



Eaton® Transmission

Service Manual

ESO-6205
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1. General Information

Purpose and Scope of the Manual

This manual is designed to provide detailed information necessary to service and repair Eaton ESO-6205 transmission.

How to Use this Manual

Disassembly and assembly instructions in this manual make use of a typical ESO-6205 transmission. Provided illustrations and pictures show parts that may differ from one transmission model to another, according to its application and serial number, but the procedure is the same.

In addition, it is also assumed in the manual that the transmission has been removed from the vehicle and the lubricant has been drained.

The manual has been divided into two main groups as follows:

1. General Information

This section contains information and technical references of the transmission such as Warnings, Precautions and Care in disassembly and assembly, Identification and Designation of Models, Gear Ratios, Tightening Torque and Sealants Specifications, Lubrication and Special Tools.

2. Operation

This section contains information on the transmission operation and functioning: Gear Shift Lever Diagram, Tips for the Driver, Power Flow and Troubleshooting.

3. Disassembly and Assembly

This section contains procedures for disassembling, assembling and adjusting the transmission components. At the beginning of this section, Exploded Views of the transmission are provided with the identification and description of each part, to make easy its visualization during the procedure.

To disassemble and assemble the transmission completely, carefully follow the instructions in this manual in its natural sequence, making use of the text, illustrations and pictures provided. Always observe the precautions and recommendations in the manual.

For more detailed information on product improvement, repair procedures and other subjects related to service, please contact:

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NOTE: Eaton reserves the right to make modifications in its products and to change specifications included in this manual at any time without previous notice.

Warnings and Precautions



Before starting a vehicle always be seated in the driver's seat, place the transmission in neutral, set the parking brakes and disengage the clutch.

Before working on a vehicle place the transmission in neutral, set the parking brakes and block the wheels.

Before towing the vehicle, place the transmission in neutral, and lift the rear wheels off the ground, or remove the axle shafts, or disconnect the driveline to avoid damage to the transmission during towing.

The description and specifications contained in this service publication are current at the time of printing.

Eaton Corporation reserves the right to discontinue or modify its models and/or procedures and to change specifications at any time without notice.

Any reference to brand name in this publication is made as an example of the types of tools and materials recommended for use and should not be considered an endorsement. Equivalents may be used.



This symbol is used throughout this manual to call attention to procedures where carelessness or failure to follow specific instructions may result in personal injury and/or component damage.

Departure from the instructions, choice of tools, materials and recommended parts mentioned in this publication may jeopardize the personal safety of the service technician or vehicle operator.

WARNING: Failure to follow indicated procedures creates a high risk of personal injury to the servicing technician.

CAUTION: Failure to follow indicated procedures may cause component damage or malfunction.

NOTE: Additional service information not covered in the service procedures.

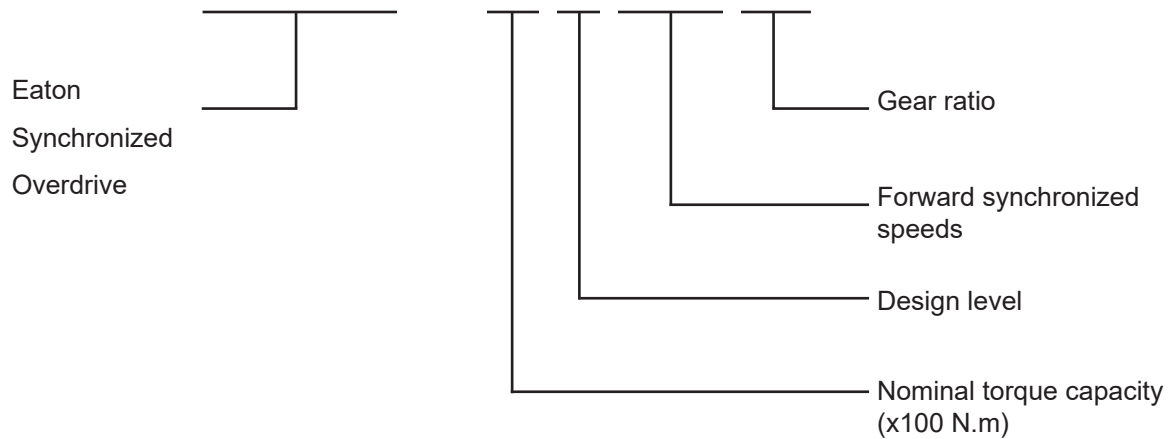
TIP: Helpful removal and installation procedures to aid in the service of this unit.

Always use genuine Eaton replacement parts.

Model designation

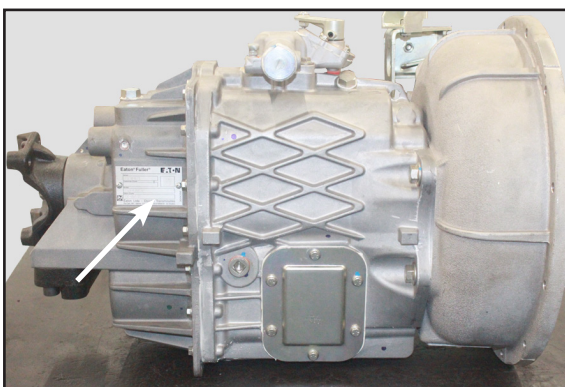
All Eaton transmissions are identified by the model designation and serial number. This information is stamped on the identification plate fixed to the transmission case.

ESO - 6205 A

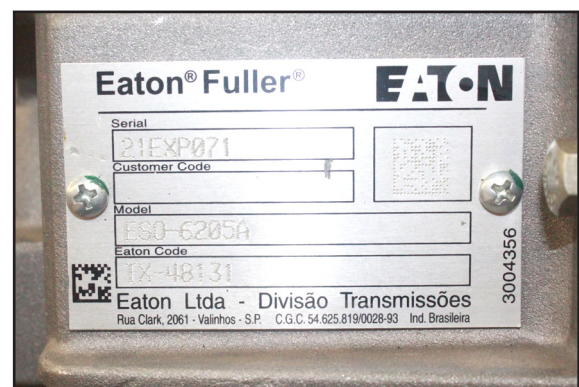


NOTE:

- *Do not remove or destroy the transmission identification plate.*
- *When ordering replacement parts or calling for service support, please inform numbers found in the identification plate.*



6205187



6205188

		ESO-6205A	
Torque	N.m	600	
	Lb.ft	442	
		Z	Ratio
Input gear set	Input Shaft (I)	28	
	Countershaft (C)	44	
1st	Countershaft (C)	12	5.762
	Mainshaft (M)	44	
2nd	Countershaft (C)	18	2.968
	Mainshaft (M)	34	
3rd	Countershaft (C)	26	1.632
	Mainshaft (M)	48	
4th	Countershaft (C)	-	1.00
	Mainshaft (M)	-	
5th	Countershaft (C)	47	0.769
	Mainshaft (M)	23	
Reverse	Countershaft (C)	12	5.238
	Reverse Idler Gear (R)	28	
	Mainshaft (M)	40	

Z = Number of teeth of the gear

R = Reverse Idler Gear

C = Countershaft

I = Input Shaft

M = Mainshaft

NOTE: Transmission specifications may change. The data in the table is provided for reference only.

Weight

Transmission without oil = 94.7 kg

Definition and Calculation

Gear ratio of a transmission speed is the relationship between the transmission's output and input speeds, with the said gear shifted. If the gear ratio is greater than 1, it means that the transmission's output speed is slower than the input speed and it is said that there is a reduction in the speed. On the other hand, if the gear ratio is less than 1, the transmission's output speed will be faster than the input speed and, in this case, it is said that there is an overdrive.

The gear ratio is calculated by dividing the number of teeth of the driven gear by the number of teeth of the driving gear of that specific speed and multiplying by the ratio of the input gear set.

Example:

Input gear ratio = $C \div I$ (input gear set) = $44 \div 28 = 1.572$

1st speed ratio = $M \div C$ (1st speed) $\times 1.572$ (input gear set) = $44 \div 12 \times 1.572 = 5.762$

This means that the 1st speed gear ratio is 5.762:1 or, in other words, with the transmission shifted into the 1st speed, the engine (input shaft) makes 5.762 revolutions for every revolution of the transmission's output shaft. So, in 1st gear, there is a reduction in the output speed.

Lubrication

Proper lubrication procedure is the key to a good and complete maintenance program.

If the oil is not doing its job, or if the oil level is ignored, all the other possible maintenance procedures will not be enough to keep the transmission running or to assure a long transmission life.

Eaton transmissions are designed so that all the internal parts operate in an oil circulating bath, created by the motion of gears and shafts. Thus, all parts are properly lubricated if the following procedures are closely followed:

1. Maintain proper oil level by checking it regularly.
2. Change oil regularly following the maintenance interval chart.
3. Use the recommended grade and type of oil.
4. Buy the oil from a reputable dealer.

Oil change and level check

Periodic transmission oil change eliminates possible bearing failures, ring wear and seizures, since the products from normal wear in service (tiny metal particles), which circulate in the transmission oil, are harmful to these parts.

In addition, the oil changes chemically due to the repeated heating and cooling cycles of a transmission in use.

As a general guide, the following chart provides maintenance interval recommendation for oil level check and oil change.



CAUTION! Always follow the vehicle manufacturer maintenance recommendation, which prevails over this chart.

Lubricant Oil	Service Type	Oil Change Interval	Check Oil Level every
Chevron TGF SAE 80W90 API GL3 (Mineral) Ref. Eaton 300880	Regular	120,000 km or 12 months	10,000 km
	Heavy Duty	60,000 km or 12 months	7,500 km
Mobil Mobilube GX SAE 80W90 API GL4 (Mineral)	Off-Road	500 hours	50 horas
Chevron Ursa MTF HD SAE 75W80 API GL4 (Sintético)	Regular	400,000 km or 36 months	10,000 km
	Heavy Duty	180,000 km or 36 months	7,500 km
Total Gear 9FE 75W80 (Sintético)	Off-Road	1,000 hours	50 horas
Shell Spirax GXME S6 75W80 (Sintético)			

NOTE: Synthetic oils are only approved for truck transmissions.

NOTE:

- The oil change should be carried out at the recommended mileage or time, whichever comes first.
- Daily, inspect the transmission for lubricating oil leaks and correct them whenever necessary.
- The type of vehicle service is considered **SEVERE** when the use of the vehicle consists of:
 1. Long periods with low gears engaged;
 2. Use of the vehicle at high speeds on the road;

3. Use of the vehicle with full load on the road at ambient temperatures above or equal to 40°C;
4. Typical off-road applications, e.g. unpaved dirt or sand roads;
5. Use of the vehicle on mountainous routes with considerable slopes and inclines;
6. Special applications, such as taxis, police vehicles, military vehicles, motorhomes or similar activities.

Draining

Drain transmission oil while the oil is warm.

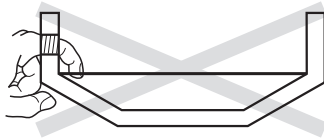
To drain oil, remove the magnetic drain plug. Clean the drain plug before reinstalling it.

Refilling

Clean case area around oil filler plug, remove the plug and refill the transmission until lubricant level is aligned with the bottom of the filler plug hole.



Correct Oil Level



Incorrect Oil Level

The amount of oil varies with the position of vehicle related to the ground and the installation angle of transmission. Before refilling, place vehicle on a flat and level surface.

NOTE: Do not add oil above the recommended level. This will cause the oil to be forced out through the front bearing cover, shift lever housing cover, etc.

Oil level check

Before checking oil level, clean case area around filler plug and if necessary, add enough oil to maintain the proper oil level.



CAUTION! Do not mix lubricant of different types and brands, as this may cause incompatibility issues.

6106/02

The correct application of adhesives (threadlockers) and sealing compounds (sealants) is important to assure a proper assembly and to avoid leakages.

Tightening capscrews, plugs and nuts to the proper torque is important to prevent them from loosening and to avoid oil leakage, assuring a long transmission life. Additionally, apply the recommended adhesive to the threads.



CAUTION! Always use a torque wrench to tighten fastenings to the specified torque.

The following table presents tightening torque and sealant recommendation for the transmission fastening elements and components.

In the table, the item number corresponds to the number of the component in the exploded views included in this manual. Please refer to the exploded views to identify the item in the table.

Item	Description	Torque N.m (Lb.ft)	Remarks
Remote Gear Shift Control Assembly			
1	Gear shift lever housing		Aplique Dow Corning 780 a la cara de montaje
6	Breather		Rosca cónica, apriete ligero hasta bloquear
11	Spring retaining plug	34-41 (25-30)	Aplique Dow Corning 780 a la rosca
12B	Gear shift lever housing cover		Aplique Dow Corning 780 a la cara de montaje
13	Cover capscrew	4-7 (2,9-5)	Aplique Loctite 262 a la rosca de los tornillos
22	Spherical pin	19-25 (14-18)	En la tuerca
23	Capscrew M10x1,5x25	19-26 (14-19)	
Front Case Assembly			
62	Capscrew M5x08x10, Inspection cover	2-7 (1.5-5)	
66	Capscrew M8x1.25x16, Cable support	19-26 (14-19)	
68	Capscrew, Cable support base	108-122 (80-90)	
70	Capscrew M8x1.25x20, Mainshaft bearing retaining cover	24-27 (18-20)	Apply Loctite 262 onto the thread
71	Mainshaft bearing retaining cover		Apply Loctite 518 onto the mounting surface
76	Plug	9.5-16.3 (7-12)	Apply Dow Corning 780 onto the mounting surface
77	Power Take-Off (PTO) Cover		Apply Dow Corning 780 onto the mounting surface
78	Capscrew M10x16, PTO cover	19-26 (14-19)	
79	Front housing		Apply Dow Corning 780 onto the mounting surface
88	Threaded plug	9.5-16.3 (7-12)	Apply Dow Corning 780 onto the mounting surface
89	Switch	14-20 (10-15)	Apply Dow Corning 780 onto the mounting surface
90	Speed sensor	14-20 (10-15)	
91	Cup expansion plug		Apply Loctite 518 onto the mounting surface
92	Oil drain plug	20-34(15-25)	
94	Countershaft front bearing retaining cover		Apply Dow Corning 7091 onto the mounting surface

Item	Description	Torque N.m (Lb.ft)	Remarks
Front Case Assembly (continued)			
95	Capscrew, Countershaft front bearing retaining cover	24-31 (18-23)	
99	Threaded plug	9.5-16.3 (7-12)	Apply Dow Corning 780 onto the mounting surface
Rear Case Assembly			
110	Rear housing		Apply Dow Corning 780 onto the mounting surface
112	Cup expansion plug		Apply Loctite 518 onto the mounting surface
113	Capscrew M8x1.25x25	19-26 (14-19)	
117	Threaded plug	9.5-16.3 (7-12)	Apply Dow Corning 780 onto the mounting surface
122	Washer		Apply Dow Corning 780 onto the mounting surface
123	Capscrew M16x1.5x55, Yoke retaining	108-122 (80-90)	
124	Switch	14-20 (10-15)	Apply Dow Corning 780 onto the mounting surface
125	Speedometer sensor	14-20 (10-15)	
131	Allen bolt M14x2.0x45, Cushion support	108-122 (80-90)	

Recommended threadlocker and sealant

Threadlockers:

- Loctite 262
- Loctite 570 (Eaton E677)

Adhesive and Sealants:

- Loctite 5699

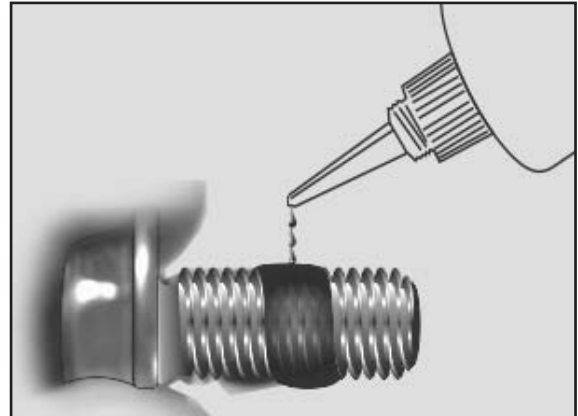
Chemical adhesives can fulfill more than one function:

1. Thread locking, which prevents loose screws by vibration or improper torque.
2. Screw lock and seal, preventing loose screws while ensuring that no lubricant leakage will occur through the holes.
3. Sealing between matching surfaces, replacing gaskets made of other materials and reducing the number of spare parts.

Applying threadlockers onto bolts and plugs

To apply properly:

- Remove all traces of adhesive in the threaded hole. Clean up threads with a tap and remove cutting chips with compressed air.
- Clean the screw and its hole with alcohol. Wait for the alcohol to dry on the screw and apply compressed air into the hole to dry it completely.
- Apply adhesive (threadlocker) on the screw thread in the central area that will be housed into the threaded hole, covering 3 or 4 fully continuous fillets to ensure that no leakage will occur.



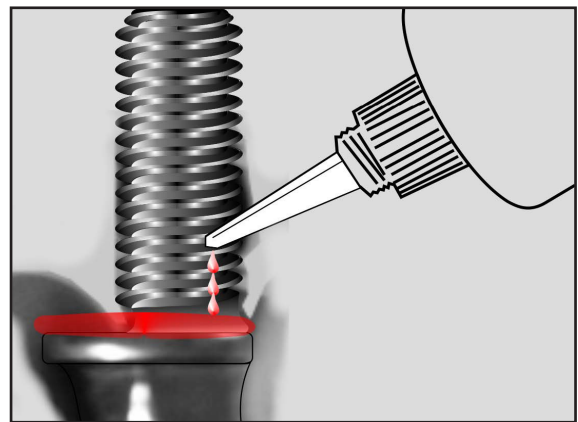
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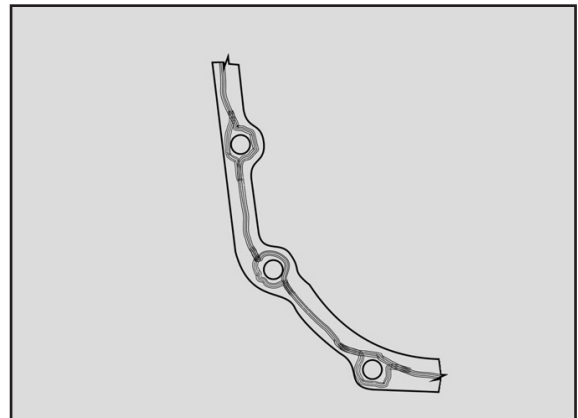
WARNING! Always use safety glasses and hearing protection when using compressed air.

Applying sealant onto the matching surfaces

- The surfaces that will receive the application of sealant or adhesive must be perfectly clean and free of oil or oxidation and must not contain particles that could damage the seal. Thoroughly clean signs of old sealant and dirt from surfaces.
- When recommended, apply sealant onto the bolt and plug contact surface with the transmission case or covers.
- On the contact surface of transmission cases, apply a continuous sealant string along the surface and around the capscrew holes and dowel pins.
- Dow Corning 780 sealant cannot remain exposed to the air for more than 15 minutes; perform the parts assembly within this time.



2106-17



2106-18

Precautions during disassembly and assembly



In order to prevent damage to transmission parts during initial gear movement, it is important when assembling the transmission, to lubricate gear bearings, needle roller bearings, non sealed bearings and all other parts under friction conditions, with the same transmission lubricant oil.

Multi Purpose Grease

Where specified Multi Purpose Grease use a NLGI 2 lithium based grease with dropping point at 177°C minimum.

Cleaning and handling

In order to completely clean the parts, wash them into a bath of solvent (kerosene, for instance), moving every part up and down slowly until all the old lubricant and foreign material have been dissolved.



Care must be taken to avoid skin rashes, fire hazard and vapor inhalation when using solvents.

Non sealed bearings

Immerse the bearings in clean solvent. Move them up and down slowly in order to loosen the deposits. Dry the bearings by means of moisture free compressed air. Repeat the operation until the bearings are thoroughly clean.



Never drive the air jet directly to bearings in order to rotate them in high speed. That can damage bearings.

Synchronizer assemblies

Avoid bad handling of synchronizer assemblies. Either drops or bumps when disassembling or assembling may cause them to lock.

Housings

Clean interior and exterior of cases, covers, etc., thoroughly. Cast parts may be cleaned in weak alkaline solution baths (we recommend a 7% soluble degreasing oil solution). The parts are to remain in the bath for the time it takes to become completely clean. The parts cleaned in alkaline solutions should be rinsed with clean water to remove any alkaline trace after cleaning process.



Care must be taken to avoid vapor inhalation and skin rashes when using alkaline solutions. Every cleaned part must be totally dried at once by means of moisture free compressed-air, or else, by means of a lint free soft cloth, not containing any abrasive material such as metal filings, contaminated oil or polishing compounds.

Inspection

A thorough and careful inspection of each part is very important for the transmission life. The replacement of parts showing either wear or fatigue will avoid future expensive and foreseen failures.

Gears, shafts and synchronizer assemblies

Check carefully gear teeth for wear, pitting, chipping and cracks. If gear teeth show areas where the case hardening is worn through or cracked, the gear should be replaced.

Check shafts for warping and excessive wear or damaged splines.

Cases, covers, etc.

Make sure cases, covers, etc. are completely clean and that mounting surfaces and bearing bores are free from nicks or burrs. Check carefully every part for cracks, excessive wear or for any other condition that may cause oil leak or a future failure.

Needle roller bearings

Check carefully every needle roller for wear, pitting, cracks or spalled areas to determine whether they are suitable for reuse or replacement. After inspection, dip the needle roller bearings in an oil bath and then wrap them in a lint-free cloth or paper, so as to protect them until they are ready for assembling.

Parts replacement

When replacement is necessary, use only genuine Eaton transmission parts to assure continued performance and extended life from the transmission. The use of either non-genuine or remanufactured parts, besides have not the factory's warranty, may lead to severe damage of the unit.

Since the cost of a new part is generally a small fraction of the total cost of downtime and labor, do not reuse a questionable part which could lead to additional repairs and expense soon after assembly.

To aid in determining the reuse or replacement of any transmission part, consideration should also be given to the unit's history, mileage, application, etc.



Oil seals and snap rings

Any oil seal, snap ring, etc. damaged during maintenance, should be replaced by a new one. Replacement of oil seals and snap rings is cheaper when unit is disassembled than a premature overhaul to replace these parts in a future time.

An oil leakage through a worn seal may result in failures of other more expensive components of the transmission. The sealing elements should be handled carefully, particularly during assembly. Cuts, scratches or rolled up seal lips decrease the sealing efficiency.

NOTE: *When assembling the transmission, apply petroleum jelly onto oil seal lips.*

Special Tools

Throughout this manual, several transmission maintenance procedures are performed using special tools specifically recommended for this purpose.

These special tools are required for properly servicing the transmission and its use will prevent damages to the transmission and its components.

In addition, the use of these tools is important to prevent personal injuries and to preserve the safety of the mechanic.



WARNING! Following the disassembly and assembly instructions and using the recommended special tools in this manual are important to prevent personal injuries and/or damage to the transmission and its components.

The following table lists the special tools recommended in this manual and their respective codes.

These special tools should be ordered directly from the approved tools supplier:

ESPECIFER FERRAMENTAS E EQUIPAMENTOS ESPECIAIS

Rua Nazário, 618 - Europark Comercial

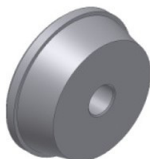
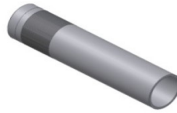
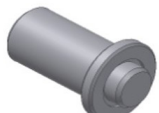
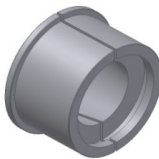
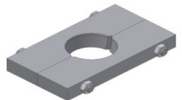
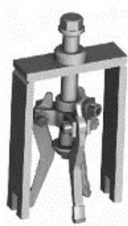
Indaiatuba - SP (CEP 13348-757)

Phone: +55 19 3936-9797

www.especifer.com.br

Code	Tool	Description
E001013		Universal handle 200mm
E001024		Driver, Input shaft bearing
E001026		Driver, Rear oil seal
E001028		Driver, Countershaft bearing cup (use with E001013)

Code	Tool	Description
E001031		Driver, Input shaft bearing cover oil seal (use with E001013)
E001054		Driver, Input shaft bearing cover bearing cup (use with E001013)
E001056		Driver, Permaglides bushing
E001058		Driver, Cup expansion plug

Code	Tool	Description	Code	Tool	Description
E001069		Driver, Rear splined shaft bearing cup (use with E001013)	E010001		Driver, Main shaft pocket bearing
E001073		Driver, Gear shift control housing oil seal	E010005		Driver, Main shaft rear bearing
E001090		Driver, Countershaft bearing cone	E011001		3-Jaw puller, Countershaft bearing cup
E005003		Puller, Pocket bearing cone (use with E005004)	E012011		2-Jaw puller
E005004		Spindle puller	E014022		Transmission bracket for service stand
E005013		Puller, Countershaft bearing cone (use with E005004)	E017011		Yoke lock plate
E007014		Puller, Input shaft bearing cone	EE20000		Transmission service stand
E007015		Puller, Main shaft rear bearing cone (5th gear)	EEA-23102		3-Jaw puller, Main shaft bearing cup
E008006		Pry bar and base plate for measuring main shaft end play			

Code	Tool	Description
EEA-23510		Support, Main shaft and countershaft assembly removal

Gear Shift Lever Pattern and Tips to the Driver

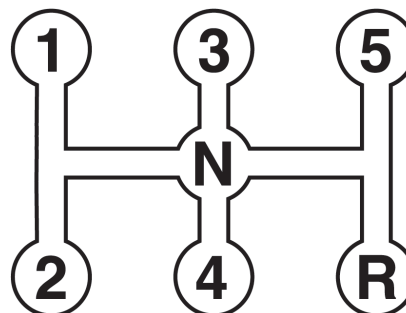
2. Operation

Gear Shift Lever Pattern

ESO-6205 transmission has five forward synchronized speeds and one reverse.

To shift into gears, follow the shift pattern shown in the figure on the side.

An interlocking system prevents from accidental transmission shifting from a forward to reverse gear. To shift into the reverse gear, put shift lever at the position, push it down and complete the shifting.



ESO6205-marcha

Tips for the Driver

Always use the clutch to change gears. The incorrect use of the clutch may cause premature failures of the synchronizer assembly.

Always select a starting gear that will provide sufficient reduction(torque) for the vehicle`s load and working condition (terrain).

Never slam or jerk the gear shift lever to complete gear shifting.

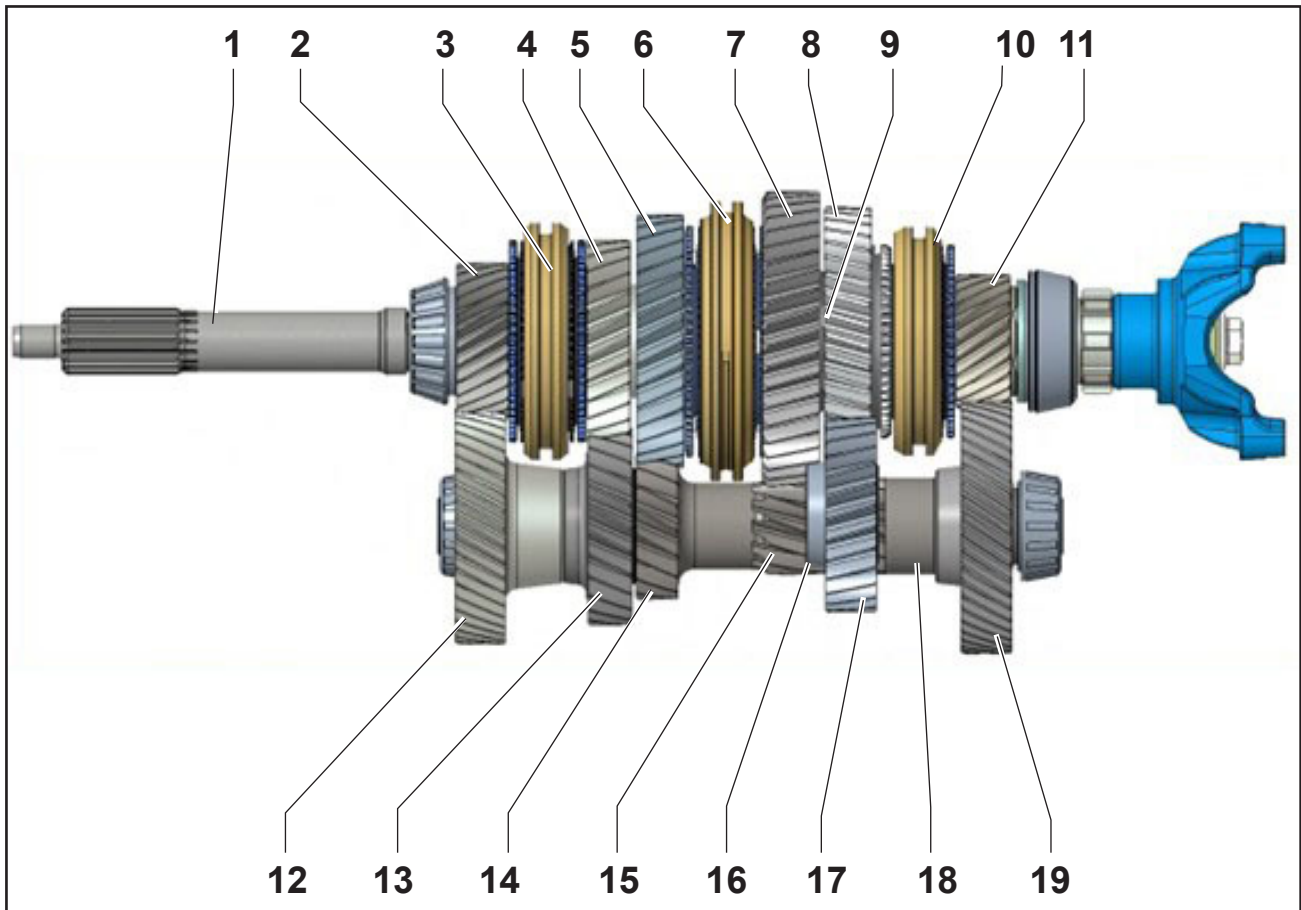
Never drive with the shift lever in the neutral position when going downhill.

