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TRANSMISSION

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Section 51 - POWRREVERSER POWRREVERSER IS A TRADEMARK OF DEERE & COMPANY.

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Section 55 - POWRQUAD POWRQUAD IS A TRADEMARK OF DEERE & COMPANY.

TRANSMISSION

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Group 05 - Transmission Shift Controls

Group 10 - PowrQuad PowrQuad is a trademark of Deere & Company. Module

Section 56 - DRIVE SYSTEMS

Foreword

This manual is written for an experienced technician. Essential tools required in performing certain service work are identified in this manual and are recommended for use.

Live with safety: Read the safety messages in the introduction of this manual and the cautions presented throughout the text of the manual.

 This is the safety-alert symbol. When you see this symbol on the machine or in this manual, be alert to the potential for personal injury.

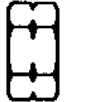
Technical manuals are divided in two parts: repair and operation and tests. Repair sections tell how to repair the components. Operation and tests sections help you identify the majority of routine failures quickly.

Information is organized in groups for the various components requiring service instruction. At the beginning of each group are summary listings of all applicable essential tools, service equipment and tools, other materials needed to do the job, service parts kits, specifications, wear tolerances, and torque values.

Technical Manuals are concise guides for specific machines. They are on-the-job guides containing only the vital information needed for diagnosis, analysis, testing, and repair.

Fundamental service information is available from other sources covering basic theory of operation, fundamentals of troubleshooting, general maintenance, and basic type of failures and their causes.

Type	
- 6100, 6506 and SE 6100	naturally aspirated diesel engine
- 6200, 6300, 6400, 6600, SE 6200, SE 6300 and SE 6400	turbocharged diesel engine
Number of cylinders	
- 6100 to 6400	4
- SE tractors	4
- 6506 and 6600	6
Bore	106.5 mm (4.19 in.)
Compression ratio	
-6100 to 6300 and 6600	17.8:1
-6400, 6506 and SE 6400	17.2:1
-SE 6100 to SE 6300	17.8:1
Stroke	
- 6100, 6400, 6506, SE 6100 and SE 6400	127.0 mm (5.00 in.)
- 6200, 6300, 6600, SE 6200 and SE 6300	110.0 mm (4.33 in.)
Displacement	
- 6100, 6400, SE 6100 and SE 6400	4530 cm ³ (276 cu.in.)
- 6200, 6300, SE 6200 and SE 6300	3920 cm ³ (239 cu.in.)
- 6506	6790 cm ³ (414 cu.in.)
- 6600	5880 cm ³ (359 cu.in.)
Firing order	
- 6100 to 6400	1-3-4-2
- SE tractors	1-3-4-2
- 6506 and 6600	1-5-3-6-2-4
Valve clearance (engine hot or cold)	
- Intake valves	0.35 mm (0.014 in.)
- Exhaust valves	0.45 mm (0.018 in.)
Slow idle	800 to 900 rpm
Fast idle	2460 to 2510 rpm
Rated engine speed	2300 rpm
Working speed range	
- 6100 to 6300 and SE 6100 to SE 6300	1500 - 2300 rpm
- 6400 and SE 6400	1600 - 2300 rpm
- 6506	1300 - 2300 rpm
- 6600	1400 - 2300 rpm
Engine power at rated engine speed (with viscous fan drive) according to ECE-R24	
- 6100 and SE 6100	55 kW (75 hp)
- 6200 and SE 6200	62 kW (84 hp)
- 6300 and SE 6300	66 kW (90 hp)
- 6400 and SE 6400	73 kW (100 hp)
- 6506	77 kW (105 hp)
- 6600	81 kW (110 hp)
Max. PTO power at rated PTO speed (factory measured, 1000 rpm PTO)	
- 6100 and SE 6100	48 kW (65 hp)
- 6200 and SE 6200	55 kW (75 hp)
- 6300 and SE 6300	59 kW (80 hp)
- 6400 and SE 6400	65 kW (88 hp)
- 6506	68 kW (92 hp)
- 6600	71 kW (96 hp)
Max. torque	
- 6100 and SE 6100 at 1500 rpm	301 N·m (222 lb-ft)
- 6200 and SE 6200 at 1500 rpm	327 N·m (241 lb-ft)
- 6300 and SE 6300 at 1500 rpm	350 N·m (258 lb-ft)
- 6400 and SE 6400 at 1600 rpm	403 N·m (297 lb-ft)
- 6506 at 1300 rpm	430 N·m (320 lb-ft)
- 6600 at 1600 rpm	455 N·m (336 lb-ft)

SAE Grade and Head Markings	1 or 2 ^b 	5 	5.1 	5.2 	8 	8.2 
SAE Grade and Nut Markings	2 	5 			8 	

Size	Grade 1				Grade 2 ^b				Grade 5, 5.1, or 5.2				Grade 8 or 8.2			
	Lubricated ^a		Dry ^a		Lubricated ^a		Dry ^a		Lubricated ^a		Dry ^a		Lubricated ^a		Dry ^a	
	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft
1/4	3.7	2.8	4.7	3.5	6	4.5	7.5	5.5	9.5	7	12	9	13.5	10	17	12.5
5/16	7.7	5.5	10	7	12	9	15	11	20	15	25	18	28	21	35	26
3/8	14	10	17	13	22	16	27	20	35	26	44	33	50	36	63	46
7/16	22	16	28	20	35	26	44	32	55	41	70	52	80	58	100	75
1/2	33	25	42	31	53	39	67	50	85	63	110	80	120	90	150	115
9/16	48	36	60	45	75	56	95	70	125	90	155	115	175	130	225	160
5/8	67	50	85	62	105	78	135	100	170	125	215	160	240	175	300	225
3/4	120	87	150	110	190	140	240	175	300	225	375	280	425	310	550	400
7/8	190	140	240	175	190	140	240	175	490	360	625	450	700	500	875	650
1	290	210	360	270	290	210	360	270	725	540	925	675	1050	750	1300	975
1-1/8	400	300	510	375	400	300	510	375	900	675	1150	850	1450	1075	1850	1350
1-1/4	570	425	725	530	570	425	725	530	1300	950	1650	1200	2050	1500	2600	1950
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2150	1550	2700	2000	3400	2550
1-1/2	1000	725	1250	925	990	725	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

^a "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.

