# Bolt Tightening Torque

**Hexagon bolt**

1. Thread type
   Metric thread, Unified thread
2. Bolt strength
   8.8 (8T) ~ 10.9 (11T)
3. Thread pitch
   Metric thread: Coarse pitch thread (C), fine pitch thread (F)
   Unified thread: Coarse pitch thread (UNC), fine pitch thread (UNF)

(N-m)

| Type | Bolt size | | | Bolt strength | |
|---|---|---|---|---|---|
| | Nominal dimension | Nominal diameter | Pitch | 8.8 (8T) | 10.9 (11T) |
| Metric thread | M8 | 8 | (C) 1.25 | 26 | 38 |
| | M10 | 10 | (C) 1.5 | 53 | 76 |
| | | | (F) 1.25 | 55 | 80 |
| | M12 | 12 | (C) 1.75 | 90 | 132 |
| | | | (F) 1.25 | 96 | 142 |
| | M14 | 14 | (C) 2.0 | 142 | 206 |
| | | | (F) 1.5 | 152 | 221 |
| | M16 | 16 | (C) 2.0 | 216 | 314 |
| | | | (F) 1.5 | 226 | 330 |
| | M18 | 18 | (C) 2.5 | 299 | 436 |
| | | | (F) 1.5 | 324 | 476 |
| | M20 | 20 | (C) 2.5 | 417 | 608 |
| | | | (F) 1.5 | 451 | 662 |
| | M22 | 22 | (C) 2.5 | 559 | 814 |
| | | | (F) 1.5 | 598 | 878 |
| | M24 | 24 | (C) 3.0 | 721 | 1,030 |
| | | | (F) 2.0 | 770 | 1,128 |
| | M27 | 27 | (C) 3.0 | 1,030 | 1,520 |
| | | | (F) 2.0 | 1,128 | 1,618 |
| | M30 | 30 | (C) 3.5 | 1,422 | 2,109 |
| | | | (F) 2.0 | 1,569 | 2,256 |
| | M33 | 33 | (C) 3.5 | 1,912 | 2,844 |
| | | | (F) 2.0 | 2,059 | 3,040 |
| Unified thread | 5/16 | 05 | 18 UNC | 25 | 35 |
| | 3/8 | 06 | 16 UNC | 44 | 65 |
| | 7/16 | 07 | 14 UNC | 71 | 103 |
| | 1/2 | 08 | 13 UNC | 103 | 147 |
| | 9/16 | 09 | 12 UNC | 147 | 216 |
| | 5/8 | 10 | 11 UNC | 201 | 294 |
| | 3/4 | 12 | 10 UNC | 358 | 525 |
| | 7/8 | 14 | 9 UNC | 554 | 809 |
| | 1 | 16 | 8 UNC | 868 | 1,275 |

Note: Tighten the bolts according to the above list, unless otherwise specified.

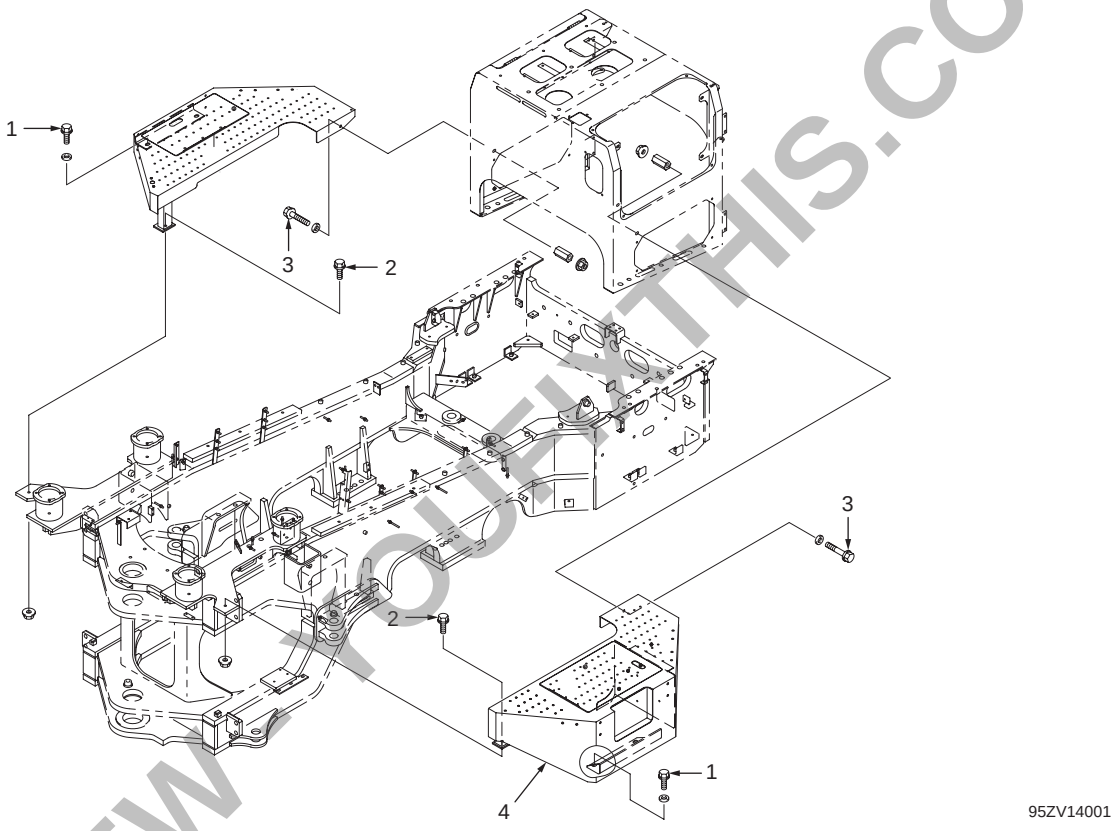
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# Deck

## Deck removing and installing

### Deck removing




1. Remove bolt (1).

   : Bolt (1): 94 N-m (9.6 kgf-m) (69 lb-ft)

2. Attach sling to handrails and remove bolts (2)(3). Lift deck (4) with the handrails.

   : Bolt (2)(3): 94 N-m (9.6 kgf-m) (69 lb-ft)

   : Deck (4) (with handrails):
   : 80 kg (180 lbs) (LH)
   : 60 kg (130 lbs) (RH)

