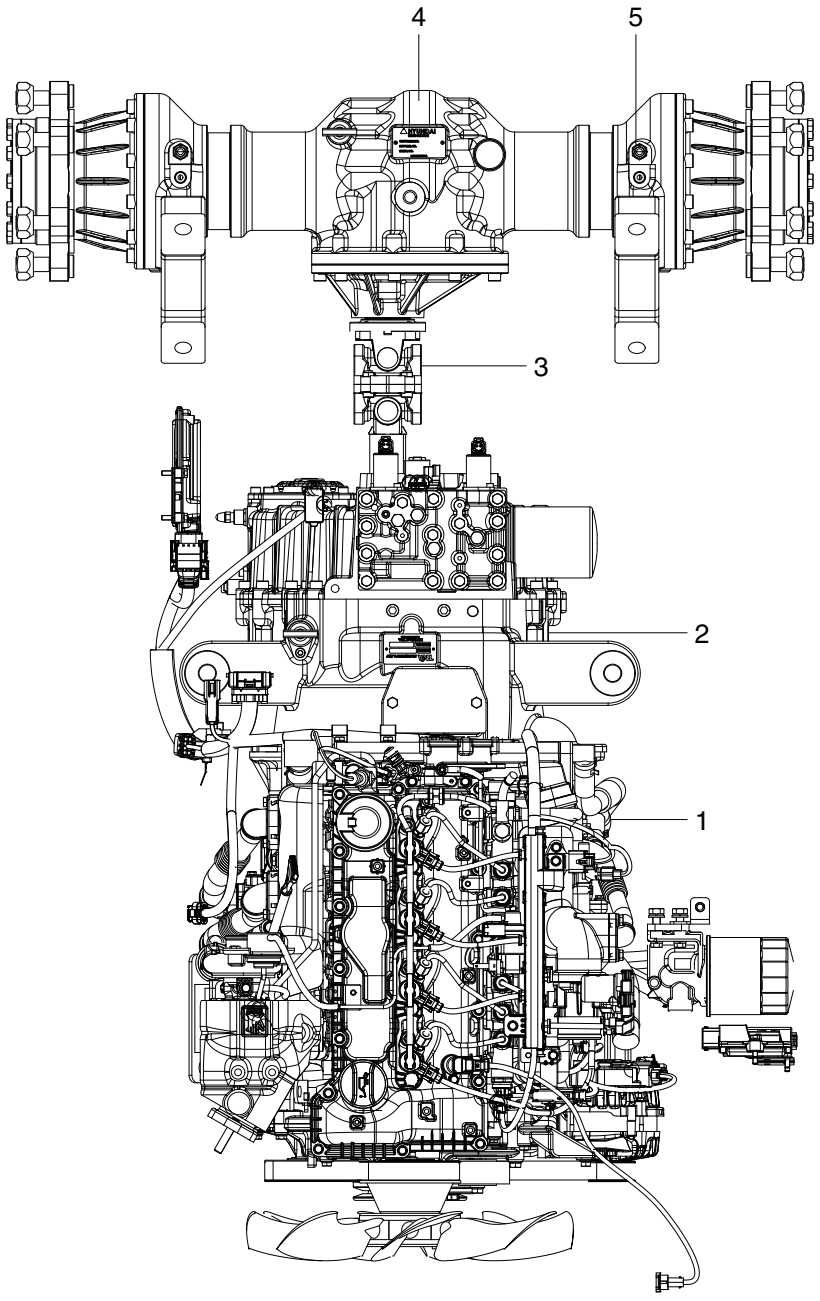
# SECTION 3 POWER TRAIN SYSTEM
## (25/30D-9V, 35DN-9V)

# SECTION 3 POWER TRAIN SYSTEM

## GROUP 1 STRUCTURE AND OPERATION

### 1. POWER TRAIN DIAGRAM

#### 1) STRUCTURE




25D9V3PS01

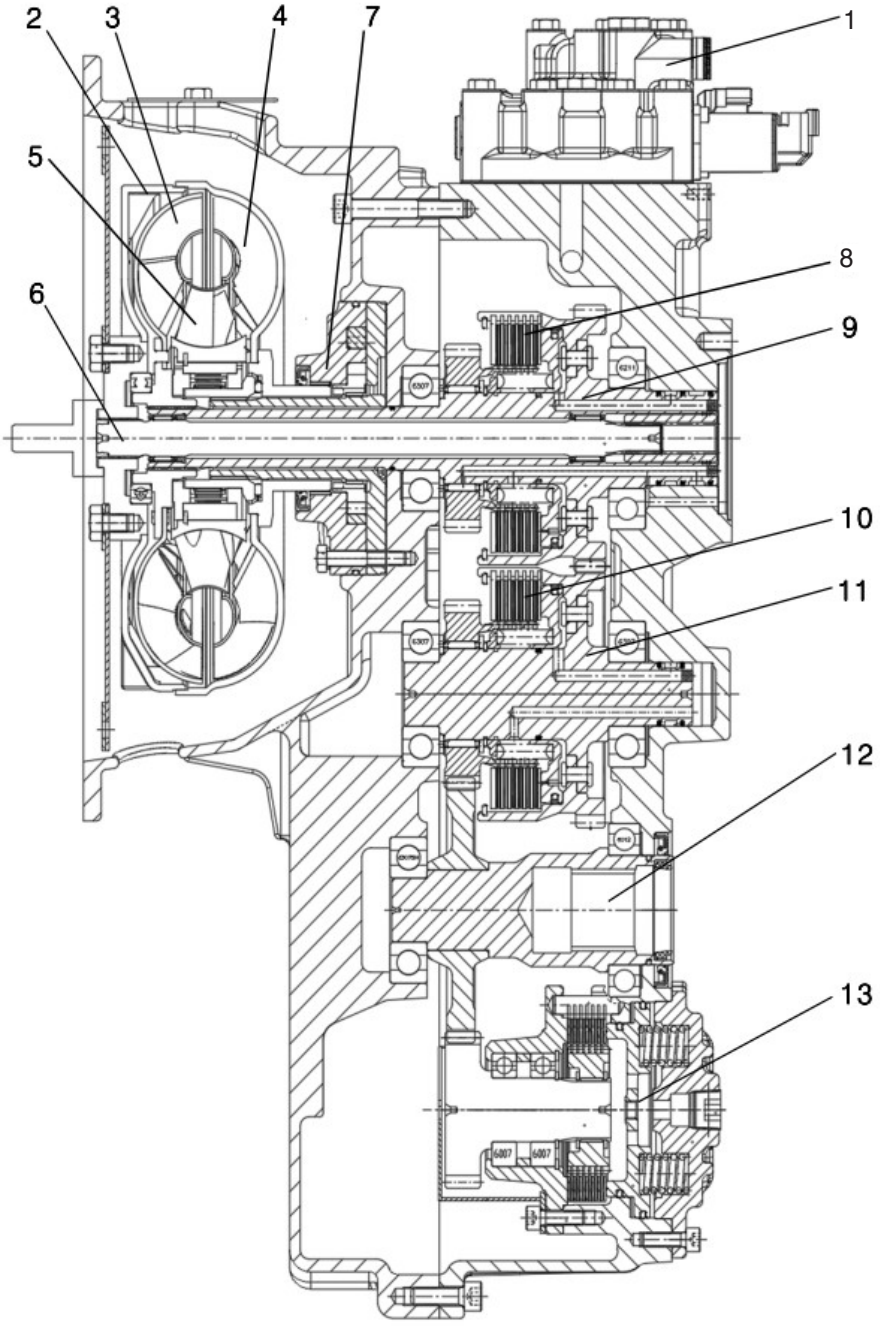
| | | | | | |
|---|---|---|---|---|---|
| 1 | Engine | 3 | Drive shaft | 5 | Brake |
| 2 | Transmission | 4 | Drive axle | | |

## 2) SPECIFICATION

| Item | | | Specification |
|---|---|---|---|
| Torque converter | Model | | KAPEC 280 DJ |
| | Type | | 3 Element, 1 stage, 2 phase |
| | Stall ratio | | 2.87 |
| Transmission | Type | | Power shift |
| | Gear shift(FWD/REV) | | 1/1 |
| | Control | | Electric Proportional Solenoid Valve (Controlled by TCU) |
| | Overhaul ratio | FWD | 1.437 |
| | | REV | 1.437 |
| Axle | Type | | Front-wheel drive type, fixed location |
| | Gear ratio | | 11.568 : 1 |
| | Gear | | Spiral bevel gear type |
| Wheels | Q'ty (FR/RR) | | Single : 2/2, Double : 4/2 |
| | Front (drive) | 2.5 T | Single : 7.00-12-12 PR<br>Double : 6.00-15-10 PR |
| | | 3.0 T | Single : 8.15-15-14 PR<br>Double : 6.00-15-10 PR |
| | | 3.5 T | |
| | Rear (steer) | 2.5 T | 6.50-10-12 PR |
| | | 3.0 T | |
| | | 3.5 T | |
| Brakes | Travel | | Front wheel, wet disk brake |
| | Parking | | Wet disk (negative brake) |
| Steering | Type | | Full hydraulic, power steering |
| | Steering angle | | 78.9˚ to both right and left angle, respectively |

## 2. TRANSMISSION

### 1) STRUCTURE

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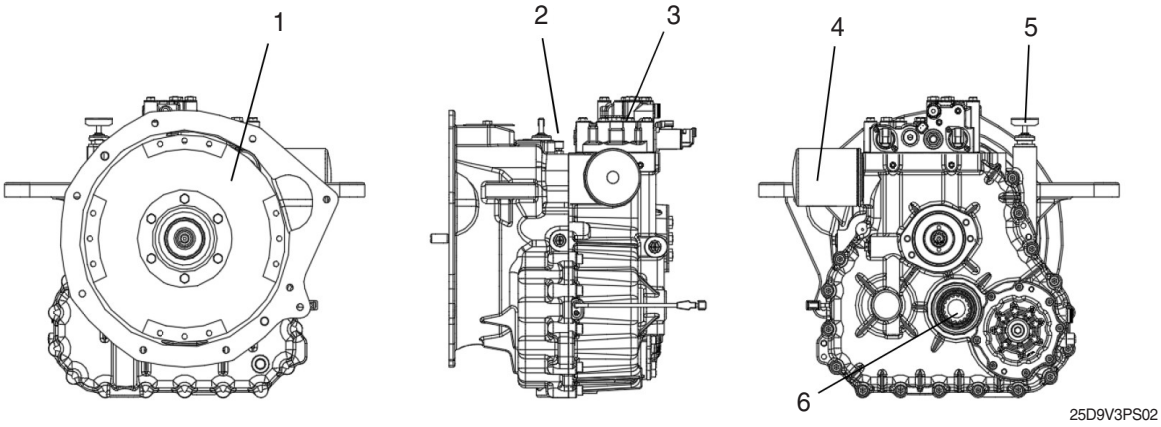
| | | | | | |
|---|---|---|---|---|---|
| 1 | Control valve | 6 | PTO shaft | 11 | Reverse clutch shaft |
| 2 | Torque converter | 7 | Oil pump | 12 | Output shaft |
| 3 | Turbine wheel | 8 | Forward clutch pack | 13 | Parking brake |
| 4 | Impeller wheel | 9 | Forward clutch shaft | | |
| 5 | Stator | 10 | Reverse clutch pack | | |

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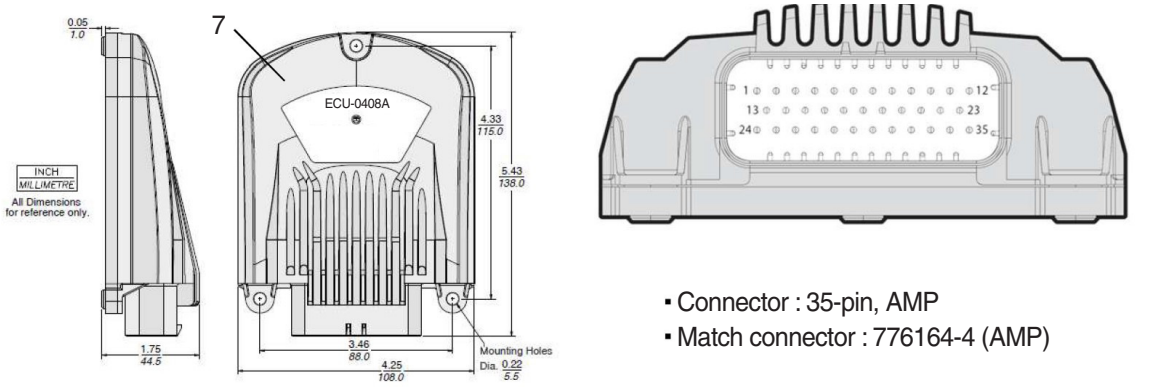



- Connector : 35-pin, AMP
- Match connector : 776164-4 (AMP)

25D9V3PS03

1 Torque converter
2 Air breather
3 Control valve
4 Oil filter
5 Oil level gauge and tube
6 Output (Universal joint link part)
7 TCU (Transmission Control Unit)

## 2) OPERATION

(1) Torque converter equipment

The torque converter is an automatic fluid drive.
It transmits engine torque by means of hydraulic force.
The torque converter leads and the power which is delivered rotated the charging pump.
Oil is drawn from the transmission reservoir by the charging pump.
The pump delivers its entire output to a full-flow oil filter for cleaning.
From the oil filter, the oil supply is sent to the control valve.

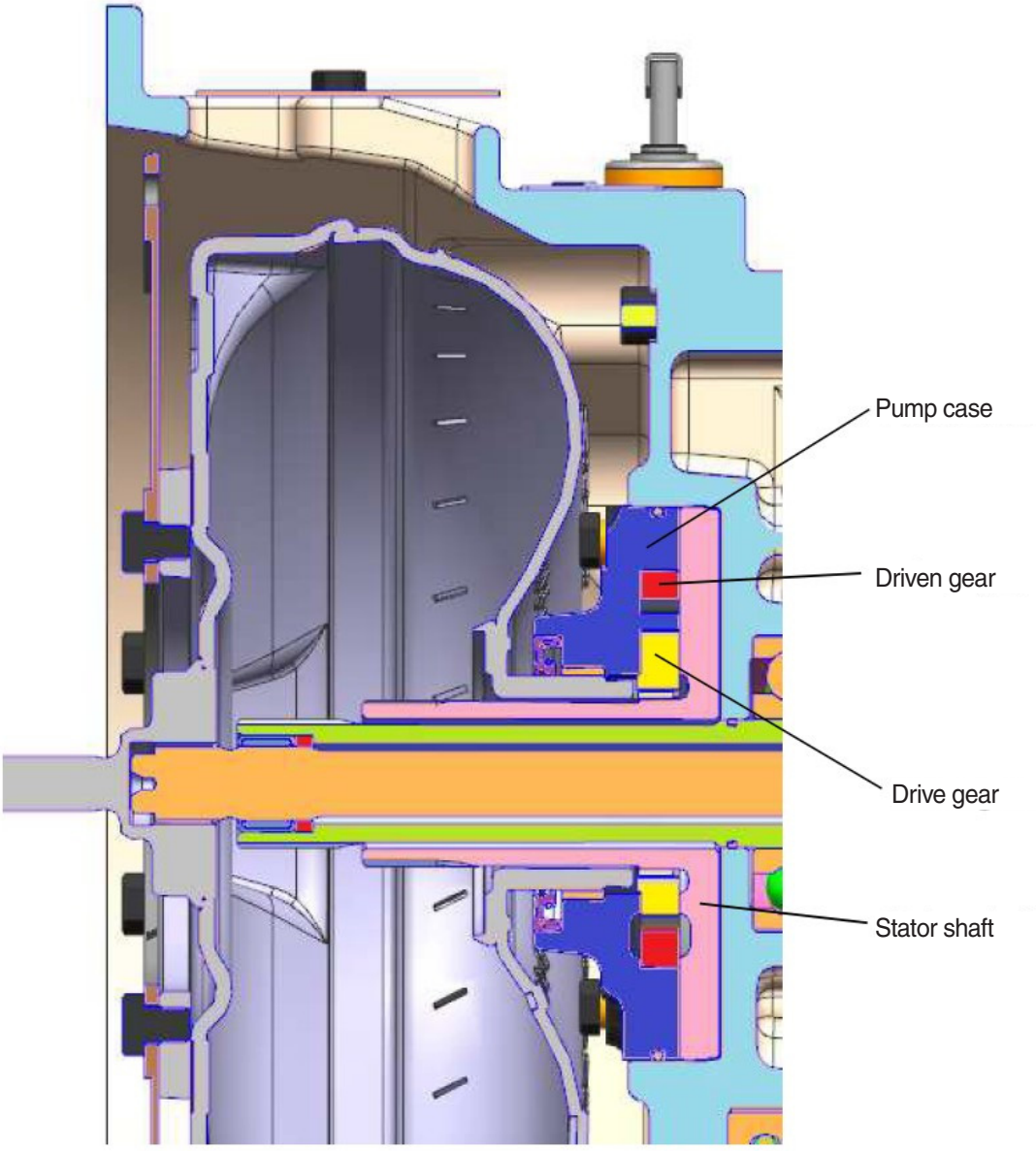
The main pressure regulator valve provides pressure for clutch pack, directs oil to the solenoid valve. Moving the solenoid valve allows oil to charge the selected (forward or reverse) clutch line and to engage that clutch.

The remaining oil appropriating clutch pressure flows into the torque converter,
A converter pressure regulator valve in the converter-in line limits the oil pressure there.
{The oil pressure input to the torque converter is adjusted 4 ~ 7 kgf/cm$^2$ (56.9 ~ 99.6 lbf/in$^2$).}
{The oil pressure output from the torque converter is adjusted below 2 ~ 4.5 kgf/cm$^2$ (28.4 ~ 49.8 lbf/in$^2$).}
The torque converter is continuously filled with oil during operation,
Rotation of the converter impeller imparts energy to the oil which, is turn, drives the turbines.
The oil then flows between the stator vanse which redirect it to the impeller.
At thist time, torque is increased.

The oil from the torque converter enters the cooler,
The cooler is a heat exchanger in which the oil flows through air cooled passages.
After refrigerated, it is in charge of clutch lubrication through the lubrication oil pach of the clutch shaft.
A lubrication valve between the cooler and lubrication system returns all excess oil to the transmission reservoir.

2) Pump drive device

There is pump device beside torque converter as below picture which is for charging pump of transmission and power take off (PTO).

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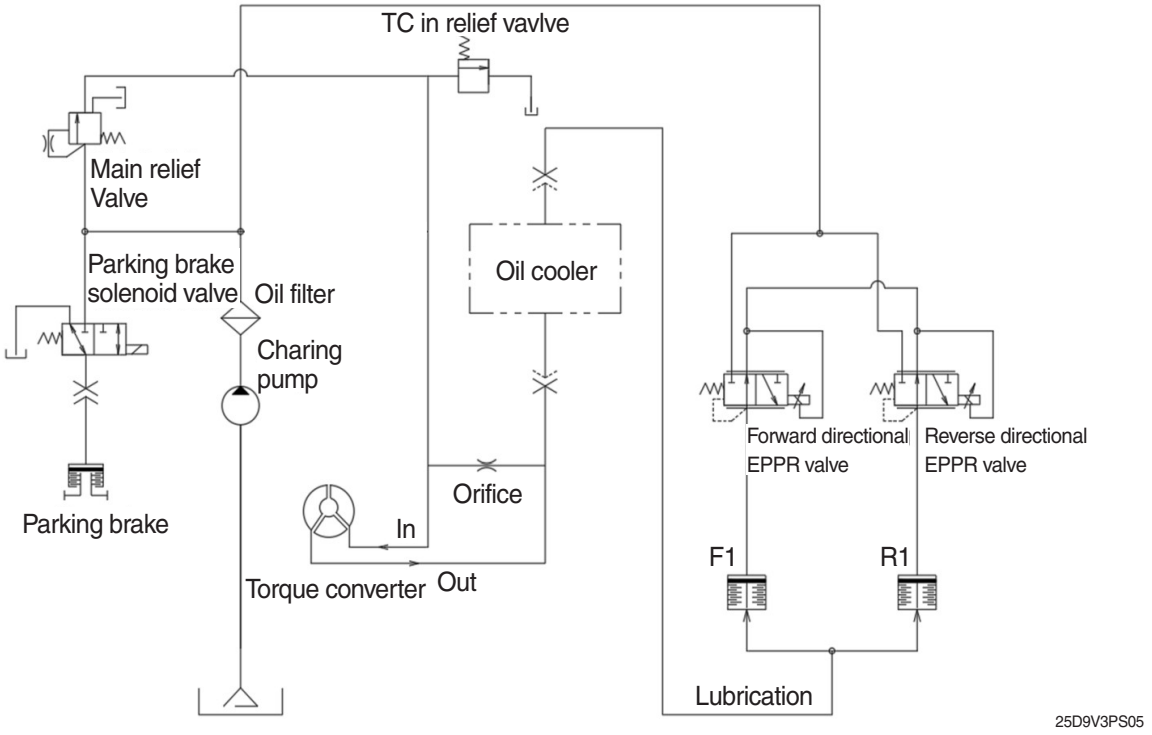
### 3) HYDRAULIC CIRCUIT



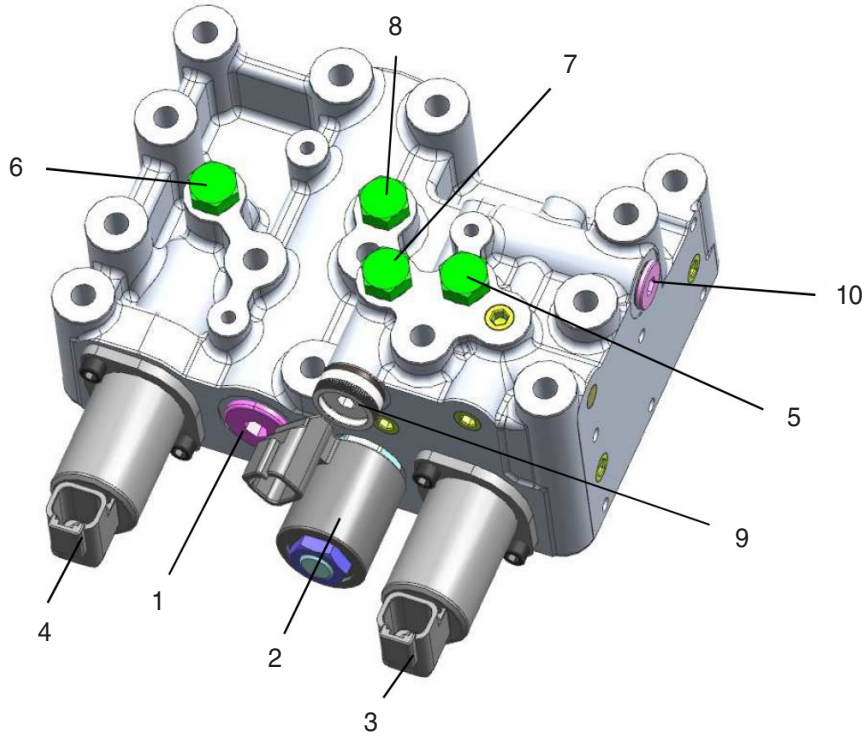

(1) The oil that is pumped up through the strainer from the oil pump of transmission by charging pump of transmission. And this oil is sent to torque converter through the relief valve for the main pressure of hydraulic clutches.

(2) The oil that is sent to torque converter flows between the turbine shaft and Inner race of free wheel, and flows into the circuit of converter through the space between stator wheel and turbine wheel.

(3) The oil which is drained from torque converter is cooled by the external cooler of the truck. And this cooled oil lubricates and cools each parts of transmission like bearings, clutches and so on.