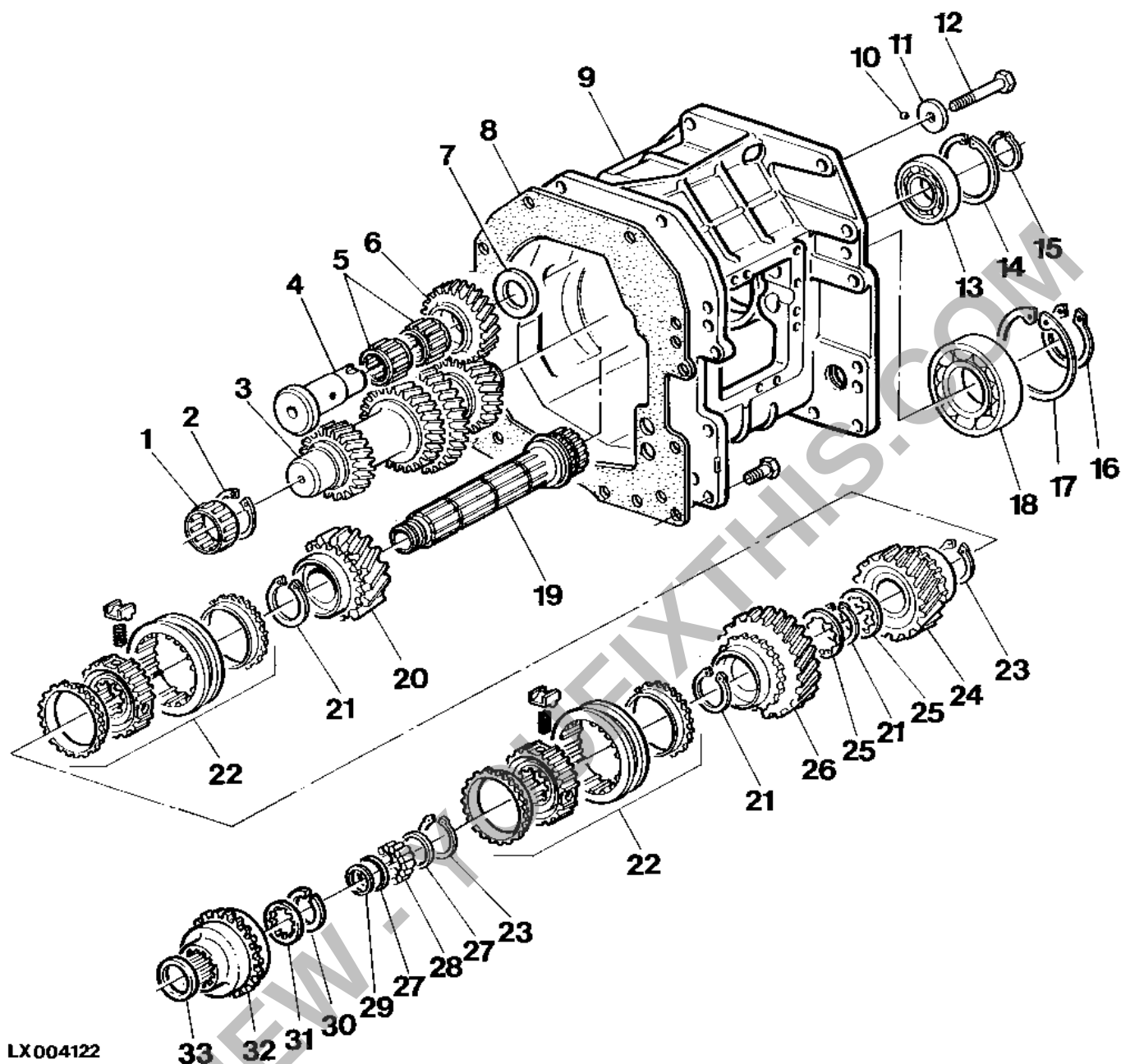
^b Grade 2 applies for hex cap screws (not hex bolts) up to 152 mm (6-in.) long. Grade 1 applies for hex cap screws over 152 mm (6-in.) long, and for all other types of bolts and screws of any length.

Fasteners should be replaced with the same or higher grade. If higher grade fasteners are used, these should only be tightened to the strength of the original.

Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

Metric Bolt and Cap Screw Torque Values

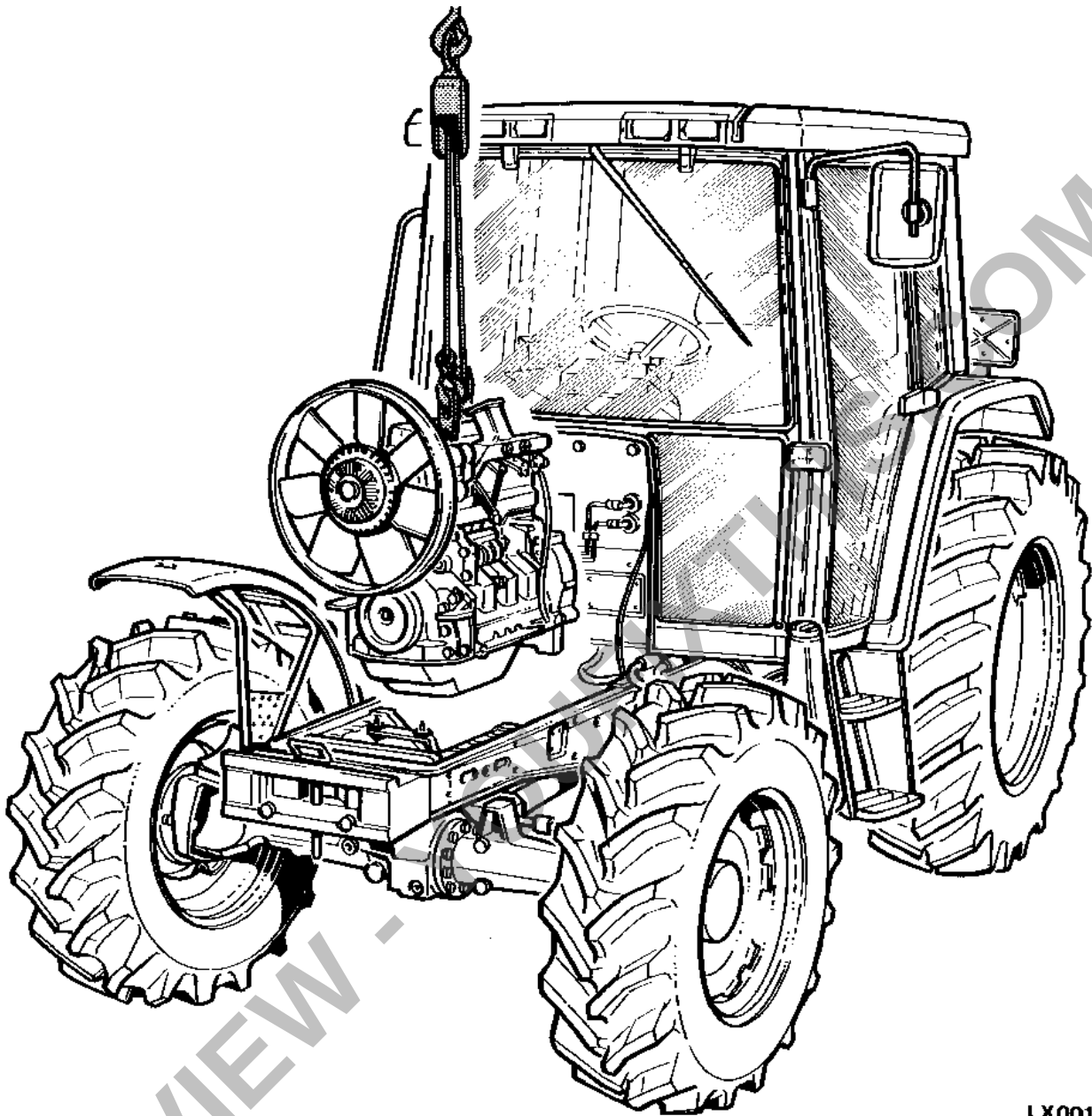


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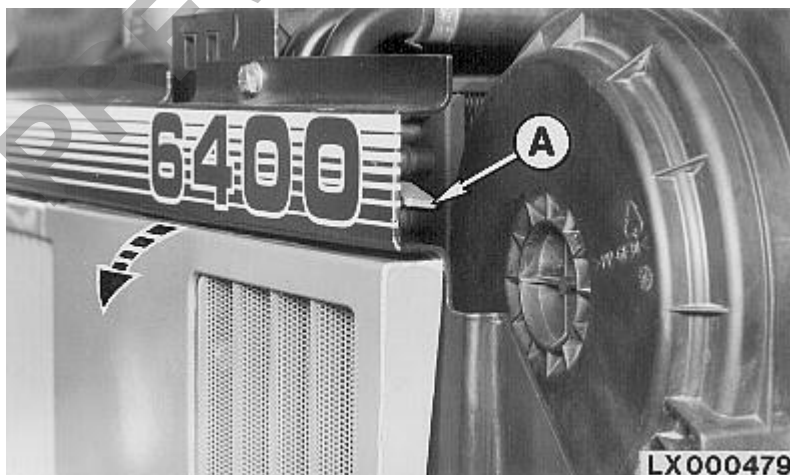
LEGEND:

- | | |
|----|----------------------|
| 1 | Needle bearing |
| 2 | Snap ring |
| 3 | Countershaft |
| 4 | Intermediate shaft |
| 5 | Needle bearing |
| 6 | Idler gear |
| 7 | Washer |
| 8 | Seal |
| 9 | Transmission housing |
| 10 | Ball |
| 11 | Washer |
| 12 | Cap screw |
| 13 | Ball bearing |
| 14 | Snap ring |
| 15 | Snap ring |

Removing Engine (6100 - 6400, and SE)



LX001880



LX000479

Remove service cover on l.h. and r.h. sides.

