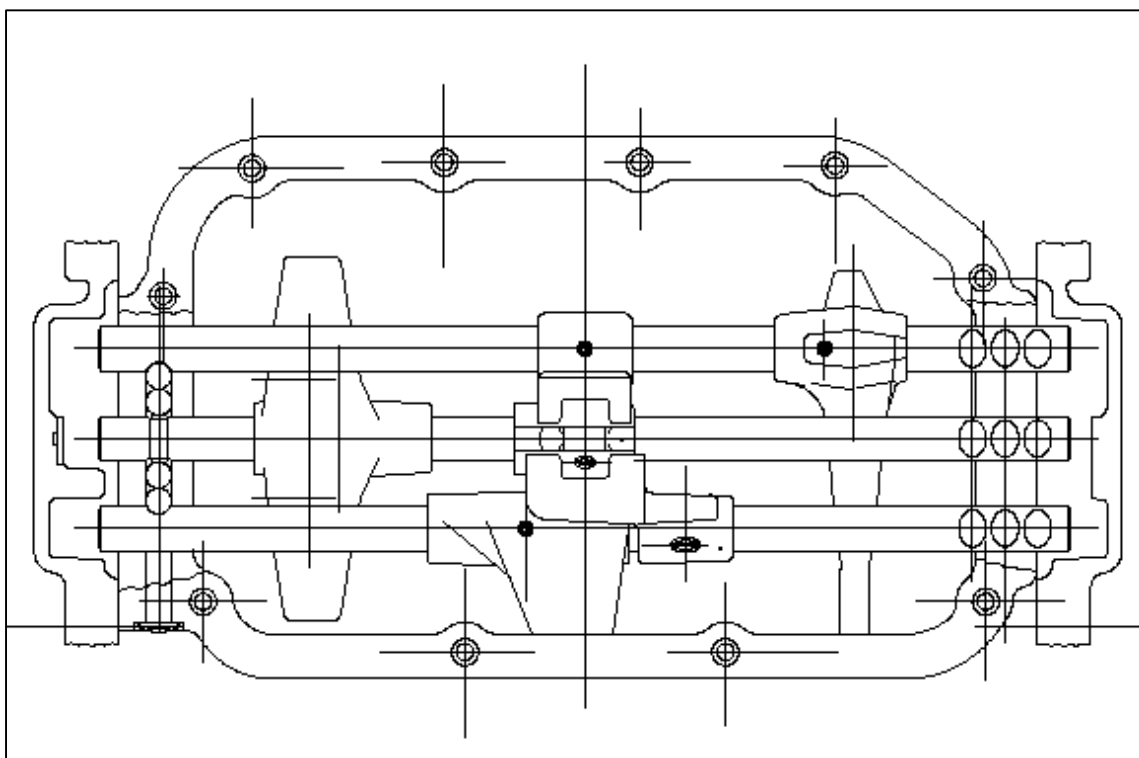
1) Direction for use

1. All forward gears of MSB-5M (reinforced) gearbox have clamping ring synchronizer, in order to reduce abrasion between the gear and the synchronizer and enable the synchronizer and gear to declutch smoothly so as to prevent the gear being destroyed, the action of shifting the gear must be gentle. Only after the vehicle has stopped steadily can forward gear be shifted to reverse gear or reverse gear to forward gear.
2. Special attention must be paid to: The fifth gear of gearbox is overdrive gear; to avoid the overdrive gear being damaged, the fifth gear can only be used when the vehicle is not overloaded, the road surface condition is excellent, and the vehicle is running at the speed above 50 km/h. When at the fifth gear, in case some kind of situation requires the vehicle to slow its speed to below 50 km/h, it is necessary to shift to lower gear; if it continues to run at the fifth gear, it is extremely easy to break up the fifth gear.
3. The gearbox uses 80W/90 GL-4 gear oil in winter and 85W/90 GL-4 gear oil in summer. Generally, the vehicle has to change its gear oil after running every 6,000 km. After draining dirty oil, put the gearbox at reversing gear, jack up the rear axle, pour kerosene into it, let the gearbox gear rotate for 2-3 minutes, then after draining the dirty oil again, fill it with pure gear oil.
4. When the vehicle is running downhill, it does not allowed to turn off the engine; and it is forbidden to start the engine by using the inertia running downhill under the flameout condition, so as to avoid the gear being damaged.