## 4) CONTROL VALVE

(1) Structure

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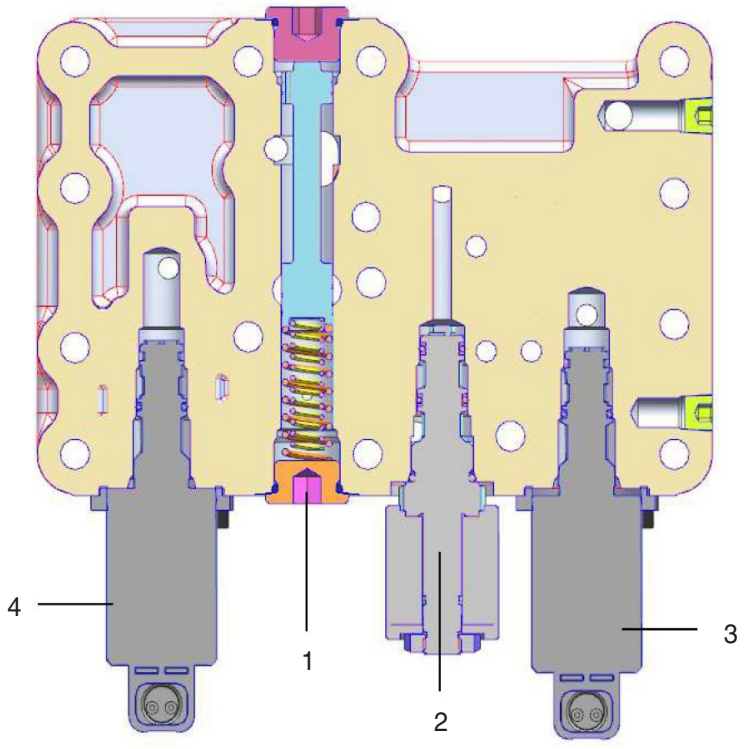



25D9V3PS07

| | | | |
|---|---|---|---|
| 1 | Main relief | 6 | Reverse clutch pressure check port |
| 2 | Parking brake solenoid valve | 7 | Parking brake pressure check port |
| 3 | Forward directional EPPR valve | 8 | Main pressure check port |
| 4 | Revese directional EPPR valve | 9 | Outlet port for releasing parking brake |
| 5 | Forward clutch pressure check port | 10 | Clutch pressure / temperature sensor port |

(2) Assembly

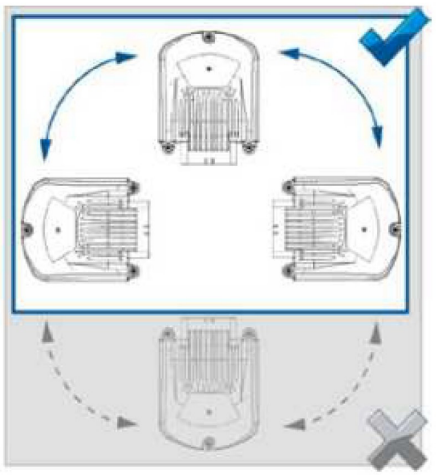
Control valve assassembly contains main relief valve for regulating pressure of hydraulic clutch assembly, forward & reverse directional EPPR Valve for adjusting clutch pressure and riging up clutch pressure smoothly, parking brake solenoid valves for controlling parking brake.

| Strucutre | Opeartion |
|---|---|
| Main relief valve | This valve regulates the clutch pressure stably. |
| Forward & reverse directional EPPR valve | These valve control the oil flow for moving smoothly forward & reverse through propotional current signal which is given by direction selector and Potentio-meter. |
| Solenoid valve for parking | This valve control the oil flow for applying and releasing parking brake. |

## 5) TCU

(1) TCU mounting

To help prevent water ingress, mount the TCU-0408A with the integral connector facting down or sideways. Do not mount with connector facing up.



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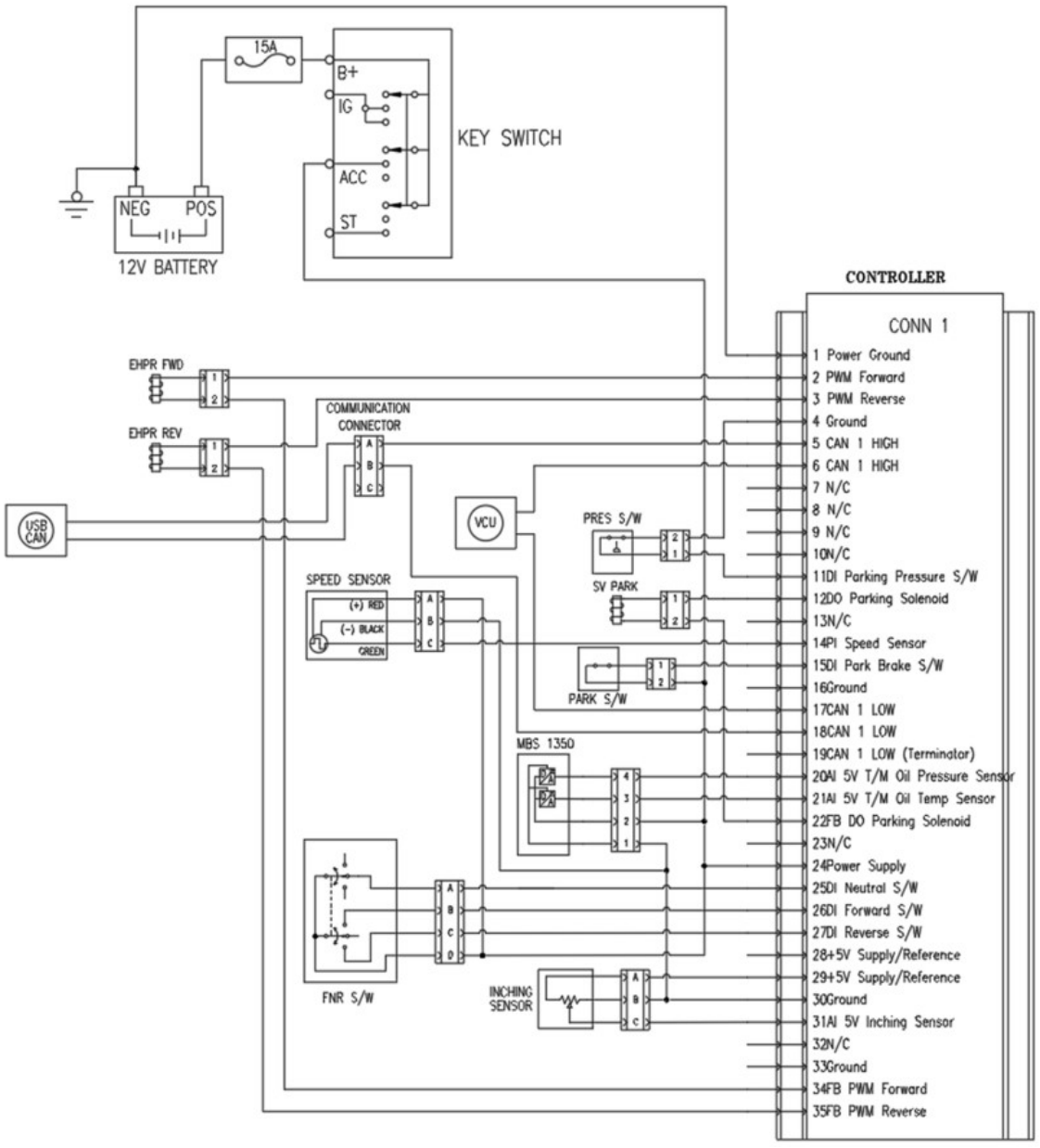
(2) TCU wiring diagram

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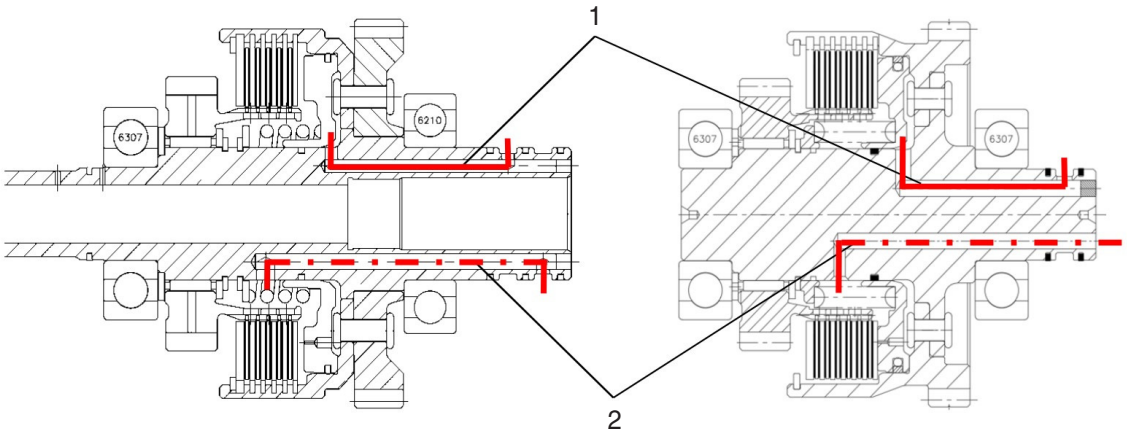
## 6) CLUTCH




Forward clutch Reverse clutch

1 Pressure line ( ——— )
2 Lubrication line ( - · - · - )

25D9V3PS10

(1) Summary

① This transmission consists of the forward and reverse shift equipments which is the wet multipic disc type of hydraulic clutch.

② There are 6 discs per each clutch which is made by carbon paper.

(2) Clutch shifting

① The explain of shift is represented in case of the shift "N (neutral) → F or R" in the truck.
Forward & Reverse EPPR valve become "ON" by current signal which is given by gear selector
② on the truck.

③ Clutch is engaged smoothly by controlling EPPR valve and TCU. The shock by clutch engagement is reduced.

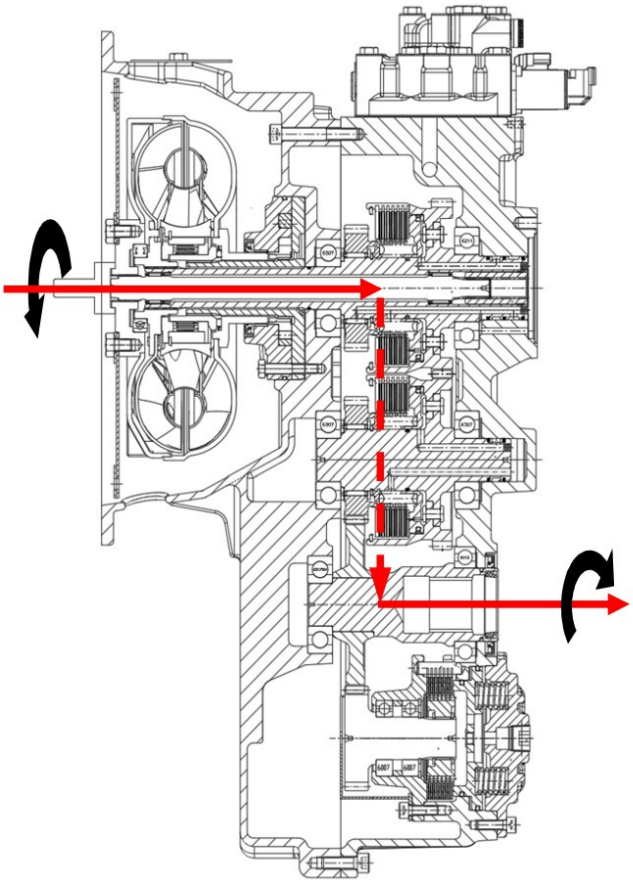
④ When the clutch engagement concludes and the hydraulic oil becomes regular pressure.

⑤ The hydraulic oil in the piston room presses the piston, and make the steel plates and the friction plates stick strongly against the force of the return spring.

⑥ Therefore the torque that is transmitted to the clutch shaft assembly transmits to the reduction gears.

## 7) POWER FLOW

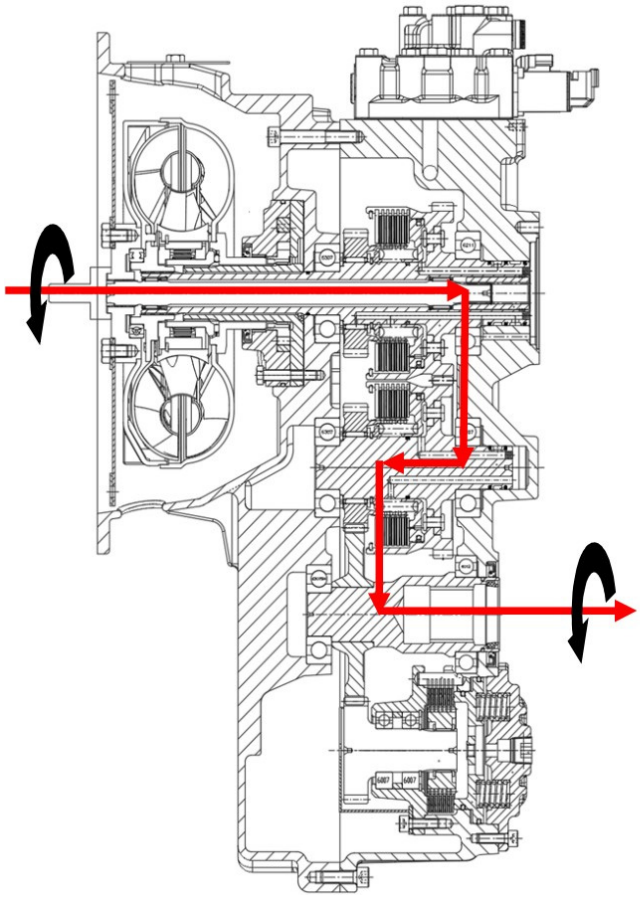
(1) Forward



Input
↓
Torque converter
↓
Forward clutch shaft
↓
Clutch gear
↓
Output gear
↓
Output

25D9V3PS11

(2) Reverse

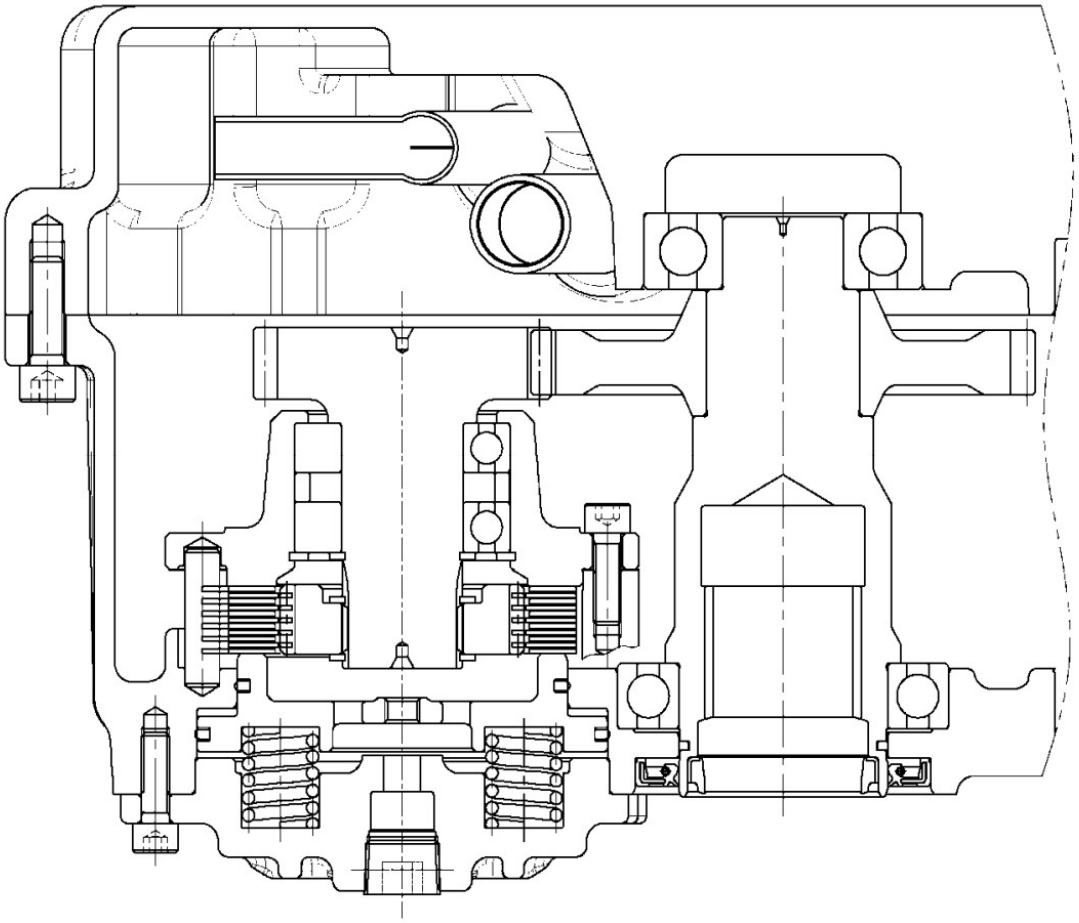


Input
↓
Torque converter
↓
Forward clutch shaft
↓
Forward drum gear
↓
Reverse drum gear
↓
Reverse clutch shaft
↓
Clutch gear
↓
Output gear
↓
Output

25D9V3PS12

### 8) PARKING BRAKE

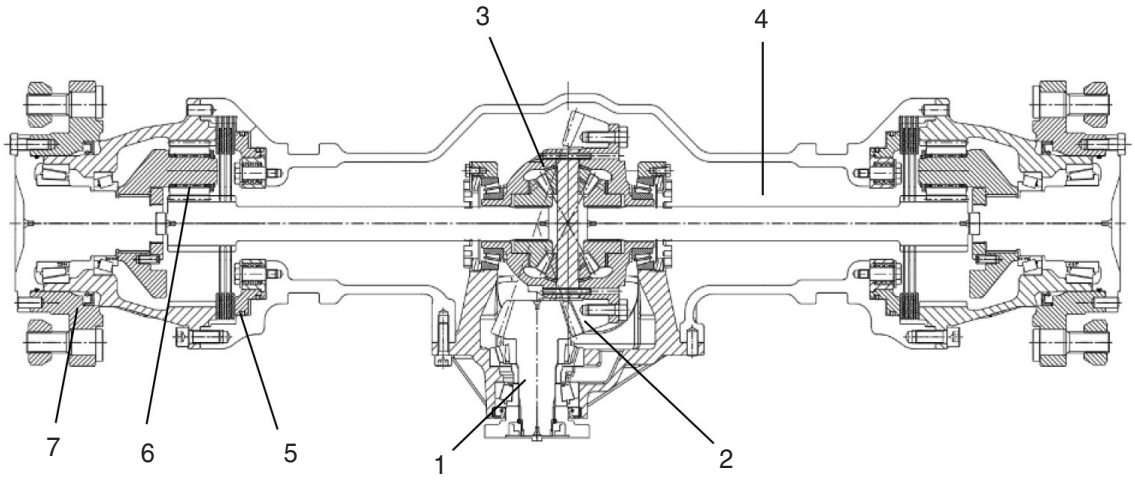
Transmission includes differential device and parking brake. Parking brake, like as traveling brake system is consists of several friction plate functions braking by sticking to each friction plate when parking brake switch is operated.



25D9V3PS13

## 3. DRIVE AXLE

### 1) STRUCTURE

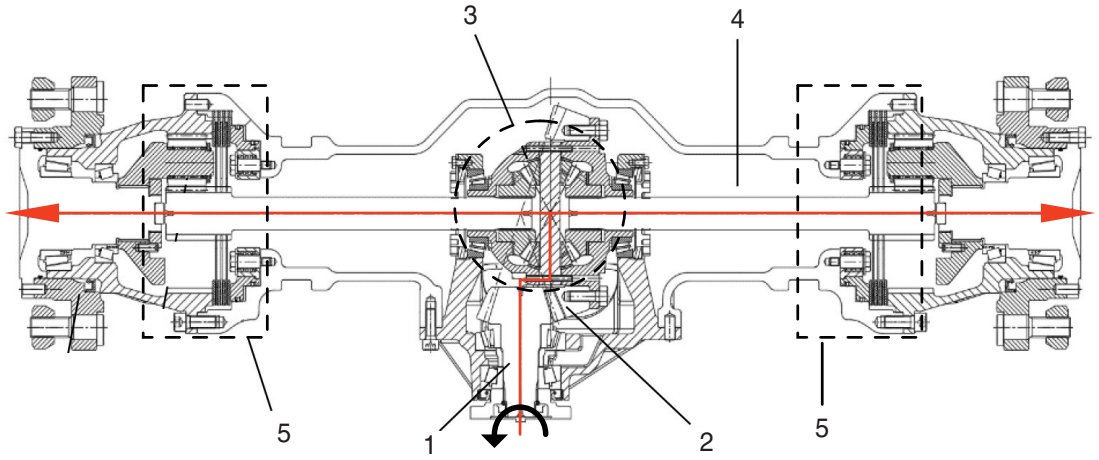



25D9V3PS102

| | | | | | |
|---|---|---|---|---|---|
| 1 | Pinion shaft | 4 | Axle shaft | 7 | Hub |
| 2 | Ring gear | 5 | Service brake | | |
| 3 | Differential device | 6 | Hub reduction | | |

### 2) OPERATION

The drive axle is connected with the transmission output gear by drive shaft assembly. The power transferred by the drive shaft assembly is connected to the pinion shaft of drive axle, the pinion shaft delivers the power to the differential device through the ring gear. The differential device deliver the power to hub reduction through axle shaft.

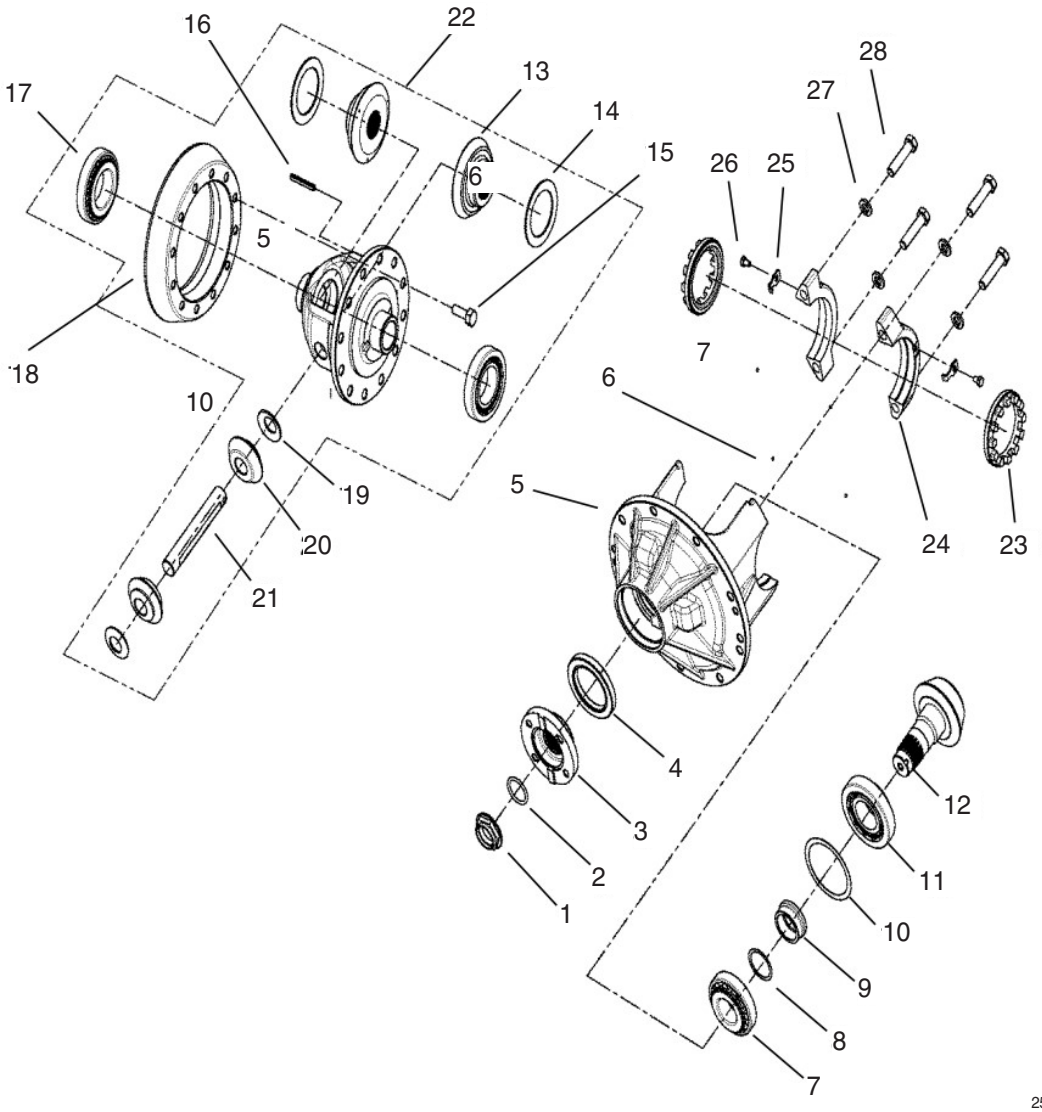



25D9V3PS103

| | | | | | |
|---|---|---|---|---|---|
| 1 | Pinion shaft | 3 | Differential device | 5 | Hub reduction |
| 2 | Ring gear | 4 | Axle shaft | 6 | Service brake |

### 3) Carrier sub assy

#### (1) Structure




25D9V3PS104

| | | | | | |
|---|---|---|---|---|---|
| 1 | Lock nut | 11 | T/R bearing | 21 | Spider |
| 2 | O-ring | 12 | Pinion shaft | 22 | Diffsub assy |
| 3 | Flange yoke | 13 | Diff side gear | 23 | Adjust screw |
| 4 | Oil seal | 14 | Thrust washer | 24 | Carrier cap |
| 5 | Carrier case | 15 | Hex bolt | 25 | Lock plate |
| 6 | Steel ball | 16 | Spring pin | 26 | Hex bolt |
| 7 | T/R bearing | 17 | T/R bearing | 27 | Plain wahser |
| 8 | Shim | 18 | Ring gear | 28 | Hex bolt |
| 9 | Spacer | 19 | Thrust washer | | |
| 10 | T/R bearing | 20 | Diff pinion gear | | |

(2) Performance property

Since the ring gear is linked with the right of the differential case and the bolt, the power transferred to the ring gear makes the differential device revolve.