Specifications

Item	Measurement	Specification
Torques		
PERMA-CLUTCH 2™ to gear transmission, cap screws	Torque	50 N·m (35 lb-ft)
Cover to clutch drum, cap screws	Torque	50 N·m (35 lb-ft)
Transmission oil pump to clutch housing, cap screws	Torque	25 N·m (18 lb-ft)
Front cover and filter housing to clutch housing, cap screws	Torque	11 N·m (8 lb-ft)
Test ports, plugs	Torque	8 to 14 N·m (6 to 10 lb-ft)
Sending unit for oil temperature warning light	Torque	max. 30 N·m (22 lb-ft)
Temperature sending unit for oil filter restriction warning light	Torque	max. 30 N·m (22 lb-ft)
Pressure sending unit for oil filter restriction warning light	Torque	30 N·m (22 lb-ft)
Pressure sending unit for system (engagement) indicator light	Torque	30 N·m (22 lb-ft)
Spring test values (approximate)		
Clutch return springs	Spring length	43 mm (1.69 in.)
	Test length	31 mm at 364 - 444 N (1.22 in. at 82 - 100 lb)
Engagement override valve spring	Spring length	34 mm (1.34 in.)
	Test length	24.5 mm at 65 - 79 N (0.96 in. at 15 - 18 lb)
Clutch cooling valve spring	Spring length	44 mm (1.73 in.)
	Test length	27 mm at 45 - 55 N (1.06 in. at 10 - 12 lb)
Spring on clutch cooling pilot valve	Spring length	84 mm (3.30 in.)
	Test length	64 mm at 157 - 173 N (2.52 in. at 35 - 39 lb)
Spring on filter relief valve	Spring length	97 mm (3.82 in.)
	Test length	74 mm at 90 - 110 N (2.91 in. at 20 - 25 lb)
Spring on lube relief valve	Spring length	57 mm (2.24 in.)
	Test length	46.5 mm at 45 - 55 N (1.83 in. at 10 - 12 lb)
Spring on cooler relief valve	Spring length	50 mm (1.97 in.)
	Test length	40 mm at 170 - 210 N (1.57 in. at 38 - 47 lb)
Spring on pressure regulating valve	Spring length	132.5 mm (5.22 in.)
	Test length	118 mm at 275 - 335 N (4.65 in. at 62 - 75 lb)
Spring in the clutch pedal valve - Inner spring	Spring length	63.5 mm (2.50 in.)
	Test length	59 mm at 24 - 32 N (2.32 in. at 5.4 - 7.2 lb)
Spring in the clutch pedal valve - Outer spring	Spring length	57 mm (2.24 in.)
	Test length	55 mm at 24 - 32 N (2.17 in. at 5.4 - 7.2 lb)

Preliminary Work

Remove PERMA-CLUTCH 2™. See Group 00.

Assembling Drive Shaft



Install reverse gear (B) with connecting ring (A) on drive shaft.

Install snap ring.



Install synchronizer ring (B) and snap ring (A).

→NOTE:

Axial play of synchronizer ring must be less than 0.1 mm (0.004 in.).

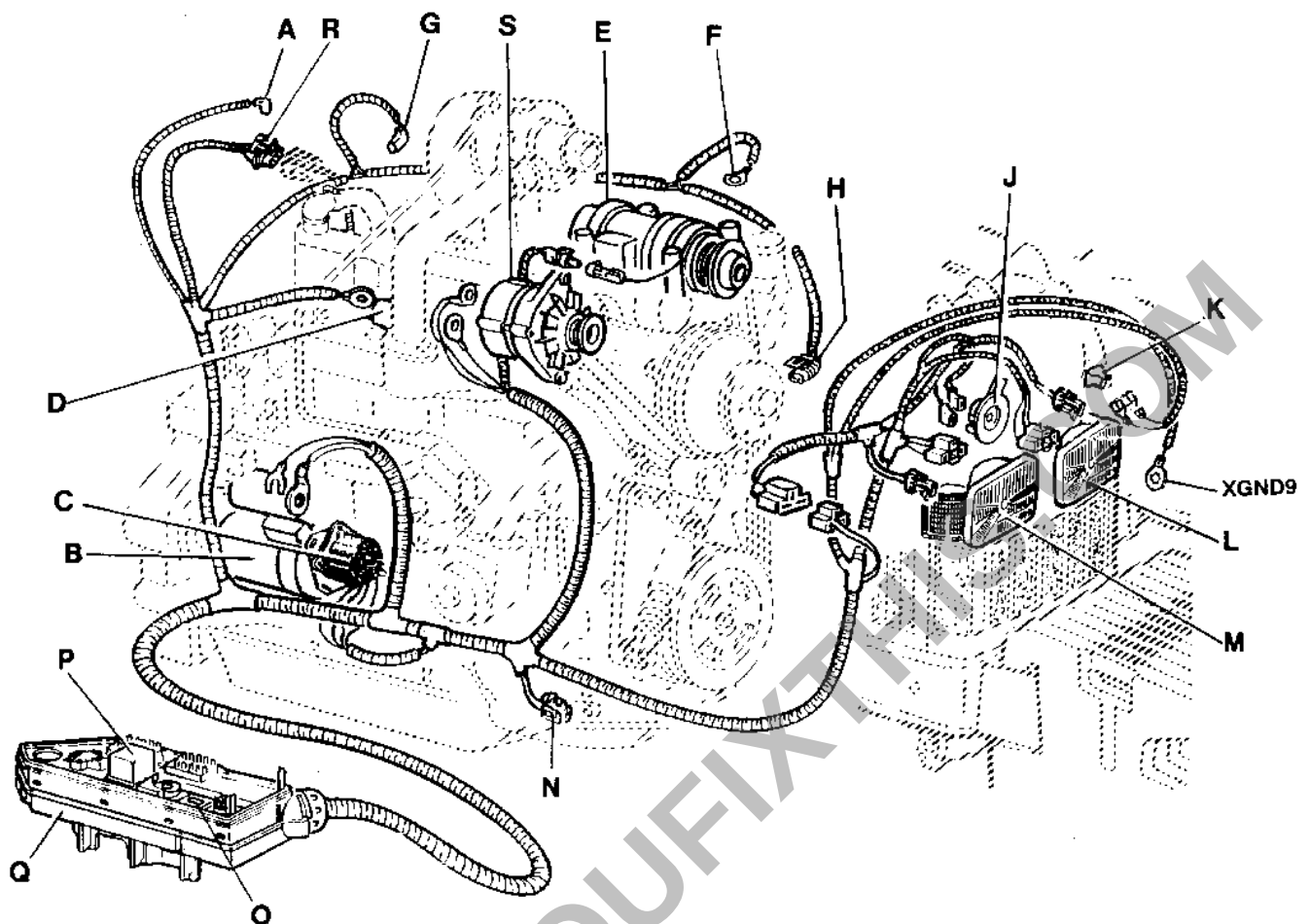
Thickness of snap rings available

1.45 mm (0.057 in.)

1.55 mm (0.061 in.)

1.65 mm (0.065 in.)

1.75 mm (0.069 in.)

