SERVICE BULLETIN

QUALITY INFORMATION ANALYSIS
OVERSEAS SERVICE DEPT. MITSUBISHI MOTORS CORPORATION

SERVICE BULLETIN	**No.:** MSB-98E37-002	
	Date: 1999-08-15	**<Model>** **<M/Y>**
Subject: NEW SERVICE PROCEDURE FOR POWER STEERING GEARBOX		(EC,EXP) L200 (K00) 97-10
Group: STEERING	**Draft No.:** 98SY100912	(EC,EXP) PAJERO (V10,V20,V30,V40) 95-10
INFORMATION	**OVERSEAS SERVICE DEPT**	T.NITTA - VICE GENERAL MANAGER QUALITY INFORMATION ANALYSIS

1. Description:

The mainshaft valve assembly in the power steering gearbox is now available only as an assembly (supply of individual components and parts discontinued). Accordingly, the service procedure for the power steering gearbox is also changed as shown in the attached sheets.

2. Applicable Manuals:

Manual	Pub. No.	Language	Page(s)
'97 L200 Workshop Manual CHASSIS	PWTE96E1	(English)	37A-3-~6, 28-34
	PWTS96E1	(Spanish)	
	PWTF96E1	(French)	
	PWTG96E1	(German)	
'95 PAJERO Workshop Manual CHASSIS	PWJE9086-F	(English)	37-3, 4, 6, 25-32
	PWJF9088-F	(French)	
	PWJG9089-F	(German)	
	PWJD9090-F	(Dutch)	
	PWJW9091-F	(Swedish)	
'95 MONTERO Workshop Manual CHASSIS	PWJS9087-F	(Spanish)	

3. Interchangeability:

Not interchangeable

4. Effective Date:

From when the part stock has been exhausted

Items		Specifications
Pressure switch activation oil pressure		
	Mpa (kg/cm^2, psi)	
OFF → ON		1.5 – 2.0 (15 – 20, 21-284)
ON→ OFF		0.7 – 1.2 (7.2 – 12, 100-171)
Mainshaft starting torque (Manual steering)		
<Deleted>	Nm (kgcm, in.lbs.)	0.35 – 0.55 (3.5 – 5.5, 3 – 5)
~~Mainshaft axial play (Power steering)~~	~~mm (in.)~~	~~0.03 – (0.0012) or less~~
Cross-shaft axial play	mm (in.)	
Manual steering’		0.05 (0.0020)
Power steering		0.05 (0.0020)
Mainshaft total starting torque	Nm (kgcm, in.lbs.)	
Manual steering		0.65 – 0.85 (6.5 – 8.5, 5.7 – 7.3)
Power steering		0.45 – 1.25 (4.5 – 12, 5, 4 – 11)
Ball joint starting torque	Nm (kgcm, in.lbs.)	
Tie rod end		1 – 3 (10 – 30, 8.9 – 26)
Idler arm		0.5 – 2.0 (5 – 520, 4 – 17)
Idler arm turning torque	Nm (kgcm, in.lbs.)	0.3 – 2.0 (3 – 20, 3 – 17)
Spring balance reading	N (kg,lbs)	2.3 – 15.4 (0.23 – 1.54, 0.5 – 33.9)
Limit		
Steering wheel free play	mm (in.)	
Manual steering		50 (1.97)
Power steering		50 (1.97)
Steering gear backlash	mm (in.)	0.5 (0.020)
Ball joint axia play	mm (in.)	1.5 (0.059)
Backlash between ball groove of rack piston		
And balls	mm (in.)	0.05 (0.0020)
Gap between vane and rotor groove	mm (in.)	0.06 (0.0024)
Clearance between oil pump drive shaft		
And pump body	mm (in.)	0.1 (0.004)

LUBRICANTS

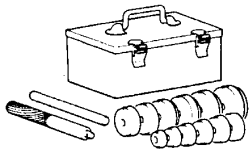
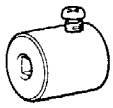
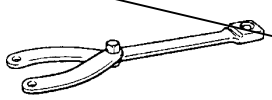
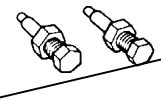
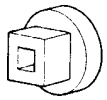
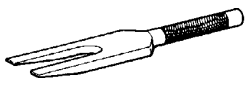
E37CD--

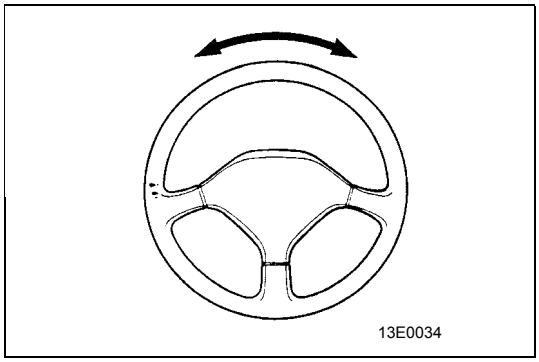
Items	Specified lubricant	Quantity
Manual steering gear oil	Hypoid gear oil API GL-4 or higher SAE 80	210 cm3 (12.81 cu.in.)
Power steering fluid		
L.H. drive vehicles		
<2800D>		11.1 dm3 (1.17 U.S.qts., 0.98 lmp.qts.)
<Except 2800D>		1.06 dm3 (1.12 U.S.qts., 0.93 lmp.qts.)
R.H. drive vehicels	Automatic transmission fluid DEXRON or DEXRON II	
<2800D>		1.02 dm3 (1,08 U.S.qts., 0.90 lmp.qts.)
<Except 2800D>		0.97 dm3 (1.02 U.S. qts., 0.85 lmp.qts.)
Power steering gear box		
~~Bearing~~, O-ring and oil seal <Deleted>	Automatic transmission fluid DEXRON or DEXRON II	As required
Oil pump		
Flow control valve and O-ring Friction surface of rotor, vane, cam ring and pump cover	Automatic transmission fluid DEXRON or DEXRON II	As required