### Deck installing

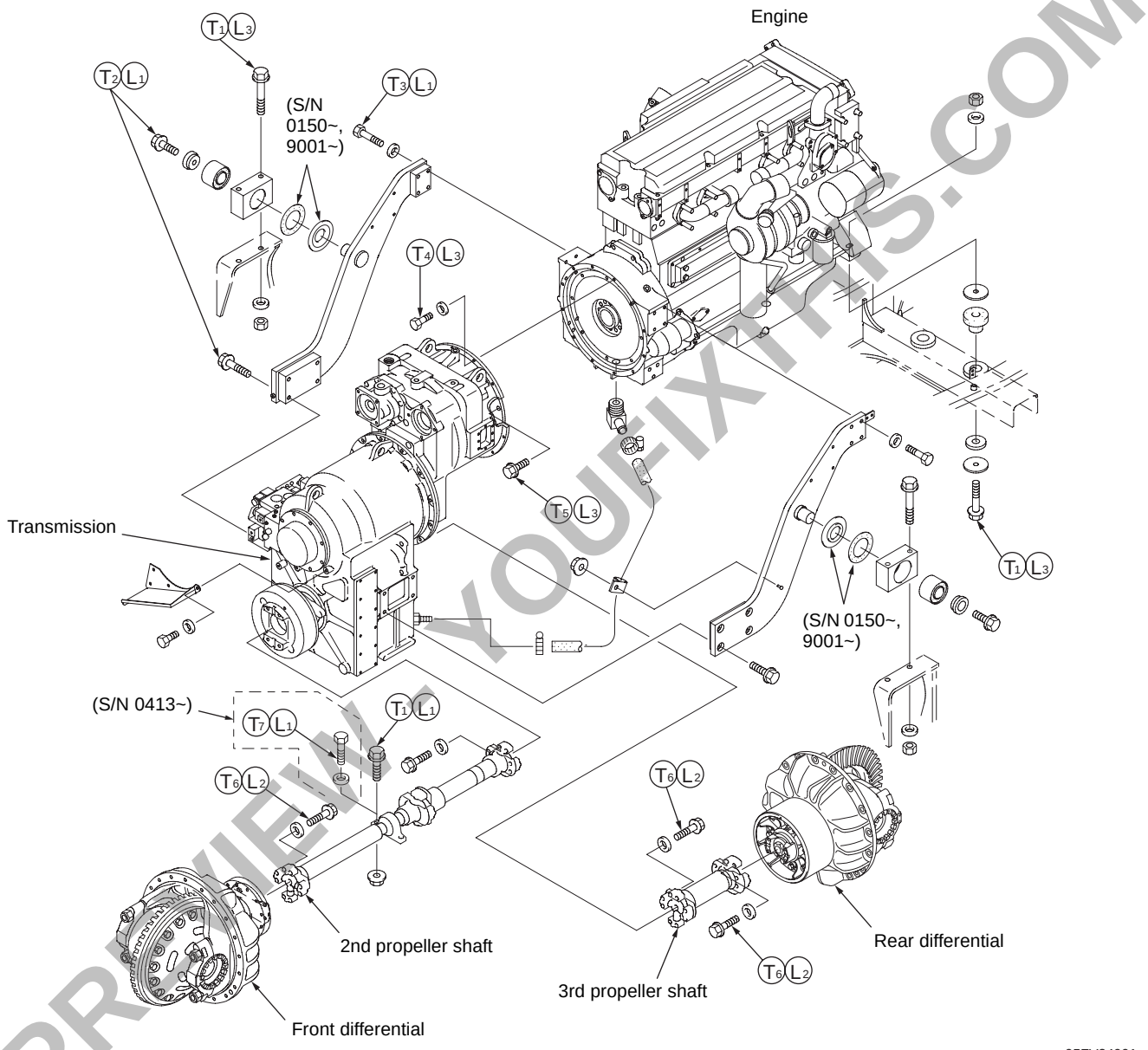
For reinstallation, follow the above procedure in reverse order.

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# Power Line

## Power line tightening torque




: 
$T_1$: 441 N-m (45.0 kgf-m) (325 lb-ft)
$T_2$: 230 N-m (23.5 kgf-m) (170 lb-ft)
$T_3$: 201 N-m (20.5 kgf-m) (148 lb-ft)
$T_4$: 67 N-m (6.85 kgf-m) (50 lb-ft)
$T_5$: 157 N-m (16.0 kgf-m) (116 lb-ft)
$T_6$: 142 N-m (14.5 kgf-m) (105 lb-ft)
$T_7$: 417 N-m (42.5 kgf-m) (307 lb-ft)

$L_1$: With liquid adhesive (Loctite® 262)
$L_2$: With liquid adhesive (Three Bond 1327)
$L_3$: With lubricating oil (Engine oil or gear oil)

**Note**
Always replace drive shaft bolts with new ones - never reuse them.

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(kgf-m)

| Type | Bolt size | | | Bolt strength | |
|---|---|---|---|---|---|
| | Nominal dimension | Nominal diameter | Pitch | 8.8 (8T) | 10.9 (11T) |
| Metric thread | M8 | 8 | (C) 1.25 | 2.7 | 3.9 |
| | M10 | 10 | (C) 1.5 | 5.4 | 7.8 |
| | | | (F) 1.25 | 5.6 | 8.2 |
| | M12 | 12 | (C) 1.75 | 9.2 | 13.5 |
| | | | (F) 1.25 | 9.8 | 14.5 |
| | M14 | 14 | (C) 2.0 | 14.5 | 21.0 |
| | | | (F) 1.5 | 15.5 | 22.5 |
| | M16 | 16 | (C) 2.0 | 22.0 | 32.0 |
| | | | (F) 1.5 | 23.0 | 33.7 |
| | M18 | 18 | (C) 2.5 | 30.5 | 44.5 |
| | | | (F) 1.5 | 33.0 | 48.5 |
| | M20 | 20 | (C) 2.5 | 42.5 | 62.0 |
| | | | (F) 1.5 | 46.0 | 67.5 |
| | M22 | 22 | (C) 2.5 | 57.0 | 83.0 |
| | | | (F) 1.5 | 61.0 | 89.5 |
| | M24 | 24 | (C) 3.0 | 73.5 | 105.0 |
| | | | (F) 2.0 | 78.5 | 115.0 |
| | M27 | 27 | (C) 3.0 | 105.0 | 155.0 |
| | | | (F) 2.0 | 115.0 | 165.0 |
| | M30 | 30 | (C) 3.5 | 145.0 | 215.0 |
| | | | (F) 2.0 | 160.0 | 230.0 |
| | M33 | 33 | (C) 3.5 | 195.0 | 290.0 |
| | | | (F) 2.0 | 210.0 | 310.0 |
| Unified thread | 5/16 | 05 | 18 UNC | 2.5 | 3.6 |
| | 3/8 | 06 | 16 UNC | 4.5 | 6.6 |
| | 7/16 | 07 | 14 UNC | 7.2 | 10.5 |
| | 1/2 | 08 | 13 UNC | 10.5 | 15.0 |
| | 9/16 | 09 | 12 UNC | 15.0 | 22.0 |
| | 5/8 | 10 | 11 UNC | 20.5 | 30.0 |
| | 3/4 | 12 | 10 UNC | 36.5 | 53.5 |
| | 7/8 | 14 | 9 UNC | 56.5 | 82.5 |
| | 1 | 16 | 8 UNC | 88.5 | 130.0 |

Note: Tighten the bolts according to the above list, unless otherwise specified.

