

# SECTION 3 POWER TRAIN SYSTEM

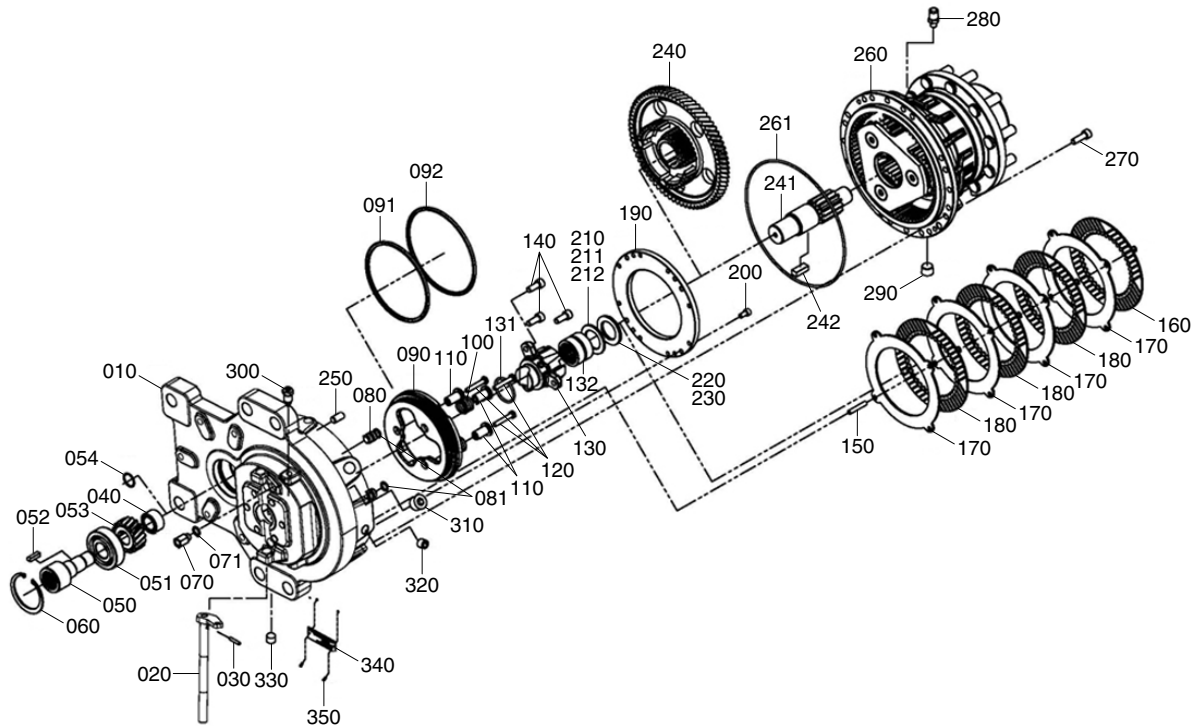
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# SECTION 3 POWER TRAIN SYSTEM

## GROUP 1 STRUCTURE AND OPERATION

### 1. STRUCTURE

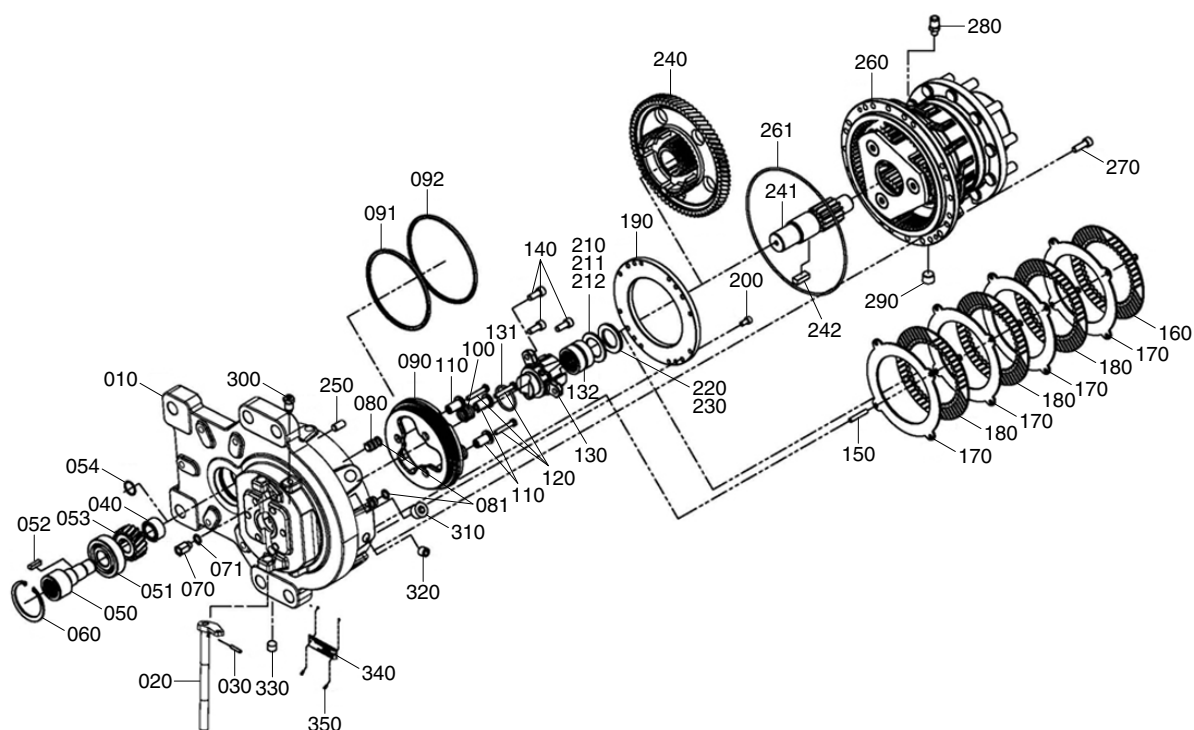
#### 1) DRIVE AXLE (1/2)



22B9PT01

010 Housing (LH, RH)	070 Fitting (brake)	120 Bolt (piston brake)
020 Parking lever (LH, RH)	071 O-ring (fit-brake)	130 Bearing boss (drive)
030 Spring pin	080 Parking pin	131 O-ring (bearing boss)
040 Needle roller bearing (drive)	081 O-ring (parking pin)	132 Needle bearing roller (drive)
050 Drive gear shaft	090 Brake piston	140 Hex socket bolt (bearing boss)
051 Ball bearing (drive)	091 D-ring (small)	150 Guide pin
052 Key (drive)	092 D-ring (large)	160 Spring brake disc
053 Drive gear	100 Return spring	170 Reaction plate
054 Snap ring (drive)	110 Spacer	180 Friction plate
060 Snap ring (drive)		

