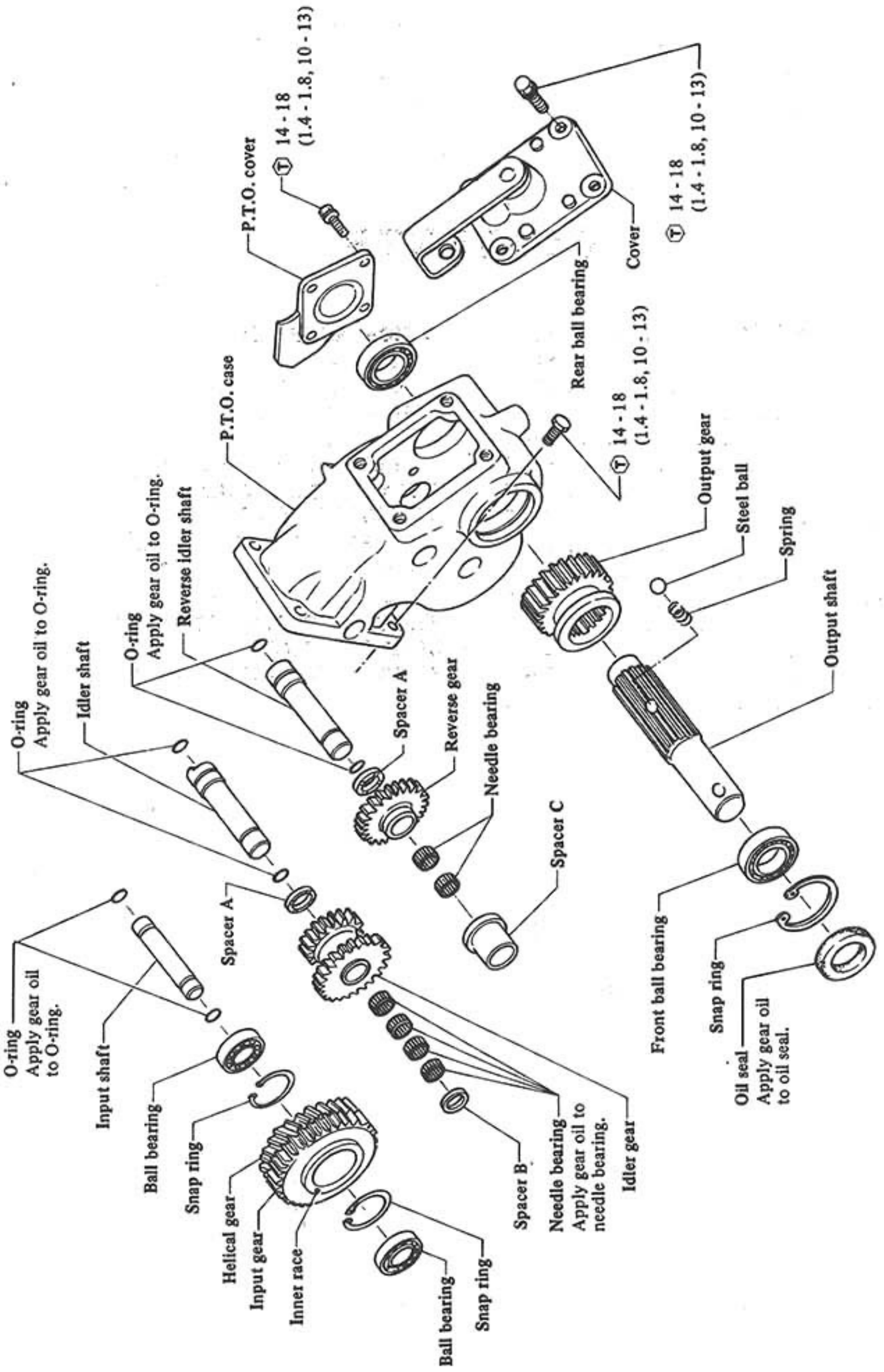
SPECIAL EQUIPMENT

CONTENTS

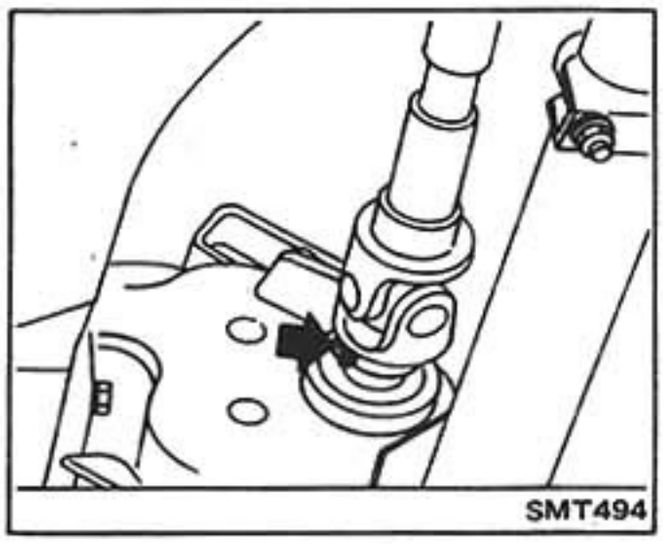
P.T.O. (Power Take-Off)



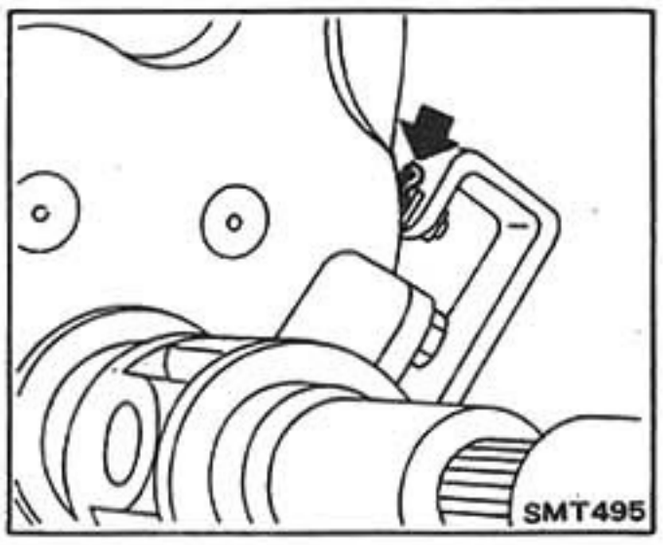
SSE036

REMOVAL

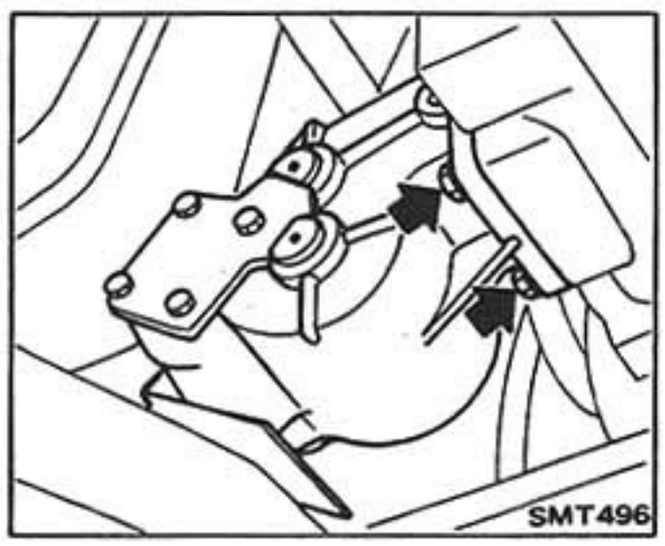
1. Drain oil from transmission case.
2. Remove pin from drive shaft.



3. Slide rear joint of drive shaft forward.
4. Remove P.T.O. control cable.



5. Remove P.T.O. unit.



INSTALLATION

Install P.T.O. unit in reverse order of removal, paying attention to the following points.

- Before installing, clean mating surfaces of P.T.O. case and transmission case.
- Remove filler plug and fill transmission with recommended gear oil to the level of the plug hole.

Oil capacity:
2.7 liters
(4-3/4 Imp pt)

- **Apply sealant to threads of filler plug,** and install filler plug to transmission case.

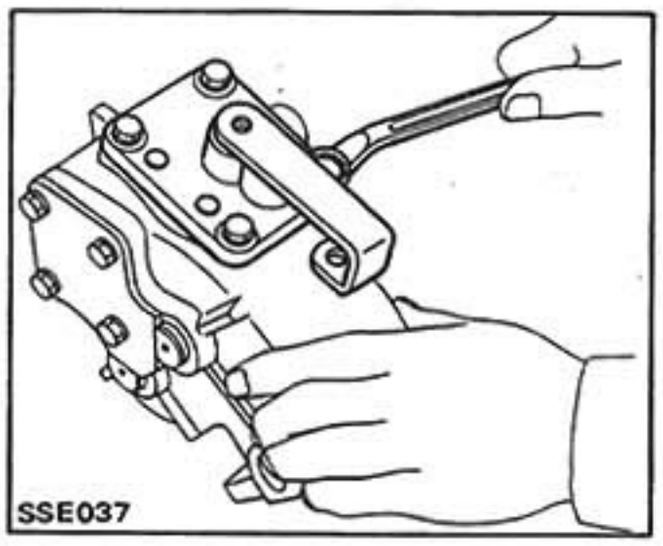
Ⓣ **: Filler plug**
25 - 34 N·m
(2.5 - 3.5 kg-m, 18 - 25 ft-lb)

- Tighten bolts securing transmission to P.T.O. unit.

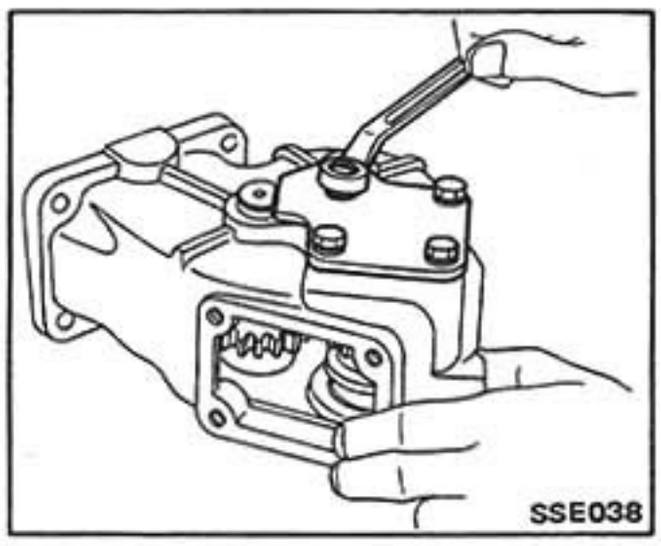
Ⓣ **: 14 - 18 N·m**
(1.4 - 1.8 kg-m, 10 - 13 ft-lb)

DISASSEMBLY

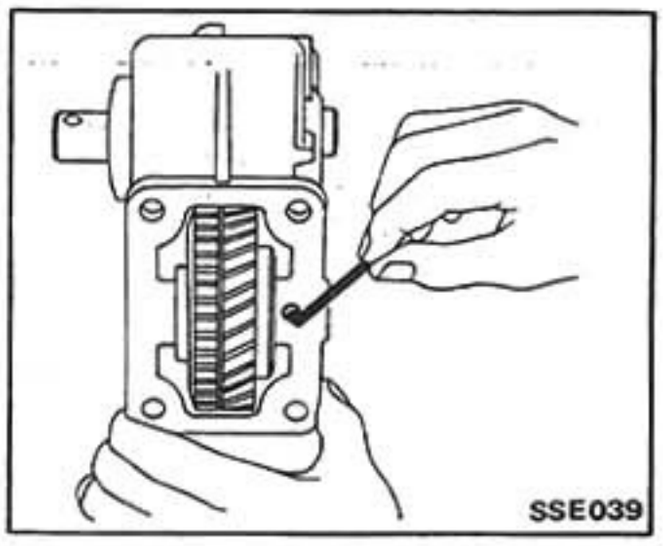
1. Remove cover and gasket.



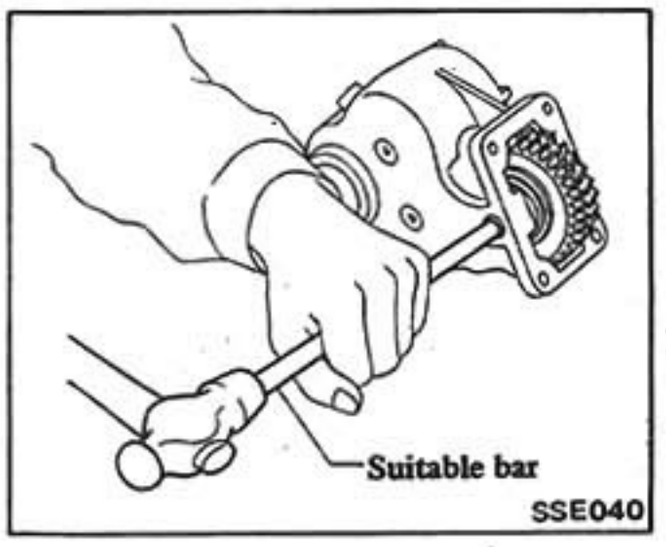
2. **Measure gear end play.**
Refer to Gears and Shafts for inspection.
3. Remove P.T.O. cover and gasket.



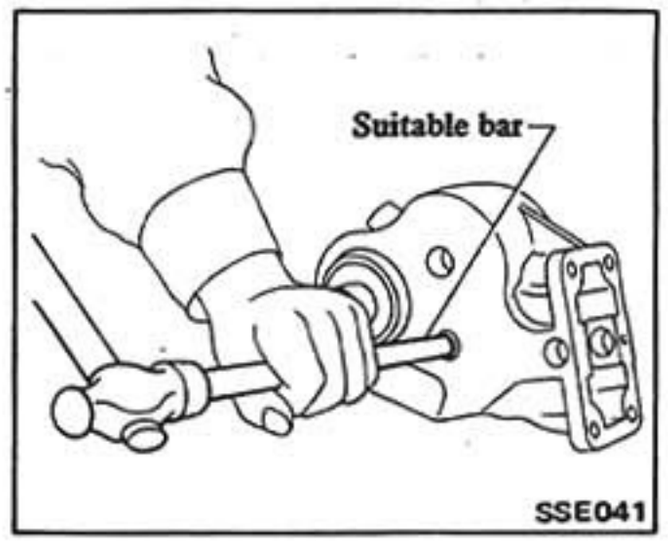
4. Remove screw.