2) Assembling diagram



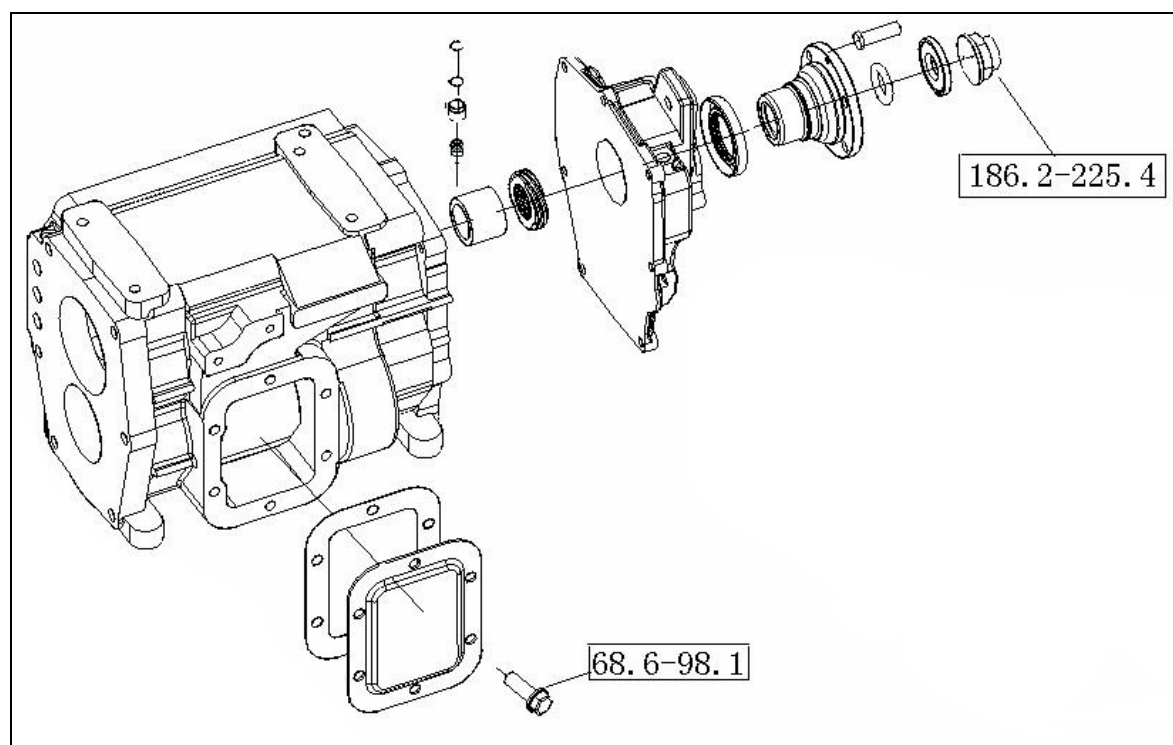
3) Diagram of gear shifting mechanism

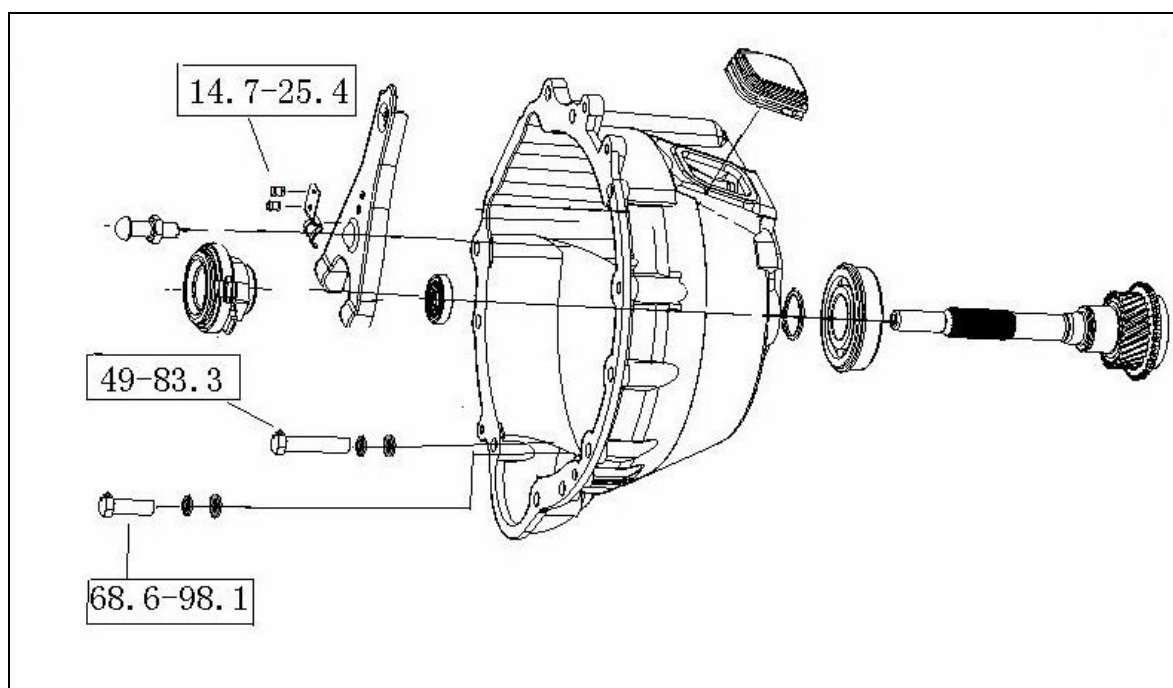
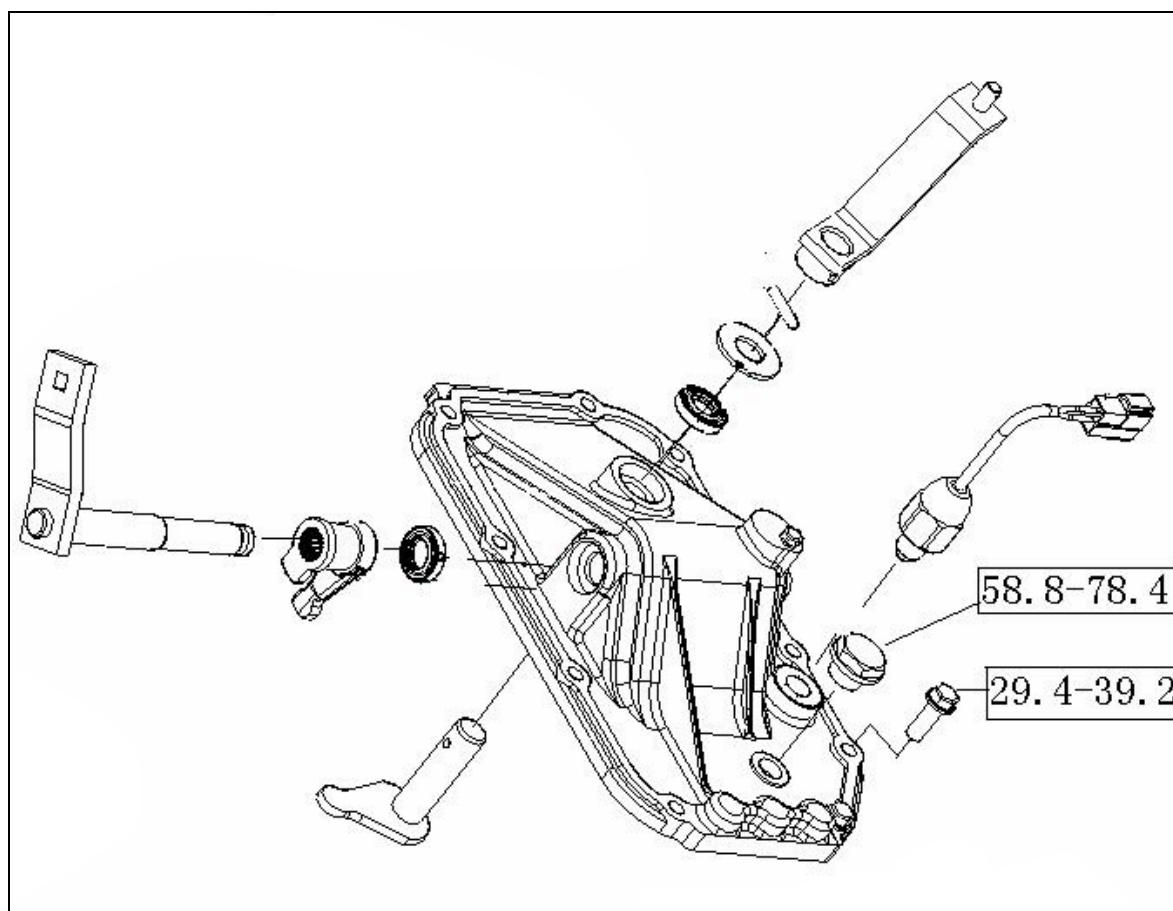


Technical parameters

Rated input torque	254.8N·m
Assembly mass	Approx. 78Kg
Speed ratio	1st 5.529
	2nd 2.782
	3rd 1.641
	4th 1
	5th 0.785
	Rev 5.271
Lube oil amount	2.7L
Lube oil brand	Use (GL-4) 85W/90 in summer
	Use (GL-4) 80W/90 in winter

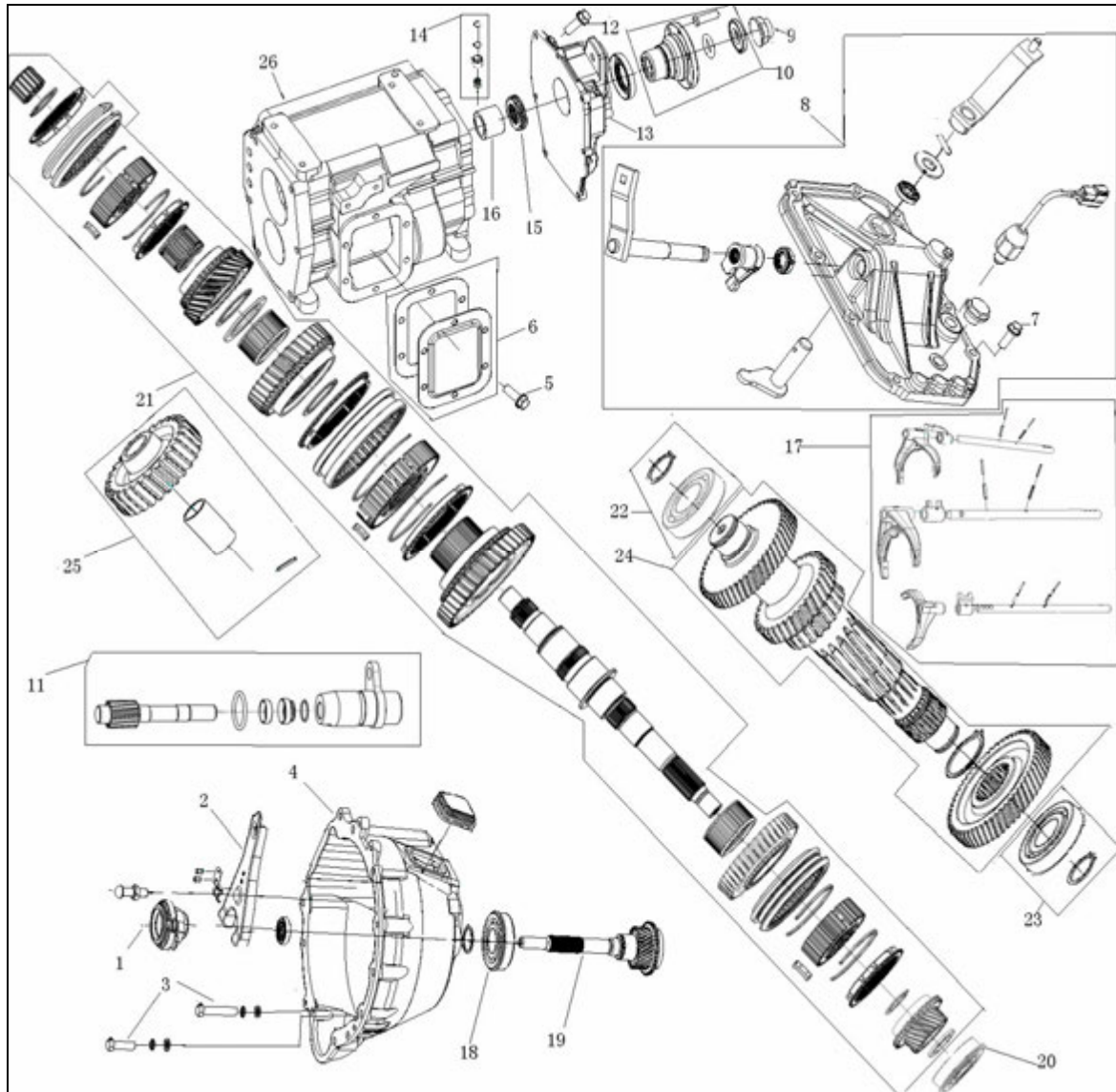
II. Tightening torque N·m





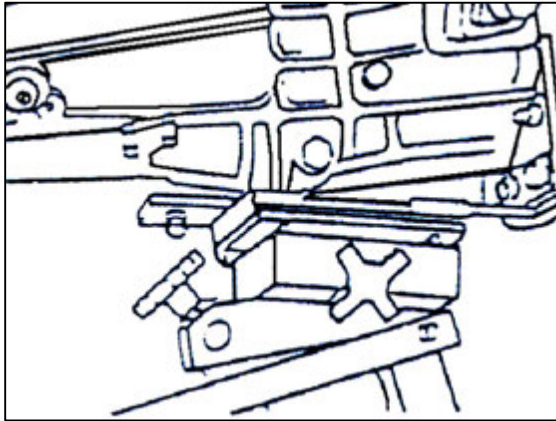
III. Gearbox disassembling drawing

Disassembling of large parts



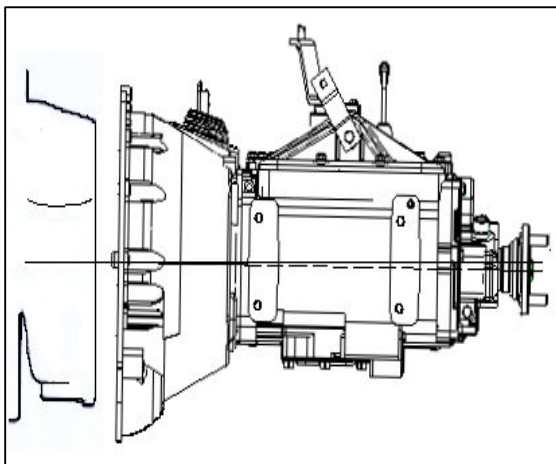
Disassembling sequence:

- | | | |
|---|---|--|
| 1 Separation bearing | 11 Odometer driven gear | 20 Secondary axle bearing |
| 2 Separation shifting yoke assembly | 12 Rear cover bolt | 21 Secondary axle assembly |
| 3 Clutch housing bolt | 13 Rear cover | 22 Intermediate axle front bearing, retaining ring |
| 4 Clutch housing | 14 Breather valve | 23 Intermediate axle rear bearing, retaining ring |
| 5 Gearbox side cover bolt | 15 Odometer driven gear driving gear | 24 Intermediate axle assembly |
| 6 Gearbox gear side cover and side cover gasket | 16 Odometer driven gear driving gear spacer | 25 Reversing gear |
| 7 Gearbox top head bolt | 17 Shifting yoke and shifting yoke shaft | |
| 8 Top head assembly | 18 Primary axle bearing | |
| 9 Second axle nut | 19 Primary axle assembly | |
| 10 Flange | | |



Important operation-- gearbox assembling

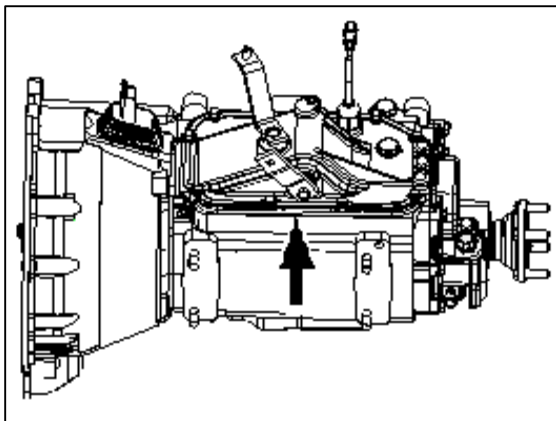
When disassembling, do use jack or similar tool so as to guarantee safety of disassembling and facilitate disassembling.



Assembling

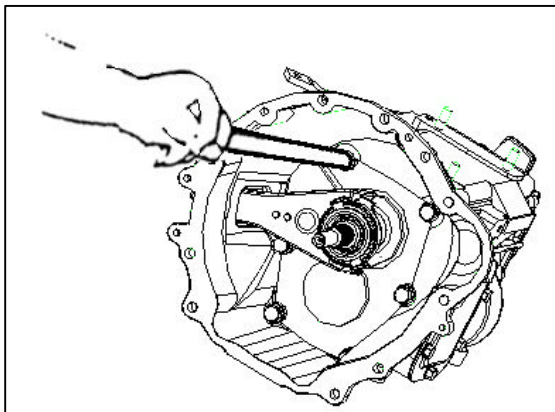
Gearbox assembly

- (1) Align the inclined line of gearbox to the inclined line of engine.
- (2) Adjust the gearbox to the direct gear position, turn the secondary axle flanged disc to align it with clutch.



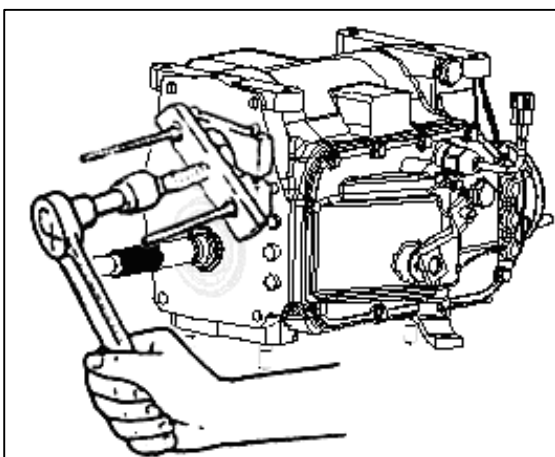
Gearbox cover assembly

Insert a screwdriver to the groove indicated by the arrow in the picture. Remove the gearbox cover assembly from the gearbox body. Do not disassemble it roughly, be careful and put it down gently.



Clutch housing bolts

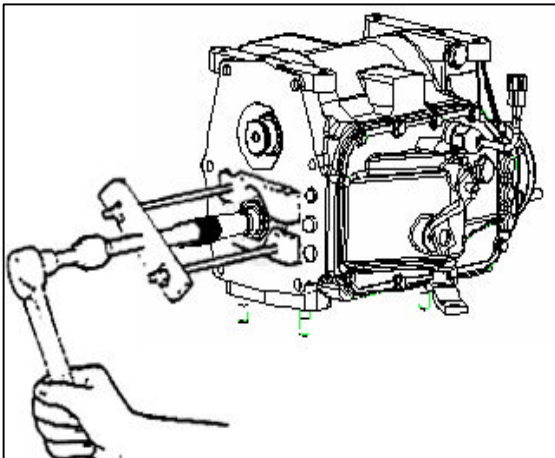
Torque (N·M) 68.6-91.3



Intermediate axle front bearing

Use a copper bar and a hammer to strike the rear end of the axle, move the intermediate axle for about 3mm.

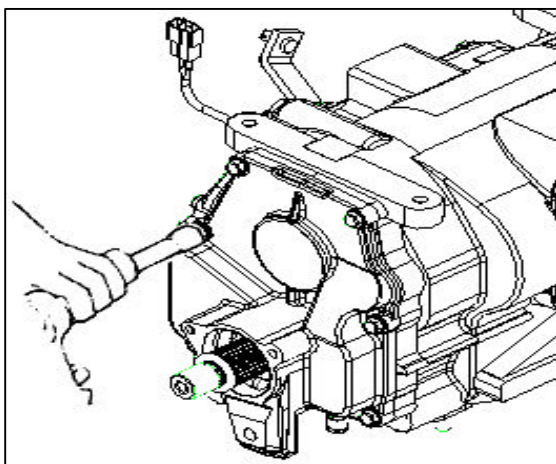
Use special tool to insert to the stop ring groove; remove the front bearing.



Primary axle ball bearing

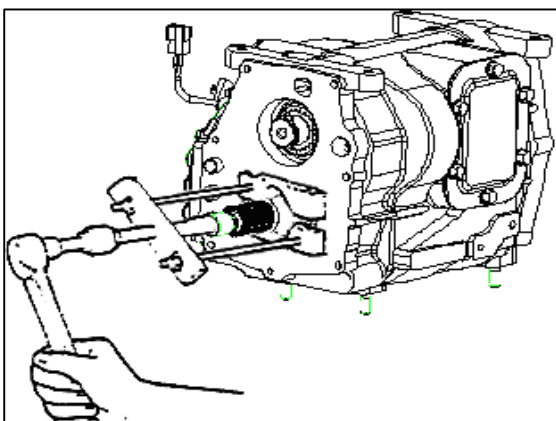
Use a copper bar and a hammer to strike the rear end of the axle; move the primary axle for about 3mm.

Use special tool to insert into the brake ring groove; remove the ball bearing.



Gearbox rear cover bolts

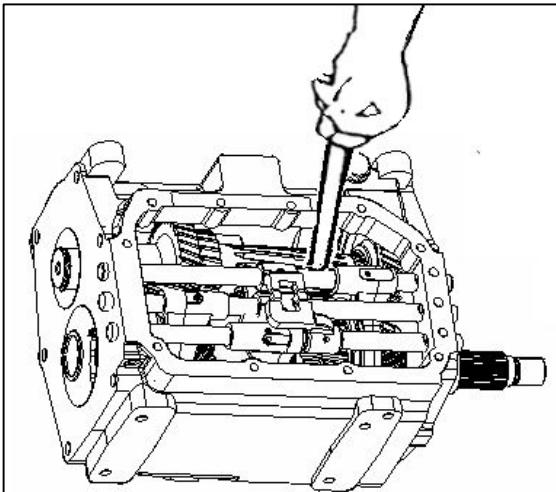
Torque (N·M) 68.6-91.3



Secondary axle ball bearing

Use a copper bar and a hammer to strike the rear end of the axle; move the secondary axle for about 3mm.

Use special tool to insert into the brake ring groove; remove the bearing.

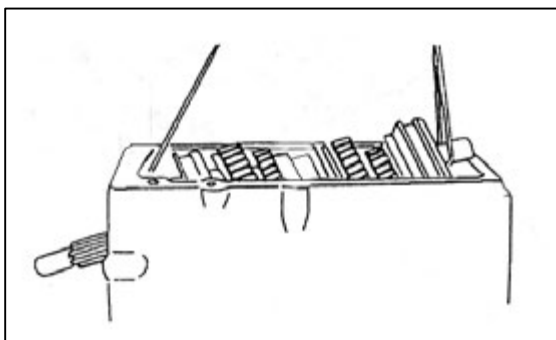


Spring pin, shifting yoke, shifting yoke shaft

Before disassembling, put all the shifting yoke axles at neutral position.

After pushing out the spring pin, push the rear end of the shifting yoke shaft forward.

Then, strike the rear end of the shifting yoke shaft forward and gently, remove the shifting yoke and the shifting yoke shaft.

