3. AXLE

1) GENERAL INSTRUCTIONS

(1) SHIMS

All adjustments shall be carried out after all adjustment shims have been selected measuring them one by one with a micrometer gauge and, then, summing up all values measured; don't trust incorrect measurement of pack as a unit or sum of nominal value printed on each shim.

(2) SEALS FOR REVOLVING SHAFTS

Proceed as follows for proper fitting of captioned seals:

① Prior assembly, seals should be kept, for at least half an hour, in a bath with the same oil to be sealed;
② Clean thoroughly shaft and make that working surface be not damaged;
③ Position sealing lip against the fluid to be sealed; in case of hydrodynamic lip lines should be oriented so as that, considering direction of revolving shaft, they lead fluid inside of sealing means;
④ Smear sealing lip with a film of lubricant(oil is better than grease) and fill up with grease the space between sealing lip and dust shield lip, if using double sealing lip type seals;
⑤ Press seal in relevant seat or use a proper fitter with flat contact surface; never use hammer or mallet to mount seal;
⑥ When press fitting seal make sure that it be correctly driven in relevant seat, i.e., perpendicular with respect to its seat, as fitting is completed make sure, if required, that seal itself be in contact with relevant shoulder;
⑦ To prevent damage of seal lip when inserting shaft, duly protect component during assembly.

(3) O-RING SEALS

Lubricate O-RING seals at assembly to prevent twisting that would impair correct sealing.
Clean matching surface as follows prior, smearing compound:

① Remove old deposits using a metal brush;
② Degrease surfaces by one the following cleaners: trichloroethylene, kerosene or a warm water and soda solution.

(4) BEARINGS

When assembling them it is advisable to proceed as follows:

① Heat them with 80 to 90°C before fitting on relevant shafts;
② Cool them before inserting in relevant external seats.

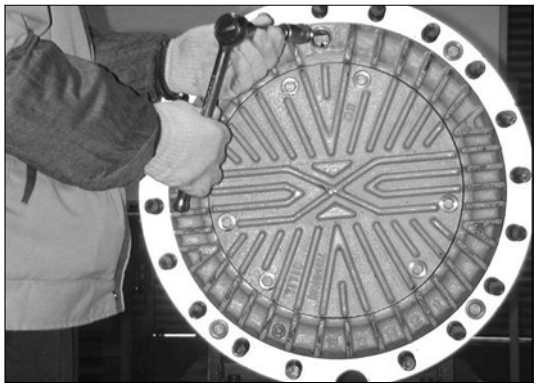
(5) SPRING PINS

When using split pins be sure that lengthwise cleft be positioned toward stress on pin.
Coil pins don't require specific position.

2) REDUCTION ASSEMBLY

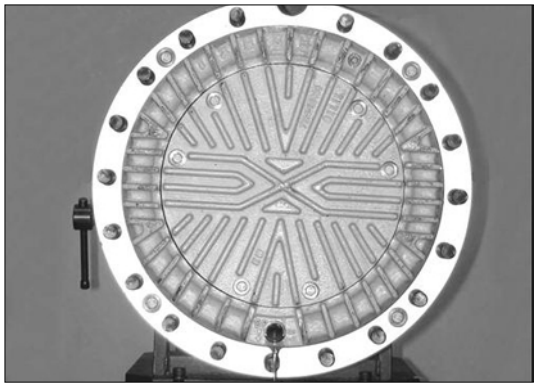
(1) DISASSEMBLY

① Turn the plug toward top position and remove the plug for the air vent.
Assemble the plug temporary.



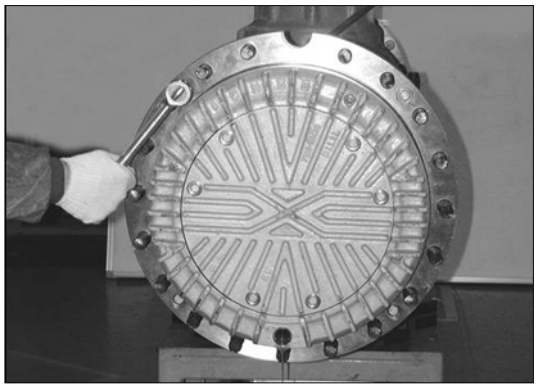
AX001

② Drain oil from final drive unit.



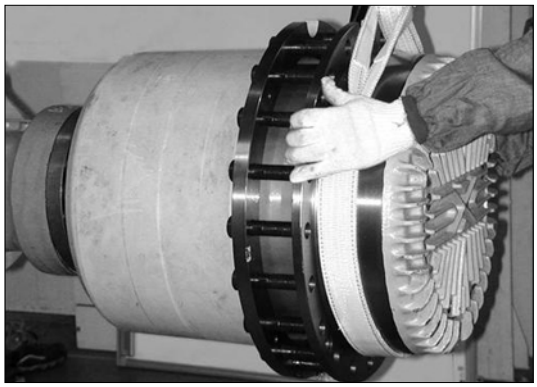
AX002

③ Loosen screws securing side gear carrier to wheel hub.



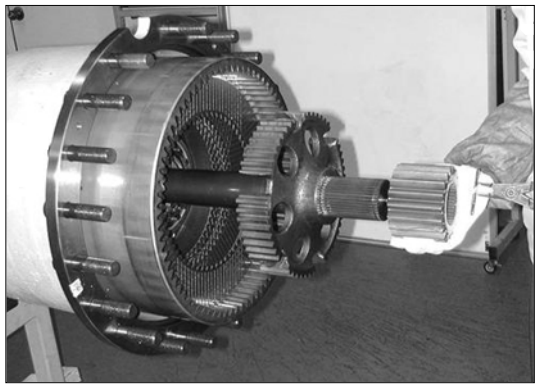
AX003

④ Pull out complete side gear carrier.



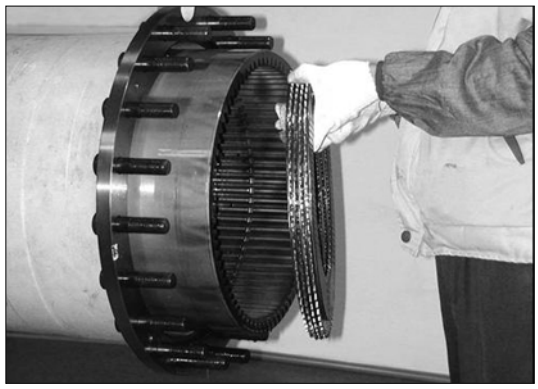
AX004

⑤ Pull out wheel shaft with sun gear, discs carrier hub and thrust plate.



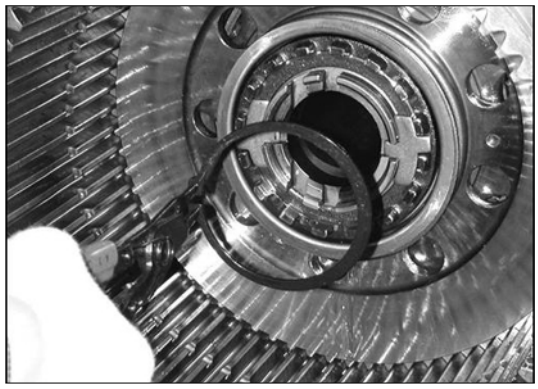
AX005

⑥ Remove brake disc pack.