5. Remove input shaft by tapping it.
Helical and input gears, inner race and ball bearings can be removed together.

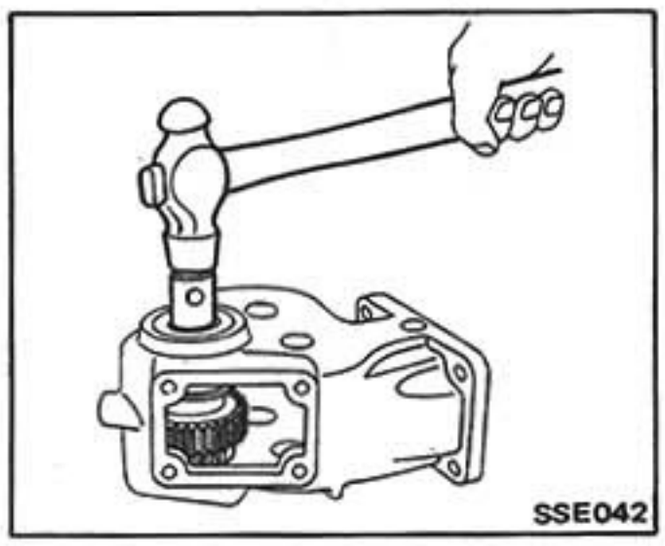


6. Remove idler shaft by tapping it. Idler gear, needle bearings and spacers A and B can be removed.

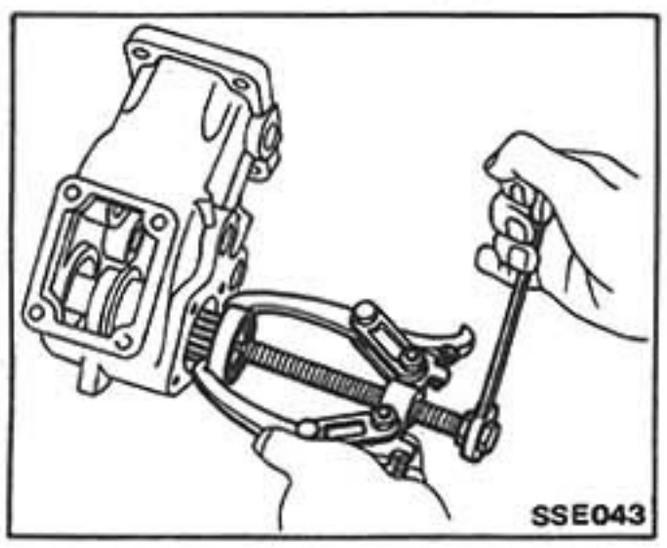


7. Remove reverse idler shaft, reverse gear, spacer A, spacer C and needle bearings in the same manner as step 6.

8. Tap front end of output shaft to remove front ball bearing.

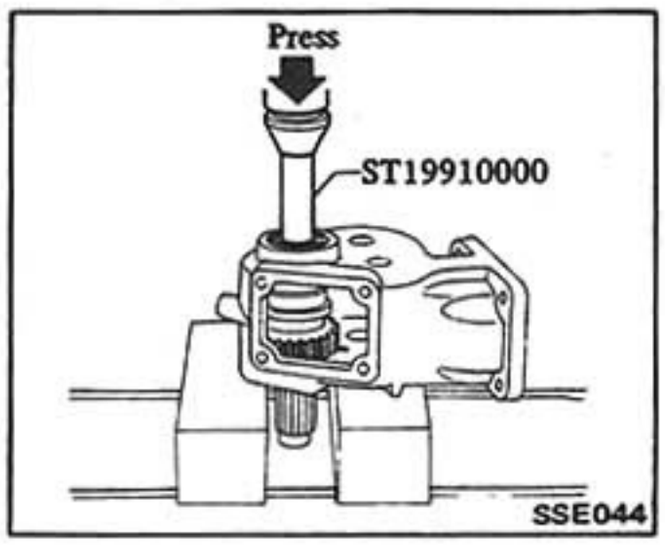

SSE042

9. Remove rear ball bearing.


SSE043

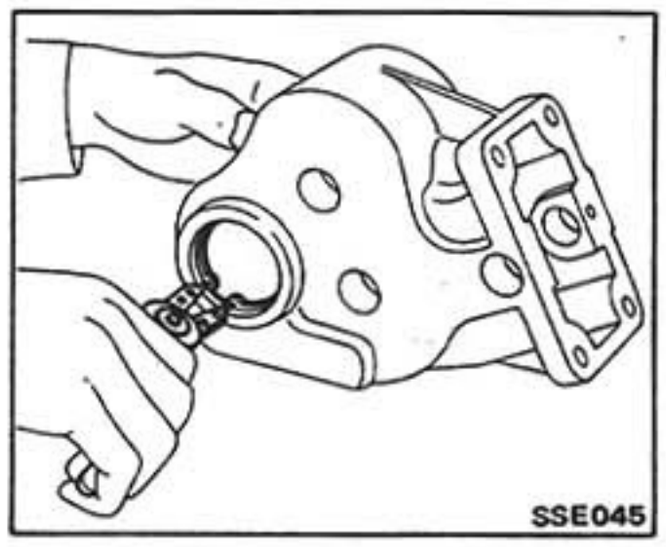
10. Press out output shaft, output gear and front ball bearing.

Be careful not to lose steel ball and spring.

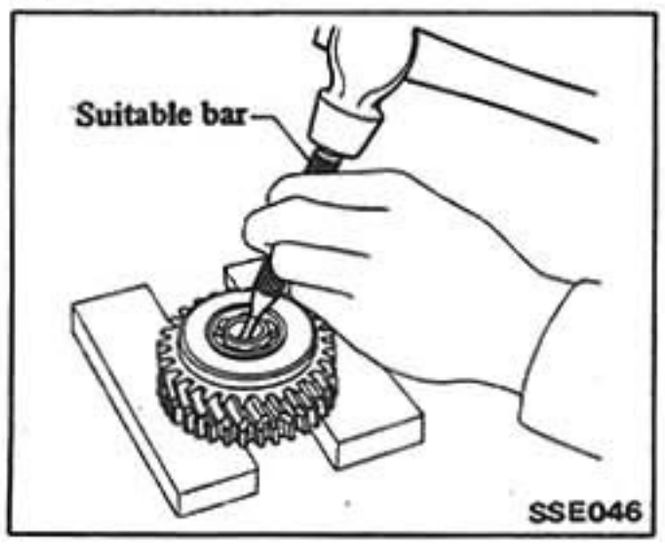


SSE044

11. Remove oil seal then remove snap ring.

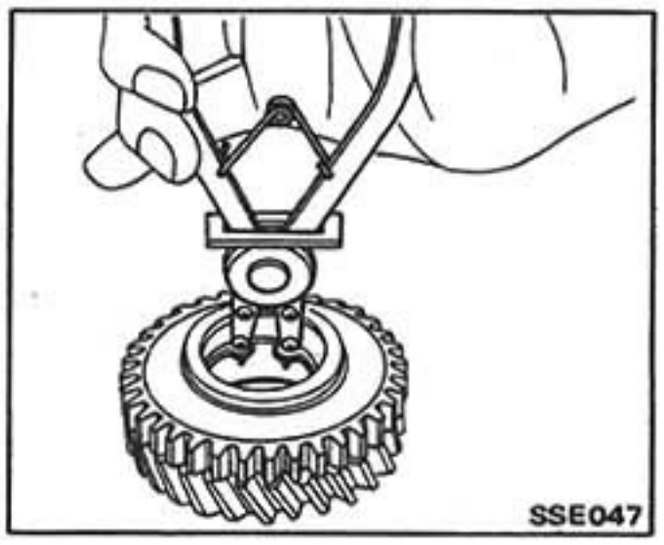

SSE045

12. Remove ball bearings from inner race.



SSE046

13. Remove snap rings.


SSE047

INSPECTION

P.T.O. CASE

1. Clean with solvent and check for cracks or cavities by means of dyeing test.
2. Check mating surface of P.T.O. case for small nicks or projection.

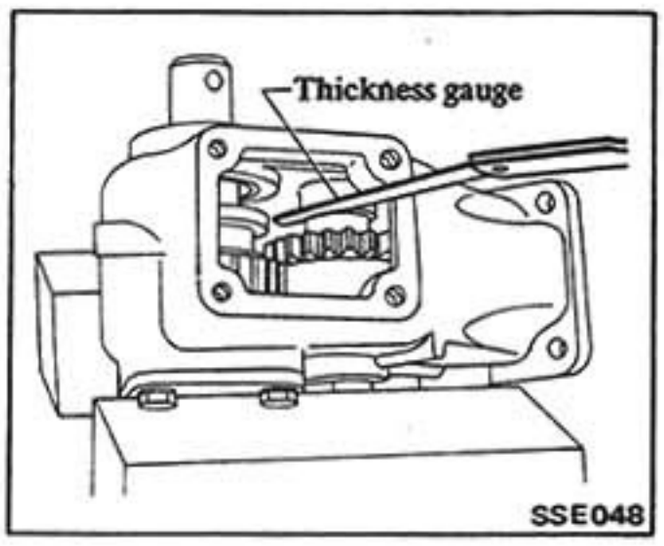
GEARS AND SHAFTS

1. Check all gears for excessive wear, chips or cracks; replace as required.
2. Check shaft for bending, cracks, wear, and worn spline; if necessary, replace.
3. **Measure gear end play:**

- It is necessary to measure end play before disassembling reverse and idler gears and after reassembling reverse and idler gears.
- Measure end play to insure that it is within specified limit.

(1) Measure idler gear end play with thickness gauge.

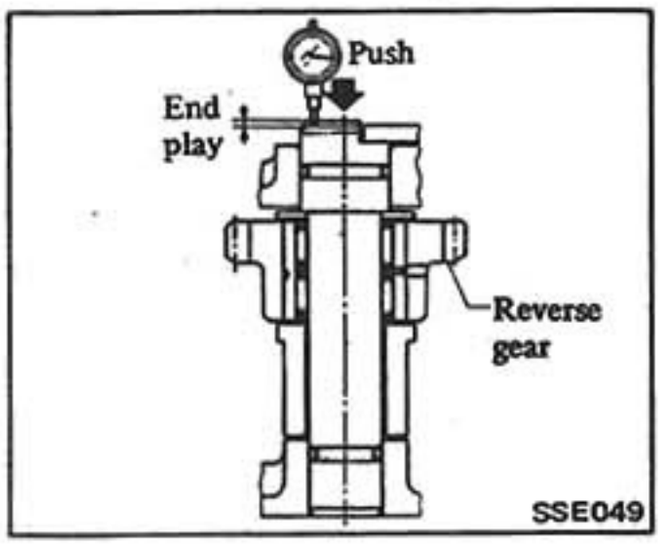
Idler gear



SSE048

(2) Measure reverse gear end play by moving idler shaft.

Reverse gear



SSE049

Standard end play:

Reverse gear
0.02 - 0.50 mm (0.0008 - 0.0197 in)

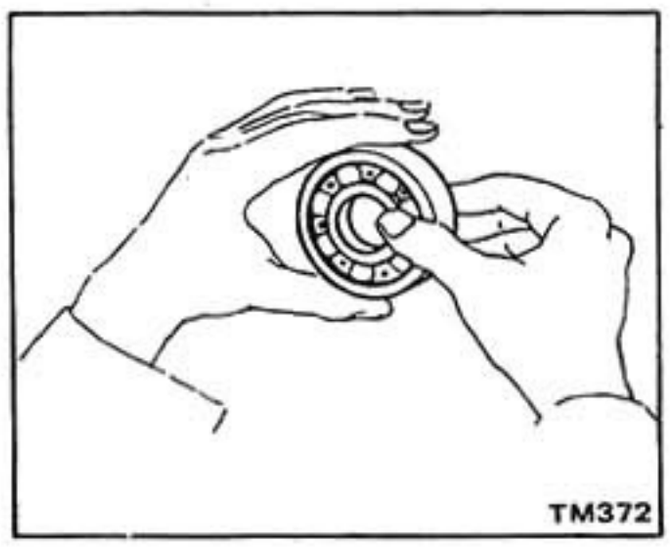
Idler gear
0.02 - 0.50 mm (0.0008 - 0.0197 in)

- If end play is not within specified limit, disassemble and check parts for condition.
- Replace any part which is worn or damaged.

BEARINGS

1. Thoroughly clean bearing and dry with compressed air.

CAUTION:
Do not allow the bearings to spin. Because it will damage the race and balls. Turn them slowly by hand.



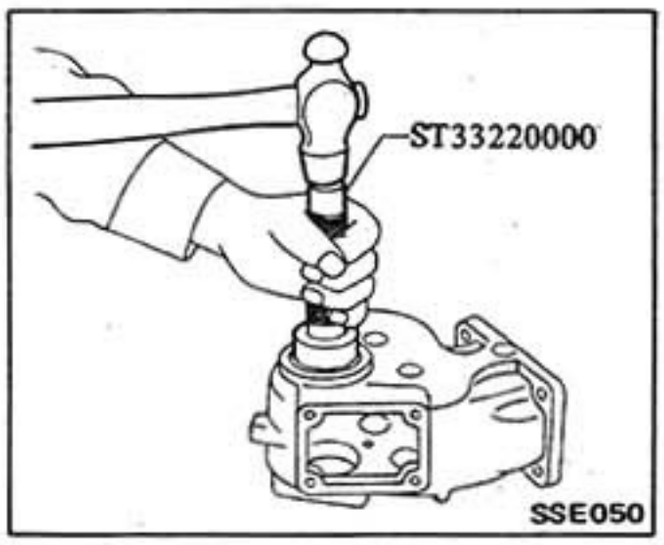
2. When race and ball surfaces are worn or rough, or when balls are out-of-round or rough, replace bearing with a new one.
3. Replace needle bearing if worn or damaged.

OIL SEALS

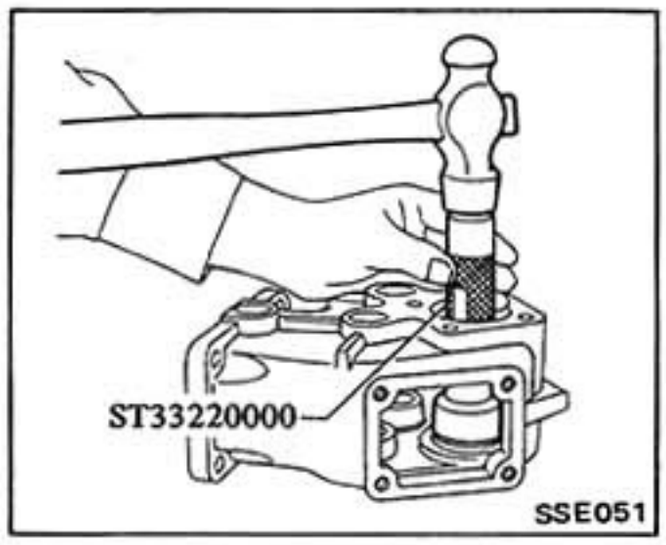
1. Replace oil seal if sealing lip is deformed or cracked. Also discard oil seal if spring is out of position.
2. Check the oil seal lip contacting with shaft; if necessary replace oil seal and shaft as a set.

ASSEMBLY

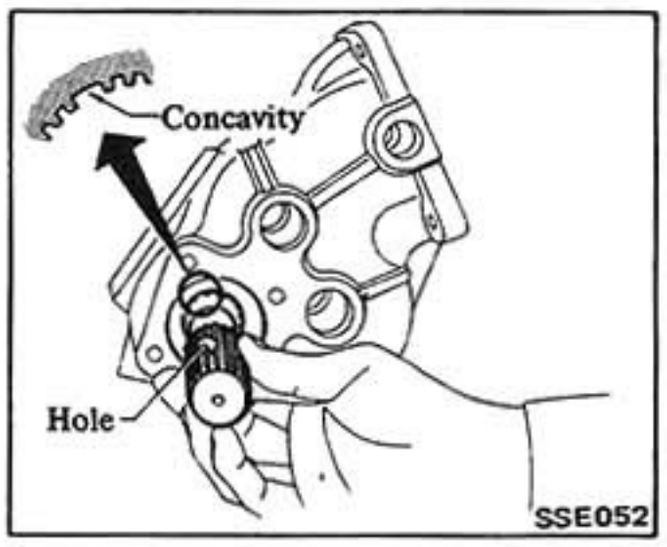
1. Install snap ring.
2. Apply coat of gear oil to oil seal surface, then drive new seal into place.