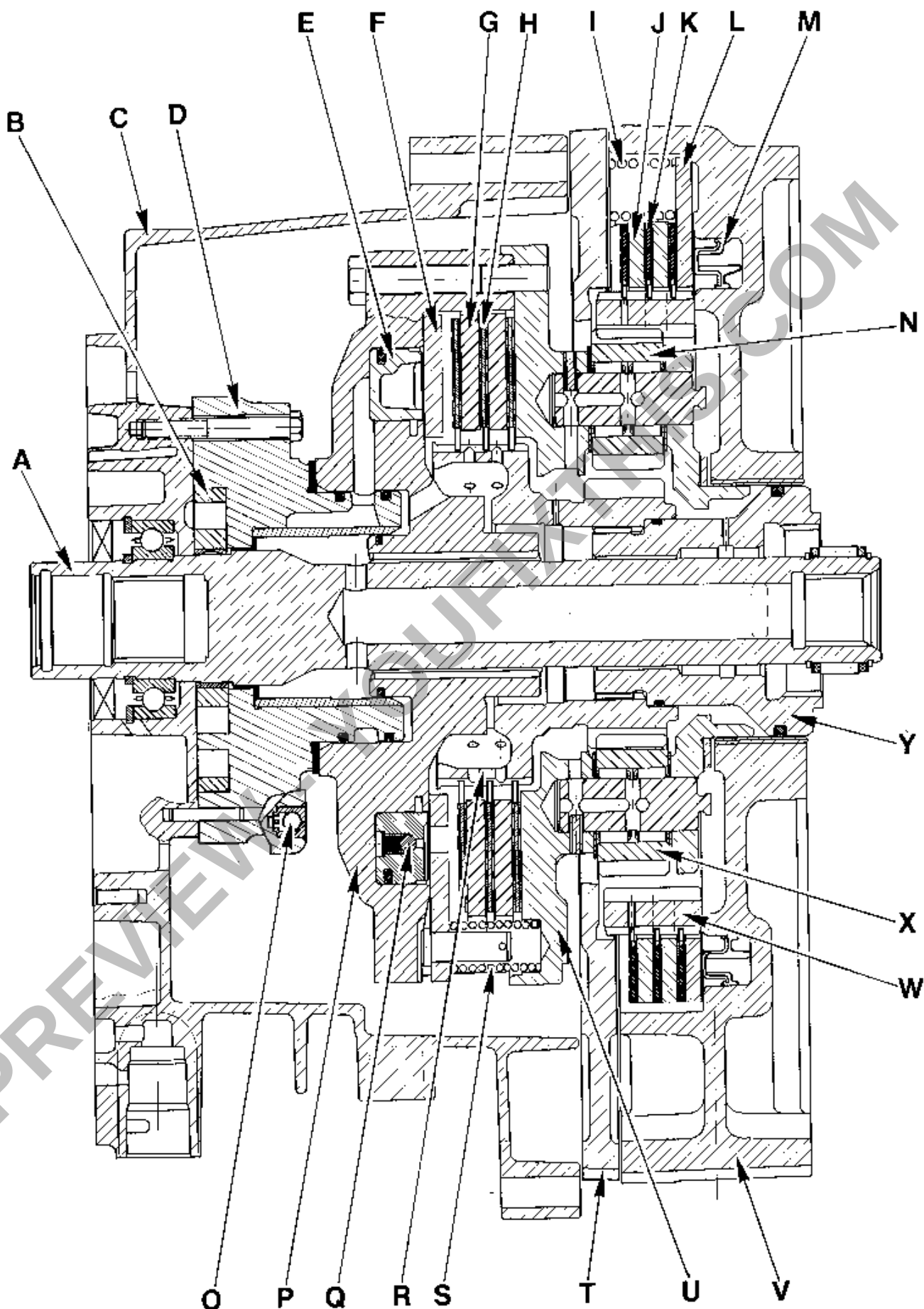


LX012943

LEGEND:

- A Plug (coolant temperature gauge)
- B Starting motor
- C Starting motor relay
- D Glow plug (electrical starting aid)
- E Compressor
- F Plug (injection pump shut-off valve)
- G Plug (engine oil pressure warning lamp)
- H Plug (speed meter sending unit)
- J Horn
- K Plug (sending unit of air cleaner indicator light)
- L Headlight, left-hand
- M Headlight, right-hand
- N Plug (front PTO)
- O Fuse (electrical starting aid)
- P Relay of electrical starting aid
- Q Plug (connecting point-engine)
- R Plug (fuel preheater)
- S Alternator

Removing and Installing Cab Wiring Harness

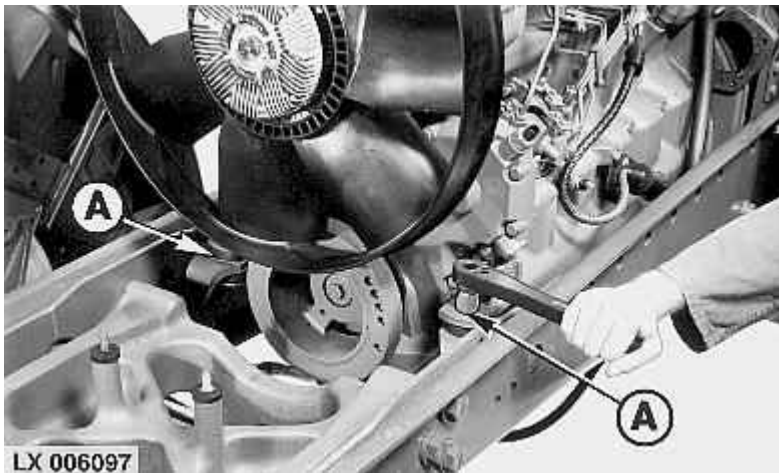


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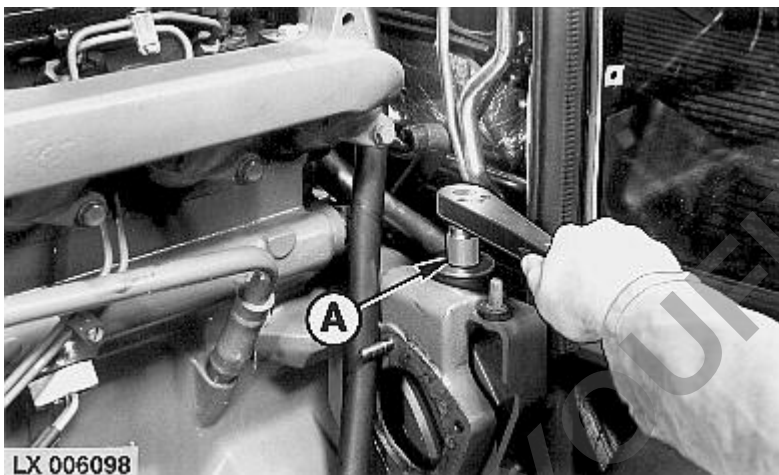
LEGEND:

Group 05 - Special Tools (Dealer-Fabricated)

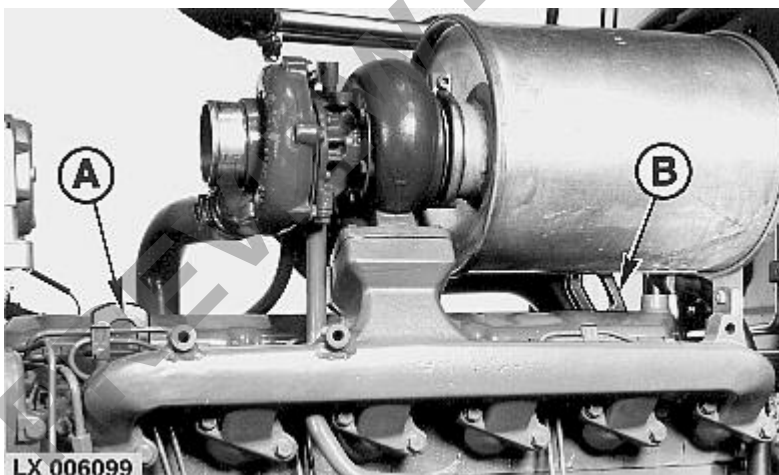
PREVIEW - YOUFIXTHIS.COM



Remove cap screws (A) of front engine supports.



Remove cap screws (A) of rear engine supports.