Power Flow

The transmission must efficiently transfer the engine's power or torque to the vehicle's driveline.

It is essential to know what takes place in the transmission during torque transfer when troubleshooting or making repairs.

Gears and Synchronizers Identification



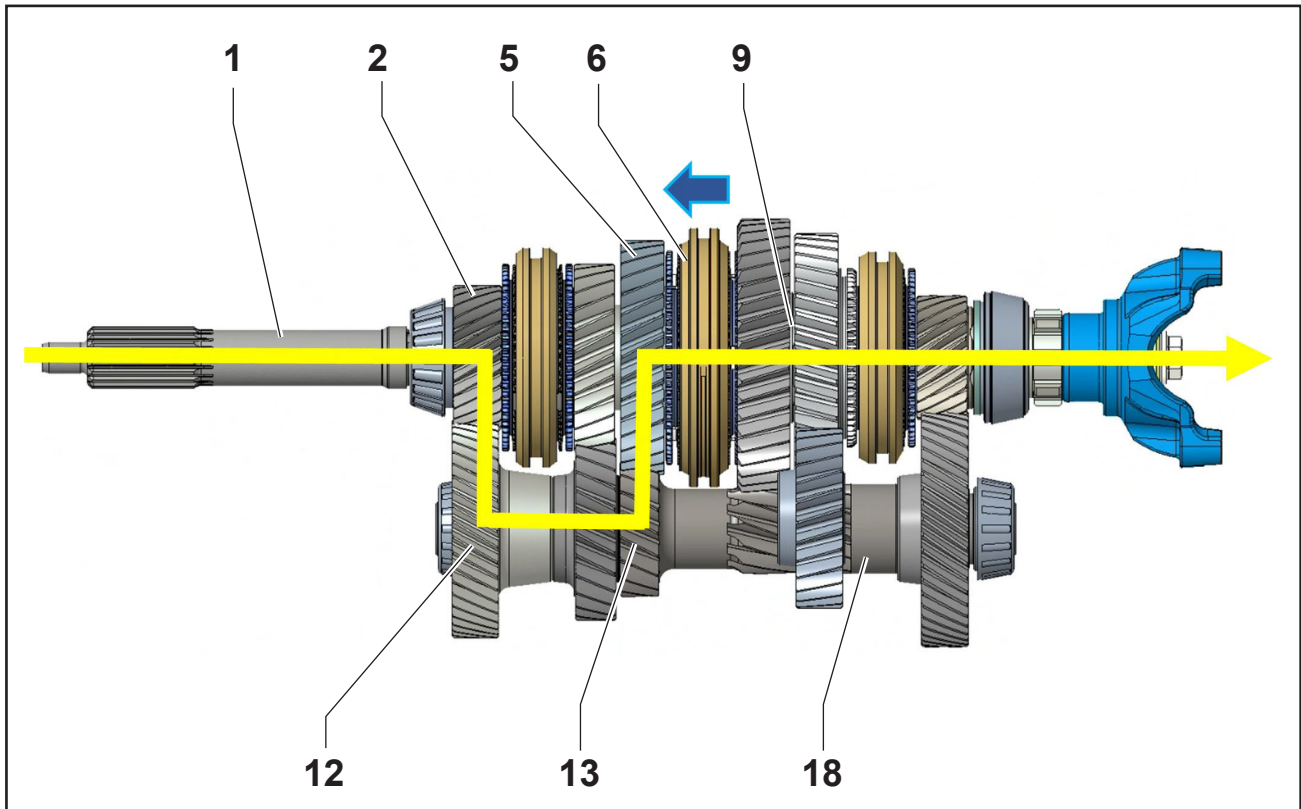
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- | | |
|-------------------------------------|-------------------------------------|
| 1. Input shaft | 11. Main shaft 5th speed gear |
| 2. Input shaft drive gear | 12. Countershaft driven gear |
| 3. 3rd/4th speed synchronizer assy. | 13. Countershaft 3rd speed gear |
| 4. Main shaft 3rd speed gear | 14. Countershaft 2nd speed gear |
| 5. Main shaft 2nd speed gear | 15. Countershaft 1st speed gear |
| 6. 1st/2nd speed synchronizer assy. | 16. Countershaft reverse speed gear |
| 7. Main shaft 1st speed gear | 17. Reverse Idler gear |
| 8. Main shaft reverse speed gear | 18. Countershaft |
| 9. Main shaft | 19. Countershaft 5th speed gear |
| 10. 5th speed synchronizer assy. | |

How the Transmission Works

(See figure on next page)

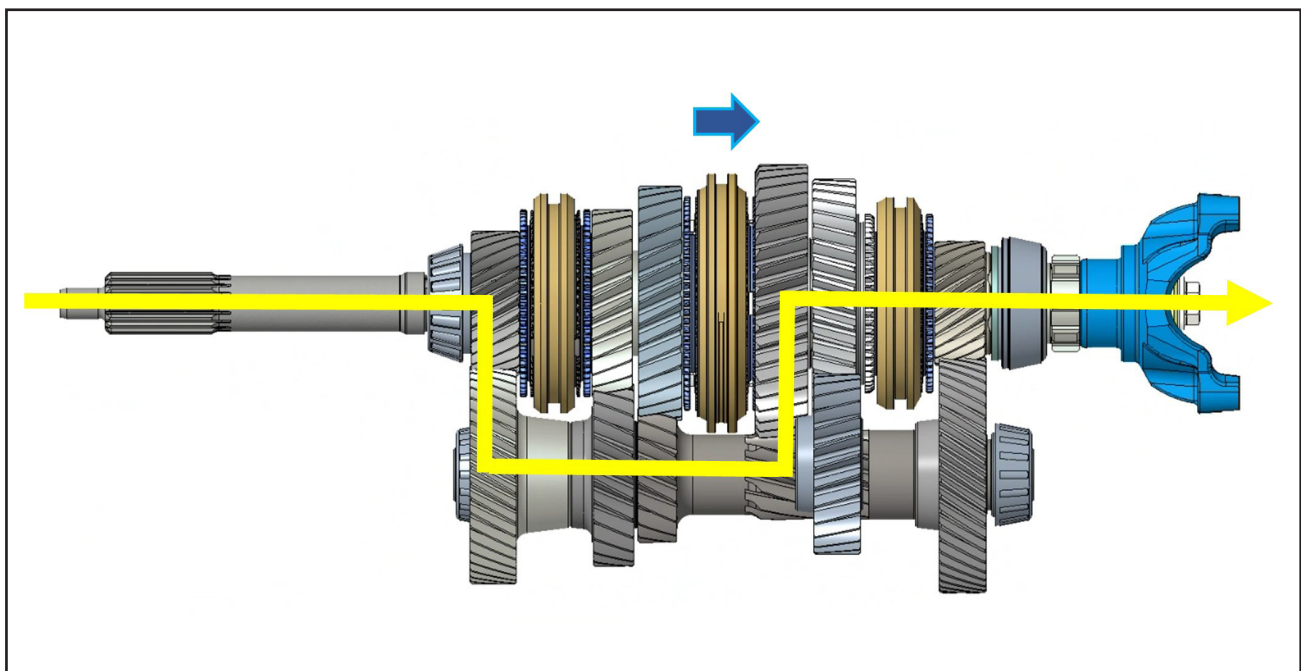
1. Torque from the engine is transferred, through the clutch, to the input shaft (1) of the transmission. The direction of rotation of the input shaft is the same as the engine, always clockwise.
2. From the input shaft, the torque is transferred to the countershaft driven gear (12), through the input shaft drive gear (2), performing the first reduction in the transmission (input gear set 2 and 12). With the exception of the 4th speed gear, which is mounted on needle roller bearing, all other gears on the countershaft (18) rotate attached to the shaft and at the same speed, and the direction of rotation is counterclockwise.
3. The input shaft (1) rotates apart from the main shaft (9) so that it can transmit torque to the countershaft (18) independently of the main shaft. Between these two shafts there is a conical bearing known as "pocket", installed at the end of the main shaft and supported on the input shaft, which allows the two shafts to rotate at different rotation speeds.
4. With the exception of the 5th speed gear, the torque along the countershaft (18) is transmitted to all other main shaft (9) gears, assembled on needle roller bearings, by the corresponding countershaft gears. Each gear on the main shaft rotates at a different speed, according to the gear ratio of the specific selected speed (see Gear Ratio table in the General Information section of this manual).
5. When a forward speed is selected (the example in the figure shows the 2nd speed), the torque is transferred to the main shaft (9) by the corresponding gear (5) of that shifted speed, through the synchronizer (6) spline that is actuating. At this moment, the second reduction occurs inside the transmission (in the example in the figure, gear set 5 and 13). In forward gears, the direction of rotation of the main shaft will always be clockwise.
6. In the case of 5th gear, the operation and transmission of torque between the gear pair are similar to that described previously, except for the fact that the gear that rotates freely on needle bearing is mounted on the countershaft (18).



Fluxo2

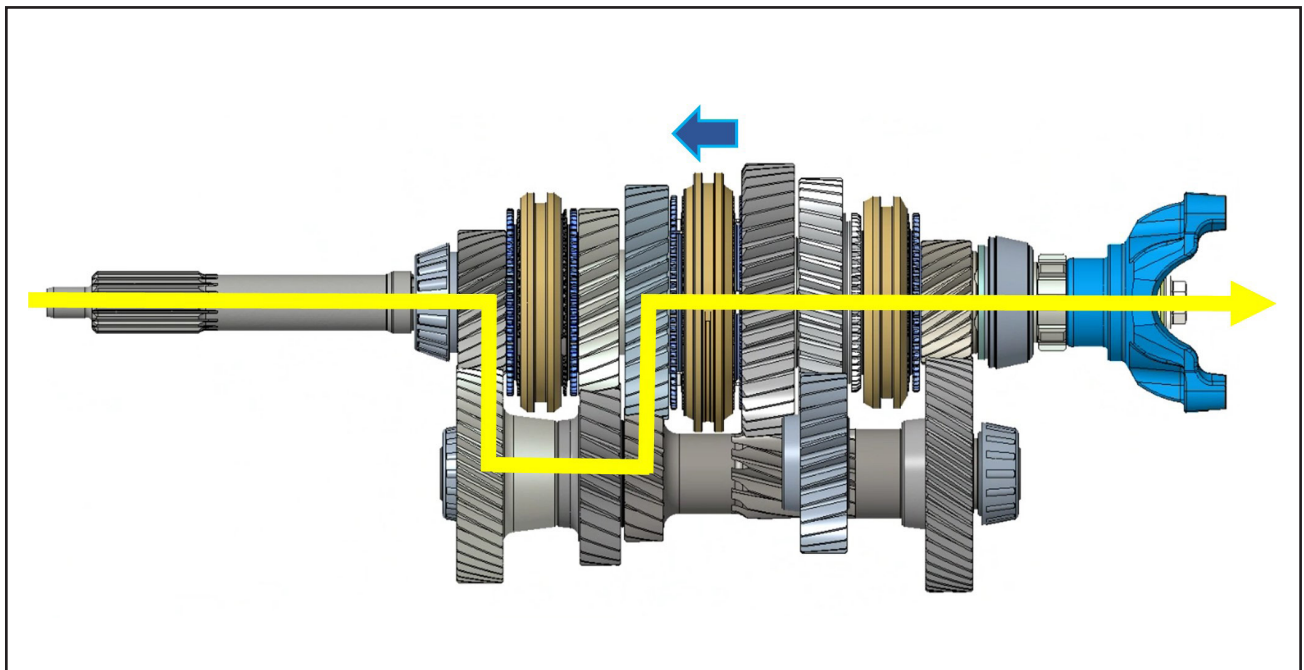
- | | |
|-------------------------------------|---------------------------------|
| 1. Input shaft | 9. Main shaft |
| 2. Input shaft drive gear | 12. Countershaft driven gear |
| 5. Main shaft 2nd speed gear | 13. Countershaft 3rd speed gear |
| 6. 1st/2nd speed synchronizer assy. | 18. Countershaft |

1st Speed



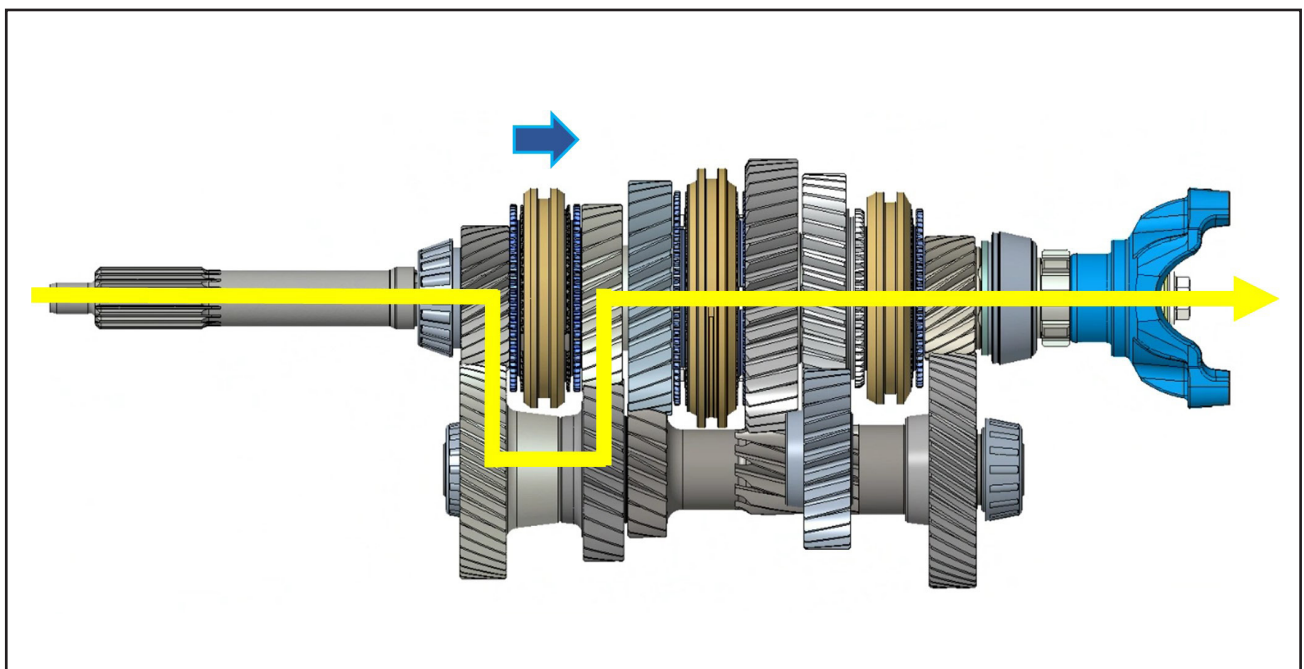
Marcha1

2nd Speed



Marcha2

3rd Speed

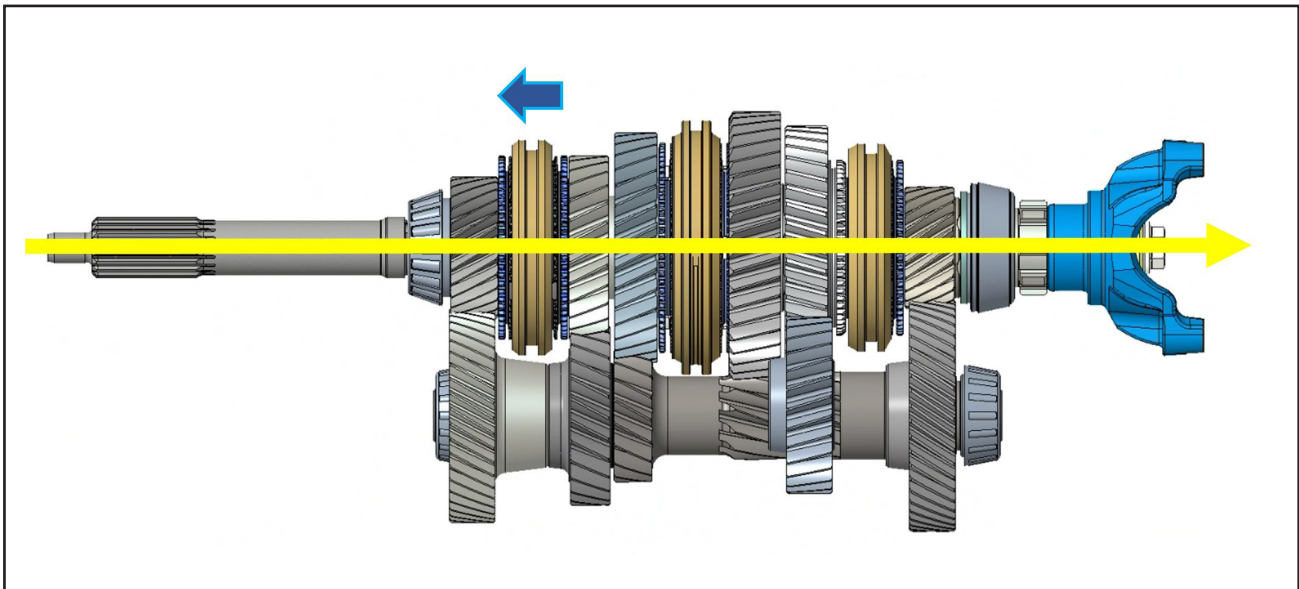


Marcha3

4th Speed

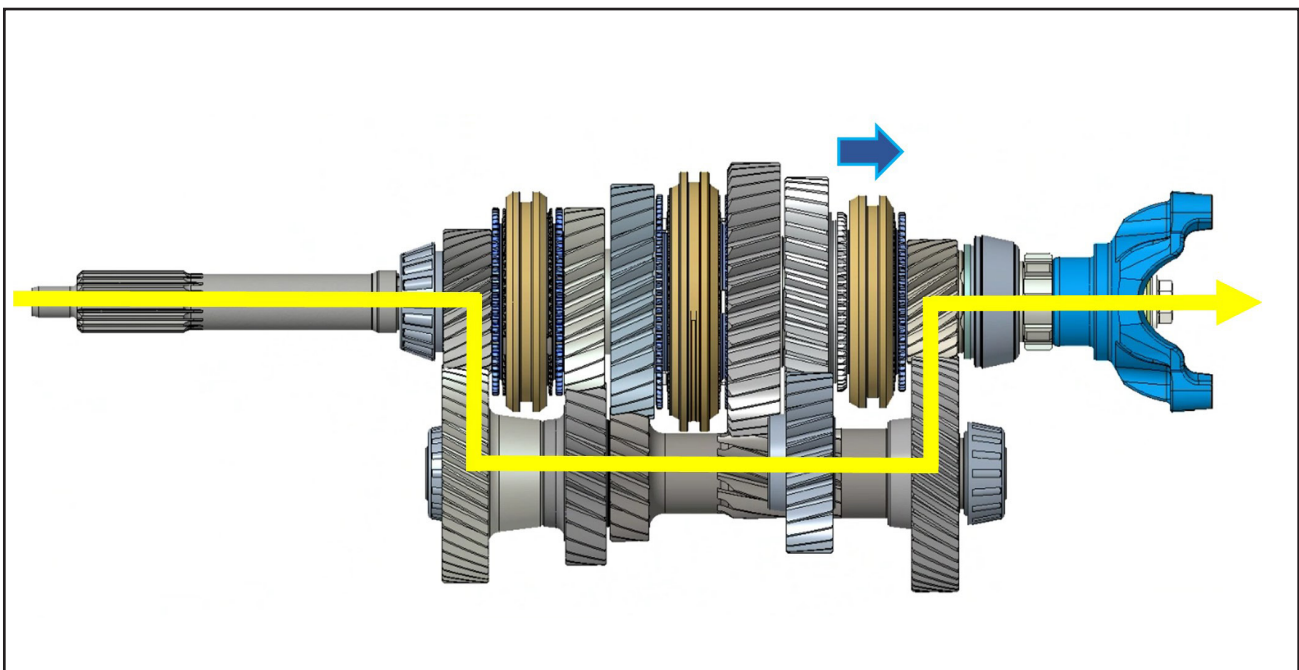
The 4th speed in this transmission is a direct drive speed. This designation is due to the fact that in this speed the input shaft, although it drives the countershaft together, transfers the engine torque directly to the main shaft, without any gear reduction.

The coupling teeth of the pilot shaft mesh with the coupling teeth of the 4th speed synchronizer which, in turn, transfers the torque to the main shaft. Everything happens as if it were a single shaft.



Marcha4

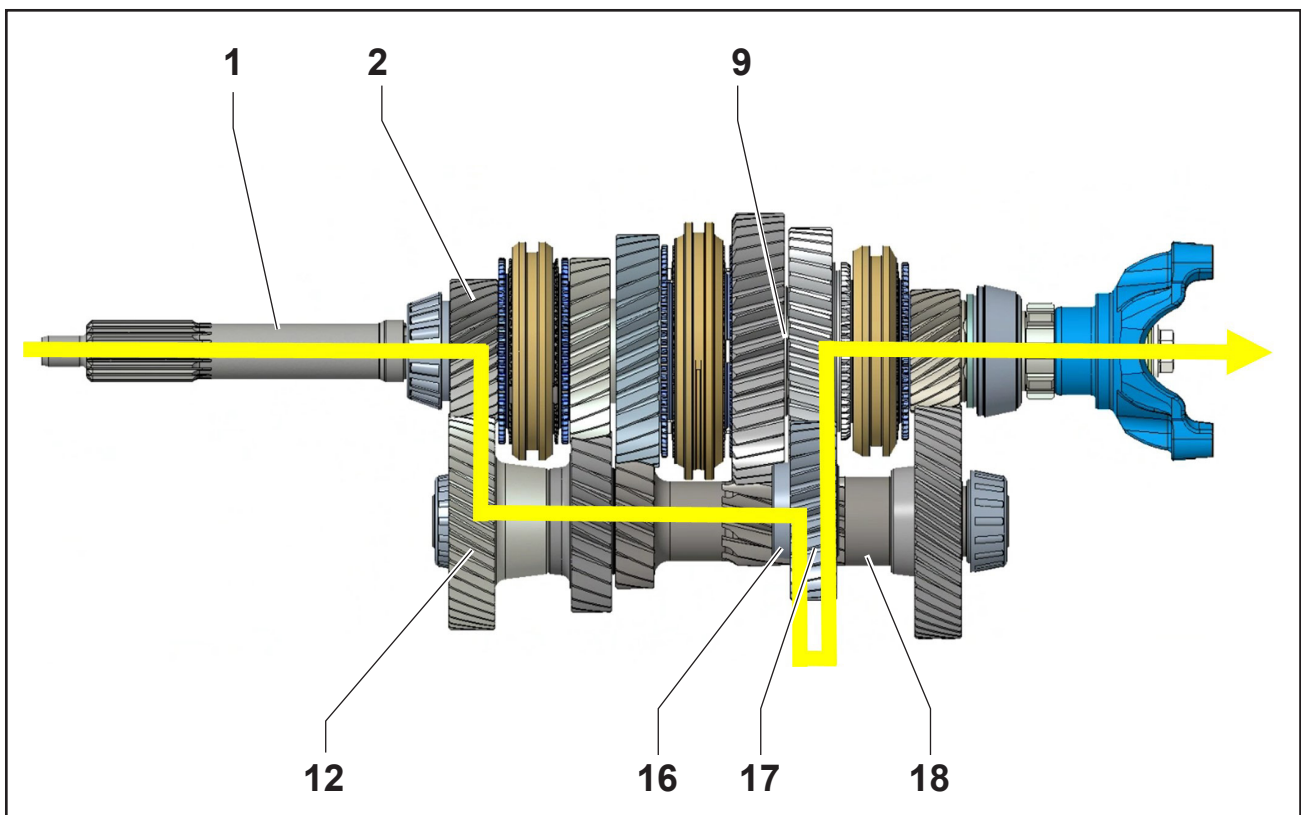
5th Speed



Marcha5

Reverse Speed

1. When the reverse speed gear is shifted, the torque is transferred from the input shaft (1) to the countershaft (18) performing the first reduction (gear set 2 and 12) of the reverse speed.
2. After that, the torque is transferred from countershaft (18), through the countershaft reverse gear (16) to the reverse idler gear (17), performing the second reduction (gear set 16 and 17) of this speed, and finally, the torque is transferred from the reverse idler gear (17) to the main shaft reverse gear (9), performing the third reduction (gear set 9 and 17) of the reverse speed.
3. As a result of the reverse idler gear (17) in this engagement, the rotation of the main shaft (9) in the reverse speed is counterclockwise. This way, the rotation to the wheels is inverted and the vehicle can go backward.



Marcha Re

- | | |
|------------------------------|-------------------------------------|
| 1. Input shaft | 16. Countershaft reverse speed gear |
| 2. Input shaft drive gear | 17. Reverse Idler gear |
| 9. Main shaft | 18. Countershaft |
| 12. Countershaft driven gear | |

The following chart presents some transmission malfunctions with their most common causes and possible solutions.

Problem	Probable cause	Possible solution	Reference
Transmission noise when in neutral	Incorrect idle speed adjustment	Adjust idle speed	Instructions in vehicle's manual
	Improper or damaged clutch disc	Replace disc	Instructions in vehicle's manual
	Loose or damaged engine or transmission mounts	Replace and/or tighten mounts	Instructions in vehicle's manual
	Worn or damaged yoke	Replace yoke	Instructions in vehicle's manual
	Warped or unbalanced drive shaft	Repair or replace drive shaft	Requires specific procedure
	Low lubricant level	Fill with recommended oil to the proper level	Lubrication, in this manual
	Contaminated lubricant	Drain and clean transmission and refill with recommended oil	Lubrication, in this manual
	Worn or damaged gears and/or bearings	Replace damaged parts	Instructions in this manual
	Misalignment due to loose tightening capscrews	Retighten capscrews	Instructions in this manual
Transmission noise with shifted gears	Improper or damaged clutch disc	Replace disc	Instructions in vehicle's manual
	Low lubricant level	Fill with recommended oil to the proper level	Lubrication, in this manual

Problem	Probable cause	Possible solution	Reference
Transmission noise with shifted gears (continued)	Worn or damaged flywheel bushing or bearing	Replace damaged parts	Instructions in vehicle's manual
	Vibration from other vehicle components (drive shaft, mounts, yoke)	Verify and repair as per vehicle's manual	Instructions in vehicle's manual
	Misalignment between engine and transmission	Realign	Instructions in vehicle's manual
	Worn or damaged gears and/or bearings	Replace damaged parts	Instructions in this manual
	Warped main shaft or countershaft	Replace warped shaft	Instructions in this manual
Hard shifting	Malfunction of clutch (not releasing)	Verify and adjust clutch driving system	Instructions in vehicle's manual
	Wrong adjustment of clutch pedal	Adjust pedal stroke	Instructions in vehicle's manual
	Worn or damaged flywheel bushing or bearing	Replace damaged parts	Instructions in vehicle's manual
	Improper lubricant	Drain and refill with recommended oil	Lubrication, in this manual
	Low lubricant level	Fill with recommended oil to the proper level	Lubrication, in this manual
	Worn or damaged gear shift lever components	Replace damaged parts	Gear shift lever housing

Problem	Probable cause	Possible solution	Reference
Hard shifting (continued)	Worn or damaged synchronizer rings	Replace rings	Synchronizer assemblies
	Excessively worn or damaged synchronizer assemblies (keys, sleeve or hub)	Replace synchronizer assemblies	Synchronizer assemblies
	Improper adjustment of synchronizer assemblies sleeve or hub	Readjust synchr assemblies	Synchronizer assemblies
	Worn or damaged shifting system components (yokes, nylon pads, bars, shift blocks)	Replace damaged parts	Instructions in this manual
	Improper end play on mainshaft or countershaft	Adjust end play	Mainshaft and countershaft end play adjustment
Gear shift rubbing	Malfunction of clutch (not releasing)	Verify and adjust clutch driving system	Instructions in vehicle's manual
	Wrong adjustment of clutch pedal stroke	Adjust pedal stroke	Instructions in vehicle's manual
	Malfunction of clutch driving system	Verify and adjust system	Instructions in vehicle's manual
	Worn or damaged flywheel bushing or bearing	Replace damaged parts	Instructions in vehicle's manual
	Incorrect idle speed adjustment	Adjust idle speed	Instructions in vehicle's manual

Problem	Probable cause	Possible solution	Reference
Gear shift rubbing (continued)	Worn or damaged synchronizer rings	Replace rings	Synchronizer assemblies
	Worn or damaged gear clutching teeth	Replace gear	Instructions in this manual
	Worn shift yokes nylon pads	Replace nylon pads	Shift bars
Transmission slips out of gears	Misalignment between engine and transmission	Realign	Instructions in vehicle's manual
	Incomplete gear shifting	Shift gear properly	Instructions in this manual
	Excessive vibration on gear shift lever due to loose or damaged engine or transmission mounts	Replace and/or tighten mounts	Instructions in vehicle's manual
	Gear shift lever console out of position, forcing the lever	Adjust console	Instructions in vehicle's manual
	Worn or damaged synchronizer assemblies	Replace synchronizer assemblies	Synchronizer assemblies
	Excessive axial clearance on main shaft gears	Adjust clearance	Mainshaft end play adjustment
	Worn or damaged clutching gear teeth	Replace gear	Instructions in this manual
	Worn or damaged shifting system (gear shifting lever housing, yokes, bars, etc.)	Replace damaged parts	Instructions in this manual

Problem	Probable cause	Possible solution	Reference
Oil leak	Lubricant above proper level	Correct to proper level	Lubrication, in this manual
	Clogged breather	Verify and unclog breather	
	Worn or damaged oil seals	Replace damaged seals	Instructions in this manual
	Housing capscrews not properly tightened or lack of sealant	Reassemble with proper sealant and tightening torque	Instructions in this manual
	Cracked housing or covers	Replace or repair damaged parts	Requires specific procedure
	Warped or damaged mounting surfaces of housings and covers	Replace or repair damaged parts	Requires specific procedure
Bearings failures	Low lubricant level	Fill with recommended oil to the proper level	Lubrication, in this manual
	Contaminated or not recommended lubricant	Drain and clean transmission and refill with recommended oil	Lubrication, in this manual
	Improper assembly of transmission components	Reassemble transmission	Instructions in this manual
	Improper end play on mainshaft or countershaft	Adjust end play countershaft end play	Mainshaft and adjustment
	Bearings were not lubricated prior to assembly	Replace damaged parts Reassemble following right procedure	Instructions in this manual
Double shifting	Double gear shifting interlock system assembled improperly	Reassemble system	Instructions in this manual

3. Disassembly and Assembly



The section “General Information” contains important information and specifications to be used when servicing the transmission.