3. Press output shaft front ball bearing.

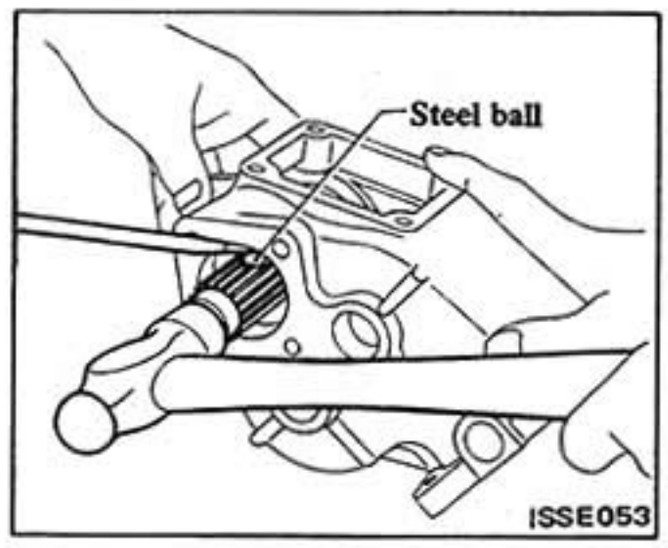


4. Install output gear into P.T.O. case then install output shaft into output gear.

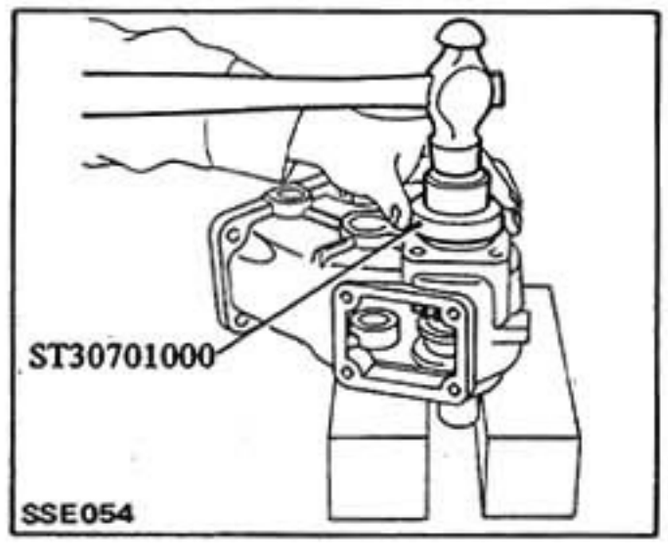


When installing output shaft, be sure to align hole in output shaft with concavity in output gear.

5. Install spring and steel ball into place.
6. While pushing steel ball, tap output shaft.

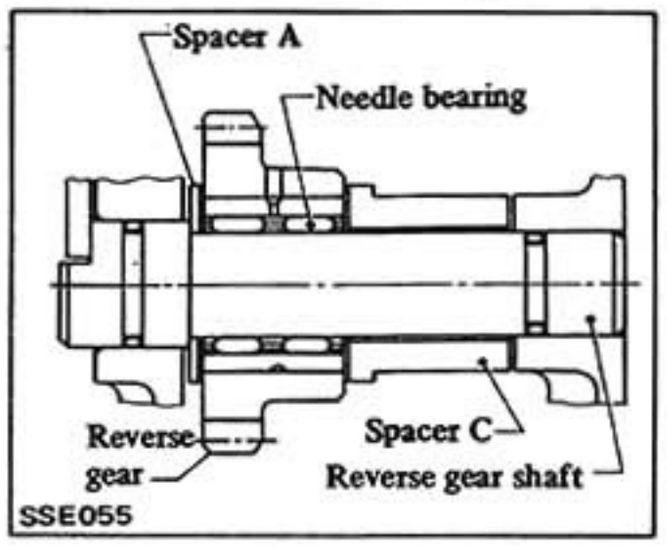


7. Install rear ball bearing.
Then install P.T.O. cover temporarily.



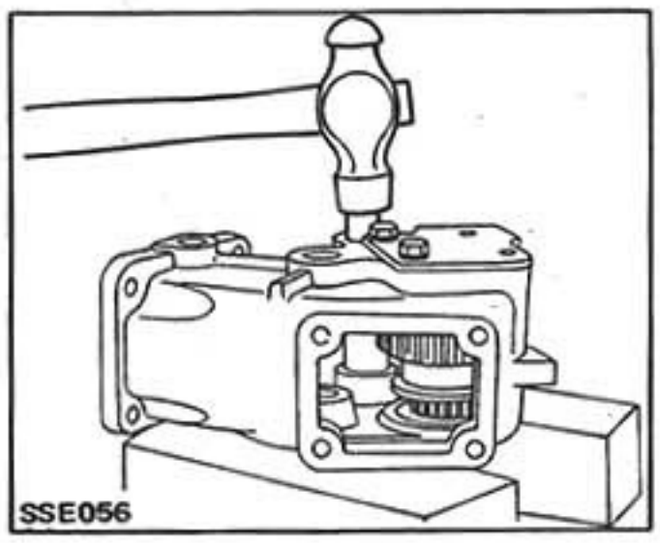
8. Install spacer C, needle bearings, reverse gear, spacer A and O-rings.

When installing spacer A, make sure that oil groove faces toward gear.



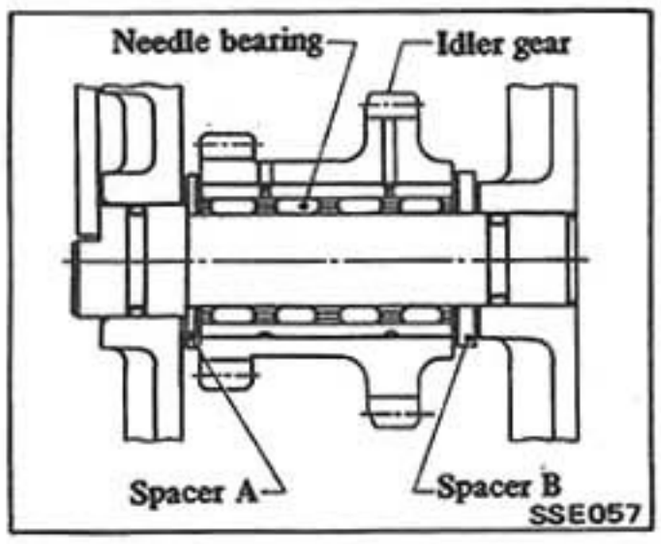
- **Apply gear oil to new O-rings then install them to reverse idler shaft.**

9. Tap idler shaft aligning it with center of spacers and bearing.


SSE056

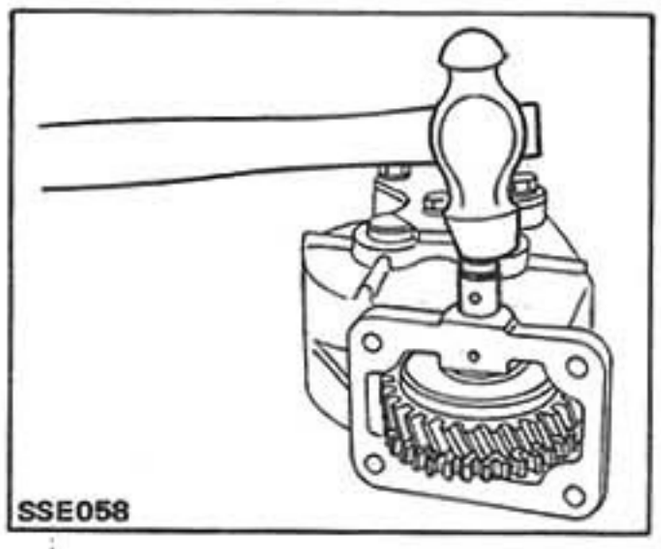
10. Install spacer B, needle bearings, idler gear, spacer A and O-rings.

a. **When installing spacers A and B, make sure that oil groove faces toward gear.**
b. **Apply gear oil to new O-rings then install them to idler shaft.**

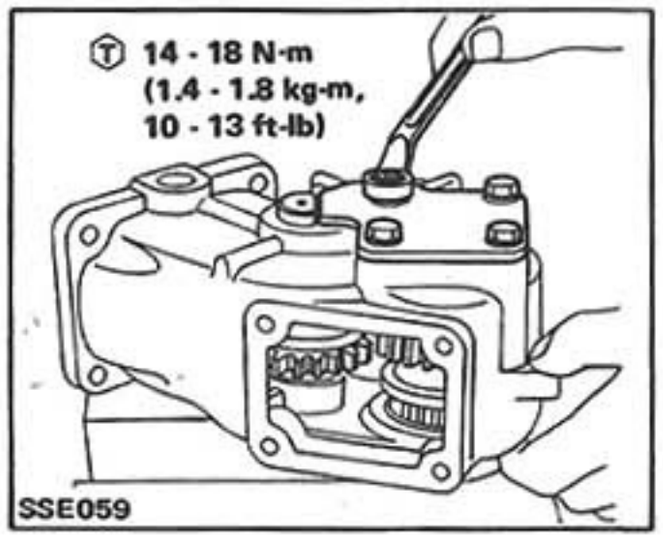


SSE057

11. Align hole of idler shaft with that of P.T.O. case. Then, tap idler shaft by aligning it with center of spacers and bearings.
12. Install snap rings to inner race then press ball bearings into inner race.
13. Install inner race together with helical and input gears in P.T.O. case.
14. Apply gear oil to new O-rings then install them to input shaft.
15. Tap input shaft aligning it with center of ball bearings. Then tighten screw.


SSE058

16. **Apply sealant to threads of bolts** and both faces of gasket. Install P.T.O. cover and gasket.



SSE059

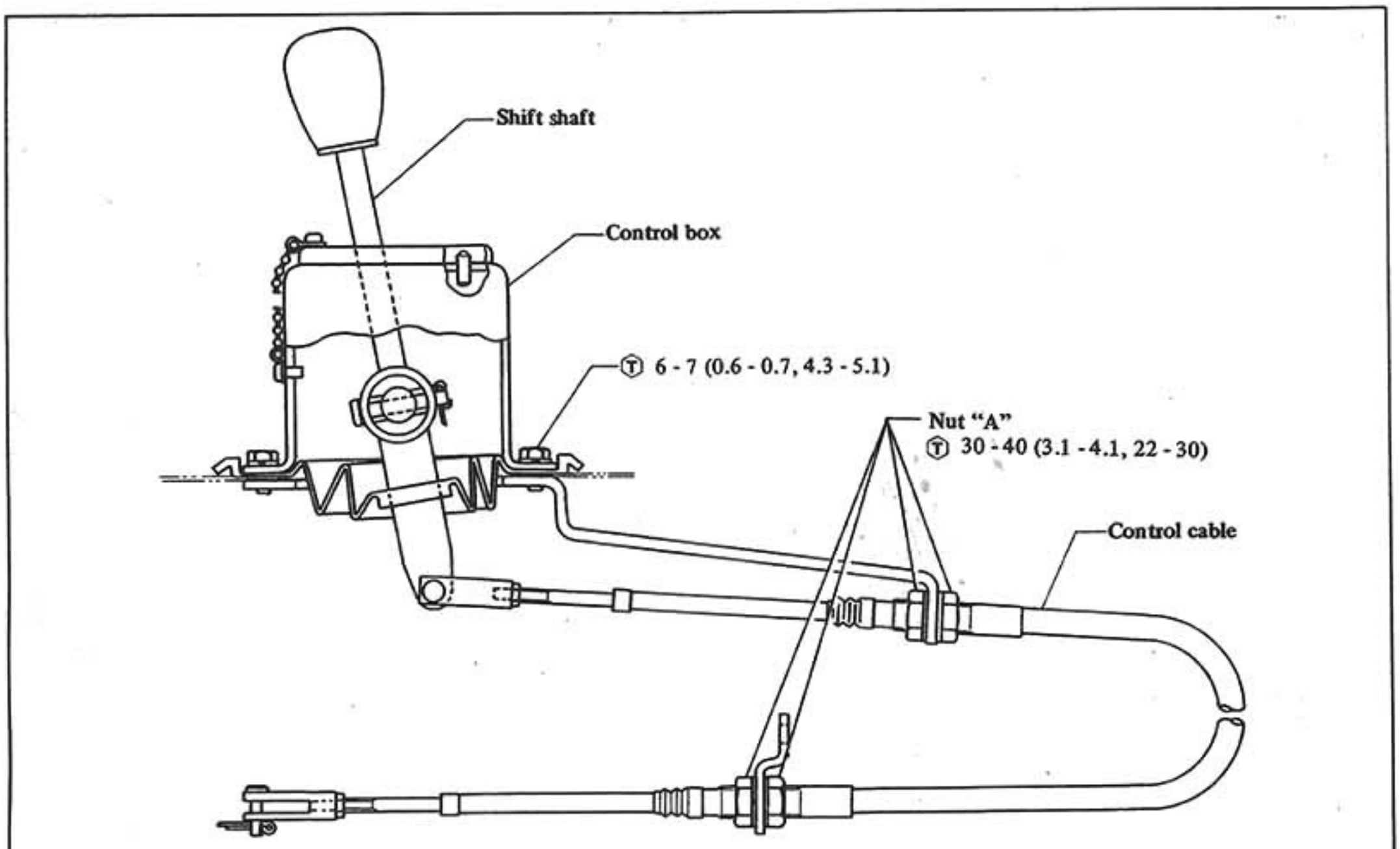
17. **Measure gear end play.**
Refer to Inspection.
18. Apply sealant to threads of bolts, then install gasket and cover.

Before installing cover, be sure to align fork with groove on output gear.

T : Cover securing bolt
14 - 18 N·m
(1.4 - 1.8 kg-m,
10 - 13 ft-lb)

19. Make sure that gears rotate smoothly at any position.

CONTROL CABLE



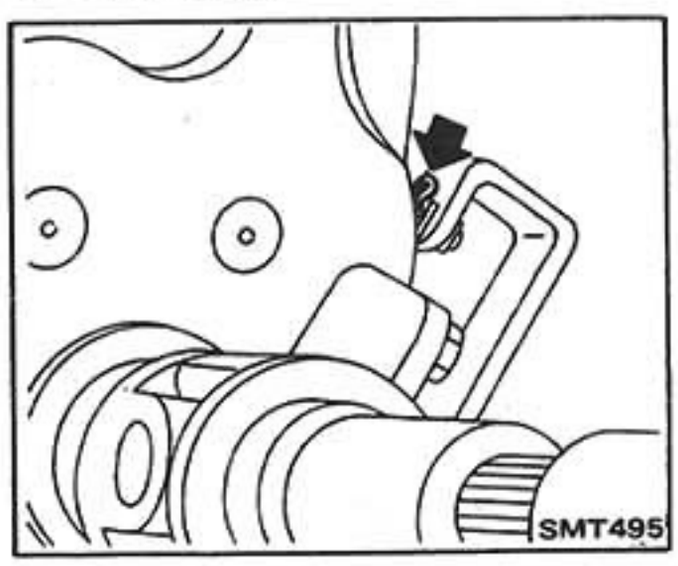
ADJUSTMENT

1. Set shift shaft at "F" position.
2. Loosen nuts "A" and set them in middle portion of threads.
3. Tighten nuts "A".
4. Make sure that shift shaft can be shifted at all positions and move smoothly.