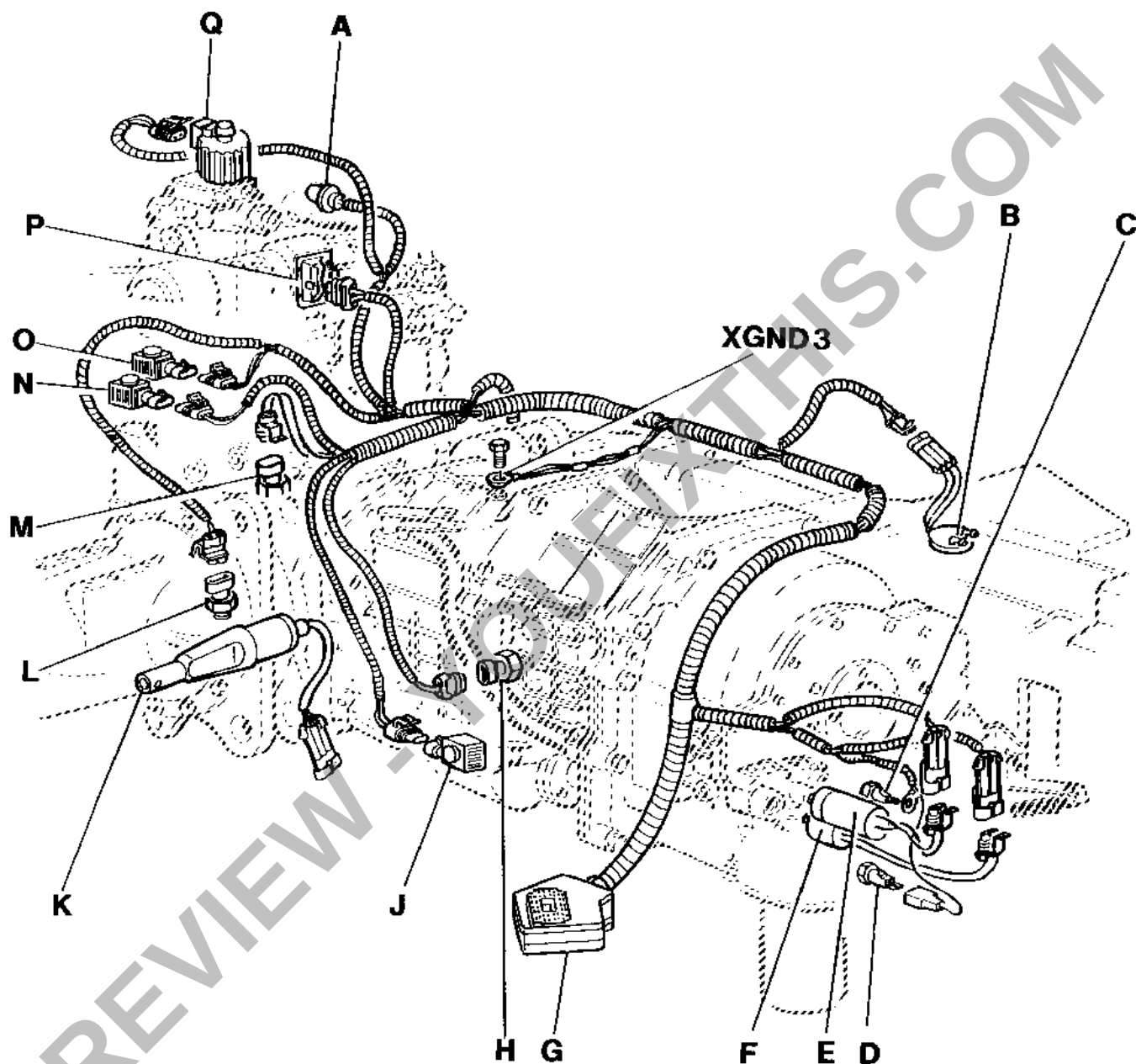


LEGEND:

- A Lifting eye JD-244-2
- B Lifting eye JD-244-1

Attach lifting eyes (A) and (B) to cylinder head.

Removing and Installing Transmission Wiring Harness

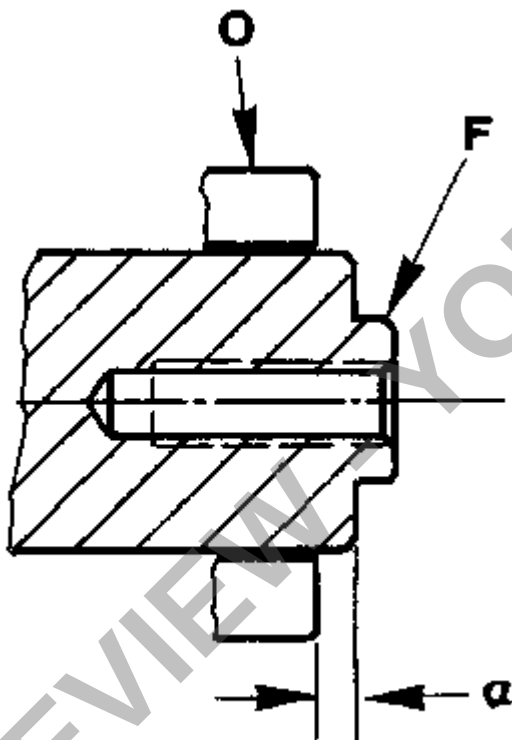


LX012946

LEGEND:

- A 7-terminal socket
- B Sending unit, fuel gauge and fuel pump
- C High temperature switch
- D Low temperature switch
- E Sending unit, oil filter warning light
- F Sending unit, engagement oil warning light
- G Plug (connecting point-transmission)
- H Neutral start switch
- J Front wheel drive solenoid

G	Belleville spring (4 used)
H	Quadrant, 2nd and 3rd gear
I	Bearing bushing (4 used)
J	Washer (6 used)
K	Quadrant, reverse and 1st gear
L	Shift lever
M	Support
N	Self-locking hex. nut
O	Quadrant, parking lock
P	Shim (thickness as required)
Q	Console
R	Parking lock spring
S	Bracket
T	Rubber sleeve
U	Bowden cable, parking lock
V	Bowden cable, reverse and 1st gear
W	Bowden cable, 2nd and 3rd gear



LX1016909

Assembly

- [1] - Assemble shift linkage parts using illustration as a guide.
- [2] - Tighten self-locking hex. nut (N) to 35 N·m (25 lb-ft).

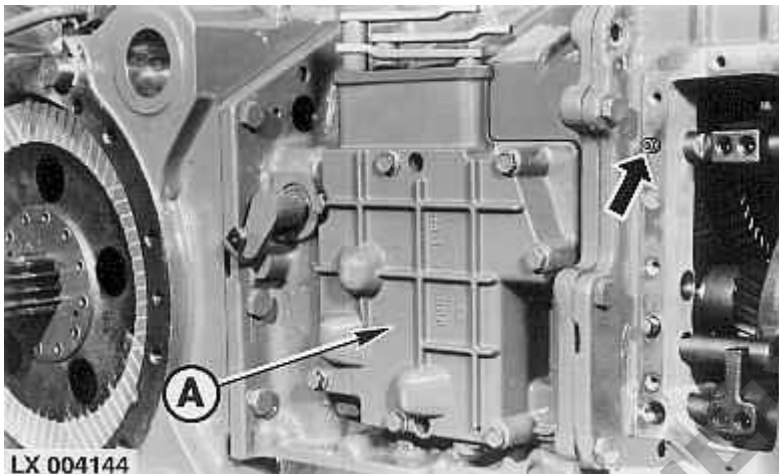
Adjusting pretension at quadrants

- [1] - Install parts (D) to (O).