When disassembling, inspect all components for wear or any other damage.

During disassembly and assembly, replace any part when required.

CAUTION: *Whenever you use a vise to secure transmission components during service, for example shafts, gears, etc., protect the jaws with an aluminum angle or other soft material to prevent damage to the part.*

During assembly, lubricate the following parts using the same lubricant specified for the transmission:

- Mainshaft gears and reverse idle gear bores, faces and cones;
- Contact surfaces of synchronizer rings, cones and friction surfaces;
- Needle bearings and conical bearings;
- Thrust surfaces, bearing bushings.

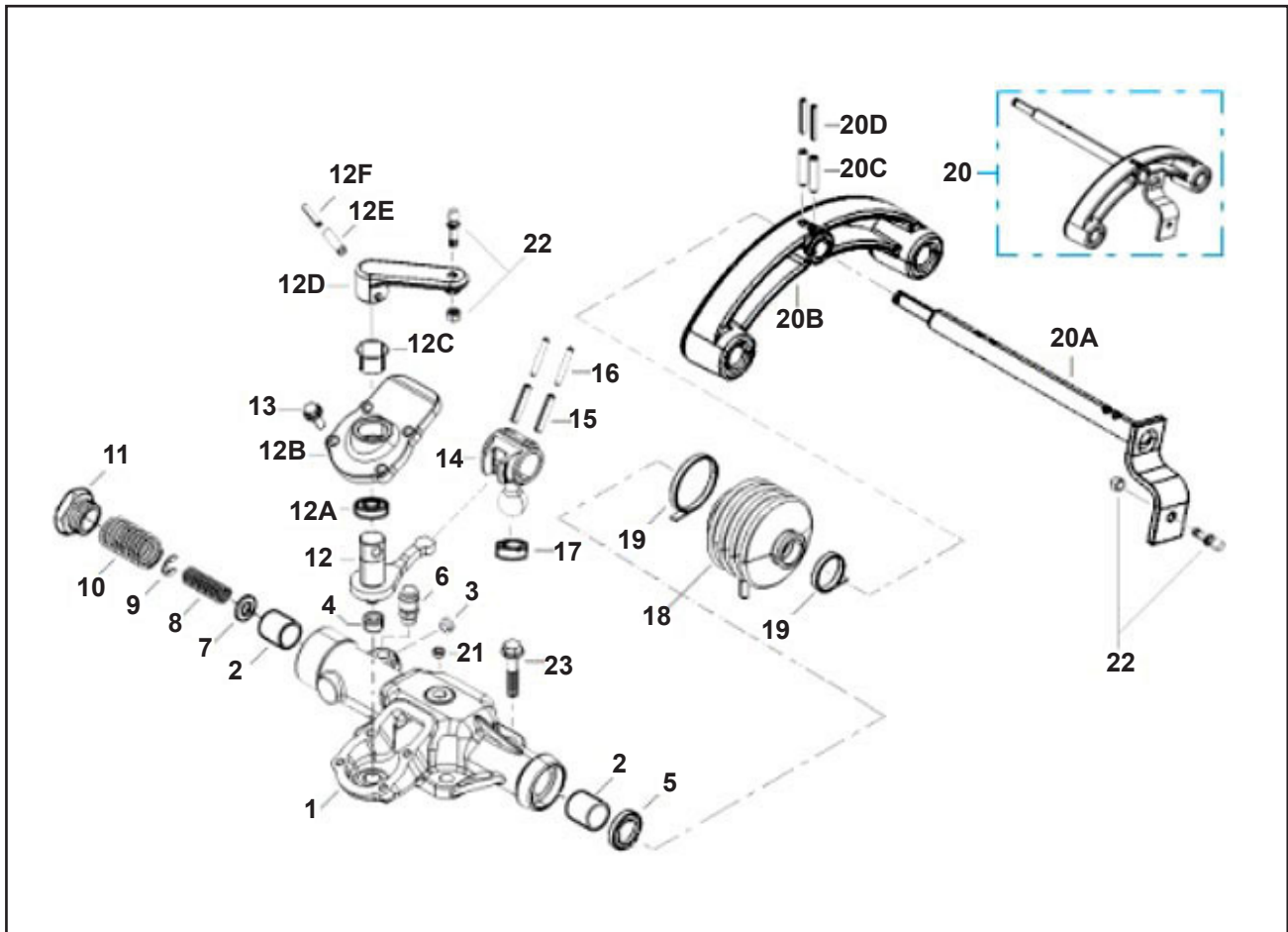
During assembly, constantly check the transmission (horizontally) to ensure that gears and synchronizers are rotating smoothly and freely.

Apply grease MS-9C onto following parts of the control tower:

- Bushings, inner levers, pivot balls of external shift levers, pivot pins.

Apply petroleum jelly onto oil seal lips.

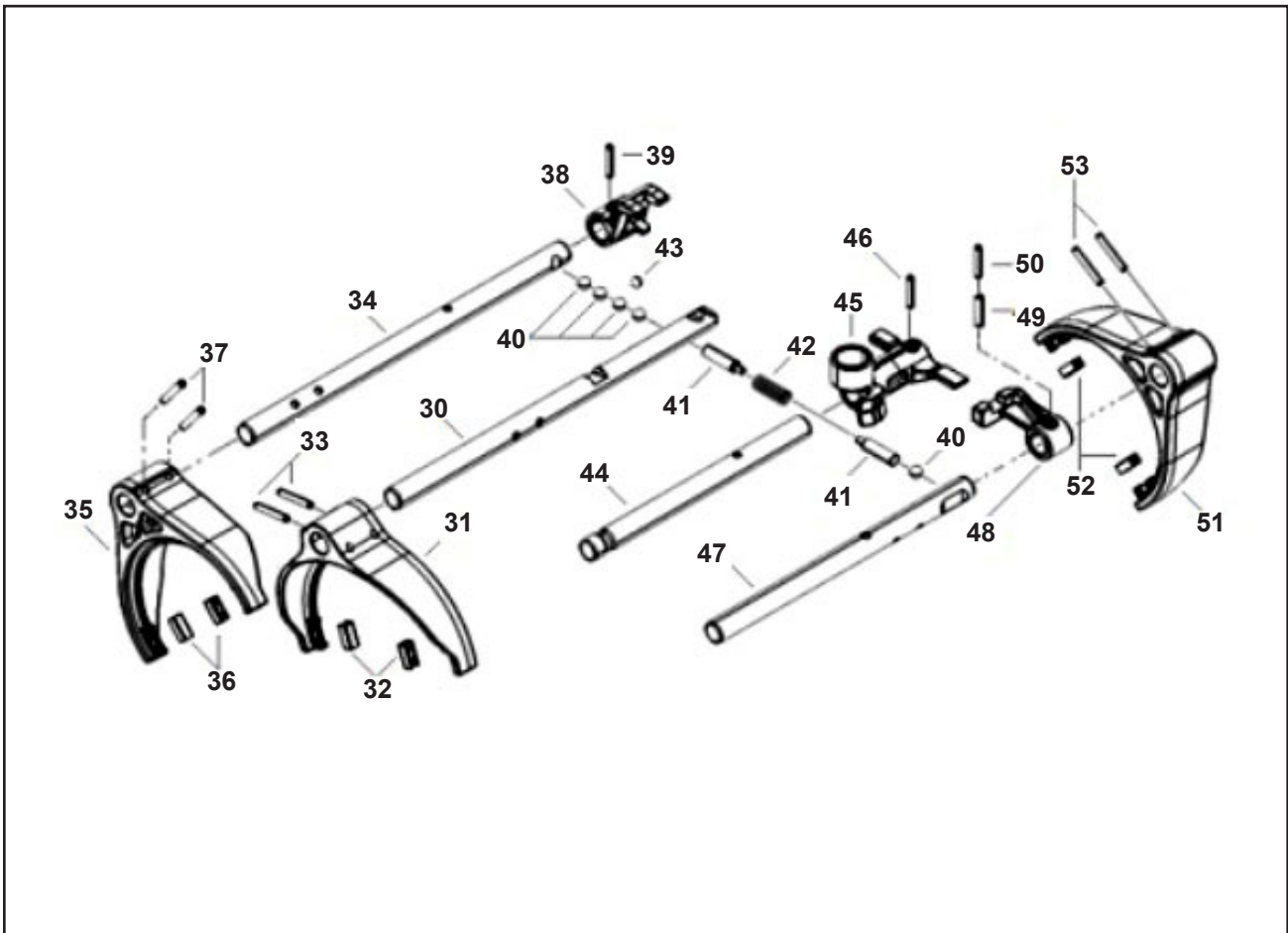
Remote Gear Shift Control



6205-EX001

1. Remote gear shift control housing	12. Internal selection lever	17. Shift lever bushing
2. Bushing	12A. Oil seal	18. Dust boot
3. Cup expansion plug	12B. Cover	19. Clamp
4. Bushing	12C. Bushing	20. Lever and counterweight assy.
5. Oil seal	12D. External selection lever	20A. Shift lever
6. Breather	12E. Roll pin	20B. Counterweight assy.
7. Thrust washer	12F. Roll pin	20C. Roll pin
8. Spring	13. Capscrew	20D. Roll pin
9. Snap ring	14. Internal shift lever	21. Cup expansion plug
10. 1st/2nd speed selection spring	15. Roll pin	22. Spherical plug
11. Spring retaining plug	16. Roll pin	23. Capscrew M10x1.5x25

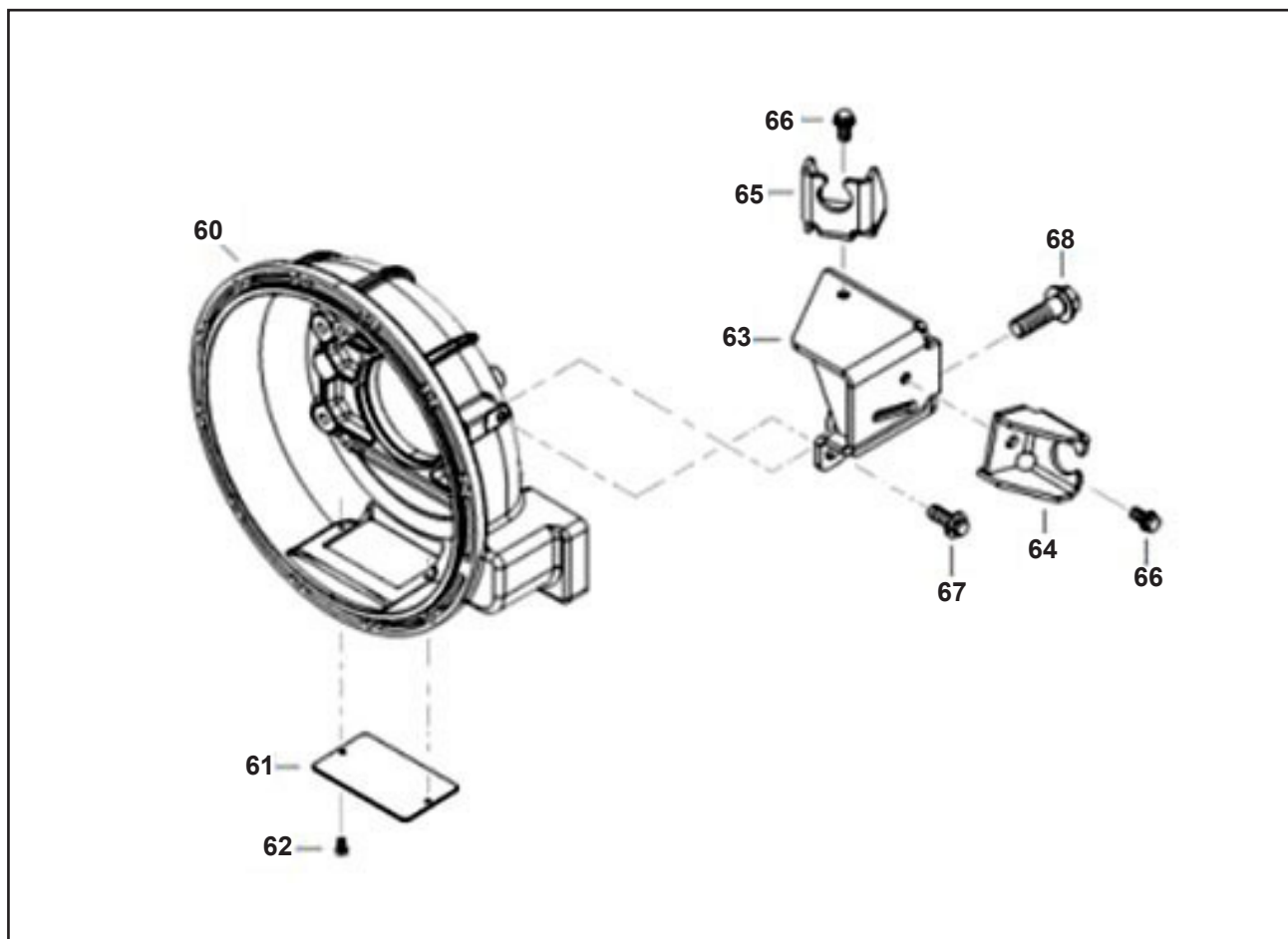
Shift Yoke and Bars



6205-EX002

30. 1st/2nd speed shift bar	38. 3rd/4th speed shift block	46. Roll pin
31. 1st/2nd speed shift yoke	39. Roll pin	47. 5th/reverse speed shift bar
32. Yoke pads	40. Ball	48. 5th/reverse speed shift block
33. Roll pin	41. Interlock pin	49. Roll pin
34. 3rd/4th speed shift bar	42. Spring	50. Roll pin
35. 3rd/4th speed shift yoke	43. Ball	51. 5th/reverse speed shift yoke
36. Yoke pads	44. Gear selector bar	52. Yoke pads
37. Roll pin	45. Gear selector block	53. Roll pin

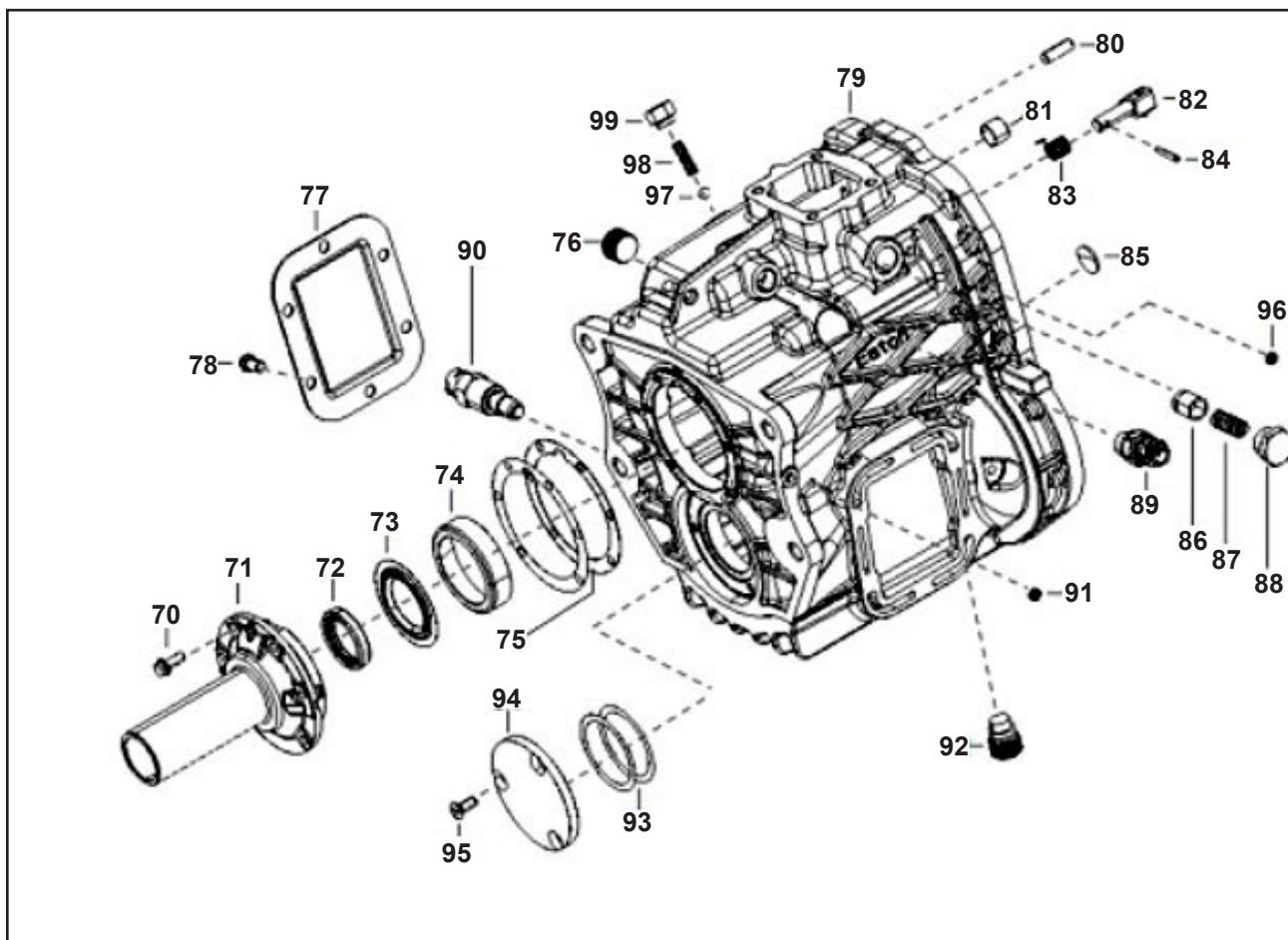
Clutch Housing



6205-EX003

60. Clutch housing	63. Cable bracket - Base	66. Capscrew M8x1.25x16
61. Inspection cover	64. Cable bracket - Shift	67. Capscrew M10x1.5x25
62. Capscrew M5x0.8x10	65. Cable bracket - Selection	68. Capscrew

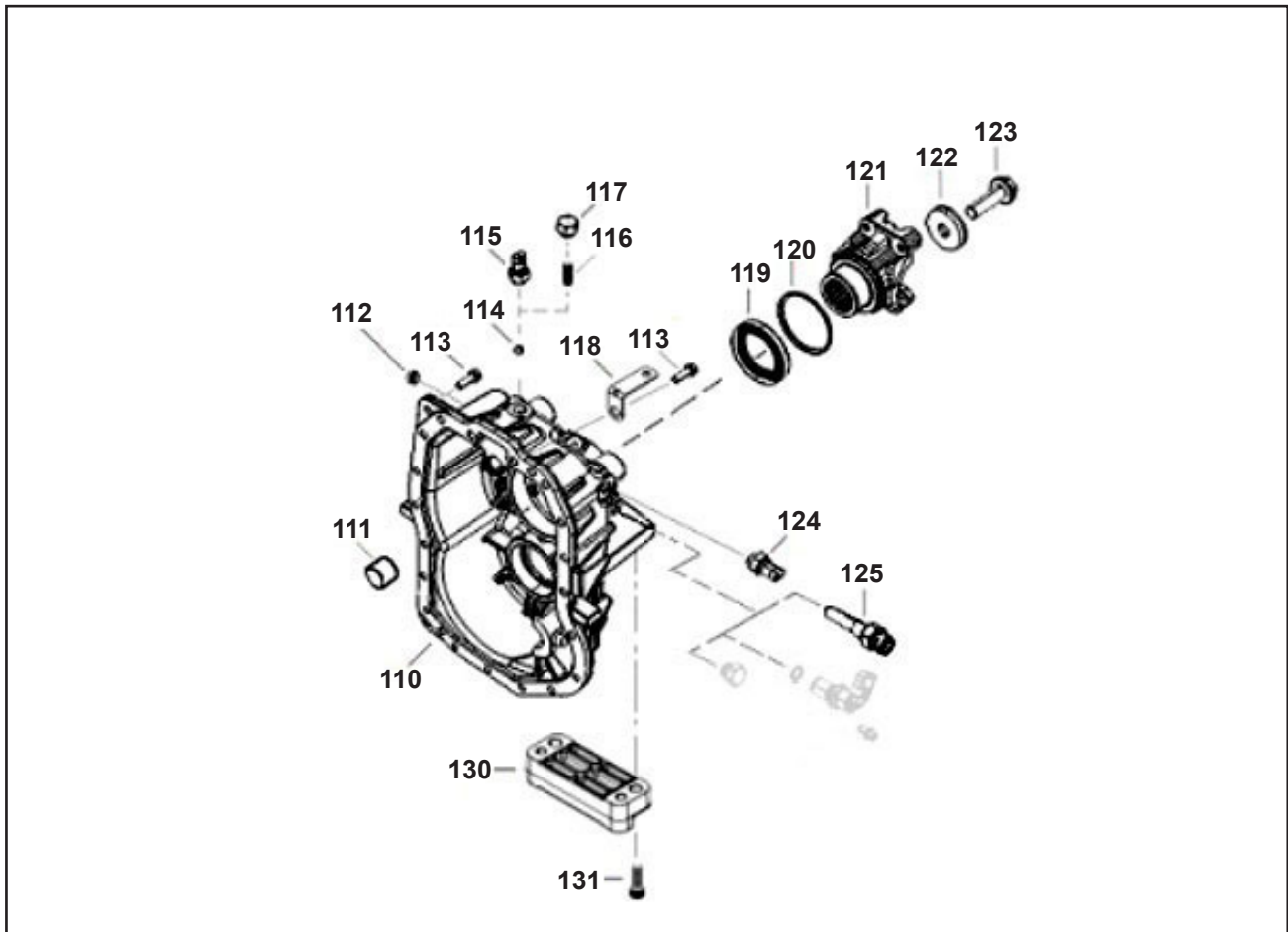
Front Case Assy.



6205-EX004

70. Capscrew M8x1.25x20	80. Dowel pin	90. Speed sensor
71. Input shaft bearing cover	81. Bushing	91. Cup expansion plug
72. Oil seal	82. Reverse interlock assy.	92. Drain plug
73. Oil baffle	83. Reverse interlock spring	93. Adjusting shim - 0.102mm
74. Bearing cup	84. Roll pin	94. Countershaft front cover
75. Adjusting shim - 0.102mm	85. Cup expansion plug	95. Capscrew
76. Plug	86. Cam actuator	96. Cup expansion plug
77. Power Take-Off (PTO) cover	87. Actuator spring	97. Ball
78. Capscrew	88. Threaded plug	98. Spring
79. Front housing	89. Switch	99. Threaded plug

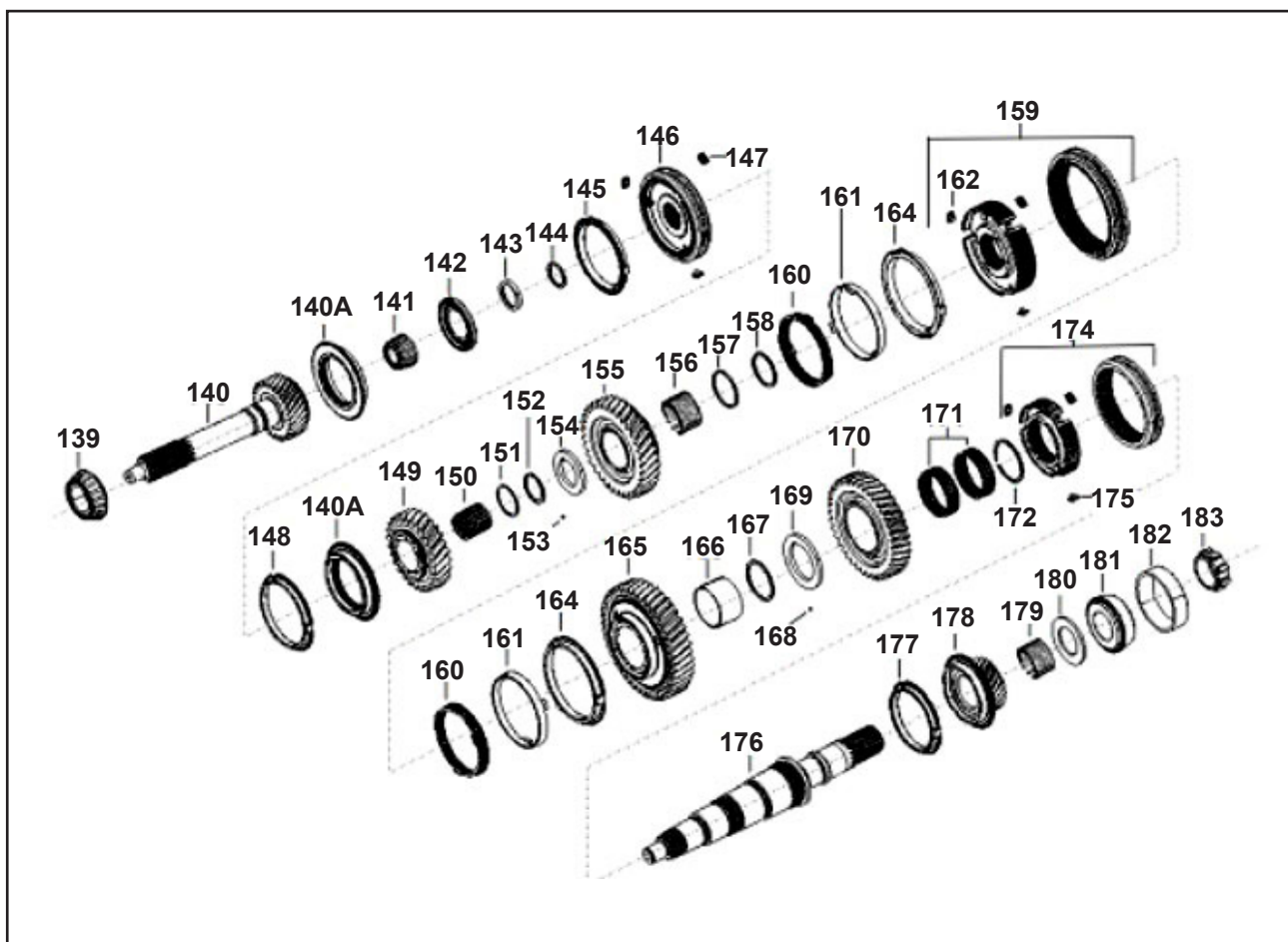
Rear Case Assy.