SEALANTS AND ADHESIVES

E37CE--

Items	Specified sealant and adhesive	Remarks
Steering column cover assembly installation hole		
Dash panel cover installed surface		
Manual steering gear box top cover packing		
Manual steering gear box cross-shaft adjusting and lock nut	3M ATD Part No. 861 or equivalent	Semi-drying sealant
Manual steering gear box top cover bolt		
Manual steering gear box adjusting shim		
Tie-rod end dust cover installed surface		
Inside of steering column lower pipe bearing		
Connection of steering column upper and steering column lower (Nut side)	3M Stud Locking Part No. 4170 or equivalent	Semi-drying sealant
Steering column upper bearing	3M ATD Part No. 8001 or equivalent	Semi-drying sealant

Tool	Number	Name	Use
	MB990925	Bearing and oil seal installer set	Installation of the oil seal and the ball bearing (Refer to GROUP 26.) MB990938, MB99028,MB990926, ~~MB991203~~ ◄—— **<Deleted>**
	MB991151 MB990685	Torque wrench	Measurement of the mainshaft starting torque
	MB991006 or MB990228	Preload socket	Measurement of the mainshaft total starting torque **<Deleted>**
	MB991367	Special spanner	~~Removal and installation of the lock nut~~
	MB991394	~~Pin set~~	
	MB990326	Preload socket	Measurement of the ball joint starting torque
	MB990778	Ball joint remover	Disconnection of idler arm from relay rod



SERVICE ADJUSTMENT PROCEDURES

STEERING WHEEL FREE PLAY CHECK

E37FAAF

MANUAL STEERING

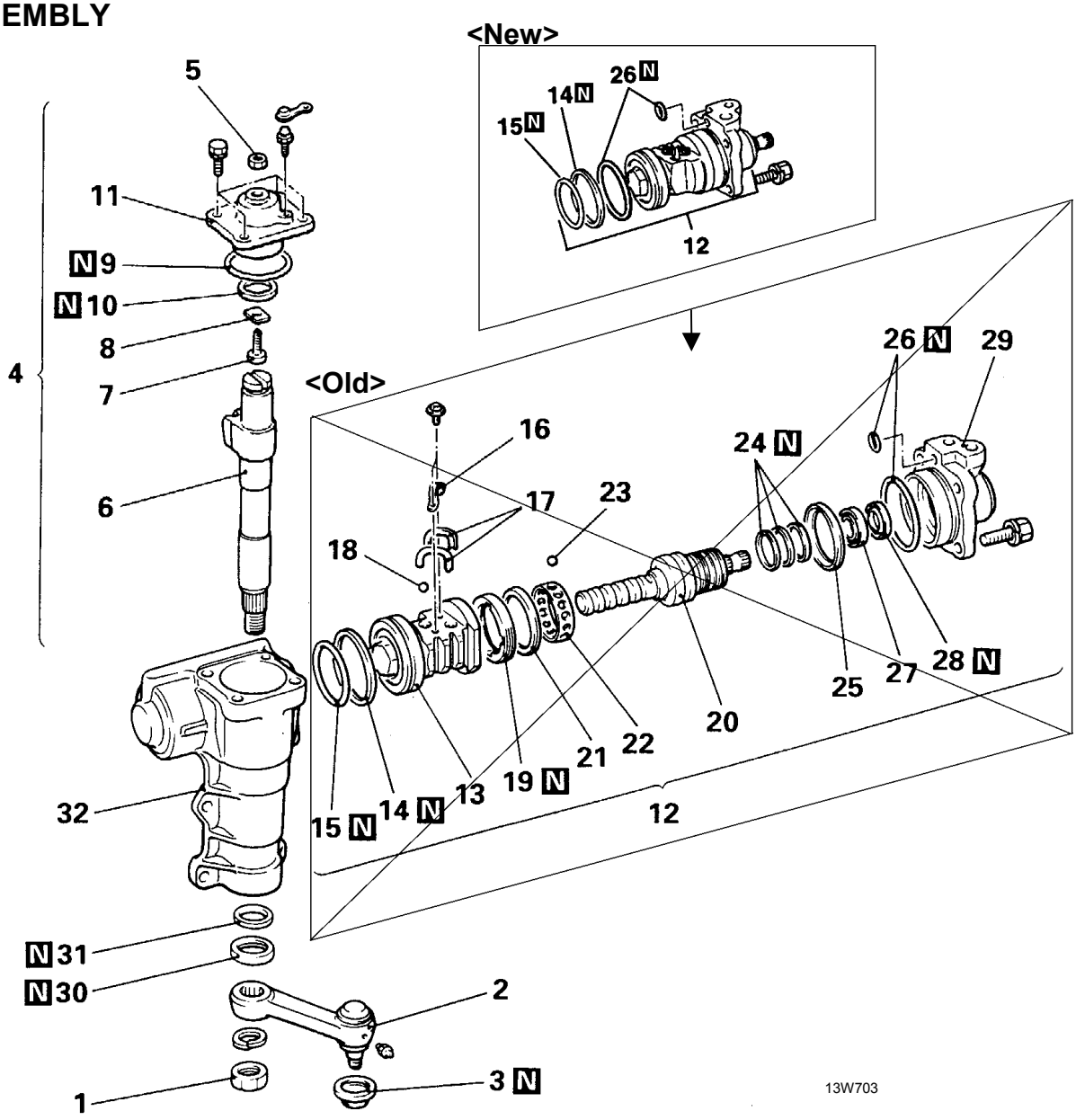
Standard value: **26.6 mm (1.05 in.) or less**