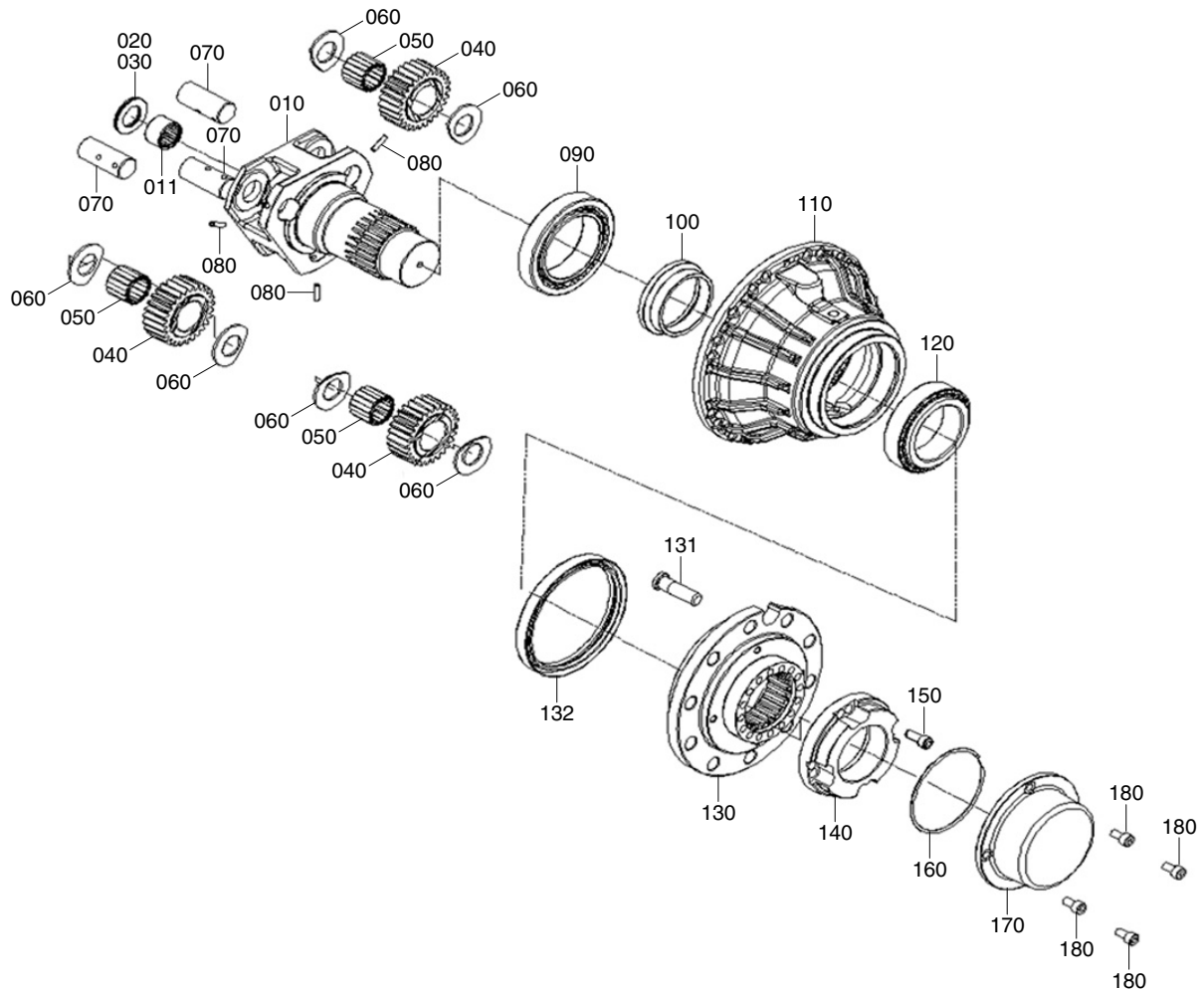
## DRIVE AXLE (2/2)



22B9PT01

190	Disc plate stopper	241	Sun gear shaft	300	Air breather (brake)
200	Hex socket bolt (brake cover)	242	Key (driven)	310	Socket plug (fill oil)
210	Spacer (bearing boss), 3.0t	250	Dowel pin (plate housing)	320	Socket plug (level)
211	Spacer (bearing boss), 3.1t	260	Wheel assy	330	Socket plug (drain)
212	Spacer (bearing boss), 3.2t	261	O-ring (final housing)	340	Name plate (LH, RH)
220	Thrust needle bearing (bearing boss)	270	Hex socket bolt (housing)	350	Rivet
230	Thrust needle washer (bearing boss)	280	Air breather		
240	Driven gear	290	Magnetic plug (drain)		

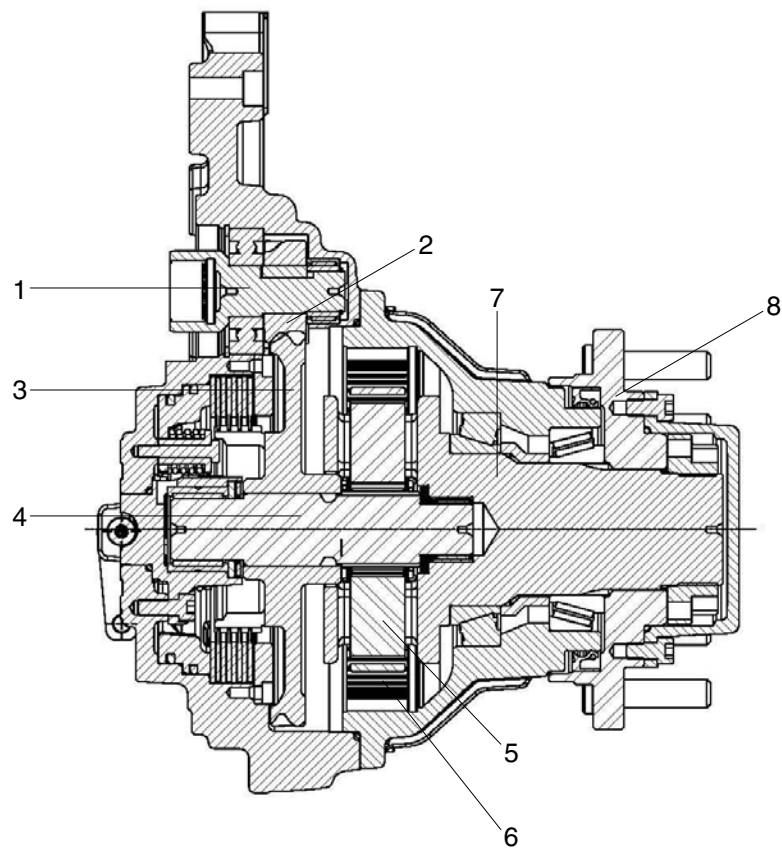
## 2) WHEEL



22B9PT02

010	Carrier shaft	070	Planetary gear shaft	131	Stud bolt
011	Needle roller bearing	080	Spring pin	132	Oil seal
020	Thrust needle bearing	090	Taper roller bearing	140	Lock nut
030	Thrust needle washer	100	Spacer	150	Hex socket bolt
040	Planetary gear	110	Final housing	160	O-ring
050	Needle roller bearing	120	Taper roller bearing	170	Wheel cap
060	Thrust washer	130	Adapter	180	Hex socket bolt

### 3) OPERATION PRINCIPLE



DU003B

- |   |             |   |                |   |               |
|---|-------------|---|----------------|---|---------------|
| 1 | Drive shaft | 4 | Sun gear shaft | 7 | Carrier shaft |
| 2 | Drive gear  | 5 | Planetary gear | 8 | Wheel adapter |
| 3 | Driven gear | 6 | Ring gear      |   |               |

The drive axle include service brake and parking brake as a power transfer components which are assembled to drive wheels of the battery fork lift.

The rotation power from the drive motor transmits to the drive shaft (1).

The driven gear (3) engages with the drive gear (2) which is fixed by key to the drive shaft.

The driven gear (3) is fixed by key to the sun gear shaft (4).

The planetary gears (5) which are fixed by key to the sun gear shaft (4) engage with the ring gear (6).

Finally reduced rotation power is transmitted to the wheel adapter (8) which is fixed with the carrier shaft (7) and the wheel is rotated.