6205-EX005

110. Redar housing	116. Spring	122. Washer
111. Bushing	117. Threaded plug	123. Capscrew M16x1,5x55
112. Cup expansion plug	118. Bracket	124. Switch
113. Capscrew M8x1,25x25	119. Oil seal	125. Speedometer sensor
114. Ball	120. Baffle	130. Cushion support
115. Switch	121. Universal joint yoke	131. Allen bolt M14x2,0x45

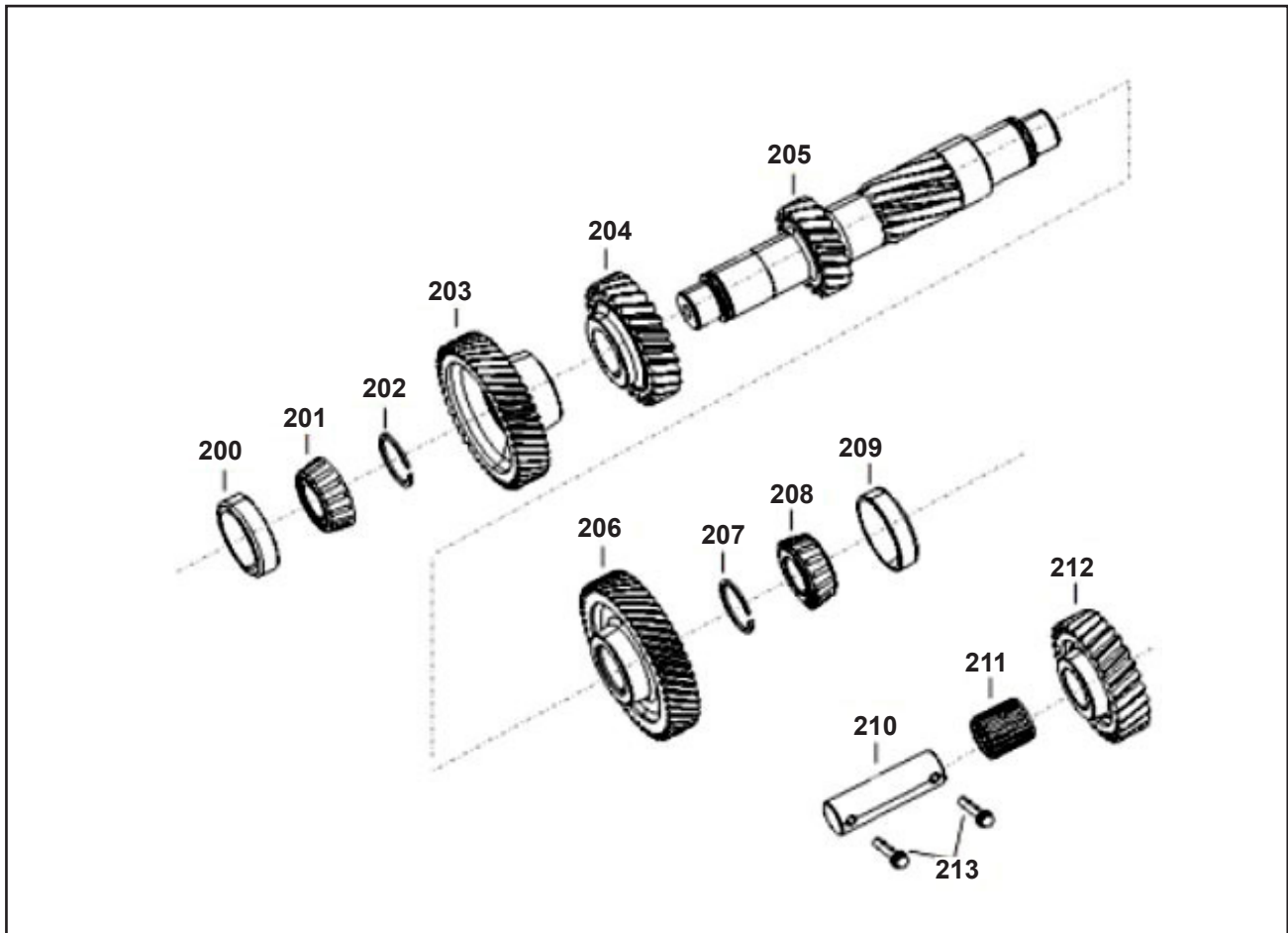
Input Shaft and Main Shaft



6205-EX006

139. Bearing cone	153. Ball	168. Ball
140. Input shaft	154. Thrust washer	169. Thrust washer
140A. Synchronizer ring	155. 2nd Speed gear	170. Reverse speed gear
141. Bearing cone	156. Rollers	171. Needle roller bearing
142. Oil baffle	157. Spacer	172. Snap ring
143. Retaining washer	158. Snap ring	174. 5th Speed synchronizer assy
144. Snap ring	159. 1st/2nd Speed synchronizer assy	175. Key
145. Synchronizer ring	160. Inner synchronizer ring	176. Main shaft
146. 3rd/4th Speed synchronizer assy	161. Intermediate synchronizer ring	177. Synchronizer ring
147. Key	162. Key	178. 5th Speed gear
148. Synchronizer ring	163. Spring support (not illustrated)	179. Rollers
149. 3rd Speed gear	164. Outer synchronizer ring	180. Thrust washer
150. Needle roller bearing	165. 1st Speed gear	181. Bearing cone
151. Spacer	166. Needle roller bearing	182. Bearing cup
152. Snap ring	167. Snap ring	183. Speedometer rotor

Countershaft and Reverse Idler Gear



6205-EX007

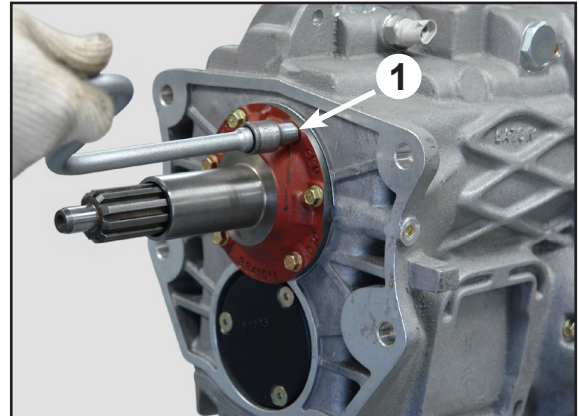
200. Bearing cup	205. Countershaft	210. Reverse idler gear shaft
201. Bearing cone	206. 5th Speed gear	211. Needle roller bearing
202. Snap ring	207. Snap ring	212. Reverse idler gear
203. Countershaft drive gear	208. Bearing cone	213. Screw
204. 3rd Speed gear	209. Bearing cup	

Input Shaft Bearing Cover

Removal

1. Remove the input shaft bearing cover retaining capscrews.

- 11mm Socket

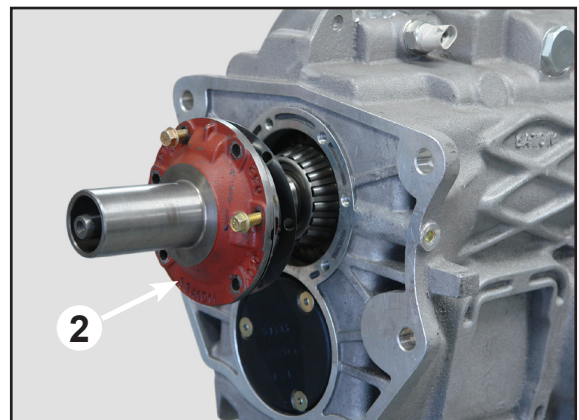


6205001

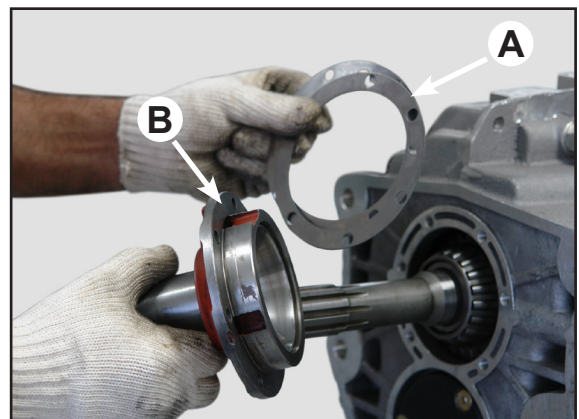
2. Remove the input shaft bearing cover and the adjusting shims.

A - Adjusting shims

B - Input shaft bearing cover



6205002



6205003

Disassembly

1. Locate the oil seal. It is inside the input shaft bearing cover.



6205004

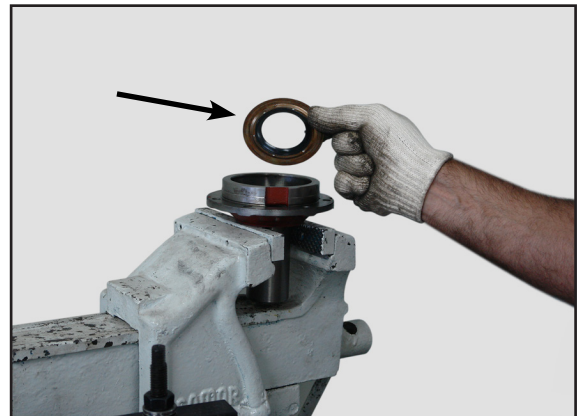
2. Remove the tapered bearing cup.

NOTE: Use the special tool #E012006.



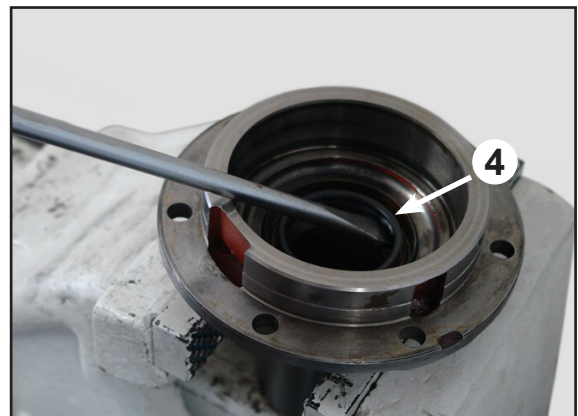
6205005

3. Remove the oil baffle.



6205006

4. Remove the oil seal.



6205007

Input Shaft Bearing Cover

Assembly

1. Install the oil seal.

NOTE: Use the special tools #E001013 and #E001054.



6205008

2. Install the oil baffle.



6205009

3. Install the tapered bearing cup.

NOTE: Use the special tools #E001067 and #E001013.



6205010

Installation

1. Install the shim pack.



6205011

2. Install the input shaft bearing cover.

NOTE: Apply Dow Corning 740 sealant to the mounting surface of the input shaft bearing cover and Loctite 262 sealant to the threads of retaining capscrews.

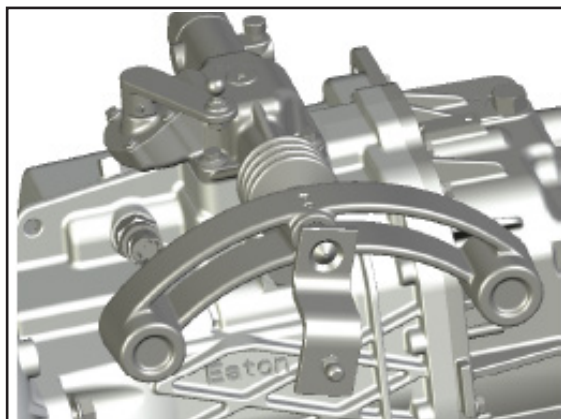
Torque: 14-18 lb.ft / 19-25 N.m



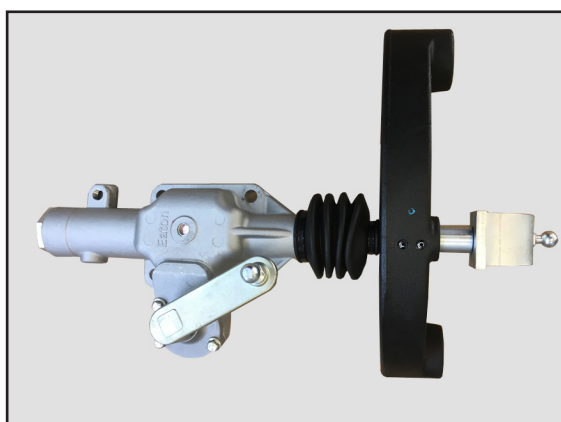
6205012

Removal

1. Remove the four retaining capscrews.
- 10mm Socket
2. Remove the remote gear shift control assembly.



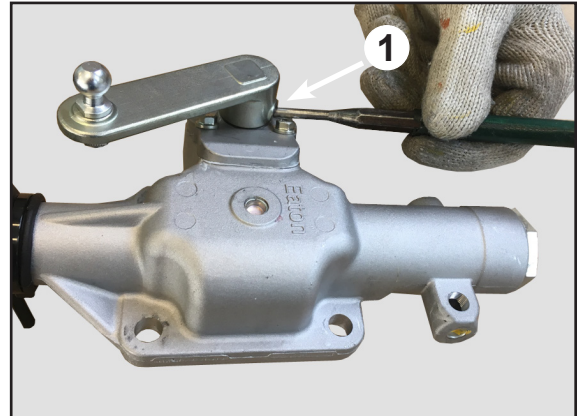
6205172



6205173

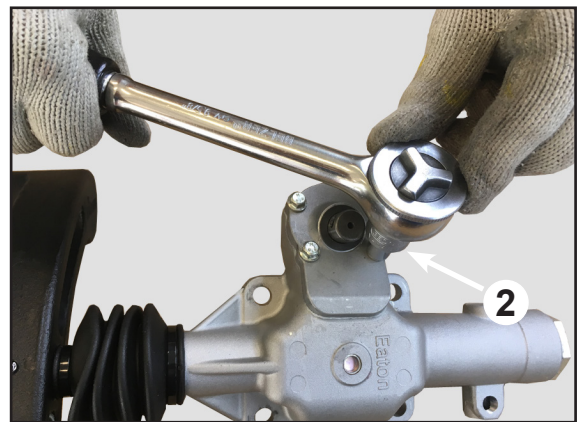
Disassembly

1. Remove the roll pin.



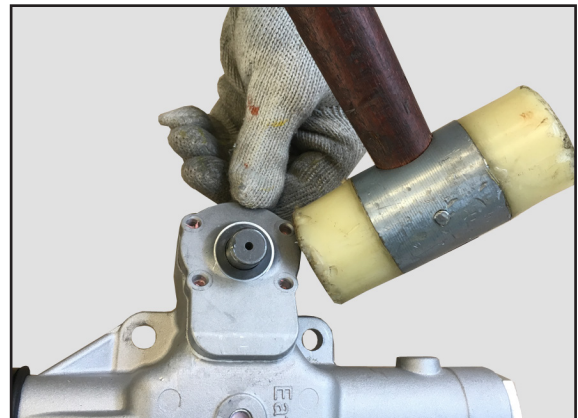
6205174

2. Remove the cover retaining capscrews.
- 6mm Socket



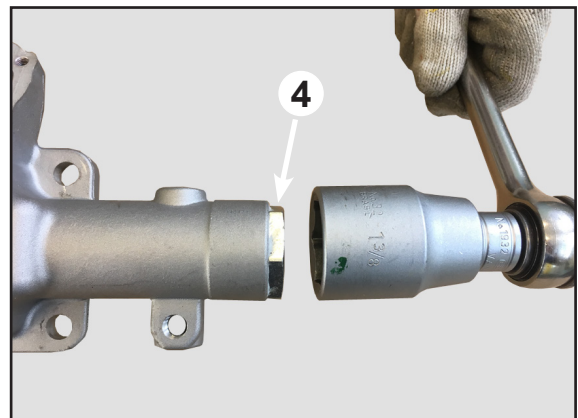
6205175

3. Tap lightly to detach the gear shift control housing cover.



6205176

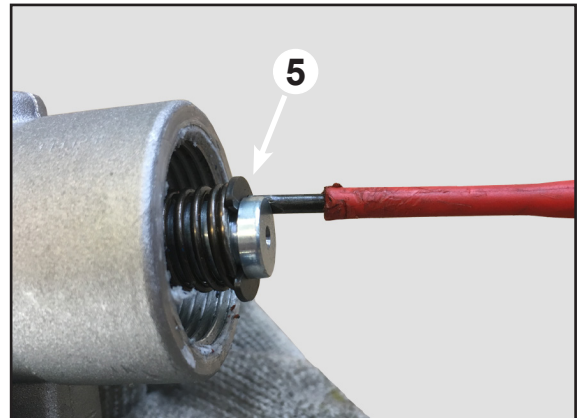
4. Remove the spring retaining plug.
- 1 3/8" Socket



6205177

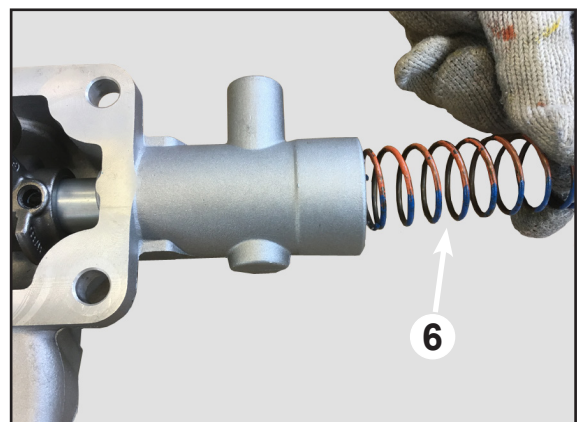
Remote Gear Shift Control

5. Remove the snap ring and spring.



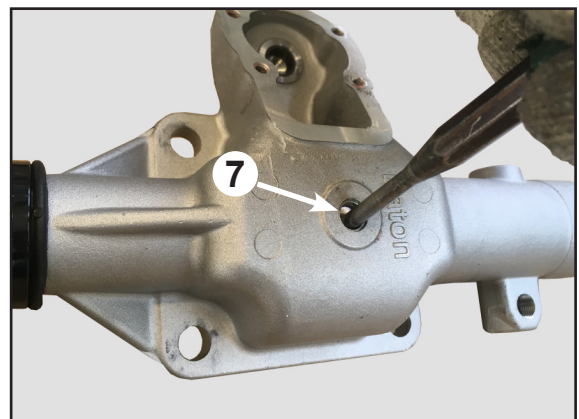
6205178

6. Remove the 1st and 2nd speed spring.



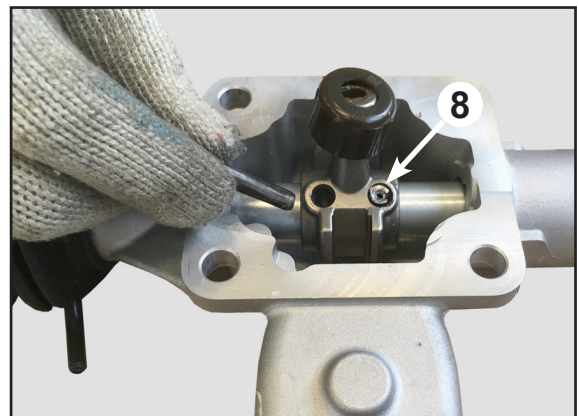
6205179

7. Remove the cup expansion plug.



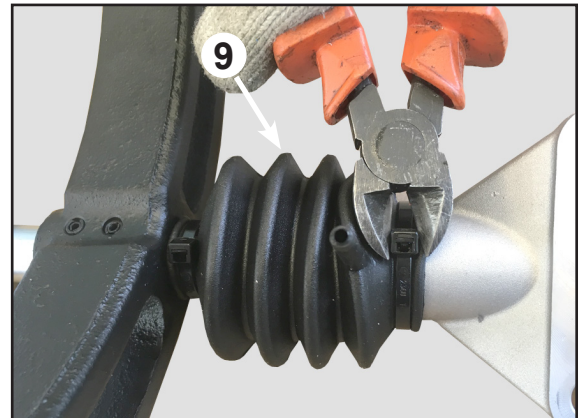
6205180

8. Remove the roll pins.



6205181

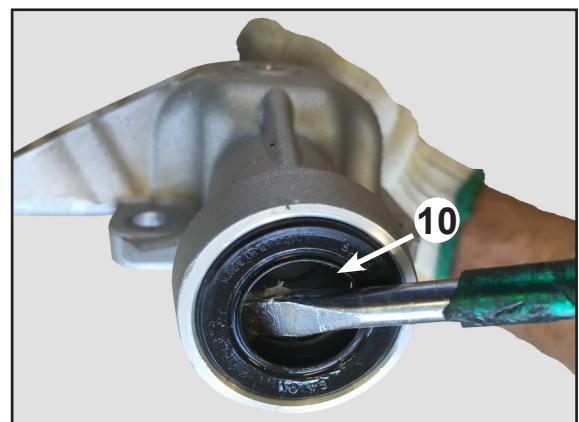
9. Remove the dust boot.



6205182

10. Remove the oil seal.

NOTE: If there is a need to change the oil seal, remove it using a screwdriver.



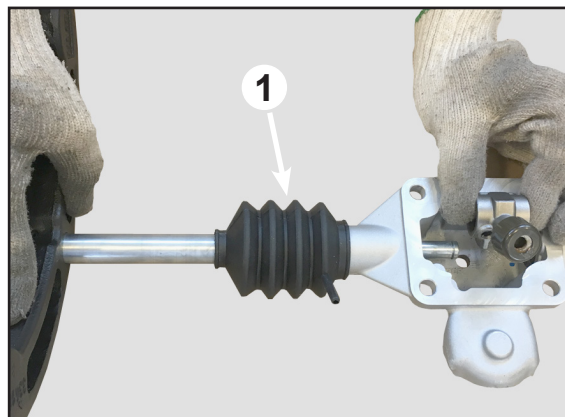
6205183

Assembly

1. Install the oil seal.

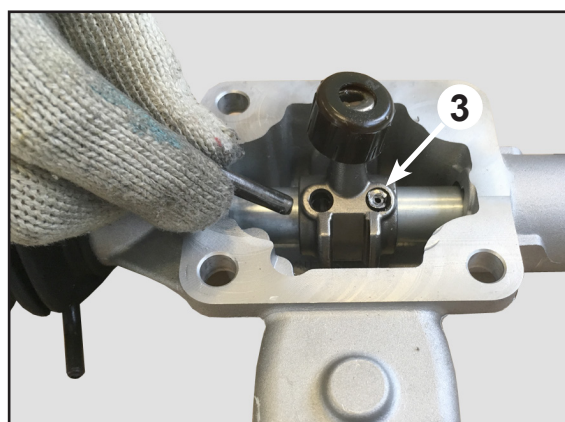
NOTE: Use special tool #E001073.

2. Install the dust boot, shaft and lever.



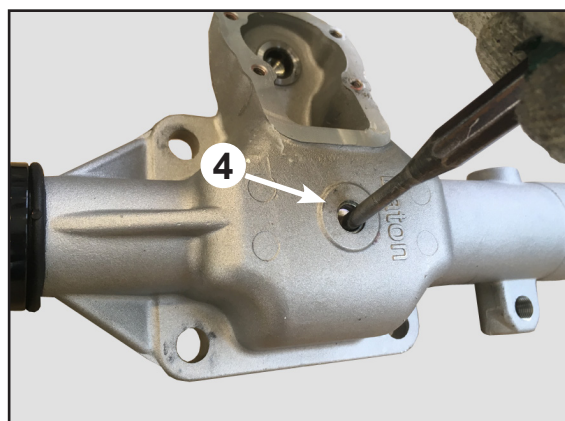
6205185

3. Install the roll pins.



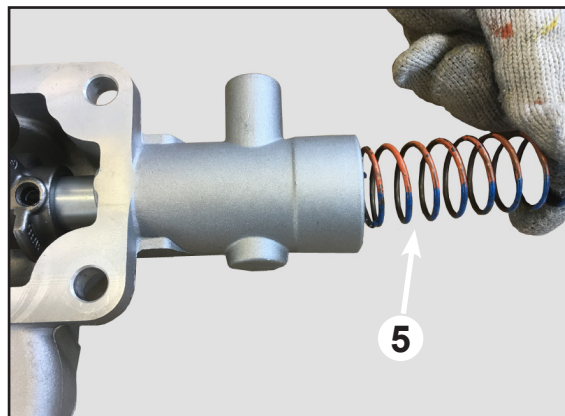
6205181

4. Install the cup expansion plug.



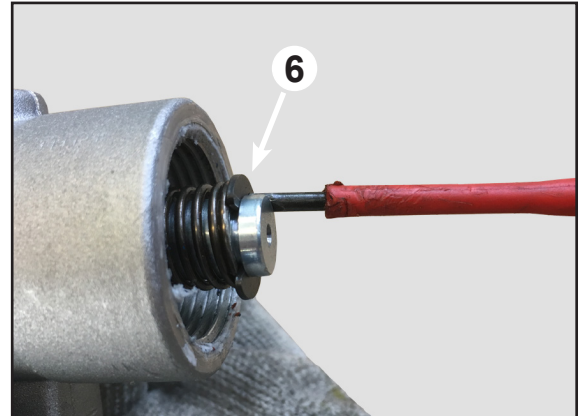
6205180

5. Install the 1st and 2nd speed spring.



6205179

6. Install the spring and snap ring.

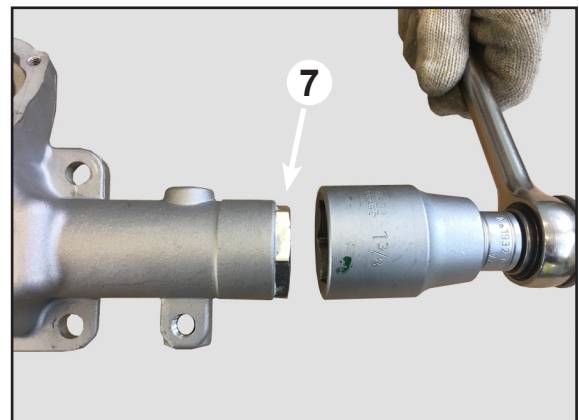


6205178

7. Install the spring retaining plug.

NOTE: Apply Loctite 518 to the plug.

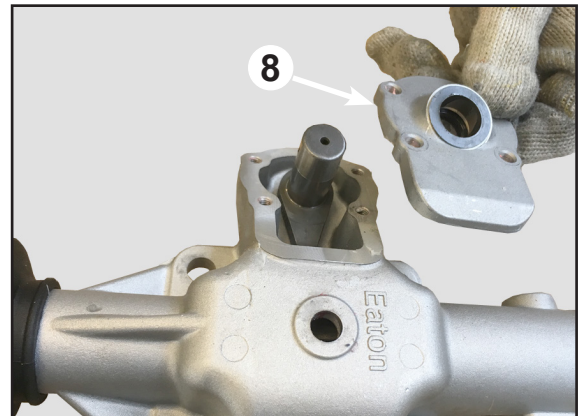
Torque: 20-27 N.m /15-20 lb.ft



6205177

8. Install the internal selection lever and the gear shift control housing cover.

NOTE: Apply Dow Corning 780 to the mounting face.

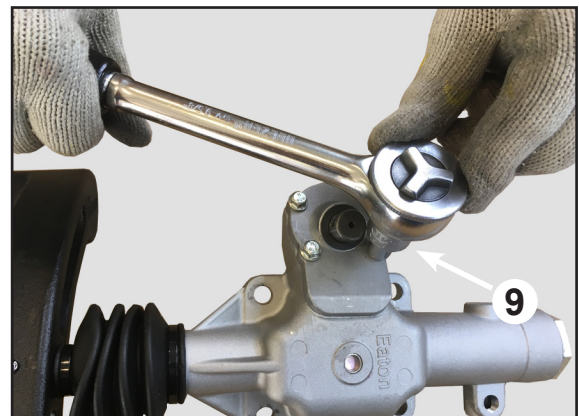


6205186

9. Install the four capscrews.

NOTE: Apply Loctite 612 to the threads of capscrews.

Torque: 4-7 N.m/ 2.9-5 lb.ft

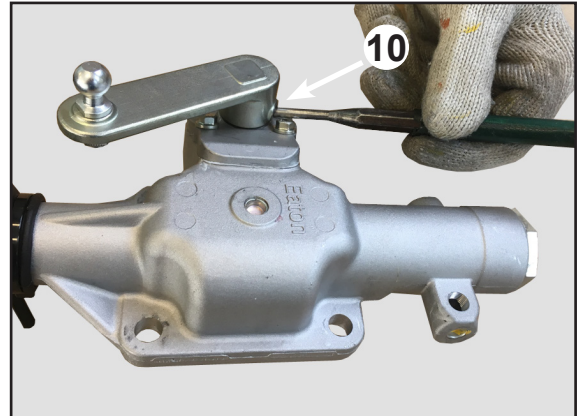


6205175

Remote Gear Shift Control



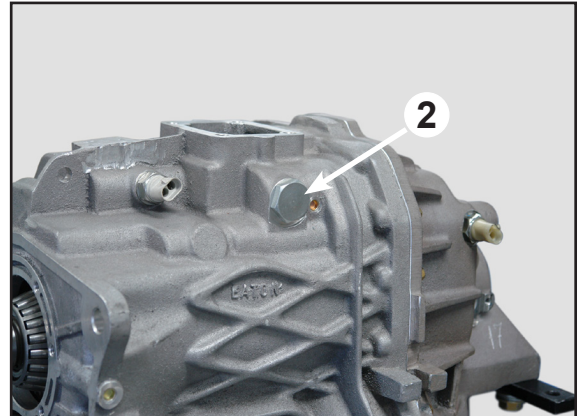
10. Assemble the external selection lever and secure the clamps.