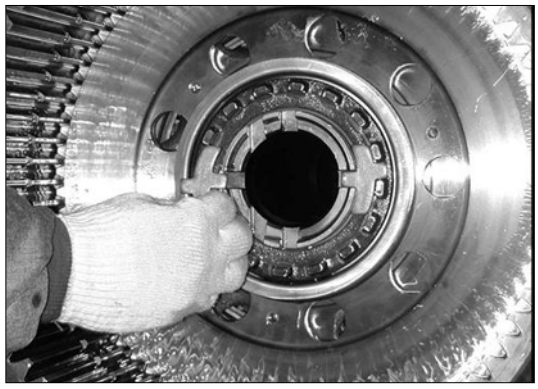
AX006

⑦ Remove lock ring nut locks.



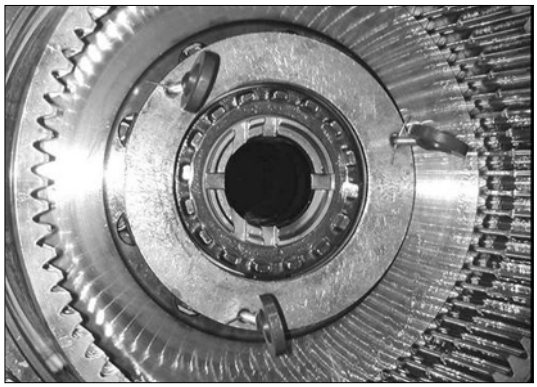
AX007

⑧ Remove locks.



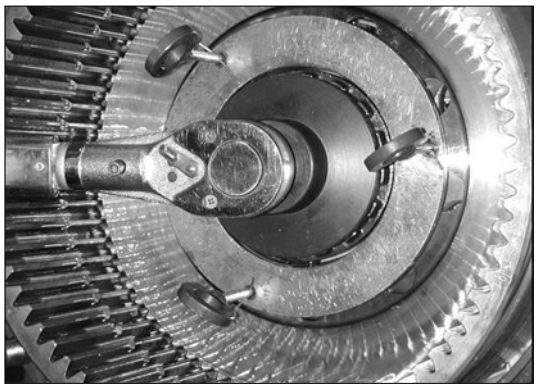
AX008

⑨ Install the proper tool on pressure plate and apply the eye bolt(3EA) temporary.
Tighten the eye bolt tool perfectly.



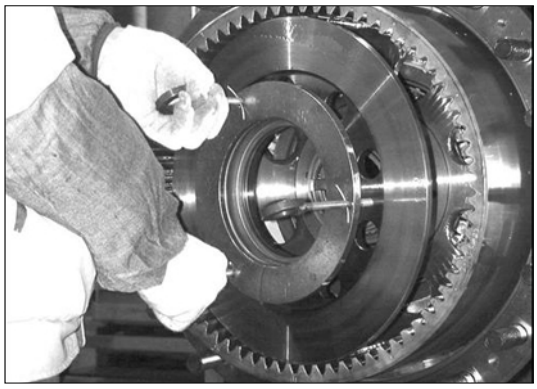
AX009

⑩ Remove the nut-adjusting by the use of the special tool.



AX0010

⑪ Remove the pressure plate, spring, cover.



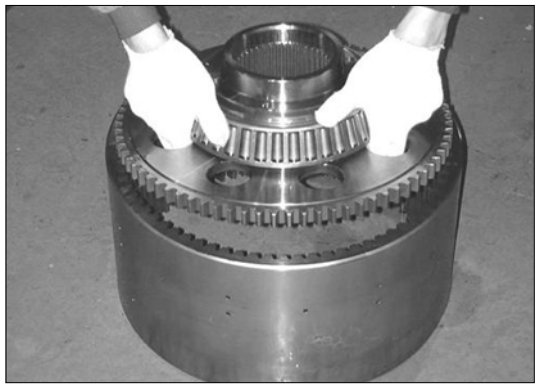
AX0011

⑫ Remove the ring gear assembly.

※ Attention to the weight.

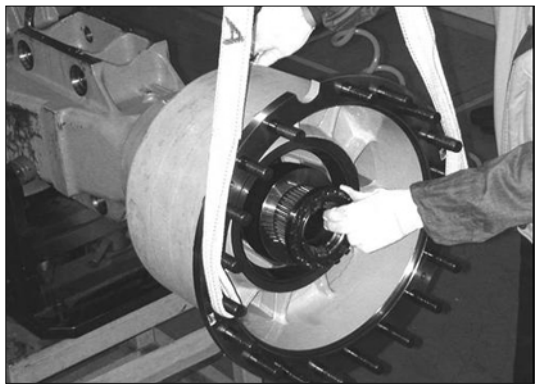
AX0012

⑬ Pry off lock ring from ring from ring gear by a screw driver, and remove ring gear support.



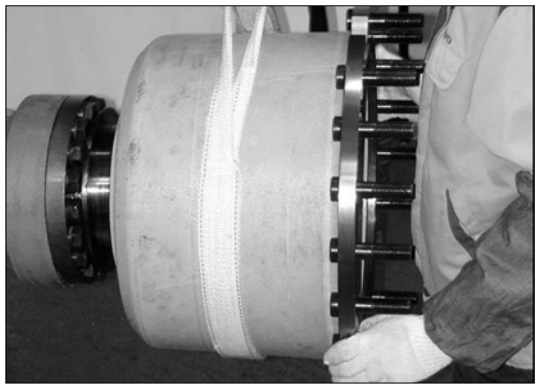
AX0013

⑭ Remove piston, it's easier by blowing compressed air in brake oil delivery ducting.



AX0014

⑮ Remove wheel hub assembly.



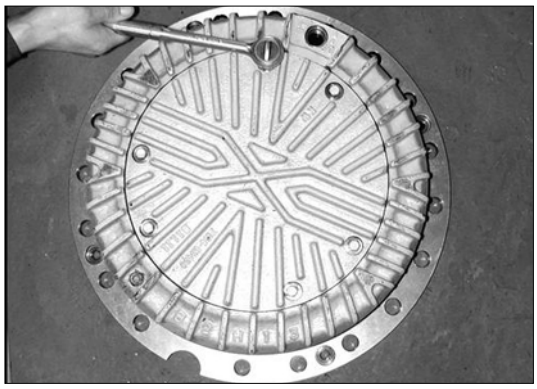
AX0015

⑯ Pry off wheel hub seal and remove inner race with roller cage of wheel inside bearing. By using a punch remove from wheel hub outer races of inner and outer bearings.

AX0016

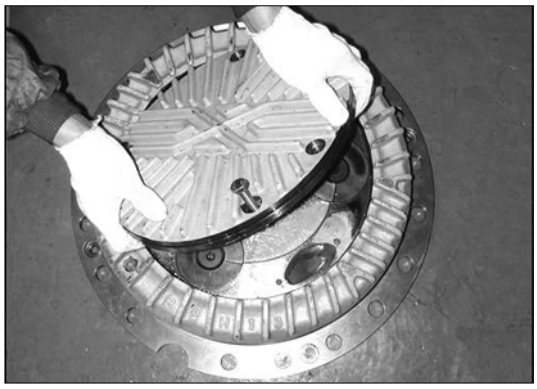
AX0017

13. Remove final drive cover.



AX0018

14. It is provided with three threaded holes (M10×1.5) to be used for puller screws.



AX0019

15. Remove the pin-planetary(3EA) from Drum-Hub(Side gear carrier support) assembly.

AX0020

16. Remove the planetary gear and thrust washer step by step.

AX0021

(2) ASSEMBLY

① Insert the inner bearing cone.