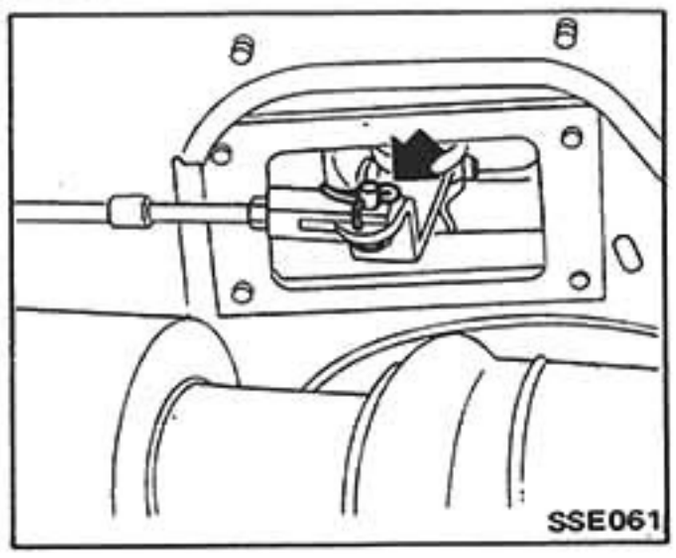
REMOVAL

1. Remove P.T.O. control cable.

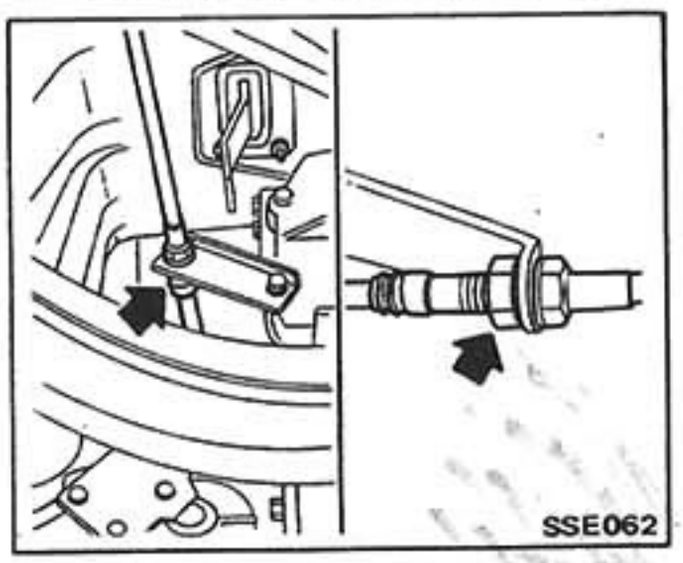
P.T.O. unit side



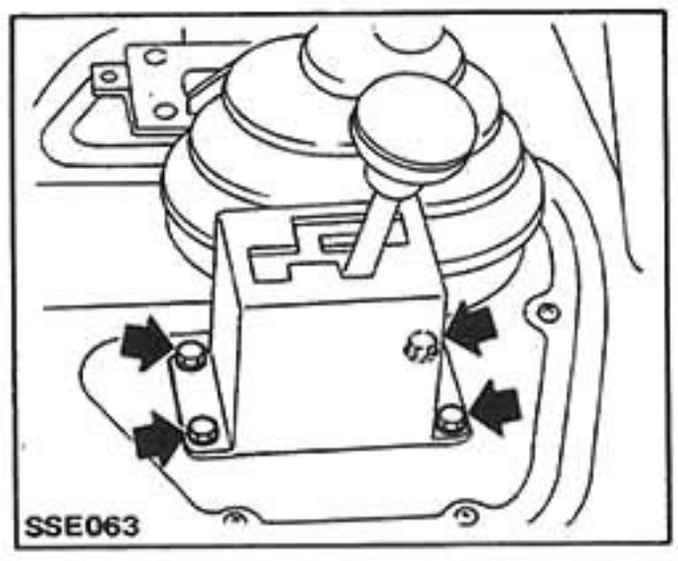
Shift shaft side



2. Remove nuts and control cable.



3. Remove control box.

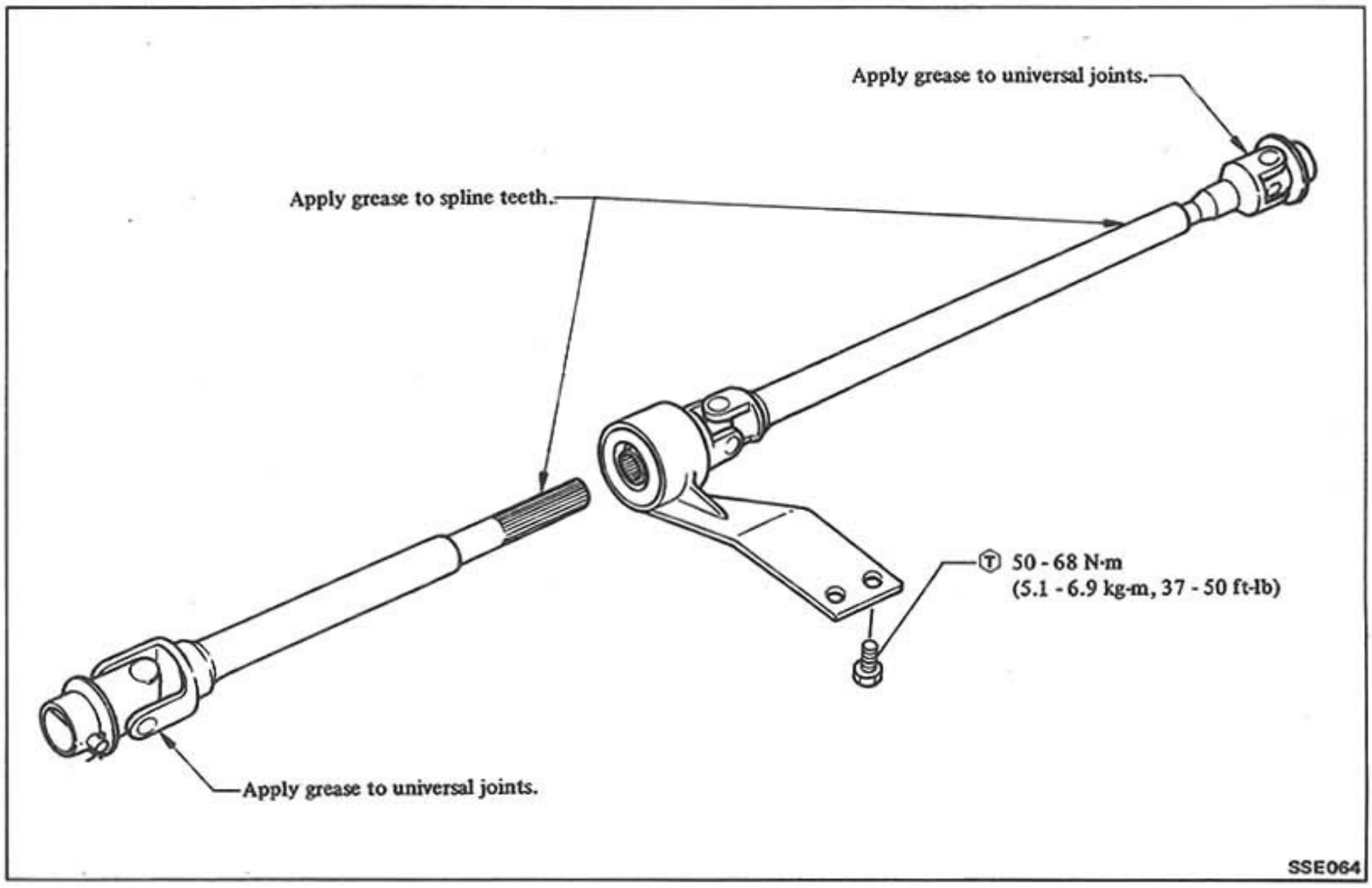


INSTALLATION

Install control cable in reverse order of removal, then adjust control cable. **Refer to Control Cable for adjustment.**

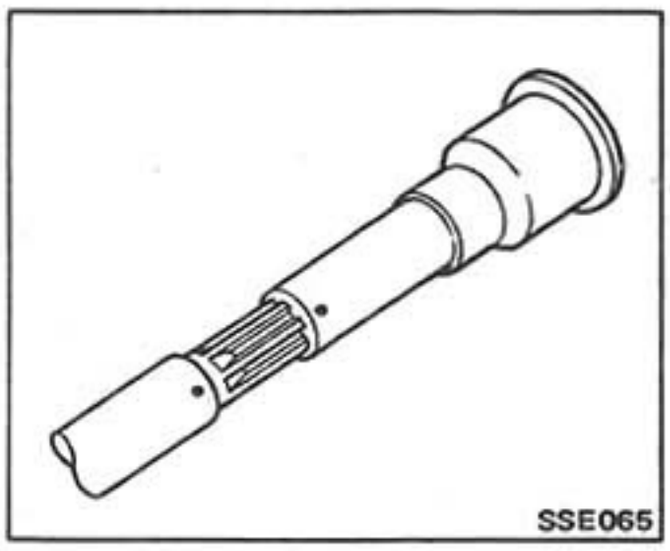
Ⓣ : Control box securing bolt
6 - 7 N·m
(0.6 - 0.7 kg-m,
4.3 - 5.1 ft-lb)
Control cable securing nut:
30 - 40 N·m
(3.1 - 4.1 kg-m,
22 - 30 ft-lb)

DRIVE SHAFT

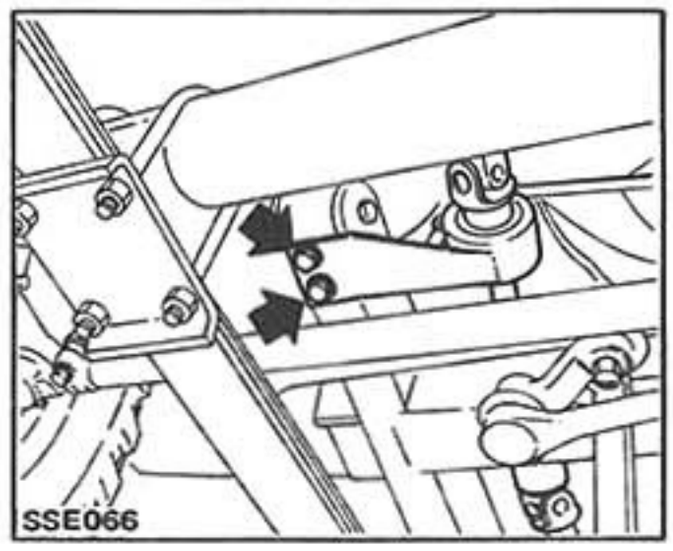


REMOVAL

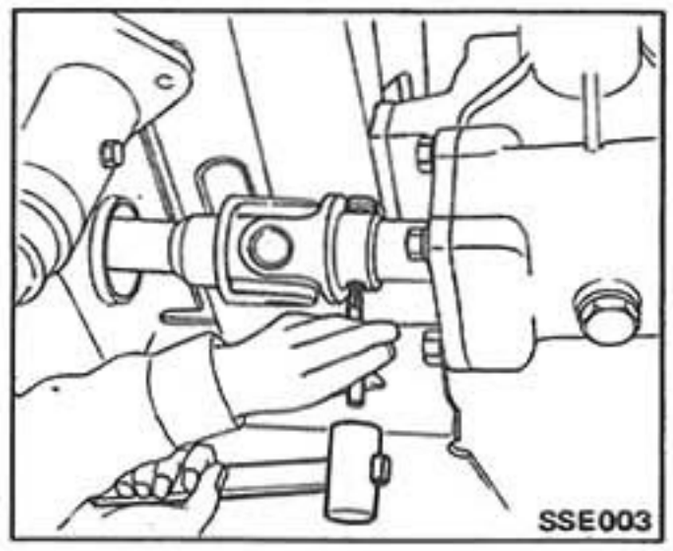
1. Put "match" marks on splined yokes and splined shafts.



2. Remove center bearing bracket securing bolts.



3. Disconnect shear pin on winch side. If it proves difficult to remove, knock it out with a suitable tool.



INSPECTION

1. Check splined shaft for excessive play, wear or damage and replace as an assembly if required.
2. Check joint and shear pin for any bends or deformation.

ASSEMBLY

Assemble drive shaft in the reverse order of disassembly, noting following.
Apply grease to splines and joints.

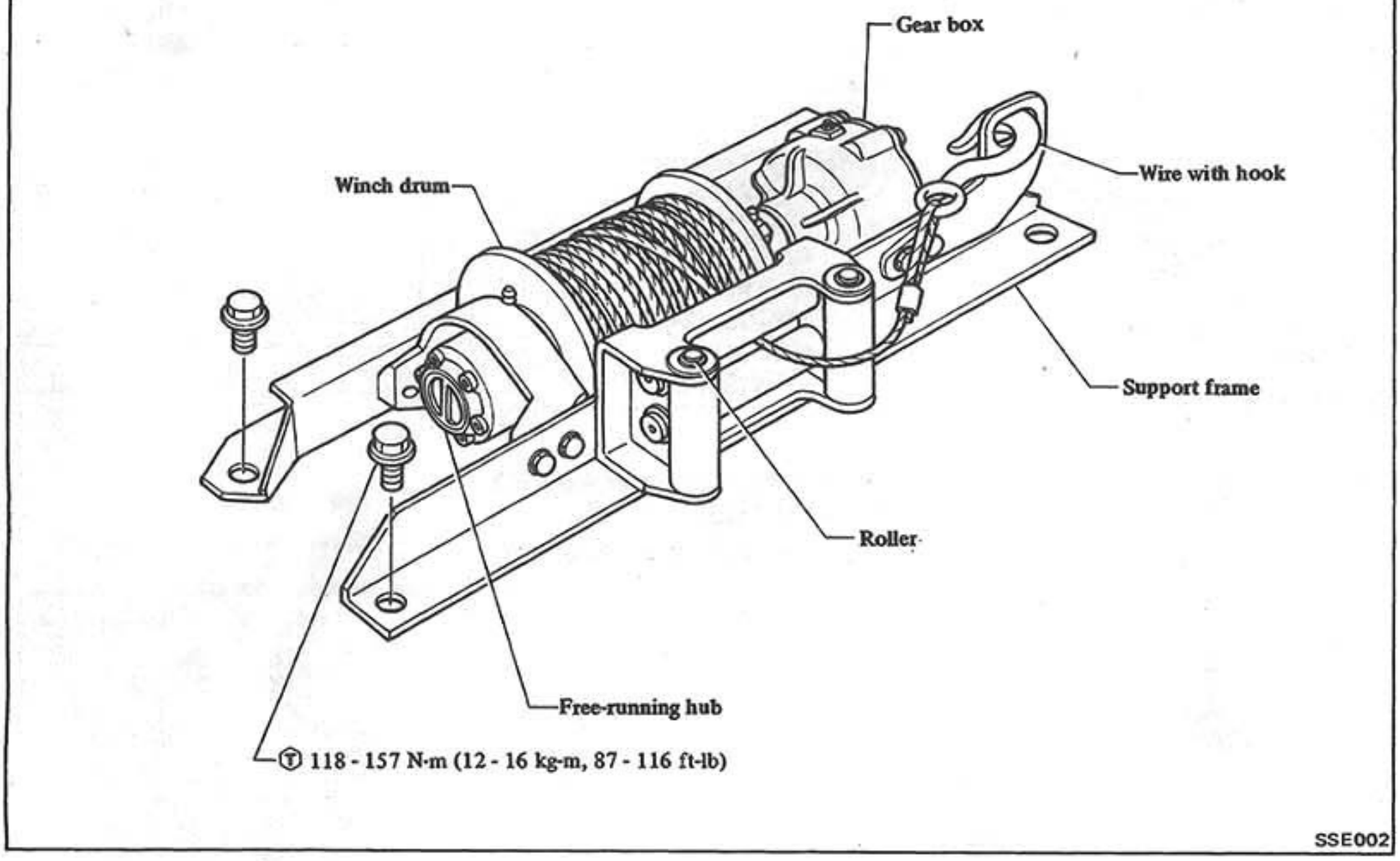
INSTALLATION

Install drive shaft in the reverse order of removal, noting following.