6205174

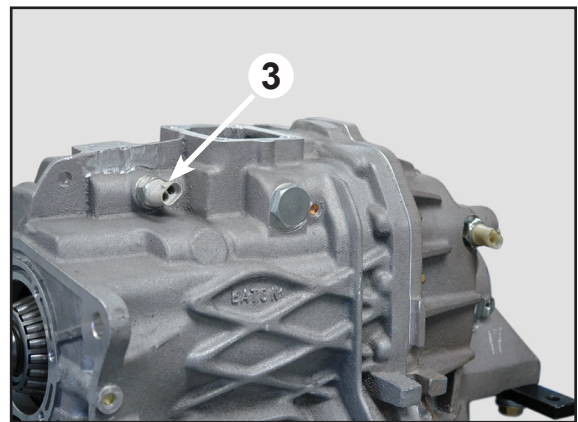
Disassembling the Front Section

1. Remove the yoke. Refer to "Rear Section".
- 24mm Socket
2. Remove the actuator plug.
- 30mm Socket



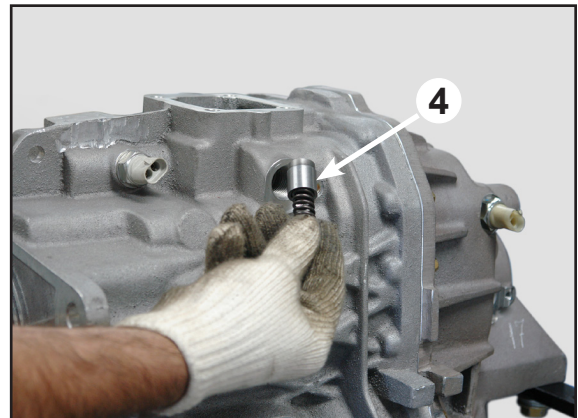
6205013

3. Remove the switch.
- 21mm Socket



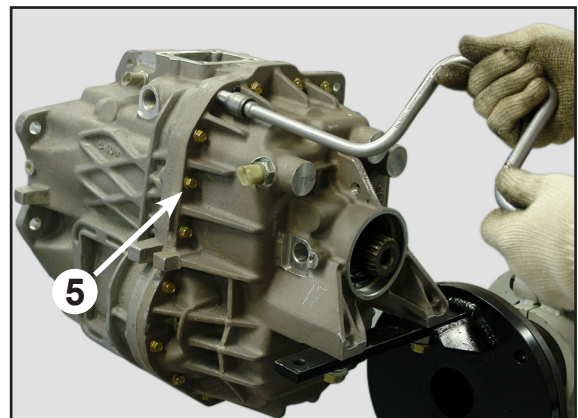
6205013

4. Remove the spring and the actuator.



6205014

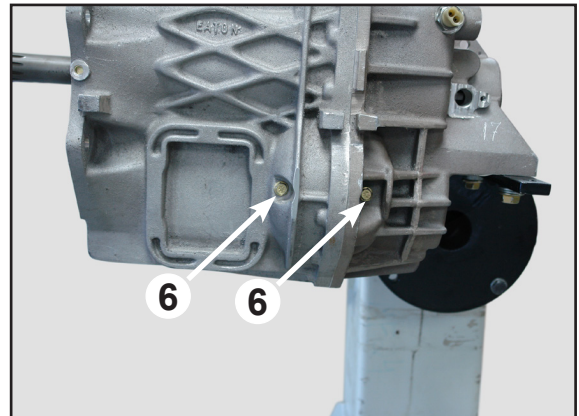
5. Remove the nineteen retaining capscrews that secure the rear housing to the front housing.
- 11mm Socket



6205015

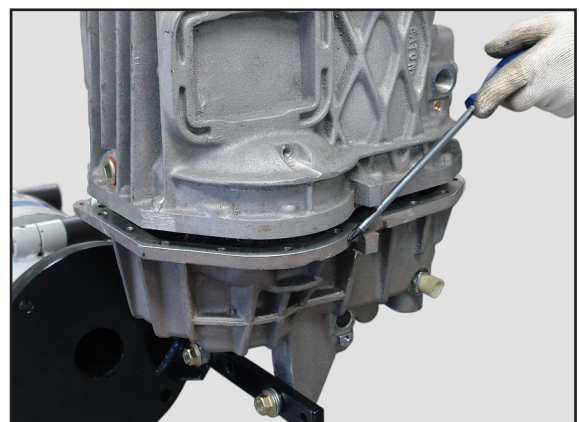
Disassembling the Front Section

6. Remove the two retaining capscrews that secure the reverse idler gear shaft.



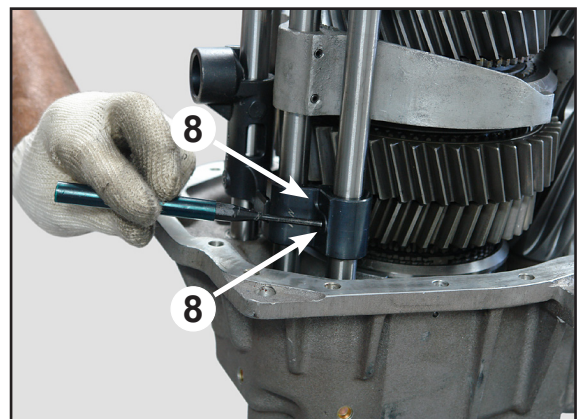
6205016

7. Remove the front housing.



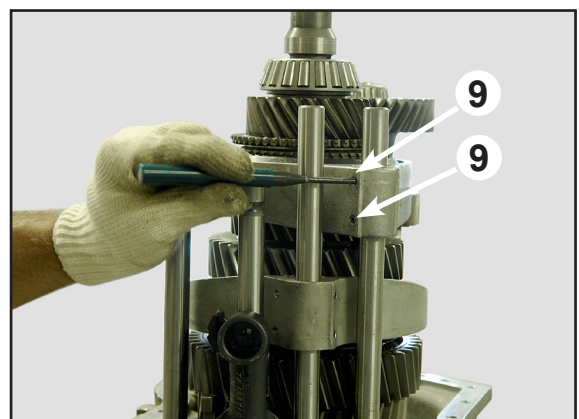
6205017

8. Remove the roll pins from the 3rd/4th speed shift block.



6205018

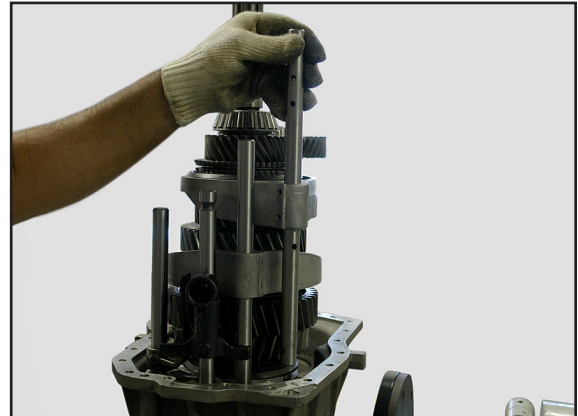
9. Remove the roll pins from the 3rd/4th speed shift yoke.



6205019

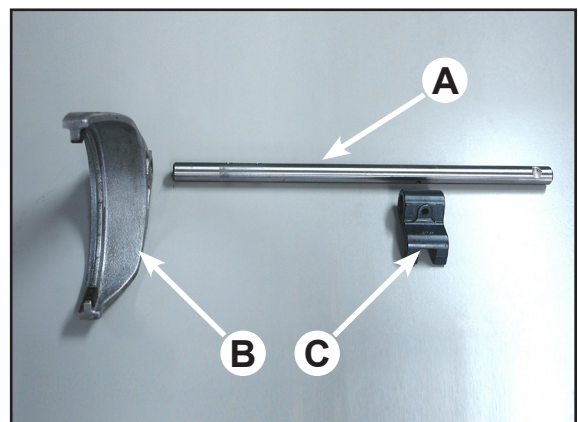
Disassembling the Front Section

10. Remove the 3rd/4th speed shift bar, yoke and block.



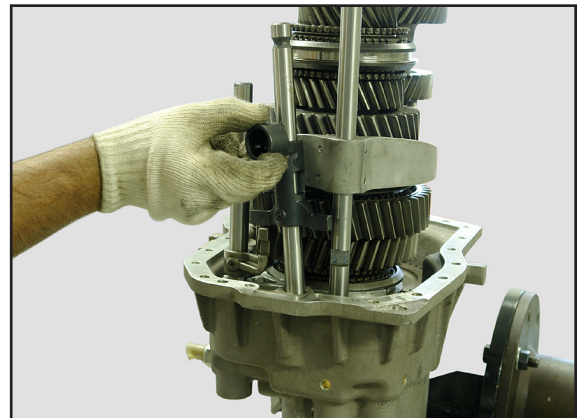
620520

- A - Shift bar
- B - Shift yoke
- C - Shift block



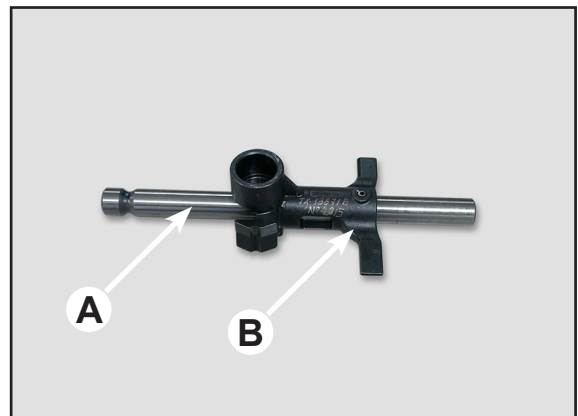
620521

11. Remove the gear selector bar.



620522

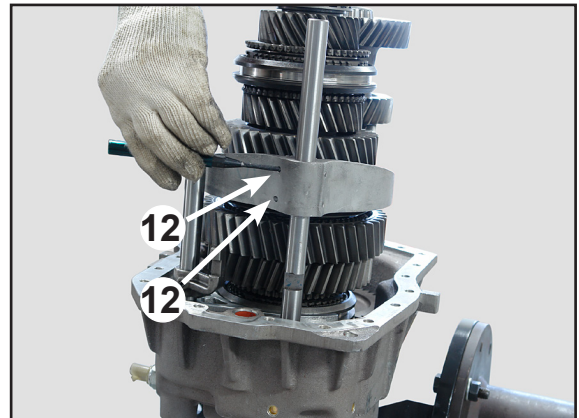
- A - Gear selector bar
- B - Selector block



620523

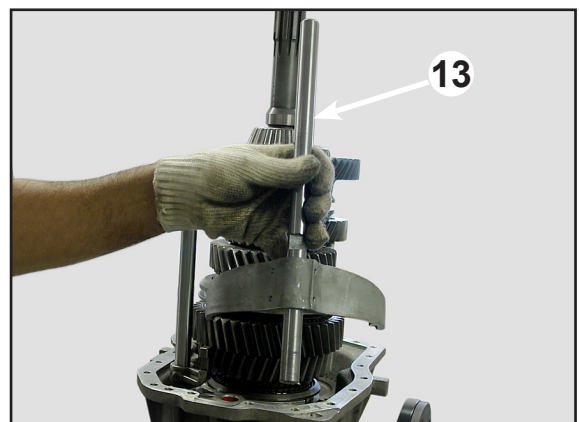
Disassembling the Front Section

12. Remove the two roll pins from the 1st/2nd speed shift yoke.



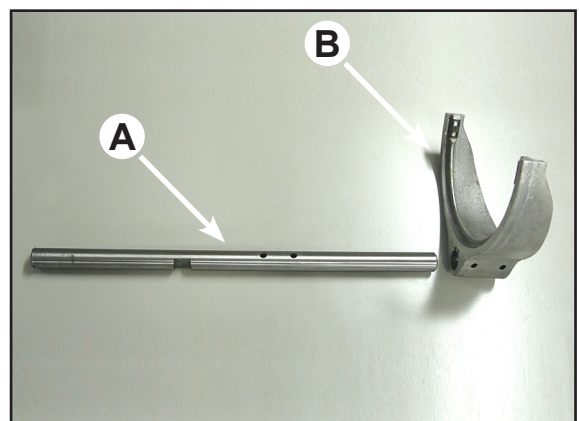
620524

13. Remove the 1st/2nd speed shift bar and yoke.



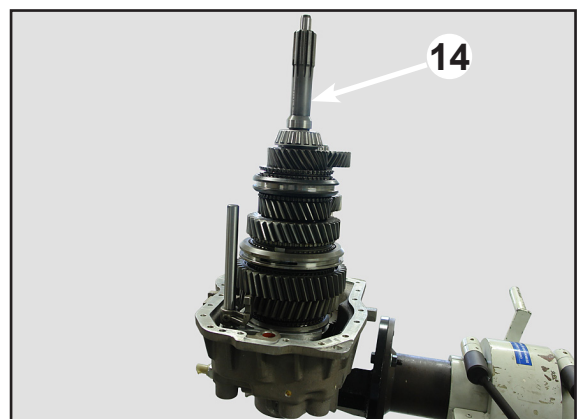
620525

- A - 1st/2nd Speed shift bar
B - 1st/2nd Speed shift yoke



620526

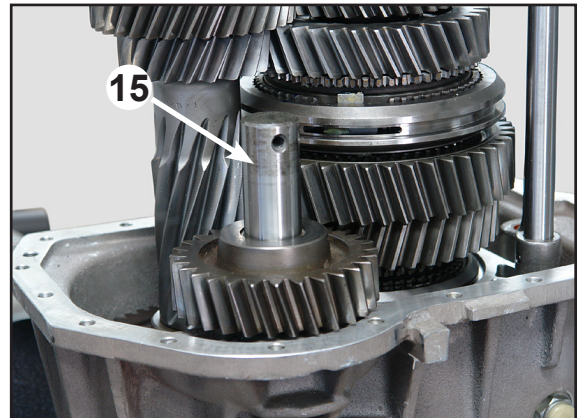
14. Remove the input shaft.



620527

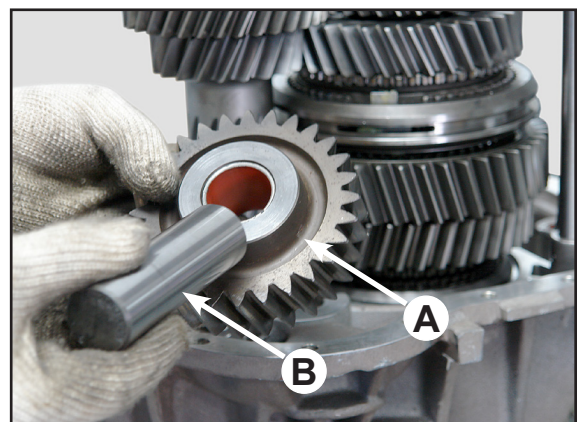
Disassembling the Front Section

15. Remove the reverse idler shaft and gear.



620528

- A - Reverse idler gear
B - Reverse idler gear shaft



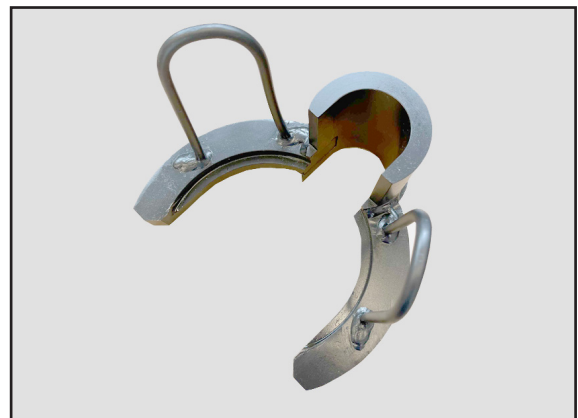
620529

16. Remove the countershaft and main shaft assembly together with the 5th/reverse speed shift yoke and bar.

NOTE: Use the special tool EEA-23510.



620530



620531

Assembling the Front Section

1. Service the rear section.

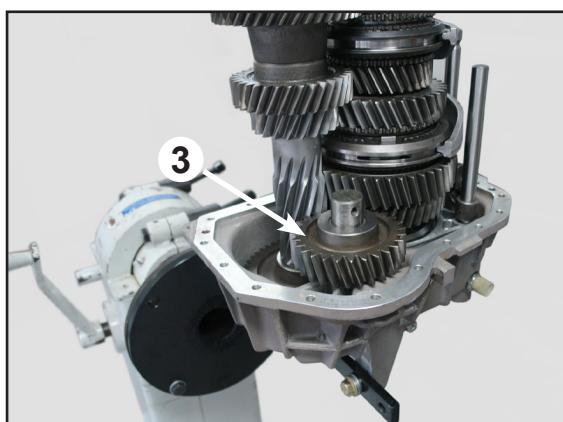
NOTE: Refer to "Rear Section".

2. Install the countershaft and main shaft assembly together with the 5th/reverse speed shift yoke and bar.



620530

3. Install the reverse idler shaft and gear.

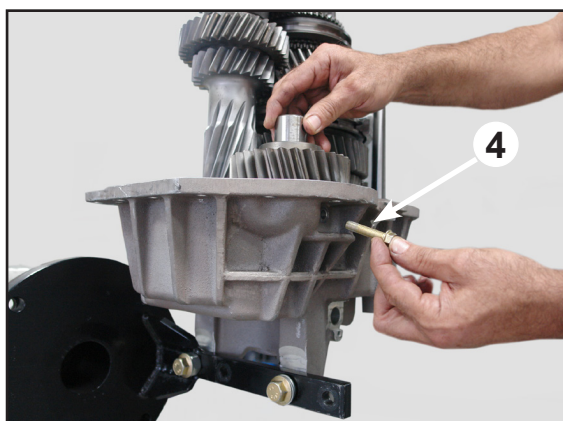


6205030

4. Install the capscrew that secures the reverse idler gear shaft.

NOTE: Apply Loctite 262 to the screw thread.

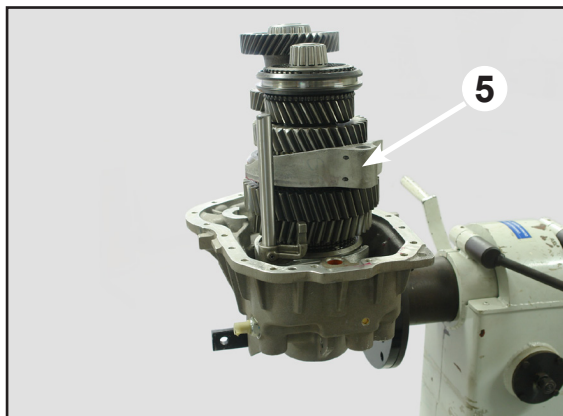
Torque: 14-19 lb.ft / 19-26 N.m



6205031

5. Fit the 1st/2nd speed shift yoke into the groove of the 1st/2nd speed synchronizer.

NOTE: Observe the correct mounting side of the yoke.

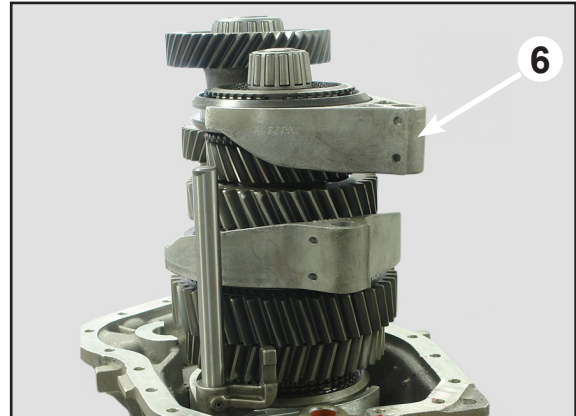


6205032

Assembling the Front Section

6. Fit the 3rd/4th speed shift yoke into the groove of the 3rd/4th speed synchronizer assembly.

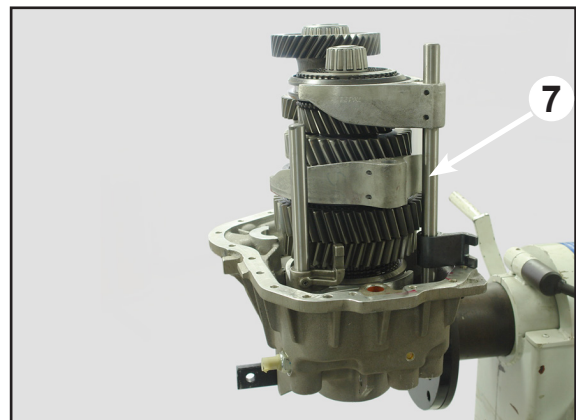
NOTE: Pay attention to the correct shift yoke mounting side.



6205033

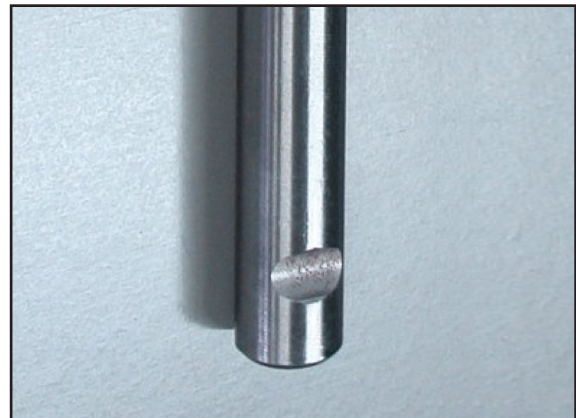
7. Install the 3rd/4th speed shift bar together with the 3rd/4th speed shift block.

NOTE: Pay attention to the correct 3rd/4th speed shift block mounting side.



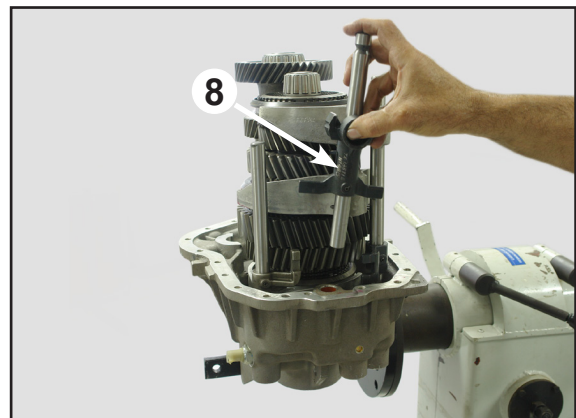
6205034

NOTE: Pay attention to the correct shift bar mounting side. The bar end with the notch for the ball must be facing down.



6205035

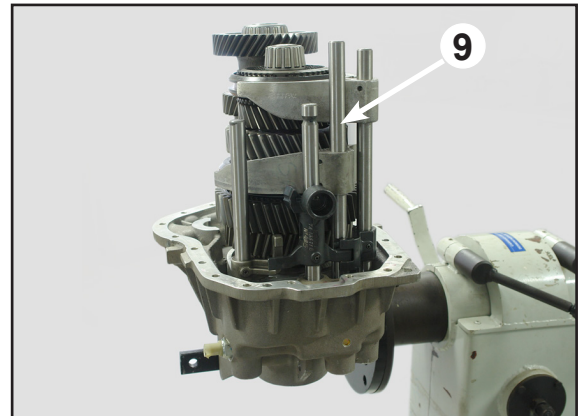
8. Install the gear selector bar and block.



6205036

Assembling the Front Section

9. Install the 1st/2nd speed shift bar.



6205037

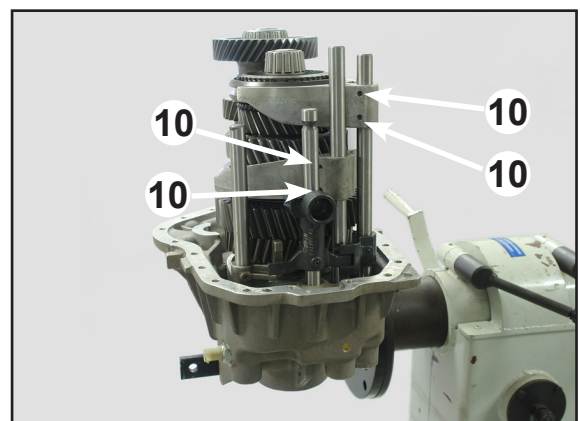
NOTE: Pay attention to the correct shift bar mounting side. The end with the notch for the locating ball must be facing down.



6205038

10. Install the roll pins on the 3rd/4th and 1st/2nd speed yokes.

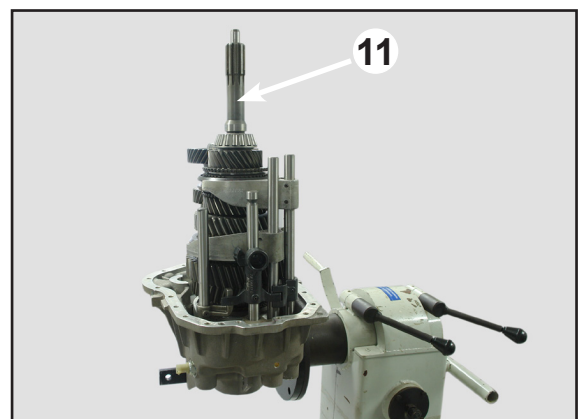
NOTE: There are two roll pins in each bar. New roll pins must be installed.



6205039

11. Install the input shaft.

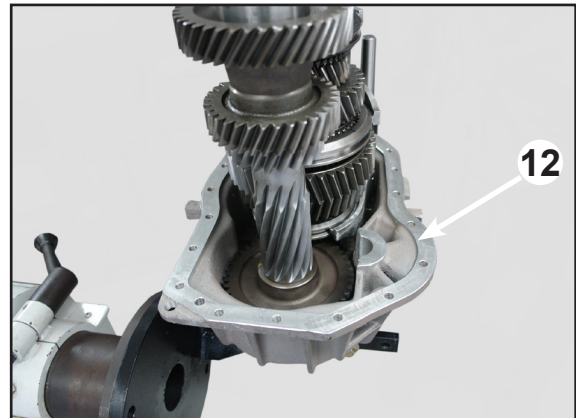
NOTE: Apply transmission lubricant on the bearing.



6205040

12. Clean the rear and front housings mounting surfaces of any old sealant material and apply new sealant to the mounting surfaces.

NOTE: Apply Dow Corning 780 sealant to the mounting surfaces.

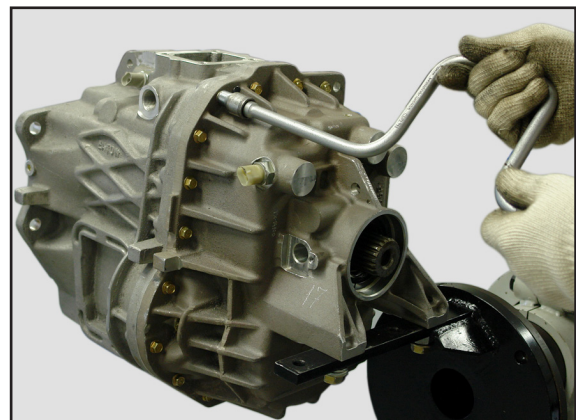


6205041

13. Install the retaining capscrews on the housing.

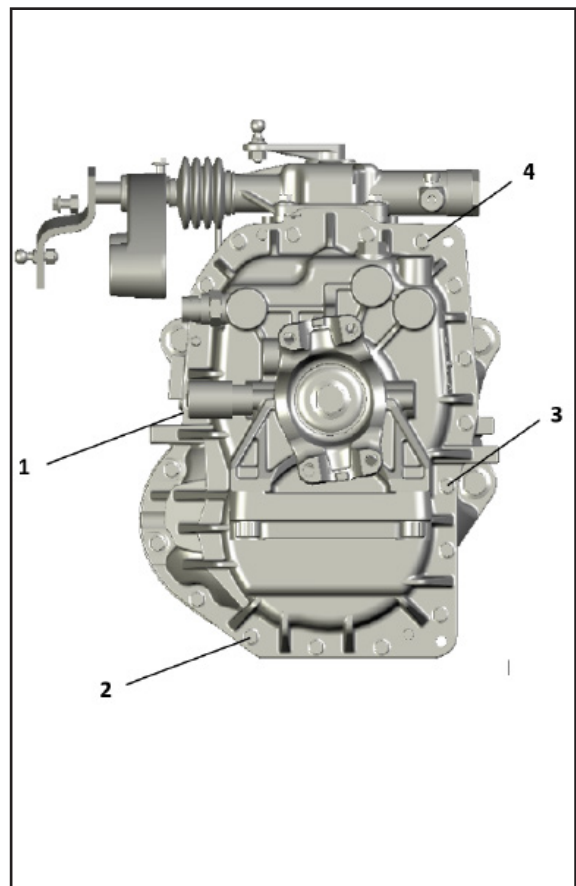
NOTE: Apply Loctite 262 sealant to the threads of retaining capscrews.

Torque: 14-19 lb.ft / 19-26 N.m



6205042

NOTE: Tighten the capscrews in the order shown in the figure. The remaining capscrews may be tighten in any order.



6205

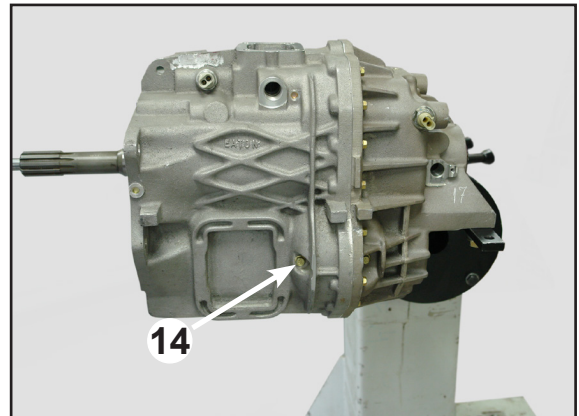
Assembling the Front Section



14. Install the retaining capscrew of the reverse idler gear shaft.

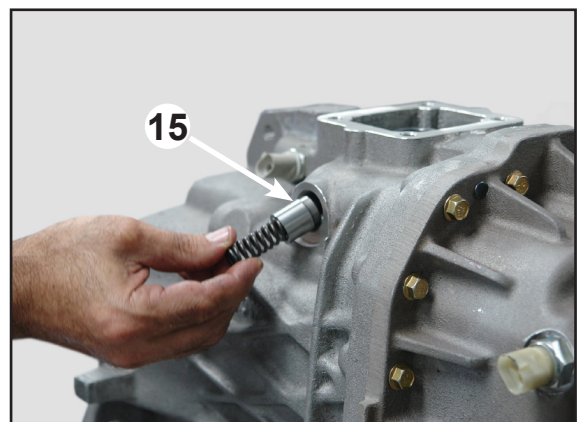
NOTE: Apply Loctite 262 sealant to the threads of retaining capscrew.

Torque: 14-19 lb.ft / 19-26 N.m



6205043

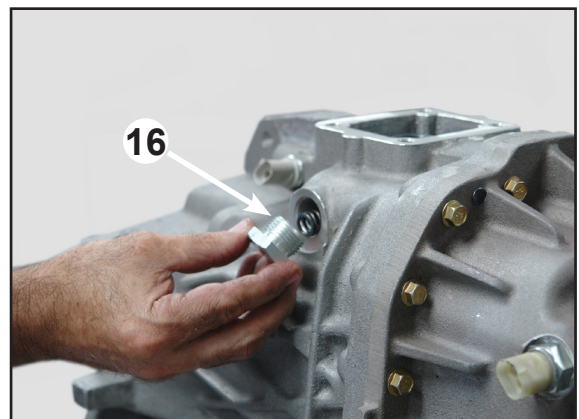
15. Install the plunger and the spring.



6205044

16. Install the spring retaining plug.

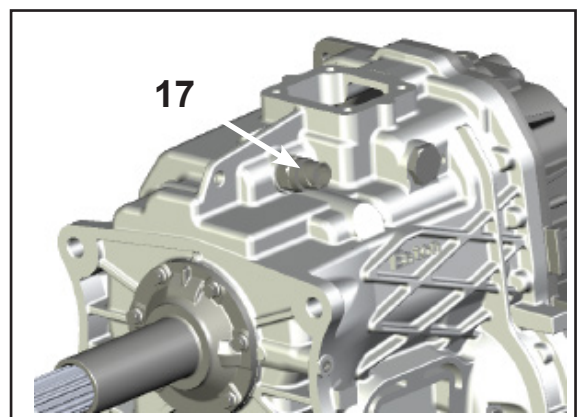
NOTE: Apply Loctite 518 sealant to the plug.