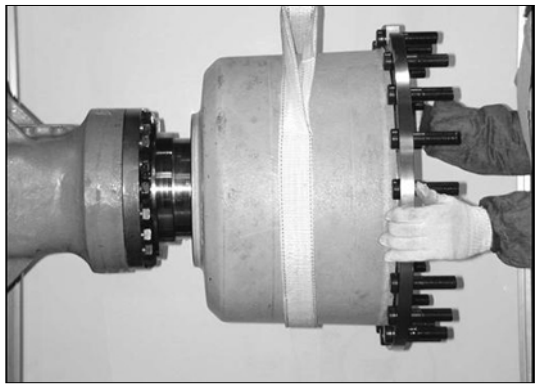
AX085

② Press fitting lip seal.

※ Smear loctite 573 or equivalent sealant on outer diameter surface.

AX086

③ Support suitably wheel hub while assembling parts to prevent damage of seal; then go on by fitting wheel bearing on hub spindle.



AX087

④ Replace O-ring seals on piston.

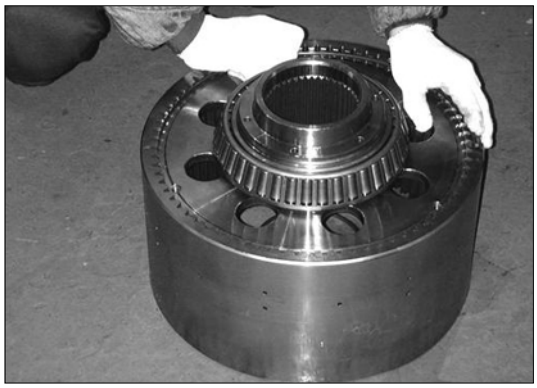
※ Cover the oil on O-ring seal enough.

AX088

⑤ Insert piston full travel down on hub spindle.

AX089

⑥ Insert ring gear support in ring gear, then fit spring ring retaining axle.

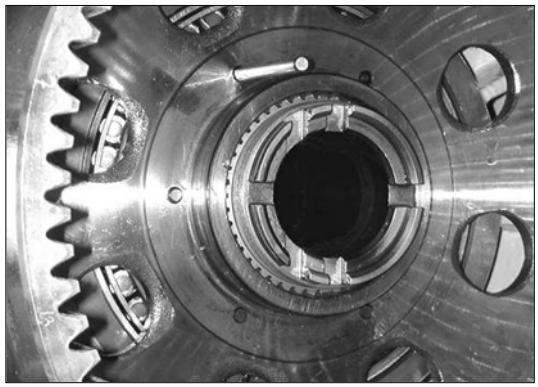


AX090

⑦ Mount on hub spindle the complete ring gear unit.

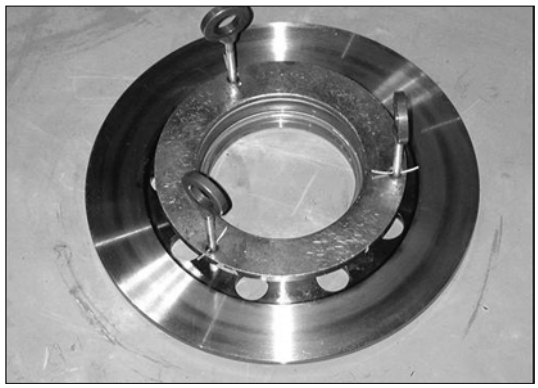
AX091

⑧ Insert into relevant holes the six pins that, for proper operation of whole system, have to be of the same length and however in accordance with relevant drawing.



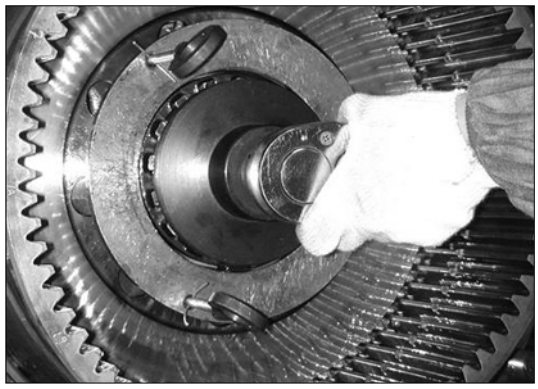
AX092

⑨ Position spring return cover on pressure plate, press compression tool.
(Front axle only)



AX093

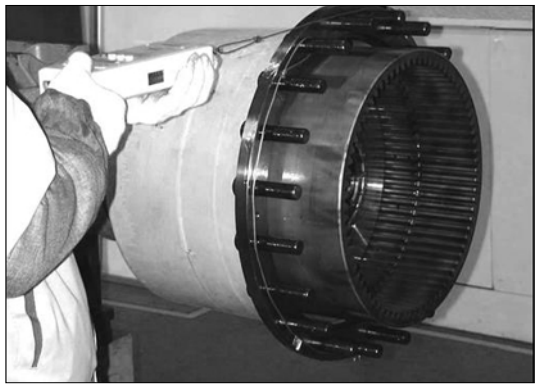
⑩ Assemble support assembly with spring compression tool on spindle and tighten nut-adjusting.



AX094

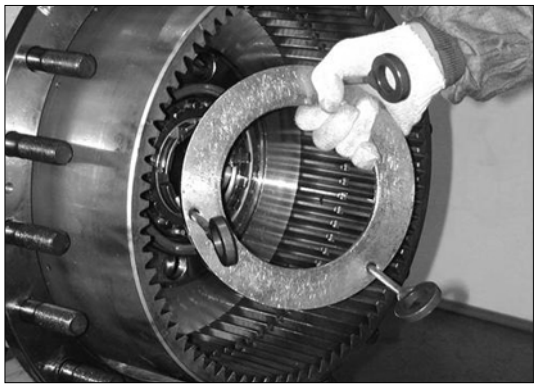
⑪ With proper wrench lock ring so to reach the specified wheel bearing pre-load corresponding to a rotation torque and a rope pull strength on studs included into 15~18kg.

To prevent wrong torque recording, it is advisable to set bearings, by various wheel revolutions, prior performing the check.



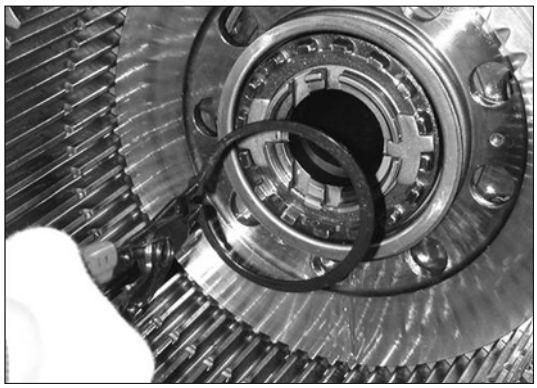
AX095

⑫ Remove spring compression tool.