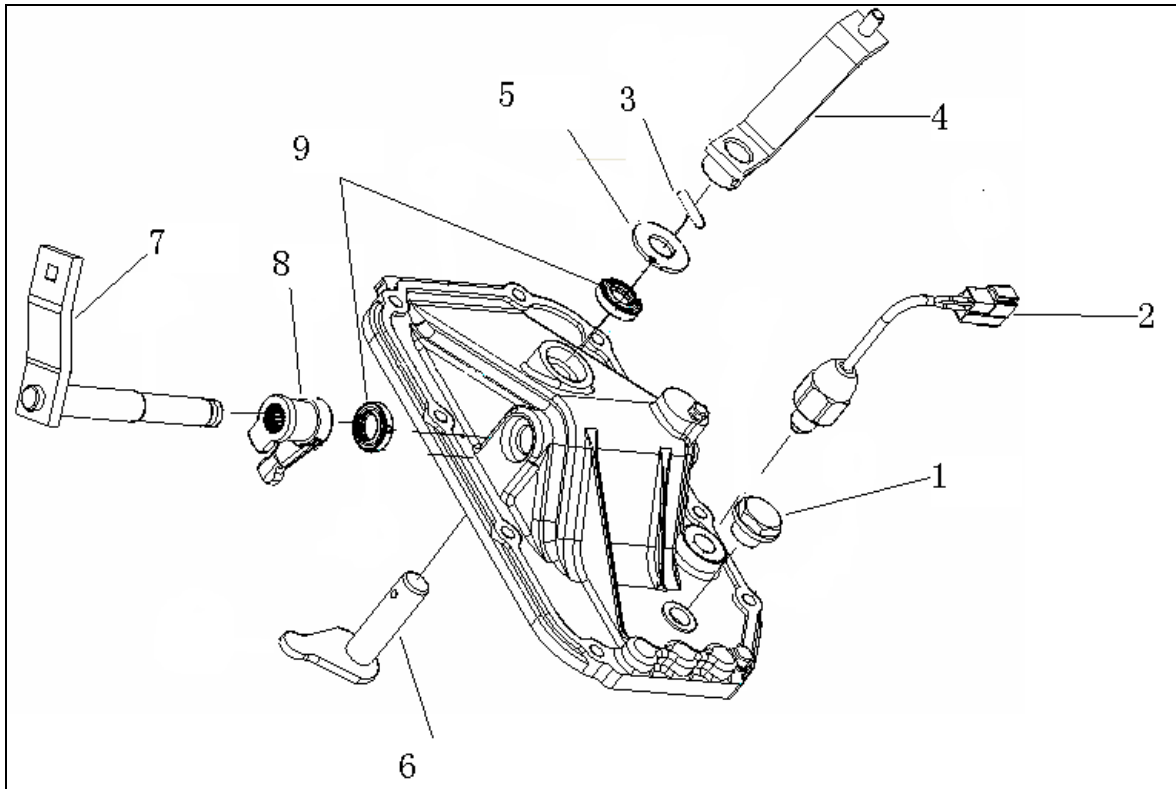


Secondary axle assembly

When disassembling, use strong steel cable, and pay attention to safety.

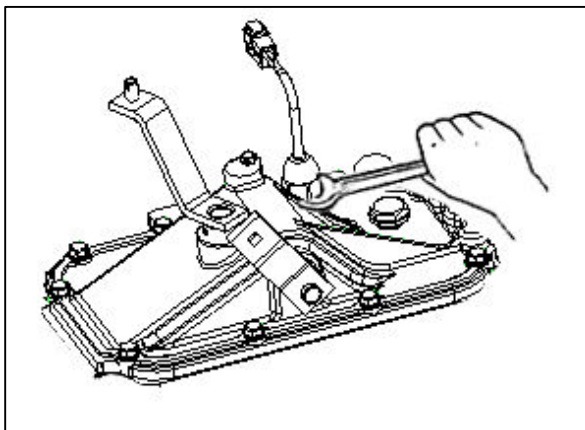
Disassembling of small parts

Top head assembly



Disassembling sequence:

1 Oil filling plug 2 Reversing lamp switch 3 Elastic cylindrical pin 4 External selected gear rocker arm combined part 5 Plain washer 6 Internal selected gear rocker arm 7 External shifting gear rocker arm combined part 8 Internal shifting gear rocker arm 9 Oil seal

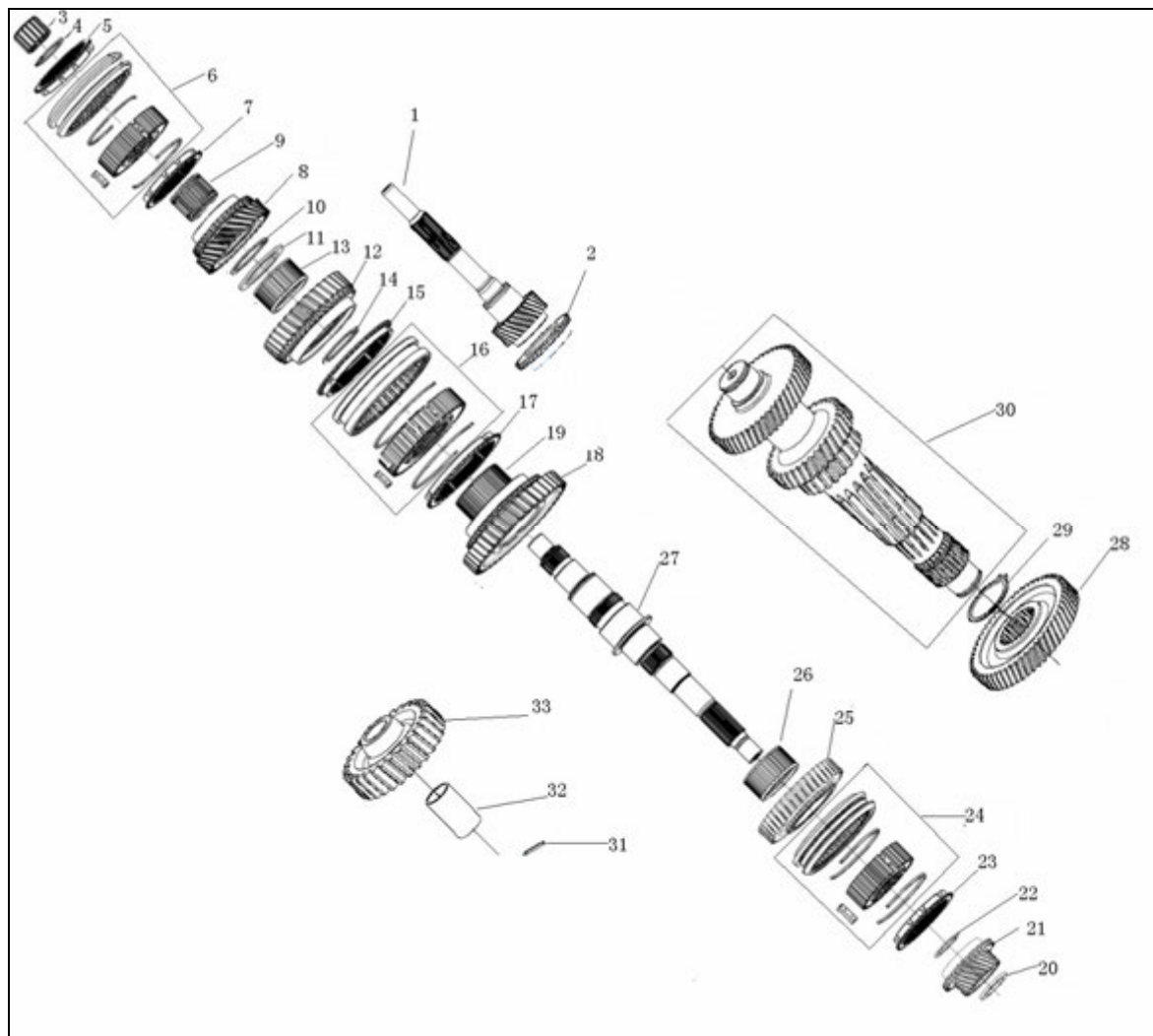


Important operation

Reversing lamp switch

Torque N·m 30-50

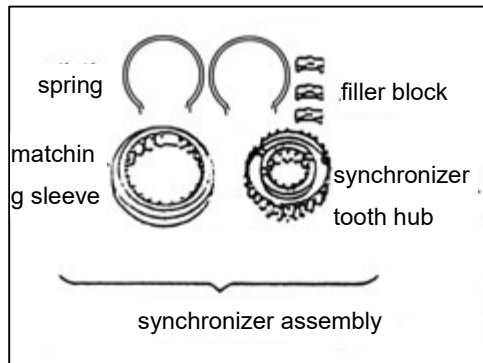
Primary axle assembly, secondary axle assembly, intermediate axle assembly, reversing gear



Disassembling sequence:

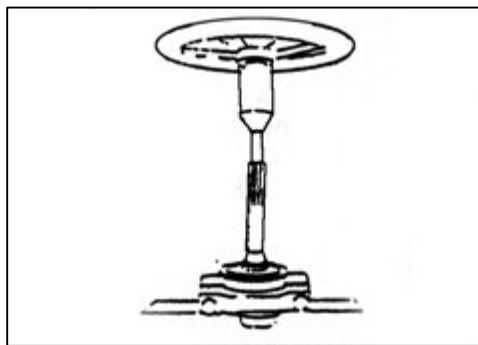
- | | | |
|-------------------------------------|--|------------------------------------|
| 1 Primary axle | 14 Retaining ring | 23 R/5 gear synchronizer gear ring |
| 2 Primary axle connection gear ring | 15 1/2 gear synchronizer gear ring | 24 R/5 gear synchronizer assembly |
| 3 Needle roller bearing | 16 1/2 gear synchronizer assembly | 25 Secondary axle reversing gear |
| 4 Retaining ring | 17 1/2 gear synchronizer gear ring | 26 Needle roller bearing |
| 5 3/4 gear synchronizer gear ring | 18 Secondary axle first gear | 27 Secondary axle |
| 6 3/4 gear synchronizer assembly | 19 Needle roller bearing | 28 Intermediate axle fifth gear |
| 7 3/4 gear synchronizer gear ring | 20 Secondary axle fifth gear thrust washer | 29 Retaining ring |
| 8 Secondary axle third gear | 21 Secondary axle fifth gear | 30 Intermediate axle assembly |
| 9 Needle roller bearing | 22 Retaining ring | 31 Reversing axle pin |
| 10 Retaining ring | | 32 Reversing axle |
| 11 Secondary axle thrust washer | | 33 Reversing gear |
| 12 Secondary axle second gear | | |
| 13 Needle roller bearing | | |

Essential points for attention



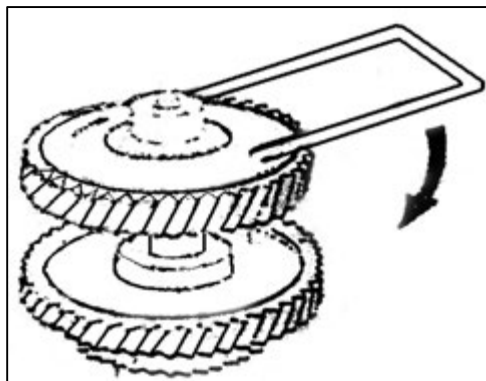
Synchronizer assembly

Disassemble the synchronizer assembly altogether; then disassemble the gear sleeve, slide block, spring and synchronizer tooth hub.