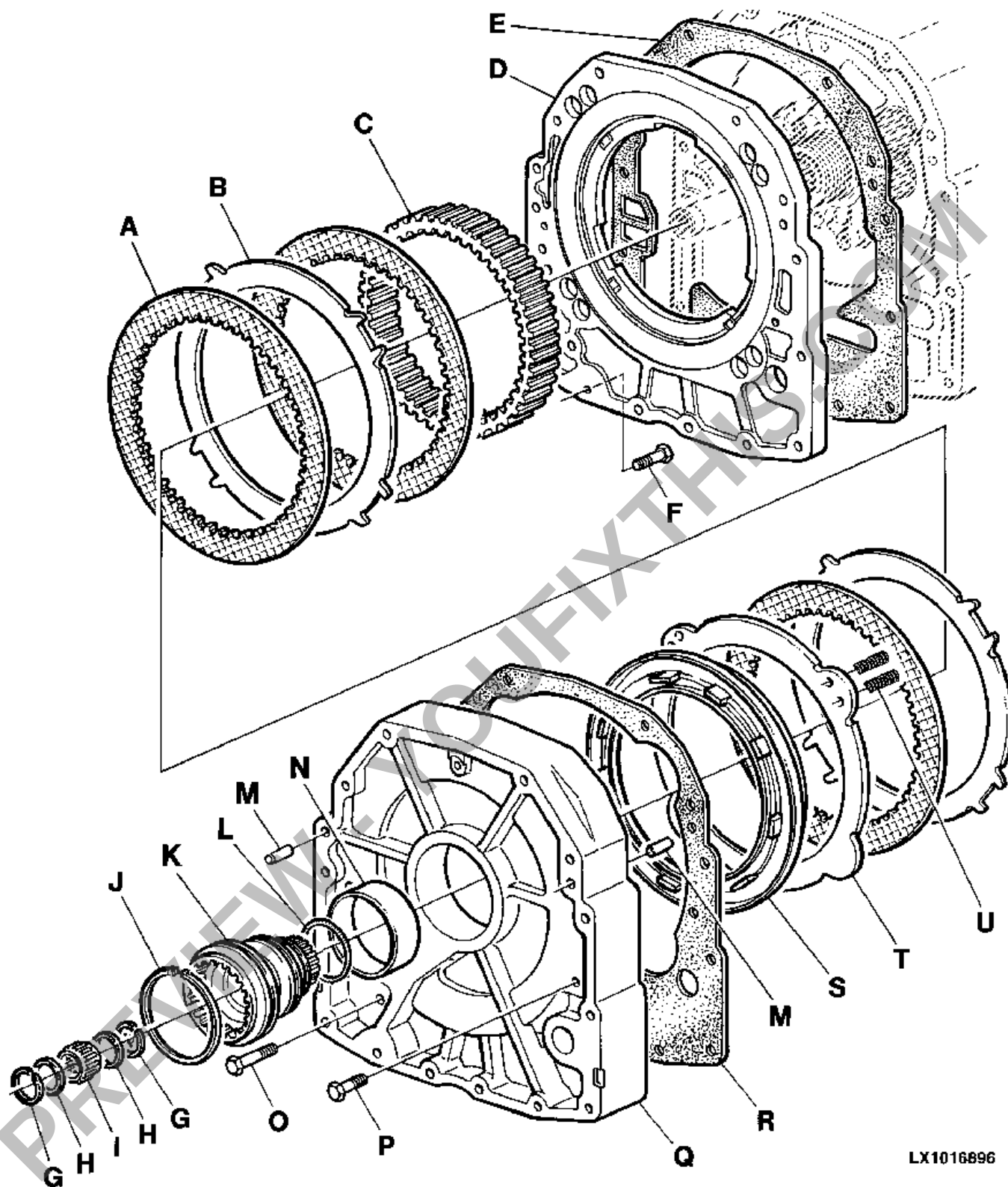
→NOTE:

The illustration shows the 18-gear transmission (SyncroPlus [™]) or 24-gear transmission (PowrQuad [™]). On the 15-gear transmission (SyncroPlus [™]) or 20-gear transmission (PowrQuad [™]) a spacer is installed instead of the range F gear (H).

Preliminary Work



- [1] - Remove hydraulic clutch and gear transmission, see Group 00.
- [2] - Without creeper transmission: Remove cover at option transmission.
With creeper transmission: Remove shift cover and shifter shaft lock (see arrow).
- [3] - Remove range transmission shift cover (A).
- [4] - Remove the cap screw that attaches the countershaft to the differential drive shaft.
- [5] - Remove option transmission; refer to Group 00.



LX1016896

LEGEND:

- A Internally toothed brake disk (3 used)
- B Externally toothed brake disk (2 used)
- C Ring gear
- D Plate
- E Gasket
- F Cap screw
- G Snap ring

[1] - Make sure that the range shift lever is adjusted correctly. i.e. shift quadrants (B)

[20-and 24-speed transmissions only]

, (C) and (D) must be aligned precisely (see illustration opposite, above).

[2] - Disengage parking lock bowden cable (I).

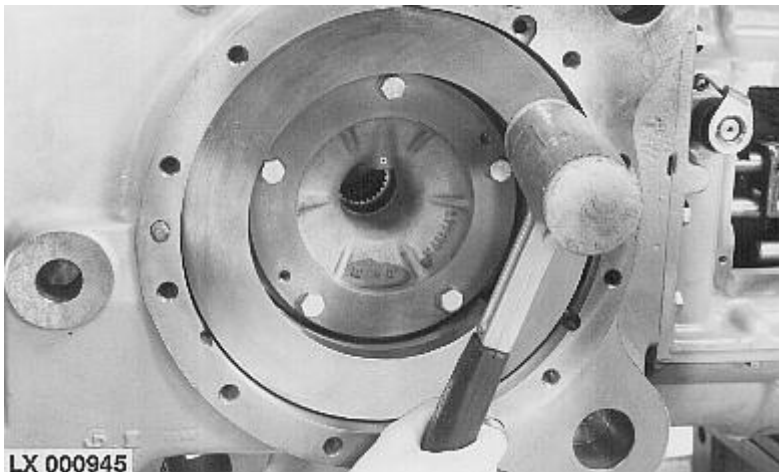
[3] - With range shift lever (A) in neutral, slacken off screws (G) and adjust the stop (F) so that the parking lock shift quadrant (E) is aligned precisely with the other shift quadrants (see arrow). Retighten screws (G).

[4] - Press down on the yoke of the parking lock bowden cable (apply force!), so that the parking lock cannot operate.

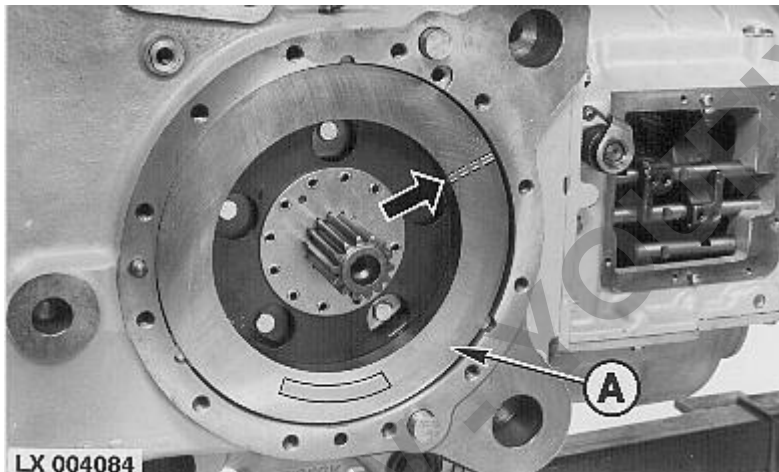
[5] - Pull gently on the yoke of the bowden cable so that the free play before actuation (approx. 2 mm; 0.08 in.) is removed from the cable. Hold the bowden cable in this zero-clearance position and turn the yoke until the bores in the yoke are aligned exactly with the bores in the shift quadrant. Engage the bowden cable again.

[6] - Carry out the adjustment once again.

Installing the Final Drives



Before installing the final drive housings, make sure that the brake piston is properly in contact with the differential housing.

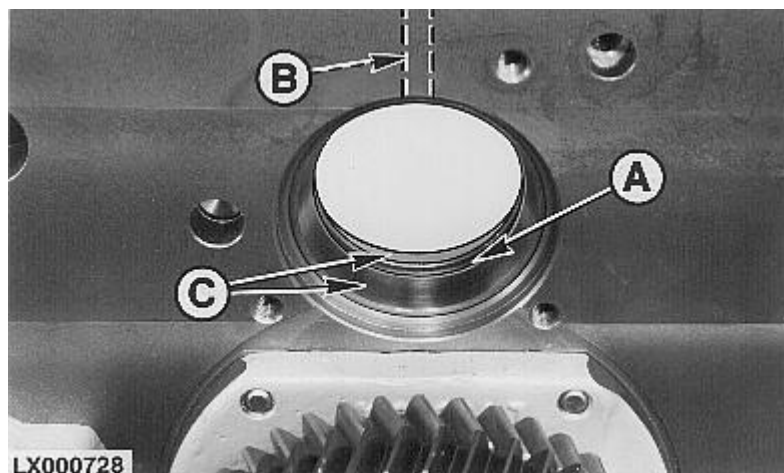


Install brake plate (A).