Align "match" marks on splined yoke and splined shaft, then assemble.

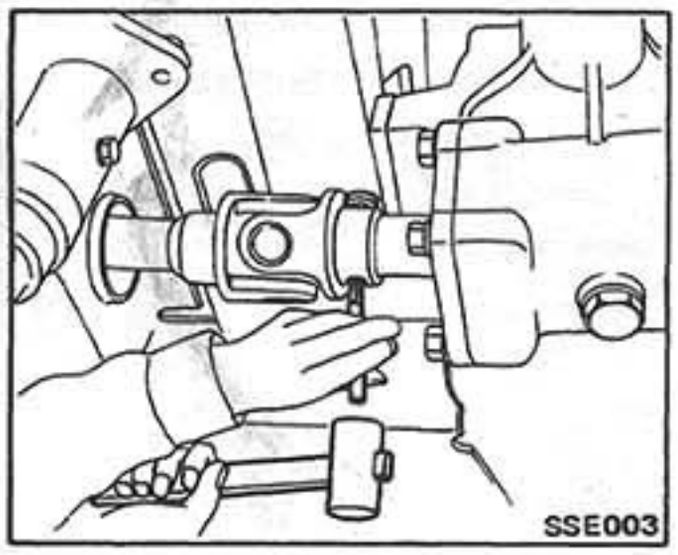
T : Center bearing bracket securing bolt
50 - 68 N·m
(5.1 - 6.9 kg-m,
37 - 50 ft-lb)

WINCH ASSEMBLY

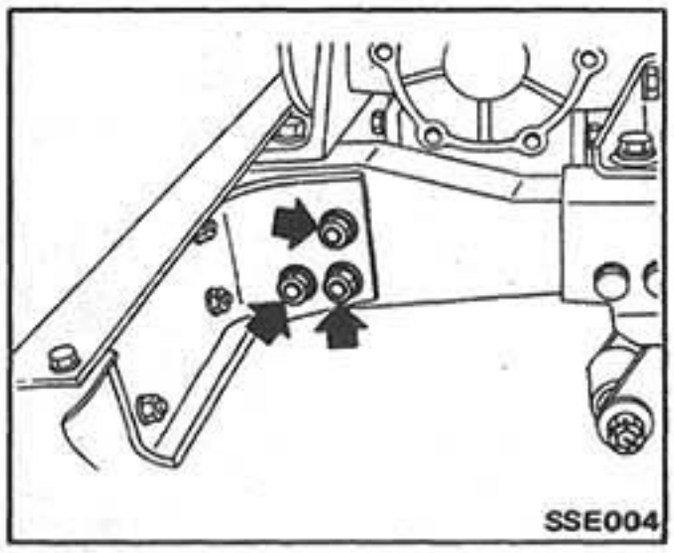


REMOVAL

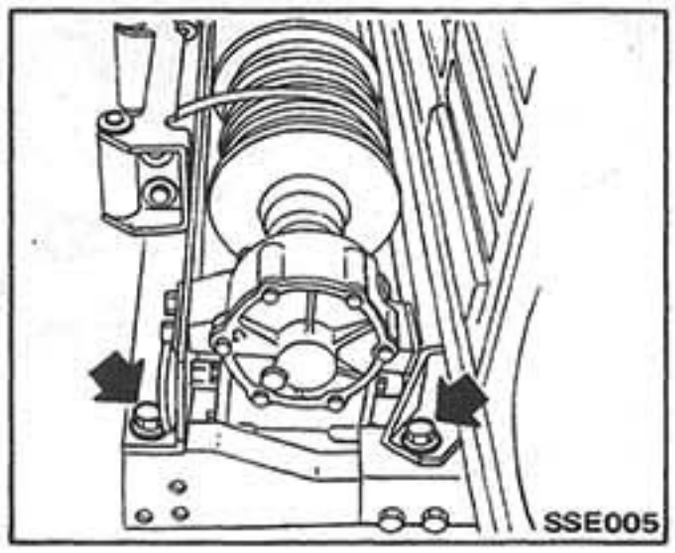
1. Disconnect shear pin on winch side. If it proves difficult to remove, knock it out with a suitable tool.



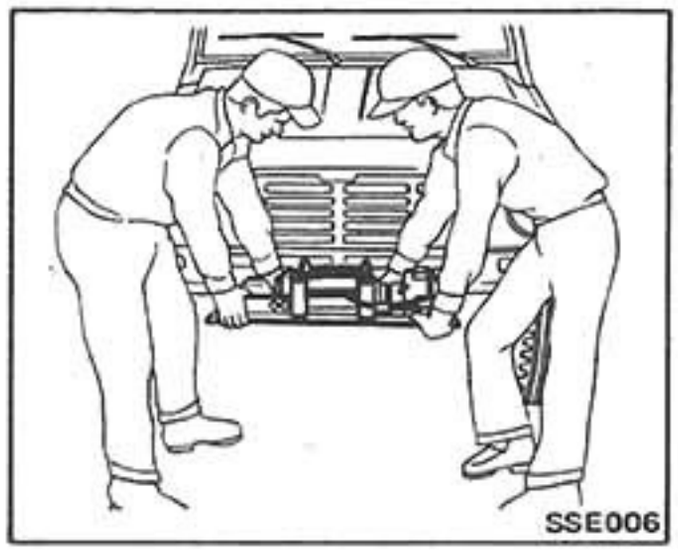
2. Remove bumper assembly.



3. Remove bolts securing winch assembly support frame.



4. Slide winch assembly support frame forward, above the chassis frame, to ensure that winch assembly is completely disconnected from drive shaft.
5. Remove winch assembly support frame.


SSE006

INSTALLATION

Install winch assembly in the reverse order of removal, observing the following:

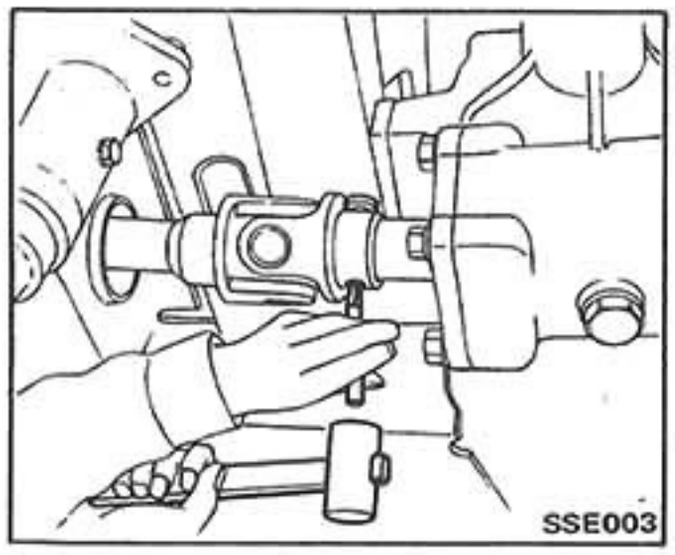
- Always use a genuine shear pin when connecting winch assembly to drive shaft.

Ⓣ : **Bumper fixing bolt**
54 - 72 N·m
(5.5 - 7.3 kg-m,
40 - 53 ft-lb)
Support frame fixing bolt
118 - 157 N·m
(12 - 16 kg-m,
87 - 116 ft-lb)

SHEAR PIN REPLACEMENT (On-vehicle)

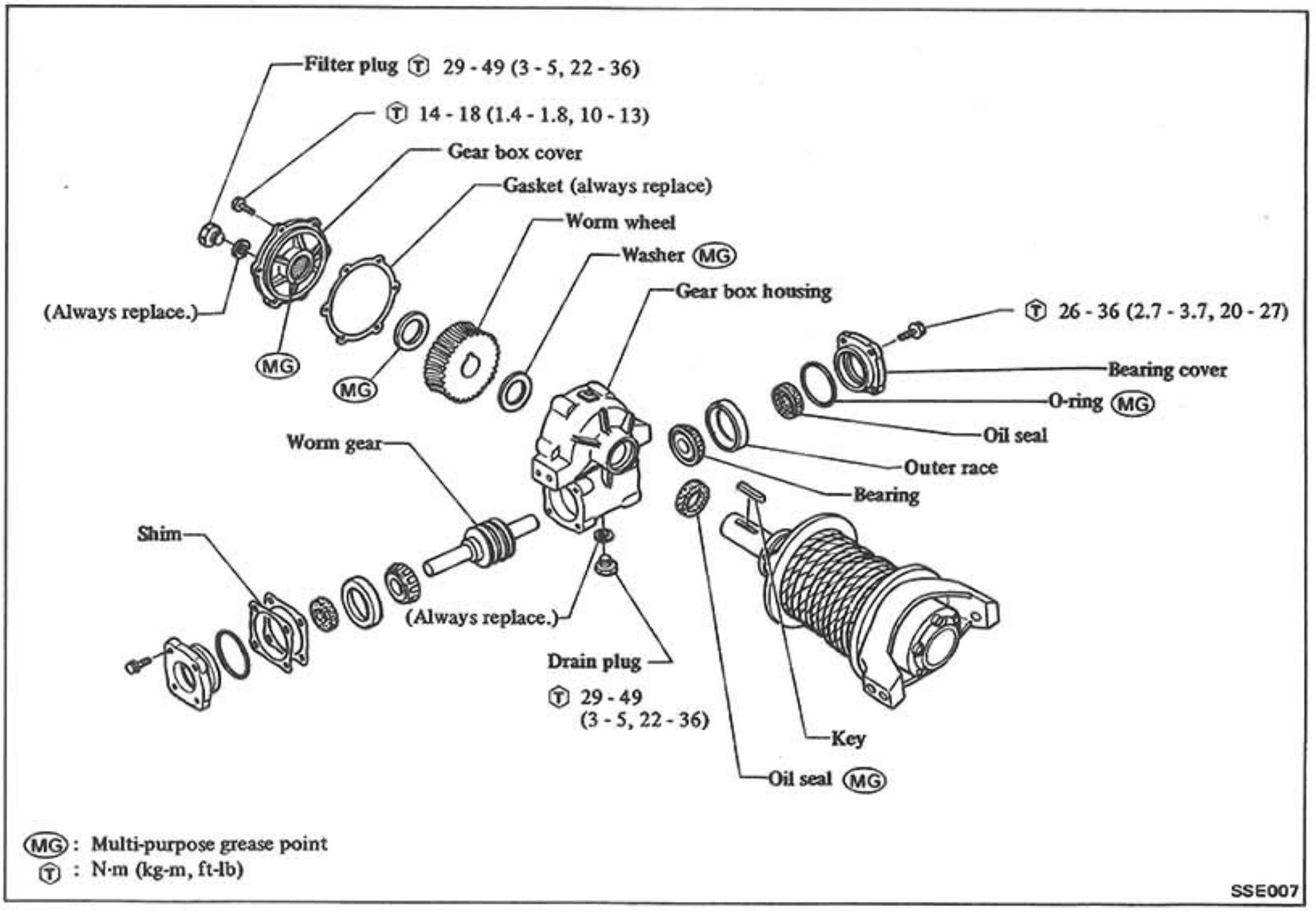
Replace shear pin if it is cracked or deformed.

1. Remove shear pin. If it proves difficult to remove, use a suitable tool to knock it out.


SSE003

2. Install new shear pin.
Always use a genuine shear pin.
3. Install cotter pin.

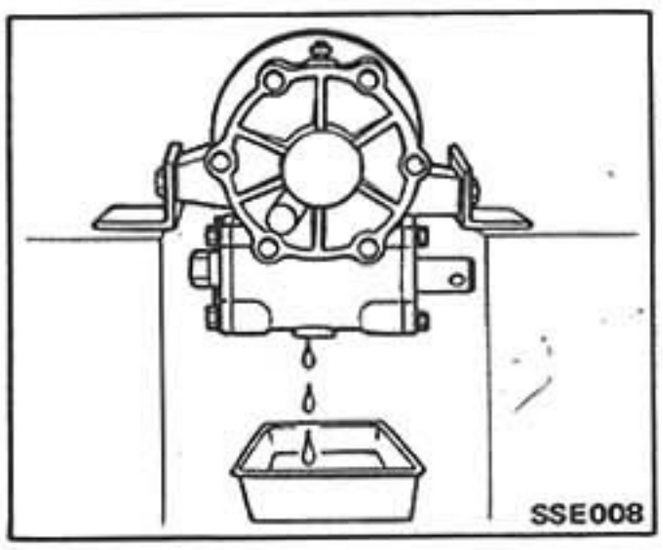
GEAR BOX



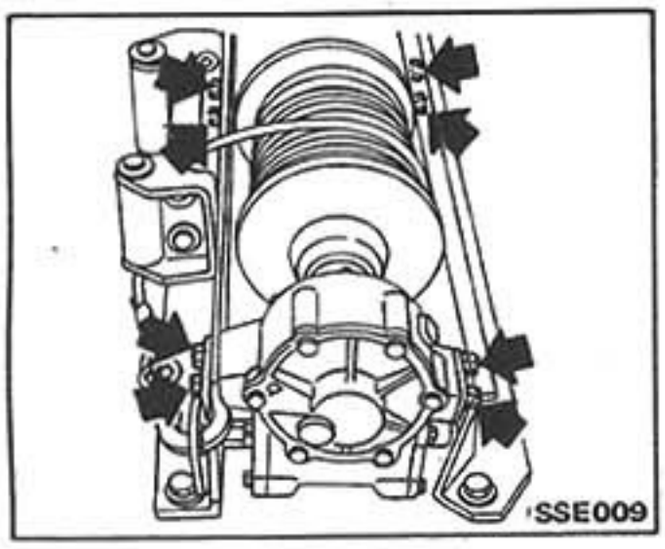
SSE007

DISASSEMBLY

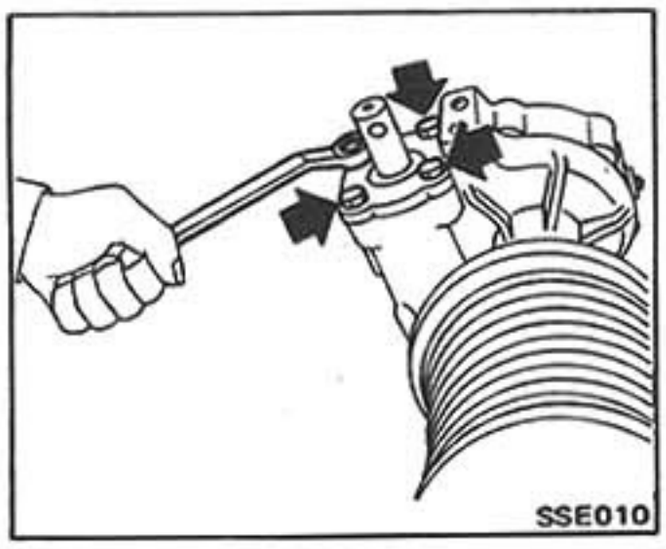
1. Remove winch assembly. **Refer to "Removal" section for procedures.**
2. Drain gear box oil.