Limit: **50 mm (1.97 in.)**

If the measured value exceeds the repair limit, check the steering gear backlash and ball joint axial play.

DISASSEMBLY

E37NF--



Disassembly steps

	1.	Jam nut
←→	2.	Pitman arm
	3.	Dust cover
←→	4.	Side cover and cross-shaft assembly
	5.	Adjusting bolt lock nut
	6.	Cross-shaft
	7.	Adjusting bolt
	8.	Adjusting plate
	9.	O-ring
←→	10.	Y-packing
	11.	Side cover
←→	12.	Main shaft and valve assembly
←→	~~13.~~	~~Rack piston~~
	14.	Seal ring
	15.	O-ring
	~~16.~~	~~Circulation holder~~
	17.	Circulator
	18.	Ball
←→	19.	Lock nut
←→	20.	Main shaft
←→	21.	Bearing race
←→	22.	Cage
←→	23.	Ball
	24.	Seal ring
	25.	Bearing race
	26.	O-ring
←→	27.	Bearing
←→	28.	Oil seal
	29.	Valve housing
	30.	Oil seal
	31.	Y-packing
	32.	Gear box housing

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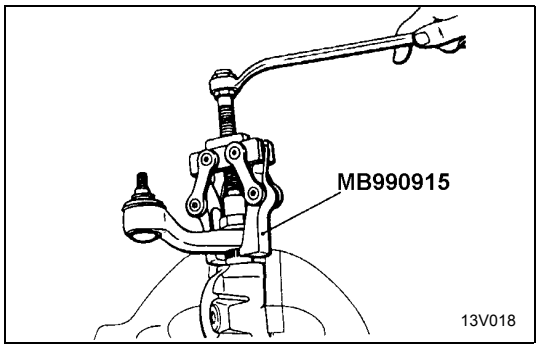
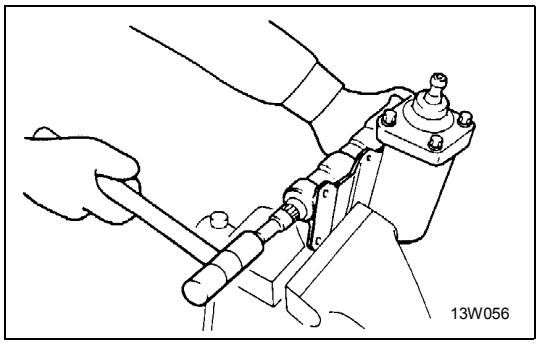


SERVICE POINTS OF DISASSEMBLY

E37NGAE

2. REMOVAL OF PITMAN ARM



4. REMOVAL OF SIDE COVER AND CROSS-SHAFT ASSEMBLY

With the mainshaft and cross-shaft placed in the straight ahead position, tap the bottom of the cross-shaft with a plastic hammer to take out the cross-shaft together with the side cover.

10. REMOVAL OF Y-PACKING

Do not remove the Y-packing at the rear of the needle bearing unless there is fluid leakage from the threads of the adjusting bolt. If there is leakage, replace the Y-pacing with a new one.

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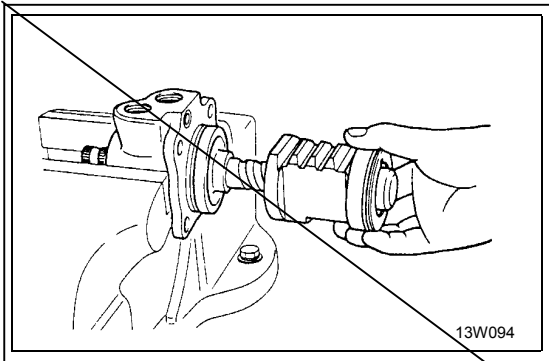
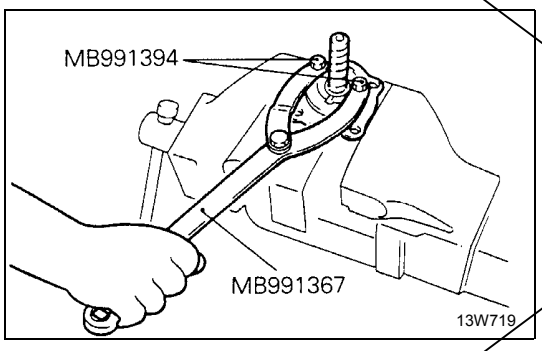


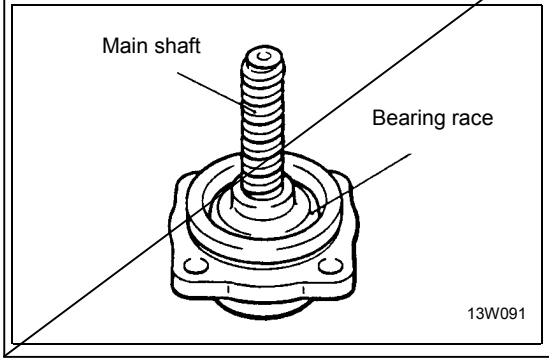
13. REMOVAL OF RACK PISTON

Remove the rack piston form the mainshaft by turning it counterclockwise.