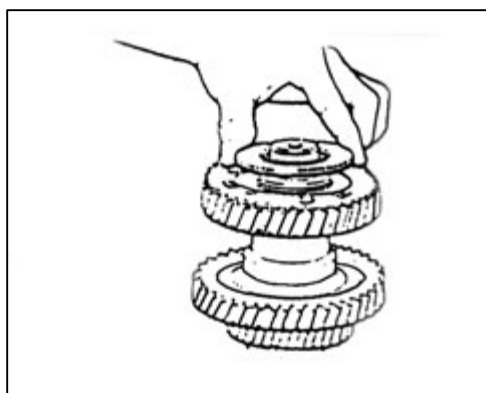
Ball bearing

When disassembling, use bench press.



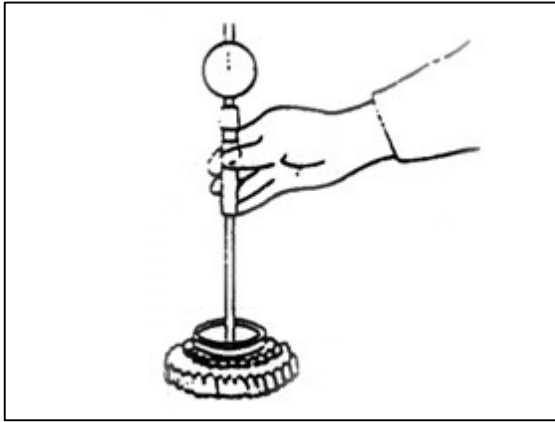
Retaining ring

Remove the retaining ring with ring pliers.



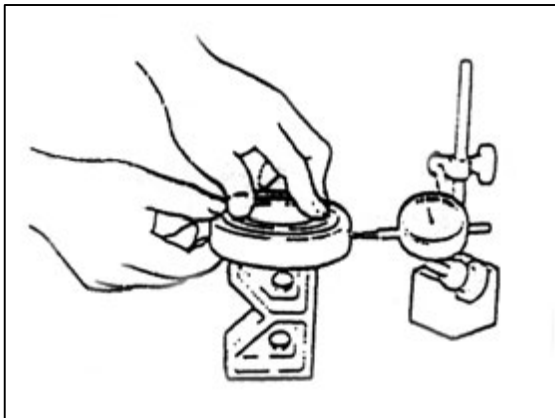
Thrust plate

IV. Inspection and repair



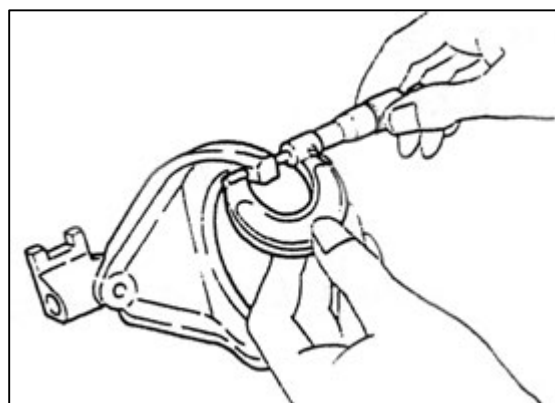
Gear inner hole

Gear 1, 2, 5	Standard	Limit
	0.05-0.09mm	0.2mm



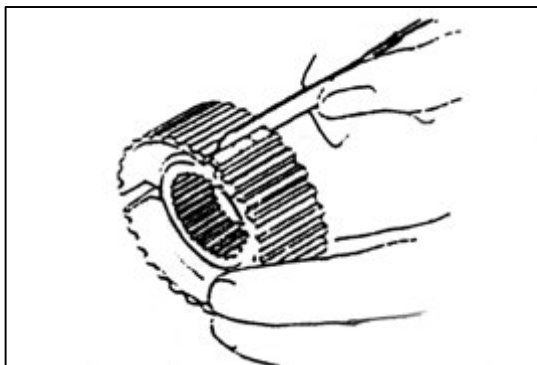
Ball bearing radial runout

Limit	0.2mm
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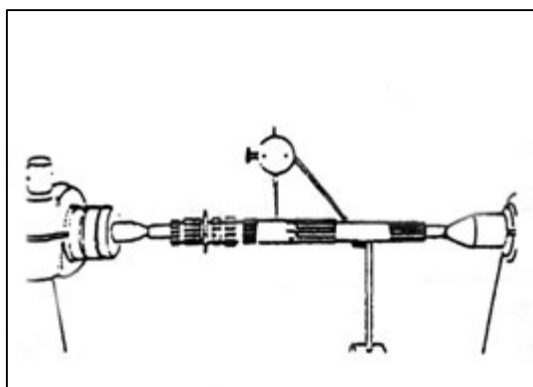
Shifting yoke

Standard	Limit
10.0mm	9.0mm

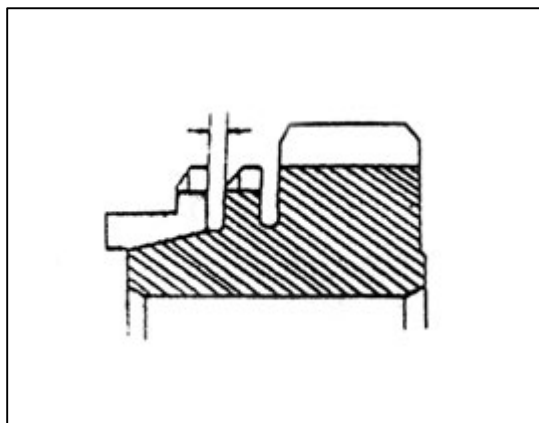


Gap between synchronizer tooth hub
and slide block

Standard	0.09-0.31mm
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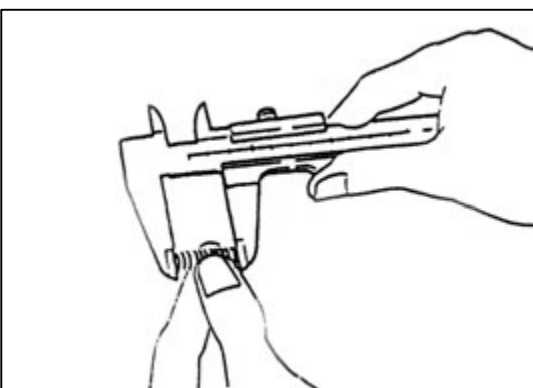