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# Fuel Tank

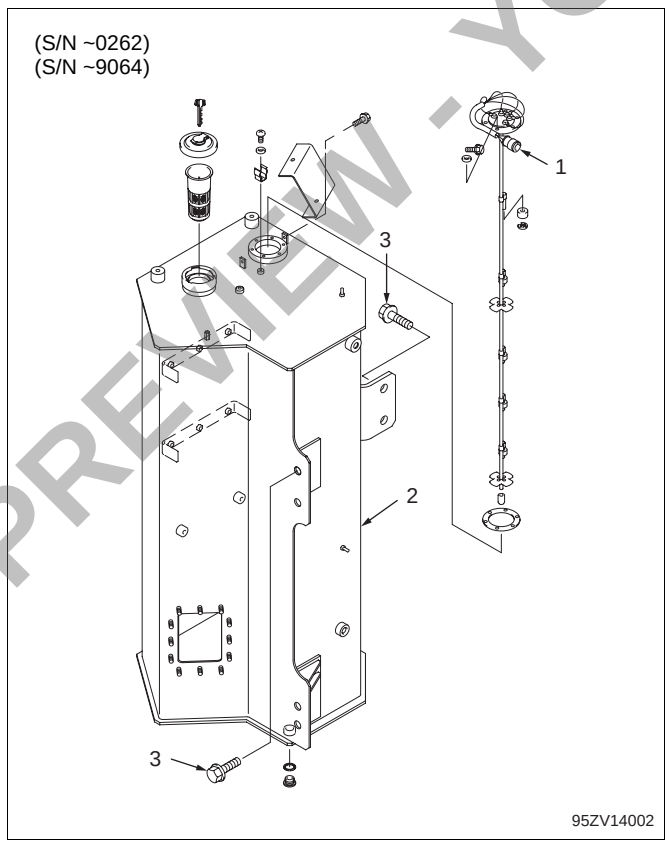
## Fuel tank removing and installing

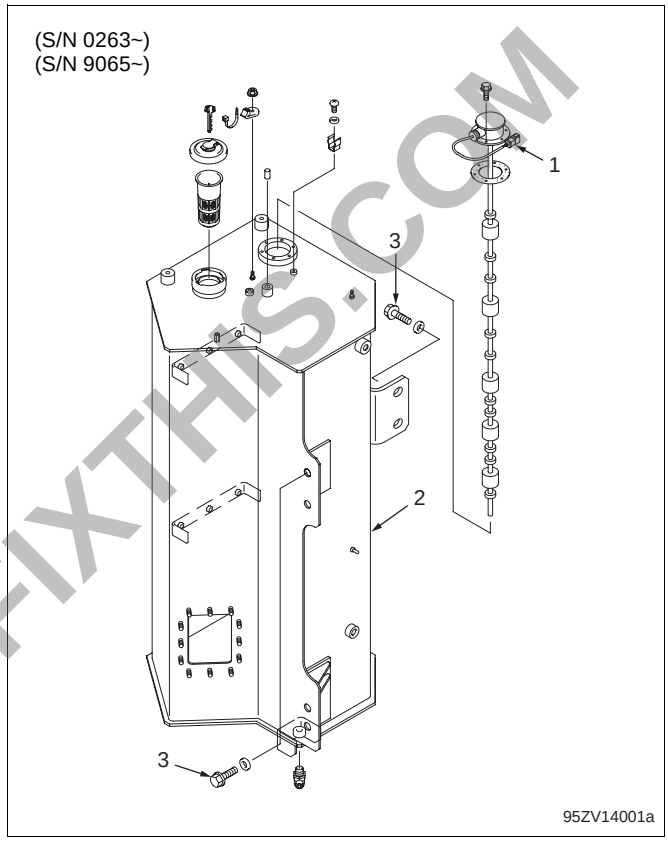
### Fuel tank removing

**⚠ WARNING**

Unexpected movement of the machine could cause an accident resulting in injury or death. Be sure to observe the following items before starting fuel tank removal:
- Position the machine on level ground, and apply the parking brake.
- Lower the attachment onto the ground, and block the tires with chocks, etc. to prevent them from moving.
- Remove the engine key, and hang a "DO NOT START ENGINE!" tag on the steering wheel.

Before starting work:
- Drain fuel from the fuel tank.
  (Fuel tank capacity: 425 L (112 gal))
- Remove the deck and the ladder.




1. Disconnect level sensor electrical line coupler (1).
2. Attach sling to fuel tank (2).

   : Fuel tank: 240 kg (530 lbs) (when empty)
3. Remove retainer bolt (3).

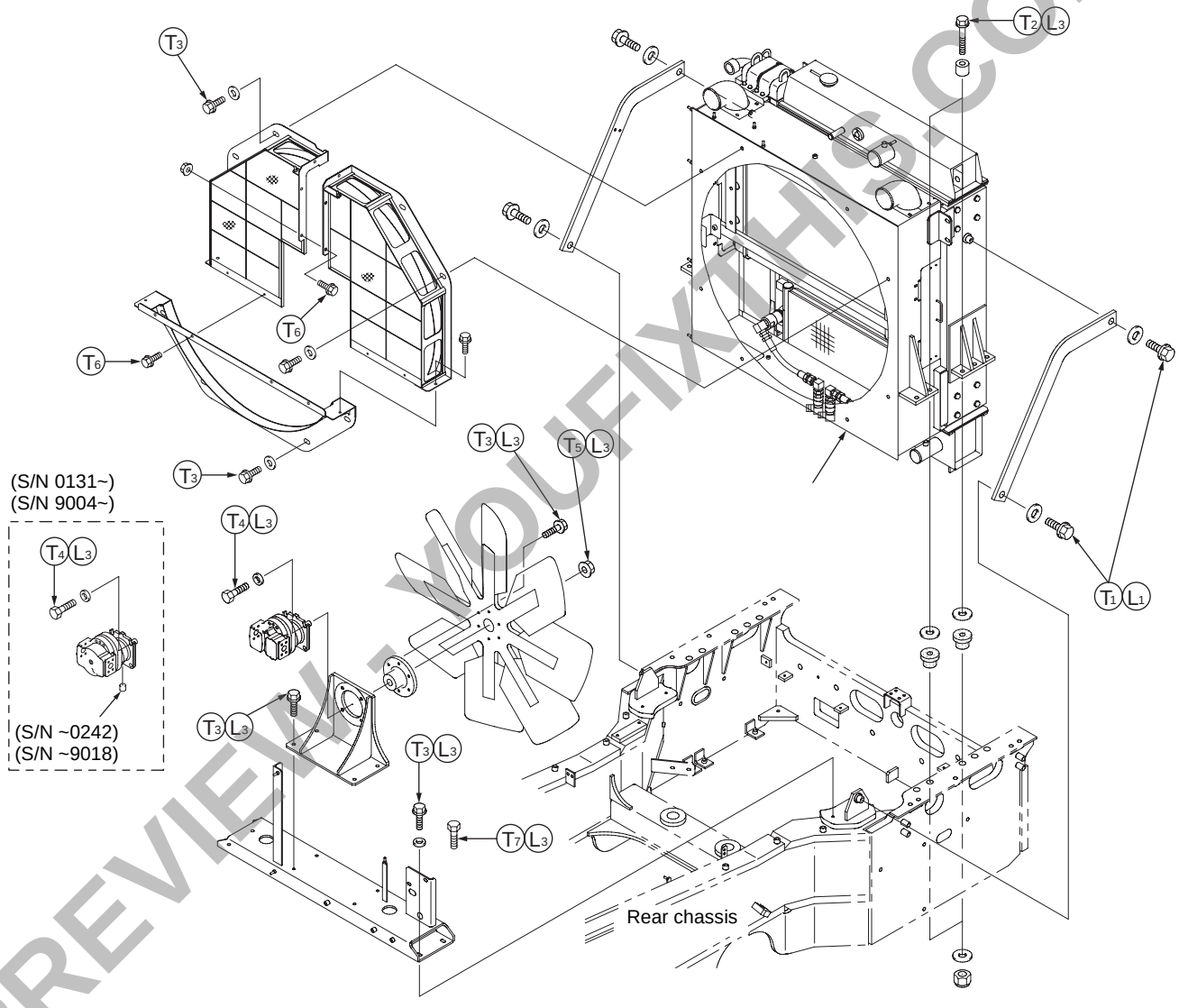
   : Bolt (3): 765 N-m (78.0 kgf-m) (562 lb-ft)

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# Radiator

## Radiator tightening torque




95ZV24002a

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: 