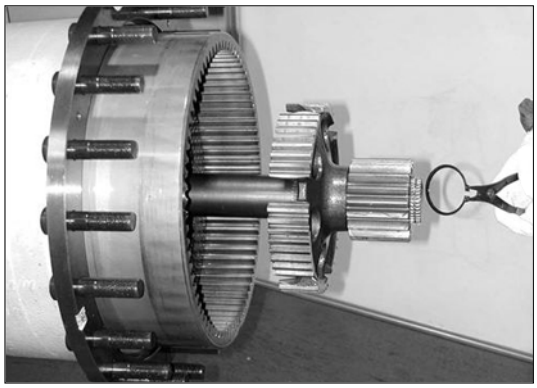
AX096

⑬ Fit plate and assemble ring-retain.

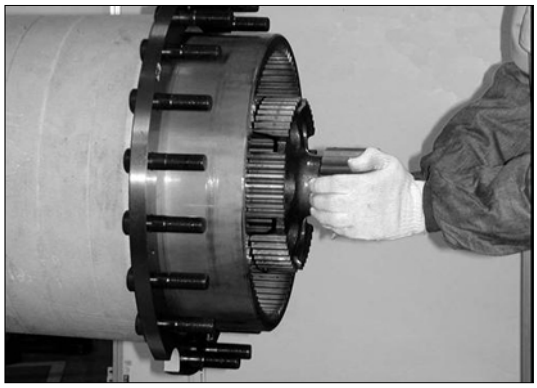


AX097

⑭ Insert wheel shaft on which sequentially mount ; the thrust washer, discs carrier hub, sun gear and lock ring ; then push all components fully down against hub spindle.



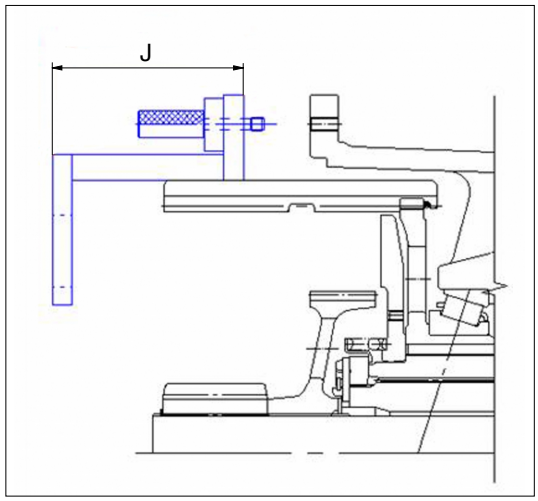
AX098



AX099

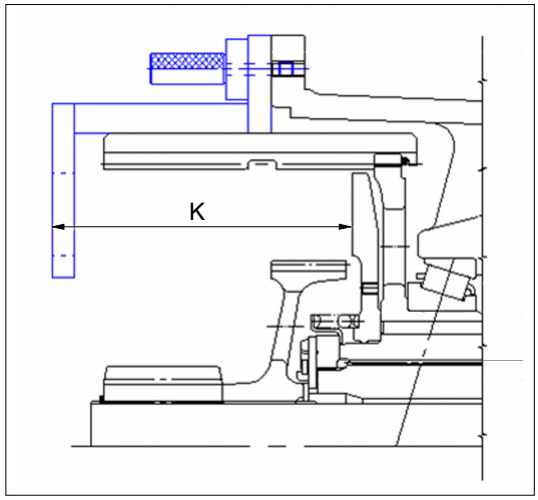
⑮ Install brake measuring tool on hub-wheel.

※ Distance of brake measuring tool **J**



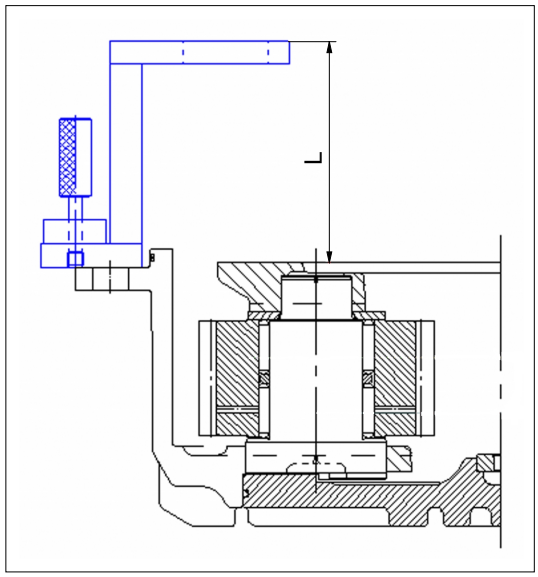
AX100

⑯ Measure **K** between end of measuring tool and pressure plate.



AX101

13. Install brake measuring tool on drum hub and measure **L**.

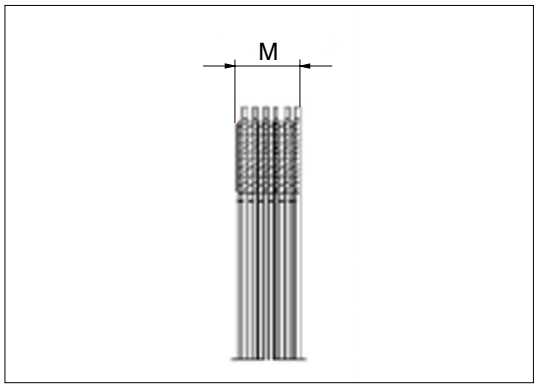


AX102

14. To determine thickness of disc pack from previsously computed value **M**.

※ Assembly procedure of brake disc pack :
To drum hub from pressure plate **C, B, C, B.....C, B**.(C=disc-count, B=disc-brake)

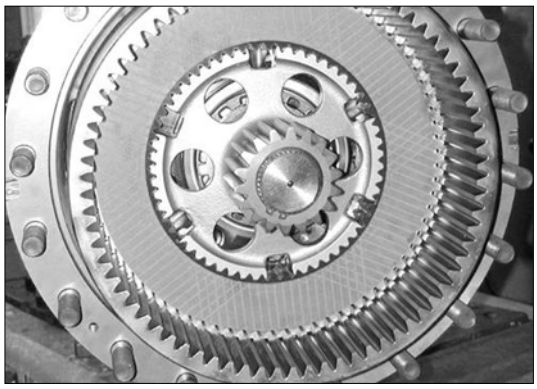
※ Quantity of brake disc.
· Front axle : disc-count 6EA
disc-brake 6EA
· Rear axle : disc-count 5EA
disc-brake 5EA



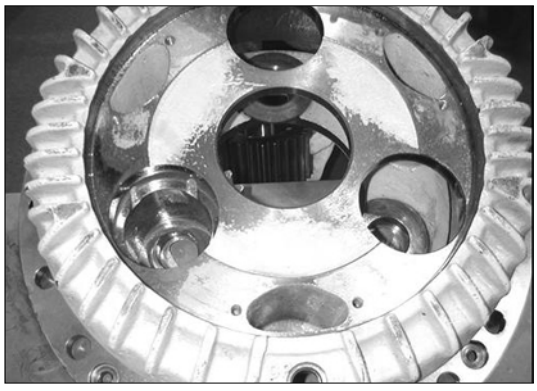
AX103

15. Calculate stroke, and if it is not satisfied with the specification, readjust stroke by means of change the thickness of each disc.
Stroke : S=(K+L-2J)-M
· Stroke
Front axle : 4.2~4.8mm
Rear axle : 3.5~4.0mm

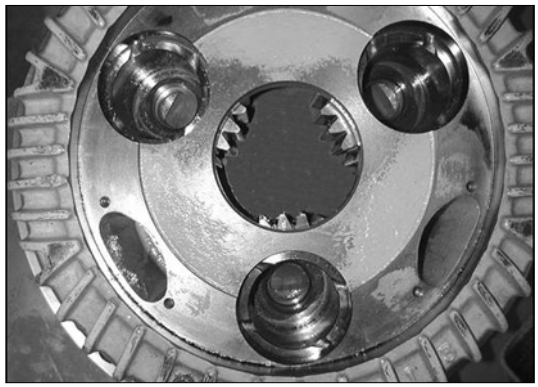
16. Assemble disc pack according to the procedure.