6205045

17. Install the switch.

NOTE: Apply Dow Corning 780 sealant to the switch.

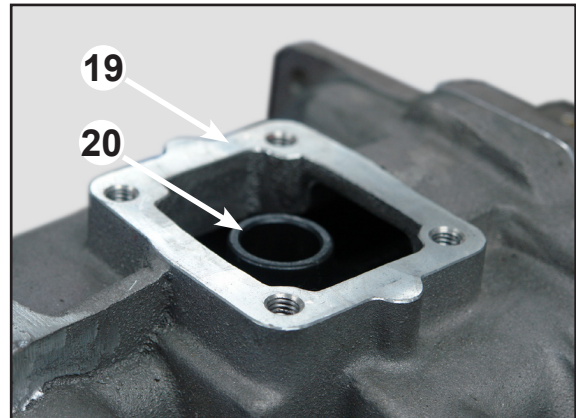


6205046

18. Install the yoke.

NOTE: Refer to "Rear Section".

19. Apply Dow Corning 780 sealant to gear shift lever housing mounting surface.
20. Apply MS-9C grease to the gear shift lever housing bushing.

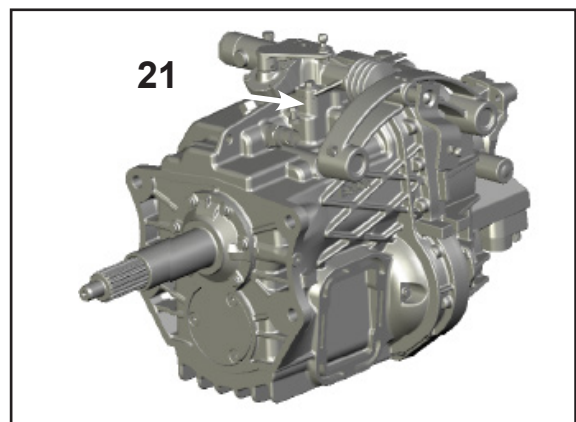


6205047

21. Install the remote gear shift control assembly.

NOTE: Apply Loctite 262 sealant to the threads of retaining capscrews.

Torque: 14-18 lb.ft / 19-25 N.m



6205

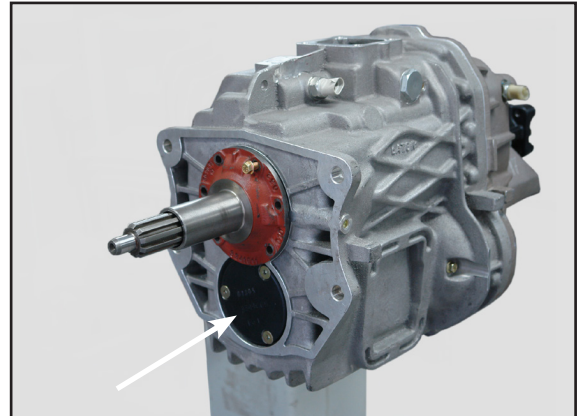
Assembling the Front Section



End Play Adjustment

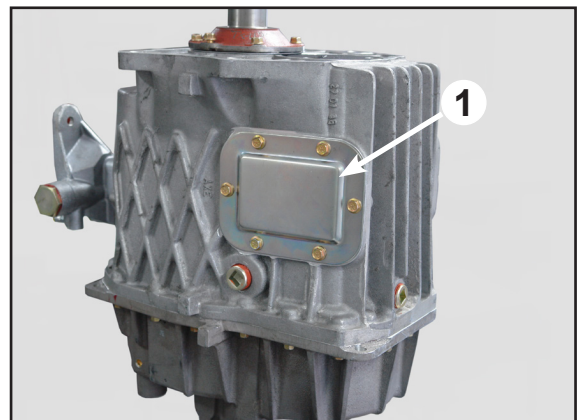
Measuring the Countershaft End Play

The adjusting shims are installed between the front housing and the front bearing retaining cover.



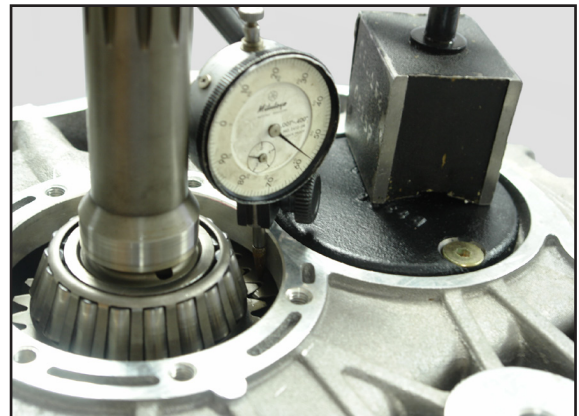
6205048

1. Remove the PTO cover.



6205049

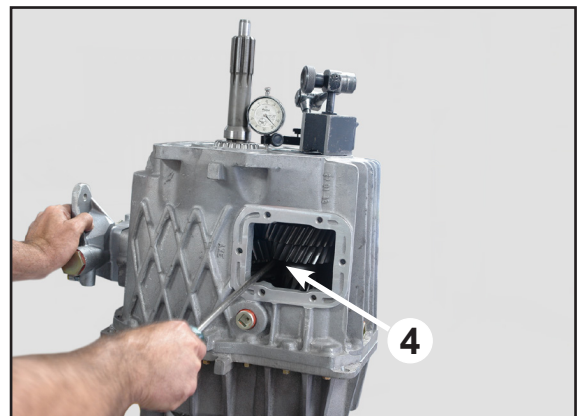
2. Place the magnetic base of the dial indicator on the front bearing retaining cover.
3. Position the tip of the dial indicator on the countershaft gear tooth and set the dial indicator to zero.



6205050

4. Using a pry bar, push the countershaft upwards and read the end play on the dial indicator.

NOTE: A special tool needs to be made.

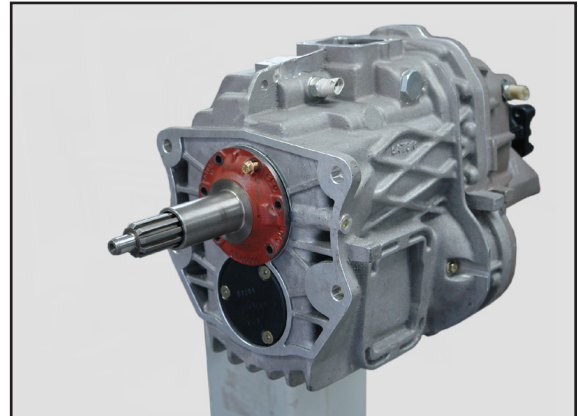


6205051

End Play Adjustment

Measuring the Main Shaft End Play

The adjusting shims are installed between the front housing and the input shaft bearing cover.



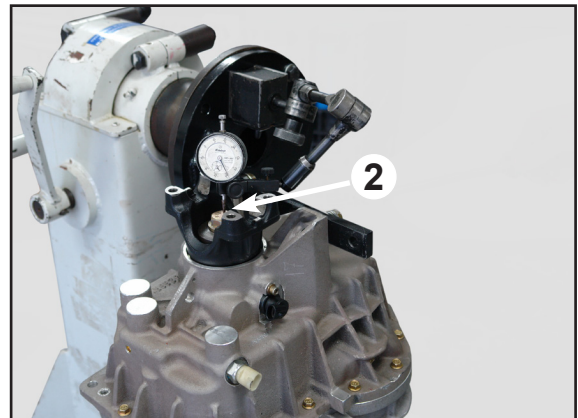
6205048

1. Place the magnetic base of the dial indicator on the transmission support.



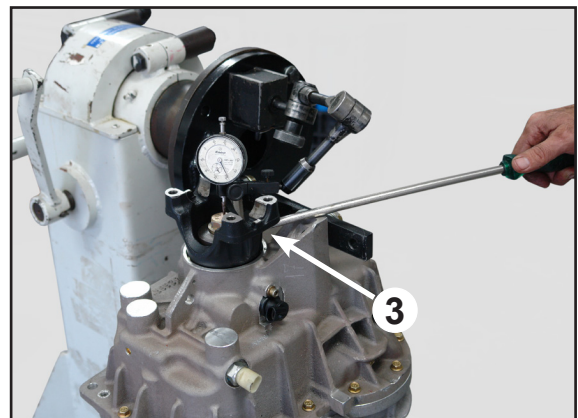
6205052

2. Position the tip of the dial indicator on the yoke retaining cap screw and set the dial indicator to zero.



6205053

3. Using a pry bar, push the yoke upwards and read the end play on the dial indicator.



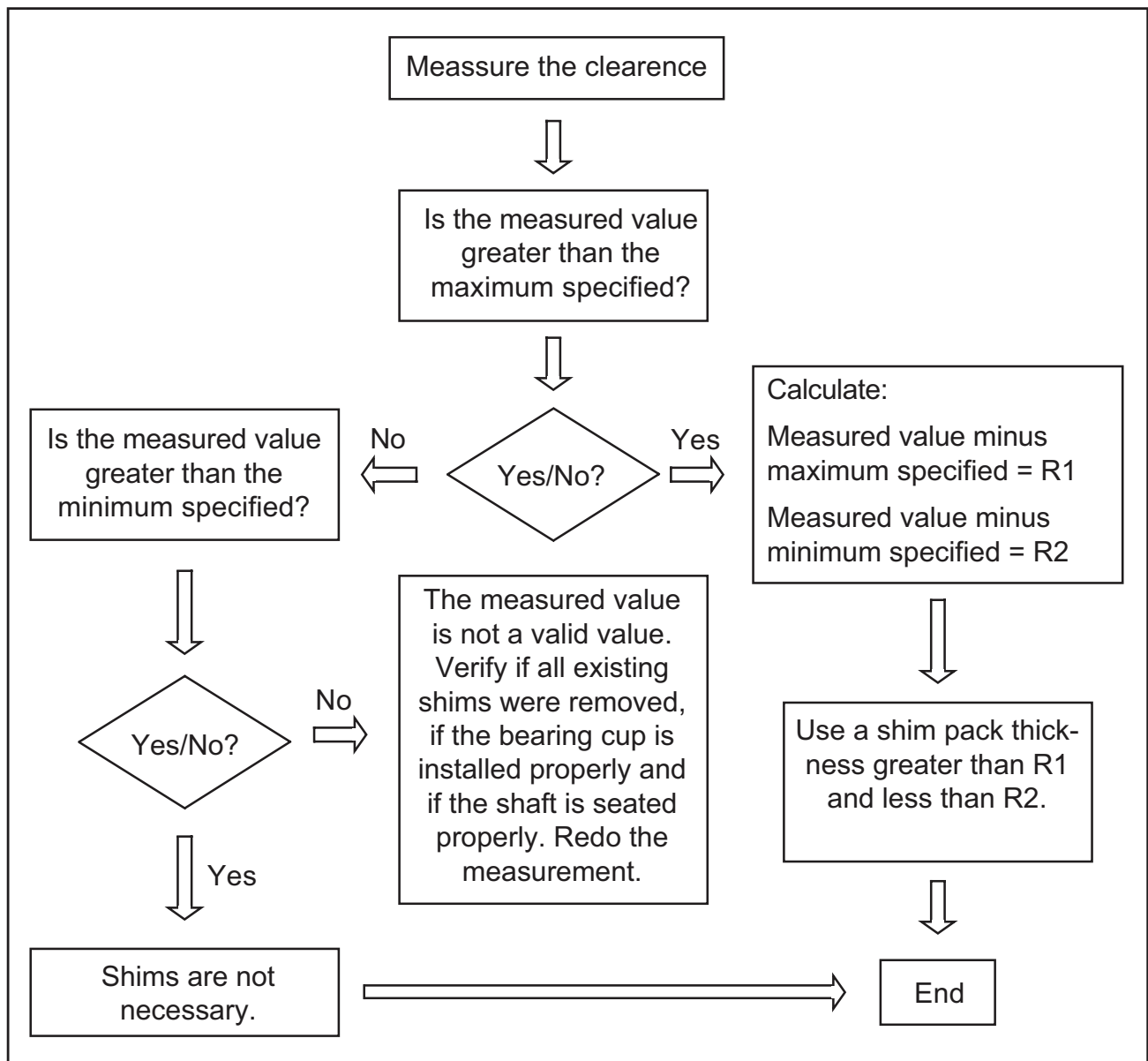
6205053

End Play Adjustment

Determination of End Play Adjusting Shims

	Specified end play (mm)	
	Minimum	Maximum
Countershaft	0.025	0.100
Main shaft	0.025	0.100

Use the following flowchart to determine the shims pack thickness to adjust the transmission end play:



End Play Adjustment

Example #1: countershaft end play adjustment

Specified end play: 0.025 mm to 0.100 mm

Measured end play: 0.150 mm

As the measured value is greater than 0.100 mm (maximum specified). calculate:

$$0.150 - 0.100 = 0.050 \text{ mm (R1)}$$

$$0.150 - 0.025 = 0.125 \text{ mm (R2)}$$

The shim pack thickness must be within 0.050 mm and 0.125 mm.

Example #2: mainshaft end play adjustment

Specified end play: 0.025 mm to 0.100 mm

Measured end play: 0.200 mm

As the measured value is greater than 0.100 mm (maximum specified). calculate:

$$0.200 - 0.100 = 0.100 \text{ mm (R1)}$$

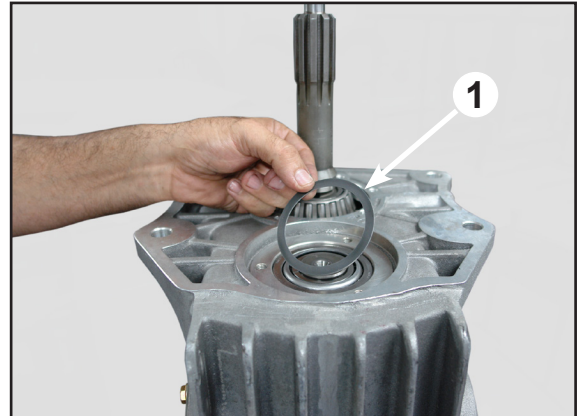
$$0.200 - 0.025 = 0.175 \text{ mm (R2)}$$

The shim pack thickness must be within 0.100 mm and 0.175 mm.

Assembling the Front Section

Countershaft

1. Install the shim pack with the calculated thickness.



6205054

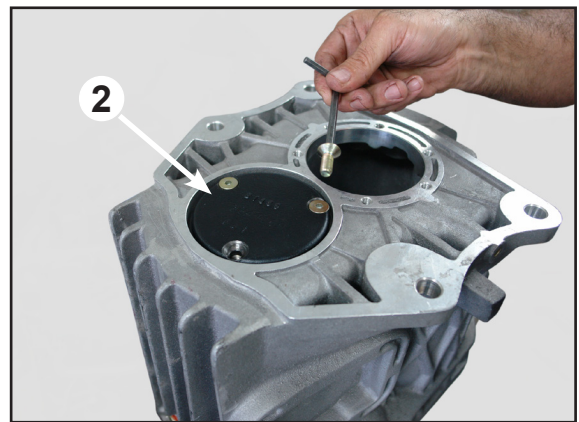
2. Install the countershaft front bearing retaining cover.

NOTE: Apply Dowsil 7091 sealant to the front cover.

NOTE: Apply Loctite 262 sealant to the threads of retaining capscrews.

Torque: 7-12 lb.ft / 10-16 N.m (sheet metal stamped cover)

Torque: 18-23 lb.ft / 25-31 N.m (cast iron cover)



6205055

Main Shaft

1. Install the shim pack with the calculated thickness. Shims should be installed in the position showed in the figure.

NOTE: Check if the seal should be repaired. Refer to "Input Shaft Bearing Cover".

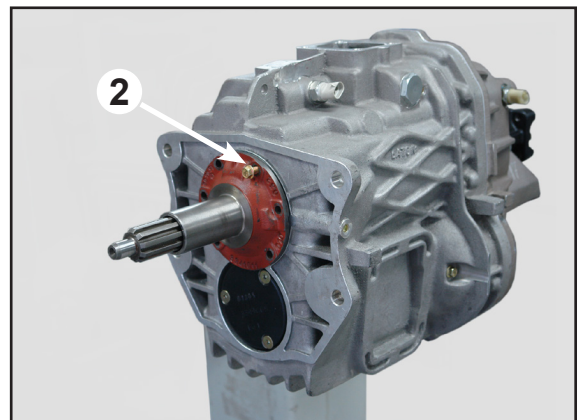


6205056

2. Install the input shaft bearing cover.

NOTE: Apply Loctite 518 sealant to the input shaft bearing cover mounting surface and to the shims. Apply Loctite 262 sealant to the threads of retaining capscrews.

Torque de 14-18 lb.ft / 19-25 N.m

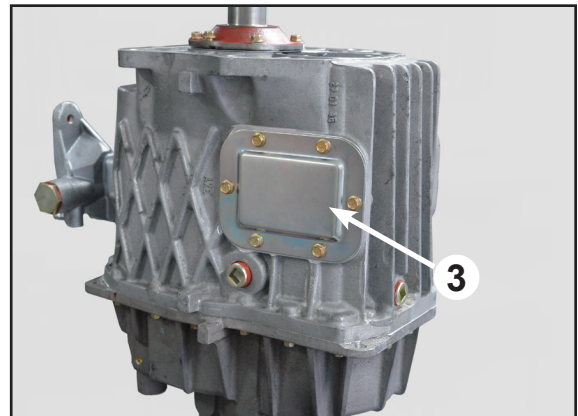


6205057

3. Install the PTO cover.

NOTE: Apply Dow Corning 780 sealant to the mounting surface and Loctite 262 sealant to the threads of retaining capscrews.

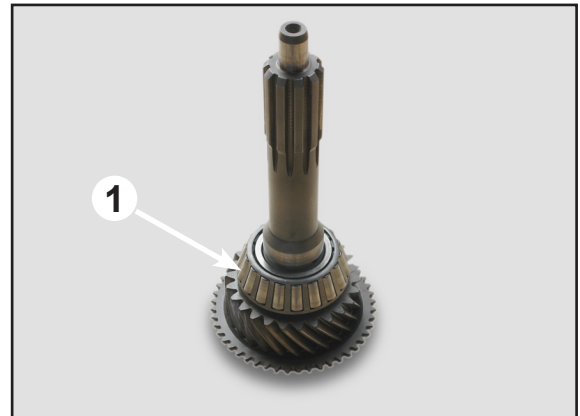
Torque de 14-18 lb.ft / 19-25 N.m



6205058

Disassembly

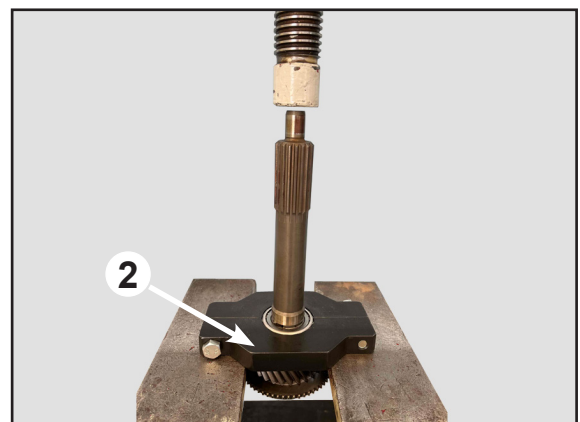
1. Locate the input shaft tapered roller bearing.



6205059

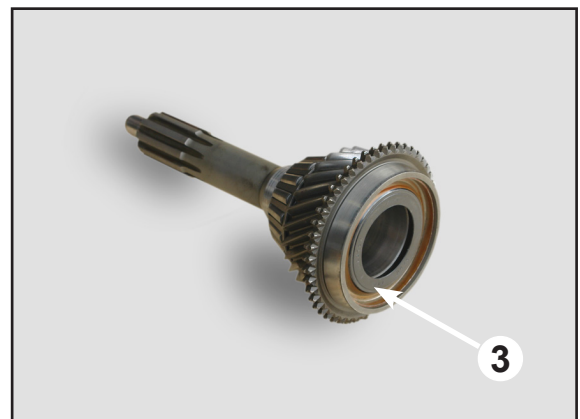
2. Remove the input shaft bearing cone.

NOTE: Use the special tool #E007014.



6205157

3. Remove the oil baffle.



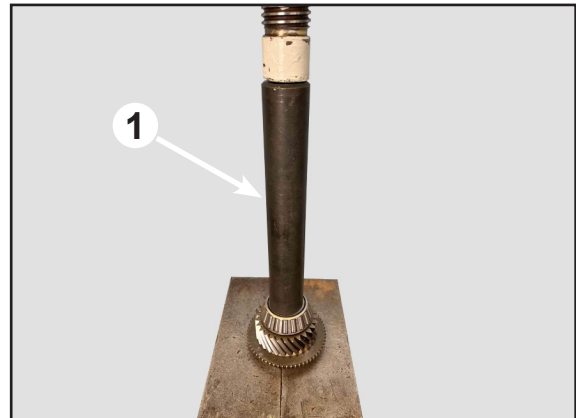
6205060

Assembly

1. Install the input shaft bearing cone.

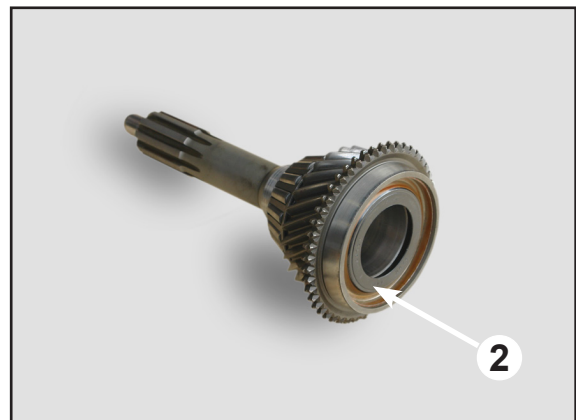
NOTE: Use the special tool #E001024.

WARNING! Use the inner race to support the special tool. Do not support it on the bearing cage.



6205158

2. Install the oil baffle.



6205060

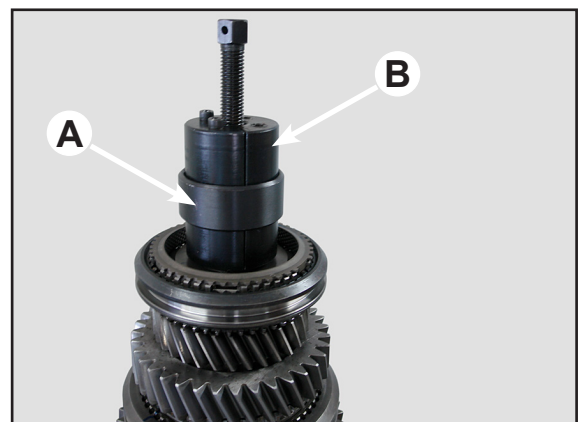
Disassembly

1. Using the special puller, remove the pocket bearing.

NOTE: Use the special tool #E005003 (A) and #E005004 (B).