$T_1$: 230 N-m (23.5 kgf-m) (170 lb-ft)
$T_2$: 49 N-m (5.0 kgf-m) (36 lb-ft)
$T_3$: 94 N-m (9.6 kgf-m) (69 lb-ft)
$T_4$: 142 N-m (14.5 kgf-m) (105 lb-ft)
$T_5$: 474 N-m (48.5 kgf-m) (349 lb-ft)
$T_6$: 53 N-m (5.4 kgf-m) (39 lb-ft)
$T_7$: 90 N-m (9.15 kgf-m) (66 lb-ft)

$L_1$: With liquid adhesive (Loctite® 262)
$L_3$: With lubrication oil (Engine oil or gear oil)

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(lb-ft)

| Type | Bolt size | | | Bolt strength | |
|---|---|---|---|---|---|
| | Nominal dimension | Nominal diameter | Pitch | 8.8 (8T) | 10.9 (11T) |
| Metric thread | M8 | 8 | (C) 1.25 | 19.5 | 28 |
| | M10 | 10 | (C) 1.5 | 39 | 56 |
| | | | (F) 1.25 | 40 | 59 |
| | M12 | 12 | (C) 1.75 | 66 | 97 |
| | | | (F) 1.25 | 70 | 105 |
| | M14 | 14 | (C) 2.0 | 105 | 150 |
| | | | (F) 1.5 | 110 | 160 |
| | M16 | 16 | (C) 2.0 | 160 | 230 |
| | | | (F) 1.5 | 165 | 245 |
| | M18 | 18 | (C) 2.5 | 220 | 320 |
| | | | (F) 1.5 | 235 | 350 |
| | M20 | 20 | (C) 2.5 | 305 | 450 |
| | | | (F) 1.5 | 330 | 490 |
| | M22 | 22 | (C) 2.5 | 410 | 600 |
| | | | (F) 1.5 | 440 | 650 |
| | M24 | 24 | (C) 3.0 | 530 | 760 |
| | | | (F) 2.0 | 565 | 830 |
| | M27 | 27 | (C) 3.0 | 760 | 1,120 |
| | | | (F) 2.0 | 830 | 1,190 |
| | M30 | 30 | (C) 3.5 | 1,050 | 1,550 |
| | | | (F) 2.0 | 1,160 | 1,660 |
| | M33 | 33 | (C) 3.5 | 1,410 | 2,100 |
| | | | (F) 2.0 | 1,520 | 2,240 |
| Unified thread | 5/16 | 05 | 18 UNC | 18.0 | 26 |
| | 3/8 | 06 | 16 UNC | 32 | 47 |
| | 7/16 | 07 | 14 UNC | 52 | 76 |
| | 1/2 | 08 | 13 UNC | 76 | 105 |
| | 9/16 | 09 | 12 UNC | 110 | 160 |
| | 5/8 | 10 | 11 UNC | 150 | 215 |
| | 3/4 | 12 | 10 UNC | 265 | 385 |
| | 7/8 | 14 | 9 UNC | 410 | 595 |
| | 1 | 16 | 8 UNC | 640 | 940 |

Note: Tighten the bolts according to the above list, unless otherwise specified.

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# Hydraulic Tank

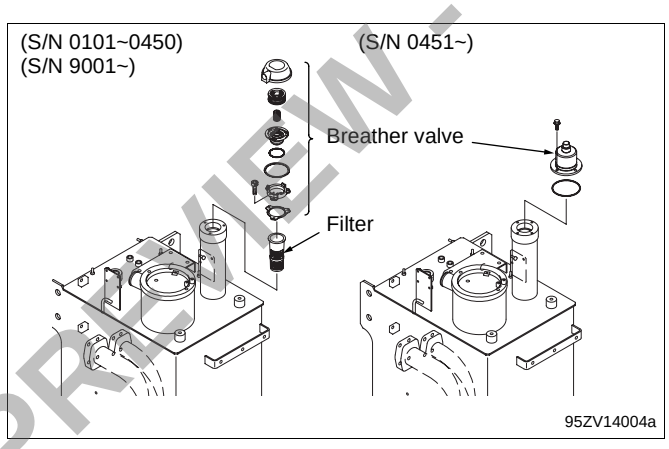
## Hydraulic tank removing and installing

### Hydraulic tank removing

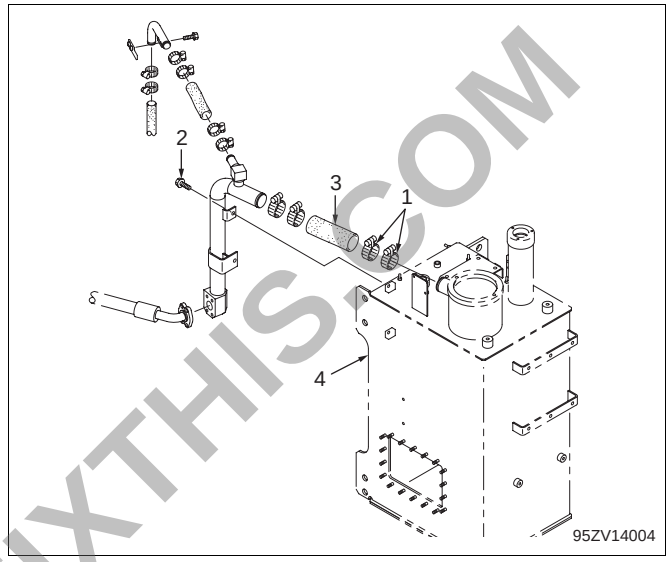
**⚠ WARNING**

Unexpected movement of the machine could cause an accident resulting in injury or death. Be sure to observe the following items before starting hydraulic tank removal:
- Position the machine on level ground, and apply the parking brake.
- Lower the attachment onto the ground, and block the tires with chocks, etc. to prevent them from moving.
- Remove the engine key, and hang a "DO NOT START ENGINE!" tag on the steering wheel.

Before starting work:
- Drain hydraulic oil from the hydraulic tank. (Hydraulic tank capacity: 150 L (40 gal))
- Remove the deck and the ladder.
- Clean the area around the tank.