### 3. SPECIFICATION

Item	Unit	Specification
Max wheel load	kg/lb	4500/9921
Gear ratio	—	24.58
Weight without fluid	kg/lb (EA)	62/137
Oil quantity (Mobilfluid 424)	ℓ /U.S. · gal	1.0/0.26

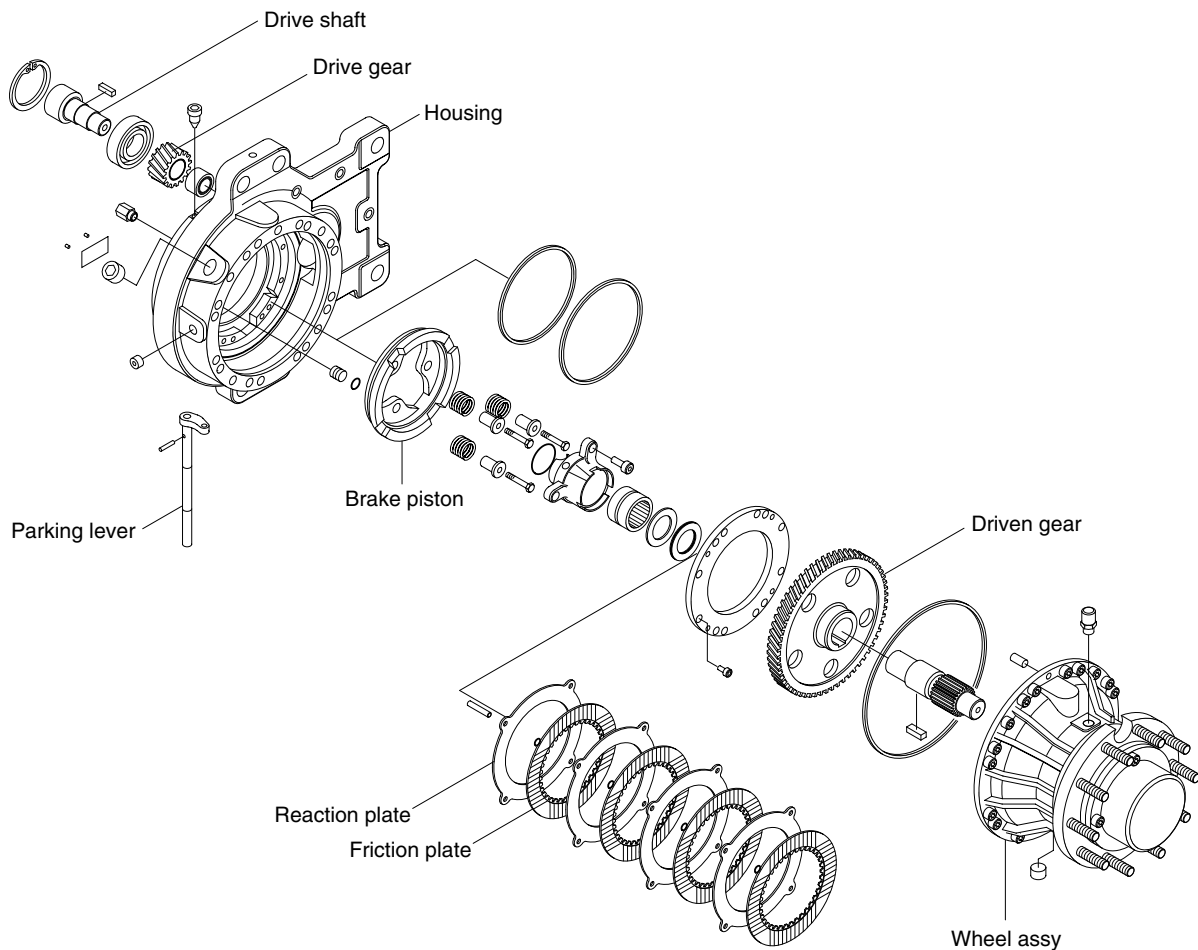
## GROUP 2 TROUBLESHOOTING

Problem	Cause	Remedy
<b>1. Noise</b> 1) Knock ing conditional on speed 2) Singing noise 3) Muffled grinding noise	<ul style="list-style-type: none"> <li>· Gearing of helical gear steep has been damaged when mounting motor.</li> <li>· Motor connection is not correct.</li> <li>· Motor bearing is faulty.</li> <li>· Wheel bearings faulty.               <ul style="list-style-type: none"> <li>- Due to insufficient gear oil level.</li> <li>- Inadmissibly high prestress of bearings.</li> </ul> </li> <li>· Gearing of planetary step is damaged               <ul style="list-style-type: none"> <li>- Due to insufficient gear oil level.</li> <li>- Due to excessive bearing clearance of wheel.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Dismount electric motor. Check drive pinion and helical gear for damage.</li> <li>- Check motor connection.</li> <li>- Check motor bearing.</li> <li>- Have bearings checked in a workshop.</li> <li>- Have gear set of planetary step and wheel bearings checked in a workshop.</li> </ul>
<b>2. Leakage</b> 1) Breather valve 2) Motor 3) Wheel shaft 4) Brake lever 5) Drive line overheat	<ul style="list-style-type: none"> <li>· Excessive gear oil level.</li> <li>· O-ring seal faulty.</li> <li>· Sealing ring of wheel shaft faulty.</li> <li>· Sealing ring of brake lever faulty.</li> <li>· Gear oil level is either too high or too low.</li> <li>· Wheel bearings with an excessive pretension.</li> </ul>	<ul style="list-style-type: none"> <li>- Check gear oil level.</li> <li>- Dismount electric motor, check O-ring and sealing surfaces for damages.</li> <li>- Check sealing ring and wheel shaft for damages in the sealing area.</li> <li>- Check sealing ring and straight pin for damages in the sealing area. Consult workshop.</li> <li>- Check gear oil level.</li> <li>- Check clearance of wheel shaft.</li> </ul>