★ Important operation—Secondary axle
radial runout



Gap between synchronizer gear
ring and connection gear

Gear	Standard	Limit
Gear 3, 4	1.0mm	0.5mm
Gear 1, 2, 5	1.5mm	



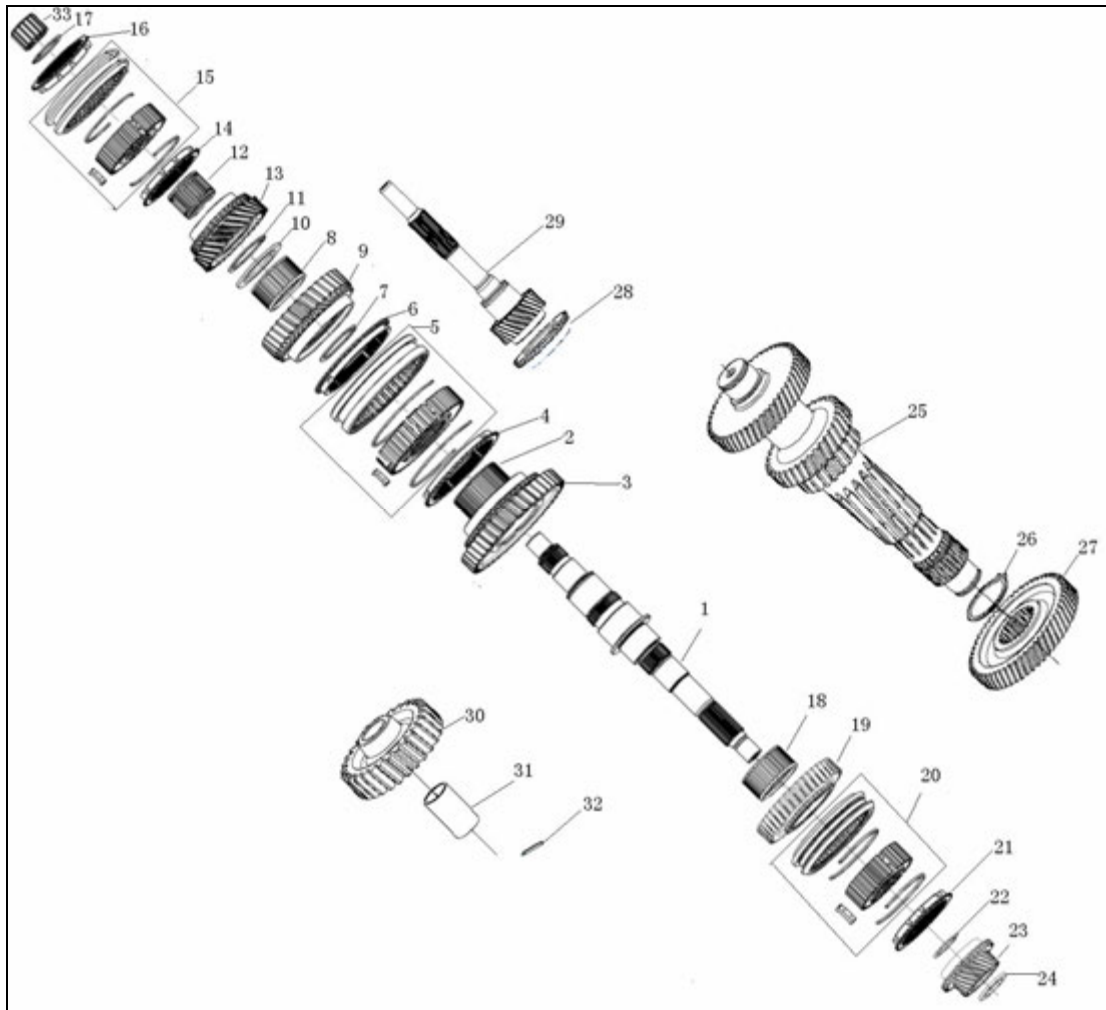
Limit spring free length

Standard	Limit
39.8mm	38.5mm

V. Gearbox reassembling

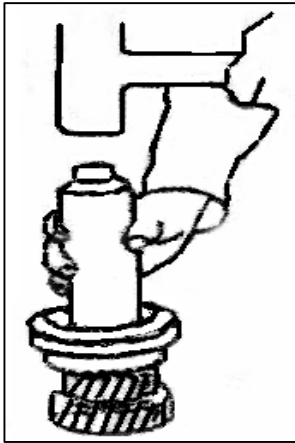
Reassembling of small parts

Secondary axle assembly, primary axle assembly, intermediate axle assembly, reversing axle assembly



Reassembling sequence:

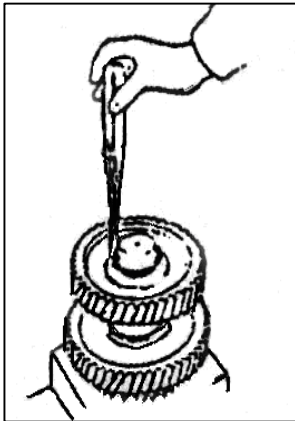
1 Secondary axle 2 Needle roller bearing 3 Secondary axle first gear 4 1/2 gear synchronizer gear ring 5 1/2 gear synchronizer assembly 6 1/2 gear synchronizer gear ring 7 Retaining ring 8 Needle roller bearing 9 Secondary axle second gear 10 Secondary axle thrust washer 11 Retaining ring 12 Needle roller bearing 13 Secondary axle third gear 14 3/4 gear synchronizer gear ring 15 3/4 gear synchronizer assembly 16 3/4 gear synchronizer gear ring 17 Retaining ring 18 Needle roller bearing 19 Secondary axle reversing gear 20 R/5 gear synchronizer assembly 21 R/5 gear synchronizer gear ring 22 Retaining ring 23 Secondary axle fifth gear 24 Secondary axle fifth gear thrust washer 25 Intermediate axle assembly 26 Retaining ring 27 Intermediate axle fifth gear 28 Primary axle 29 Primary axle connection gear 30 Reversing gear 31 Reversing axle 32 Reversing axle pin 33 Needle roller bearing



Important operation

Synchronizer assembling

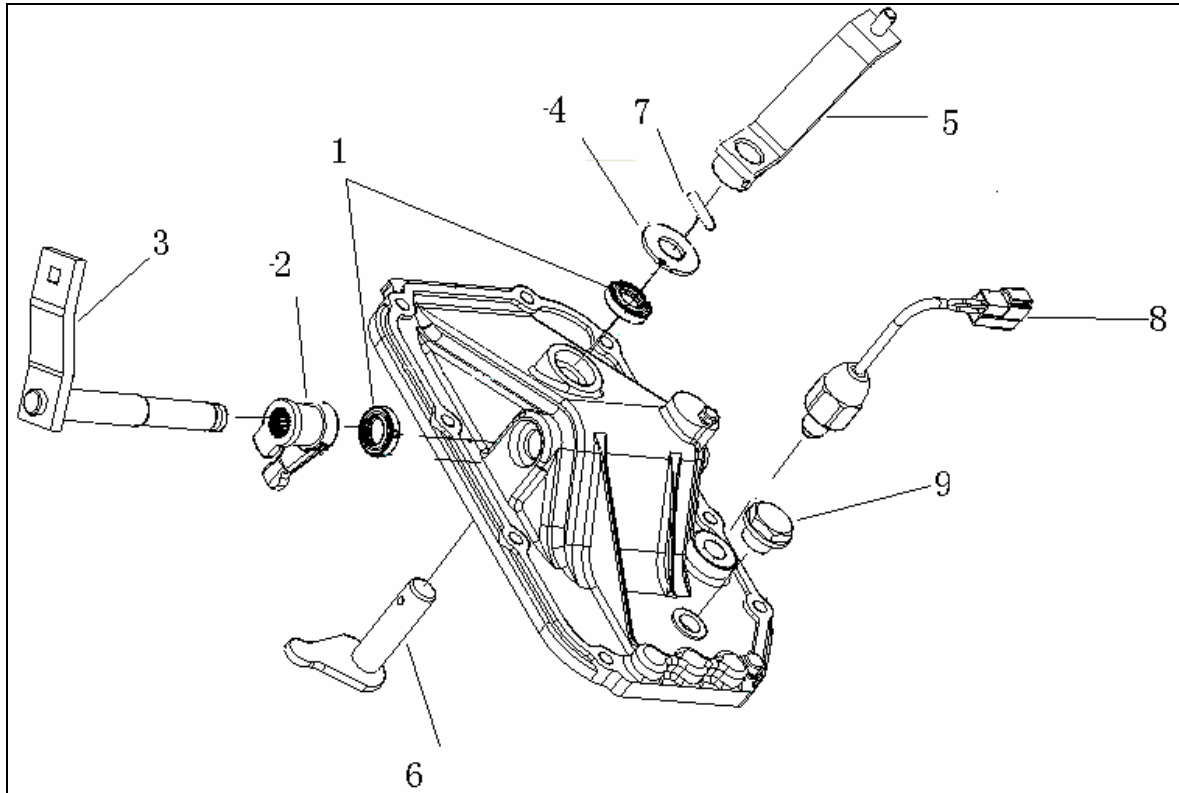
When pressing the synchronizer assembly onto the secondary axle, take care not to fall off the synchronizer gear sleeve, slide block, and synchronizer spring.



Retaining ring assembling

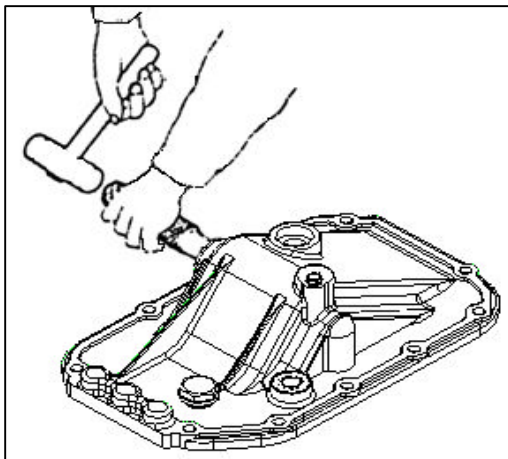
Select appropriate retaining ring to insert in, and get a minimum axial gap.

Top head reassembling



Reassembling sequence:

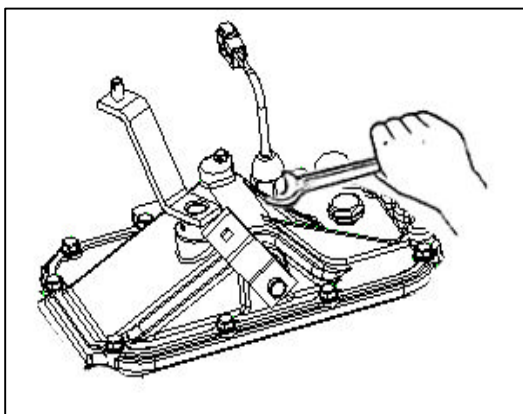
1 Oil seal 2 Inner shifting gear rocker arm 3 Outer shifting gear rocker arm combined part 4 Plain washer 5 External selected gear rocker arm combined part 6 Inner selected gear rocker arm 7 Elastic cylindrical pin 8 Reversing lamp switch 9 Oil filling plug



Important operation

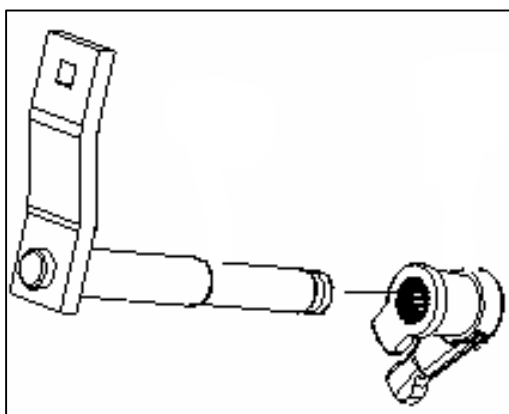
Oil seal assembling

Strike the oil seal into place gently with special tools.