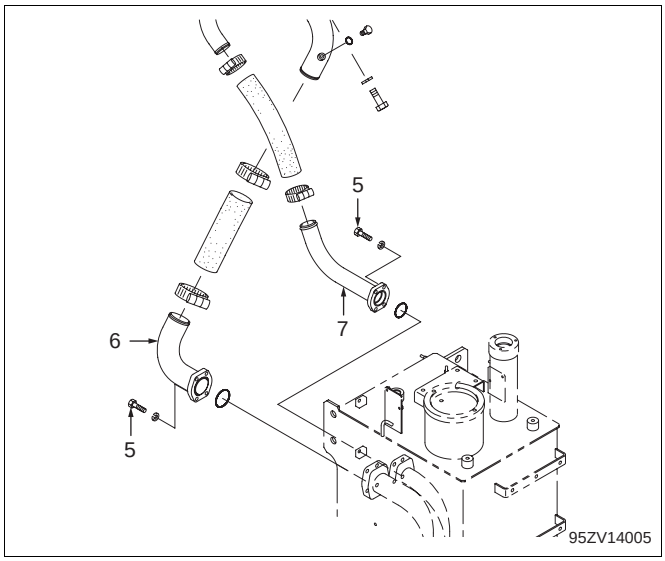



**Note**
The breather valve on the hydraulic tank has been changed as shown.




1. Remove hose band (1) and bolt (2). Remove hose (3) from hydraulic tank (4).

**Note**
Cover the disconnected hose with vinyl to protect them from dust and dirt.




2. Remove bolts (5) and disconnect pipes (6) (7) from the hydraulic tank.

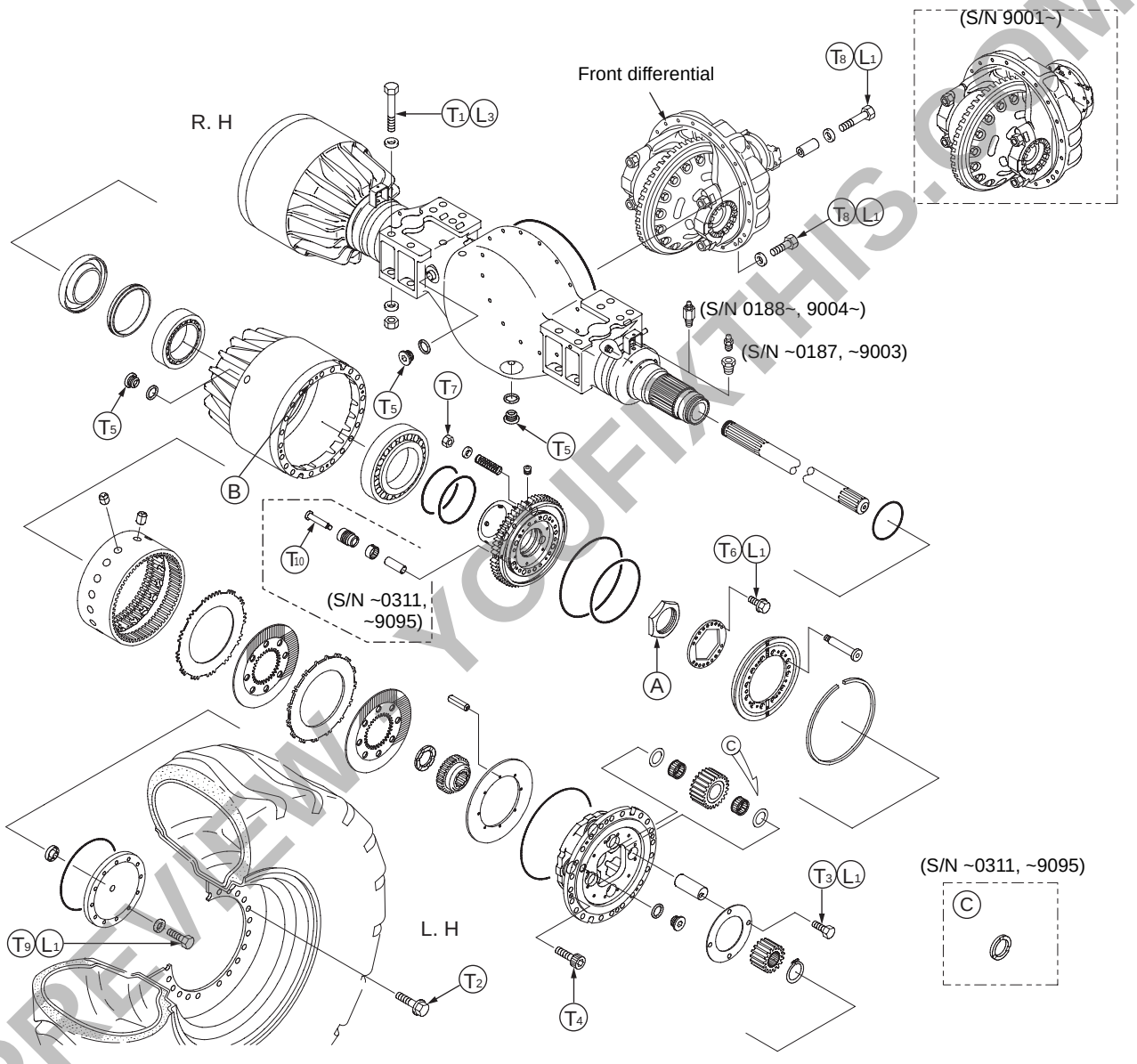
**Note**
Cover the disconnected pipes with vinyl to protect them from dust and dirt.

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# Front Axle Assembly

## Front axle assembly tightening torque




: 
$T_1$: 1,420 N-m (145.0 kgf-m) (1,049 lb-ft)
$T_2$: 892 N-m (91.0 kgf-m) (658 lb-ft)
$T_3$: 417 N-m (42.5 kgf-m) (307 lb-ft)
$T_4$: 86 N-m (8.8 kgf-m) (64 lb-ft)
$T_5$: 78 N-m (8.0 kgf-m) (58 lb-ft)
$T_6$: 53 N-m (5.4 kgf-m) (39 lb-ft)
$T_7$: 33 N-m (3.4 kgf-m) (25 lb-ft)
$T_8$: 314 N-m (32.0 kgf-m) (98 lb-ft)
$T_9$: 90 N-m (9.15 kgf-m) (66 lb-ft)
$T_{10}$: 50 N-m (5.1 kgf-m) (37 lb-ft)

$L_1$: Screw lock agent (Three Bond 1327)
$L_3$: With lubrication oil (Engine oil or gear oil)

$T_{10}$: Screw lock agent (Loctite® 648)

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# Safety precautions

The most important point in providing repair service is safety. To ensure safety, observe the general cautions described below.

- This manual is intended for properly trained and equipped service technicians.
- Any work on the machine must be performed by the trained personnel only.
- Carefully read this manual to thoroughly understand the operation method before you operate or repair the machine.
- Be sure to wear appropriate clothes and protectors, such as safety boots, hard hat and goggles.
- Place the machine on level and solid ground, and place chocks against the wheels to prevent movement.
- Remove the cable from the battery before starting the service work, and attach a "DO NOT OPERATE!" tag to the steering wheel.
- Be sure to release the internal pressure before you remove a pipe, such as the hydraulic oil, air, or engine coolant pipe.
- Be sure to apply the articulation stopper before starting work.
- While supporting the bottom of the chassis using a jack, be sure to support the chassis using the blocks.
- When the boom or bucket is raised or when a unit is lifted by a crane, be sure to place a stand or adequate cribbing under the unit to prevent unexpected dropping.
- Do not start to work in an enclosed area if adequate ventilation is not provided.
- To remove a heavy unit (20 kg (40 lbs) or more), be sure to use a crane or other lifting device.
- Just after stopping operation, be careful not to directly touch a hot component. You may get burned.
- Contact tire manufacturer's local dealer for tire servicing and changing.
- Always store the tools in good condition, and use them properly.
- Keep the work area clean. Clean up spills immediately.
- Avoid the use of flammable solvents and cleaners.
- When working outdoors keep work areas, ladders, steps, decks and work platforms clear of snow, ice, and mud.
- Use safe work platforms to reach higher areas of the machine.
- Any technician that operates a refrigerant recovery and recycling machine must first be certified through and EPA approved testing program.