6205061



6205062

2. Remove the snap ring.



6205063

3. Remove the 4th speed synchronizer ring.



6205064

4. Remove the 3rd/4th speed synchronizer assembly.



6205065

5. Remove the 3rd speed synchronizer ring.



6205066

6. Remove the 3rd speed gear.



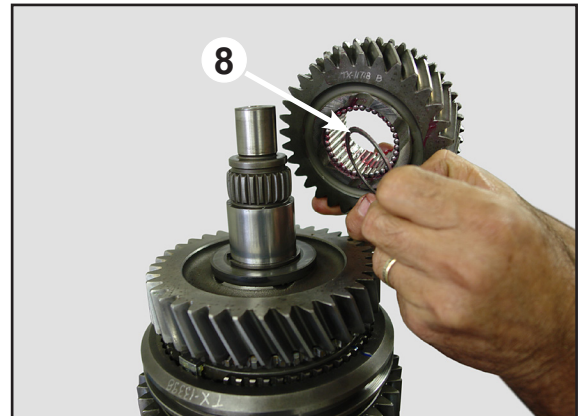
6205067

7. Remove the rollers.



6205068

8. Remove the spacer of the 3rd speed gear rollers.



6205069

9. Remove the snap ring.



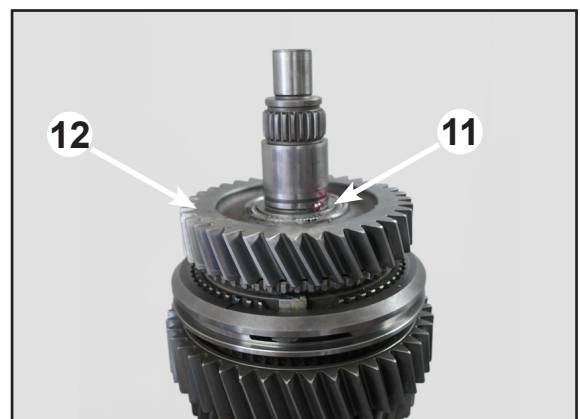
6205070

10. Remove the thrust washer.



6205071

11. Remove the ball.
12. Remove the 2nd speed gear.



6205072

13. Remove the rollers.



6205073

14. Remove the spacer of the 2nd speed gear rollers.



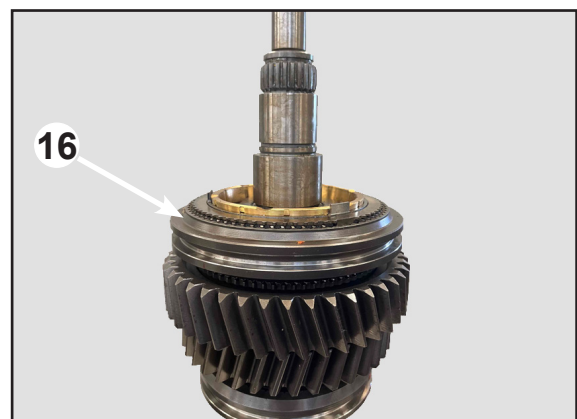
6205074

15. Remove the snap ring.



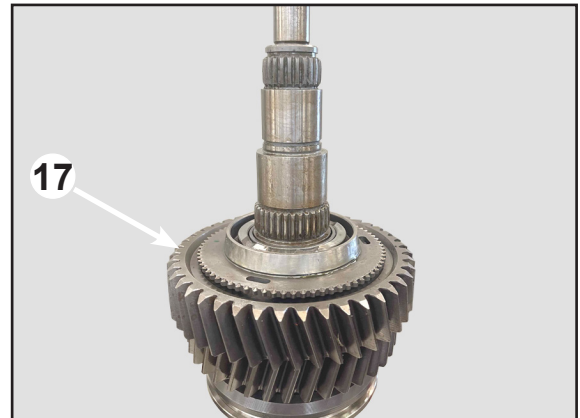
6205075

16. Remove the 1st/2nd speed synchronizer assembly (tricone).



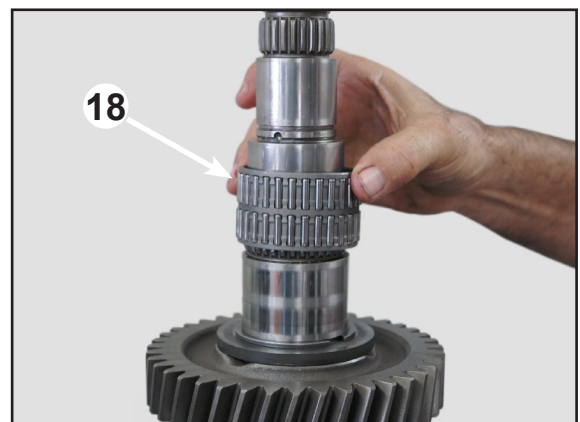
6205170

17. Remove the 1st speed gear.



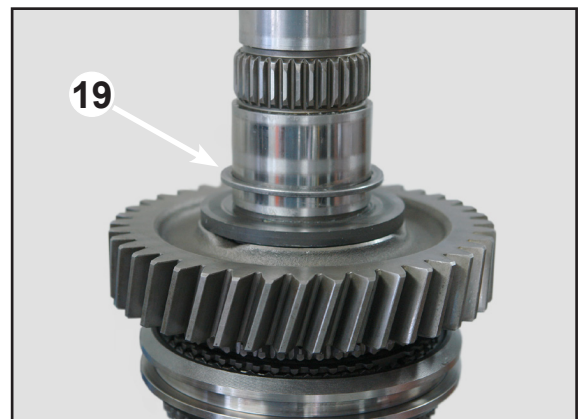
6205171

18. Remove the needle bearing.



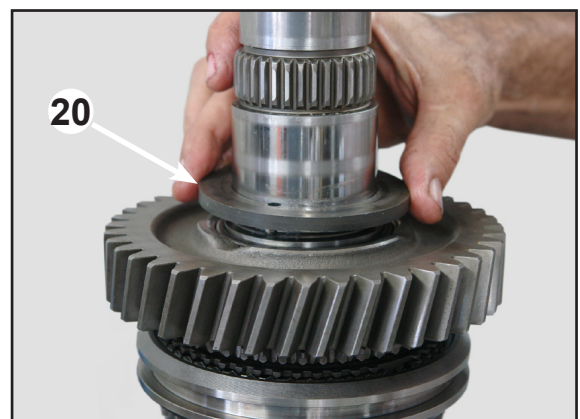
6205077

19. Remove the snap ring.



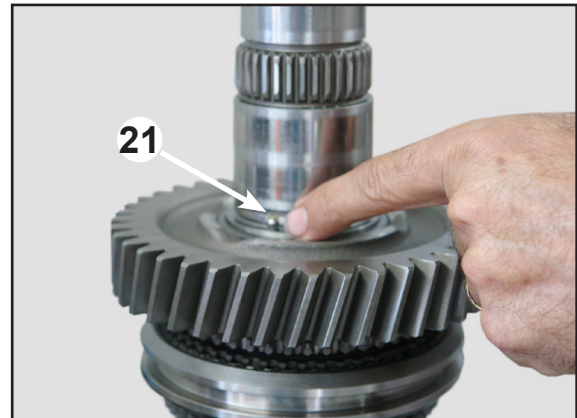
6205078

20. Remove the spacer ring.



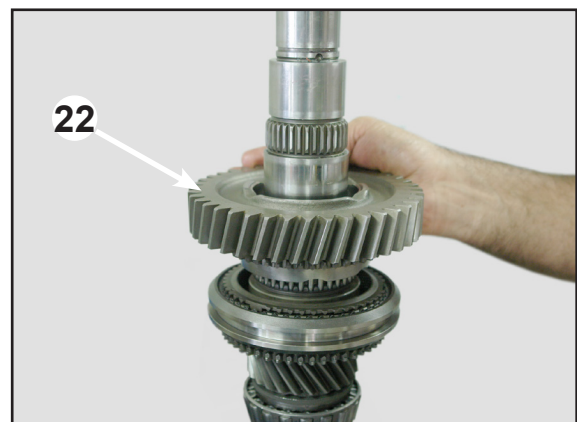
6205079

21. Remove the ball.



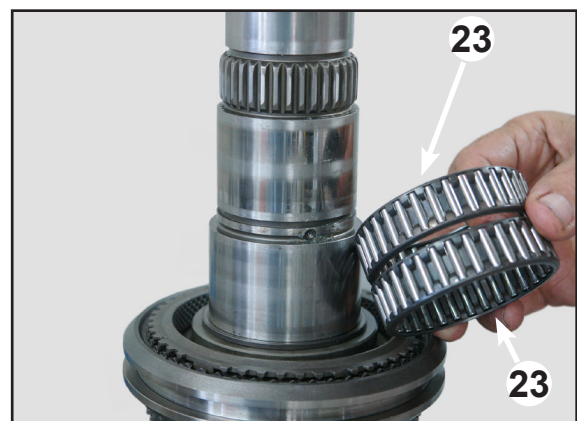
6205080

22. Remove the reverse gear.



6205081

23. Remove the two needle bearings.



6205082

24. Remove the snap ring.



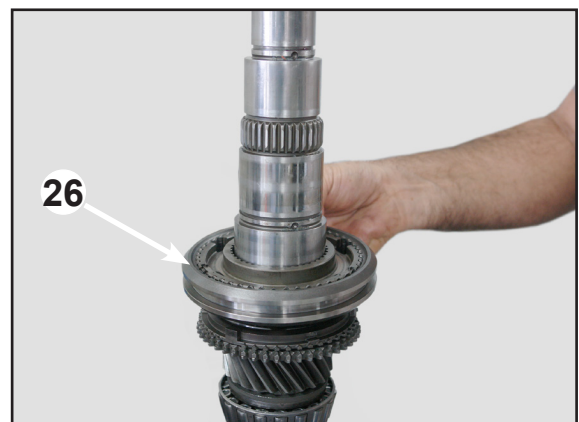
6205083

25. Remove the reverse speed synchronizer ring.



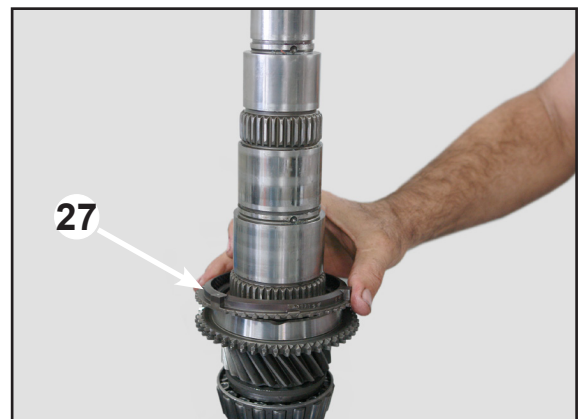
6205084

26. Remove the 5th/reverse speed synchronizer assembly.



6205085

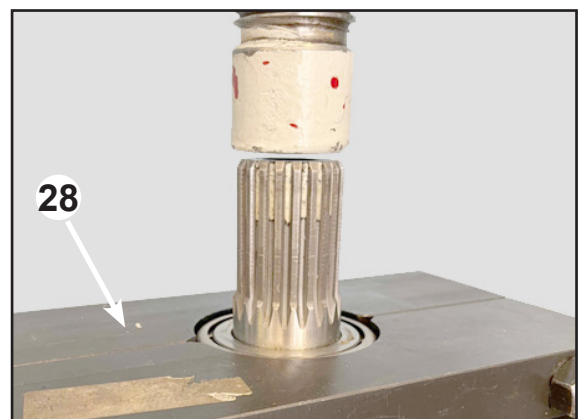
27. Remove the 5th speed synchronizer ring.



6205086

28. Remove the main shaft rear bearing together with the 5th speed gear, rollers and thrust washer.

NOTE: Use the special tool #E007015.

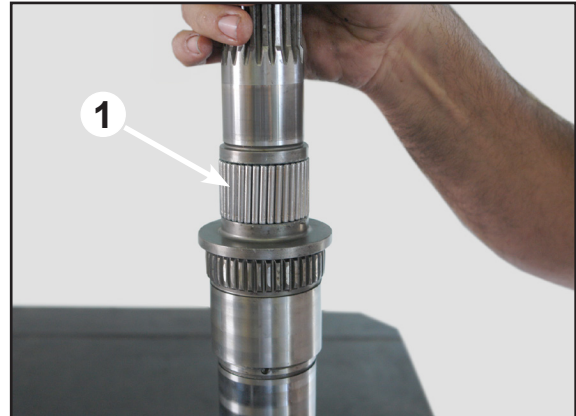


6205161

Assembly

1. Install the thirty six (36) rollers.

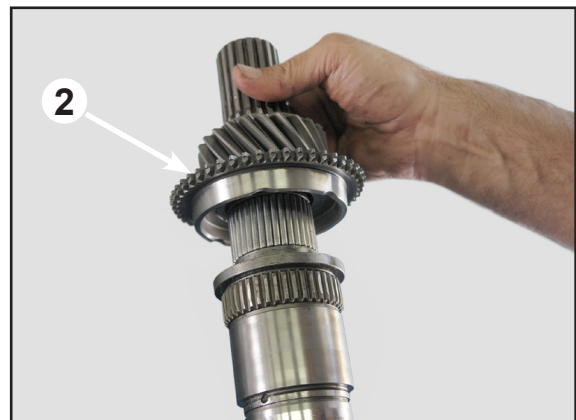
NOTE: Apply a light coat of grease to the main shaft in order to hold the rollers in their position.



6205087

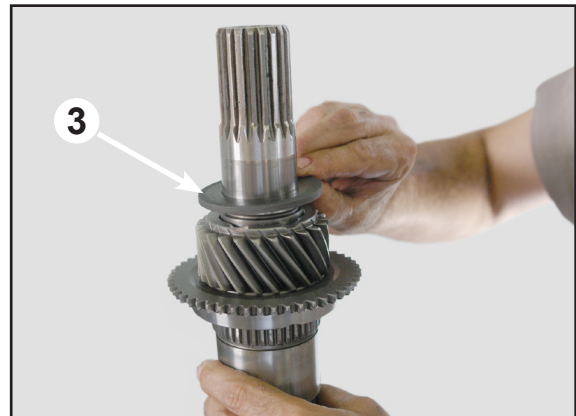
2. Install the 5th speed gear.

NOTE: Apply transmission lubricant to the gear surface, bore and cone.



6205088

3. Install the thrust washer.



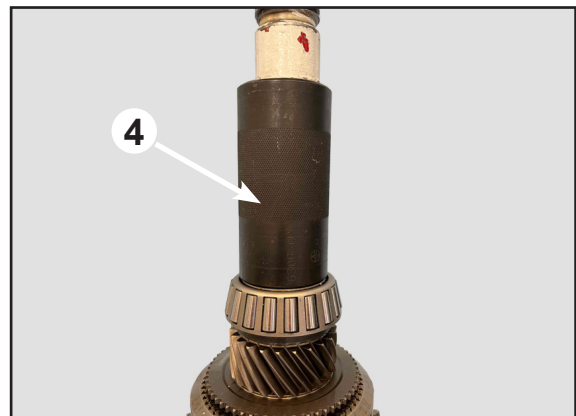
6205089

4. Install the main shaft rear bearing.

NOTE: Use the special tool #E010005 and a press.

NOTE: Apply transmission lubricant to the gear surface, bore and cone.

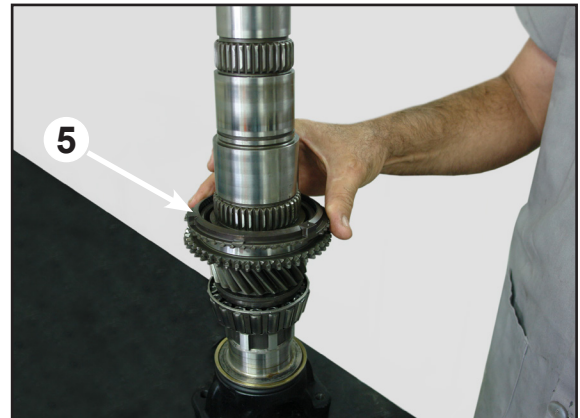
NOTE: Apply transmission lubricant to the bearing.



6205162

5. Install the 5th speed synchronizer ring.

NOTE: Apply transmission lubricant to the synchronizer ring runway.



6205091

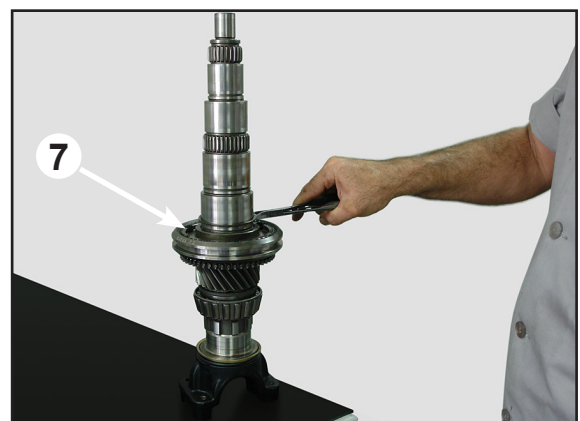
6. Install the 5th/reverse speed synchronizer assembly.



6205092

7. Install the snap ring.

NOTE: A new snap ring must be installed.



6205093

8. Install the reverse speed synchronizer ring.

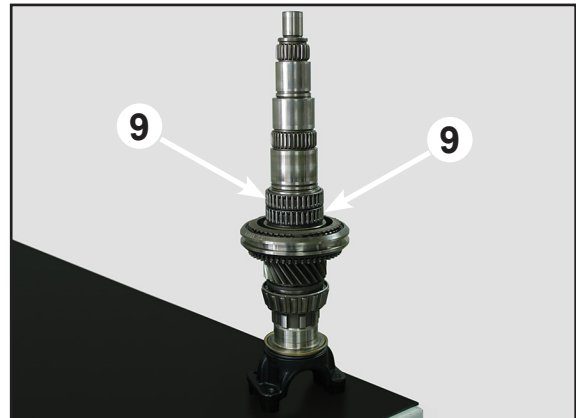
NOTE: Apply transmission lubricant to the synchronizer ring runway.



6205094

9. Install the two reverse gear needle bearings.

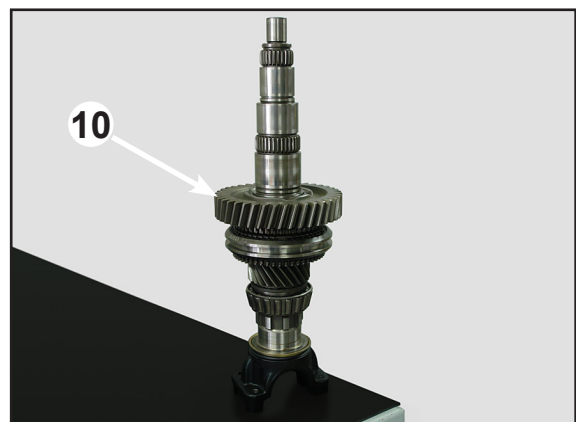
NOTE: Apply transmission lubricant to the bearing.



6205095

10. Install the reverse gear.

NOTE: Apply transmission lubricant to the gear surface, bore and cone.



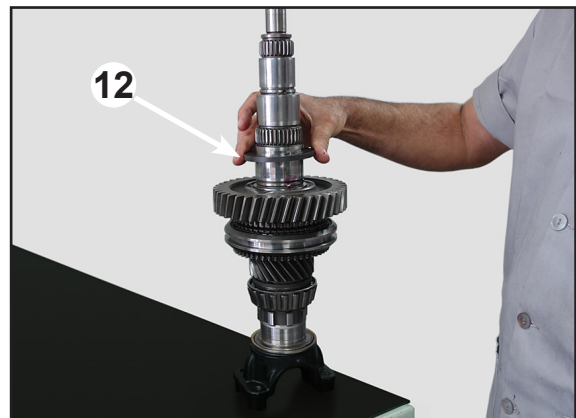
6205096

11. Install the ball.



6205097

12. Install the spacer ring.



6205098

13. Install the snap ring.

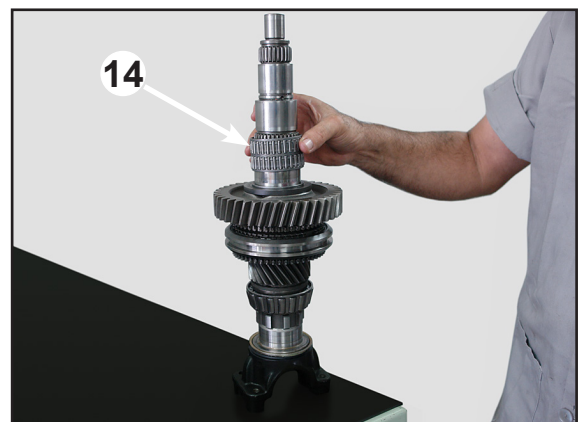
NOTE: A new snap ring must be installed.



6205099

14. Install the 1st speed gear needle bearing.

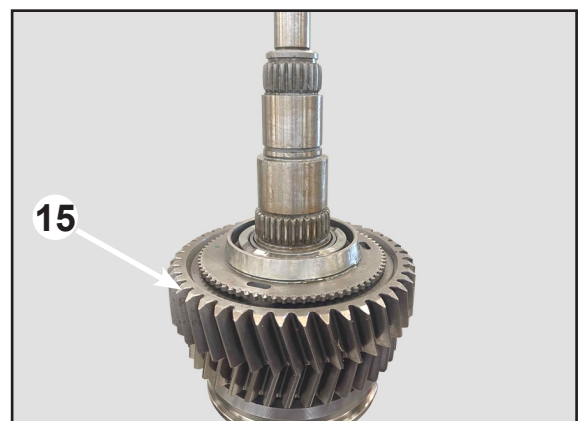
NOTE: Apply transmission lubricant to the bearing.



6205100

15. Install the 1st speed gear.

NOTE: Apply transmission lubricant to the gear surface, bore and cone.



6205171

16. Install the 1st/2nd speed synchronizer assembly.



6205170

17. Install the snap ring.

NOTE: A new snap ring must be installed.



6205103

18. Install the rollers spacer.



6205104

19. Apply grease to the gear bore and install the forty three rollers and the rollers spacer.



6205105

20. Install the 2nd speed gear.

NOTE: Apply transmission lubricant to the gear surface, bore and cone.



6205106

21. Install the ball.



6205107

22. Install the spacer ring.



6205108

23. Install the snap ring.



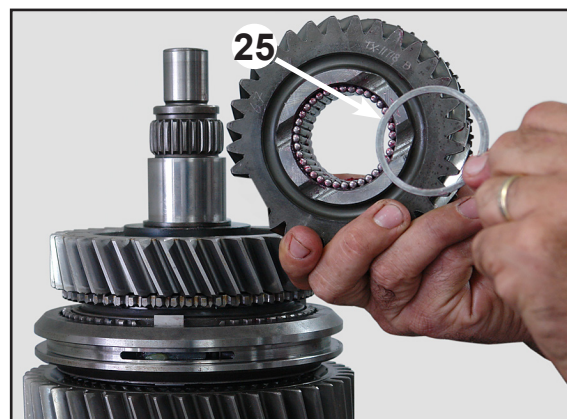
6205109

24. Apply grease to the gear bore and install the thirty six rollers.



6205110

25. Install the rollers spacer.



6205111

26. Install the 3rd speed gear.

NOTE: Apply transmission lubricant to the gear surface, bore and cone.



6205112

27. Install the 3rd speed synchronizer ring.

NOTE: Apply transmission lubricant to the synchronizer ring runway.



6205113

28. Install the 3rd/4th speed synchronizer assembly.



6205114

29. Install the snap ring.

NOTE: A new snap ring must be installed.



6205115

30. Install the pocket bearing.

NOTE: Use the special tool #E010001 and a press.

NOTE: Apply transmission lubricant to the bearing.



6205116

31. Install the 4th speed synchronizer ring.

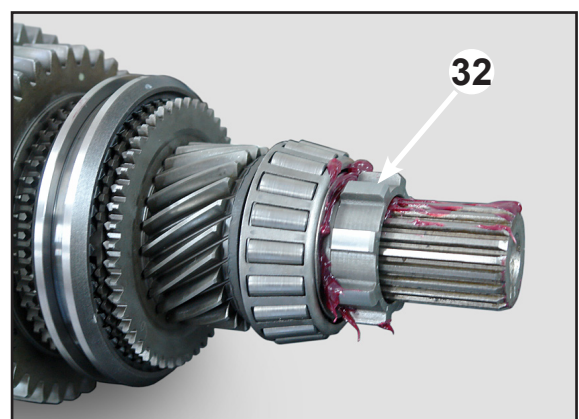
NOTE: Apply transmission lubricant to the synchronizer ring runway.



6205117

32. Install the speedometer rotor onto the rear end of the main shaft.

NOTE: Apply MS-9C grease to the speedometer rotor.



6205118

Disassembly

1. Remove the bearing.

NOTE: Use the special tool #005013 and #E005004.



6205165

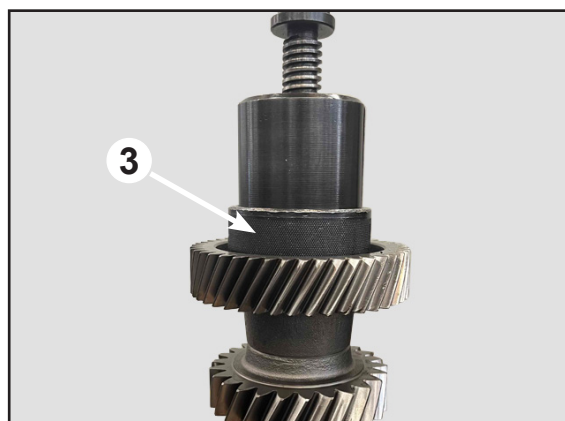
2. Remove the snap ring.



6205119

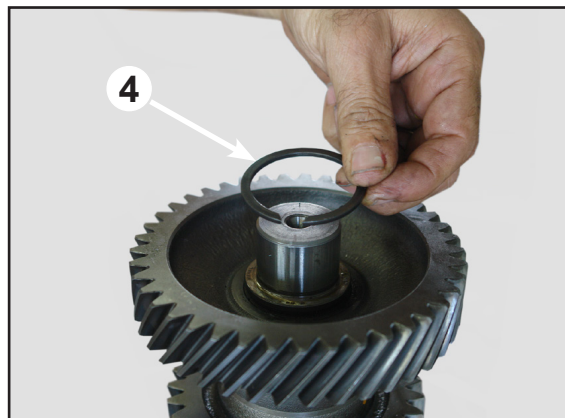
3. Remove the bearing.

NOTE: Use the special tool #005013 and #E005004.



6205166

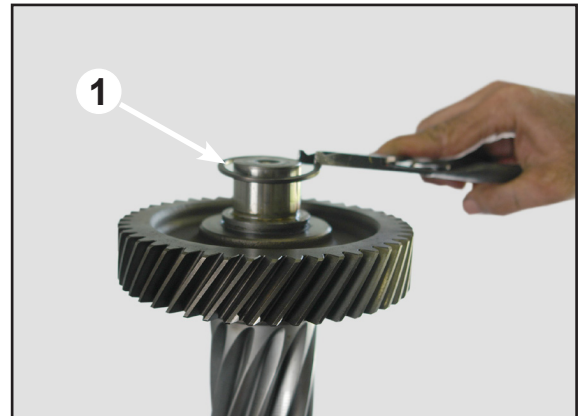
4. Remove the snap ring.



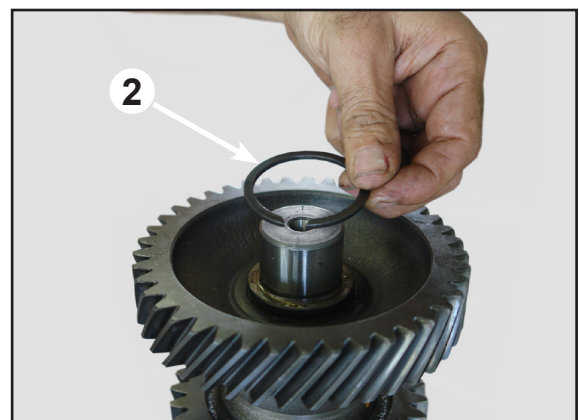
6205120

Assembly

1. Install the snap ring.

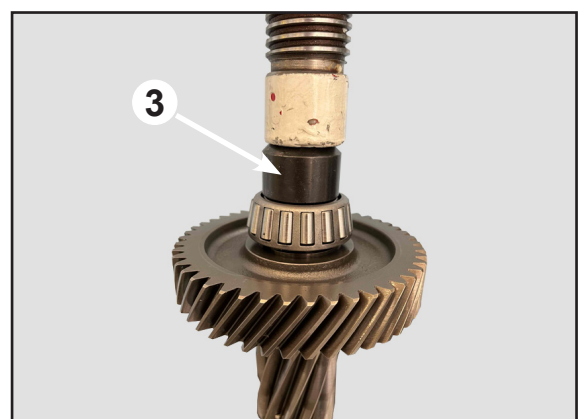
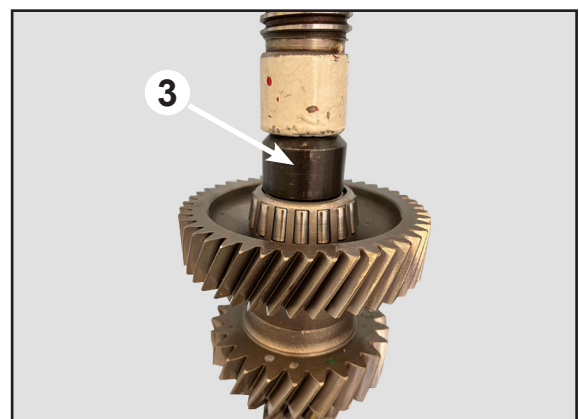


2. Install the snap ring.



3. Install both bearings.

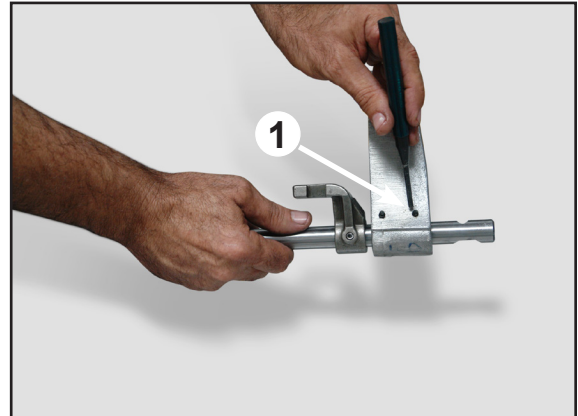
NOTE: Use the special tool #E001090.



5th/Reverse Speed Shift Bar

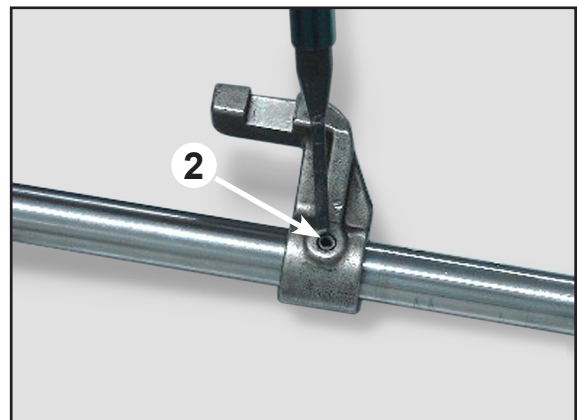
Disassembly

1. Remove the two roll pins from the 5th/reverse speed shift yoke.



6205121

2. Remove the roll pin from the 5th/reverse speed shift block.

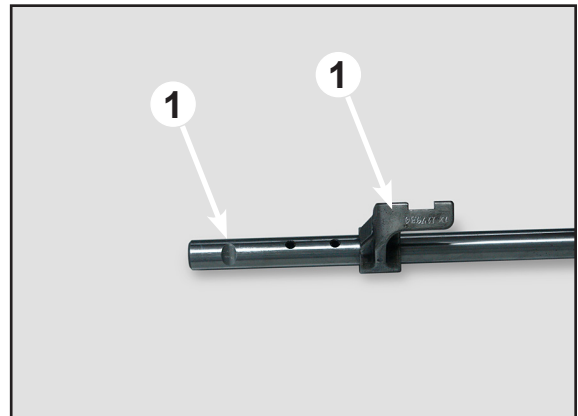


6205122

Assembly

1. Install the 5th/reverse speed shift block. Pay attention to the shift block position with respect to the notch for the locating ball.

NOTE: A new roll pin must be used.



6205123

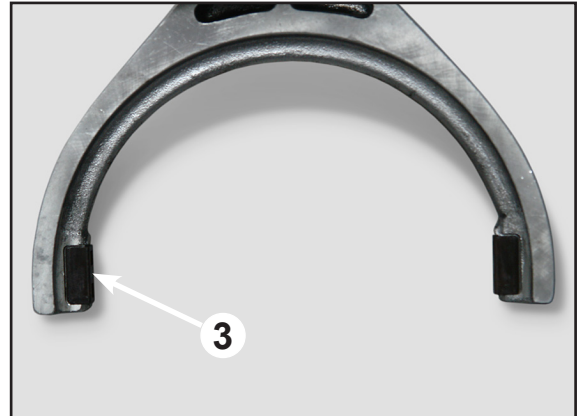
2. Install the 5th/reverse speed shift yoke. Pay attention to the correct positioning with respect to the bar.

NOTE: A new roll pin must be used.



6205124

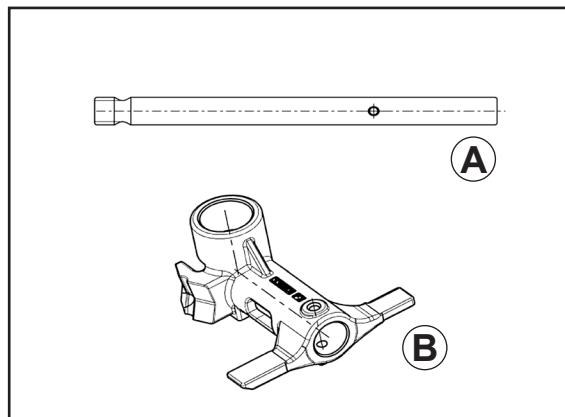
3. If necessary, replace shift yoke pads.



6205125

Gear Selector Bar

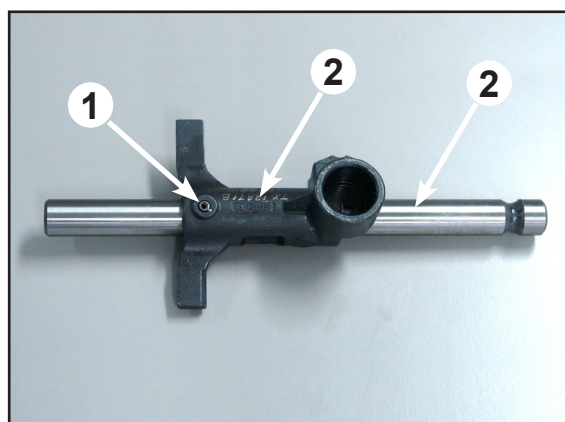
- A - Gear selector bar
- B - Gear selector block



6205126

Disassembly

1. Remove the roll pin.
2. Remove the selector block from the selector bar.

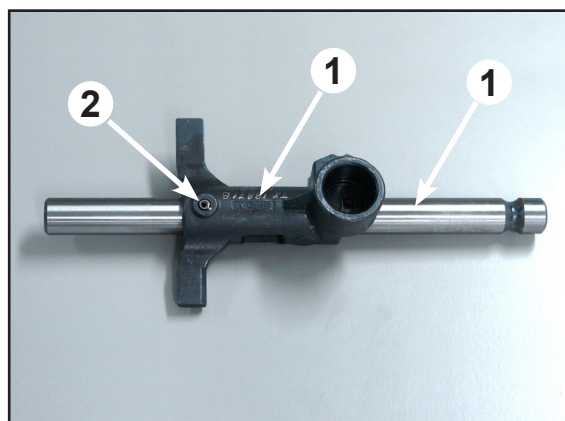


6205127

Assembly

1. Install the selector block onto the selector bar as shown in the figure.
2. Install the roll pin.

NOTE: A new roll pin must be used.