AX104

) Arrange side gear carrier on blocks made of wood and remove pins.
Save needle rollers of filling bearing casings.
It is important to keep needle rollers joined with relevant pin for allowance question of pins themselves.


AX105

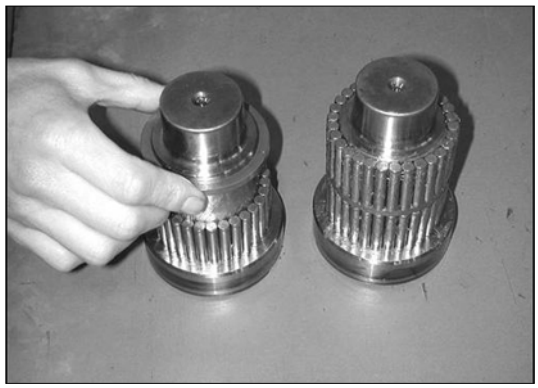
) Arrange all the three side gears into relevant seats of side gear carrier, position inner thrust washers and align holes.



AX106

) Mount on pins the two needle roller casings. Insert outer thrust washers, grease lower half of pin(head side) and position the first needle roller casing, insert spacer and position the second casing.

※ In case of needle roller replacement, use needle roller of the same selection class for the two casings of each side gear.

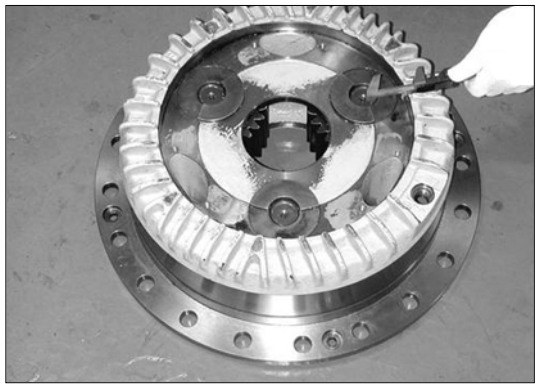


AX107

) Insert the complete pins, taking care to avoid any bump, cause of needle rollers fall.

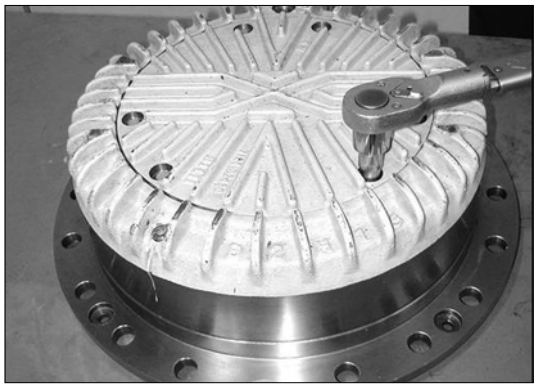
AX108

) Rotate pins so to align them and allow fitting of cover that also prevent pin rotation.



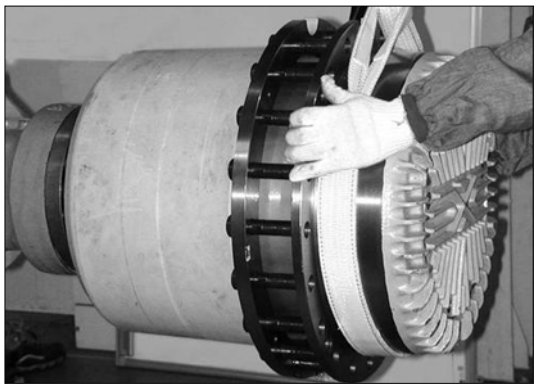
AX109

) Fit O-ring seal on outer side.
Mount side cover on final drive.
· Tightening torque
Front and rear axle : 2.9~3.6kgf · m
(21.0~26.0lbf · ft)



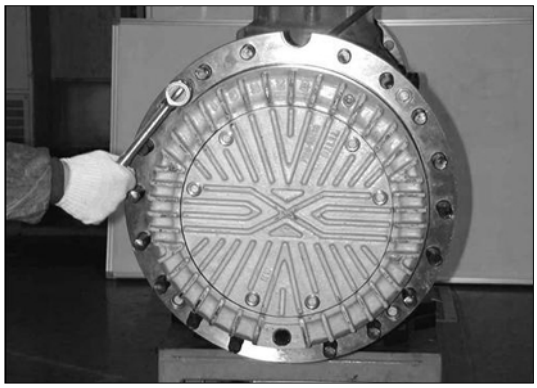
AX110

) Assemble drum-hub on hub-wheel.



AX111

) Tight the fixed bolt of drum-hub and assemble plug.
· Tightening torque
Front and rear axle : 6.3~6.9kgf · m
(45.6~50.0lbf · ft)

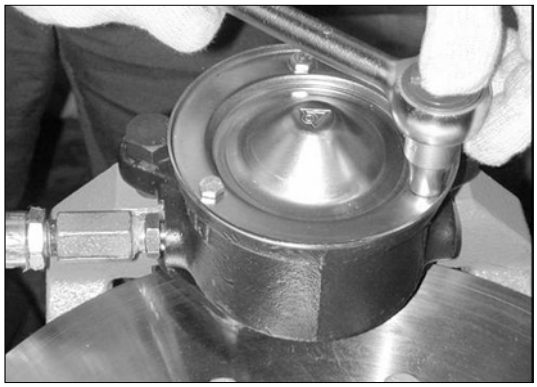


AX112

3) PARKING BRAKE(FRONT AXLE ONLY)

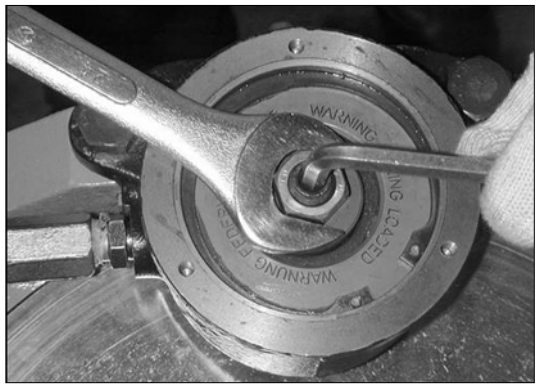
(1) DISASSEMBLY

① Insert through oil adding hole of gripper the pressure of 100~120bar, in order to obtain calipers release.
Remove the cover bolts of caliper.