## GROUP 3 DISASSEMBLY AND ASSEMBLY

### 1. THE DRIVE AXLE ASSY

#### 1) STRUCTURE

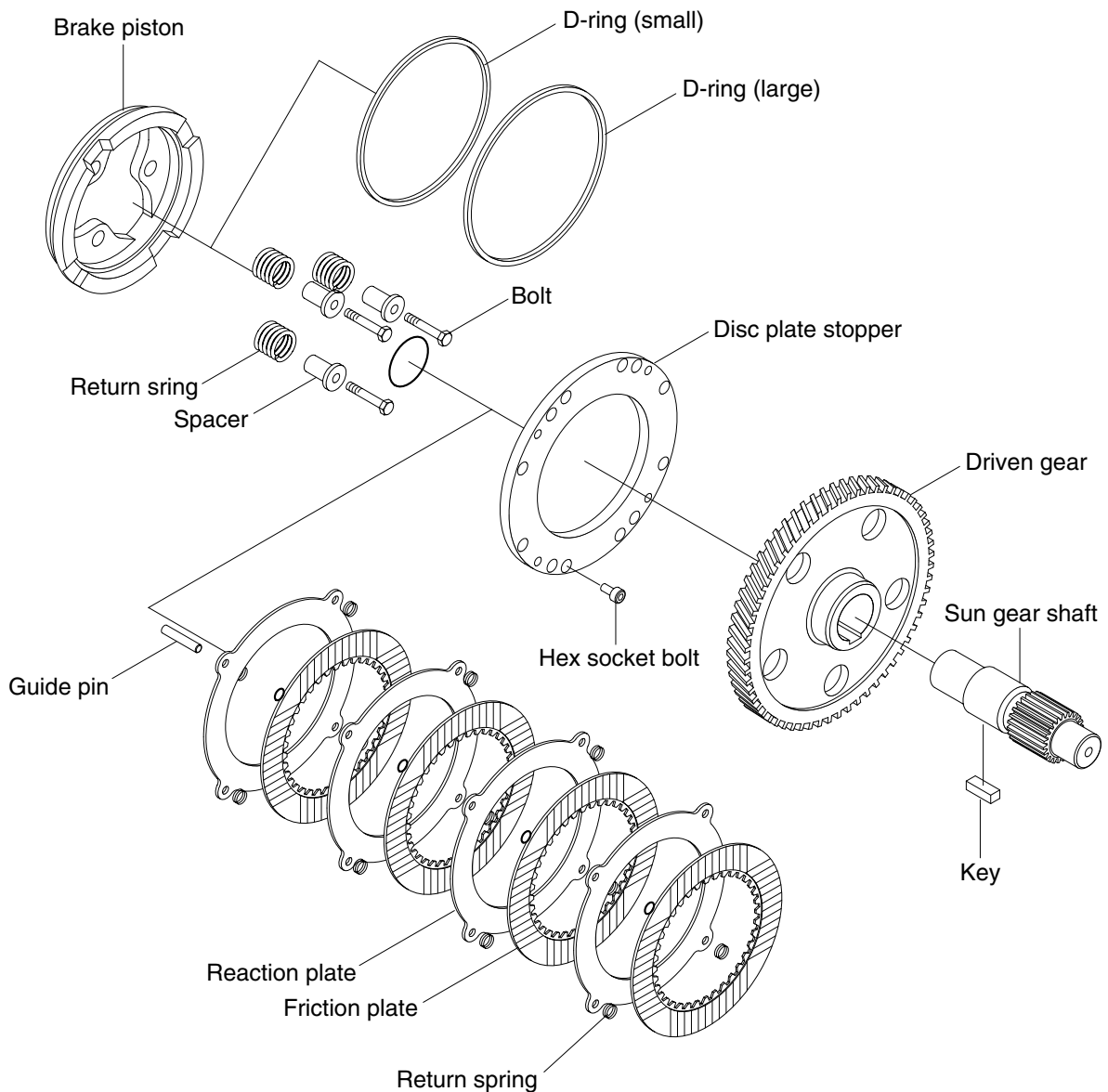


DU003A

- ※ Arrange all the components according to disassembled sequence when disassembling the drive axle assy.
- ※ Record using the felt-tip pen if necessary and provide the components to discriminate easily.
- ※ Store the disassembled components to clean place for cleanliness of it.



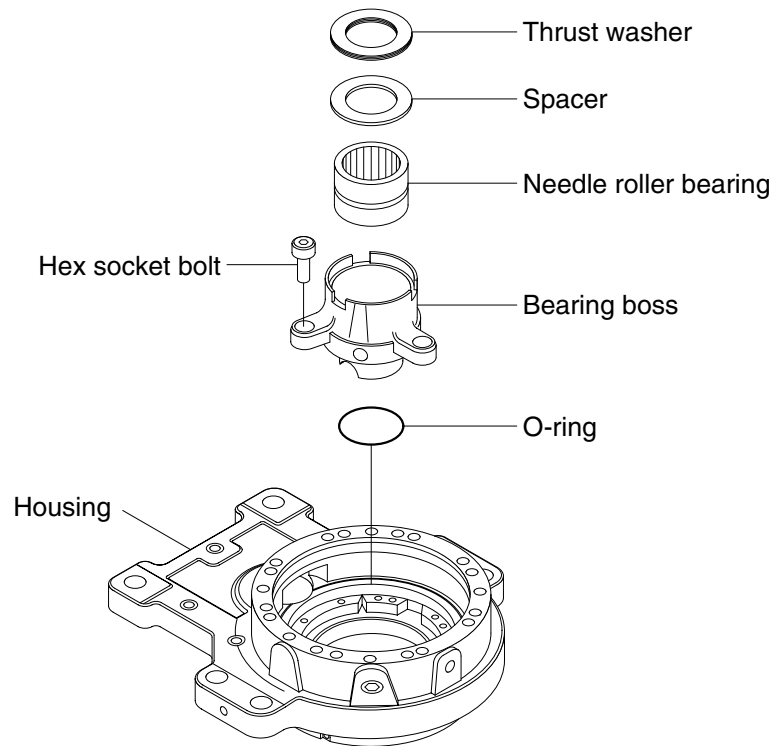
## 2) DISASSEMBLY OF SERVICE BRAKE



DA010

- (1) Disassemble the sun gear shaft and the driven gear from the bearing boss.
- (2) Loosen and remove the socket bolts (14 EA) to fix the stopper using the special tool.
- (3) Disassemble the reaction plates (4 pcs) and the friction plates (4 pcs) from the housing.
  - ※ When disassembling the reaction plates and the friction plate, take care to damage or loss of the return springs (16EA).
- (4) Remove the bolts to fix the piston from the housing using the spanner or wrench.
  - ※ When disassembling the piston, let air pressure into the brake port.

### 3) DISASSEMBLY OF BEARING BOSS

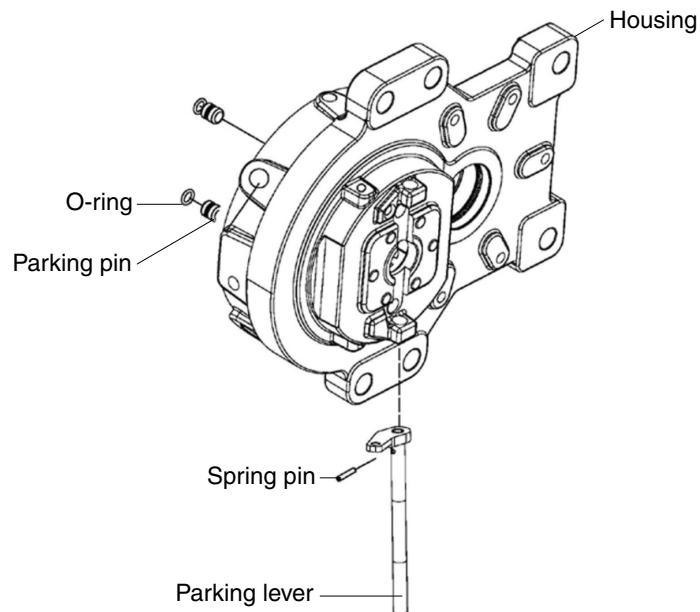


DA011

- (1) Remove the thrust washer and spacer from the bearing boss.
  - (2) Disassemble the hex socket bolts (3EA) to fix the bearing boss from the housing using the special tool.
  - (3) Take care to the damage and the break away of the O-ring for the bearing boss.
- ※ When disassembling the bearing boss, always renew the O-ring.

#### 4) DISASSEMBLY OF PARKING LEVER AND DRIVE SHAFT ASSY

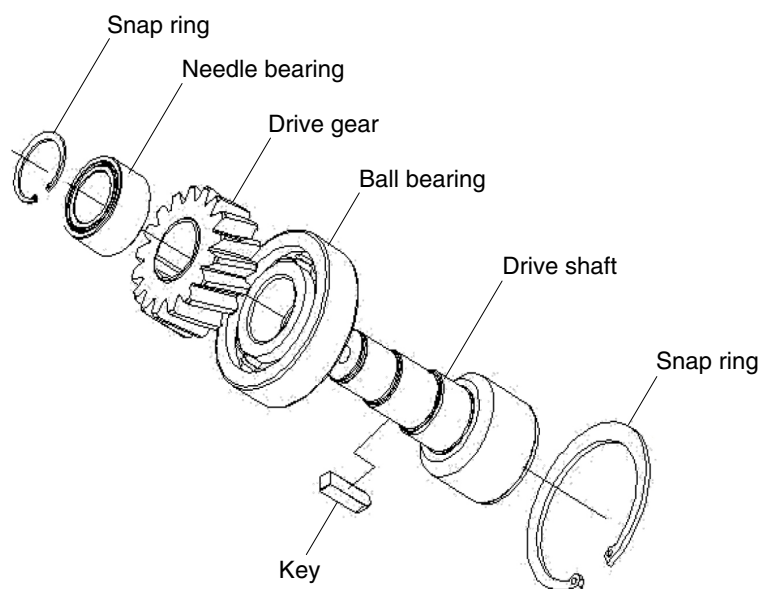
##### (1) The parking lever and pin



DA012A

- ① Remove the spring pin using the pryer.
- ② Remove the parking pin and the O-ring from the housing using the rubber mallet and driver.  
※ Take tare to do not damage for the O-ring of the parking pin.
- ③ Remove the parking lever from the housing.