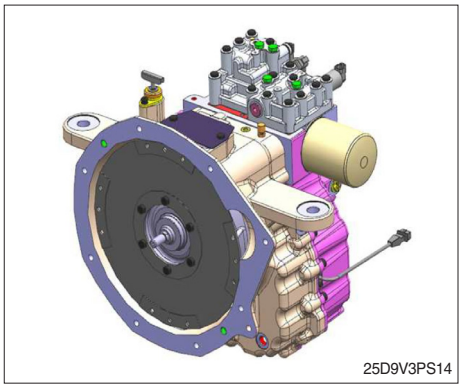
And also, the differential case are connected with the left and right of the axle shaft and the spline respectively, it delivers the power to the final drive.

If the load concerning in the left and right of the final drive is different, the shock is transferred to the drive axle, the differential gear in the differential device runs, the power transferred to the differential device adjusts the delivering rate to the left and right axle shaft. Consequently, it guarantees for safety of drivers.

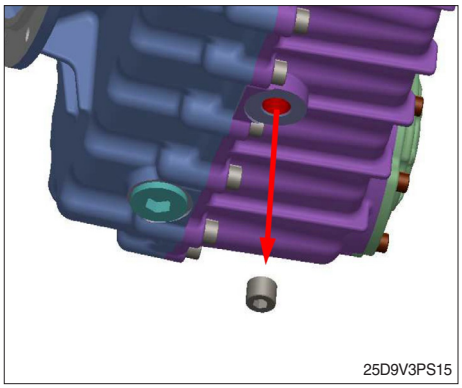
## 1. DISASSEMBLY OF TRANSMISSION

### 1) DISASSEMBLY OF TRANSMISSION ASSY

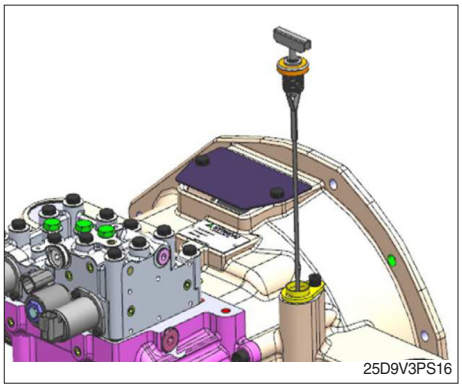
(1) Disassembly transmission assy.




(2) Discharge transmission oil. Disassemble drain plug of T/M case.

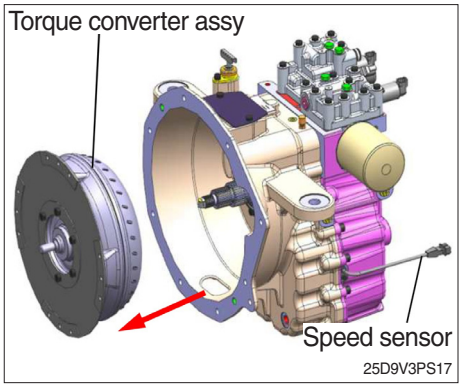



(3) Check oil residue in T/M.

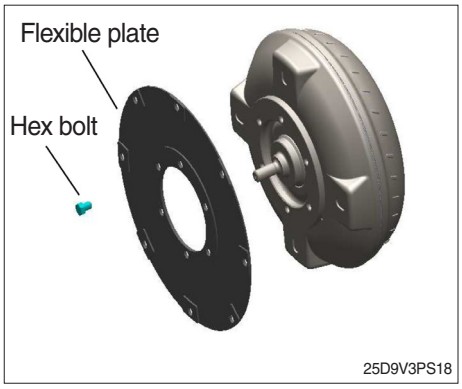



**(4) Disassemble torque converter part.**

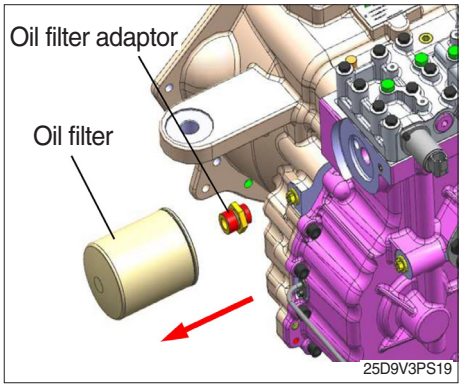
① Disassemble torque converter sub assy and speed sensor.



② Disassemble hex bolt and flexible plate.

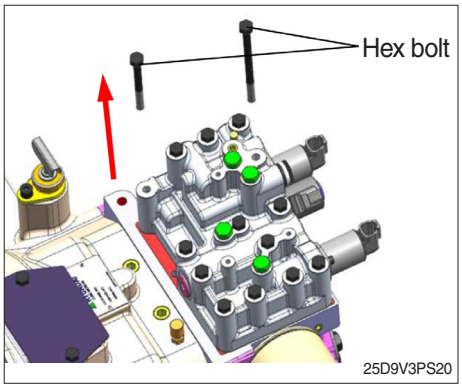



(5) Disassemble oil filter and oil filter adaptor.

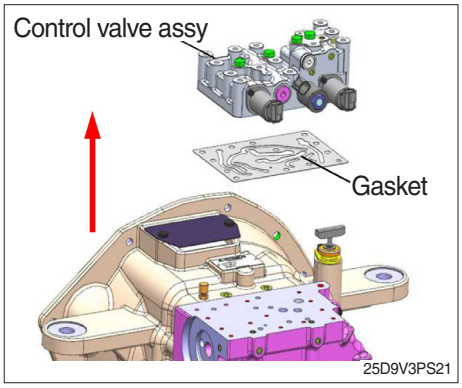



**(6) Disassemble control valve part.**

① Disassemble hex bolt.

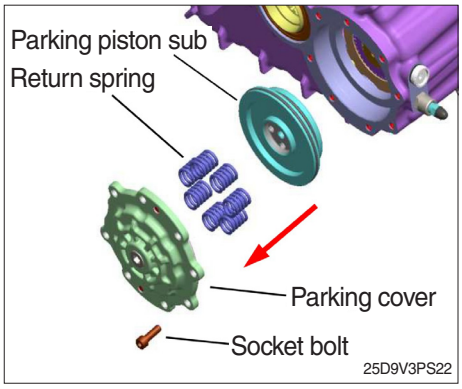



② Disassemble control valve assembly and gasket.

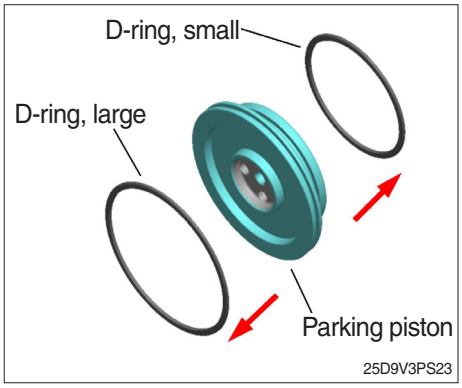


**(7) Disassemble parking part.**

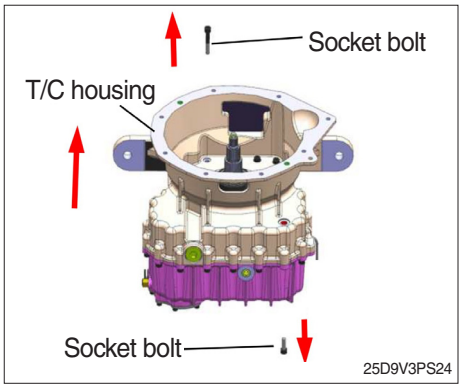
① Disassemble socket bolt and parking cover. After disassemble return spring and parking piston sub.



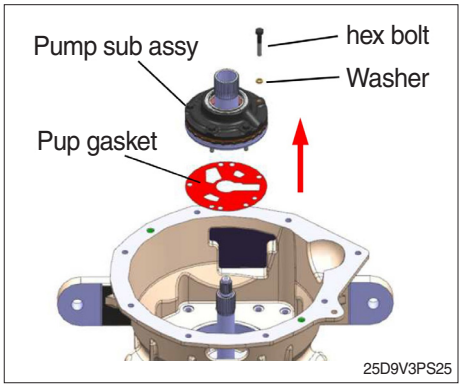

② Disassemble d-ring large and d-ring small.



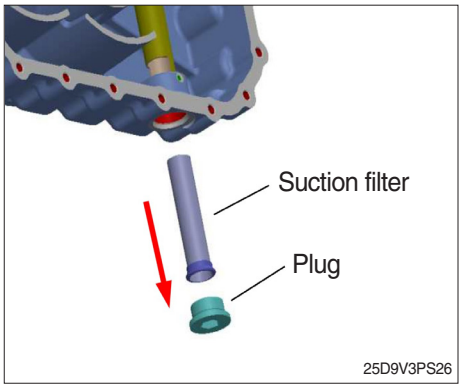

(8) Disassemble socket bolt and T/C housing.



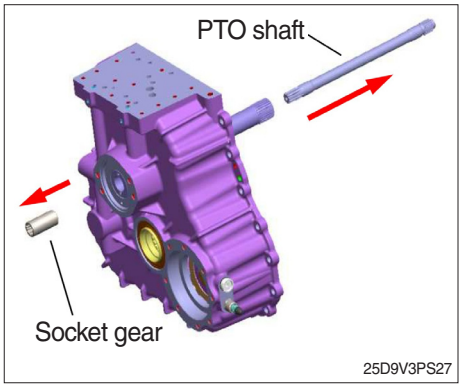

(9) Disassemble hex bolt and washer. After disassemble pump sub ass'y and gasket.



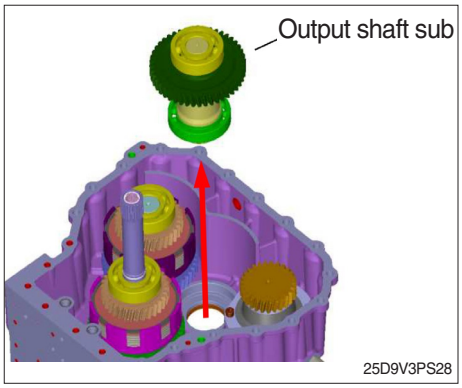
(10) Disassemble plug and suction filter.



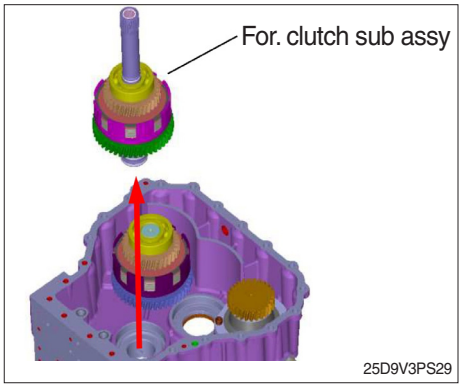

(11) Disassemble PTO shaft and socket gear.



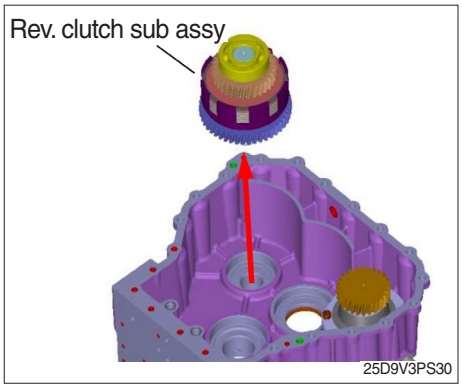

(12) Disassemble output shaft sub assy.



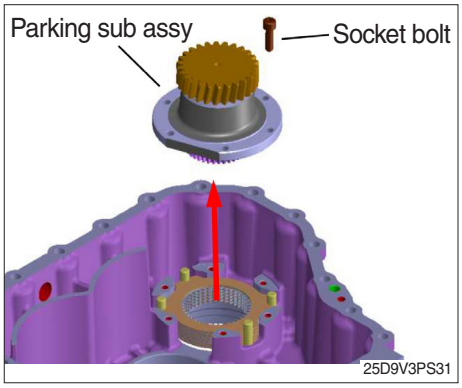

(13) Disassemble forward clutch sub assy.



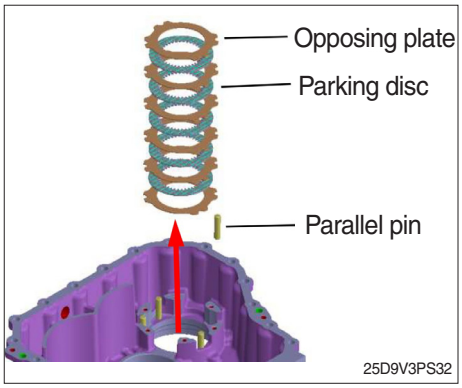
(14) Disassemble rev. clutch sub assy.




(15) Disassemble socket bolt and parking sub assy.

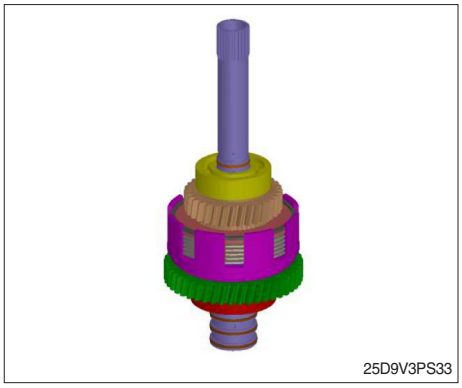



(16) Disassemble opposing plate and parking disc, after disassemble parallel pin.

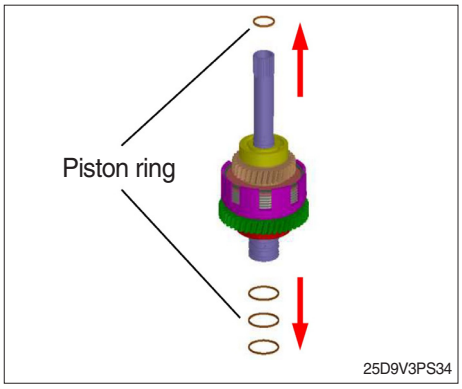



## 2) DISASSEMBLY OF CLUTCH SUB ASSY

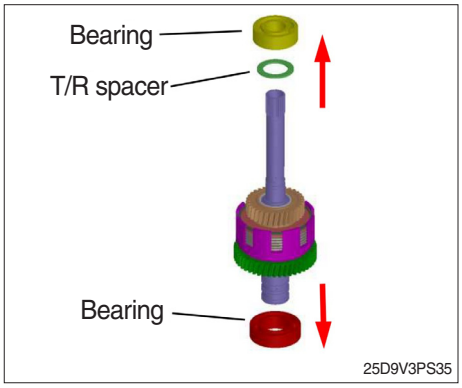
(1) Disassemble forward clutch sub assembly.



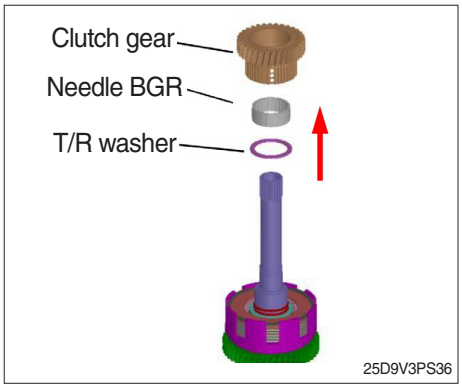
(2) Disassemble piston ring from groove of shaft.



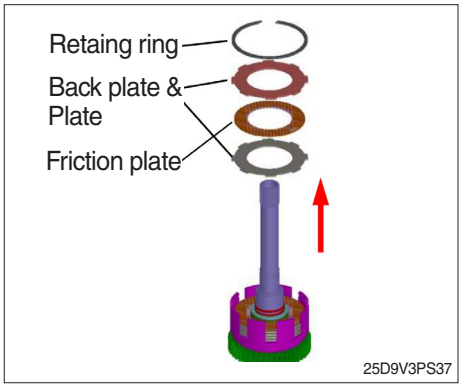

(3) Disassemble bearing and thrust spacer from shaft.



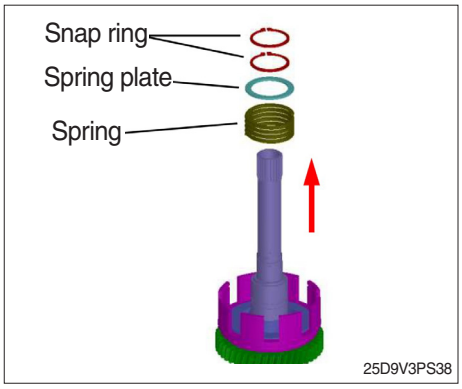

(4) Disassemble clutch gear, needle BRG and thrust washer from shaft.Disassemble clutch gear, needle BRG and thrust washer from shaft.



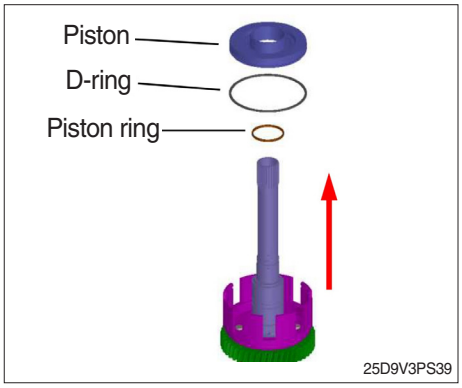

(5) Disassemble retaining ring, plate and friction plate from drum.



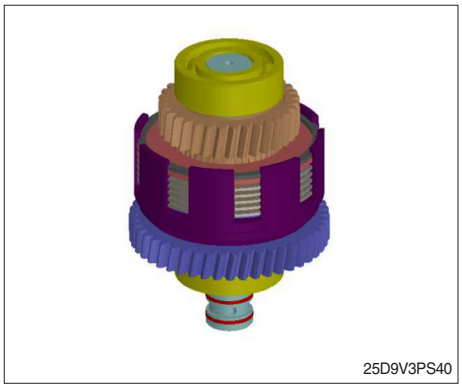
(6) Disassemble snap ring, spring plate and spring from shaft.



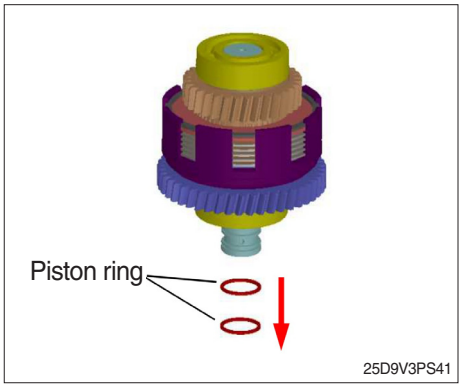

(7) Disassemble piston and piston ring. After disassemble D-ring from piston.



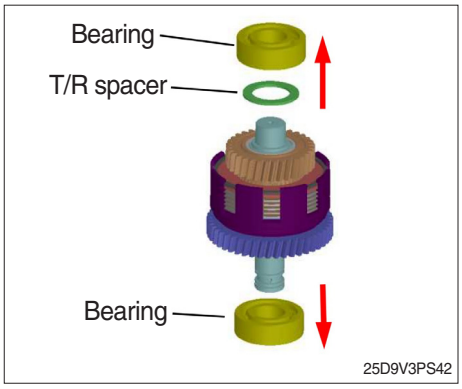

(8) Disassemble Rev. clutch sub assembly.



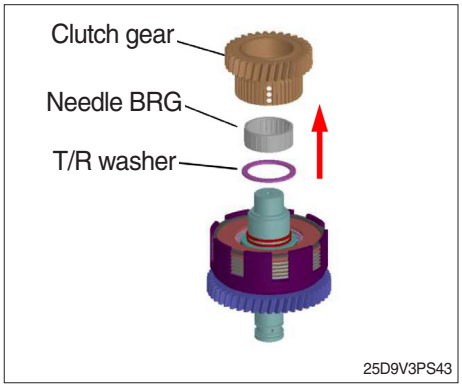

(9) Disassemble piston ring from groove of shaft.



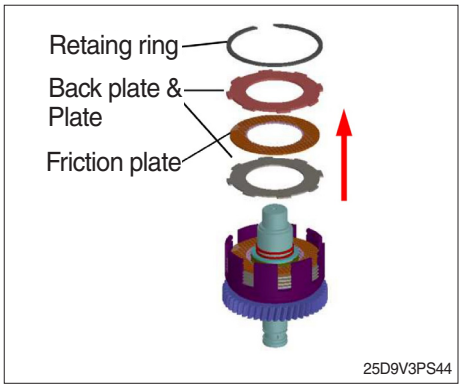
(10) Disassemble bearing & thrust spacer from shaft.



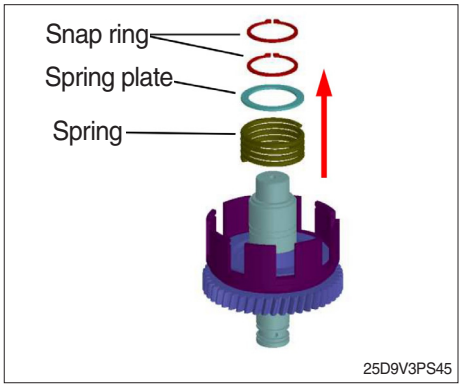

(11) Disassemble clutch gear, needle BRG & thrust washer.



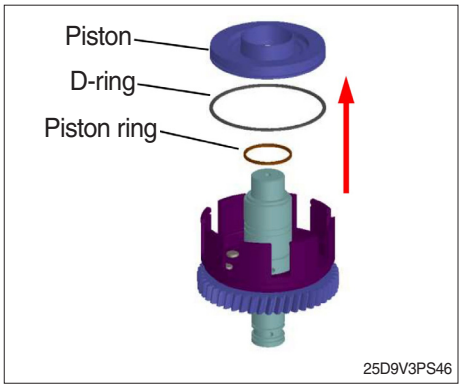

(12) Disassemble retaining ring, plate & friction plate from drum.




(13) Disassemble snap ring, spring plate and spring from shaft.

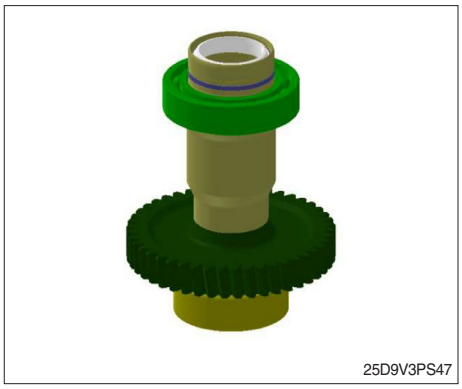


(14) Disaddemble piston and piston ring. After disassemble D-ring from clutch piston.

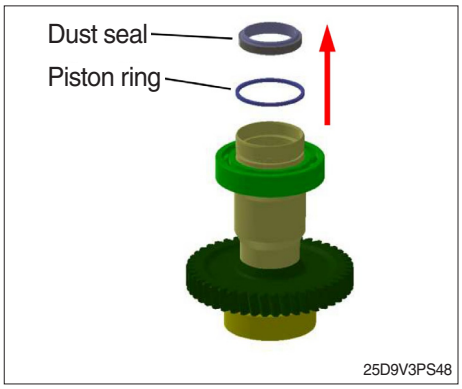



### 3) DISASSEMBLY OF OUTPUT SHAFT SUB ASSY

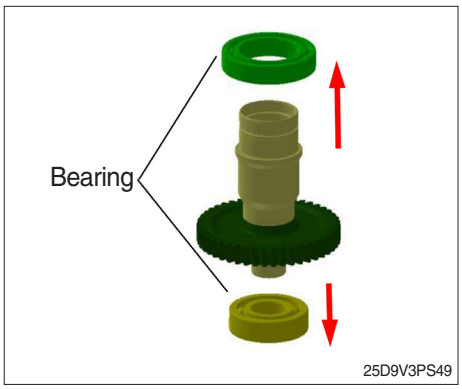
(1) Disassemble output shaft sub assembly.




(2) Disassemble dust seal and piston ring from shaft.

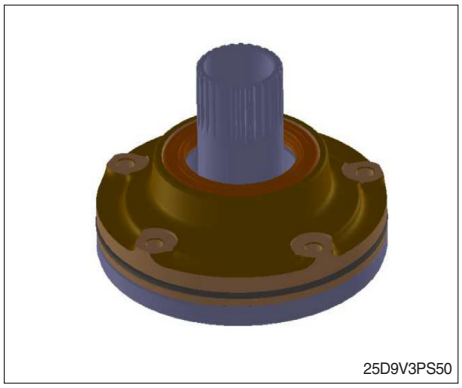



(3) Disassemble bearing from shaft.

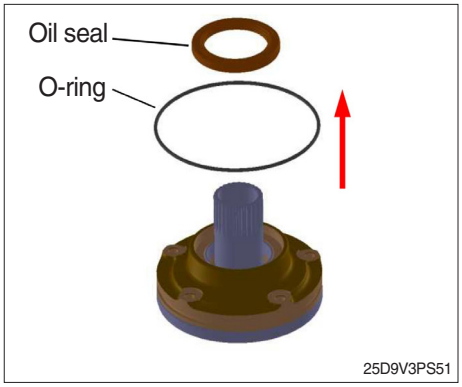


### 4) DISASSEMBLY OF PUMP SUB ASSY

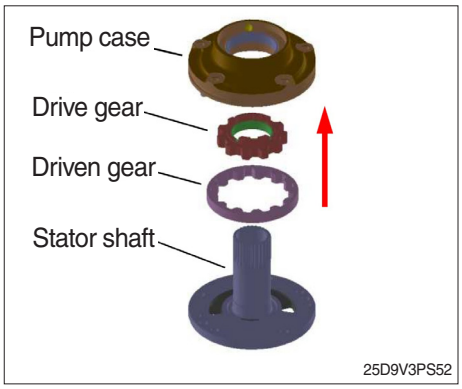
(1) Disassemble pump sub assembly.