Reversing lamp switch

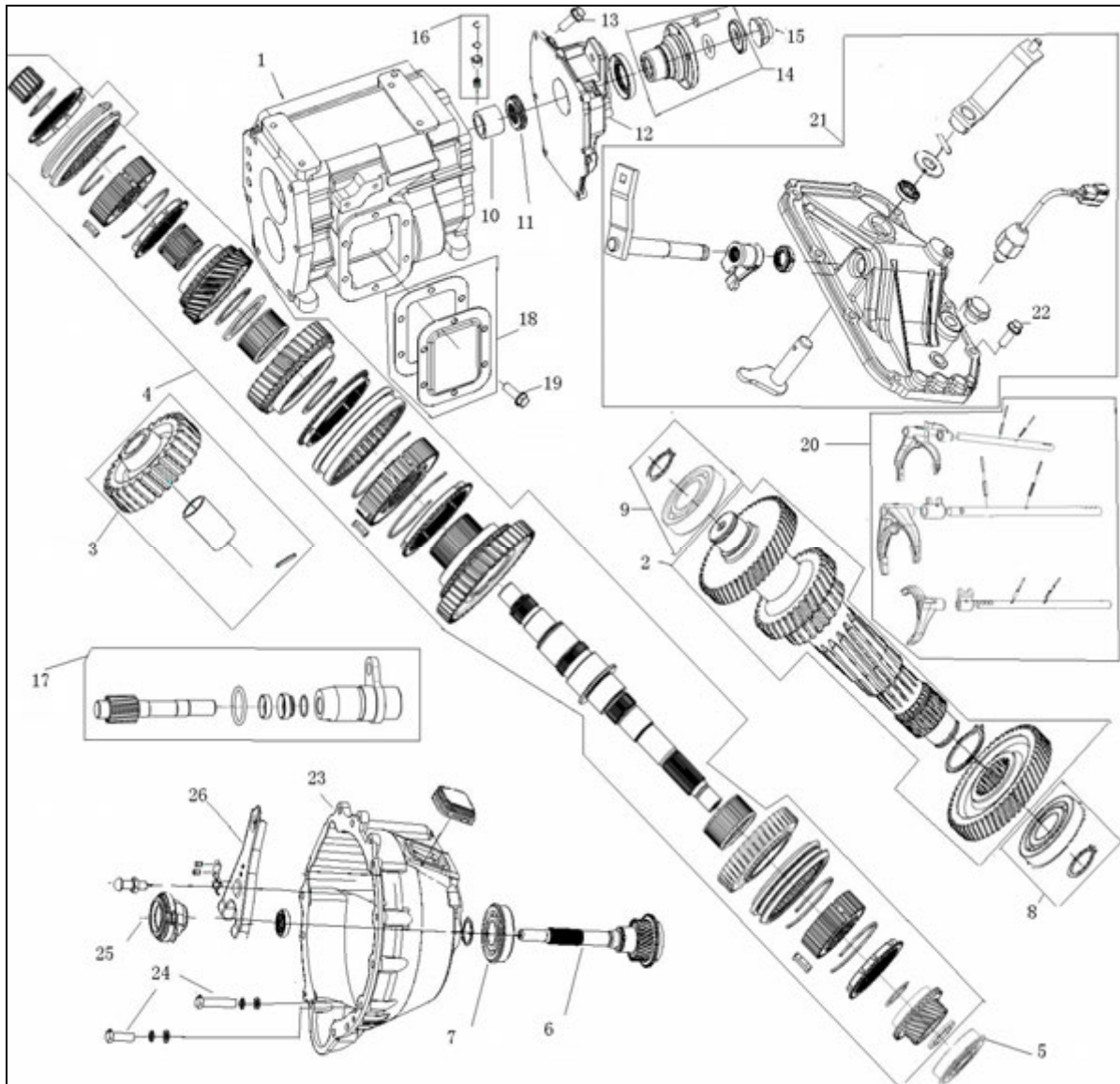
Torque	N·m	30-50
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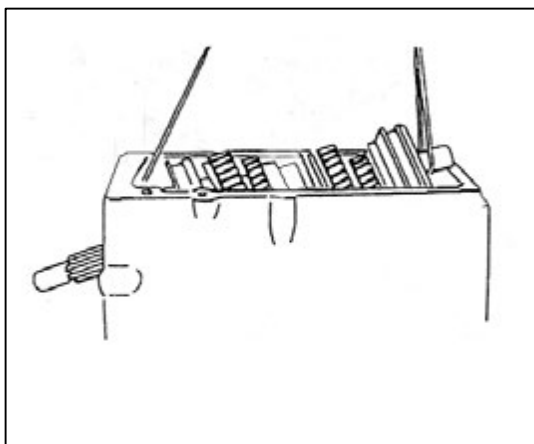
Internal/external shifting gear rocker arm

Assembling of internal/external shifting gear rocker arm

Large parts reassembling



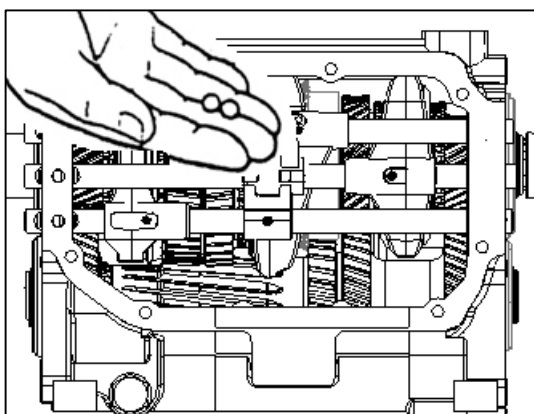
1 Housing 2 Intermediate axle assembly 3 Reversing gear 4 Secondary axle assembly 5 Secondary axle bearing 6 Primary axle assembly 7 Primary axle bearing 8 Intermediate axle rear bearing, retaining ring 9 Intermediate axle front bearing, retaining ring 10 Inner driven gear and driving gear spacer 11 Inner driven gear driving gear 12 Rear cover and oil seal 13 Rear cover bolt 14 Flange 15 Secondary axle nut 16 Breather valve 17 Inner driven gear 18 Side cover and side gasket 19 Side cover bolt 20 Shifting yoke, shifting yoke shaft 21 Top head assembly 22 Top head bolt 23 Clutch housing 24 Clutch housing bolt 25 Separation bearing 26 Separation shifting yoke assembly



Important operation

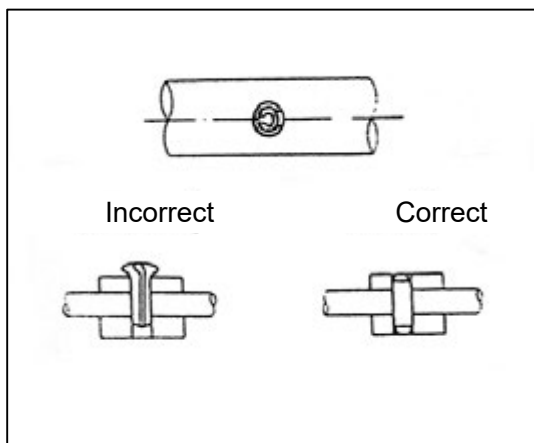
Secondary axle assembling

Use strong steel cable while assembling, and pay attention to safety.



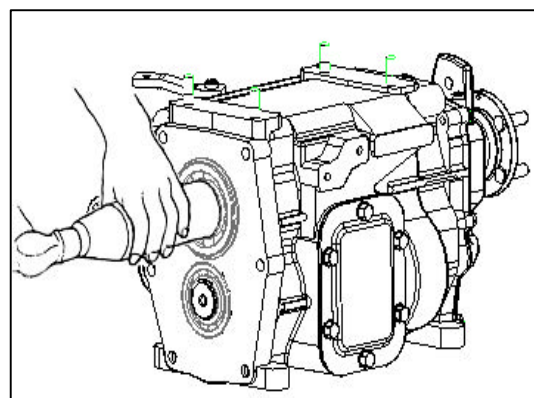
Interlocking pin, steel ball

Put the steel ball into the housing, insert the interlocking pin into pin hole of shifting yoke, make it arrive at the other side of the housing through the case hole, 3/4 gear shifting yoke, and 3/4 gear shifting block in sequence.



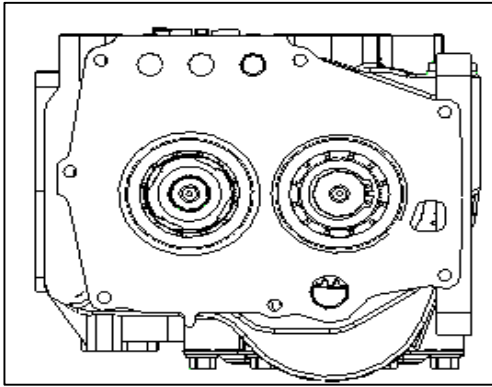
Spring pin

Do not reuse the disassembled spring pin; replace it with a new one.