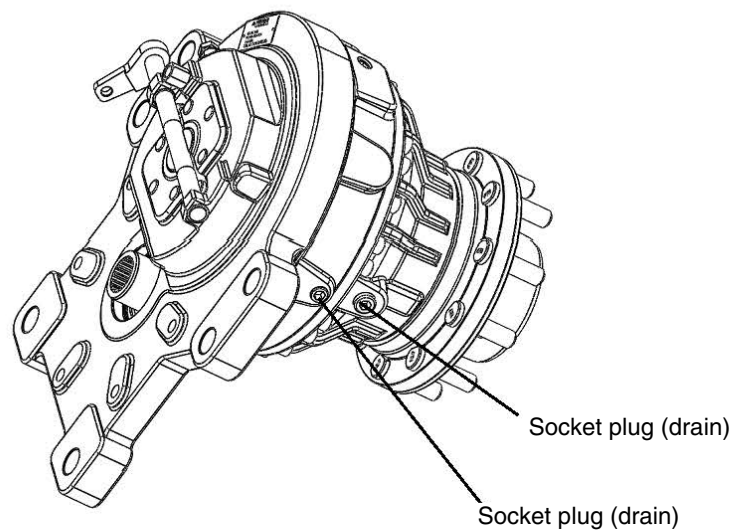
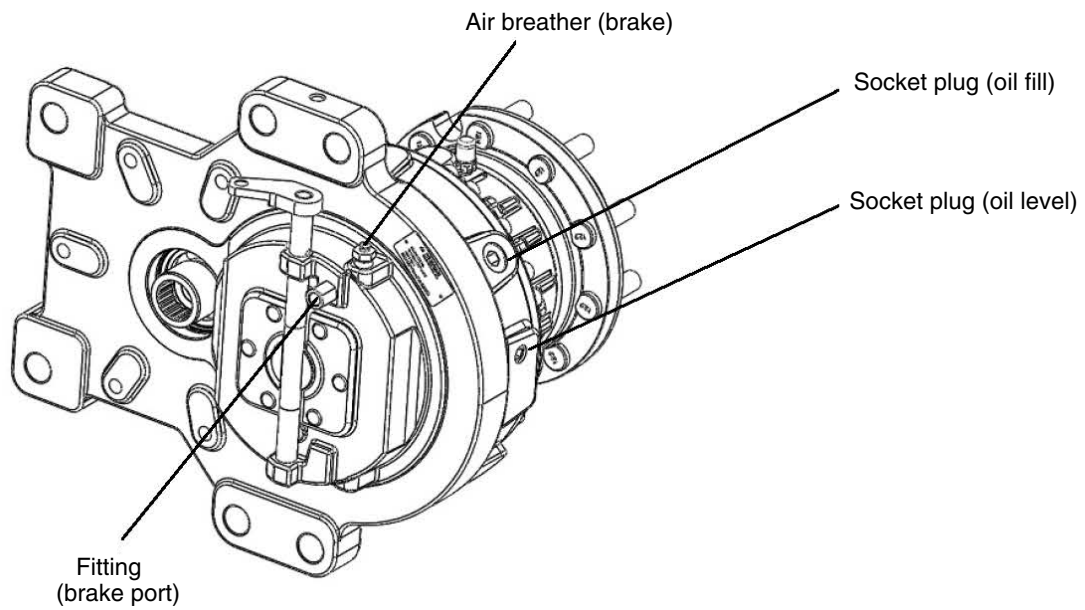
##### (2) The drive shaft assy



DA012B

- ① Remove snap ring from the drive shaft.
- ② Disassemble the drive gear and the key from the drive shaft.
- ③ Disassemble the ball bearing from the drive shaft using the gear puller.  
※ When disassembling the ball bearing, fix the gear to the inner race of the ball bearing.

## 5) DISASSEMBLY OF THE BRAKE FITTING AND PLUG



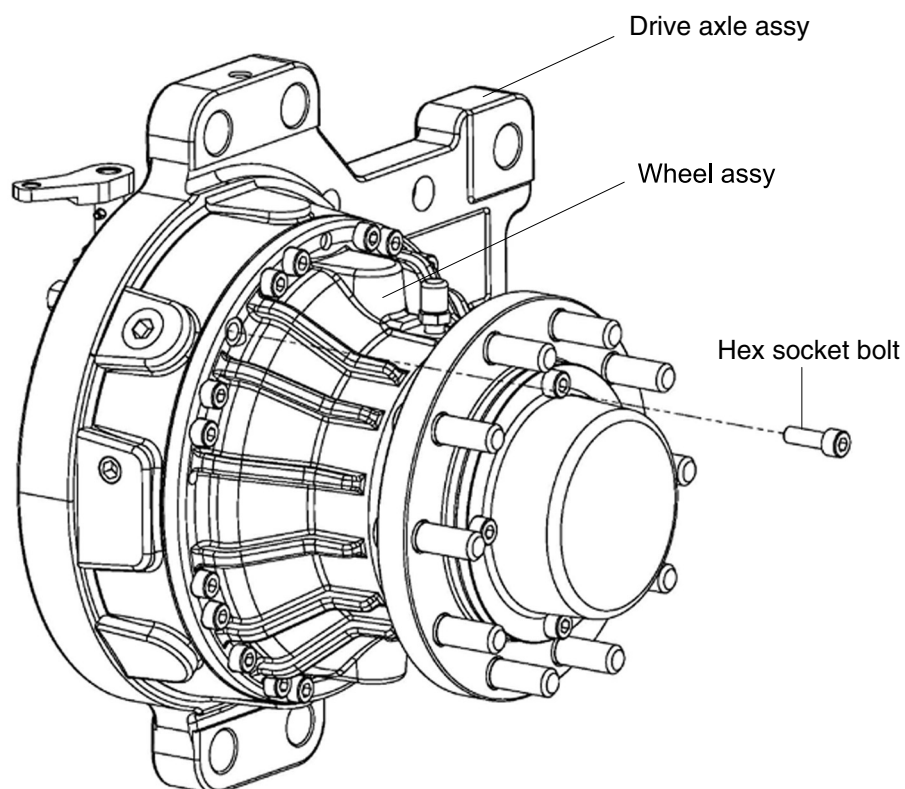
DA013

- (1) Remove the fitting of the brake port and the air breather.
- (2) Remove the socket plug (oil level and filling).
- (3) Remove the socket plug (drain 2EA).