(2) Disassemble oil seal and o-ring.

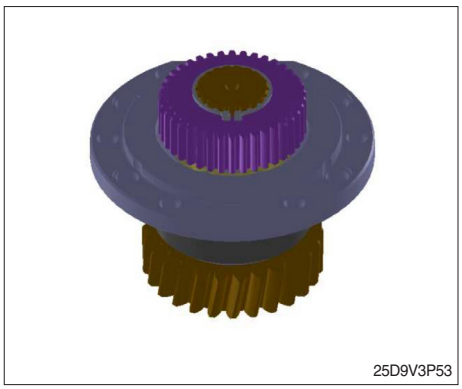



(3) Disassemble pump case, drive & driven gear from stator shaft.

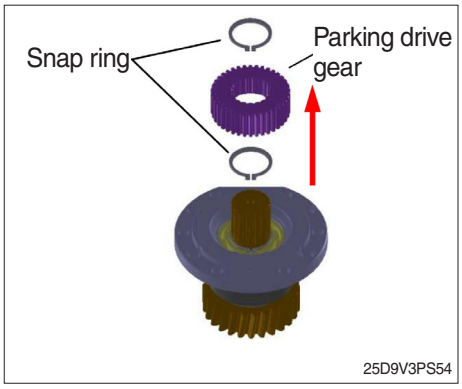



### 5) DISASSEMBLY OF PARKING SUB ASSY

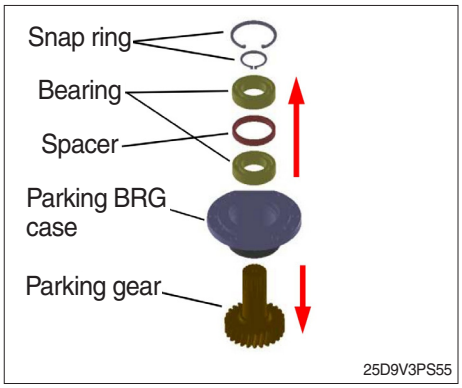
(1) Disassemble parking sub assembly.



(2) Disassemble snap ring and parking drive gear.




(3) Disassemble pump case, drive & driven gear from stator shaft.

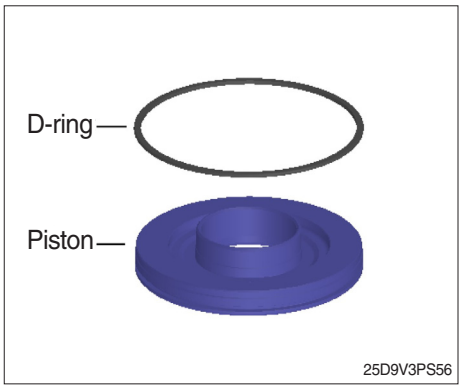


## 2. ASSEMBLY OF TRANSMISSION

### 1) SUB-ASSEMBLY OF CLUTCH

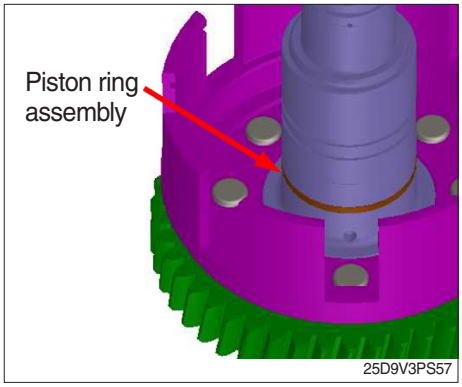
(1) Assemble d-ring at groove of piston.

※ **Spread T/M oil on d-ring.**

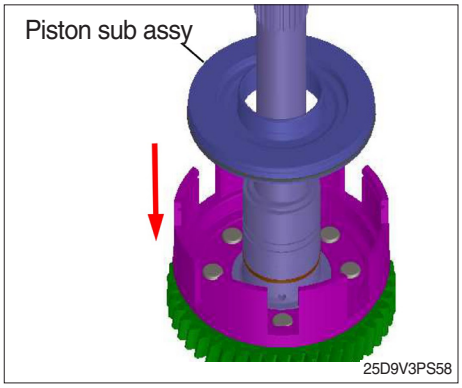



(2) Assemble piston ring at groove of clutch shaft.

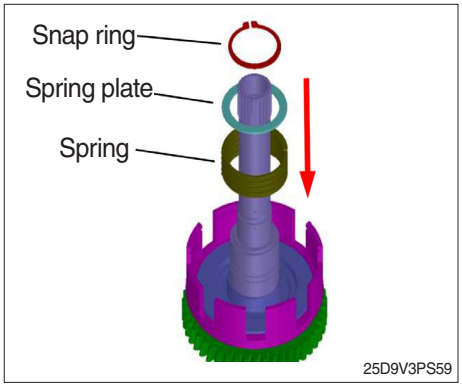
※ **Spread T/M oil on piston ring.**



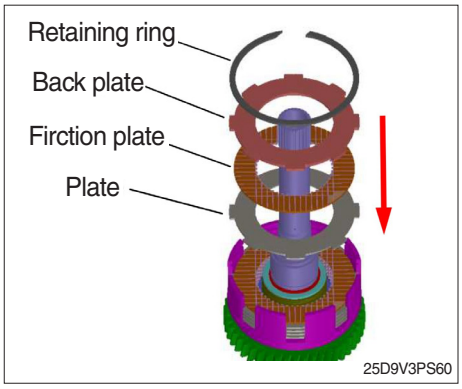

(3) Assemble piston sub assembly.




(4) Assemble spring, spring plate & snap ring.



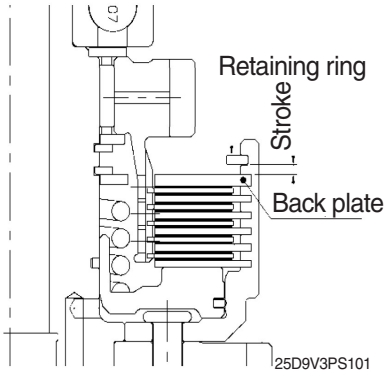
(5) Assemble plate, friction plate and back plate. After assemble retaining ring.

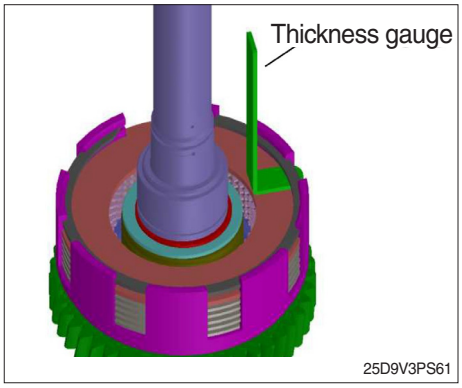



(6) Calculate the distance between back plate and retaining ring.

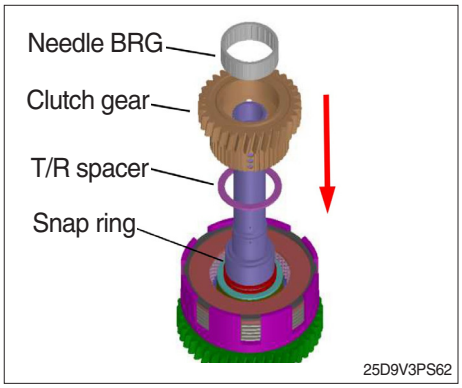
· Stroke : 2.2 ~ 2.6 mm (0.087 ~0.102 in)

※ **Use thickness gauge.**

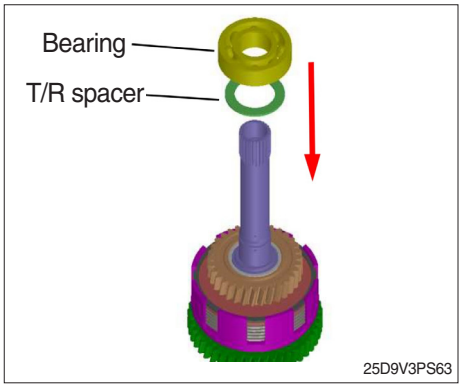


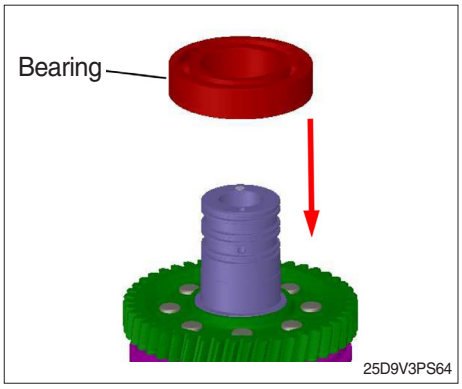

(7) Assemble forward clutch shaft sub assy. Assemble snap ring at groove of clutch shaft. After assemble thrust washer, clutch gear & needle bearing.




(8) Assemble thrust spacer and bearing.

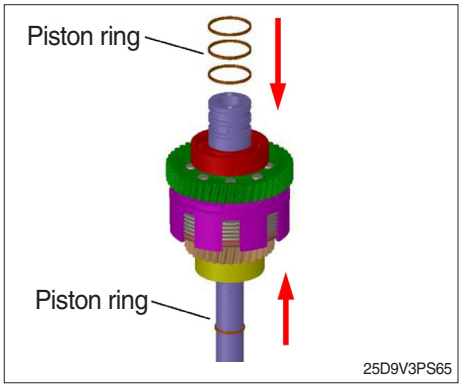


(9) Assemble bearing.

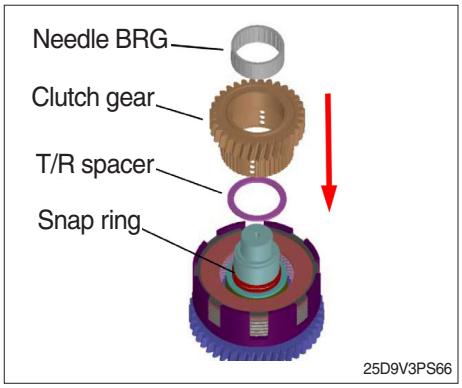



(10) Assemble piston ring at groove of clutch shaft.

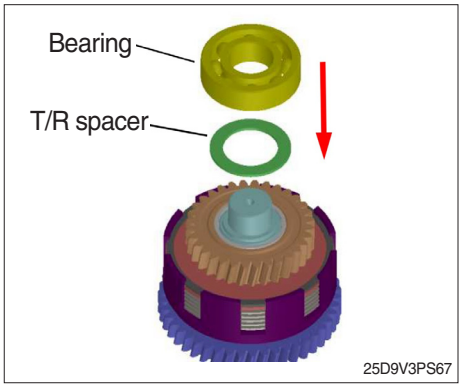
※ **Spread T/M oil on piston ring.**



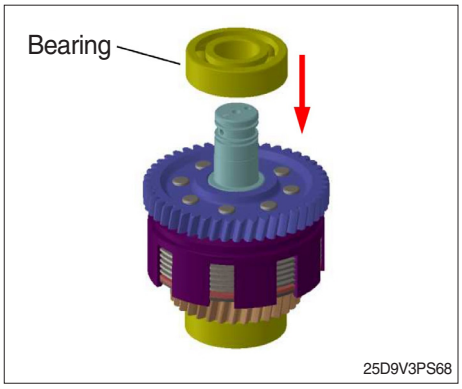

(11) Assemble Rev. clutch shaft sub assy. Assemble snap ring at groove of clutch shaft. After assemble thrust washer, clutch gear & needle bearing.




(12) Assemble thrust spacer and bearing.

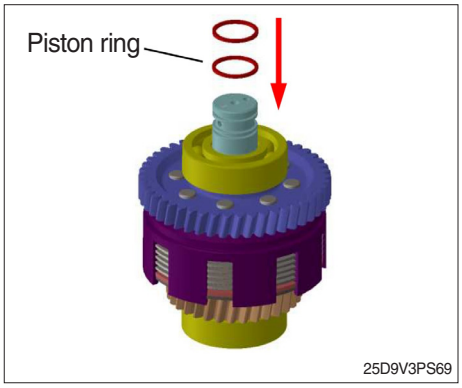


(10) Assemble bearing.



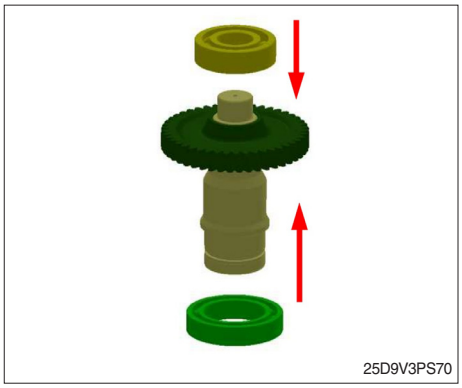

(11) Assemble piston ring at groove of clutch shaft.

※ **Spread T/M oil on piston ring.**

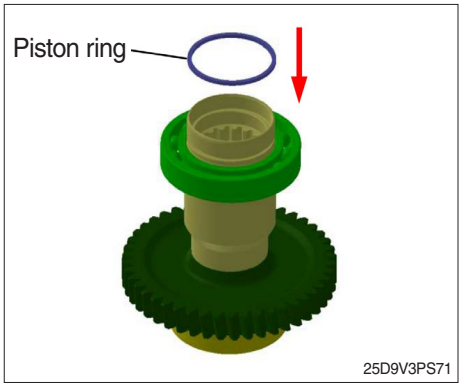



## 2) ASSEMBLY OF OUTPUT SHAFT

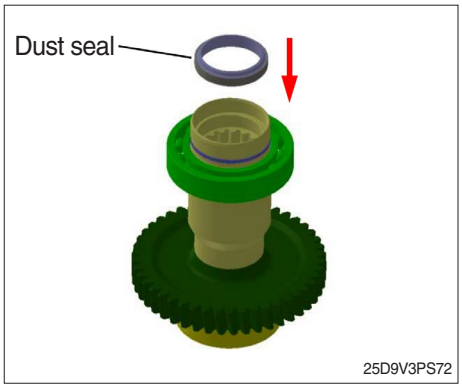
(1) Assemble bearing.




(2) Assemble piston ring at groove of shaft.



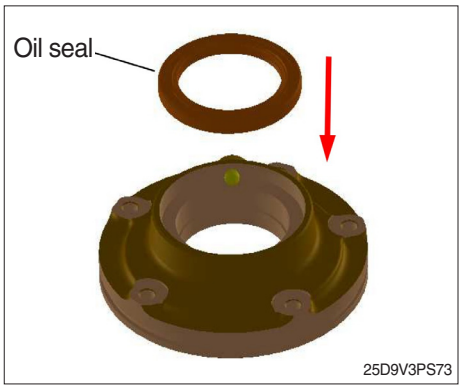
(3) Assemble dust seal.



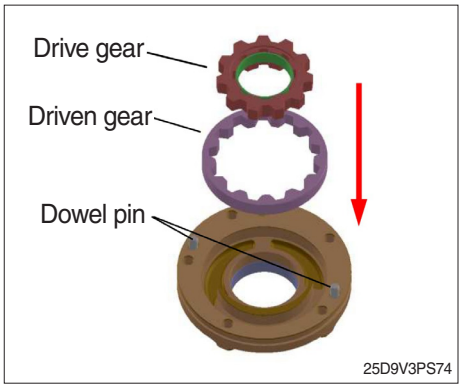

### 3) ASSEMBLY OF PUMP

(1) Press in oil seal.

※ **Cover Loctite #592 on outside of oil seal. Spread grease on inside of oil seal.**

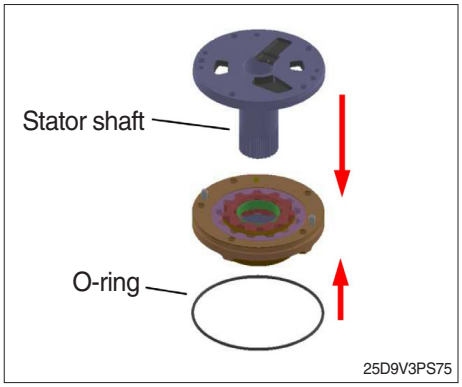



(2) Assemble dowel pin, driven & drive gear.



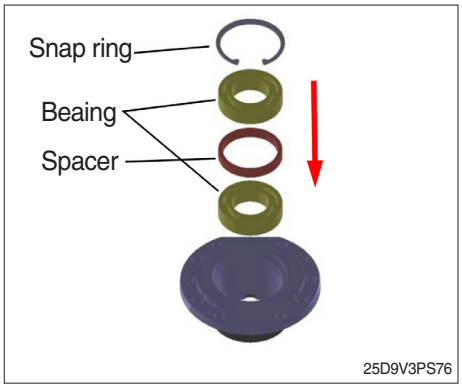

(3) Assemble stator shaft. After assemble o-ring at groove of pump case.

※ **Spread grease on inside of o-ring.**

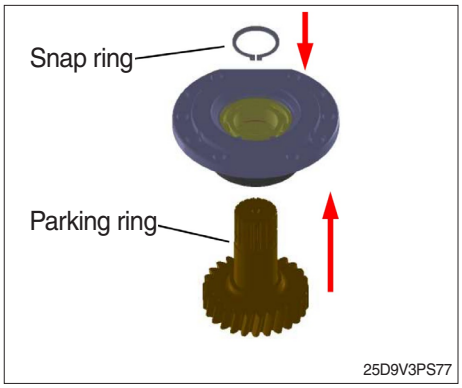


## 4) ASSEMBLY OF PARKING

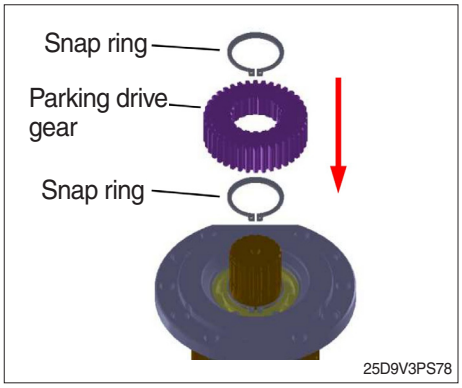
(1) Assemble bearing, spacer & snap ring.




(2) Assemble parking gear and snap ring.




(3) Assemble snap ring and parking drive gear.

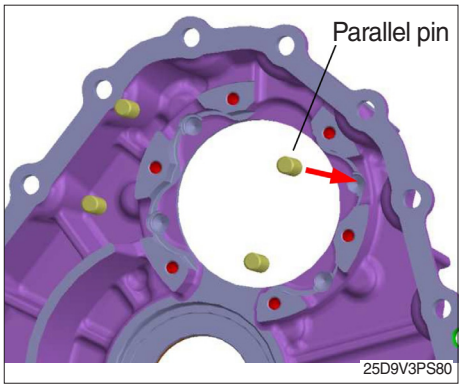



## 4) ASSEMBLY OF TRANSMISSION

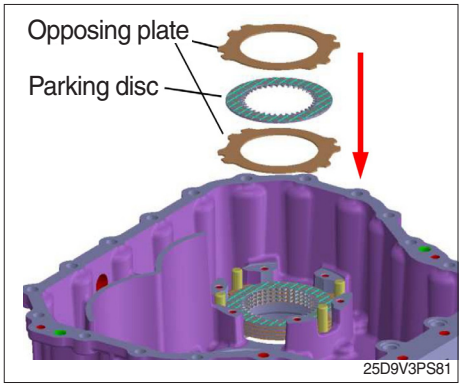
(1) Press in oil seal.

※ **Cover Loctite #592 on outside of oil seal. Spread grease on inside of oil seal.**

(2) Press in parallel pin. (4ea)



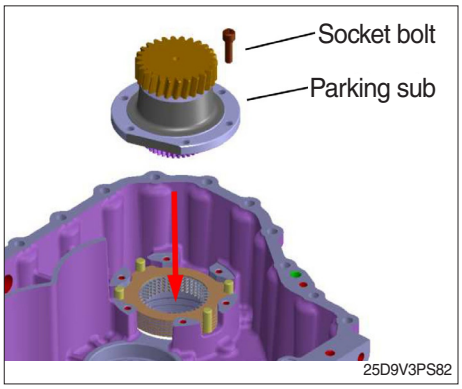

(3) Assemble parking disc and opposing plate.




(4) Assemble parking sub ass'y and socket bolt.

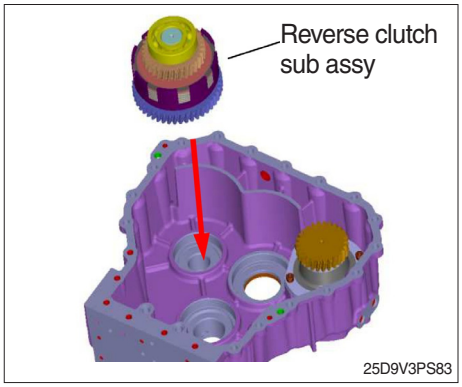
※ **Cover Loctite #277 on socket bolt.**

· Tightening torque : 3.1 ~ 3.6 kgf·m
(22.4 ~ 26.04 lbf·ft)



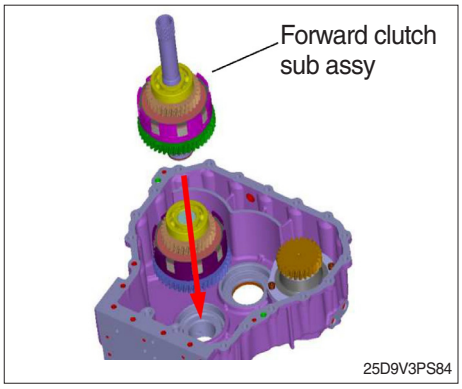

(5) Assemble reverse clutch sub assy. Press in slowly clutch sub assy.

※ **Spread grease on piston ring.**

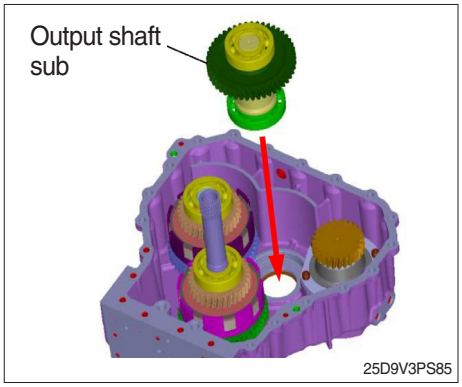


(6) Assemble forward clutch sub assy. Press in slowly clutch sub assy.

※ **Spread grease on piston ring.**

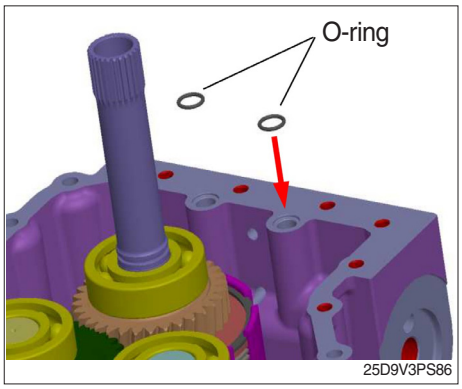



(7) Assemble output shaft sub assy. Press in slowly output shaft sub assy.

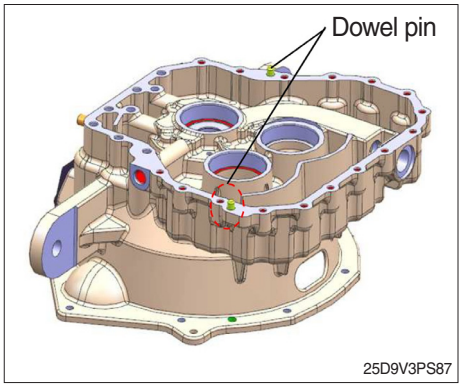



(8) Assemble o-rings.

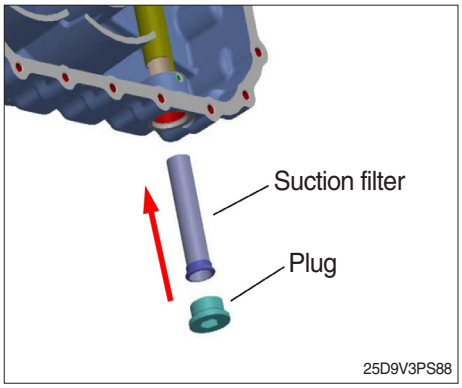
※ **Spread grease on o-ring.**




(9) Press in dowel pin. (2ea)



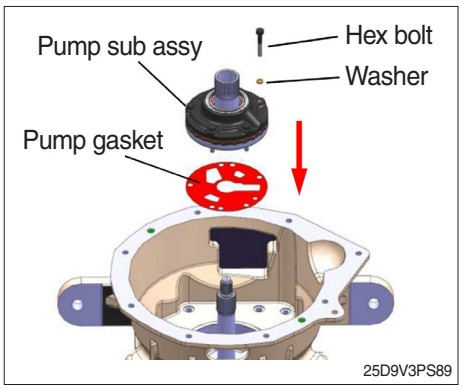
(10) Assemble suction filter and plug.




(11) Assemble pump gasket, pump sub assy and washer & hex Bolt.