Caution
Be careful not to lose the 26 balls inside the rack piston.



19. REMOVAL OF LOCK NUT



20. REMOVAL OF MAIN SHAFT/21. BEARING RACE/22. CAGE/23. BALL

When removing the main shaft, remove it while pressing the bearing race so that the balls do not come out.

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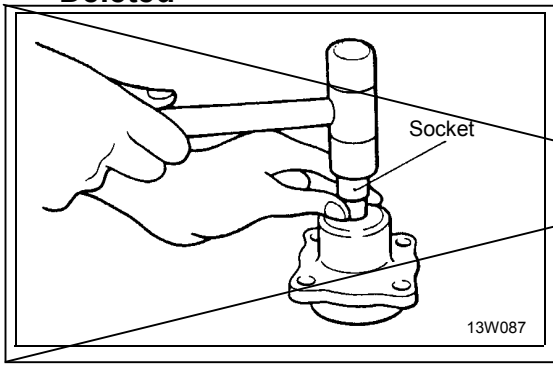
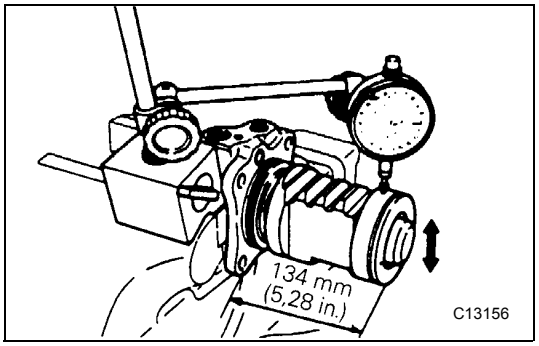


27. REMOVAL OF BEARING/28. OIL SEAL

Using a socket, remove the oil seal and the bearing from the valve housing simultaneously.

INSPECTION

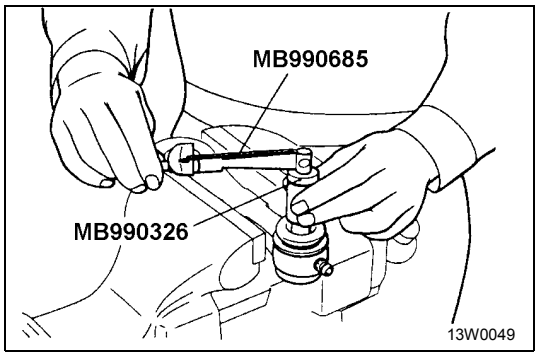
E37NHAD



BACKLASH BETWEEN BALL GROOVE OF RACK PISTON AND BALLS

Set the rack piston to the position shown in the figure, and then measure the backlash by using a dial gauge.

Limit: 0.05 mm (0.0020 in.)