SSE008

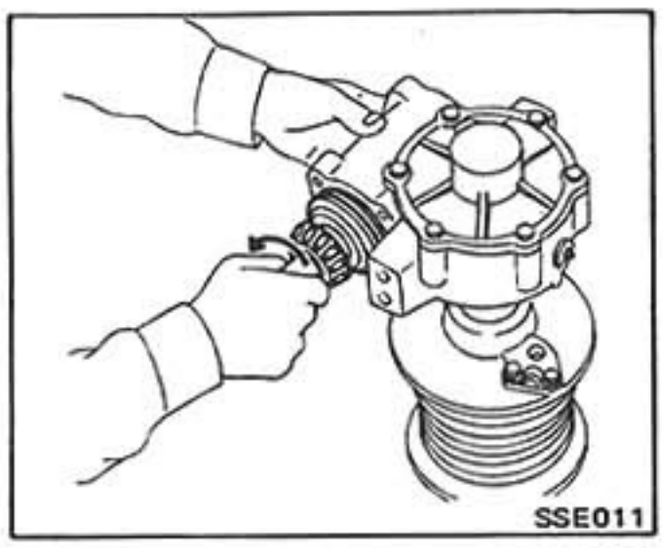
3. Remove support frame.


SSE009

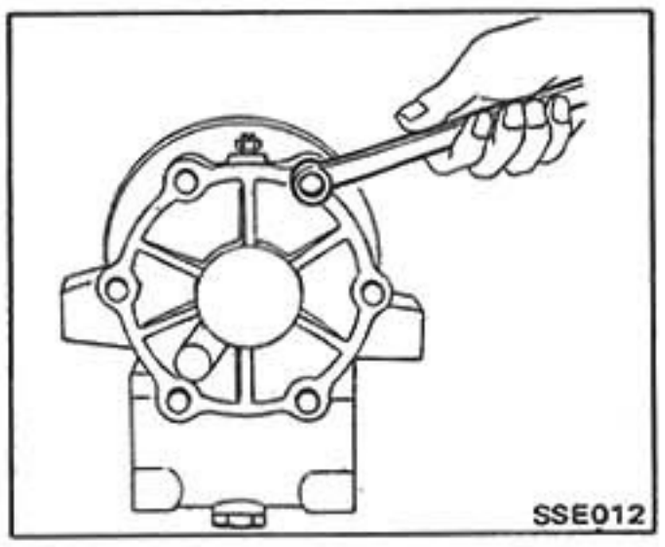
4. Remove both side bearing covers.


SSE010

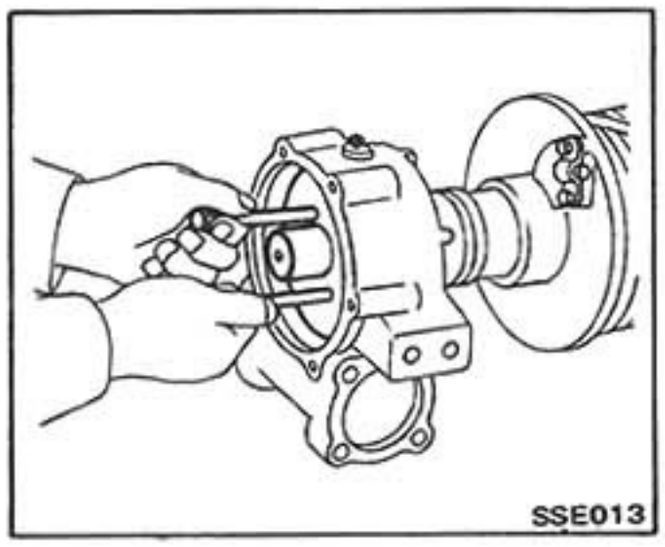
5. Turn worm gear counterclockwise to remove it.


SSE011

6. Remove gear box cover.


SSE012

7. Remove worm wheel, key and washer.


SSE013

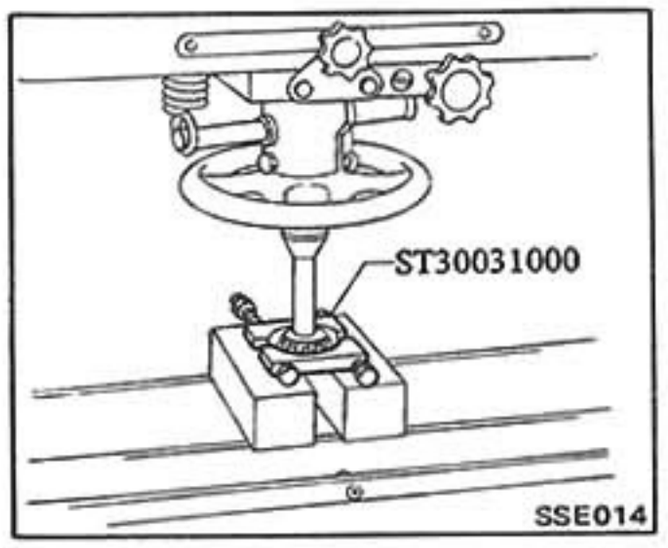
8. Remove gear box housing.

Worm gear bearing replacement (Inner race)

If inspection reveals that bearing is faulty, replace it as follows:

Replace bearing as a set.

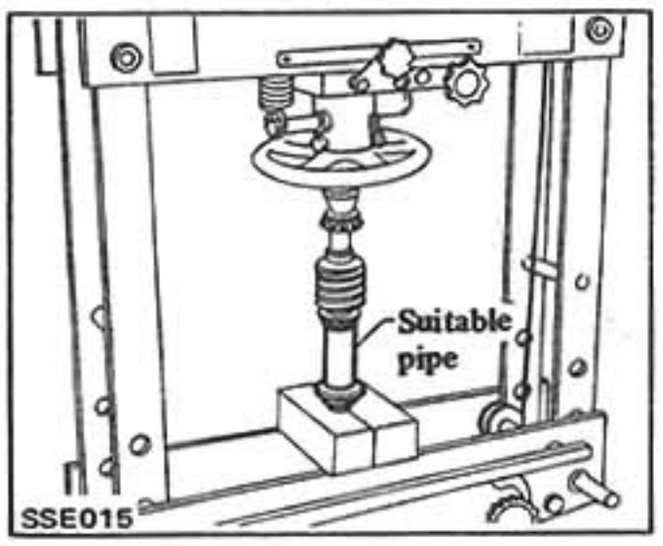
1. Remove bearing using a press and **Tool.**



SSE014

Be careful not to drop worm gear.

2. Apply gear oil and install new bearing in worm gear.



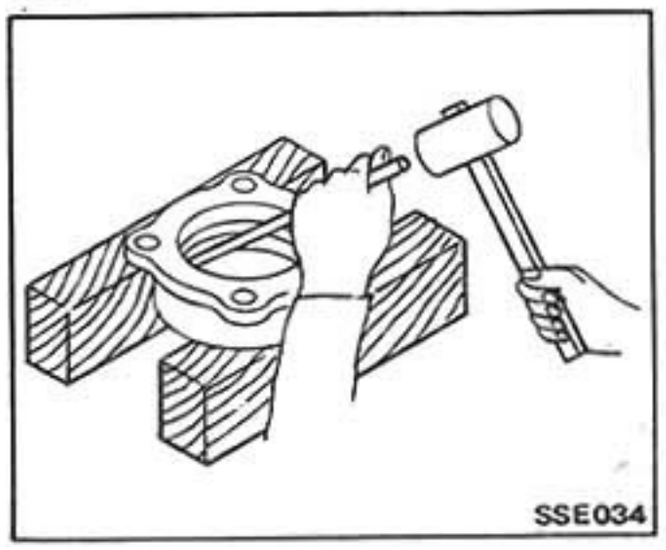
SSE015

Bearing cover bearing replacement (Outer race)

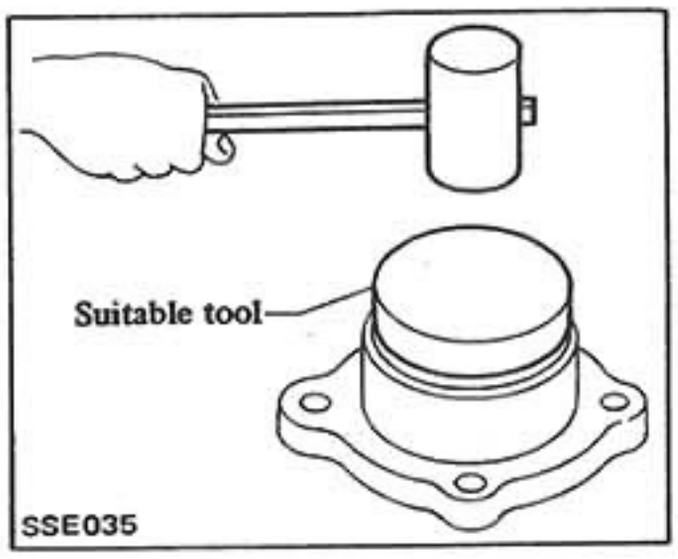
If inspection reveals that bearing is faulty, replace it as follows:

Replace bearing as a set.

1. Remove bearing using a suitable tool.


SSE034

2. Apply oil to bearing and small bearing on bearing cover.

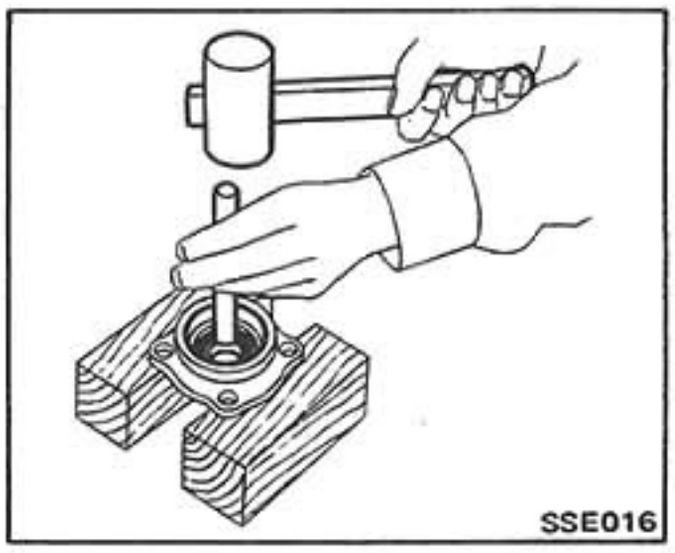


Drive bearing straight.

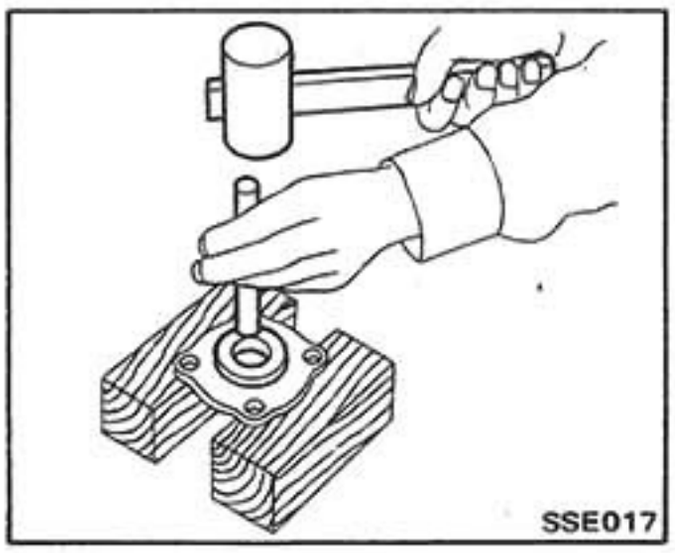
Oil seal replacement

If oil seal is found to be damaged, replace it as follows:

1. Remove oil seal using a suitable tool.



2. Apply grease to new oil seal and install it.



Always install oil seal on gear box properly.

INSPECTION

Clean all parts thoroughly and dry with compressed air.

Support frame

Check for deformities or damage and replace if necessary.

Worm gear and worm wheel

Check for excessive wear, chips or cracks and replace if necessary.

Gear box cover and bearing cover

- Check for cracks or deformities and replace if necessary.
- Check gear box cover bushing for wear or deformation.
  Replace gear box cover if necessary.

Gear box housing

Check for cracks or deformities and replace if necessary.

Oil seal

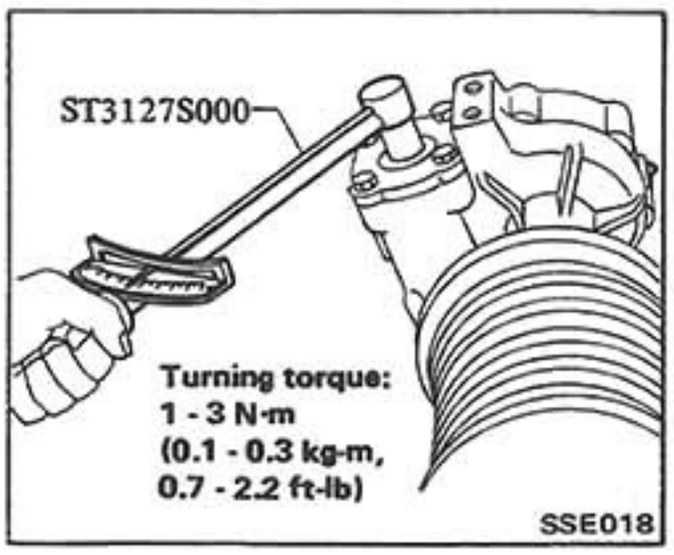
Check for cracks or deformities and replace if necessary.

ASSEMBLY

Assemble gear box in the reverse order of disassembly, observing the following:

1. After worm gear, bearings and bearing covers have been installed, check preload to determine the required number of shims to be used.

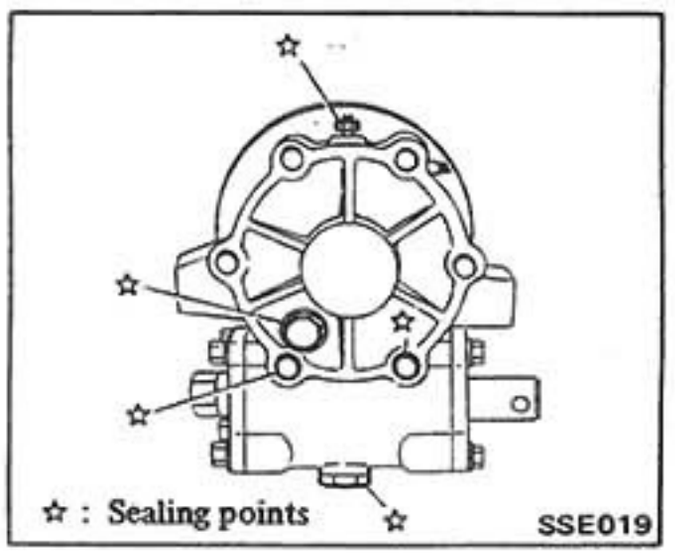
Tighten bearing cover bolts to the specified torque.