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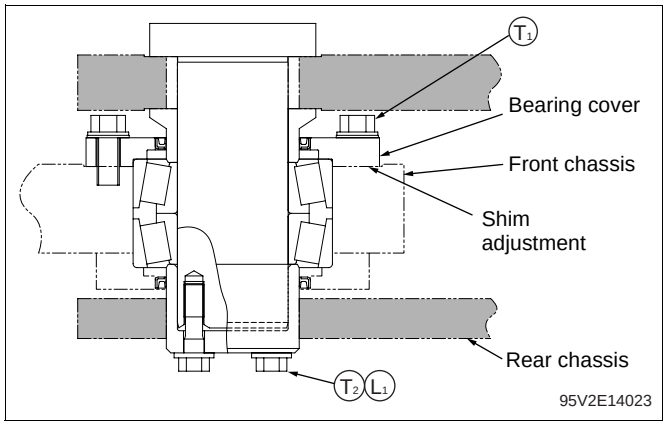
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# Center Pin

## Center pin shim adjustment

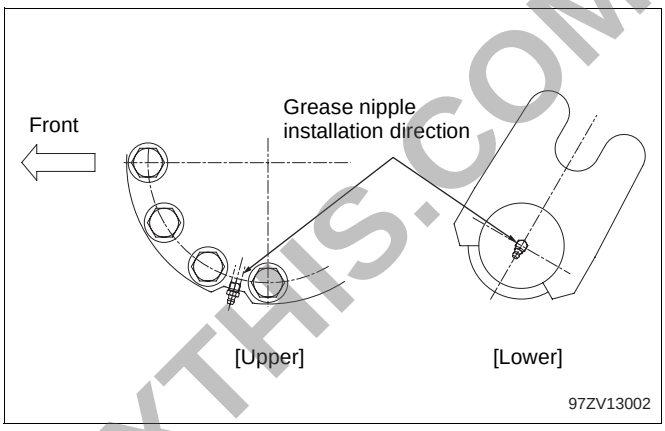



The clearance between the front chassis and bearing cover is 0.75 ± 0.5 mm (0.0295 ± 0.0197 in) before shim adjustment.
Add shims so that the clearance is 0.1 ± 0.05 mm (0.0039 ± 0.0020 in).

: 
$T_1$: 441 N-m (45.0 kgf-m) (324 lb-ft)
$T_2$: 422 N-m (43.0 kgf-m) (311 lb-ft)

$L_1$: Lubricating oil (Engine oil or gear oil)

## Bearing cover installing



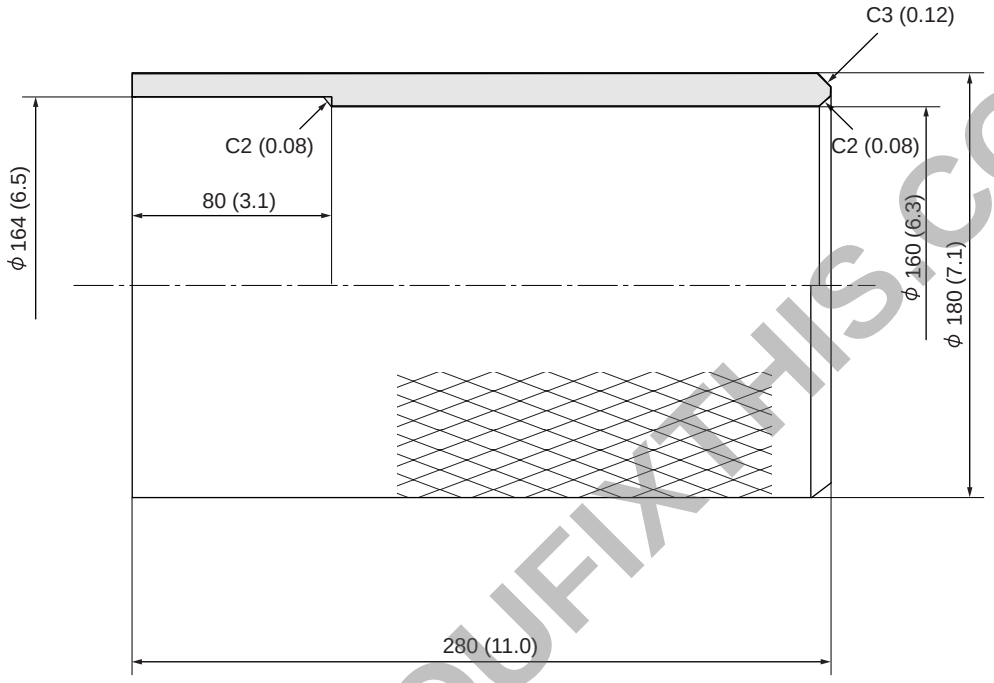

Install the bearing cover so that the grease nipple mounting hole is positioned at the specified angle as shown in the figure above.

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(E) Bearing insertion jig
mm (in)

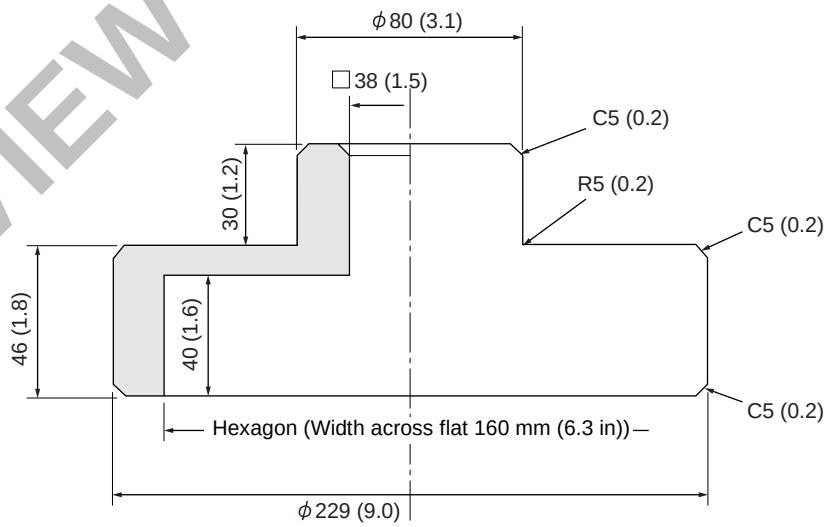
(Material: SS41)




K95V2U24025

(F) Axle nut tightening jig
mm (in)

(Material: SS41)