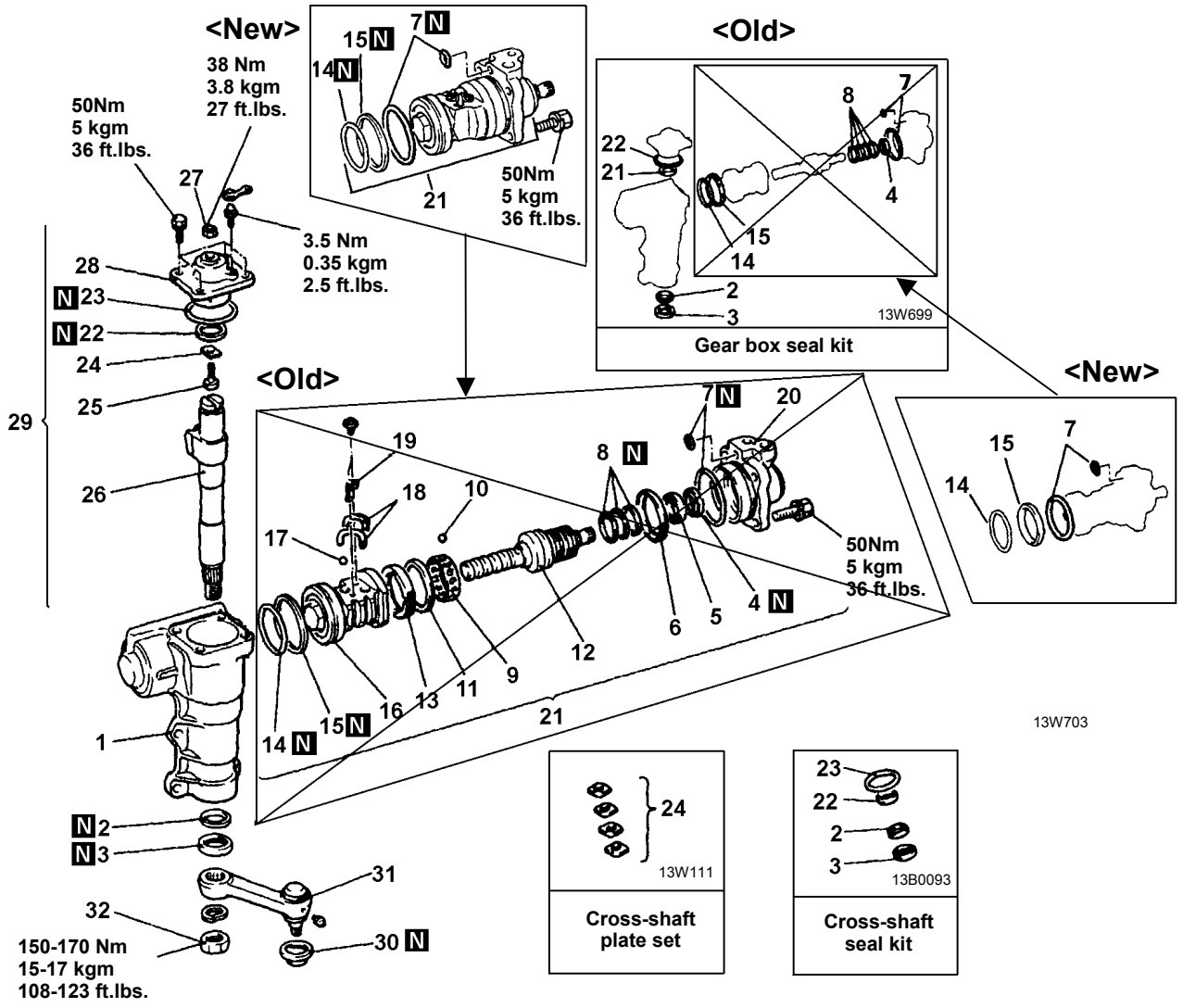


PITMAN ARM BALL JOINT STARTING TORQUE

Standard value: 1-3 Nm (10-30 kgcm, 9-26 in.lbs.)

REASSEMBLY

E37NI--



Reassembly steps

- 1. Gear box housing
- ➔← 2. Y-packing
- ➔← 3. Oil seal
- ~~➔← 4. Oil seal~~
- ~~➔← 5. Bearing~~
- ~~6. Bearing case~~
- 7. O-ring
- ~~➔← 8. Seal ring~~
- ~~➔← 9. Cage~~
- ~~➔← 10. Ball~~
- ~~➔← 11. Bearing race~~
- ~~➔← 12. Mainshaft~~
- ~~➔← 13. Lock nut~~
- ~~➔← • Adjustment of main shaft axial play~~
- 14. O-ring
- 15. Seal ring
- ~~➔← 16. Rack piston~~
- ~~17. Ball~~