2. Use new gaskets and O-rings.
3. Apply grease to:
- Mainshaft surface and oil seal
- Bearing cover O-ring

4. Apply gear oil to:
- Worm wheel
- Worm gear and bearings

5. Apply sealant to points indicated in the following figure.



6. Add gear oil until it begins to run out of filler plug.

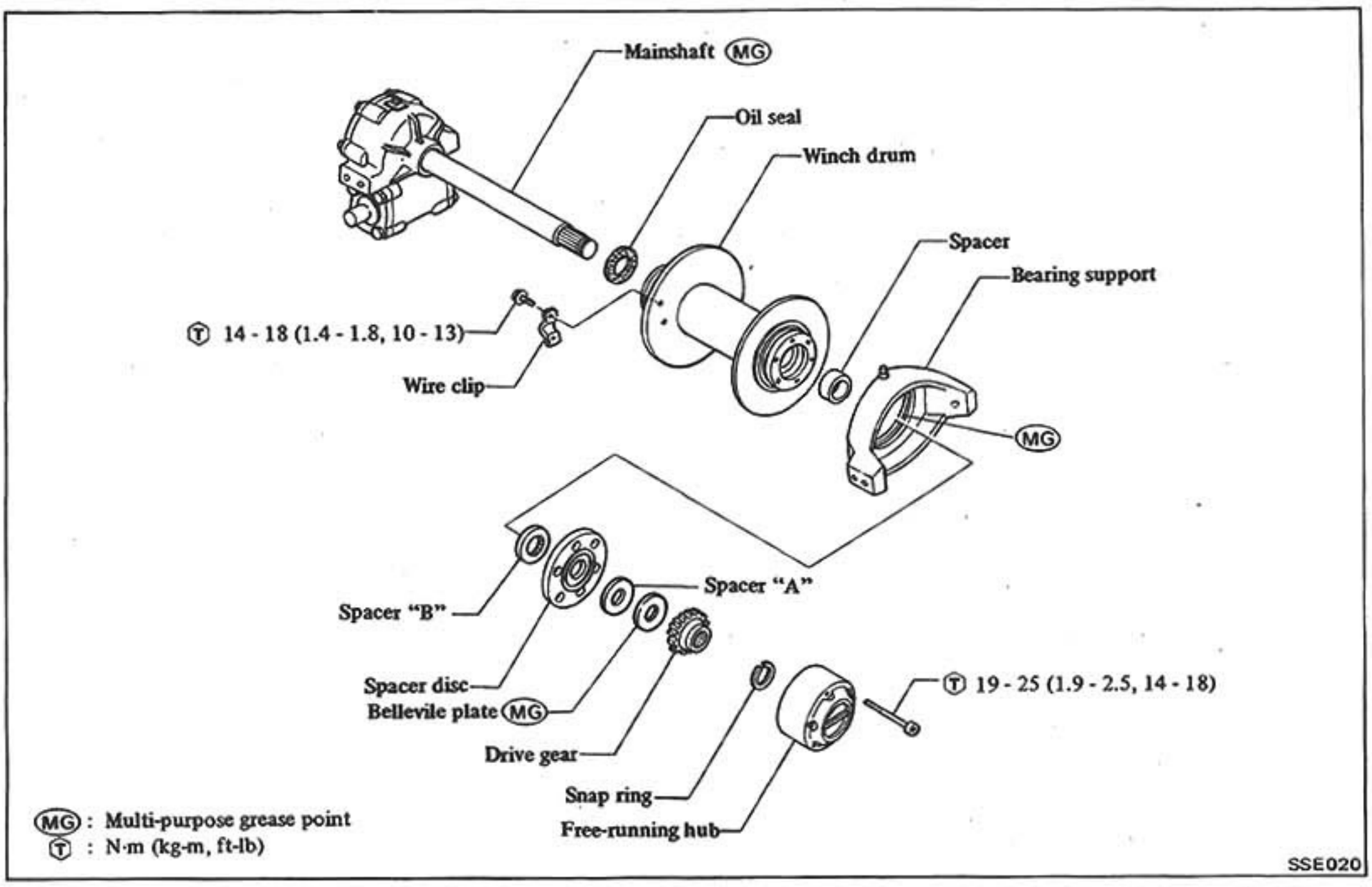
Use the specified oil or its equivalent. Otherwise worm wheel will wear abnormally.

Ⓣ : Gear box cover fixing bolt
14 - 18 N·m
(1.4 - 1.8 kg-m,
10 - 13 ft-lb)
Bearing cover fixing bolt
26 - 36 N·m
(2.7 - 3.7 kg-m,
20 - 27 ft-lb)
Drain and Filler plug
29 - 49 N·m
(3 - 5 kg-m,
22 - 36 ft-lb)

7. Install winch assembly. **Refer to "Installation" section for procedures.**

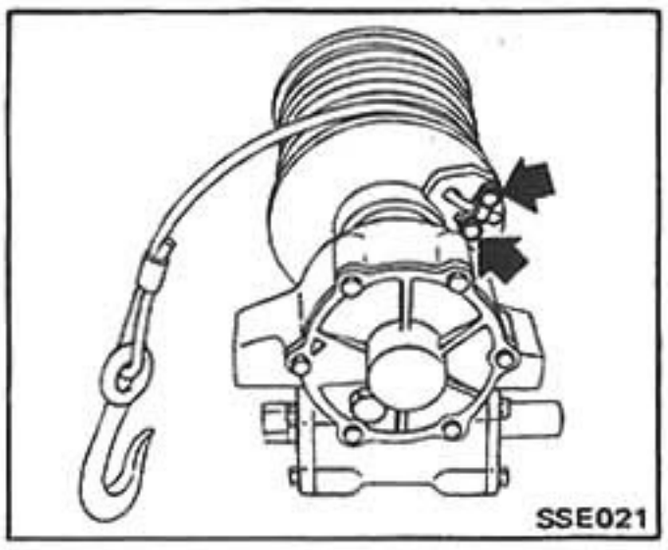
Ⓣ : Winch assembly to support frame fixing bolt
50 - 68 N·m
(5.1 - 6.9 kg-m,
37 - 50 ft-lb)

WINCH DRUM

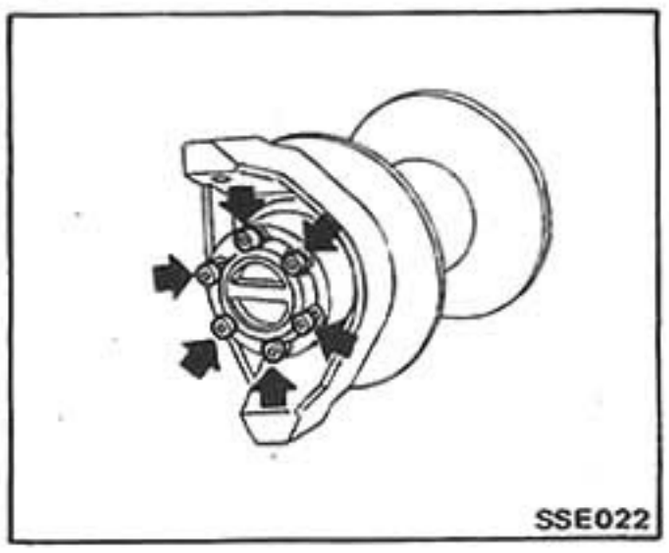


DISASSEMBLY

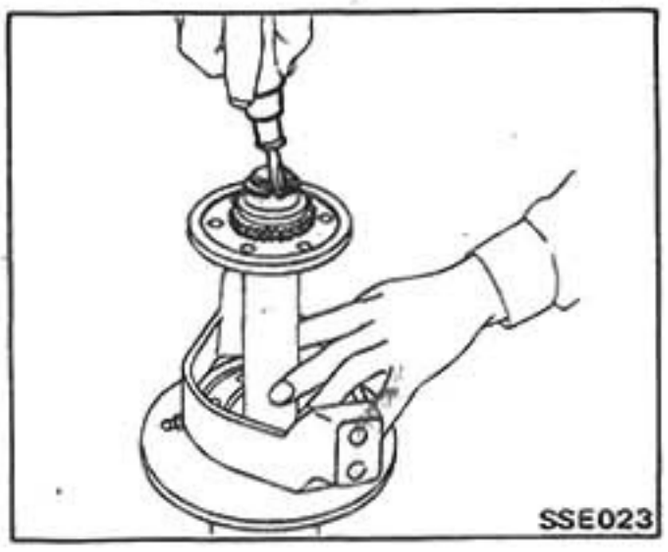
1. Remove winch assembly. **Refer to "Removal" section for procedures.**
2. Remove support frame.
3. Remove wire (Free-running hub in "FREE" position).



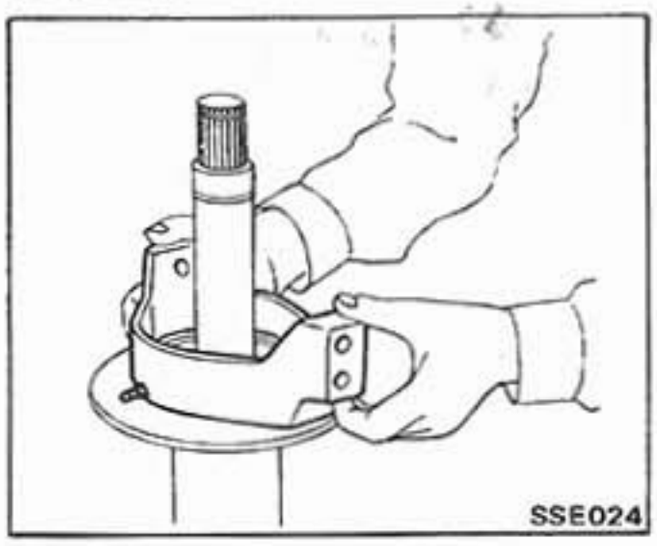
4. Remove free-running hub assembly **using torx wrench.**



5. Remove snap ring, drive gear and spacer "A".



6. Remove spacer disc and bearing support.

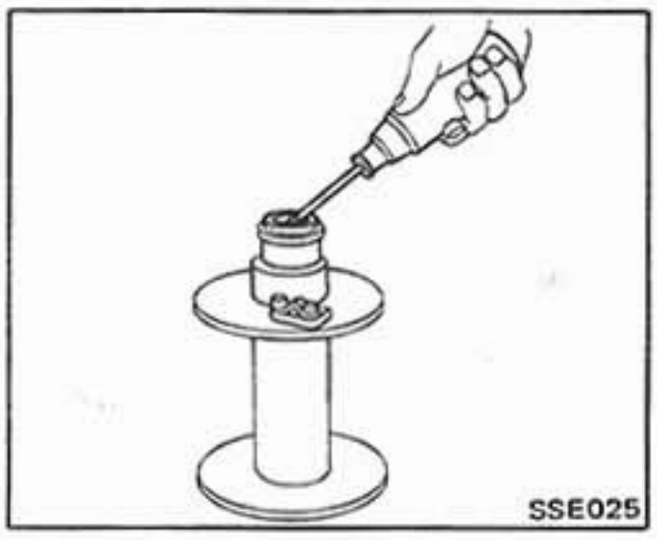

SSE024

7. Remove spacer "B" and winch drum.

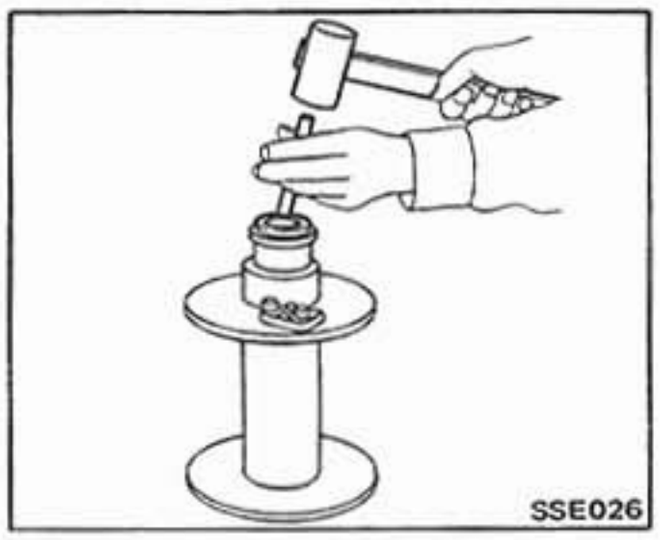
Oil seal replacement

If oil seal is faulty, replace it as follows:

1. Pry off oil seal.


SSE025

2. Apply grease to new oil seal and install it.


SSE026

Always install oil seal on winch drum properly.

INSPECTION

Clean all parts thoroughly and dry with compressed air.

Bearing support

Check for cracks or deformities and replace if necessary.

Winch drum

Check for cracks or deformities and replace if necessary.

Drive gear

Check for cracks or deformities and replace if necessary.

Free-running hub

Check for excessive wear, chips or cracks and replace if necessary.

Wire

Check for kinks, breaks or deformities and replace if necessary.

Oil seal

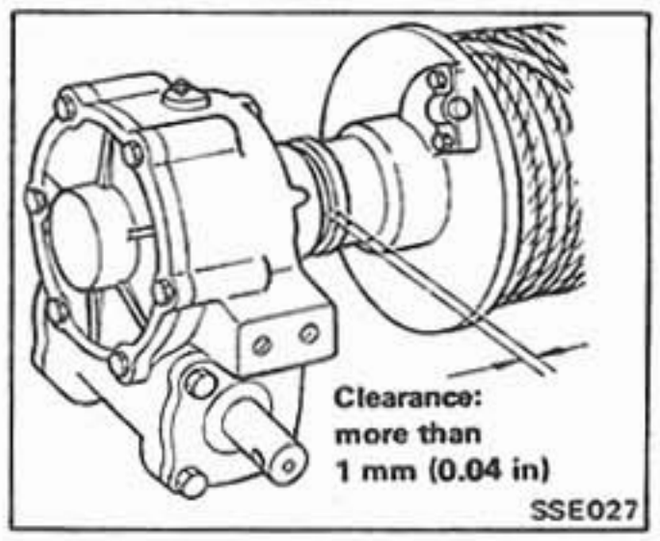
Check for cracks or deformities and replace if necessary.

ASSEMBLY

Assemble winch drum in the reverse order of disassembly, observing the following:

1. Apply grease to:
- Bearing support inner surface
- Mainshaft surface
- Bellevile plate surface

2. After winch drum has been installed, check clearance between it and the gear box to determine whether it is within the specified range.