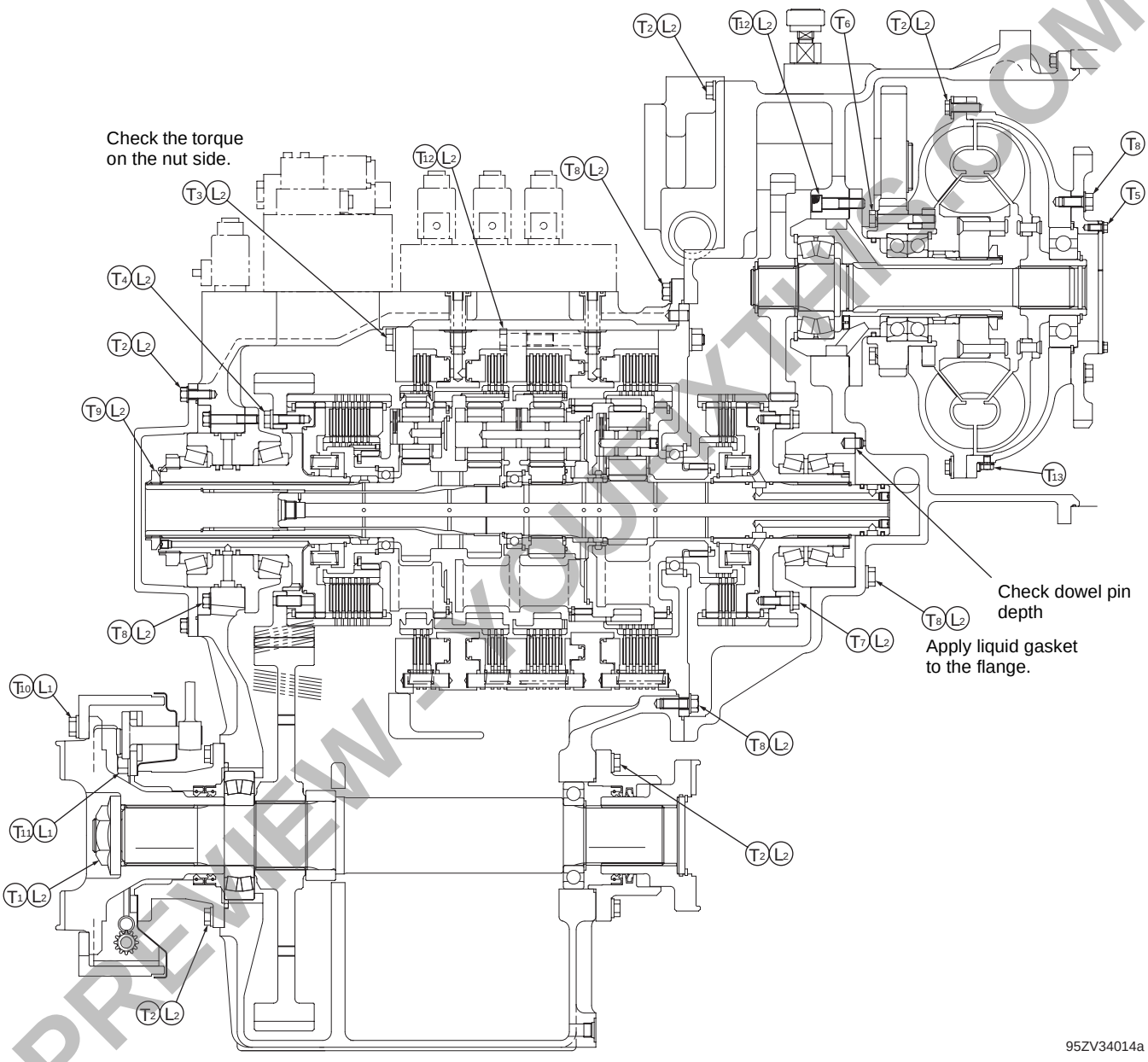

K95V2U24026

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# Transmission Assembly

## Transmission assembly bolt tightening torque




:

$T_1$: 882 N-m (90.0 kgf-m) (651 lb-ft)
$T_2$: 53 N-m (5.40 kgf-m) (39 lb-ft)
$T_3$: 132 N-m (13.5 kgf-m) (98 lb-ft)
$T_4$: 76 N-m (7.80 kgf-m) (56 lb-ft)
$T_5$: 28 N-m (2.85 kgf-m) (21 lb-ft) (T/M S/N ~0501)
$T_5$: 38 N-m (3.90 kgf-m) (28 lb-ft) (T/M S/N 0502~)
$T_6$: 55 N-m (5.60 kgf-m) (41 lb-ft)
$T_7$: 52.5 N-m (5.35 kgf-m) (39 lb-ft)
$T_8$: 94 N-m (9.55 kgf-m) (69 lb-ft)
$T_9$: 177 N-m (18.0 kgf-m) (130 lb-ft)
$T_{10}$: 132 N-m (13.5 kgf-m) (98 lb-ft)
$T_{11}$: 230 N-m (23.5 kgf-m) (170 lb-ft)
$T_{12}$: 90 N-m (9.15 kgf-m) (66 lb-ft)
$T_{13}$: 16.7 N-m (1.70 kgf-m) (12 lb-ft)

$L_1$: Screw lock agent (Loctite® 262)
$L_2$: With lubrication oil (Engine oil or gear oil)

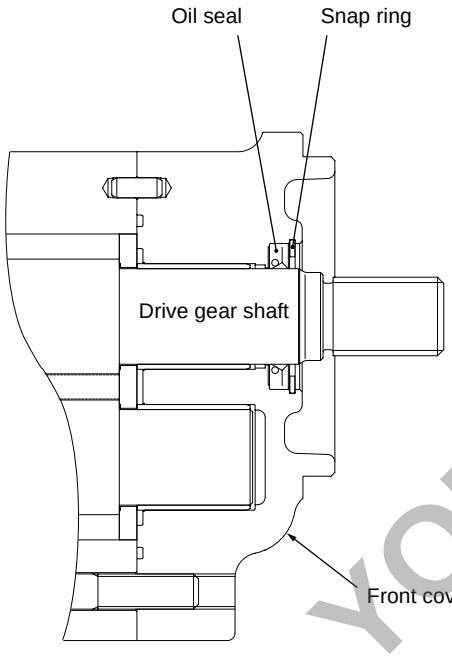
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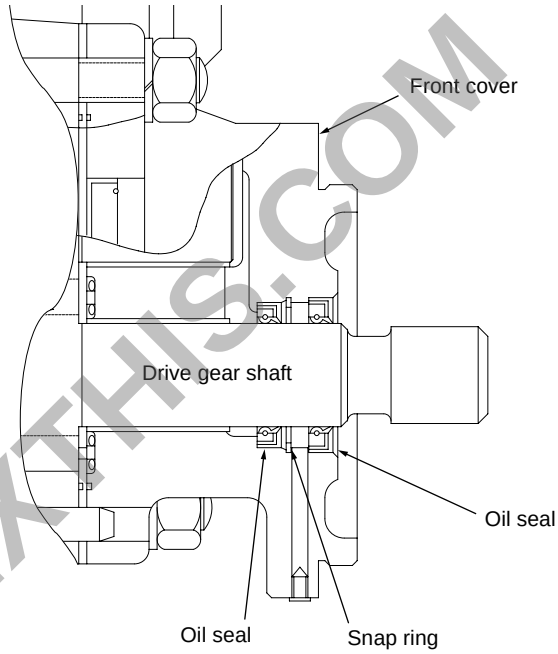
## Oil seal replacement procedure

There are two kinds of the pump drive gear shaft unit. One has one oil seal only, and the other has an additional dust seal or oil seal outside.

[Example 1]




[Example 2]




**In case of Example 2**

1. After removing the outer oil seal, remove the snap ring and the inner oil seal.
2. When removing the oil seals, remove any scores on the front cover and the drive gear shaft.
3. Cover the drive gear shaft with vinyl electrical tape to protect the splines.
4. Apply a thin coat of grease to the oil seal and the lip unit.
5. Install the seal straight.