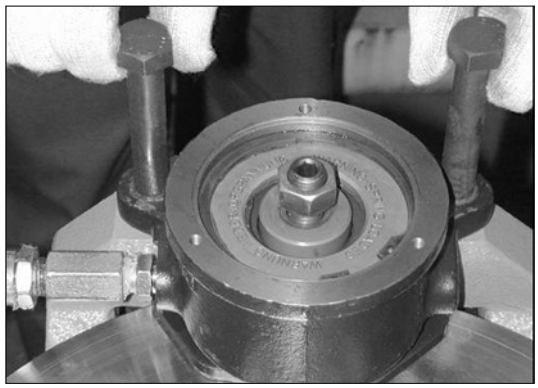
AX022

② Release nut and screw.



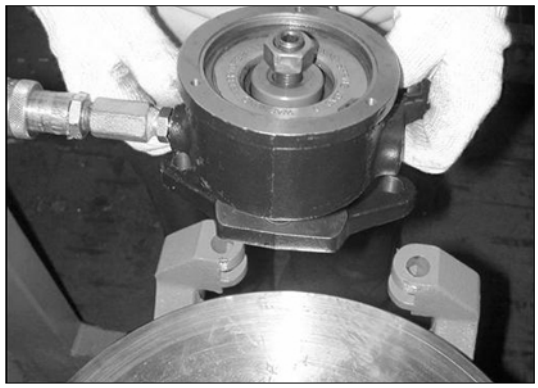
AX023

③ Remove the split pin and nut of caliper brake. Remove the bolts.



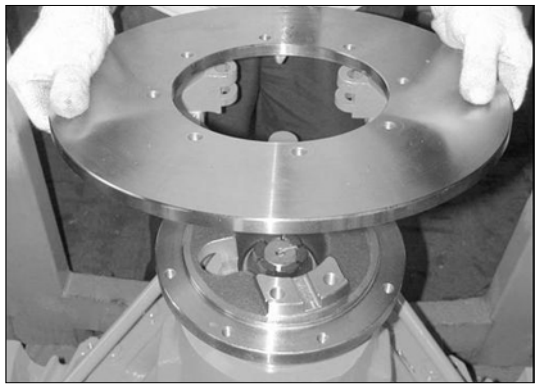
AX024

④ Remove the caliper brake.



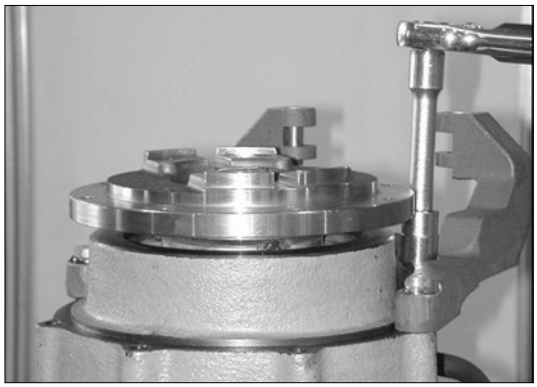
AX025

⑤ Remove the disc.



AX026

⑥ Remove the fixed bolts of bracket-caliper.

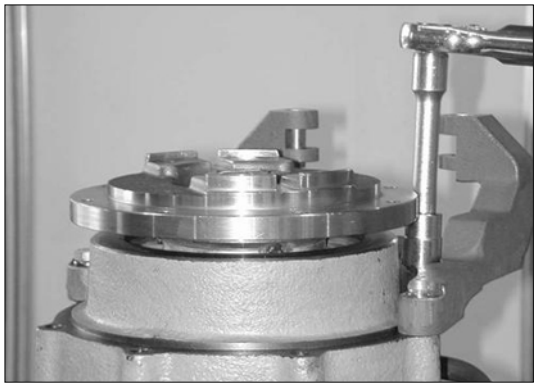


AX027

(2) ASSEMBLY

① Install bracket-caliper.

· Tightening trque
11.4~12.6kgf · m(82.5~91.1lbf · ft)



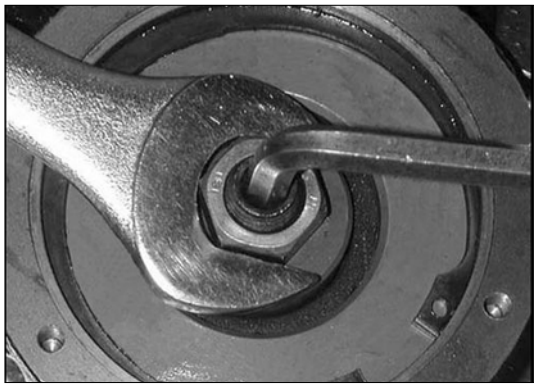
AX113

② Fit disc on flange, and tighten bolts.

· Tightening trque
6~7kgf · m(43.4~50.6lbf · ft)

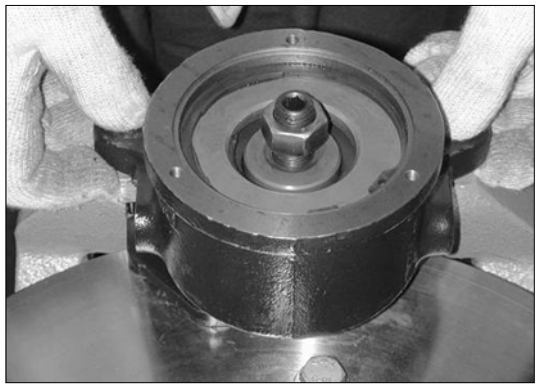
AX114

③ Remove cover and O-ring of caliper, and release nut and pin screw.



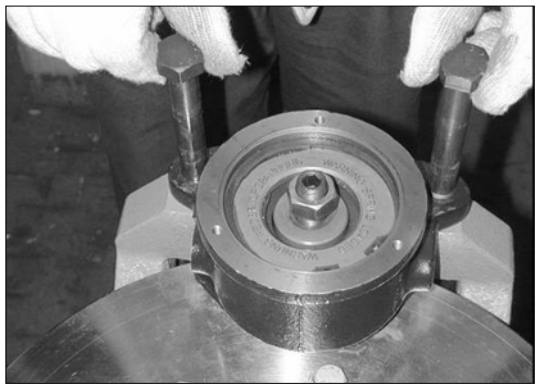
AX115

④ Release nuts on fixed bolts in order to obtain the maximum opening of gripper.



AX116

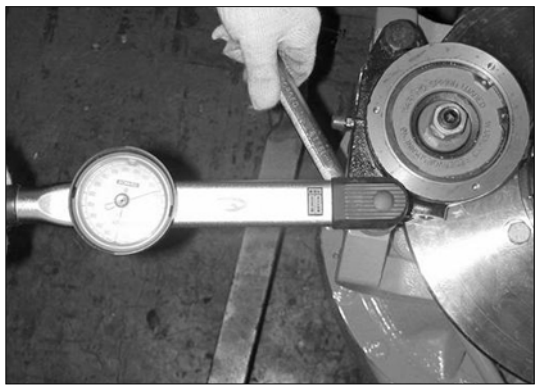
⑤ Insert fixed bolts on caliper.



AX117

⑥ Tighten nuts and split pins.