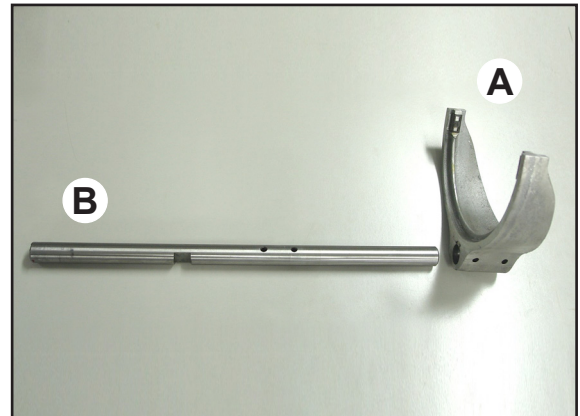
6205127

Shift Yoke and Bars

1st/2nd Speed Shift Bar

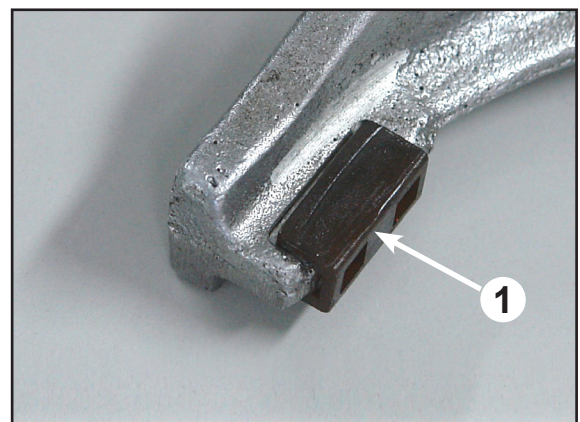
A - 1st/2nd Speed shift yoke

B - 1st/2nd Speed shift bar



6205128

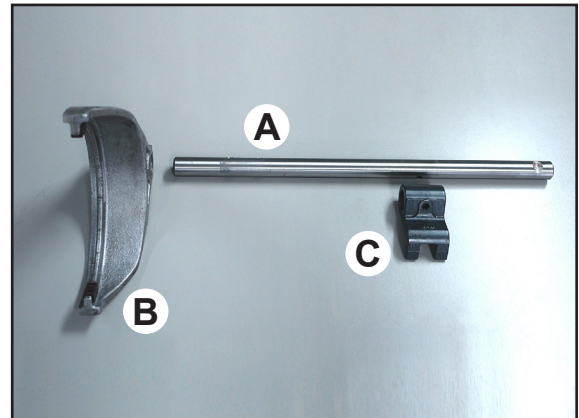
1. Replace shift yoke pads if worn out.



6205129

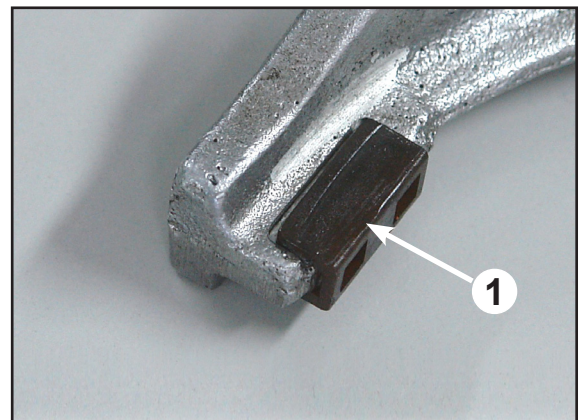
3rd/4th Speed Shift Bar

- A - 3rd/4th Speed shift yoke
- B - 3rd/4th Speed shift bar
- C - 3rd/4th Speed shift block



6205130

1. Replace shift yoke pads if worn out.



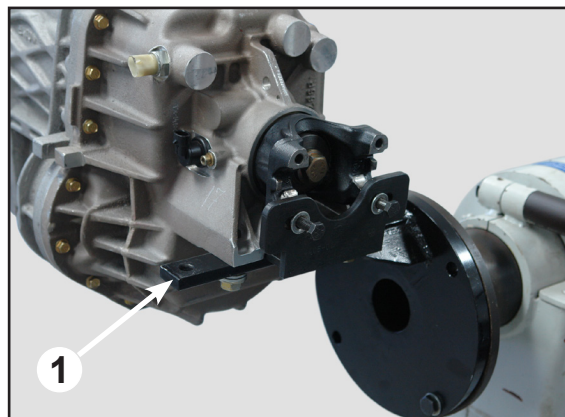
6205131

Yoke

Removal

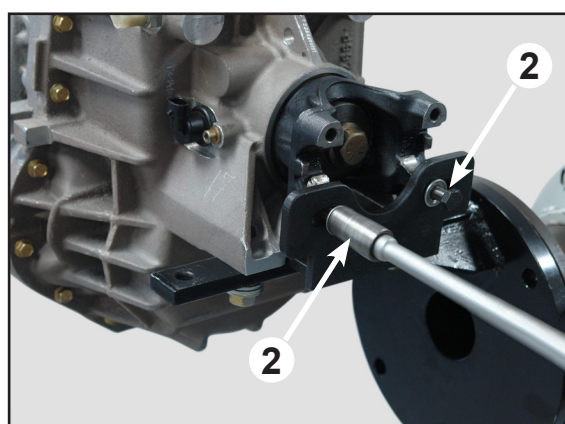
1. Lock the yoke with the special tool.

NOTE: Use the special tool #E017011.



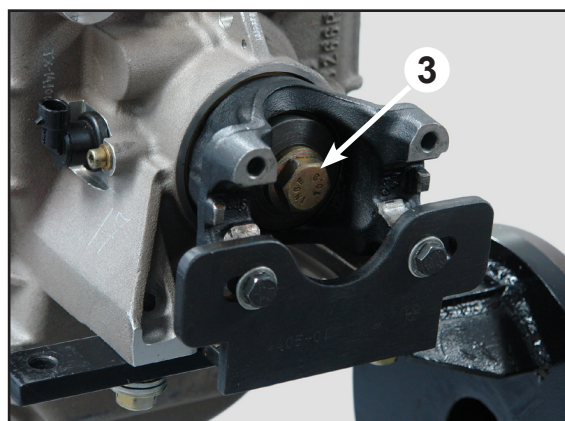
6205132

2. Tighten the two capscrews of the special tool.



6205133

3. Remove the retaining capscrew and washer from the yoke.
- 24mm Socket



6205134

4. Remove the yoke.

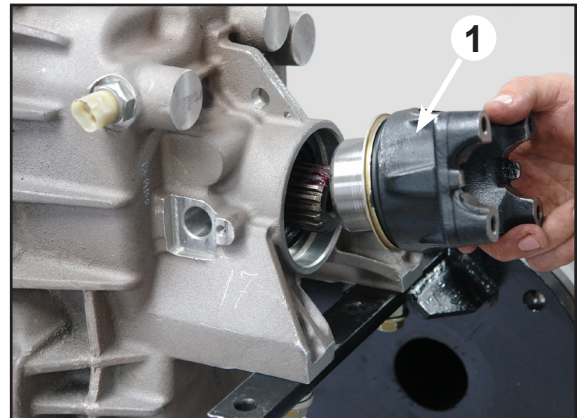


6205135

Yoke

Assembly

1. Install the yoke.

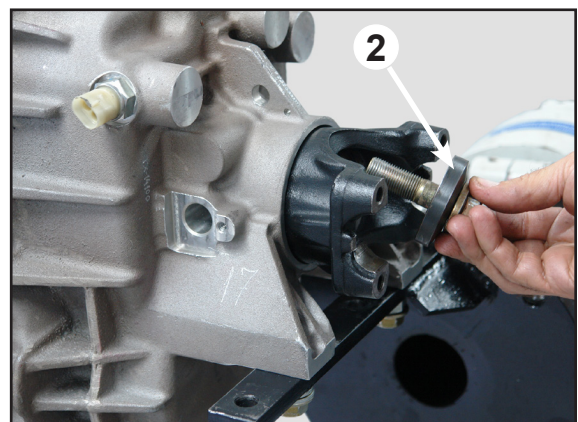


6205136

2. Install the retaining capscrew and washer.

NOTE: Apply Dowsil 780 sealant to the threads of the yoke retaining capscrew and Loctite 518 sealant to the washer and retaining capscrew contact surfaces.

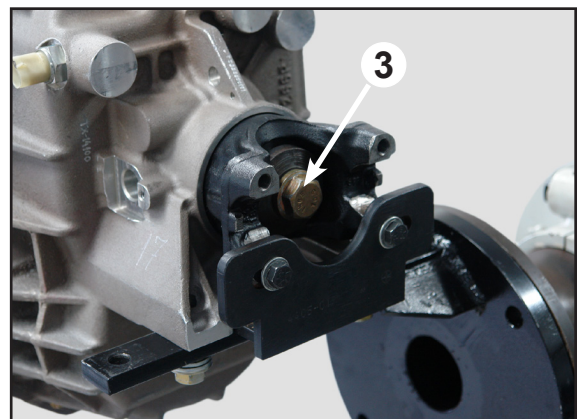
NOTE: Always replace the yoke retaining capscrew by a new one when performing a repair on the transmission.



6205137

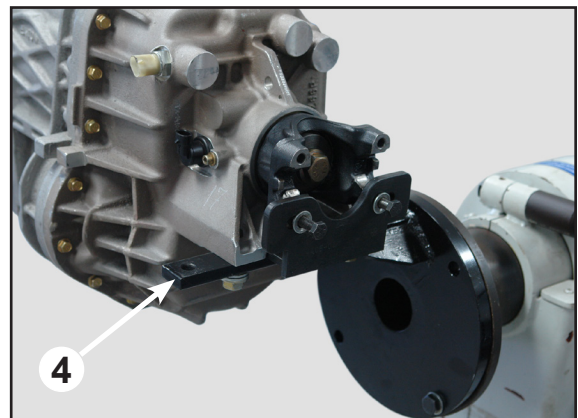
3. Tighten the yoke retaining capscrew to the specified torque.

Torque: 80-90 lb.ft / 109-122 N.m



6205138

4. Remove the special tool.



6205132

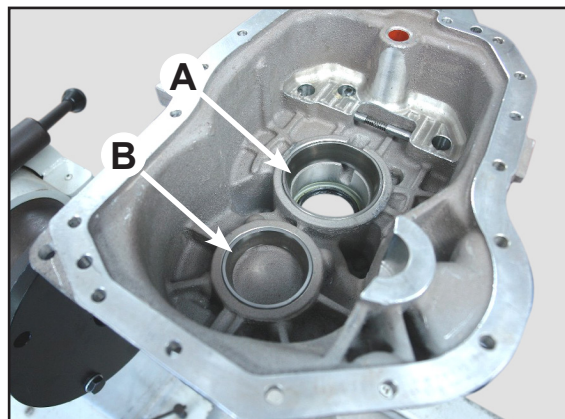
Main Shaft and Countershaft Rear Bearing Cups

The bearing cups are located on the rear housing.

A - Main shaft bearing cup

B - Countershaft bearing cup

NOTE: Never assemble bearing cone and cup from different manufacturers.

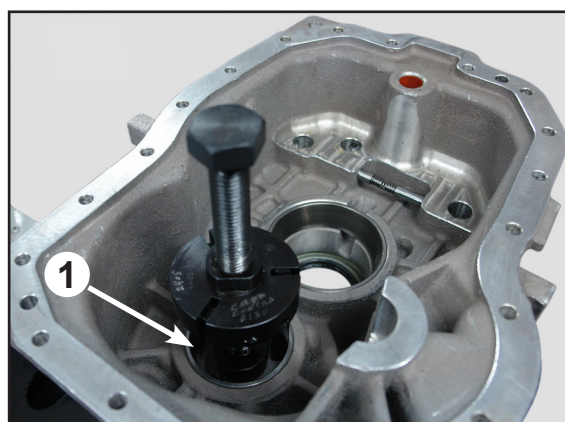


6205139

Removal

1. Remove the countershaft bearing cup.

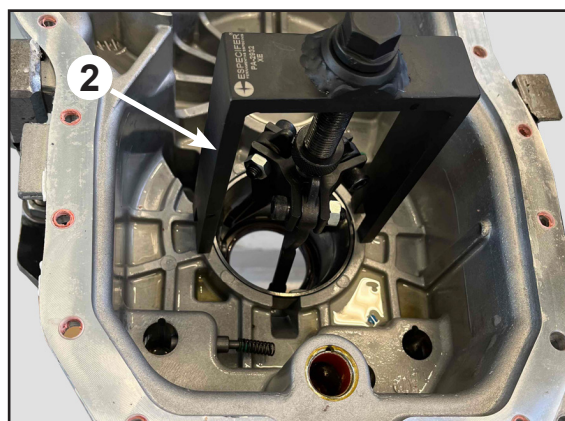
NOTE: Use the special tool #E011001.



6205140

2. Remove the main shaft bearing cup.

NOTE: Use the special tool #EEA-23102.

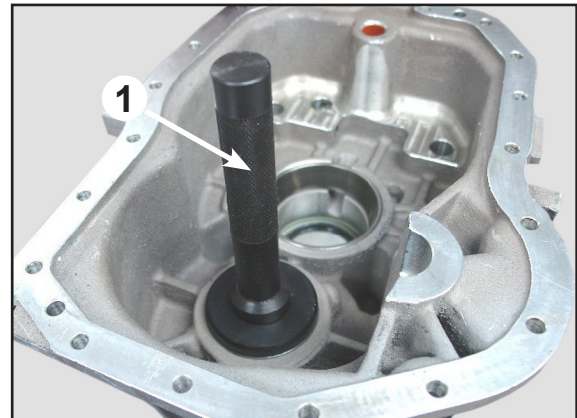


6205169

Assembly

1. Install the countershaft bearing cup.

NOTE: Use the special tools #E001028 and #E001013.



6205142

2. Install the main shaft bearing cup.

NOTE: Use the special tools #E001069 and #E001013.

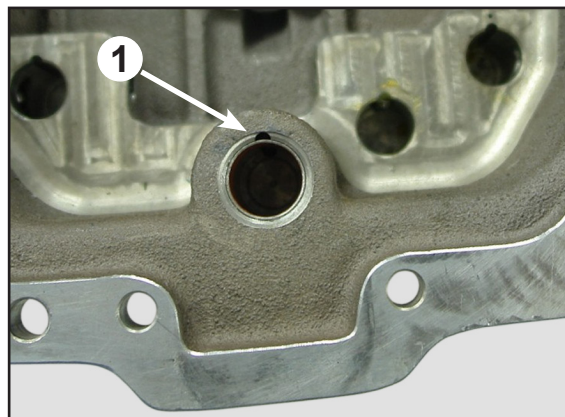


6205143

Permaglide Bushings

There are many permaglide bushings on the transmission. The repair procedure is the same for all of them.

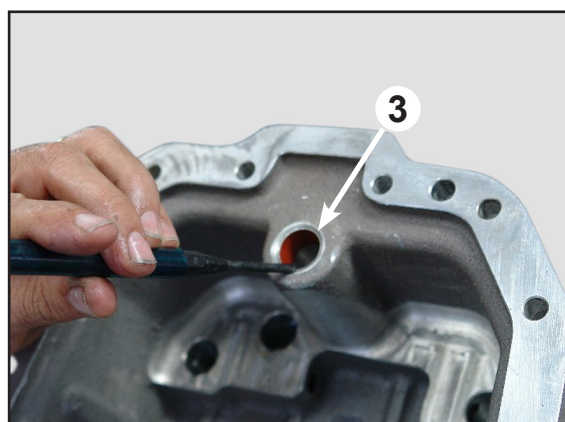
NOTE: Permaglide bushing should be repaired only if it is worn out.



6205144

Removal

1. Use the lubrication hole to place a punch against the bushing outer diameter.
2. Hit the punch to deform the bushing.
3. Remove the bushing.

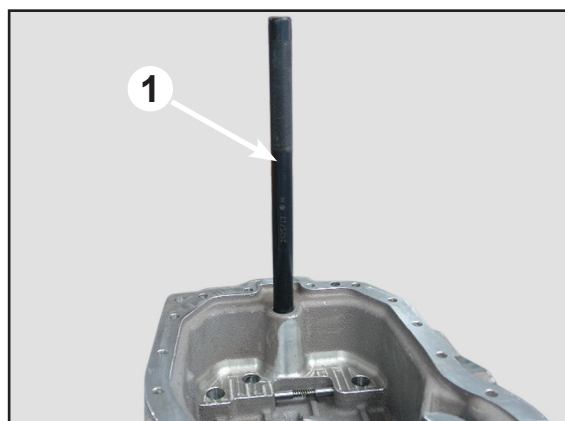


6205145

Installation

1. Install the permaglide bushing.

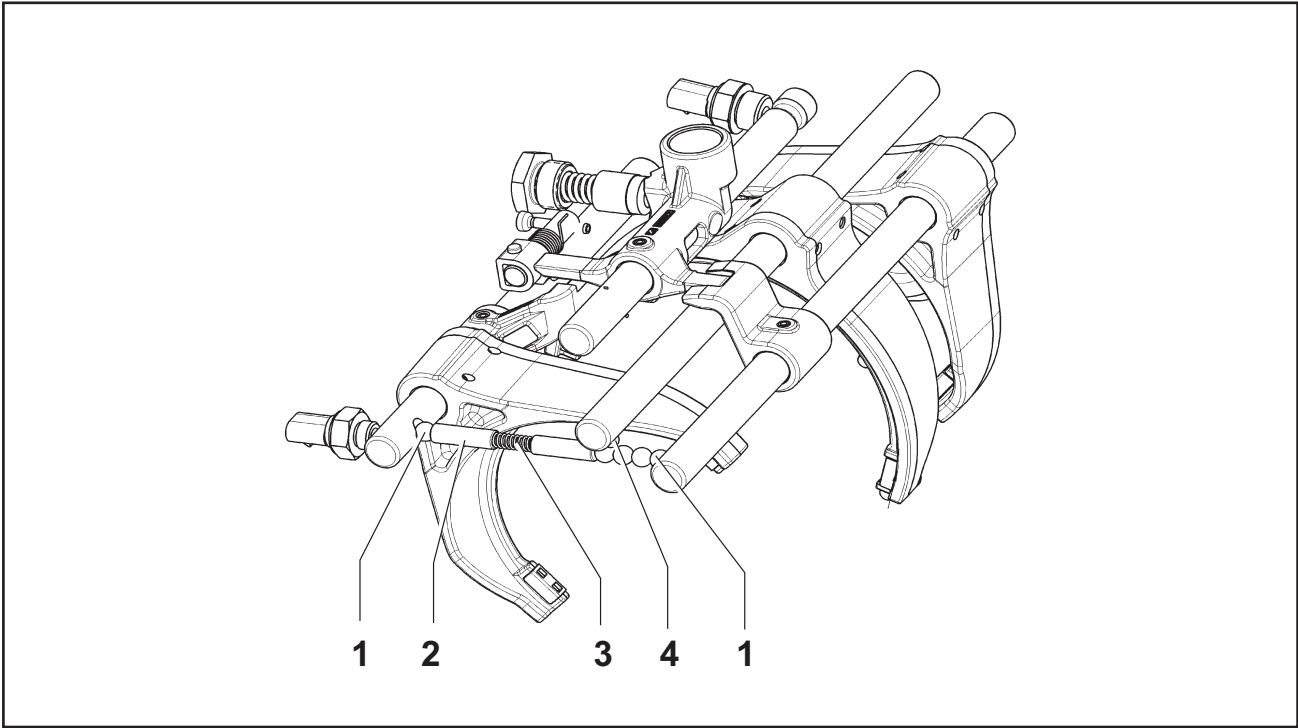
NOTE: Use the special tool #E001056.



6205146

Interlock Mechanism

The interlock mechanism prevents two gears from being engaged simultaneously.



6205147

The mechanism comprises the following parts:

<i>Num.</i>	<i>Qty.</i>	<i>Description</i>
1	5	3/8" Diameter ball
2	2	Interlock pin
3	1	Spring
4	1	5/16" Diameter ball

WARNING! All balls must be installed, otherwise two gears could be simultaneously engaged.

The interlock mechanism is located on the rear housing.



6205148

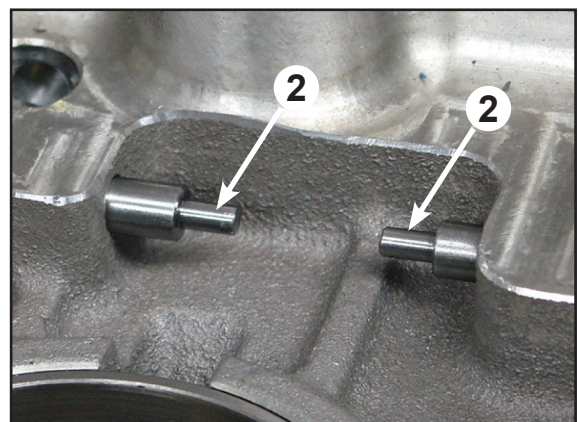
Removal

1. Remove the spring.



6205149

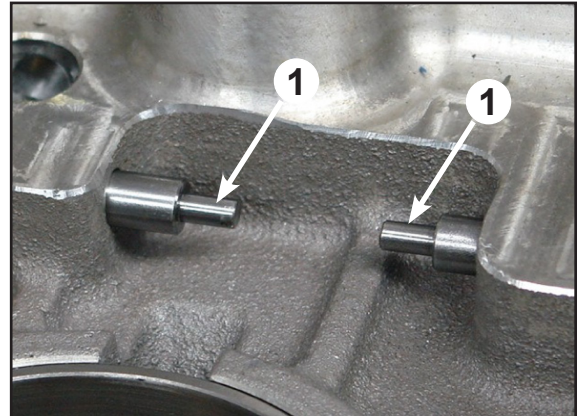
2. Remove the two interlock pins.
3. Remove the six balls.



6205150

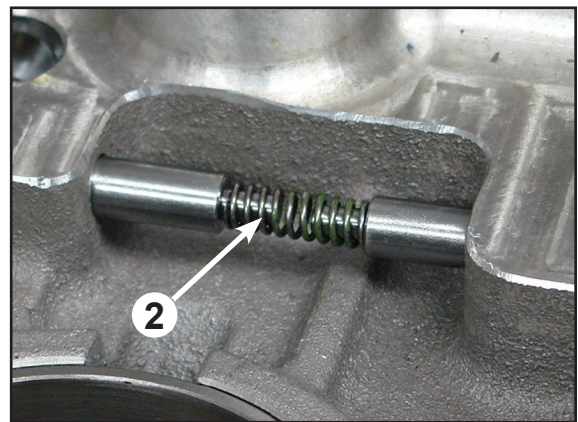
Assembly

1. Install the two interlock pins.



6205150

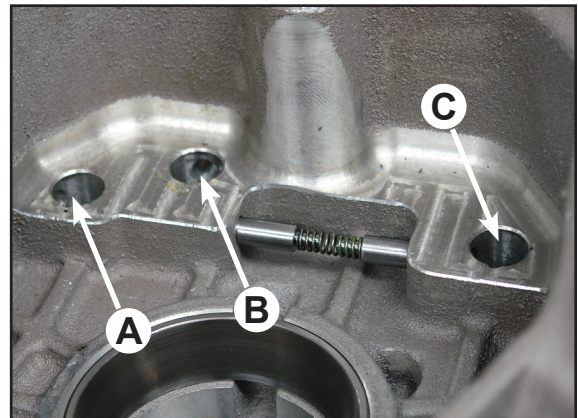
2. Install the spring.



6205149

3. Install the six balls.

*NOTE: Hole A: four 3/8" diameter balls
Hole B: one 5/16" diameter ball
Hole C: one 3/8" diameter ball*



6205151

Rear Section



Rear Seal

Disassembly

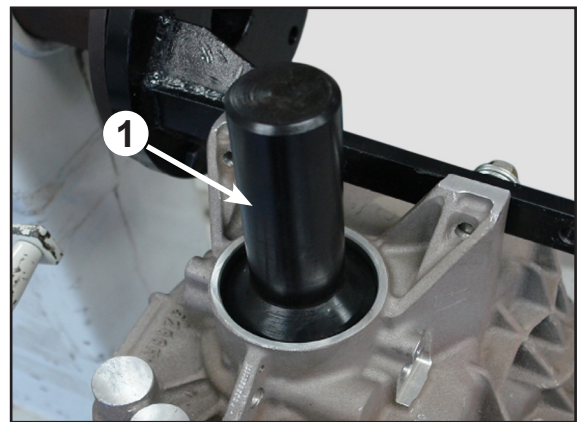
1. Remove the rear seal.



Assembly

1. Install the rear seal.

NOTE: Use the special tool #E001026.



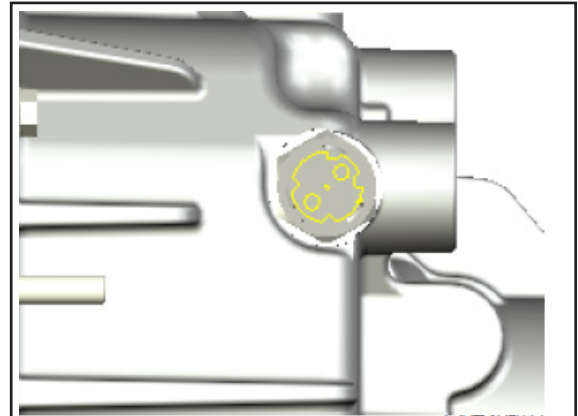
Switches

Reverse Switch

1. Using the proper tool, remove the reverse switch.
2. Install the reverse switch.

NOTE: Apply Dow Corning 780 sealant to the switch surface.

Torque de 10-15 lb.ft.ft / 14-20 N.m



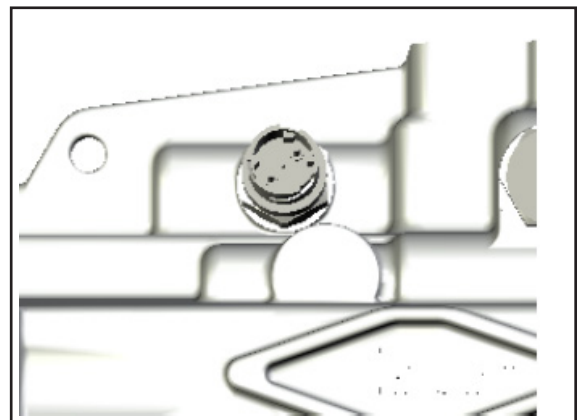
6205

Neutral Switch

1. Using the proper tool, remove the neutral switch.
2. Install the neutral switch.

NOTE: Apply Dow Corning 780 sealant to the switch surface.

Torque de 10-15 lb.ft.ft / 14-20 N.m



6205

Speedometer Sensor

Removal

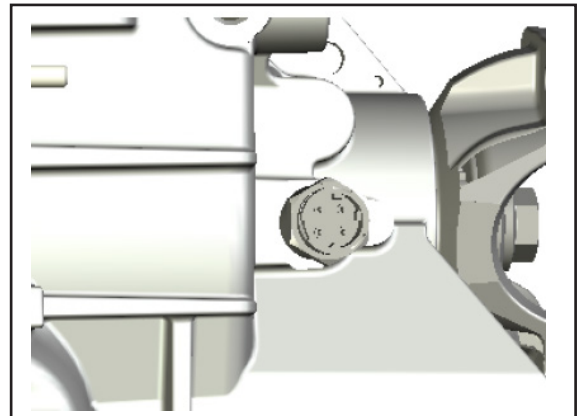
1. Remove the Allen bolt.
2. Remove the speedometer sensor.

Installation

1. Install the speedometer sensor.

NOTE: Apply Loctite 262 sealant to the threads of the sensor.

Torque: 14-19 lb.ft / 19-26 N.m



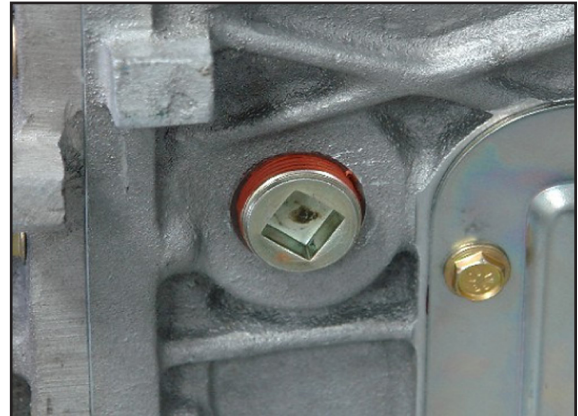
6205

Plugs

Oil Filler Plug

1. Remove the oil filler plug.
2. Install the oil filler plug.

Torque: 10-15 lb.ft / 14-20 N.m



6205154

Drain Plug

1. Remove the drain plug.
2. Install the drain plug.

Torque: 10-15 lb.ft / 14-20 N.m



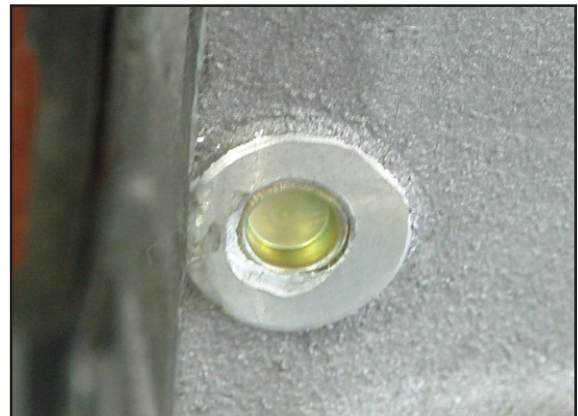
6205155

Cup Expansion Plugs

1. Remove the cup expansion plug.
2. Install the cup expansion plug.

NOTE: Apply Loctite 262 sealant to the plug.

NOTE: Use the special tool #E001058.



6205156

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