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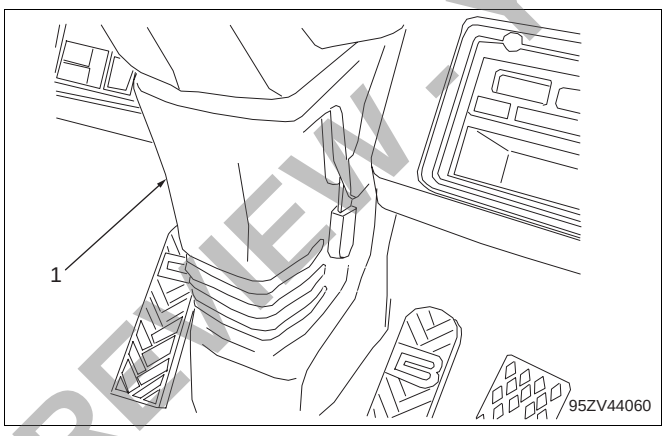
# Orbitrol®

## Orbitrol® removing and installing

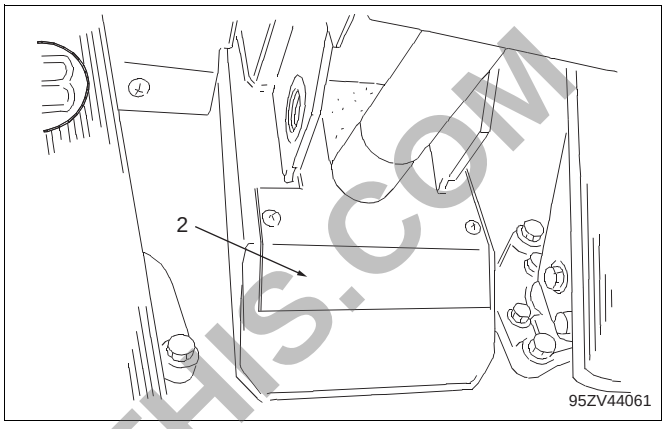
### Orbitrol® removing

**⚠ WARNING**

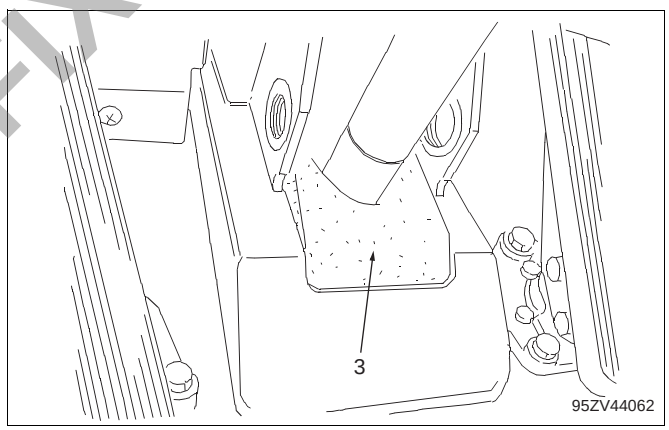
Unexpected movement of machine could cause serious injury or death. To prevent such an accident, observe the following items:
- Park the machine on level ground, and lower the attachment onto the ground.
- Block the tires with chocks to prevent the wheels from moving.
- Apply the articulation stopper.
- Before starting work, be sure to remove the engine key, and hang a "DO NOT START!" tag on the steering wheel or the operator's seat.
- Relieve the internal pressure from the steering hydraulic line by turning the steering wheel left and right.
- Relieve the internal pressure from the hydraulic tank.




1. Remove cover (1).




2. Remove plate (2).




3. Remove sound suppression sheet (3).

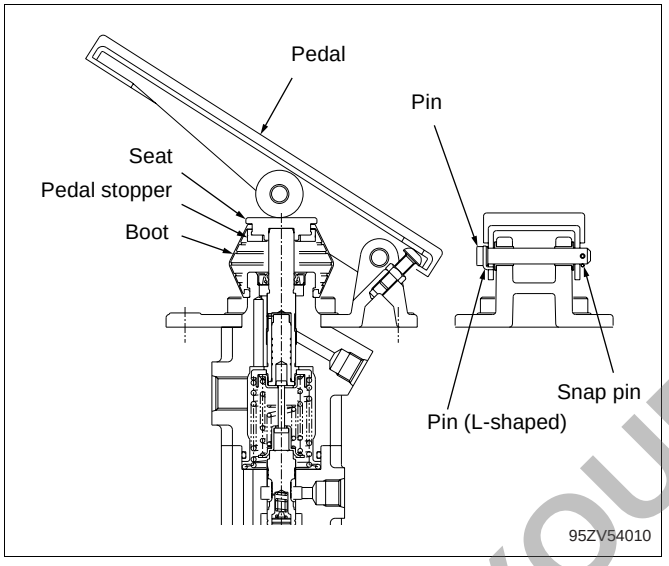
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## Brake valve disassembling

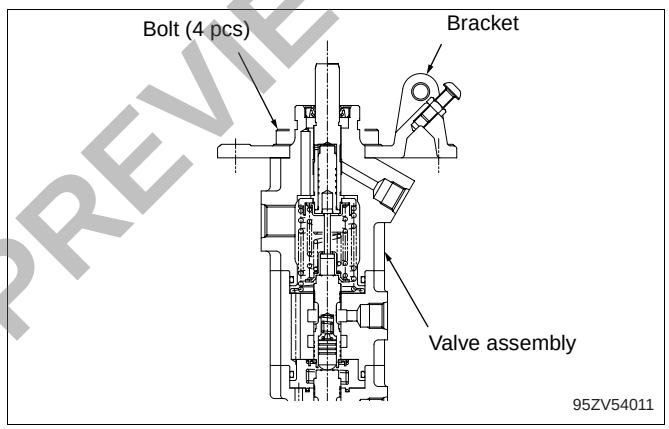
**Note**
Use a copper plate in vise and do not fix the brake valve in vise strongly.

**[ Main valve ]**

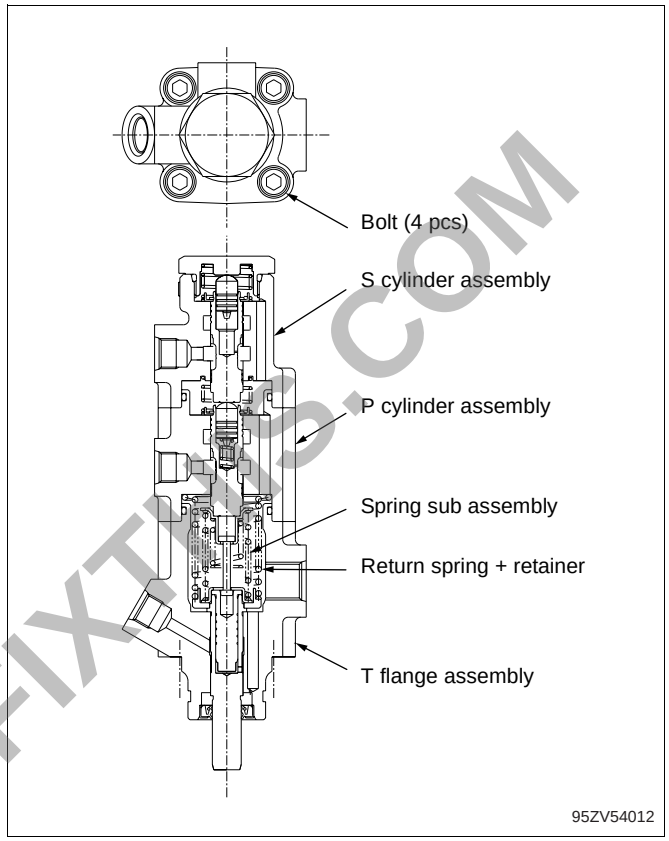



1. Pull out the snap pin to remove the pedal, seat, boot and pedal stopper.

**Note**
During this step, the L-shaped pin is dropped. Take care not to lose it.




2. Loosen four bolts and disconnect the bracket from the valve assembly.




3. Turn the valve upside down.
   Loosen four bolts and separate the valve assembly into the S cylinder assembly, P cylinder assembly, and T flange assembly.

**Note**
Carefully separate the valve assembly. It may spring out by the spring force.

4. Remove the spring sub assembly from the T flange assembly.
   Remove the return spring and retainer together.

**[ Pilot valve ]**

Follow the same disassembling procedure as the main valve.

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