· Tightening trque
1~3kgf · m(7.2~21.7lbf · ft)



AX118

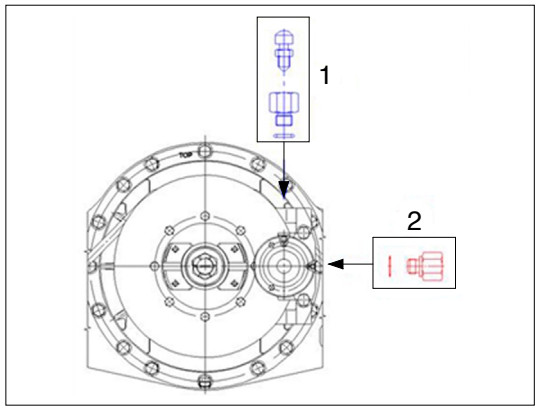
⑦ Assemble the fixed parts on caliper-brake.

· Procedure1 : Insert O-ring in adapter bleeder and assemble it, assemble bleeder on adapter.

※ Adapeter tightening torque : 1.2~1.6Kgf · m (8.7~11.6lbf · ft)
Bleeder tightening torque : 1.4~1.5Kgf · m (10.1~10.8lbf · ft)

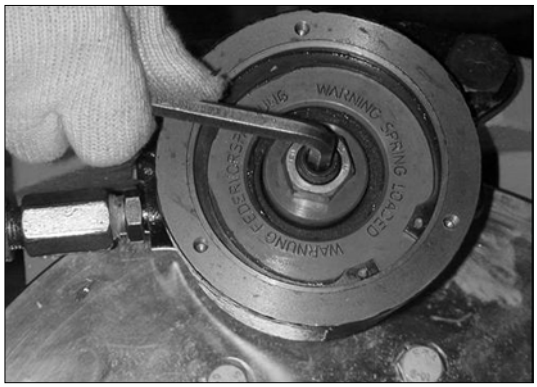
· Procedure2 : Fix copper washer and connector on caliper, and assemble it.

※ Connector tightening torque : 2.0~2.2Kgf · m (14.5~15.9lbf · ft)



AX119

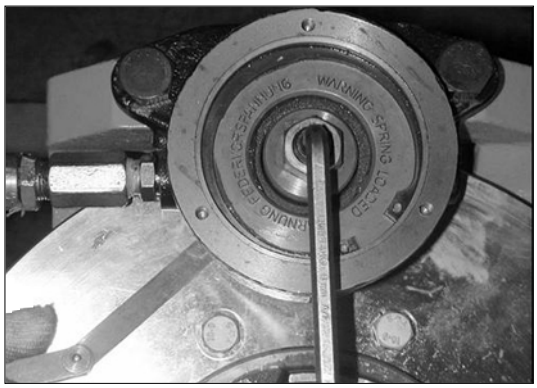
⑧ Press 110~120bar in brake port and close adhesion pad on disc by means of tightening pin-screw.



AX120

⑨ Check the gap between discs after unscrewing pin screw 1/8~1/4turn.

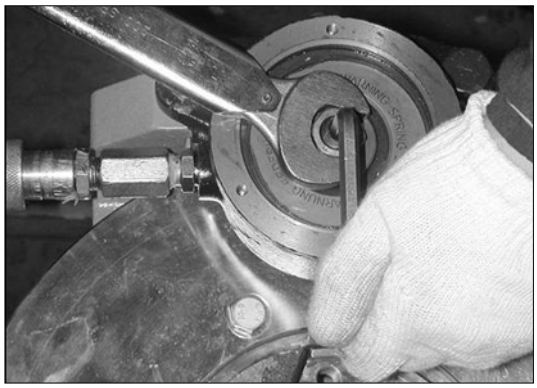
※ Disc gap : Each 0.125~0.25mm



AX121

⑩ Tighten nut.

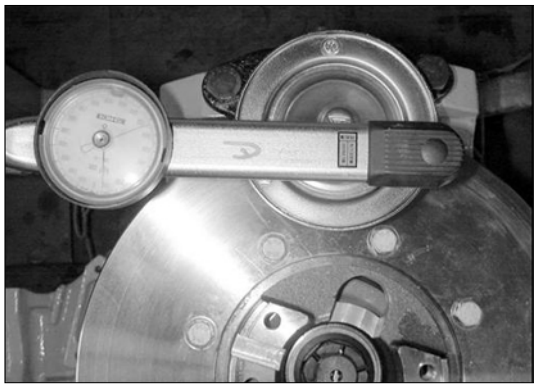
· Tightening torque : 14~16Kgf · m
(101~116lbf · ft)



AX122

⑪ Tighten bolts after assembling O-ring on cover.

· Tightening torque : 1.3~1.5Kgf · m
(9.4~10.8lbf · ft)



AX123

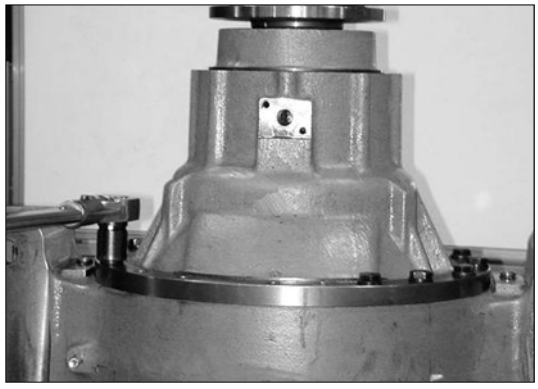
4) DIFFERENTIAL ASSEMBLY

(1) REMOVAL

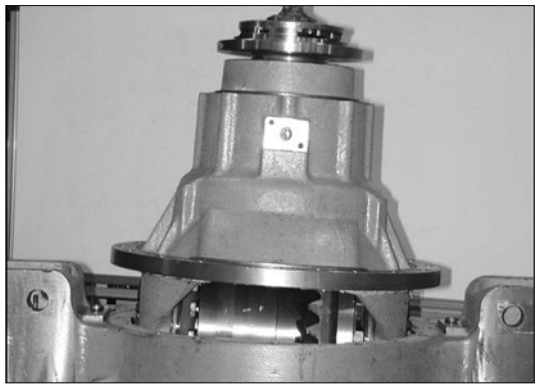
① Remove screws and take away air recirculation duct from differential support and axle case.

AX0228

② Unlock and loosen screws retaining differential group, then remove it from axle case.



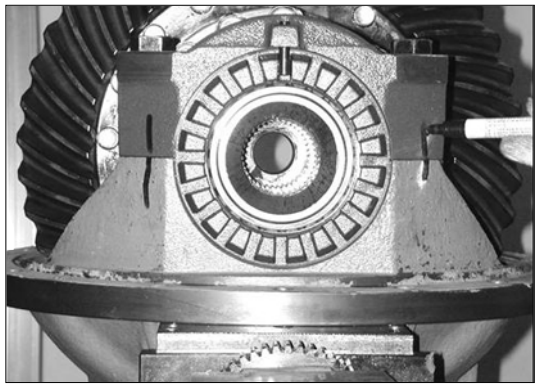
AX029



AX030

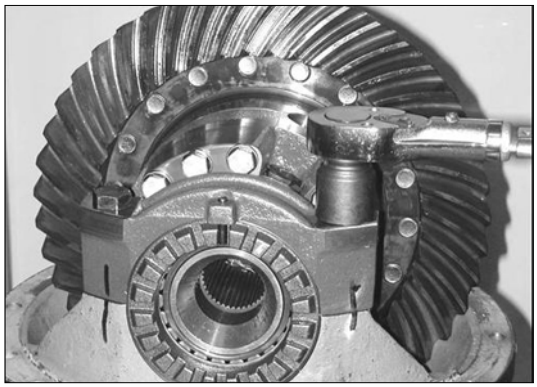
(2) DISASSEMBLY

① Place differential unit upside down; mark caps position.