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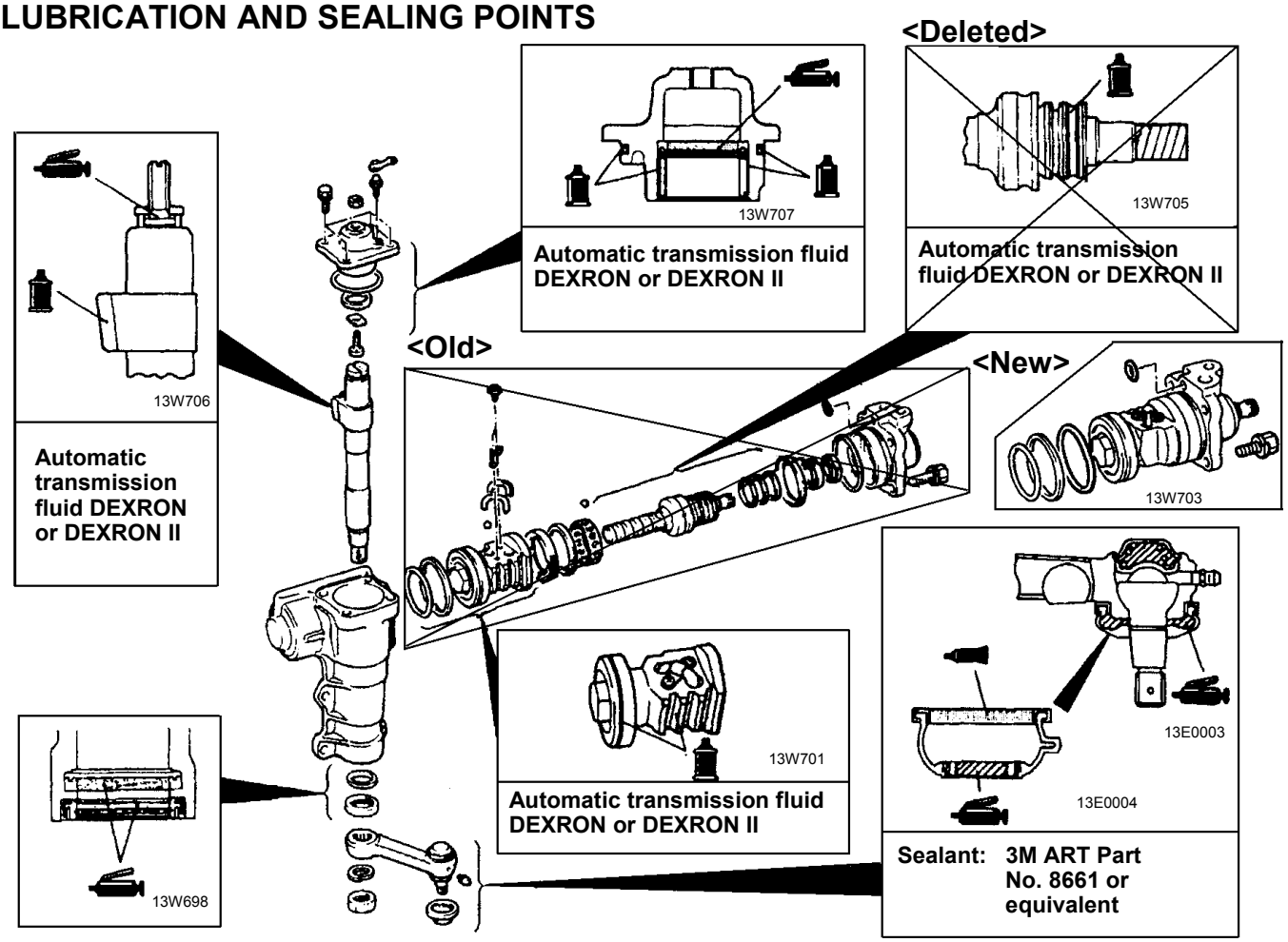
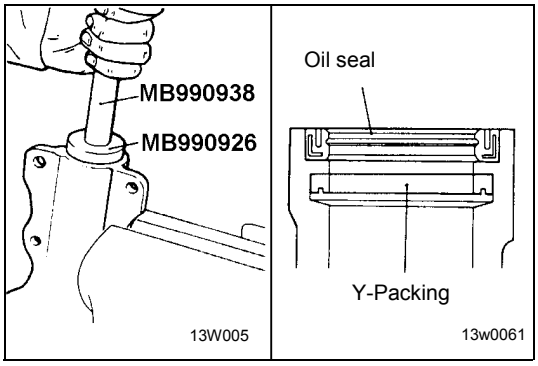
- ~~18. Circulator~~
- ~~19. Circulator holder~~
- ➔← ~~20. Valve housing~~
- 21. Mainshaft and valve assembly
- 22. Y-packing
- 23. O-ring
- ➔← 24. Adjusting plate
- ➔← 25. Adjusting bolt
- ➔← 26. Cross-shaft
- ➔← 27. Adjusting bolt lock nut
- 28. Side cover
- ➔← 29. Side cover and cross-shaft assembly
- ➔← • Adjustment of main shaft total staring torque
- 30. Dust cover
- ➔← 31. Pitman arm
- 32. Jam nut

A13V0108

LUBRICATION AND SEALING POINTS





SERVICE POINTS OF REASSEMBLY

E37NJAE

2. INSTALLATION OF Y-PACKING/3. OIL SEAL

(1) Install the Y-packing facing the direction shown in the illustration.

(2) Use the special tool to press-fit the oil seal to the gearbox housing so that it faces in the direction shown in the illustration.

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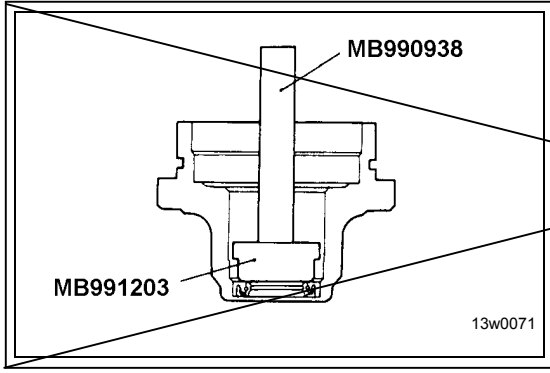

4. INSTALLATION OF OIL SEAL

Apply a coating of the specified fluid to the outside of the oil seal. Using the special tools, press the oil seal into the valve housing.

Specified fluid: Automatic transmission fluid DEXRON or DEXRON II

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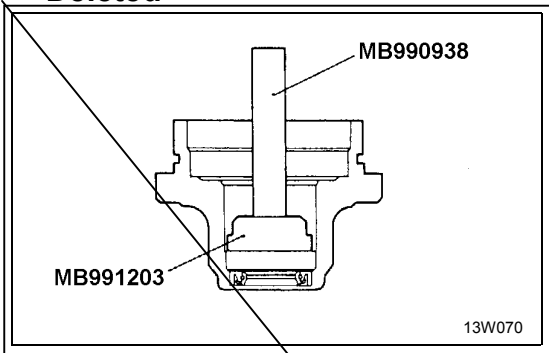
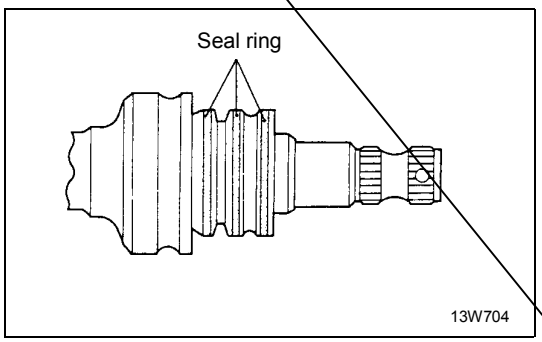