## 2. DISASSEMBLY OF THE WHEEL ASSY

### 1) REMOVE THE WHEEL ASSY

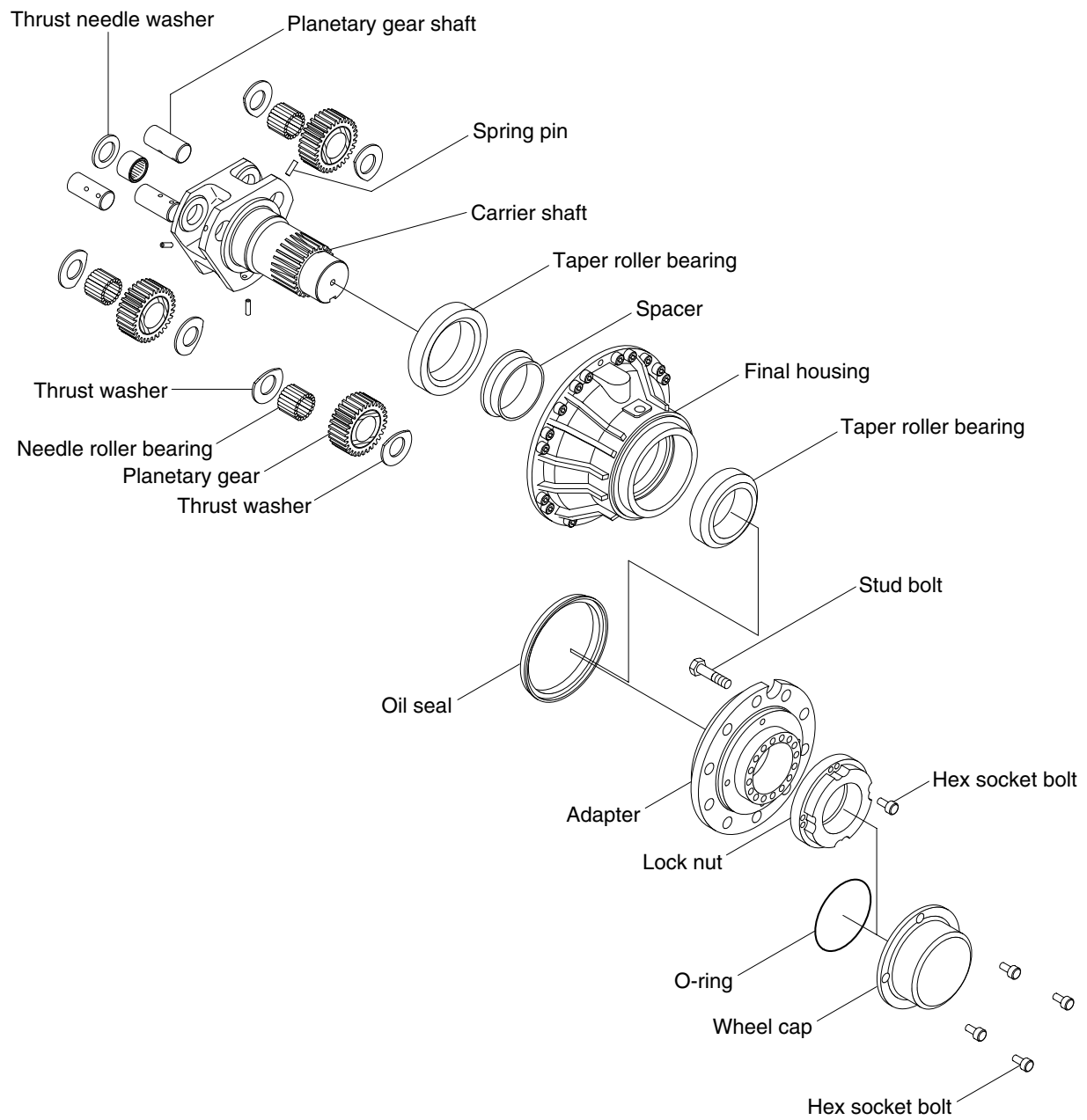
Loosen the hex socket bolts using the special tool and remove the wheel assy from the drive axle assy.



DA014

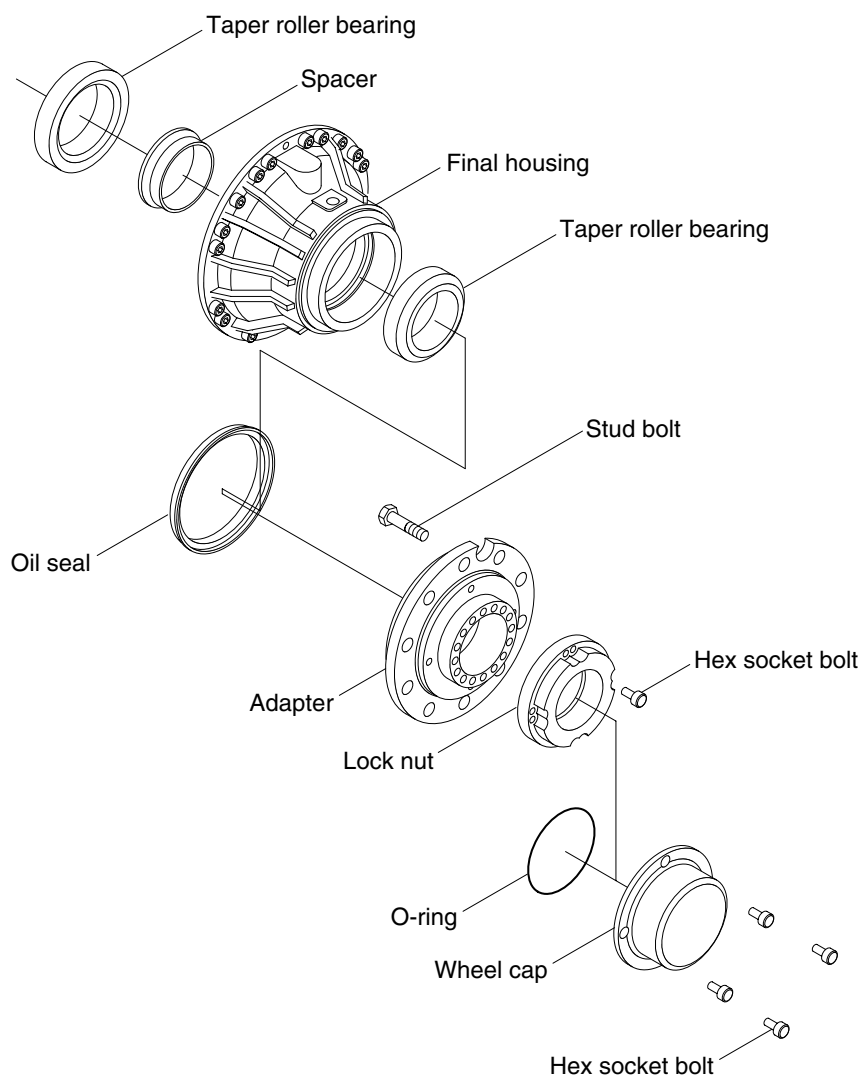
- ※ When disassembling the wheel assy, arrange the all components in regular sequence for disassembling.
- ※ Disassemble according to regular sequence for all components.
- ※ Record using the felt-tip pen if necessary and provide the components to discriminate easily.