※ **Cover Loctite #277 on hex bolt.**

· Tightening torque : 2.0 ~ 2.6 kgf·m
(14.5 ~ 18.8 lbf·ft)




(12) Assemble T/M case and T/C housing.

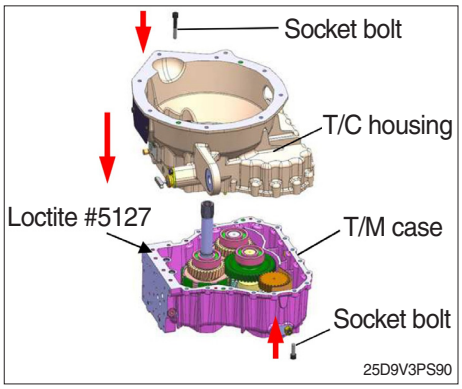
※ **Cover Loctite #5127 on T/M case.**

※ **When you assemble bolt, firstly tied up the opposites of bolt.**

Assemble socket bolt. (M10×1.5-30L : 16EA / M10×1.5-65L : 16EA)

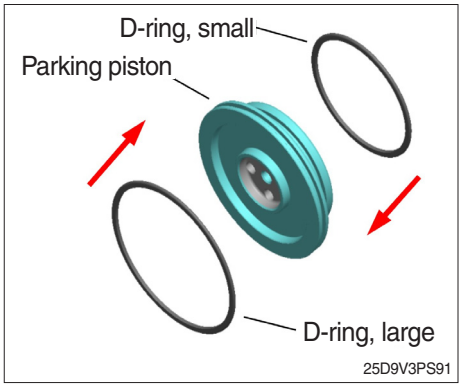
※ **Cover Loctite #277 on socket bolt.**

· Tightening torque : 7.1 ~ 7.7 kgf·m
(51.4 ~ 55.7 lbf·ft)




(13) Assemble d-ring at groove of parking piston.

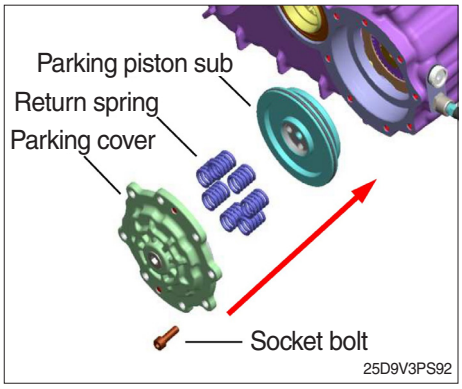
※ **Spread grease on d-ring.**



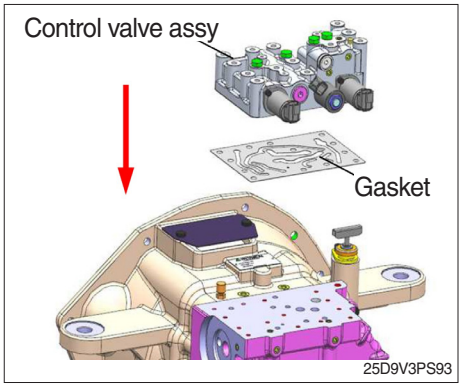
(14) Assemble parking piston sub ass'y, return spring, parking cover and socket bolt.

※ **Cover Loctite #277 on socket bolt.**

· Tightening torque : 3.1 ~ 3.6 kgf·m
(22.4 ~ 26.04 lbf·ft)



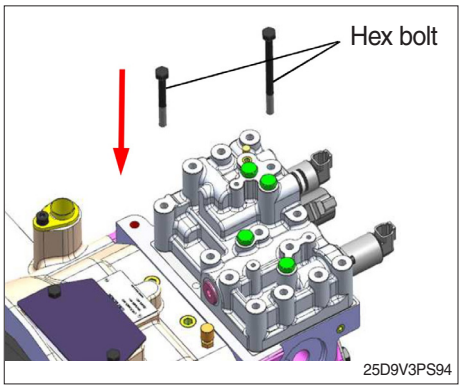

(15) Assemble valve gasket and control valve assy.




(16) Assemble hex bolt. (M8×1.25-65L : 10EA / M8×1.25-100L : 4EA)

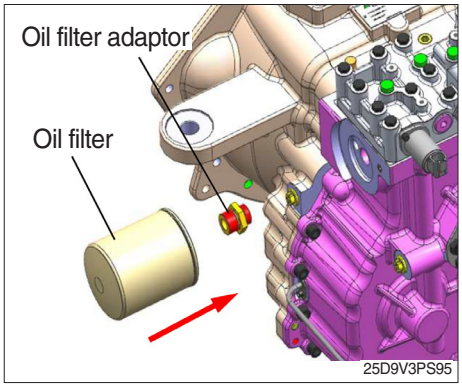
※ **Cover Loctite #277 on hex bolt.**

· Tightening torque : 3.1 ~ 3.6 kgf·m
(22.4 ~ 26.04 lbf·ft)

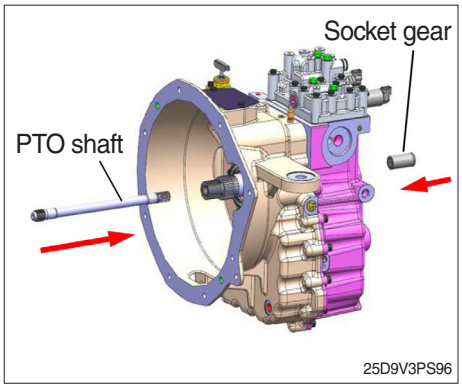



(17) Assemble oil filter adaptor and oil filter.

· Tightening torque : 4.6 ~ 5.1 kgf·m
(33.3 ~ 36.9 lbf·ft)



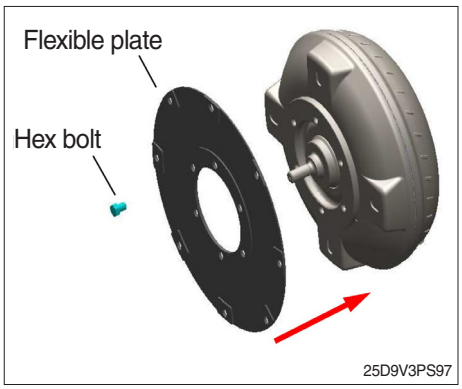
(18) Assemble PTO shaft and socket gear.



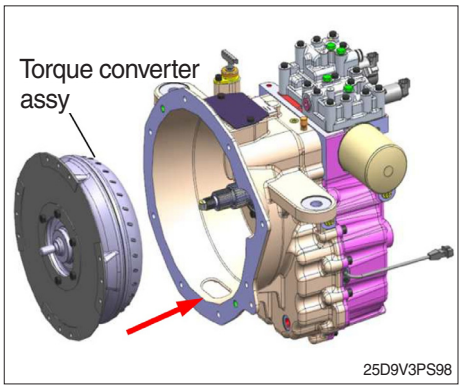

(19) Assemble flexible plate and hex bolt.

※ **Cover Loctite #277 on socket bolt.**

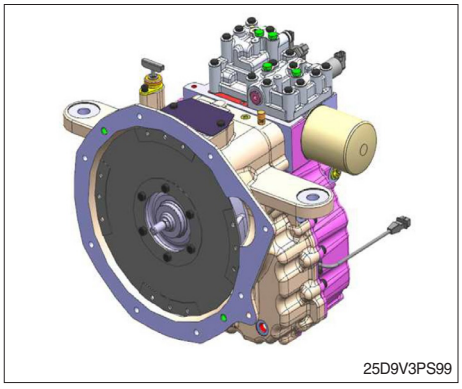
· Tightening torque : 4.6 ~ 5.1 kgf·m
(33.3 ~ 36.9 lbf·ft)




(20) Assemble torque converter assy.



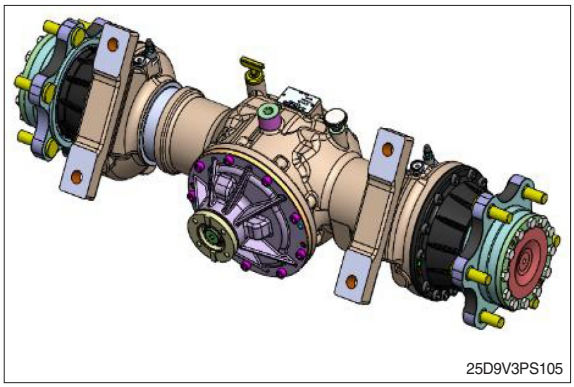

(21) Transmission assembly.



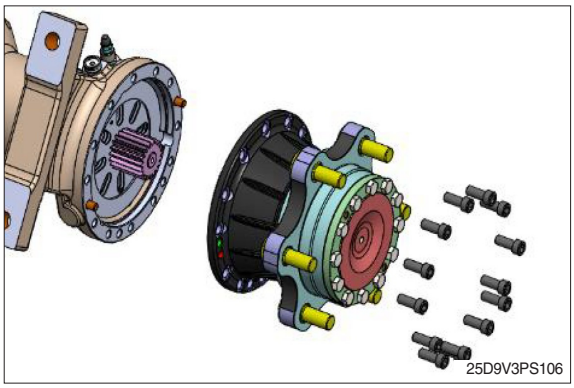
## 3. DISASSEMBLY OF DRIVE AXLE

### 1) DISASSEMBLY

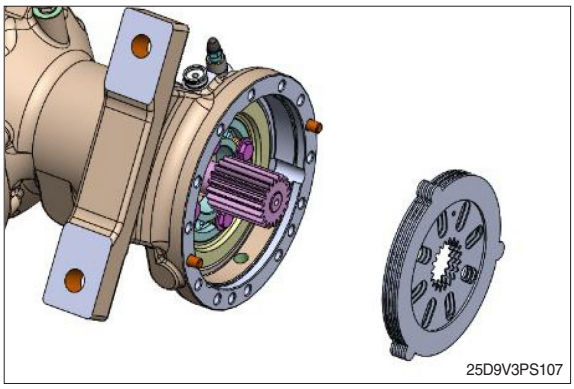
(1) Disassemble drive axle assy.



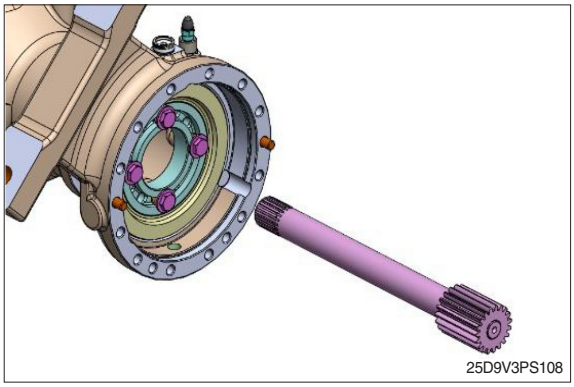

(2) Disassemble carrier hsg. sub assy.



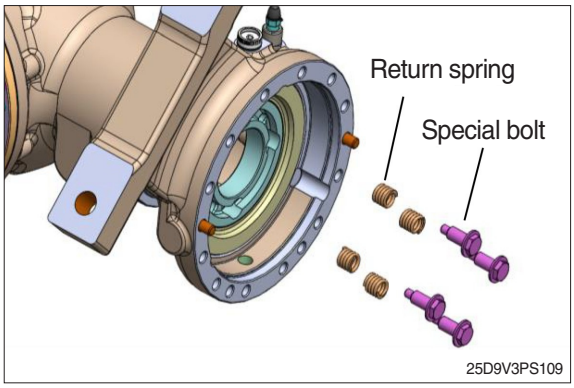

(3) Disassemble disc, opposing plate.



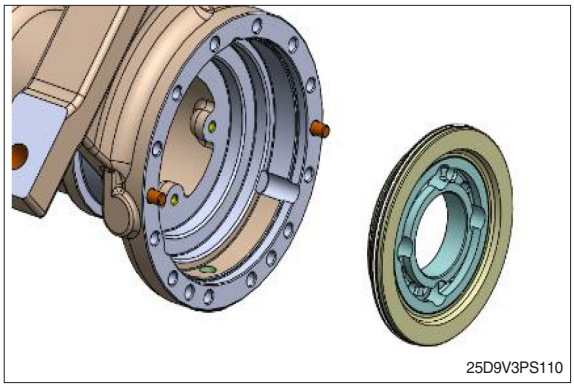

(4) Disassemble axle shaft.



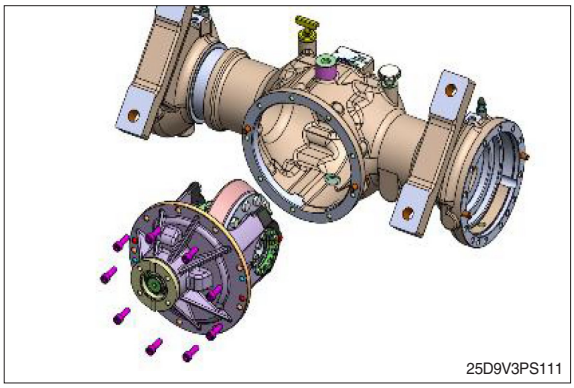
(5) Disassemble special bolt, return spring.



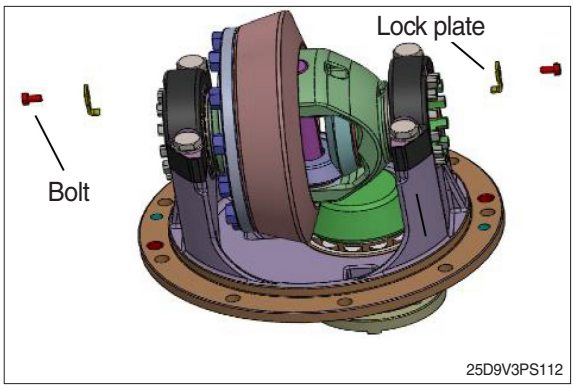

(6) Brake piston sub assy



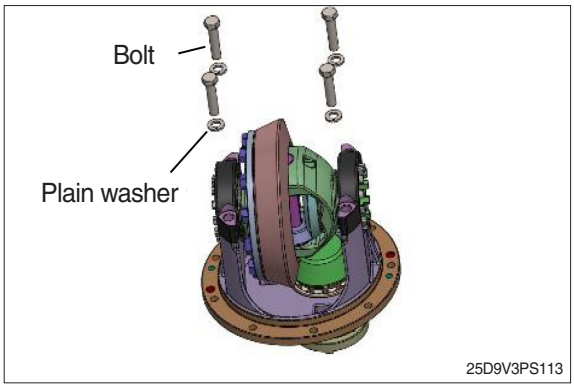

(7) Disassemble bolt, carrier sub assy.



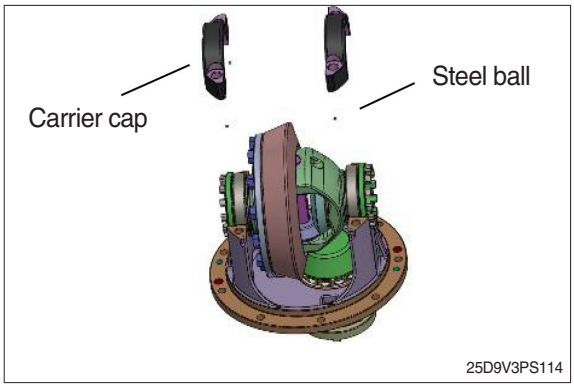

(8) Disassemble Bolt, lock plate.



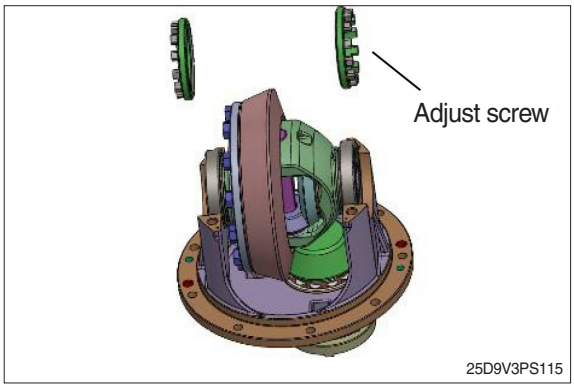
(9) Disassemble bolt, plain washer.



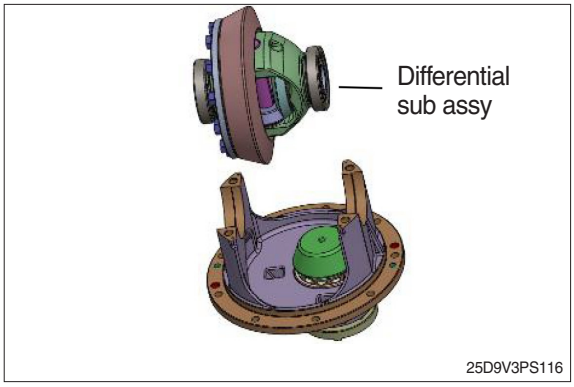

(10) Dissassemble carrier cap, steel ball.



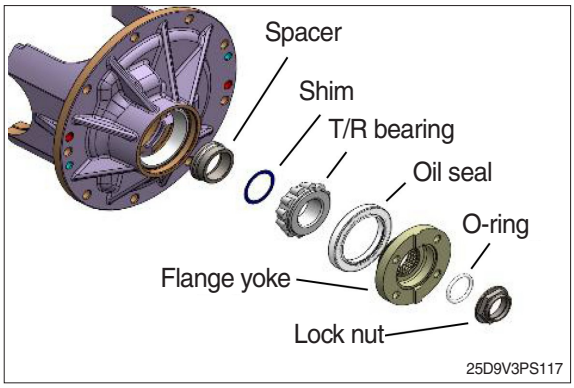

(11) Disassemble adjust screw.



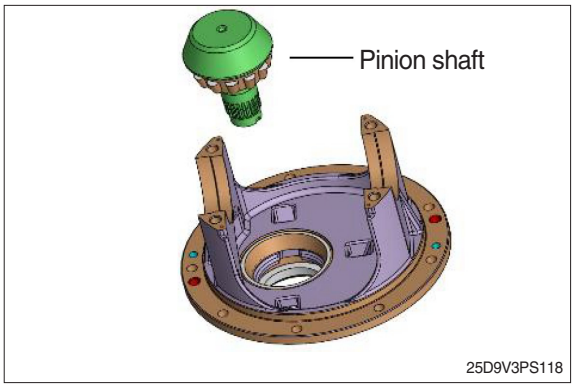

(12) Disassemble differential sub assy.



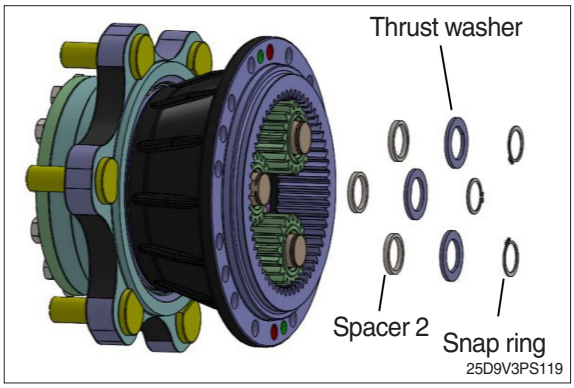
(13) Dissassemble carrier cap, steel ball.



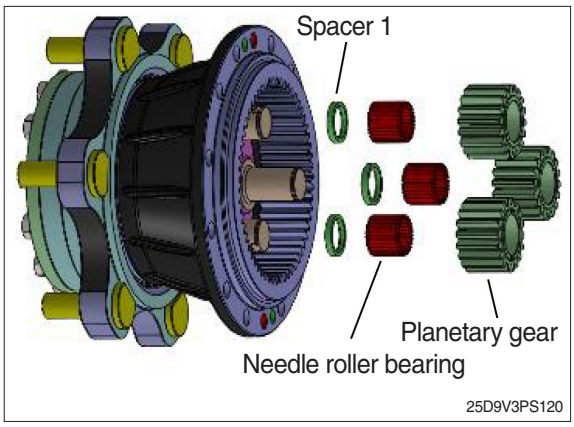

(14) The Lock nut from the decomposition order.



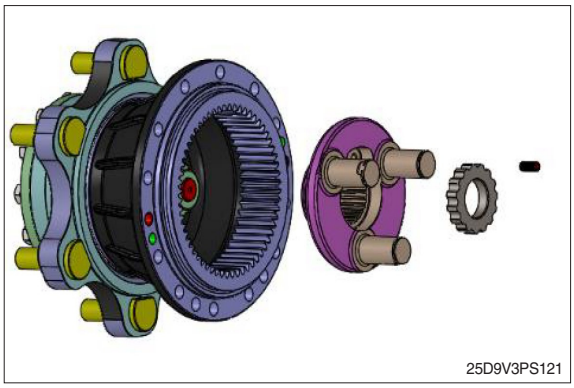

(15) Disassemble Pinion shaft.



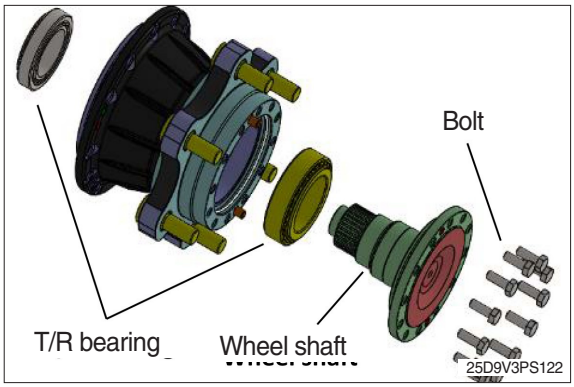

(16) Disassemble planetary gear, needle roller bearing (58EA × 3= 174EA), spacer 1.



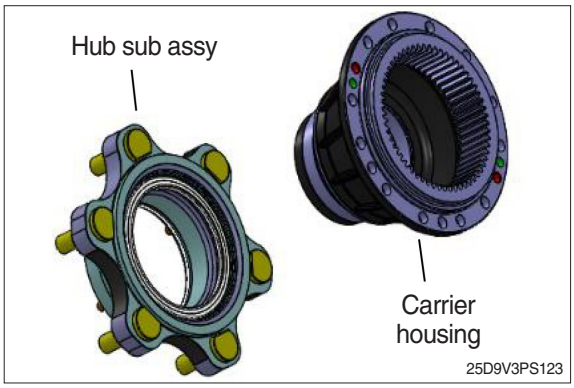
(17) Disassemble set screw, hub lock nut and PL carrier




(18) Disassemble bolt, wheel shaft and T/R bearing.



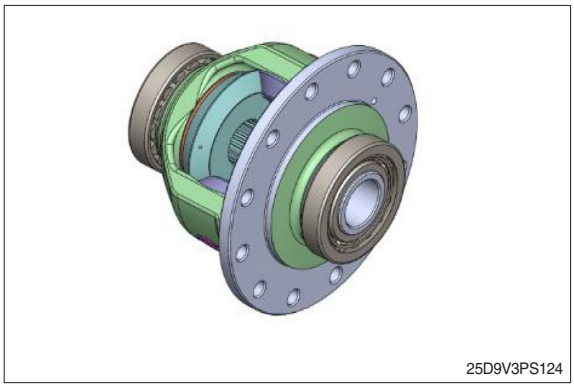

(19) Disassemble hub sub assy, carrier housing.



## 3.ASSEMBLY OF DRIVE AXLE

### 1) ASSEMBLY OF DIFFERENTIAL DEVICE

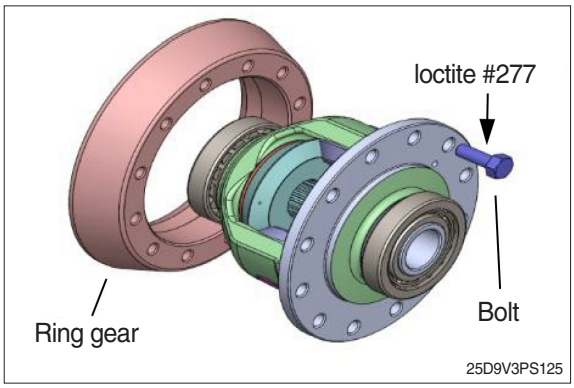
(1) Make preparation for diffdrential assembly.




(2) Assemble Ring gear by Bolt.

※ **Spread loctite #277.**

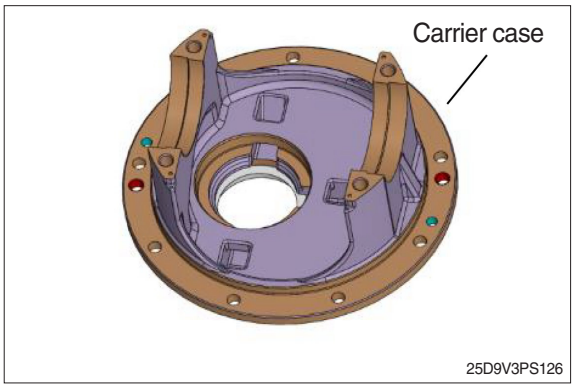
· Tightening torque : 10.2 ~ 11.2 kgf·m
(73.8 ~ 81.0 lbf·ft)

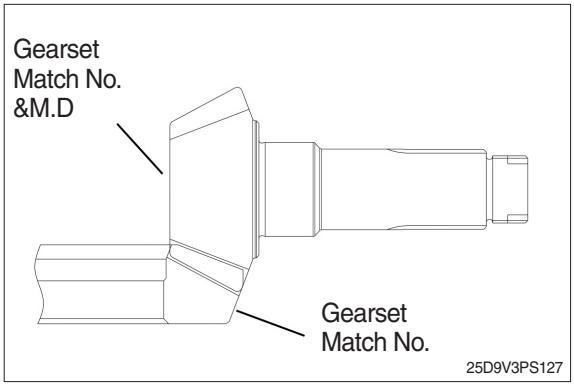



### 2) ASSEMBLY OF CONTROL OF SHIM & PINION

(1) Fix carrier case to jig.