5. INSTALLATION OF BEARING

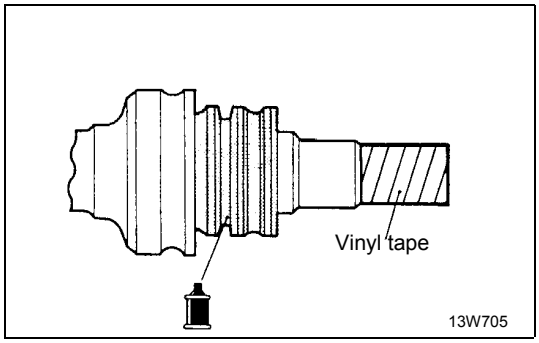
Apply a coating of the specified fluid to the outside of the bearing. Using the special tools, press the oil seal into the valve housing.

Specified fluid: Automatic transmission fluid DEXRON or DEXRON II



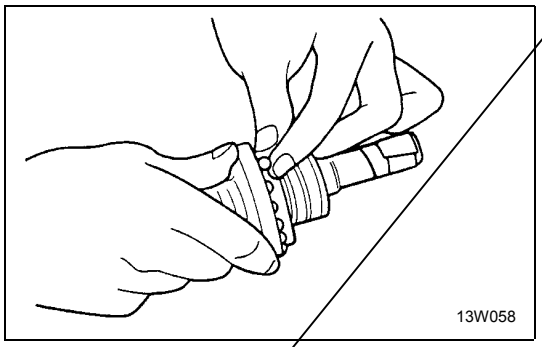
8. INSTALLATION OF SEAL RING

When installing seal ring, press firmly into valve groove.

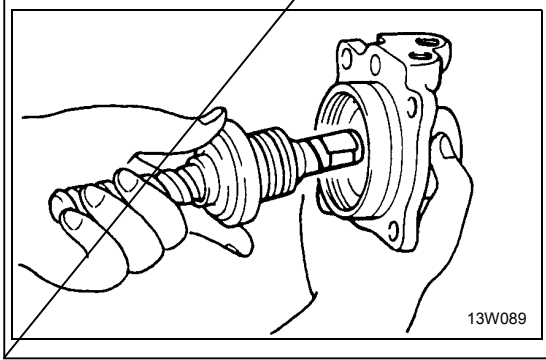


9. INSTALLATION OF CAGE/10. BALL/11. BEARING RACE/12. MAIN SHAFT

(1) Apply specified fluid to valve body.
Specified fluid: Automatic transmission fluid DEXRON or DEXRON II
(2) Wrap vinyl tape around the serrated part so that the oil seal won't be damaged when the valve body is installed tot he valve housing.
(3) Mount the valve body to the valve housing



(4) Align the cage's hole and the channel in the main shaft, and insert two or three balls.
(5) Insert the remainder of the balls into the cage's hole while pressing the ball with the bearing race.



(6) When installing the main shaft, connect it to the valve housing while pressing the bearing race so that the balls do not come out.

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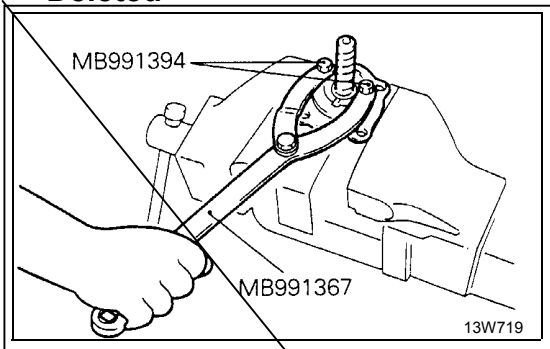
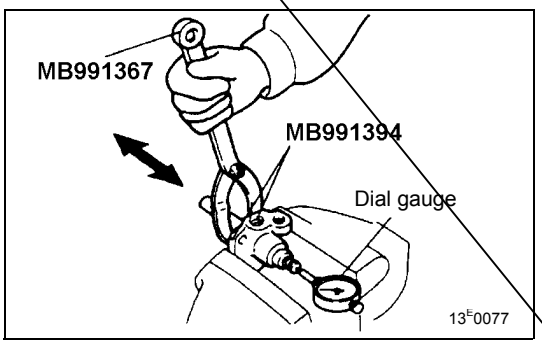


13. INSTALLATION OF LOCK NUT

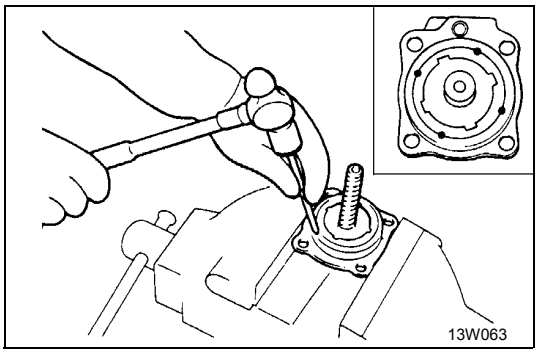
Using the special tool,tighten carefully until the lock nut contacts the bearing race.