## (1) Disassembly of the carrier and the hub bearing



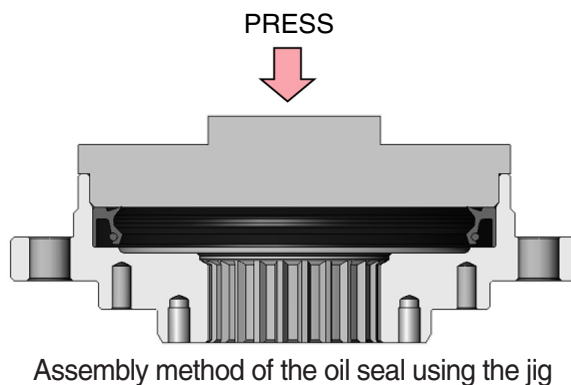
DA015

## (2) Disassembly of the wheel sub assy



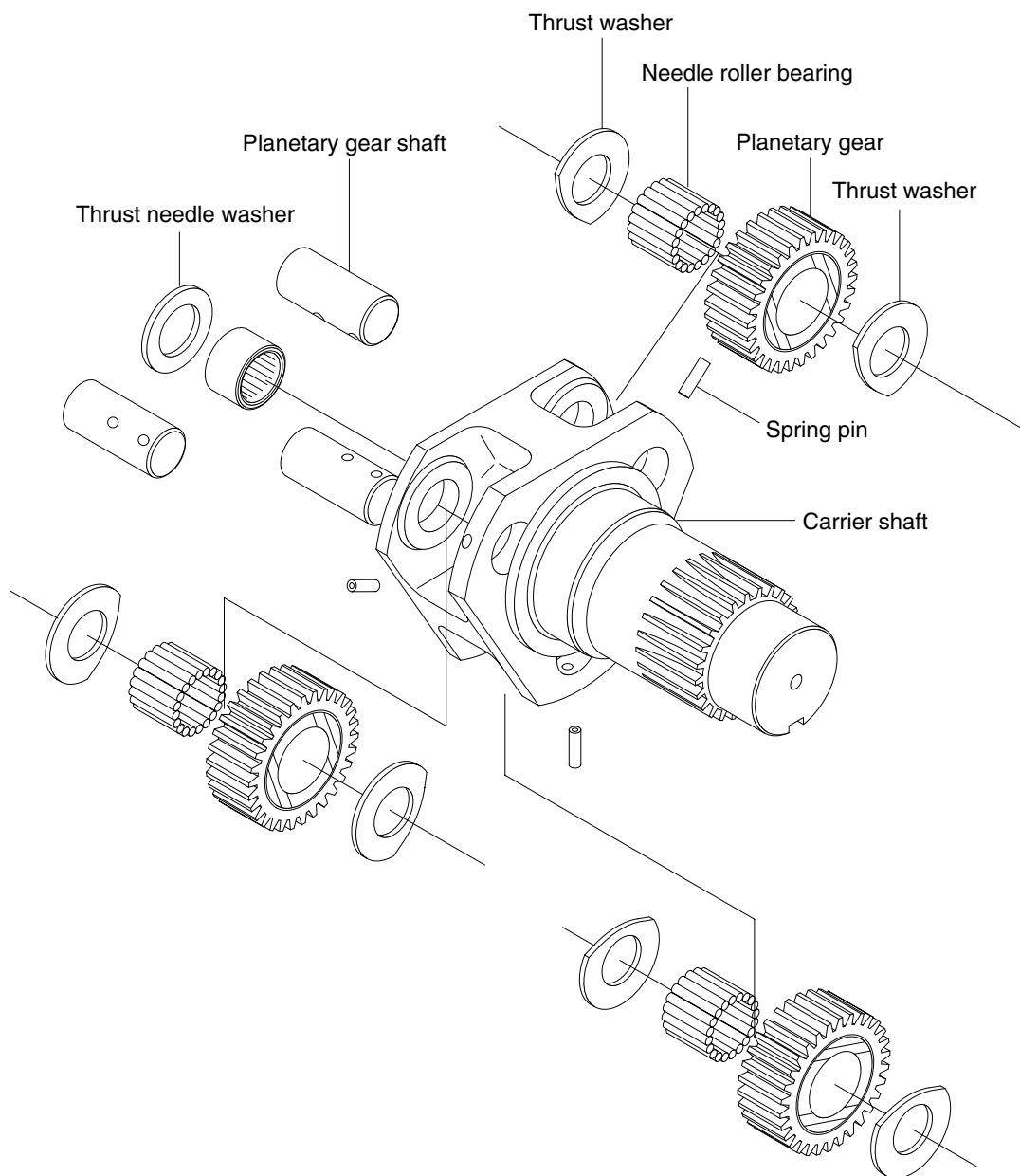
DA016A

- ① Loosen the hex socket bolts (4EA) to fix the wheel cap using the special tool and disassemble the wheel cap from the wheel adapter.
- ② Remove the hex socket bolts to fix the lock nut.
- ③ Disassemble the lock nut to fix the adapter from the carrier shaft.
- ④ Disassemble the wheel adapter from the carrier shaft.
- ※ Take care not to damage the oil seal which is inserted in the wheel adapter.
- ⑤ Disassemble the taper roller bearing after putting on the wheel assy to the press.



DA016B

### (3) Disassembly of the carrier shaft assy



DA017

- ① Set up straightly the carrier shaft assy on the flat place.
- ② Remove the spring pin to fix the planetary gear shaft using pliers or tool.
- ③ Disassemble the planetary gear shaft tapping smoothly using the mallet or tool in two or three times.

– Repeat the disassembly for the planetary gear shaft assys (3EA).

**▲** When reassembling the planetary gear shaft, take care not to lose the spring pins.  
Always make sure that the spring pins are assembled to the planetary gear shaft after assembling.



### 3. ADJUSTMENT

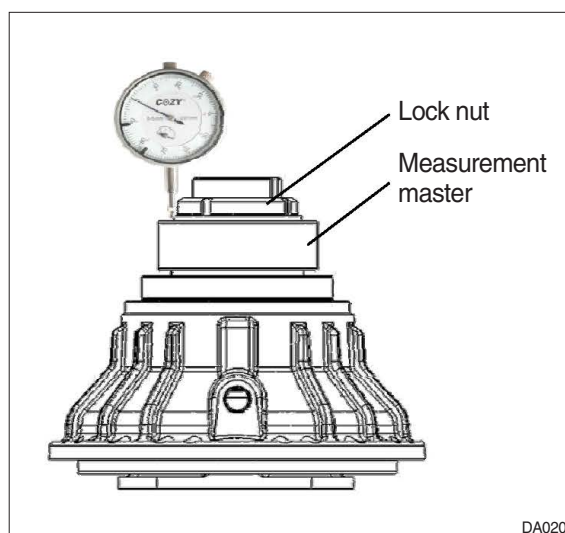
#### 1) PRELOAD AND ADJUSTMENT OF THE HUB TAPER ROLLER BEARING

##### (1) Tools for assemble and disassemble

- ① Adapter for lock nut
- ② Torque wrench : set 20 kgf · m
- ③ Minus (-) driver
- ④ Rubber hammer

##### (2) Measuring the spacer

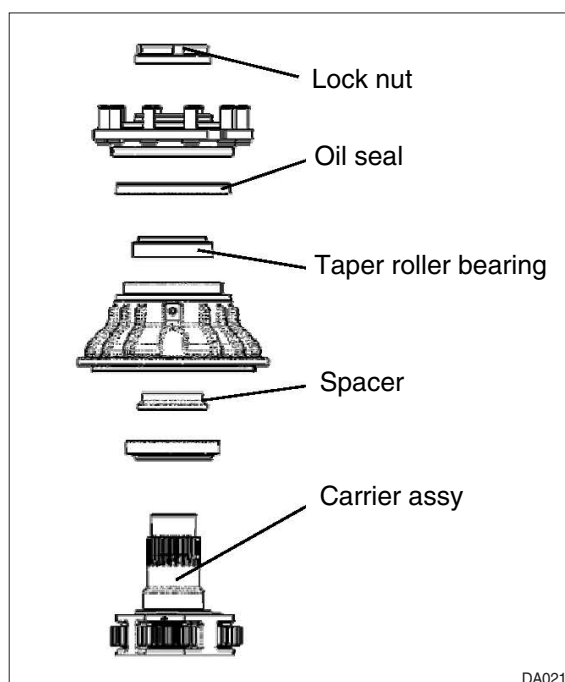
- ① Before the spacer assembling
    - Measure the spacer by using a measurement master.
    - Press in the outer race of the bearing into the housing.
    - First, combine the taper roller bearing into carrier shaft and tighten and set the pre-load adjustment nut to 20 kgf · m and record the reading value of the dial gauge.
  - ② After the spacer assembled.
    - Assemble the spacer which is selected as above method and apply the pre-load.
    - Measure the pre-load on the assembled parts using the dial gauge.
  - ③ Compare the values which are measured by above ① and ②.
    - ① > ② : Add the spacer
    - ① < ② : Reduce the spacer
- ※ Use the correct spacer according to measuring value.