SSE027

3. Also be sure that winch drum and free-running hub knob rotate smoothly.

4. Always wind wire on the drum neatly.

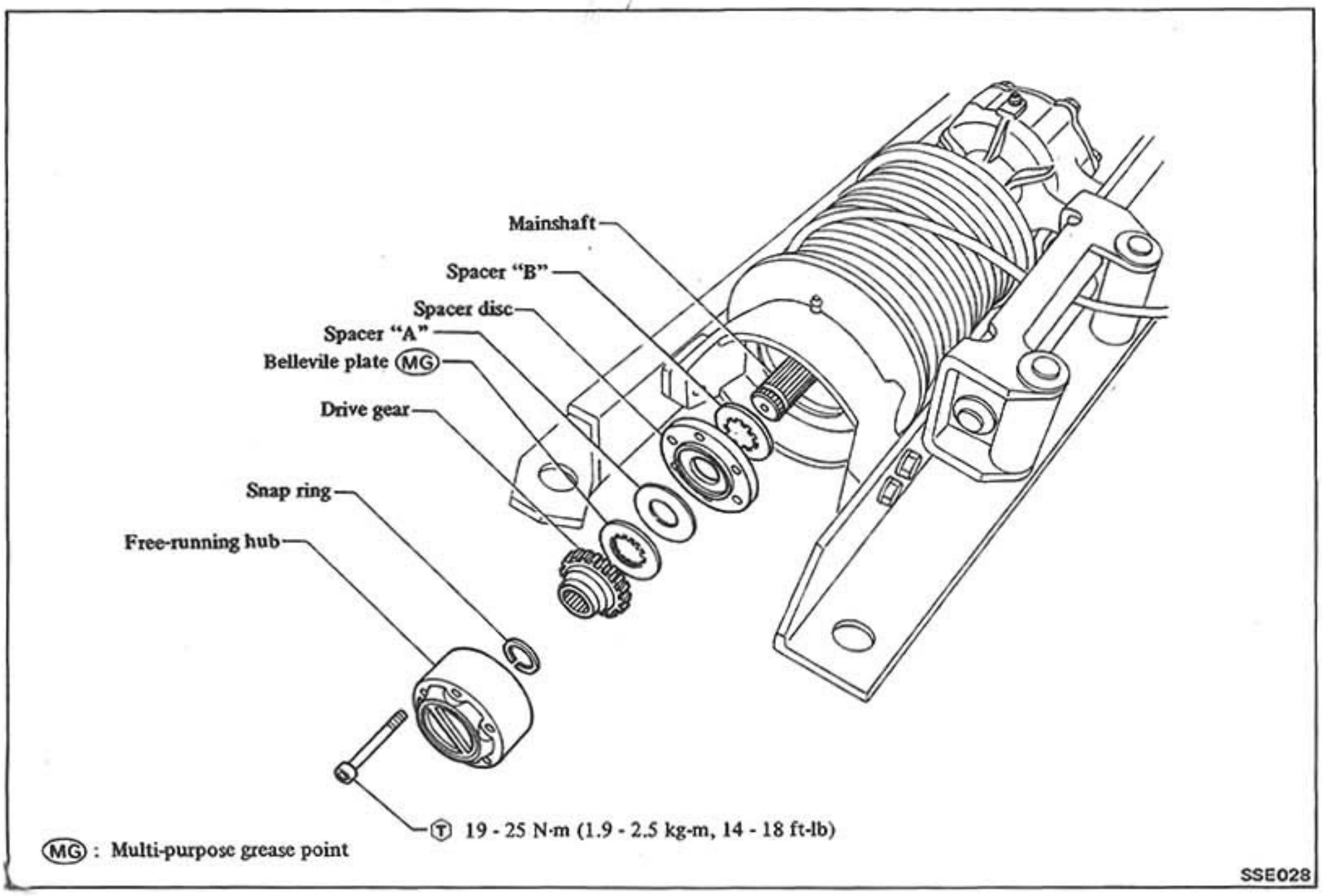
Ⓣ : Wire clamp fixing bolt
14 - 18 N·m
(1.4 - 1.8 kg-m,
10 - 13 ft-lb)
Free-running hub fixing bolt
19 - 25 N·m
(1.9 - 2.5 kg-m,
14 - 18 ft-lb)

5. Install support frame.

Ⓣ : Support frame to winch assembly
50 - 68 N·m
(5.1 - 6.9 kg-m,
37 - 50 ft-lb)

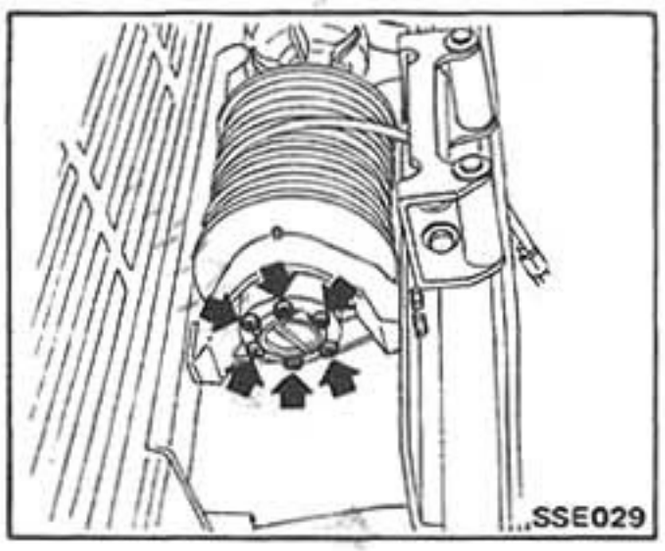
6. Install winch assembly and sup port frame on chassis frame as a unit.

FREE-RUNNING HUB (On-vehicle)

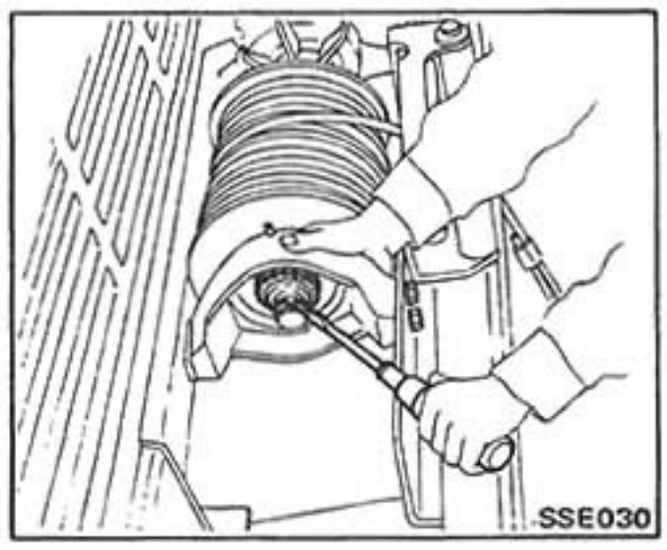


REMOVAL

1. Remove free-running hub using a torx wrench.



2. Remove snap ring and drive gear.



INSPECTION

Free-running hub

Check inner gear for excessive wear, chips or cracks and replace if necessary.

Drive gear

Check for excessive wear, chips or cracks and replace if necessary.

INSTALLATION

Install free-running hub in the reverse order of removal, observing the following:

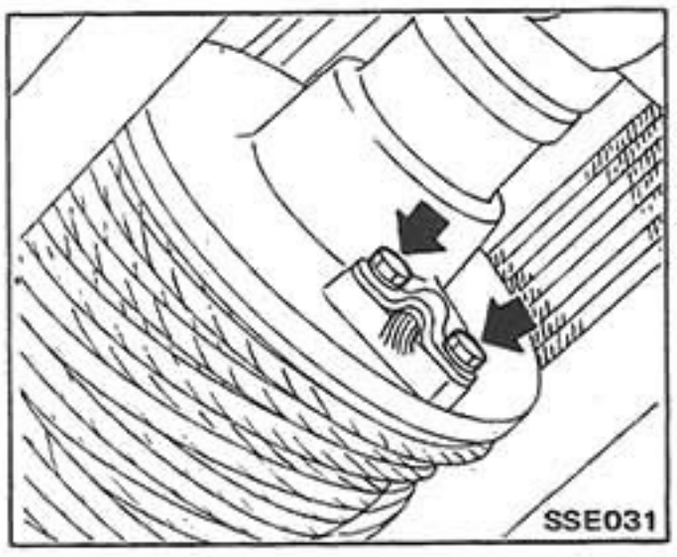
- After free-running hub has been installed, make sure that knob turns smoothly.

(T) : Free-running hub fixing bolt
19 - 25 N·m
(1.9 - 2.5 kg-m,
14 - 18 ft-lb)

Wire replacement (On-vehicle)

If wire is excessively kinked, broken or deformed, replace it.

1. Remove wire clamp and wire.



2. Install new wire.

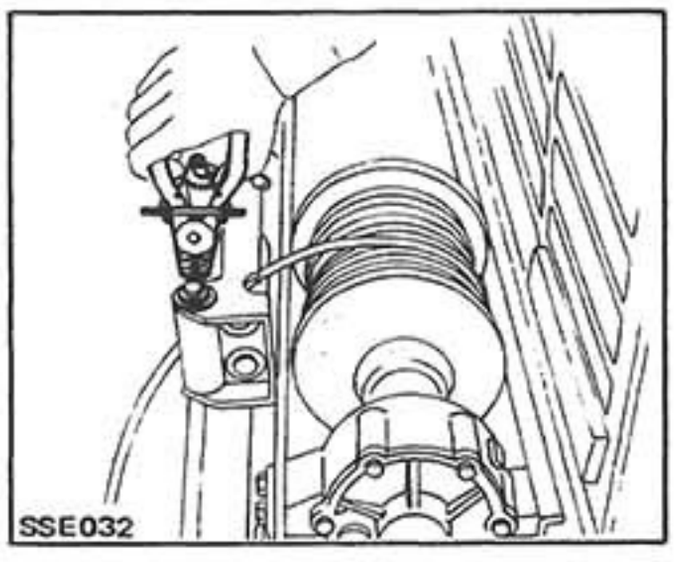
Always wind wire on the drum neatly.

Ⓣ : **Wire clamp bolt**
14 - 18 N·m
(1.4 - 1.8 kg-m,
10 - 13 ft-lb)

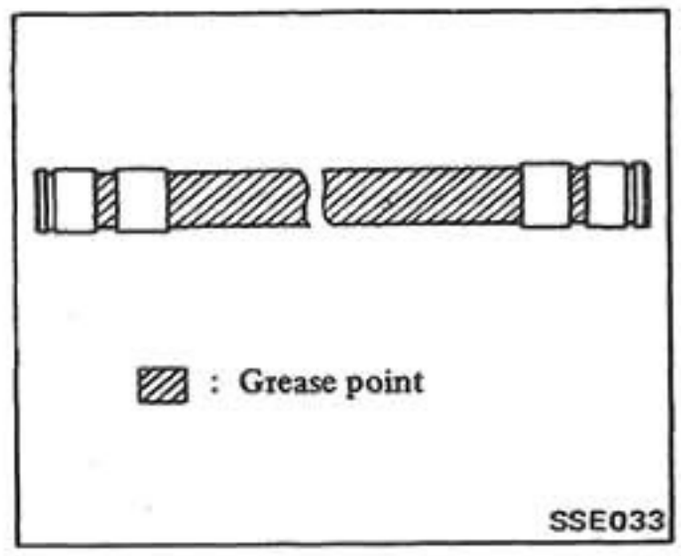
Roller replacement (On-vehicle)

If roller is excessively deformed, replace it.

1. Remove roller shaft snap ring, then roller shaft and roller.



2. Apply grease to roller shaft surface and re-install roller shaft and roller.



SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

POWER TAKE-OFF

Gear ratio	Forth	0.928
	Reverse	1.185

WINCH SYSTEM

Type	Mechanical
Capacity	14,711 N (1,500 kg, 3,308 lb)
Wire size (diameter x length)	8 mm x 40 m (0.31 in x 131 ft)
Wire winding speed/ Engine speed	9.5 m (31.2 ft)/min./ 1,000 rpm
Type of wire Number of strands x Number of core wires	7 x 19 Plated
Type of winch oil	Mobile cylinder oil 600W or equivalent
Oil capacity ℓ (Imp pt)	0.4 (3/4)

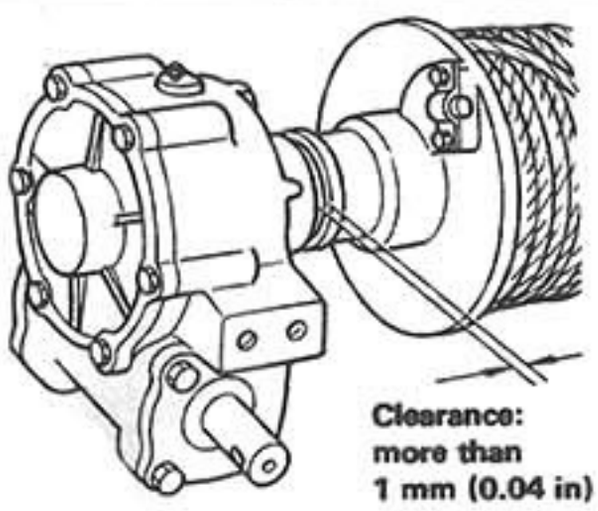
INSPECTION AND ADJUSTMENT

POWER TAKE-OFF

End play mm (in)	Reverse gear	0.02 - 0.50 (0.0008 - 0.0197)
	Idler gear	0.02 - 0.50 (0.0008 - 0.0197)

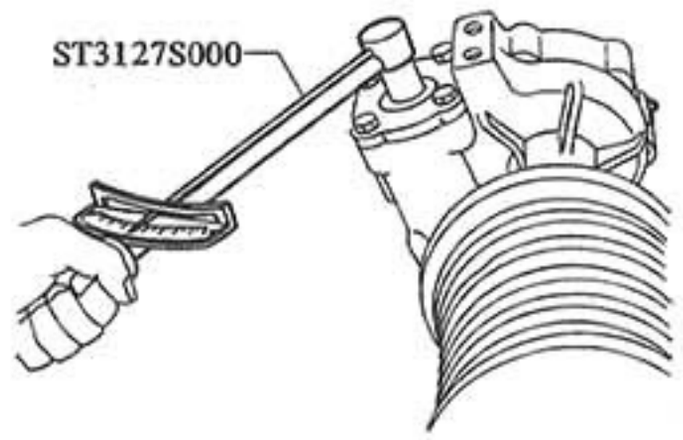
WINCH ASSEMBLY

Winch drum and gear box clearance	More than 1 mm (0.04 in)



SSE027

Worm gear turning torque	1 - 3 N·m (0.1 - 0.3 kg-m, 0.7 - 2.2 ft-lb)



SSE018

TIGHTENING TORQUE

POWER TAKE-OFF

Unit	N·m	kg-m	ft-lb
Power take-off securing bolt	14 - 18	1.4 - 1.8	10 - 13
P.T.O. cover securing bolt	14 - 18	1.4 - 1.8	10 - 13
Cover securing bolt	14 - 18	1.4 - 1.8	10 - 13

CONTROL CABLE

Unit	N·m	kg-m	ft-lb
Control box securing bolt	6 - 7	0.6 - 0.7	4.3 - 5.1
Control cable securing nut	30 - 40	3.1 - 4.1	22 - 30

DRIVE SHAFT

Unit	N·m	kg-m	ft-lb
Center bearing bracket securing bolt	50 - 68	5.1 - 6.9	37 - 50

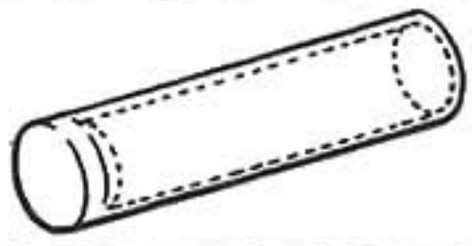
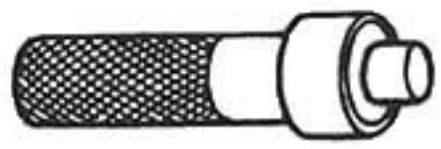
WINCH ASSEMBLY

	N-m	kg-m	ft-lb
Bumper fixing bolt	54 - 72	5.5 - 7.3	40 - 53
Winch assembly support frame to chassis frame	118 - 157	12 - 16	87 - 116
Gear box cover fixing bolt	14 - 18	1.4 - 1.8	10 - 13
Bearing cover fixing bolt	26 - 36	2.7 - 3.7	20 - 27
Drain and filler plug	29 - 49	3 - 5	22 - 36
Free-running hub bolt	19 - 25	1.9 - 2.5	14 - 18
Winch assembly to support frame fixing bolt	50 - 68	5.1 - 6.9	37 - 50
Wire clamp fixing bolt	14 - 18	1.4 - 1.8	10 - 13

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
WINCH DRUM DOES NOT ROTATE OR ROTATES FREELY.	Free-running hub not engaged.	Check or replace free-running hub. ① Free-running hub operation. ② Drive gear
	P.T.O. gear and transmission gear will not engage.	Check shift position.
	• Loosen shift linkage.	Repair or replace.
WINCH DRUM DOES NOT RUN SMOOTHLY	Drive shaft bent	Replace.
	Mainshaft bent	Replace.

SPECIAL SERVICE TOOLS

Tool number	Tool name
ST19910000	Bearing drift 
ST33220000	Bearing drift 
ST30701000	Drift 
ST3127S000 ① GG91030000 ② HT62940000 ③ HT62900000	Preload gauge ① Torque wrench ② Socket adapter ③ Socket adapter   
ST30031000	Bearing puller