※ **Before install gearset to carrier, you must recognize information. You always have tested the mark at gear set which each pair of gear suits it.**



(2) The THK of shim will be decided of measured value of gauge & machine.

① Dimensional drawings of the alphabet (mm)

a : 107 b : 25.25 c : Engraved value

d : 132.75 e : 33.75 f : 32.5 g : 1.75

② Basic shim thickness

"A" : 0.5 "B" : 0.5

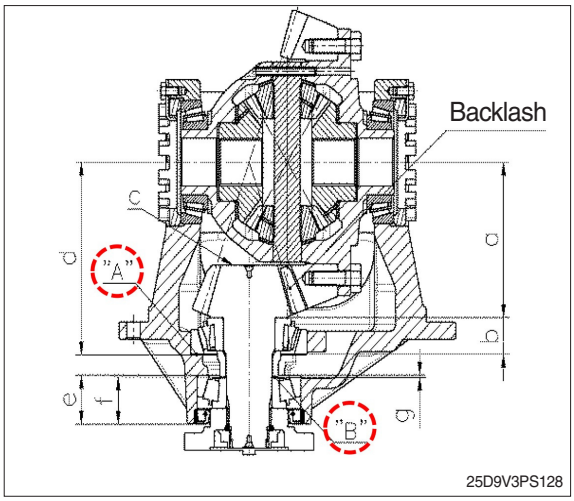
③ Shim thickness calculation

"A" : d-(a+b+c)

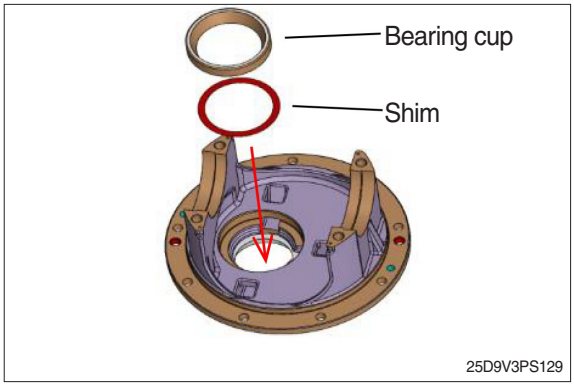
ex) 132.7 - { 106.9 + 25.22 + (-0.2) } = 0.83 → 0.85 mm

"B" : g-(e-f)

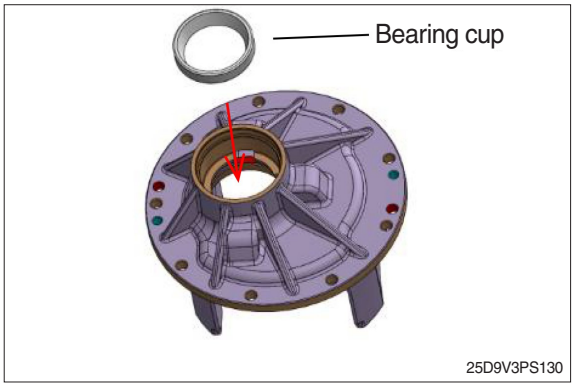
ex) 1.77 - ( 33.71 - 32.42 ) = 0.48 → 0.5 mm



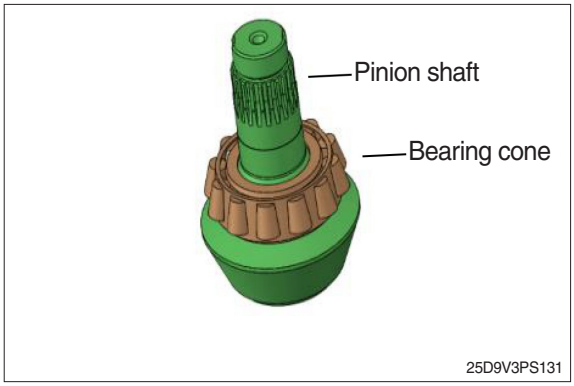

(3) Assemble shim. Sort of shim : 0.1, 0.15, 0.25, 0.5 mm. Press the bearing cup.



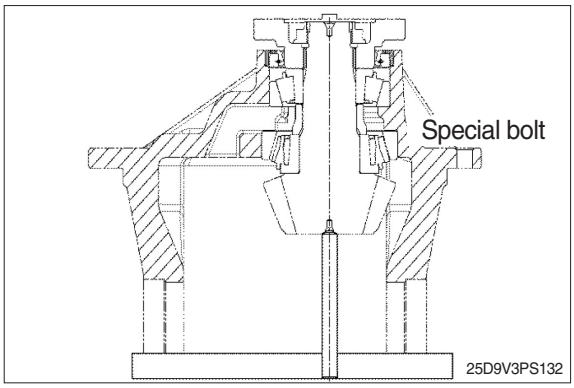

(4) Turn carrier case a on-eighty (180˚) and press bearing cup.



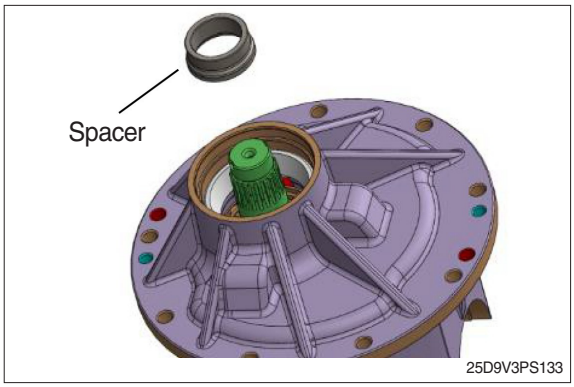

(5) Pressurize bearing cone on pinion shaft. Put into pinion shaft.



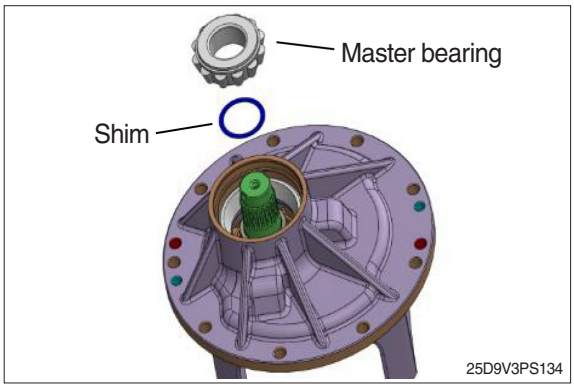
(6) Turn carrier case a one-eighty (180˚) and fix it on jig.




(7) Assemble pinion shaft on spacer.

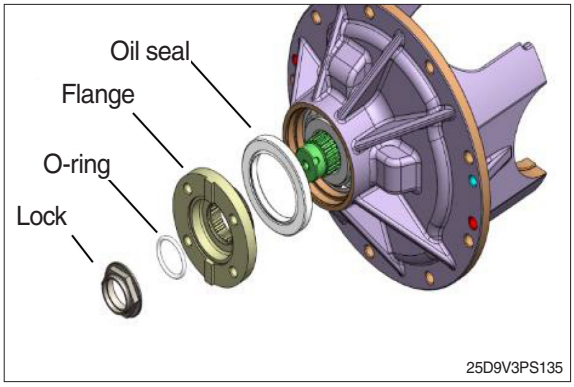



(8) Assemble pinion shaft, and assemble shim & master bearing sort of shim : 0.1, 0.15, 0.3 mm

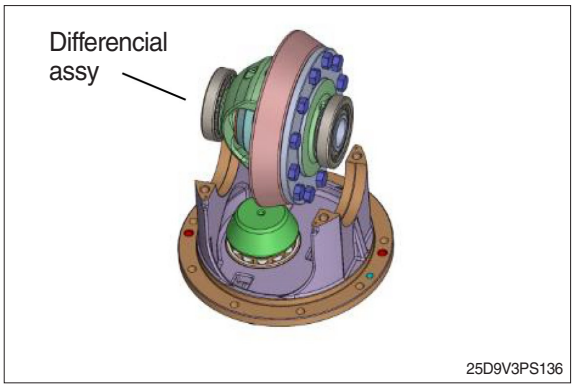



(9) Assemble oil seal, flange yoke, o-ring and lock nut.

· Tightening torque : 26.5 ~ 29.6 kgf·m
(192 ~ 214 lbf·ft)



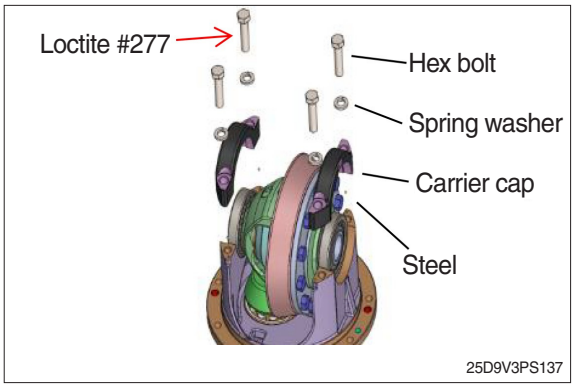
(10) Turn carrier case a one-eighty (180˚) and assemble differencial assembly on carrier case.




(11) Assemble hex bolt on carrier cap.

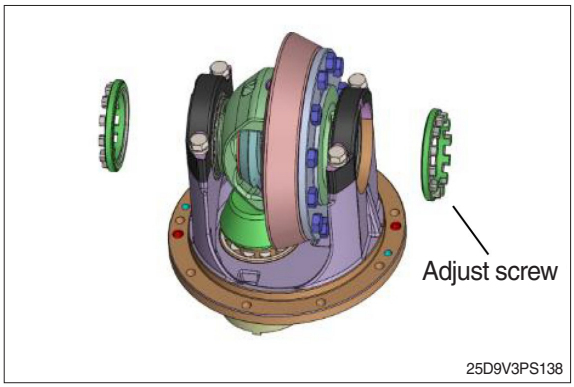
※ **Spread loctite #277 on the bolt.**

· Tightening torque : 11.7 ~ 12.5 kgf·m
(84.6 ~ 90.4 lbf·ft)

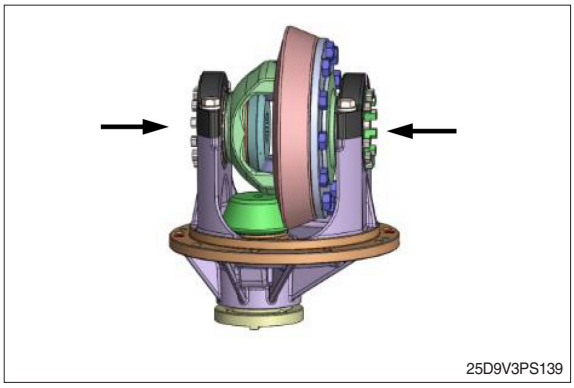



### 3) CONTROL OF GEARSET BACKLASH

(1) Assemble adjust screw on carrier case.




(2) Lock adjust screw.

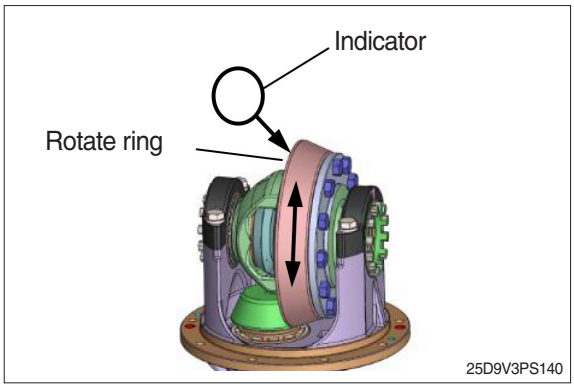


(3) Measure Backlash.

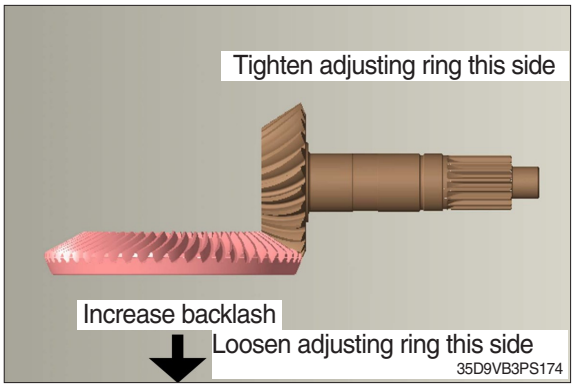
※ Backlash of pinion & ring gear : 0.18~0.23 mm

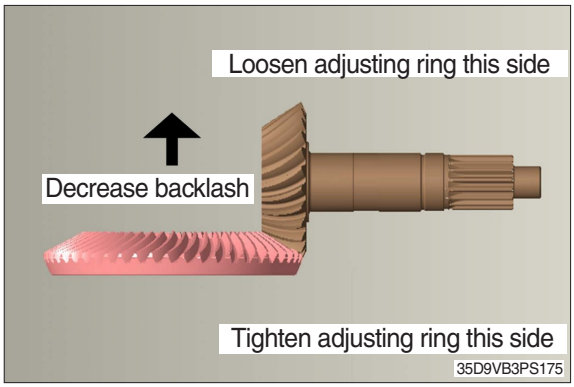
※ If it is wrong backlash, you can adjust value as moving each step.

※ If ring gear takes from pinion shaft far, the value of backlash will be increased. If ring gear takes from pinion shaft close, the value of backlash will be decreased.



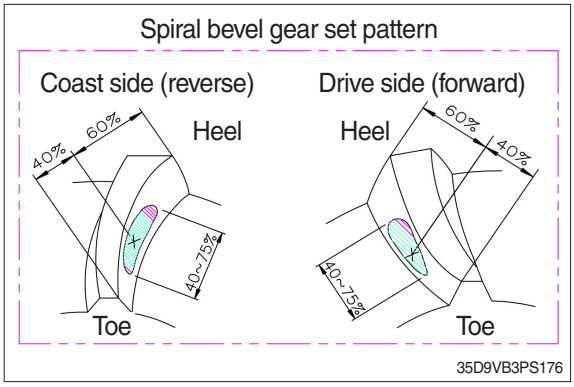

(4) If ring loosen same with one bolt screw side, you should ring tighten it. And if ring tighten it, you should loosen the adjusting ring.



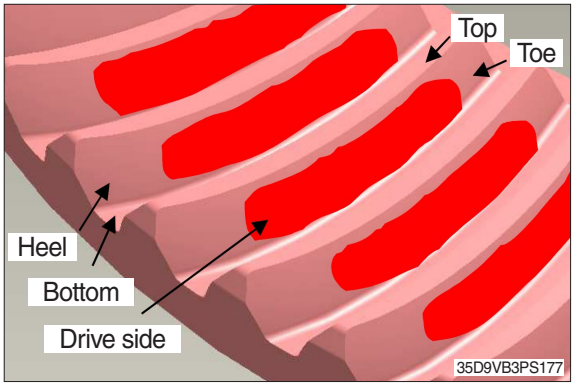



## 4) MEASUREMENT OF TOOTH CONTACT PATTERN

※ **After assemble , adjust pattern of the gear and pinion shaft figure. If pattern is not adjusted, take a measure as measuring backlash again and then reassemble.**

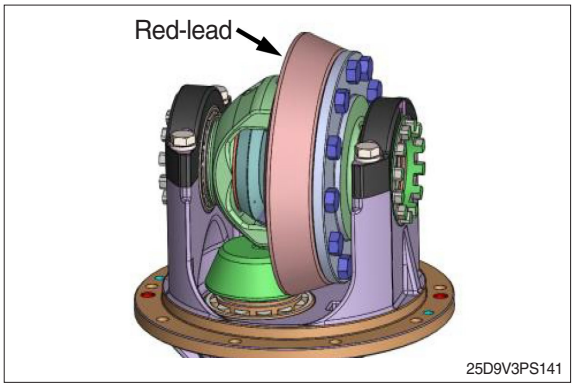



※ **Always check tooth contact pattern on the driving side of gear teeth.**



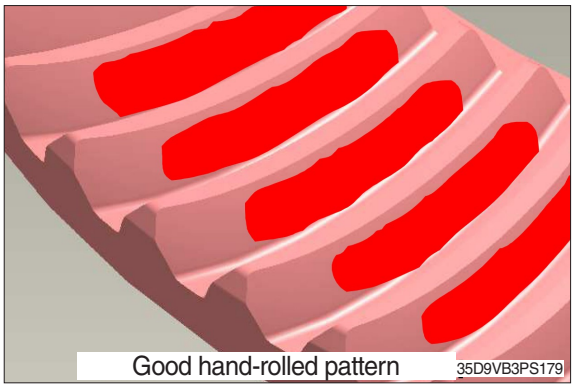

(1) Marking red-lead on 6 tooth surface of ring gear.

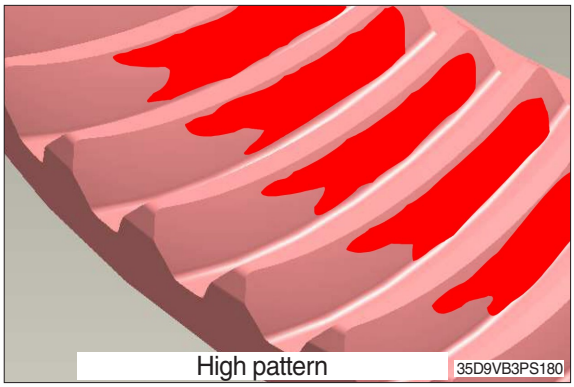
(2) Rotate ring gear forward and backward so that the 6 marked teeth go past the drive pinion six time to get a good contact pattern.

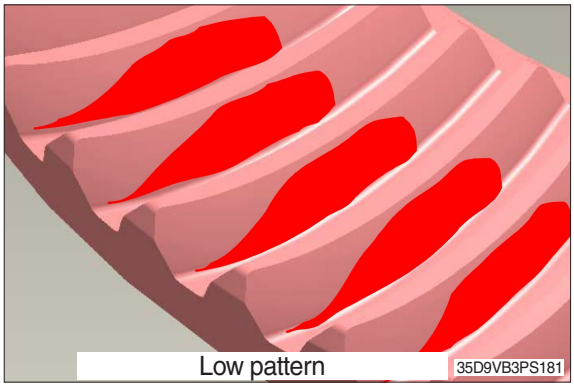


(3) Compare the contact pattern with illustrations.

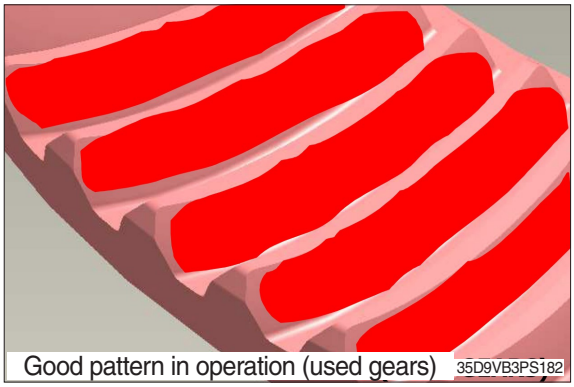
※ **The good contact pattern of gearset is appeared what the length of tooth has had.**



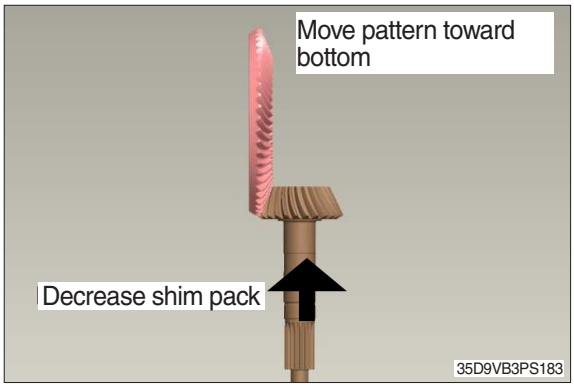

※ **The good contact pattern of used gearset is appeared what the length of tooth has had as wear pattern.**



**(4) If you need control contact pattern to adjust THK of tooth (top/bottom), you should obey steps ①-②.**
**If you need control contact pattern to adjust THK of tooth (toe/heel), you should obey steps ③-④.**

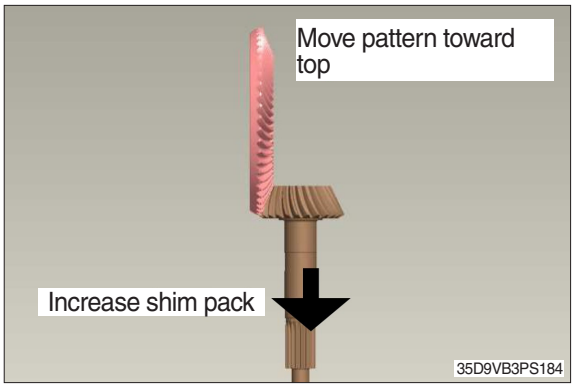
① High pattern

If A high contact pattern appear it which pinion was installed shallowly in carrier.
To modify, move the pinion toward the ring gear by decreasing the shim pack between pinion spigot and inner bearing cone.



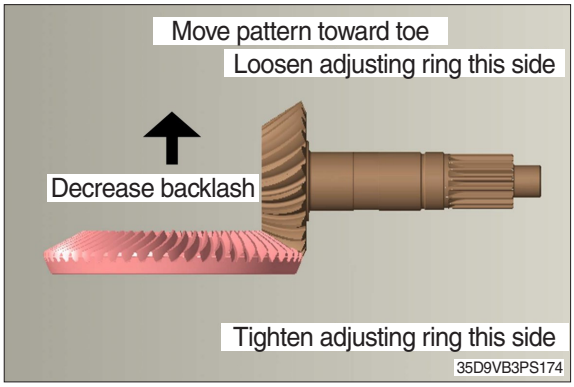

② Lower pattern

If A low contact pattern appear it which pinion was installed deeply in carrier.
To modify, move the pinion away from the ring gear by increasing the shim pack between pinion spigot and inner bearing cone.



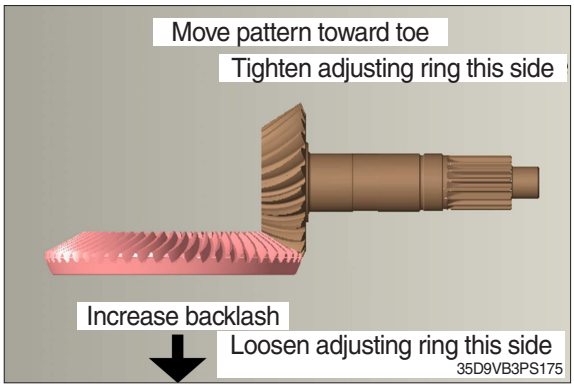

③ Heel pattern

Decrease the gearset backlash (within specified range) to move contact pattern toward toe and away from heel. Refer to " Adjusting the gearset backlash".

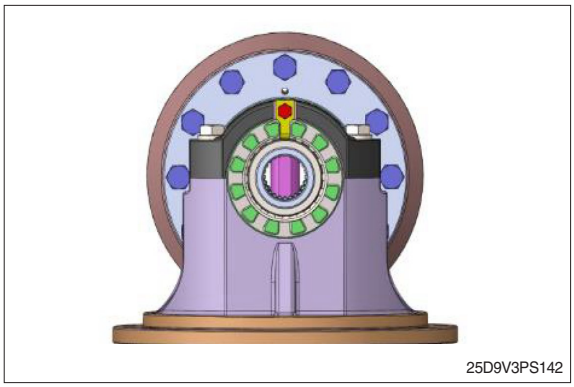


④ Toe pattern

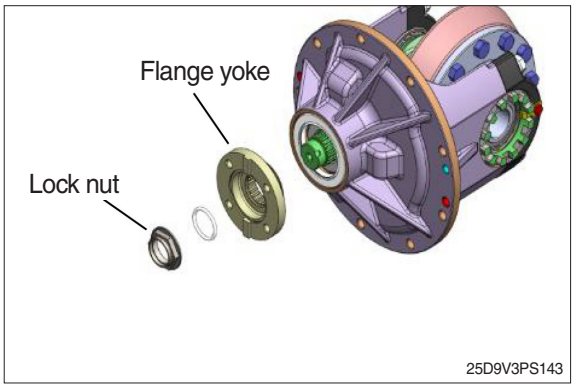
Increase the gearset backlash (within specified range) to move contact pattern toward heel and away from toe. Refer to "Adjusting the gearset back lash".



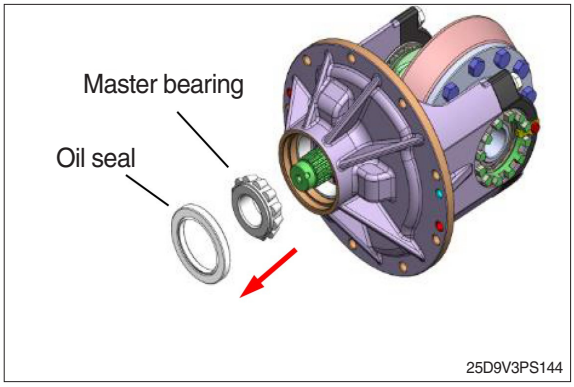

(5) Fix spring pin to adjusted Ring bearing. And then, assemble all of them.