DA020

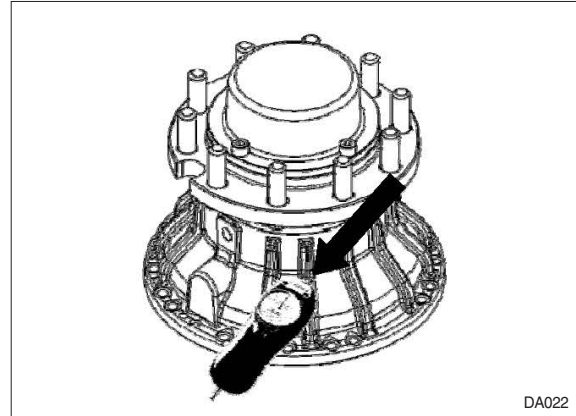
##### (3) Pre-load adjustment order

- ① Put the bearing cup into the final housing and press in by using a assembling jig.
- ② Locate the correct spacer as right figure.
- ③ Locate the taper roller bearing as right figure.
- ④ Press in the bearing by a press and a press in jig.  
Tap a plastic hammer on the bearing and rotate the wheel adapter 2 or 3 times.
- ⑤ Tighten the pre-load adjustment nut and set the torque value.  
(Torque wrench torque setting : 20 kgf·m)
- ⑥ Prevent loosening by tighten the bolt.



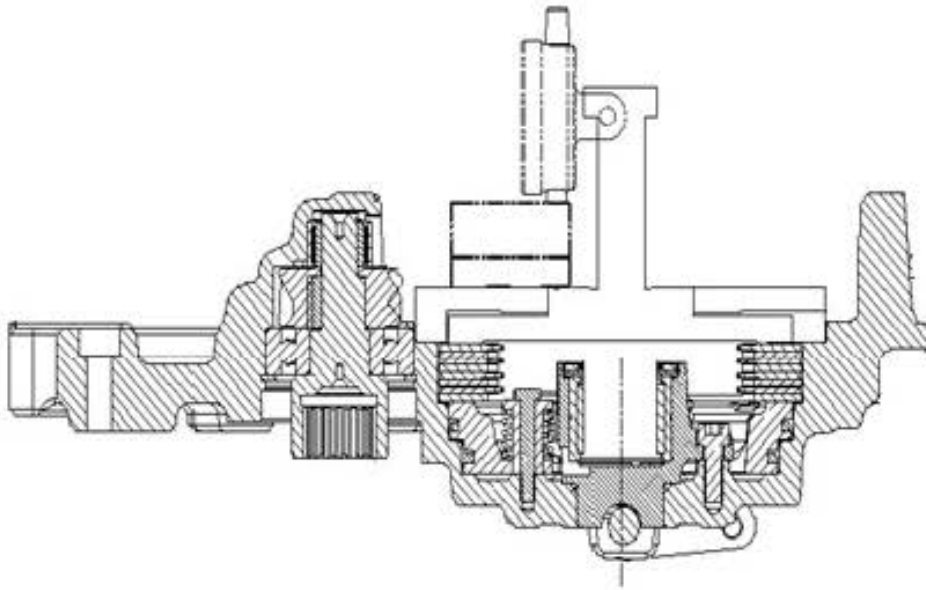
DA021

- ⑦ Measure the pre-load value using a push pull gauge as right figure.
- Torque spec of push pull gauge :  
12~15 kgf·m



DA022

## 2) CLEARANCE ADJUSTMENT OF THE BRAKE DISC



DA023

### (1) Tools for setting

- ① Measurement jig
- ② Dial gauge

### (2) Pre-load adjustment order

- ① Assemble the friction plates and reaction plates into the housing normally.
- ② Install the measuring jig each on the housing surface and brake disc surface until contact correctly.
- ③ Put a dial gauge on the jig.
- ④ Measure the difference of height from jig face to jig face.
- ※ When measuring, apply the pre-load (150 kgf · m) on the brake disc.
- ⑤ If the deviation value of the dial gauge is zero (0), the measured clearance is set correctly as 0.9 mm.
- ⑥ The clearance adjustment according to measuring value is decided by the thickness of the disc plate stopper.  
The setting stroke is decided according to the specifications. (Refer to spec.)
- ⑦ Measured clearance > 0.9 mm : Use a large-thickness stopper
- ⑧ Measured clearance < 0.9 mm : Use a small-thickness stopper

### Measure value and stroke specifications

Measure value	Setting stroke (mm)
-0.15	0.95
-0.10	0.9
-0.05	0.85
0	0.8
0.05	0.75
0.1	0.7
0.15	0.62

Spec : 0.85~0.9 mm

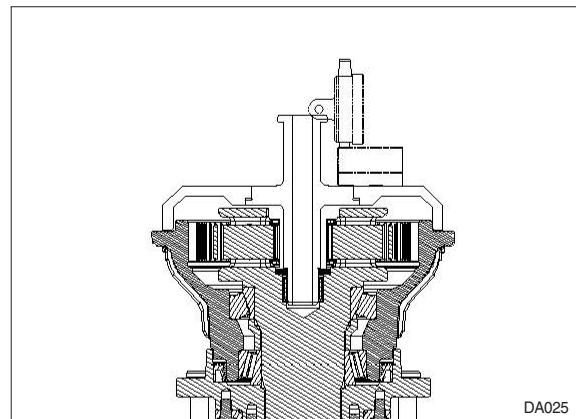
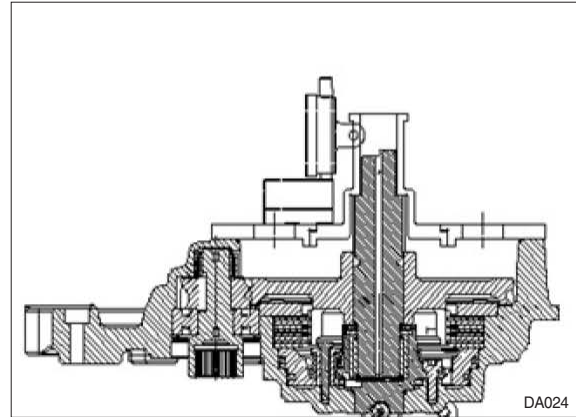
### 3) CLEARANCE ADJUSTMENT OF THRUST NEEDLE BEARING

#### (1) Tools for setting

- ① Measurement jig
- ② Dial gauge

#### (2) Clearance measuring method

- ① Place the assembled drive shaft on a special jig or a flat surface.
- ② Set a measuring jig as right figure.
- ③ Put a dial gauge on the measuring jig and measure the height difference of the measuring jig.
- ④ Record the reading value of the dial gauge.
- ⑤ Place the assembled wheel assy on a special jig or a flat surface.
- ⑥ Set a measuring jig on the wheel assy as right figure.
- ⑦ Record the reading value of the dial gauge.
- ⑧ Calculate the height difference between the drive shaft side and wheel assy side and set the clearance of the axial direction.
- ⑨ Set the specification according to the clearance specification of the thrust needle bearing.
  - Specification : 0.05~0.1 mm



#### (3) The measurement value calculation and shim adjustment

- ① Add the reading values of the wheel assy and drive shaft.
- ② Standard shim thickness (3 mm) - ① = Adjustment shim thickness
- ③ If the add value (①) is zero (0), the setting clearance is 0.1 mm.  
Prepare a correct spacer according to measured value.
- ④ Example : 3 mm, 3.1 mm, 3.2 mm