IMPORTANT:

The bore (see arrow) must be above the final drive shaft.

Installing Pump Drive



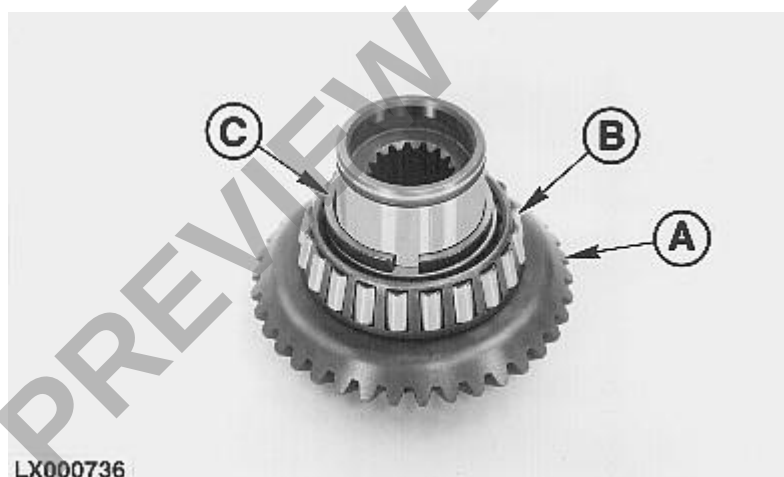
Insert snap ring (A) into groove in differential housing.

IMPORTANT:

Turn snap ring (A) in relation to the differential housing so that lubricating bore (B) is not covered.

Do not confuse the drive shaft snap rings with those for the output shaft.

Install taper roller bearing cones (C).



LEGEND:

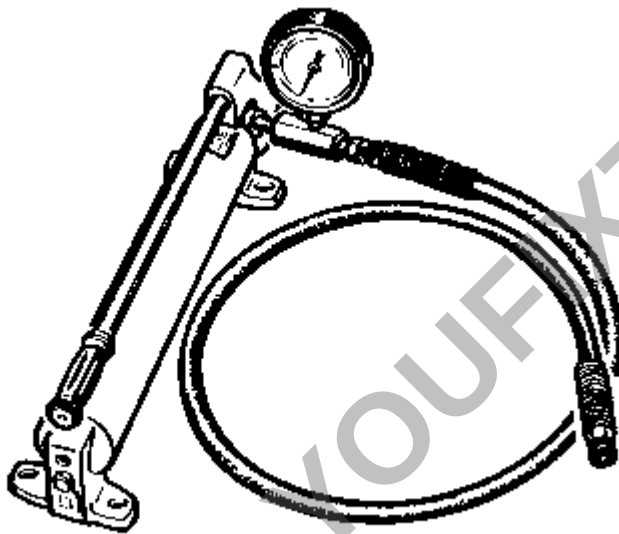
- A Input pinion
- B Taper roller bearing cone
- C Spacer ring

With taper roller bearing cone (B) in place, insert drive pinion (A) into the differential housing. Install the second taper roller bearing cone.

OSPC 200 LS (Danfoss)	X		X	X	X		
OSPF 100 LS (Danfoss)	X		X	X	X		
OSPF 125 LS (Danfoss)	X		X	X	X		
OSPF 160 LS (Danfoss)	X		X	X	X		
OSPF 200 LS (Danfoss)	X		X	X	X		
120-156 Q-AMP (Char-Lynn)		X					
OSPQ 125/200 LS (Danfoss)	X		X			X	X

Hydraulic hand-operated pump

D01019AA

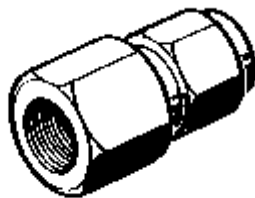


LX 001059

Adjusting double-acting shock valves

Coupler

JT03248



LX 001080

Adjusting double-acting shock valves

[2] - Measure pedal play at both pistons.

Pedal play must be between 0.15 and 0.20 mm (0.006 and 0.008 in.).

[3] - Adjust pedal play at screws (A).

IMPORTANT:

Never adjust the pedals singly. The only way to adjust the pedals and ensure that the brakes operate properly is to lock them together.

→NOTE:

If the prescribed degree of play cannot be obtained at both pedals, one pedal may have a greater play.

Bleeding the Brakes

Refer to Group 20 before bleeding the brakes.

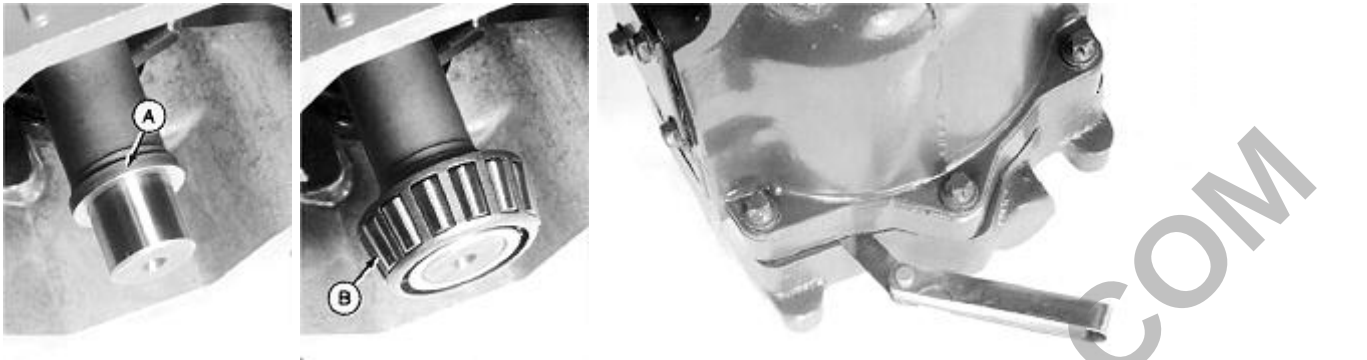
Adjusting the Stop Light Switch



[1] - Ensure that the brake system is free of leaks and correctly bled.

[2] - Remove bleed screw.

Adjust Shaft Bearing Preload 40 cm³ (2.4 cu.in) Pump



IMPORTANT:

Bearing preload adjustment must be performed if pump housing, shaft, pump cover, or shaft bearing cones and cups have been replaced.

→NOTE:

Bearing spacer kits are available.

- Install the thickest bearing spacer (A) on the shaft with the chamfer facing into the housing.
- Install new bearing cone (B).
- Install the housing to the pump cover without the gasket or the rotating group. Turn the shaft to seat the bearings.
- Install and tighten evenly the six special screws to 0.6 N·m (5 lb-in.).
- Measure the gap between the pump cover and the pump housing in four locations to obtain an average dimension (adding the four measurements and dividing by four).

Calculate the correct bearing spacer thickness as follows:

3.87 mm		Thickness of bearing spacer
- 0.69 mm		Average gap (example)
+ 0.08 mm	± 0.03 mm	Preload setting
+ 0.51 mm		Compressed thickness of gasket
<hr/>		
= 3.77 mm	± 0.03 mm	Required spacer thickness to provide 0.08 ± 0.03 mm preload

Remove the pump cover, bearing cone, and spacer.

Install O-ring (A) and wiper seal (B) with inner lip positioned up.

Install seal plate (C) with tab (D) and pointer (E) positioned as illustrated.

Inspect spring (G). Install spring seats (F) and spring.