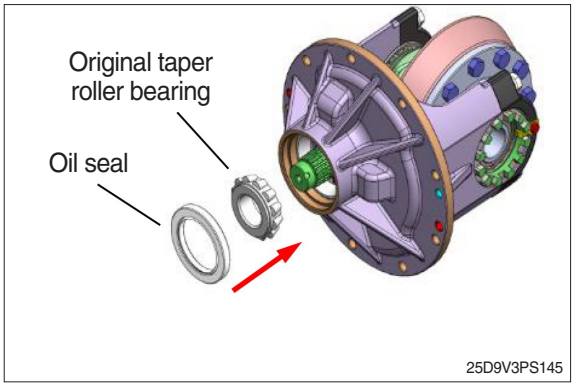

(6) Disassemble lock nut & o-ring & flange yoke.



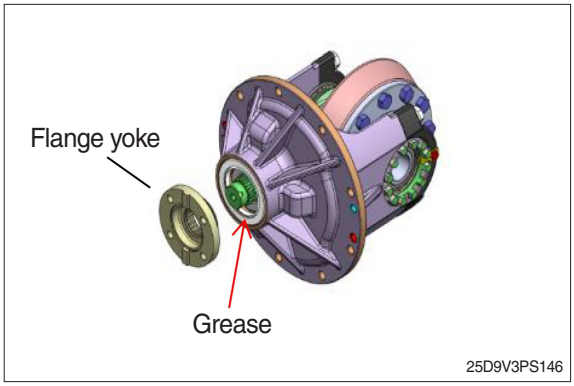

(7) Disassemble oil seal & master bearing.



(8) Assemble original taper roller bearing & oil seal.



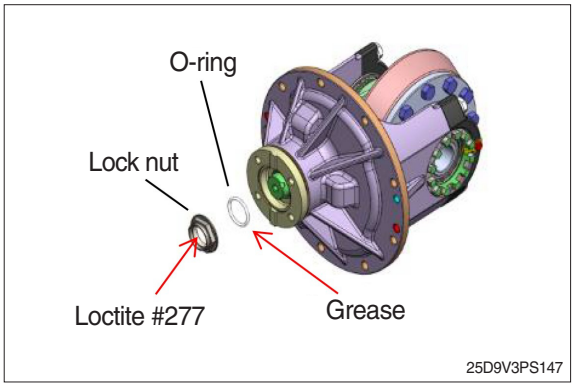

(9) Spread grease on seal rip and assemble flange yoke.



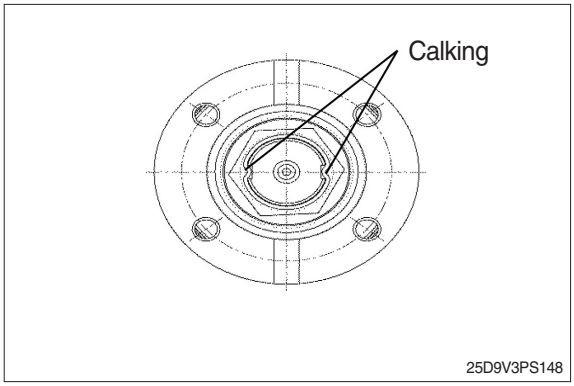

(10) spread grease on o-ring assemble o-ring and spread loctite #277 on lock nut and tighten it.

· Tightening torque : 46.9 ~ 50 kgf·m
(339 ~ 362 lbf·ft)

· Preload : 0.2 ~ 0.4 kgf·m
(1.4 ~ 2.9 lbf·ft)

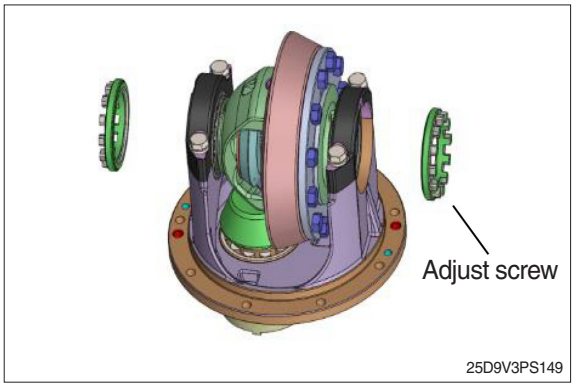



(11) Calking (2EA)



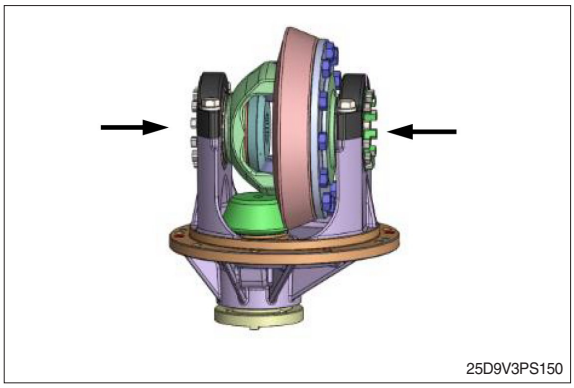
### 5) ASSEMBLY OF HUB

(1) Press hub bolt into hub.



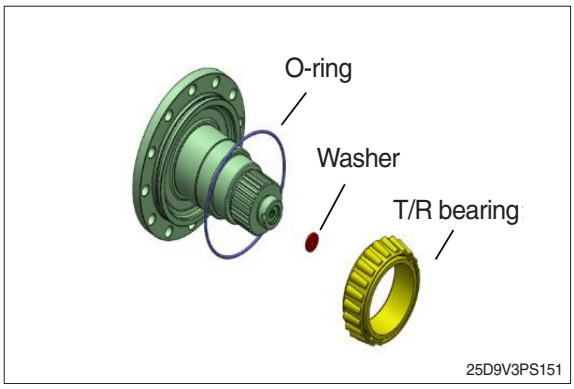

(2) Press hub outer oil seal. Before assemble, spread grease at inside hub.

※ **Grease : Shell Retinax 0434 - 60 ~ 80 % spread**



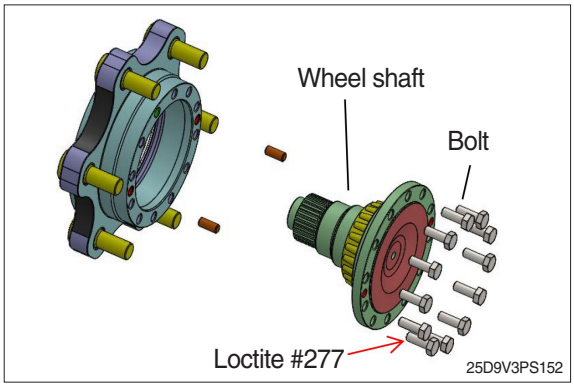

### 6) ASSEMBLY OF CARRIER HSG. SUB ASSY

(1) Cover grease on o-ring assemble o-ring and assemble washer & T/R bearing.

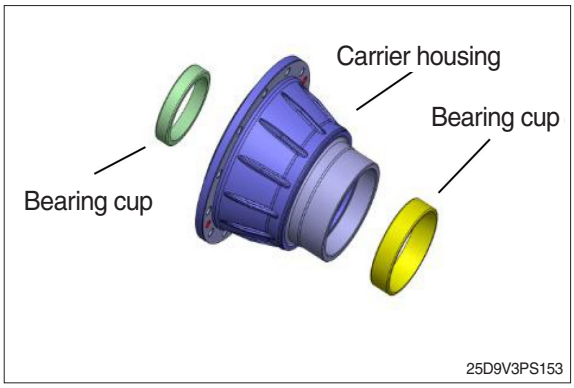



(2) Spread loctite #277 on socket bolt and assemble wheel shaft.

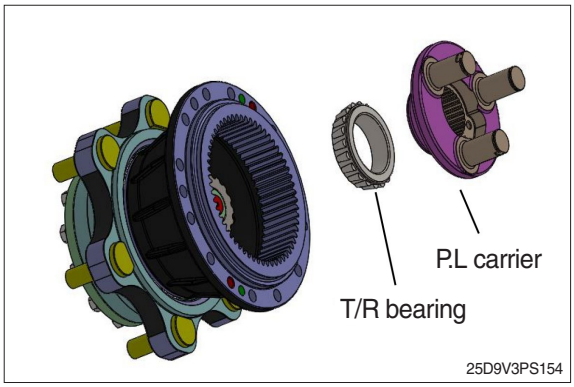
· Tightening torque : 0.69 ~ 0.73 kgf·m
(5.0 ~ 5.3 lbf·ft)



(3) Press bearing cup into carrier housing both side.




(4) Press T/R bearing and P.L carrier sub assy.



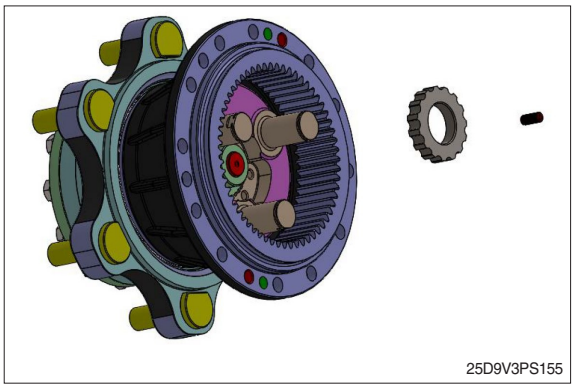

(5) Fastening hub lock nut and assemble the set screw.

※ **Spread loctite #277.**

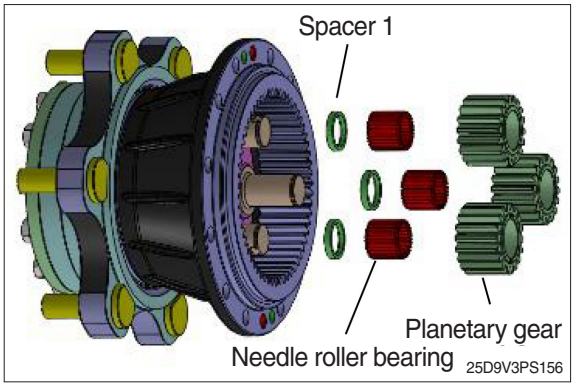
· lock nut tightening toruqe : 25.5 kgf·m (184 lbf·ft)

· Preload : 0.56 ~ 0.61 kgf·m (4.1 ~ 4.4 lbf·ft)

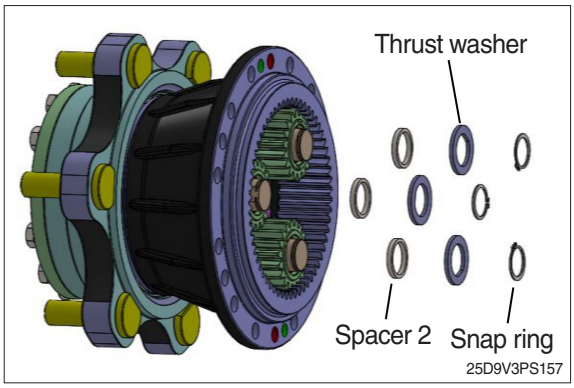
· set screw tightening toruqe : 1.3 kgf·m (9.4 lbf·ft)




(6) Assemble spacer 1, N.D roller bearing and planetary gear. Spread grease on N.D rooler bearing.

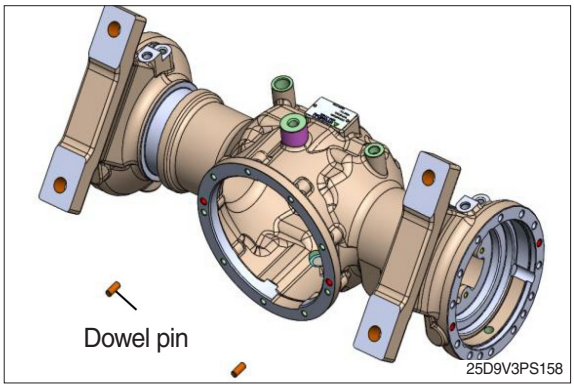


(7) Assemble spacer 2, thrust washer, snap ring.

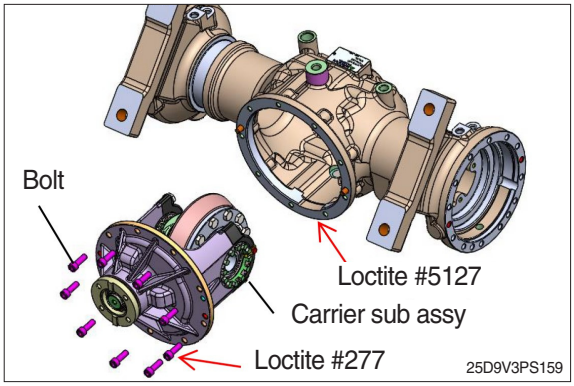



## 6) ASSEMBLY OF DRIVE AXLE

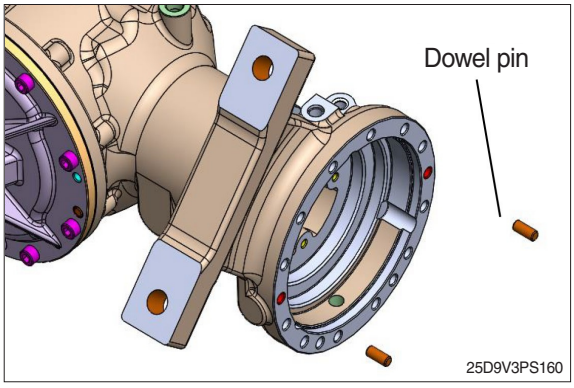
(1) Press dowel pin on axle housing.



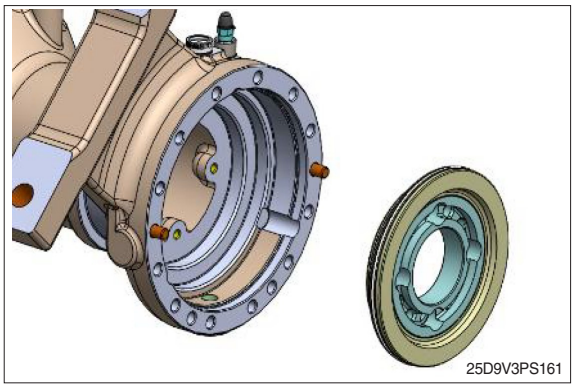

(2) Spread loctite #5127 on axle housing and assemble carrier sub assy. Spread loctite #277 on the bolt and assemble bolt.




(3) Assemble dowel pin on axle housing.



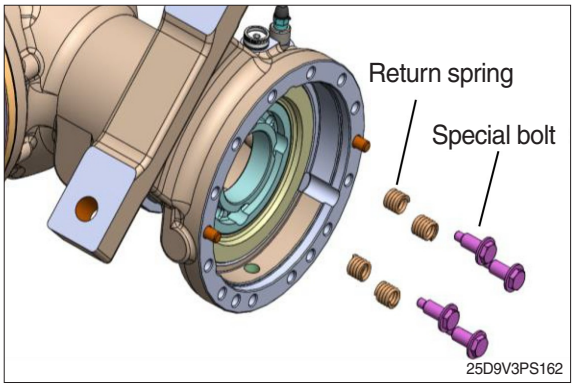
(4) Assemble piston sub.



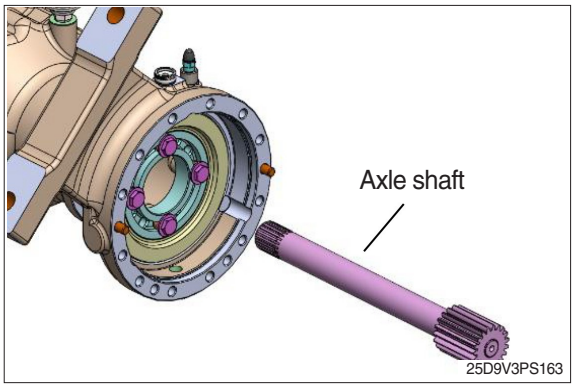

(5) Return spring, Sprecial bolt.

※ **Spread loctite #277 on the bolt.**

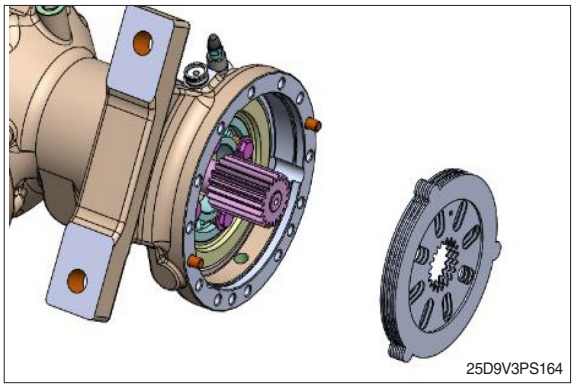
· Tightening torque : 3.1 ~ 3.5 kgf·m
(22.4 ~ 25.3 lbf·ft)




(6) Assemble axle shaft.



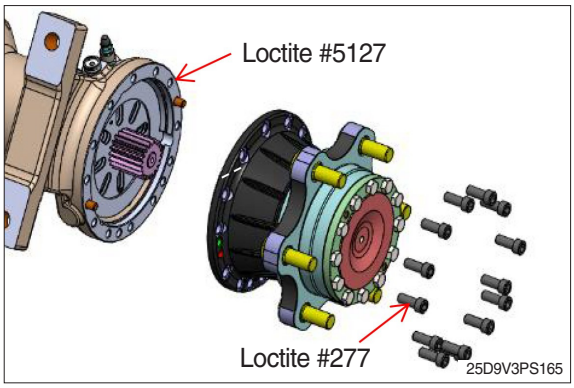

(7) Assemble brake disc pack



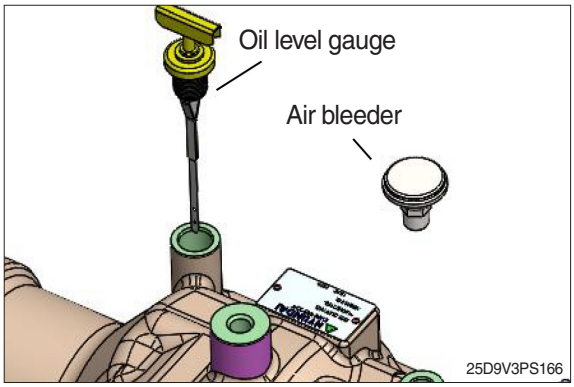
(8) Spread loctite #5127 on axle housing and assemble carrier hsg. sub assy.

※ **Spread loctite #277.**

· Tightening torque : 10.2 kgf·m (73.8 lbf·ft)

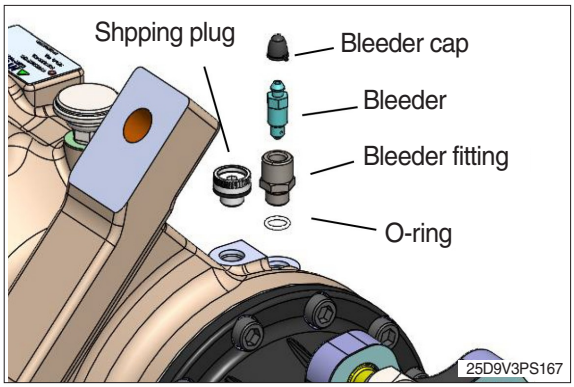



(9) Assemble oil level gauge & air breather on axle housing.



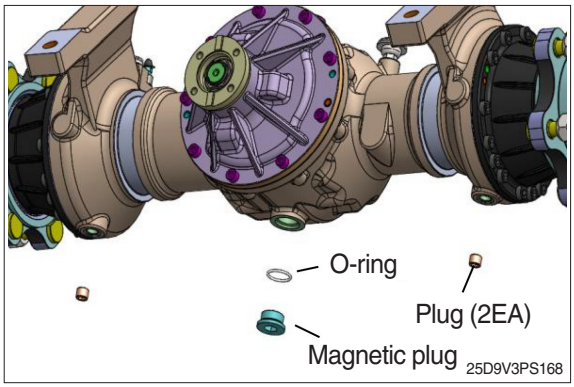

(10) Assemble o-ring, bleeder & bleeder fitting, bleeder cap.

· Tightening torque
Bleeder : 4.0 kgf·m (28.9 lbf·ft)
Bleeder fitting : 1.8 kgf·m (13.0 lbf·ft)

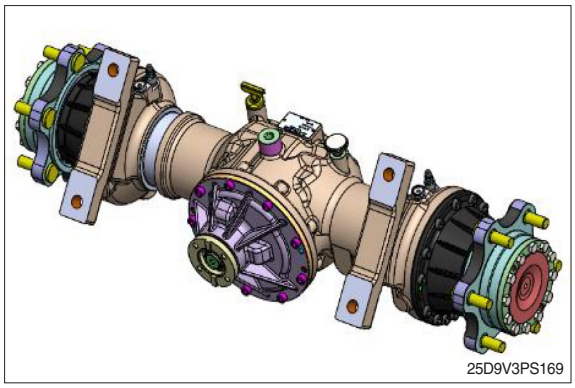



(11) Assemble o-ring, drain plug (magnetic), and plug.

· Tightening torque : 4.2 ~ 5.2 kgf·m (30.4 ~ 37.6 lbf·ft)



(12) Complete drive axle assembly.



# GROUP 3 MAINTENANCE AND TROUBLESHOOTING

## 1. MAINTENANCE

### 1) TRANSMISSION

#### (1) Recommend oils

The property that needs for auto transmission oil.

- · It has suitable viscosity at the height temperature.
- · It has suitable fluidity at the low temperature.
- · It has excellent oxidation stability.
- · It has property which remove bubble, and property of lubricant.
- · Therefore please be sure to use following the oil when you supply or change oil. In addition, please use the same oil that you supplied already.

① Oil volume is approximately 6 liters (without torque converter).

② Suggested oil : ATF (Auto Transmission oil, Dexron type)

#### (2) Point of exchange oil

**① Pulling out oil**

a. Please take off the drain plug where under of the transmission, and then discharge the old oil.

b. Please take off the hose join part, and then discharge the old oil that remained in the oil cooler and in the hose.

**※ Period of exchange oil filter : initial time 100 hr, and then every 1000 hr**

**② Oil supply**

a. Please stop the engine (ok), then refuel the oil into transmission until 「HOT」 level of oil level gauge.

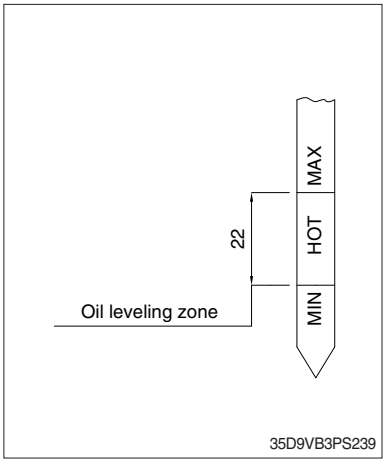
b. Please change lever "neutrality" position. Then please turn on the engine and keep low idle speed.

c. The oil reaches the hydraulic torque converter, cooler and pipe and so on, after start up the engine. Then oil level sink down.

d. Please drive the engine about 5 minutes at low idle speed, then refuel the oil gradually the oil level settle in regular position (between 「MAX」 and 「MIN」 position).

**※ Please refuel the oil carefully, without get rubbish or water and so on in the oil.**
**Lack of oil or excess of oil becomes cause of breakdown. So please be careful.**

**※ Check the oil level, when the oil temperature is 50℃ ~ 60℃.**
**Amount of all oil : about 14 liters.**



### (3) Period of overaul

① As for the overhaul, we recommend either every 5 years or 7000 hours coming early to be done as a limit.

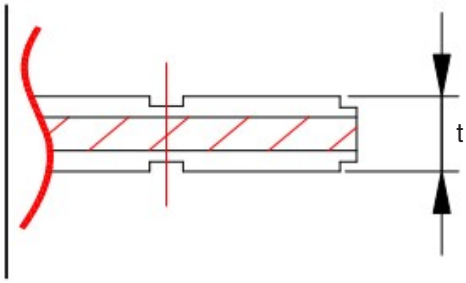
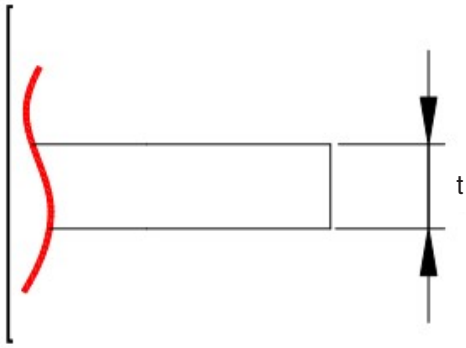
② Please change the oil seal, rubber such as o-ring, and gasket, copper gasket, if it has damaged.

③ Please check the part by your eyes which you disassembled whether they have the crack, the scar, abnormal wear and corrosion etc. If the parts have such abnormal condition, please change or repair.

④ Seal ring, snap ring, friction disc, plate → Change the part that exceeds the wear limits.

⑤ Bearing, bush → Check the bearing to see if it rotates freely. If in doubt about the wear or lack of lubrication, replace this bearing.