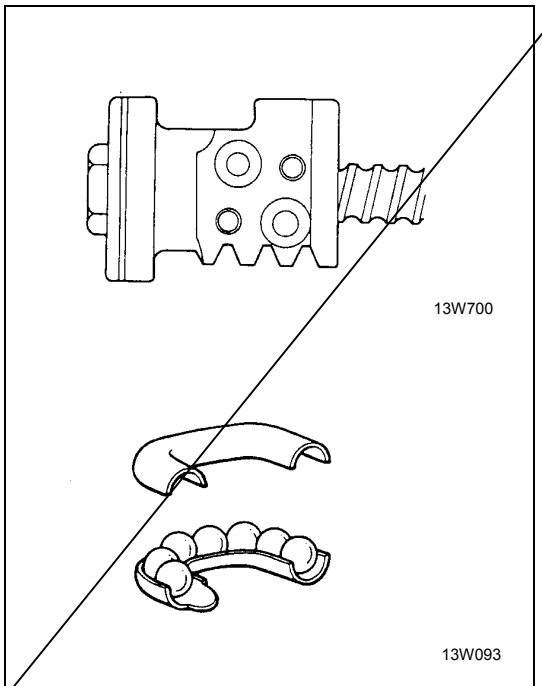
- **ADJUSTMENT OF MAIN SHAFT AXIAL PLAY**

(1) Adjust the play by tightening the lock nut gradually so that the mainshaft axial play will meet the range of standard value.

Standard value: 0.03 mm (0.0012 in.) or less



(2) Use a punch to crimp the circumference of the lock nut so as to secure the lock nut.
(3) Check to be sure that the mainshaft rotates smoothly.



16. INSTALLATION OF RACK PISTON

(1) Install the rack piston until it comes in contact with the edge of the main shaft.
(2) Rotate the main shaft to align the ball raceway with the 19-ball insertion hole.

NOTE
The balls must be inserted so that there is no clearance between the balls.

(3) Set the remaining seven balls in the circulator, and install the circulator to the rack piston.

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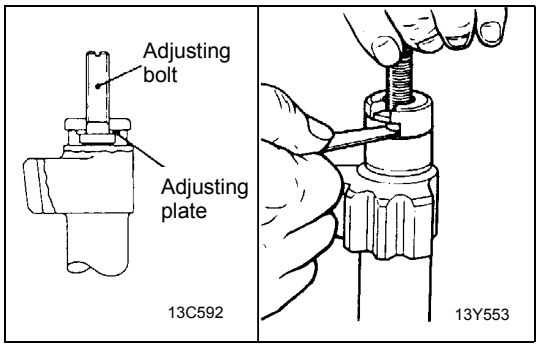
20. INSTALLATION OF VALVE HOUSING

(1) Apply specified automatic transmission fluid to the seal ring of the rack piston.
Specified fluid: Automatic transmission fluid DEXRON or DEXRON II
(2) Insert the valve housing.
(3) Rotate the main shaft until the rack piston moves to the neutral position (center).

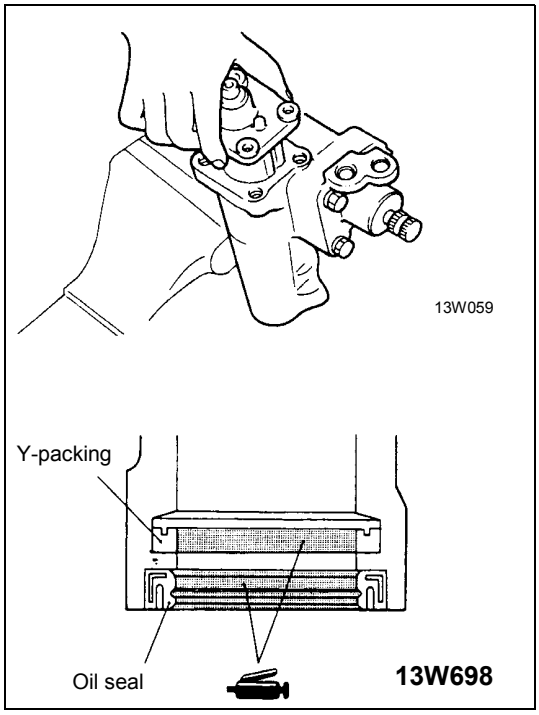


24. INSTALLATION OF ADJUSTING PLATE/25. ADJUSTING BOLT

(1) Install the adjusting plate so that the beveled part is facing downward.
(2) Using a thickness gauge, measure the clearance between the adjusting bolt and cross-shaft.
Standard value: 0 - 0.05 mm (0 – 0.002 in.)
(3) If the clearance is exceeded the standard value, replace with a suitable adjusting plate.

26. INSTALLATION OF CROSS-SHAFT/27. ADJUSTING BOLT LOCK NUT

Install the cross-shaft to the side cover, and then temporarily tighten the adjusting bolt lock nut.



29. INSTALLATION OF SIDE COVER AND CROSS-SHAFT ASSEMBLY

Install the side cover assembly (with the corss-shaft) to the gear box.

NOTE
Apply specified automatic transmission fluid to the teeth and shaft areas of the rack piston, and apply multipurpose grease to the oil seal lip.

Specified fluid: Automatic transmission fluid DEXRON or DEXRON II

Caution
Do not rotate the side cover during installation. Take care not to damage the cross-shaft oil seal.