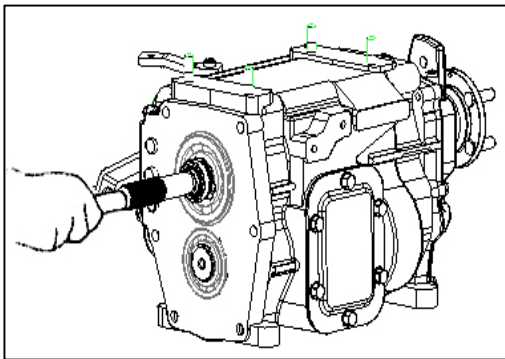
Primary axle bearing

Please assemble it with special purpose sleeve.



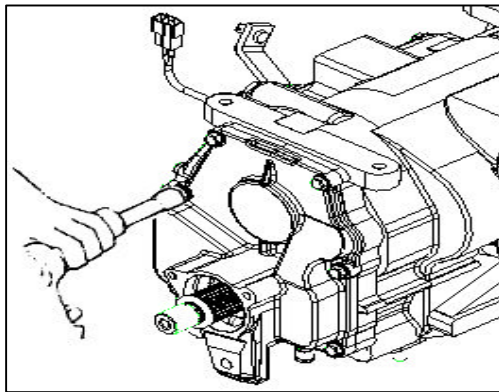
Clutch housing

Apply the connection surface of the clutch housing with liquid sealant.



Primary axle

Assemble primary axle into the gearbox; and make sure the primary axle turns flexibly.



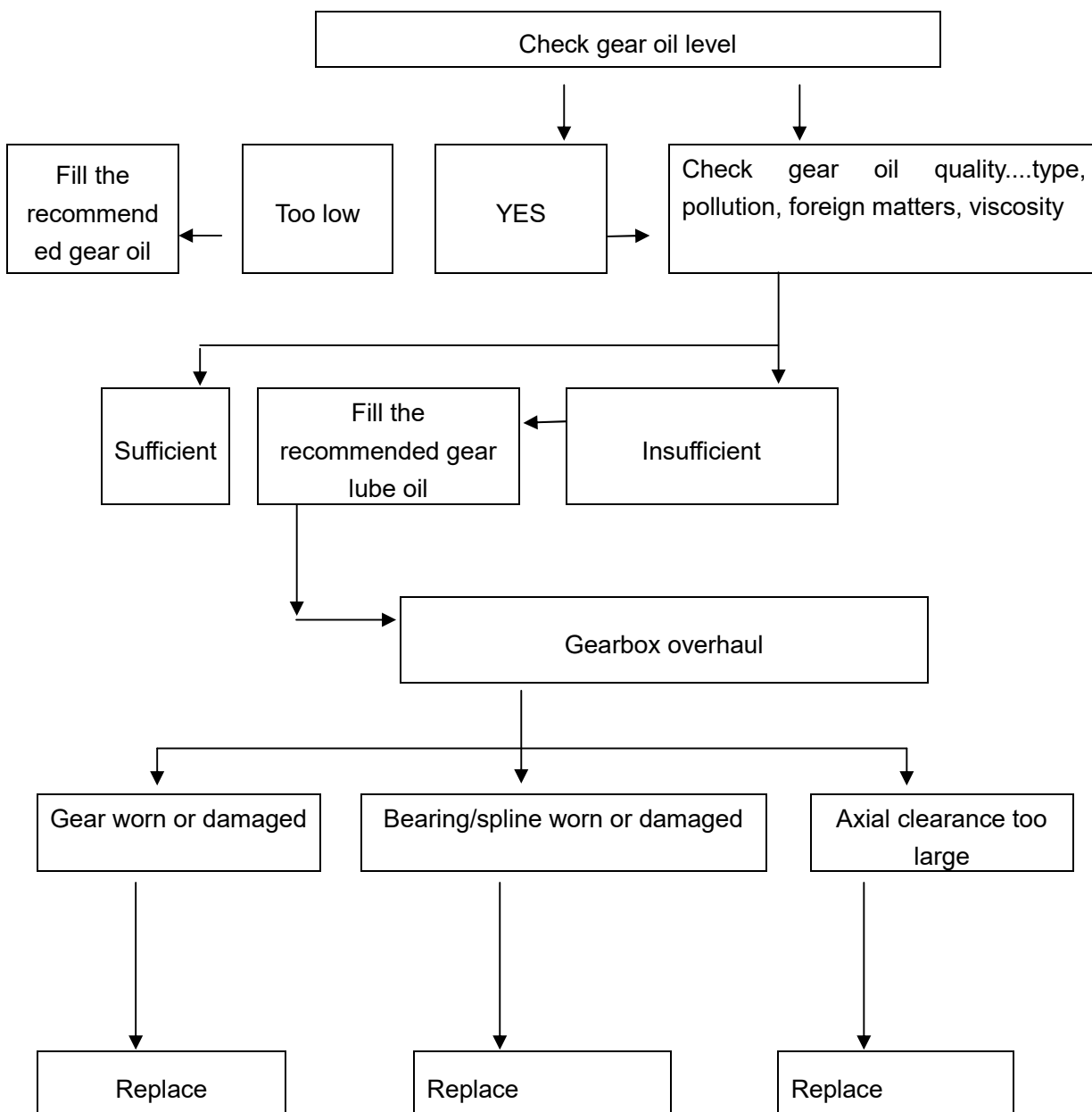
Gearbox rear cover bolt

Torque (N·m) 68.6-91.3

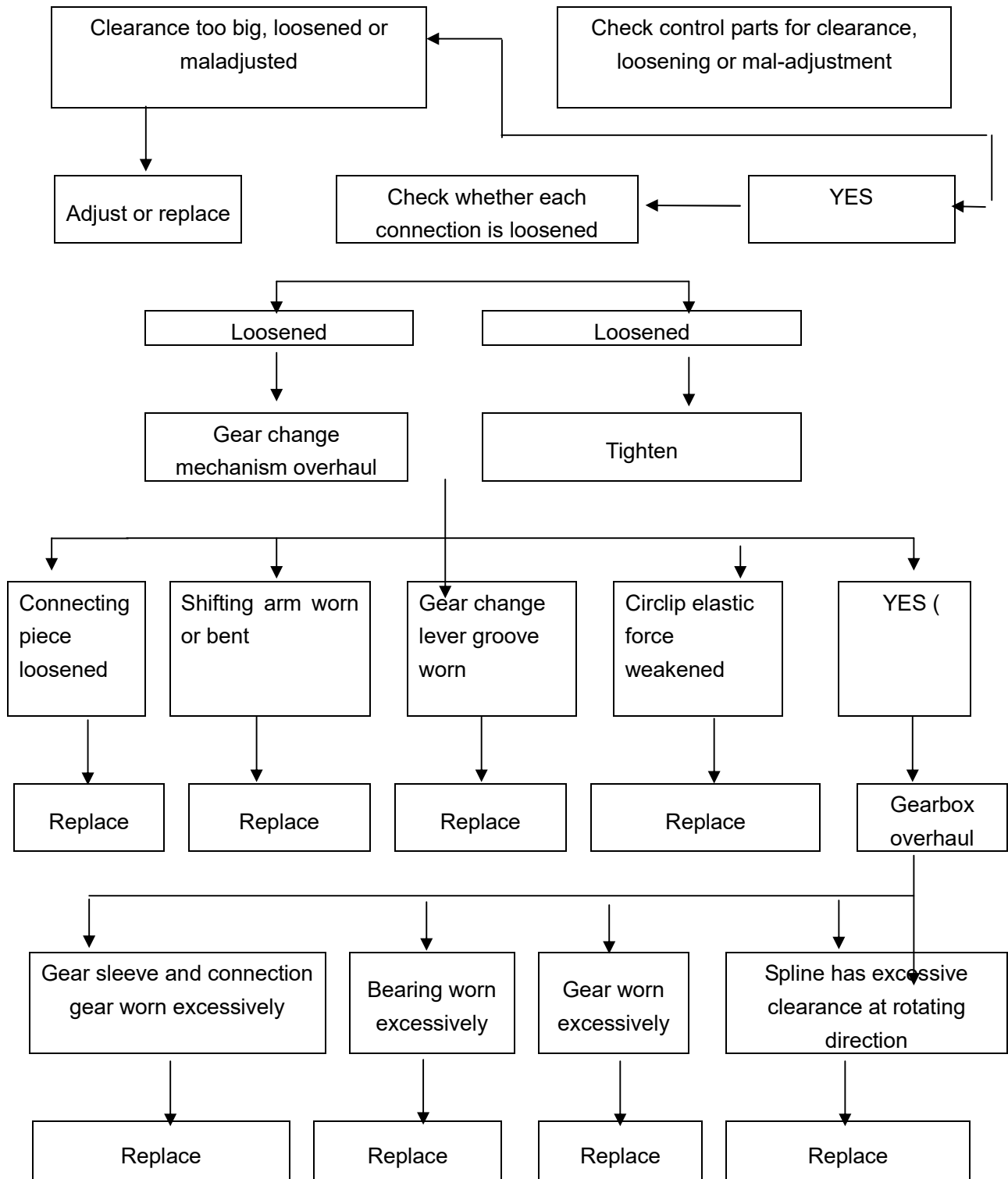
VI. Trouble shooting

1. Gearbox noises

If there is noise coming from the gearbox area during idling, inspect the clutch first. If the noise stops when treading down the clutch pedal, it shows the noise is coming from the gearbox.



II. Gear out-of-gear



III. Gear cannot shift smoothly (having noise when shifting)