⑥ Gear, shaft → if it is abnormal you have to change.

| | Item in the F&R clutch | Standard | Limit |
|---|---|---|---|
| Friction disk |  | 2.4 | 1.9 |
| Plate |  | 1.8 | 1.65 |
| Back plate | | 3 | 2.85 |

### (4) Period of exchanging parts

| time / Item name | Item in the F&R clutch | Standard |
|---|---|---|
| Oil seal | Please change all parts. | Please change all parts at every overhaul. |
| O-ring | | |
| Gasket | | |
| Copper gasket | | |
| Oil seal ring | Please check the each part. | Please change all parts at 2nd and 4th time. |
| Seal ring race plane | | Please change the part that exceeds the wear limit. |
| Sinter plate | | |
| Stator free wheel part | | Please change the part that exceeds the wear limit.<br>Please change the abnormal leaf spring. |
| Sliding surfaces of oil seal | | Please change the part that exceeds the wear limit. |
| Sliding seciton of clutch piston | | |
| Inside diameter or bush | | |
| Each bearing | | |
| Spring | | |

### (5) Standard of exchanging parts

| Classfication | Contents | Object parts | Item name |
|---|---|---|---|
| A | The part that you should change the part to new one whenever overhauling and for check cleaning. | Gasket, Rubber | Gasket, O-ring, Copper gasket, Oil seal |
| B | The part that wear of the part is extreme comparatively, so the change time is high frequency. | Seal ring, Clutch plate | Oil seal ring, Snap ring, Friction plate&steel plate in clutch |
| C | The part that you do not have to change every overhauling but it is abnormally when overhauling you have to change the part. | Bearings, Race side of seal ring | Bearing, Bush, Part of free wheel, Seal race |
| D | The part that you usually do not have to change to new part but when if it its abnormally you have to chage. | Gear, Shaft | Each gear, Clutch shaft, Turbine shaft, Flange |

(6) Test

① **Operation check**

· Please change the change lever to 「N」 position and hold this position, then please change the engine speed from low idle to high idle, and check the below condition.

· The abnormal sound dose not occur.

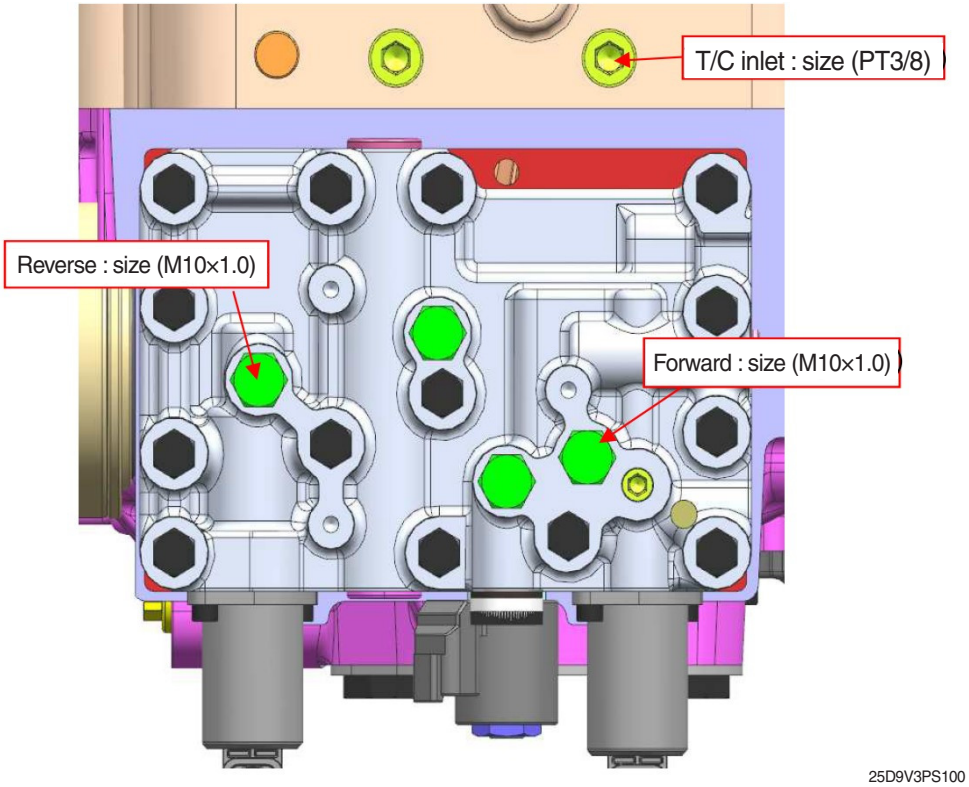
· The abnormal oscillation dose not occur.

· The oil is not leaking.

· Overheating, a strong odor of overheated oil is a major trouble sign.

② **Oil pressure measurement**

· If you measure each part pressure, remove the plug and then install the pressure gauge. (PT 3/8, M10×1.0)




a. Please warming up the engine until the torque converter oil temperature becomes about 50~60˚C.

b. Please measure the oil pressure of every required part as below under the low & high idle speed of engine.

c. When if you measure the individual pressure of clutch and pressure of lubricating. Please install the pressure gauge on the hole which take out the pressure then check the pressure while up the crane.

· Measure the oil pressure of clutch and T/C inlet at the 800 ~ 2400 rpm.

| Description | Standard (MPa) | |
|---|---|---|
| | 800 rpm | 2400 rpm |
| Main relief | 1.2±0.2 | 1.2±0.2 |
| Forward | 1.2±0.2 | 1.2±0.2 |
| Reverse | | |
| T/C inlet | 0.1 ~ 0.4 | 0.3 ~ 0.7 |

**③ Stall torque output test**

· Please pay attention to the truck starts suddenly, because the torque converter generates largest torque.

**※ When the torque converter is stall condition, heat generate suddenly inside of the torque converter. So do not drive the engine when you drive over 30 seconds and the torque converter oil temperature is over 90℃.**

a. Please use the parking brake and service brake securely.

b. Please set the lever to F or R.

c. Please step on the accelerator pedal until limit position, then check the engine speed when the engine speed become constant.

d. Standard of engine maximum speed in stall condition is around 1,800~2,000 rpm. (depends on the standard performance of engine and torque converter)

## 2) DRIVE AXLE

(1) General information

Drive axles generate small metal wear particles during operating, especially hard particles are allowed to circulate in the lubricant, along with external moisture. In these case the internal components can be more faster damaged and the brake can be made a noise.

(2) Magnets and magnetic drain plugs

The axle has magnetic drain plugs which has minimum 0.5 kg of capacity for picking-up low carbon steel. This drain plug must be checked if there are metal particles at every oil change interval.

(3) Breather

Breathers release the air pressure inside and help to minimize the condensation of oil.

**※ Please clean the plug if it has particles on the surface. Cover the breather when steam cleaning the housing. If the breather is not covered, water can enter the housing and contaminate the oil.**

**(4) Oil level**

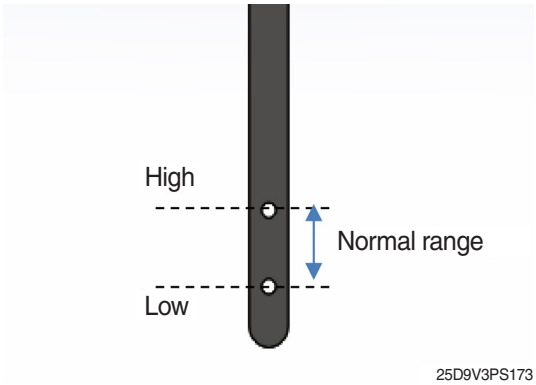
**① Check and adjust oil**

**⚠ To prevent serious eye injury, please always wear the glass for safe when you perform the truck maintenance or service.**

The part for oil filling and drain plugs are located in the axle housing.

a. Park the truck on flat ground.

b. Pull out oil level gauge from axle, then check the height of oil.

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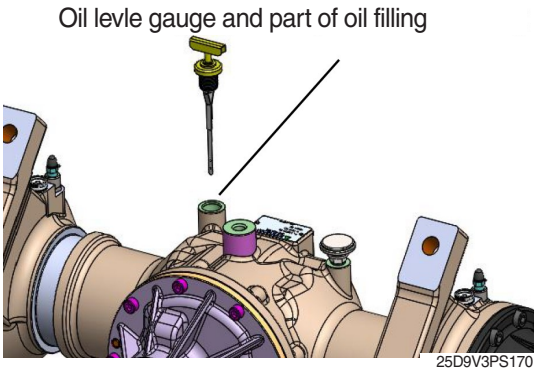
c. If the height of oil of level gauge is higher than the upper limit, drain the oil outby after loosening main drain plug , if the height of oil is lower than the lowest limit, replenish oil.

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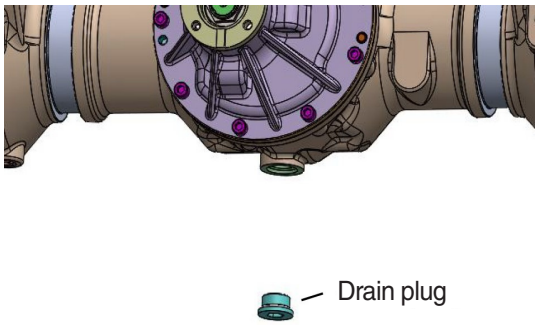


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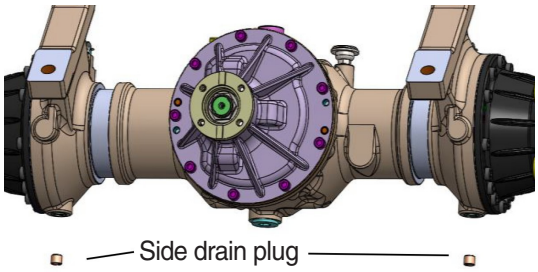


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② **Oil change**

⚠ **Park the truck on flat ground. Block the wheels to prevent the truck moving during maintenance. Do not work under the truck supported only jacks for safe. Because Jacks can slip and fall over.**

a. Make sure the vehicle is on level surface.

b. Raise lift of vehicle and drain oil by loosening main drain plug and 2 places of side plug.

c. After drain all oil, clean the magnetic plug.

d. Fill oil with checking the height of level with level gauge.

③ **Oil volume and available of list**

a. Oil volume is approximately 8.2 liters.

b. **Available oil list**

| Manufacture name | Brand name |
|---|---|
| Mobil corporation | Mobil fluid 424 |
| | Mobil Infilex33 85W90 |
| Sheel oil corporation | Shell spriax S4 TXM |
| | Donax TD 10W30 (2009 ver.) |

**(5) Period of overhul**

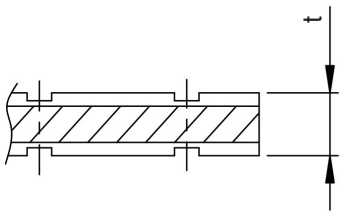
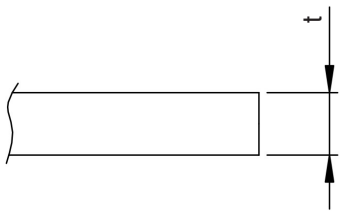
① Period of drive axle assy overhaul : Every 5 year or 7,000 hours.

② The Axle oil needs to be replaced per every 1,000 hrs, to prevent brake noise.

③ O-ring, oil seal, rubber, gasket : Change all parts at every overhaul.

※ Check internal leakage of brake system(Brake seal) : Every 2,000 hours, replace as necessary.

④ **Snap ring, disc, opposing plate : Change the part that exceeds the wear limits.**

| Item | | Part no. | Standard | Limit |
|---|---|---|---|---|
| Disc |  | HA30-60220 (Service brake) | t=2.5 | t=2.2 |
| Opposing plate |  | HA30-60200 (Service brake) | t=2.5 | t=2.35 |

⑤ Bearing, spring : Check the release bearing the see if it rotates freely. If it has doubt for the wear or lack of lubrication, replace this bearing.

⑥ Gear, shaft : If it is abnormal you have to change.

## 2. TROUBLESHOOTING

### 1) TRANSMISSION

#### (1) Output does not go up

| Locating fault and cause | | | Measures |
|---|---|---|---|
| Engine | The engine speed is abnormal. | | When the gear is neutral position and torque converter is stall state, please measure the engine speed. Then if the engine speed does not become proper speed, please adjust the engine or repair it. (Please refer to page of stall test.) |
| Torque converter | Torque converter oil | The oil is in short supply. | Please replenish oil. |
| | | The oil that is not regulated is used. | Please change the oil to regular oil. |
| | | The air has mixed into oil. | Please tighten each joint coupling and the pipe further. |
| | | The air bubble occurs because the torque converter pressure decrease. | Please check and adjust the torque converter pressure. |
| | | The water has mixed into oil. | Please check the cooler, and change all oil. |
| | | The oil filter is clogging. | Please wash the oil filter of change it. |
| | Main body of torque converter | The stator free wheel is broken. | Please change the stall revolution then if the revolution is extremely low, please change the free wheel inner race, free wheel cam and roller. |
| | | The stator free wheel is sticking. | Please check the rise of the temperature of oil at no load. And please change the free wheel inner race, free wheel cam and roller when the temperature of oil rises abnormally. |
| | | The wheel with blades is broken or it is touching other components. | Please check whether the aluminum powder and the like has mixed into torque converter oil. Please change the wheel with baldes if the aluminum powder and the like has mixed in. |
| | Charging pump | The pump dose not operates normally. | Please change the pump. |
| Transmission | Control valve assy | The clutch oil pressure has decreased because the spring is settling or break. | Please change the spring. |
| | | The valve does not move with the valve opens. | Please repair or change the valve. |

### (2) Power is not transmitted

| Locating fault and cause | | | Measures |
|---|---|---|---|
| Torque converter | The input plate wheel is broken. | | Please change the input plate. |
| | The oil is in short supply. | | Please replenish oil. |
| | The shaft and spline are worn. | | Please change the shaft and the spline. |
| | The gear is broken. | | Please change the gear. |
| | The charging pump does not operate normally. | | Please change the charging pump. |
| Transmission | Torque converter oil | The oil is in short supply. | Please replenish oil. |
| | Clutch assembly | The clutch plate is worn and broken. | Please change the clutch plate. |
| | | The clutch plate is sticking. | Please change the clutch plate. |
| | | The clutch shaft spline is worn. | Please change the clutch shaft spline. |
| | | The clutch pressure has decreased because the shaft end of the clutch and the oil seal ring of the clutch piston do not operate normally. | Please change the clutch assembly. |
| | Output shaft | The shaft spline is worn. | Please change the part which has worned spline. |
| | | The gear is broken. | Please change the gear. |
| | Solenoid valve | The solenoid valve is broken. | Please change the solenoid. |
| | | Spool does not operate normally. | Please change the solenoid valve. |

### (3) Oil temperature rises abnormally

| Locating fault and cause | | | Measures |
|---|---|---|---|
| Torque converter | Main body of torque converter | The device of stator free wheel is broken. | Please check the stall speed, and then if the speed is out of regular valve, please change the stator assembly to new part. |
| | | The wheel with blades are touching each other. | If the foreign material (the aluminum powder and the like) has entered in torque converter oil, please change the wheel with blades to new one. |
| | | The bearings are worn or sticking. | Please repair the bearings or change them. |
| | Torque converter oil | Amount of oil is not appropriate. | Please check the oil level. |
| | | The oil that is not regulated is used. | Please change the oil to regular oil. |
| | | The air has mixed into oil. | Please tighten each joint coupling and the pipe further. |
| | | The water has mixed into oil. | Please check the cooler and change the all oil. |
| | The piping resistance is large | The hose is bending, or it is broken. | Please repair the hose or change it. |
| | | The oil cooler is sticking. | Please wash the oil cooler or change them. |

| Locating fault and cause | | | Measures |
|---|---|---|---|
| Transmission | The clutch is dragging | The clutch plate is sticking. | Please change the clutch plate. |
| | | The clutch piston does not operate normally. | Please repair the clutch piston or change it. |
| | | The pressure of clutch has decreased. | Please check the clutch pressure. |
| | The bearings are worn or sticking. | | Please change the bearings. |

### (4) Clutch or converter oil pressure is too high

| Locating fault and cause | | | Measures |
|---|---|---|---|
| Torque converter | Hose of outlet side is bending, and the hose is broken and the oil cooler is clogging. | | Please repair or change the hose and oil filter, cooler |
| | Viscosity of oil is too high. (At cold time) | | Please warm up the torque converter if the temperature of torque converter oil is below outside air temperature. |
| | The oil that is not regulated is used. | | Please change the oil to regular oil. |
| Transmission | Control valve assembly | The valve does not operate normally because spring is broken or spools are sticked in the valve. | Please repair the valve assembly or change to new one. |

### (5) Clutch or converter oil pressure is too low

| Locating fault and cause | | | Measures |
|---|---|---|---|
| Transmission | The oil is in short supply. | | Please replenish oil. |
| | The oil that is not regulated is used. | | Please change the oil to regular oil. |
| | The charging pump is worn and broken. | | Please change the charging pump. |
| | The oil seal ring or o-ring is worn or damaged. | | Please change the oil seal ring or the o-ring. |
| | The filter is clogging. | | Please wash the oil filter or change it. |
| | control valve assembly | The spring is settling, and broken. | Please change the spring. |
| | | The valve does not move with the valve opens. | Please repair the valves or change it. |
| | | The restriction is clogging. | Please wash the restriction. |
| | The filter is clogging. | The end of the shaft and the seal ring of the clutch piston are damaged. | Please change the clutch piston. |

### (6) Noise occurs

| Locating fault and cause | | Measures |
|---|---|---|
| Torque converter | The input plate is broken. | Please change the input plate. |
| | The bearing is broken or bearings are worn. | Please change the bearing. |
| | The gear is broken. | Please change the gear. |
| | The wheel with blades are touching each other. | Please change the wheel with blades. |
| | The bolt and rivet are loosen or broken. | Please repair the bolt and rivet or change it. |
| | The spline is worn. | Please change the part which has worned spline. |
| | The pump does not operate normally. | Please change the pump. |
| Transmission | The clutch is sticking and dragging. | Please change the clutch. |
| | The bearings are sticking and worn. | Please change the bearing. |
| | The gear is broken. | Please change the gear. |
| | The spline is worn. | Please change the spline. |
| | The bolt is loosen or broken. | Please repair the bolt or change it. |

### (7) Shinfting is impossible

| Locating fault and cause | | Measures |
|---|---|---|
| Transmission | The clutch plate is sticking. | Please change the clutch plate. |
| | The solenoid valve does not operate normally. | Please repair the solenoid valve or change it. |
| | The gear is broken. | Please change the gear. |

### (8) DTC definition and reaction

| No. | Fault | Critria | SPN | FMI | LAMP | FLASH | Required Reaction |
|---|---|---|---|---|---|---|---|
| 1 | Key Switch Battery Potential. | > 33 Vdc | 158 | 0 | Red Stop | Slow (1Hz) | TCU Shutdown (No Ouputs) |
| 2 | | < 9 Vdc | | 1 | Red Stop | Slow (1Hz) | TCU Shutdown (No Ouputs) |
| 3 | Transmission ECU Temperature | > 105℃ | 5912 | 0 | Red Stop | Slow (1Hz) | TCU Shutdown (No Ouputs) |
| 4 | | < -40℃ | | 1 | Red Stop | Slow (1Hz) | TCU Shutdown (No Ouputs) |
| 5 | Transmission 1 Forward Solenoid Valve | Short to Batt+ | 741 | 3 | Red Stop | Slow (1Hz) | Neutral Mode |
| 6 | | Short to GND | | 4 | Protect | Slow (1Hz) | Neutral Mode |
| 7 | | Open Circuit | | 5 | Protect | Slow (1Hz) | Neutral Mode |
| 8 | Transmission 1 Reverse Solenoid Valve | Short to Batt+ | 4216 | 3 | Red Stop | Slow (1Hz) | Neutral Mode |
| 9 | | Short to GND | | 4 | Protect | Slow (1Hz) | Neutral Mode |
| 10 | | Open Circuit | | 5 | Protect | Slow (1Hz) | Neutral Mode |
| 11 | Park Brake Actuator | Short to Batt+ | 619 | 3 | Red Stop | Slow (1Hz) | Neutral Mode & Vehicle Stop |
| 12 | | Open Circuit | | 5 | Protect | Slow (1Hz) | Neutral Mode & Vehicle Stop |
| 13 | Transmission 1 Oil Pressure | Short to Batt+ | 127 | 3 | Amber | Slow (1Hz) | Neutral Mode |
| 14 | | Short to GND | | 4 | Amber | Slow (1Hz) | Neutral Mode |
| 15 | Transmisstion Oil Temperature Sensor | Short to Batt+ | 177 | 3 | Red Stop | Slow (1Hz) | Neutral Mode |
| 16 | | Short to GND | | 4 | Red Stop | Slow (1Hz) | Neutral Mode |
| 17 | | > 120℃ | | 16 | Amber | Slow (1Hz) | Neutral Mode |
| 18 | Transmission Selected Gear OR Transmission Drive Selector (Requested value)(Physical Switch) | F= 0 + N = 0 + R = 0<br>F= 1 + N = 1 + R = 0<br>F= 1 + N = 0 + R = 1<br>F= 0 + N = 1 + R = 1<br>F= 1 + N = 1 + R = 1 | 525 or 3496 | 11 | Red Stop | Slow (1Hz) | No Fwd/Rev by Default |
| 19 | Requested Percent Clutch Slip(Inching sensor) | Short to Batt+ | 684 | 3 | Amber | Slow (1Hz) | No Action |
| 20 | | Short to GND | | 4 | Amber | Slow (1Hz) | No Action |
| 21 | J1939 Network #1, Primary Vehicle Network | No message 3x trans | 639 | 9 | Red Stop | Slow (1Hz) | Neutral Mode |
| 22 | Transmission Ouput Shaft Speed Sensor | Short to Batt+ | 191 | 11 | Amber | Slow (1Hz) | Neutral Mode |
| 23 | | Short to GND | | | Amber | Slow (1Hz) | Neutral Mode |

※ Red Stop Lamp : This lamp is used to relay trouble code information that is of a severe enough condition that it warrants stopping the vehicle.

Amber Warning Lamp : This lamp is used to relay trouble code information that is reporting a problem with the vehicle system but the vehicle need not be immediately stopped.

Protect Lamp : This lamp is used to relay trouble code information that is reporting a problem with a vehicle system that is most probably not electronic subsystem related.

## 2) DRIVE AXLE

### (1) Noise and vibration

| Locating fault and cause | | Measures |
|---|---|---|
| Drive axle | Shortage of oil | Check oil level or refill lubricating oil. |
| | Inappropriate oil | Replace the oil. |
| | Damaged wheel bearing | Replace the wheel bearing. |
| | Damaged ring gear and pinion shaft | Replace the ring gear and pinion shaft. |
| | Loosened or worn bearing of pinion shaft | Disassemble, check or replace the bearing. |
| Differencial | Loosened bolt for assembling ring gear | Disassemble, check and reassemble the ring gear. |
| | Damaged ring gear | Replace the ring gear. |
| | Loosened or worn differencial bearing | Disassemble, check, reassemble or replace the differencial bearing. |
| | Damaged bevel gear bearing | Replace the bevel gear bearing. |
| | Worn or damaged diff pinion and side gear. | Replace the diff pinion and side gear. |
| | Worn or damaged thrust washer. | Replace the thrust washer. |
| | Excessive backlash of diff pinion and side gear. | Replace the diff pinion and side gear. |
| Brake | Incorrect axle fluid and/or friction material used | Use only meritor specified or approved materials. |
| | | Drain and flush fluid from axle. Replace with approved fluid. |
| | | Replace all friction discs. Throughly clean or replace stationary discs. |

### (2) Oil leakage

| Locating fault and cause | | | Measures |
|---|---|---|---|
| External leakage | Excess supply of oil | | Check oil level. set of oil amount. |
| | Inappropriate oil | | Replace the oil. |
| | Blocking air breather | | Cleaning, replace the air breather |
| | Damaged hub oil seal | | Replace the hub oil seal. |
| | Worn or damaged bevel pinion shaft oil seal | | Replace the oil seal. |
| | Loosened bleeder screw | | Tighten bleeder screw. |
| | Losened brake inlet fitting and plugs | | Tighten brake inlet fitting. |
| | Damaged brake inlet fitting, plug and o-ring | | Replace the brake inlet fitting, plug and o-ring. |
| Brake | Internal leak : Fluid bypasses seals into axle and fills axle with fluid and blows out breather or empties brake fluid reservoir. | Worn or damaged piston seal | Replace the piston seals. |
| | | Melted or extruded piston seals | Correct cause of overheating and replace seals. |
| | | Corrosion, pitting, wear or other damage, marks scratches to piston and/or brake housing bore in area of seal/sealing lips | Clean, smooth, rework or replace affected parts. |
| | External leak | Loosened bleeder screw | Tighten bleeder screw to 2 ~ 2.7 kgf·m (14.5 ~ 19.6 lbf·ft). |
| | | Loosened inlet fitting or plugs | Tighten inlet fitting to 3.4 ~ 4.8 kgf·m (24.7 ~ 34.8 lbf·ft). |
| | | Damaged inlet fitting or plugs or damaged seats | Replace inlet fitting or plug and o-ring if used. |