Item	Measurement	Specification
New Spring	Free Length (approximate)	56 mm (2.2 in.)
	Test Length	28.5 mm at 136-156 N (1.1 in. at 30-35 lb force)

IMPORTANT:

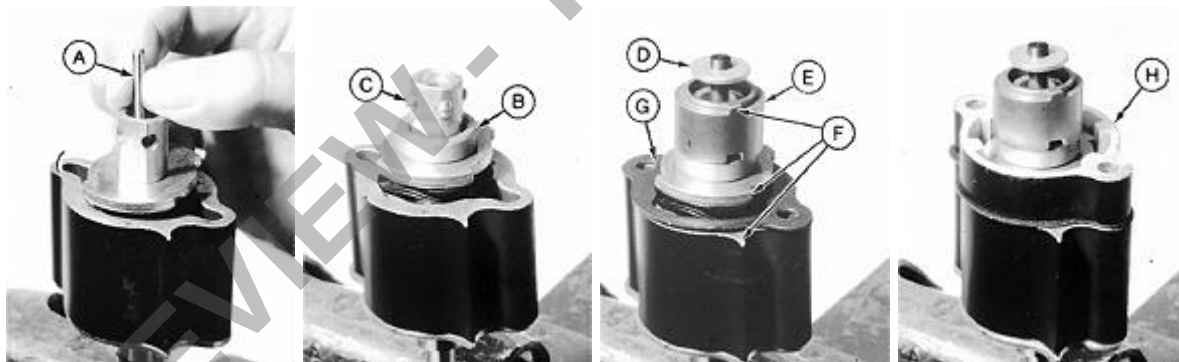
Allow a minimum of 30 minutes cure time before installing control valve.

Clean the threads on the spool end (H) removing old sealer material. Apply T43513 Threadlock and Sealer to threads and install spool end.

Install spacer (I) and washer (J).

Install the two wave springs (K) making sure the cut ends are not together.

Install the alignment plate (M) with index mark (L) toward spacer (I). Note alignment points (N).



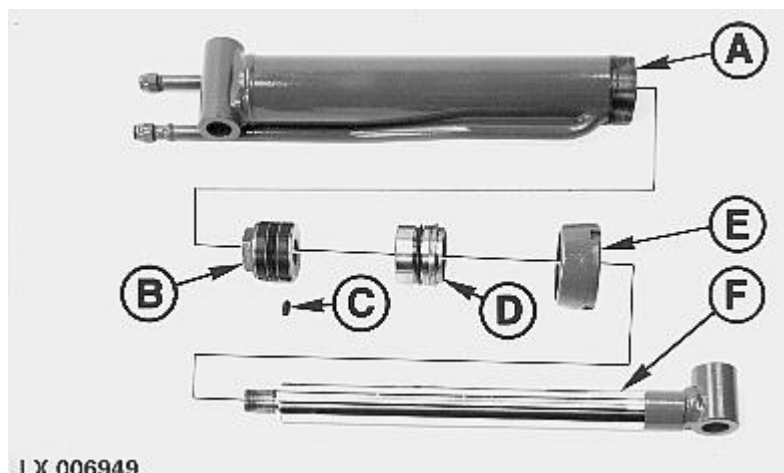
LEGEND:

A	Pin
B	Float Detent Sleeve
C	Steel Balls (4 used)
D	Detent Assembly
E	Detent Sleeve
F	Alignment Points
G	Gasket
H	Alignment Spacer

Install pin (A) with beveled end up. Use a small tool to install pin in the spool end.

Install sleeve (B) with lip side up.

Repairing Hydraulic Cylinder

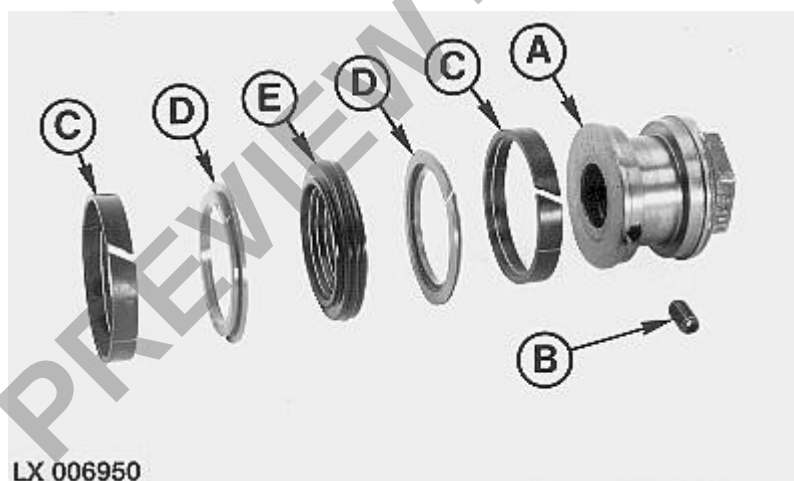


LEGEND:

A	Cylinder
B	Piston
C	Threaded pin
D	Guide bushing
E	Union
F	Piston rod

→NOTE:

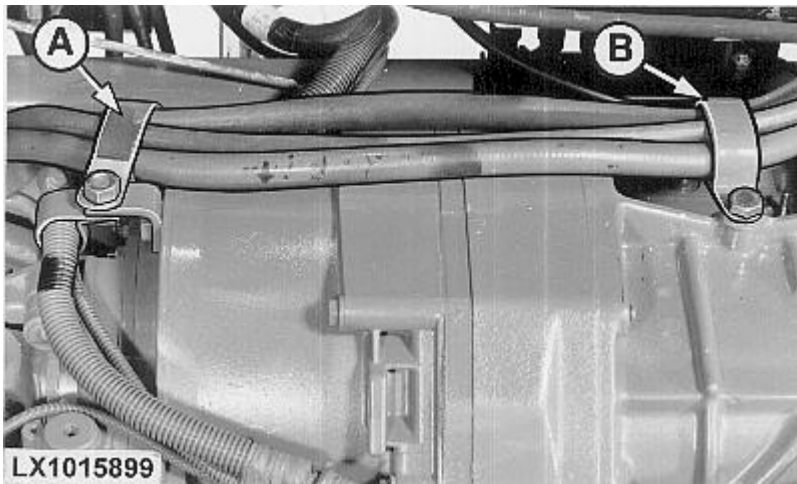
Threaded pin (C) is located under back-up ring of piston (B).



LEGEND:

A	Piston
B	Threaded pin
C	Back-up ring
D	Back-up ring
E	Piston ring

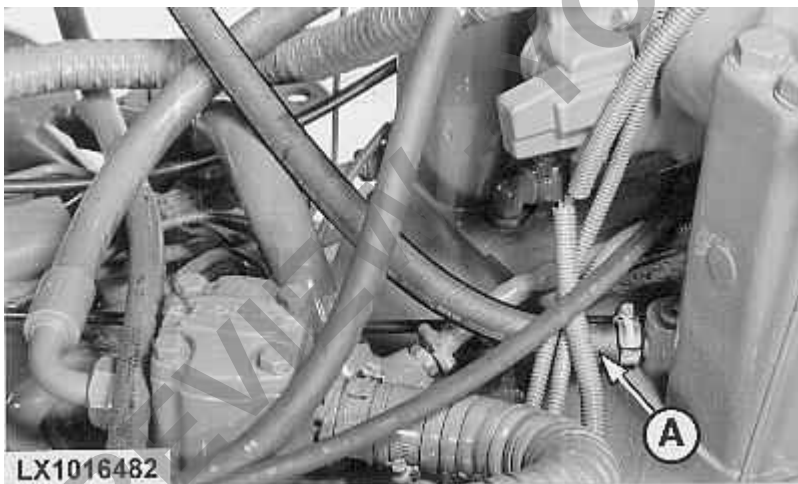
Replace piston seals.



Install the steering control line in its retaining clamps (A) and (B). Then secure the clamps to the transmission.

⚠ CAUTION:

Do not perform this job until the cab has been secured SAFELY in its temporary position above the cab mountings. Avoid accidents!



Connect steering return hose (A).

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