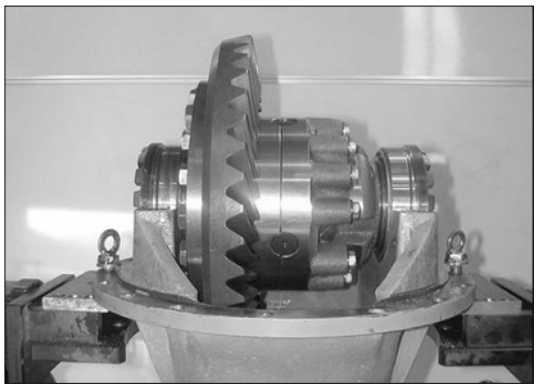
AX031

② Unlock and remove caps fixing screws.



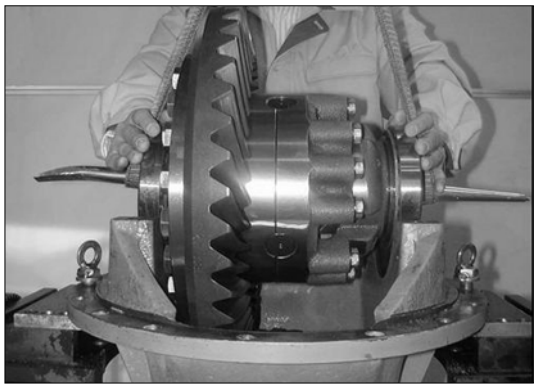
AX032

③ Remove lock pin of ring nut, remove caps.



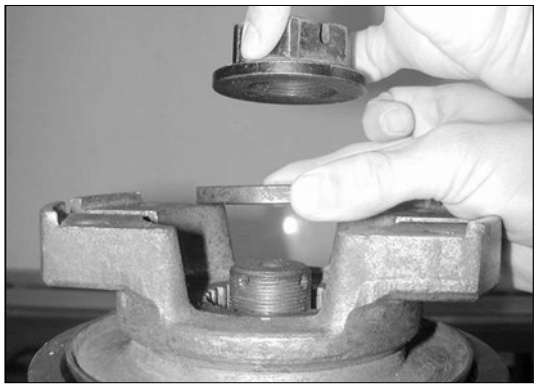
AX033

④ Lift up differential from support, by a lifting tool with proper capacity.

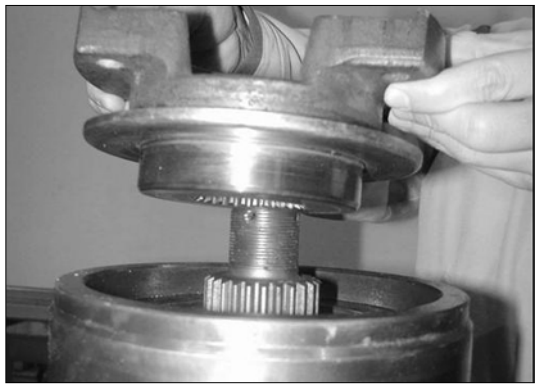


AX034

⑤ Place on proper support and lock the differential. Straighten notches on pinion nut, then position reaction tool on P.T.O. flange and unlock nut; release pinion nut. Remove drive flange from pinion shank.



AX035



AX036

⑥ Pry off seal from P.T.O. flange.

AX037

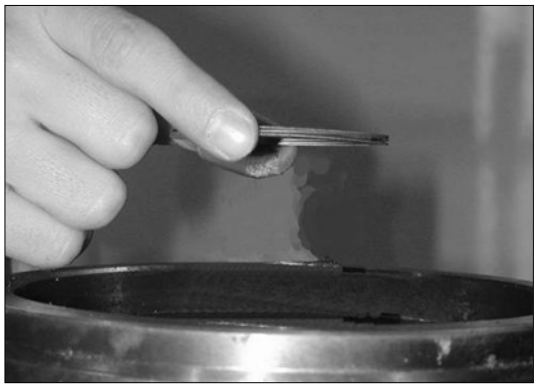
⑦ Drive out bevel pinion from differential support hammering by a proper remover on shank, don't damage thread.

AX038

⑧ Remove the bearing cone.

AX039

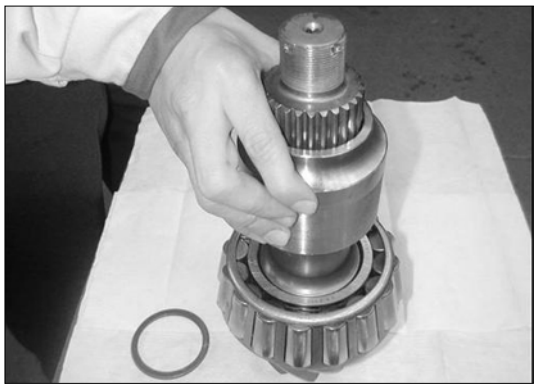
⑨ Remove the shims from P.T.O flange.



AX040

※ The conditions of assembled only bearing cone in pinion gear.

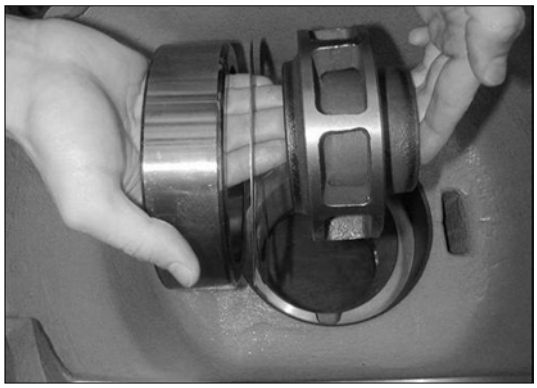
⑩ Remove the shim and spacer in removed pinion.



AX041

⑪ Remove outer races of pinion shank and under head bearings; save shims for axial position of pinion and ail recirculation impeller.

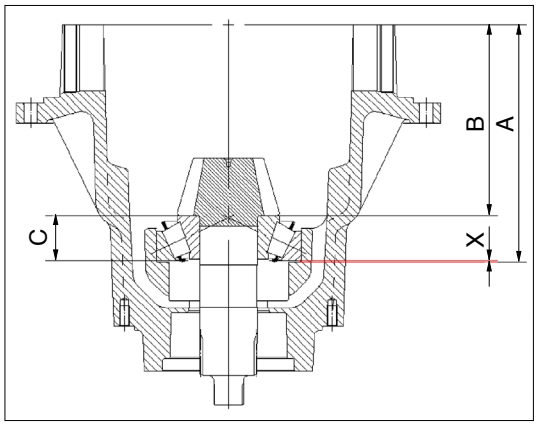
※ Press on impeller to drive out outer race of under head bearing.



AX042

(3) ASSEMBLY

① Measure the dimensions for assembly position of pinion bevel.
Decide the dimension X(shim thickness) by the calculation.



AX043

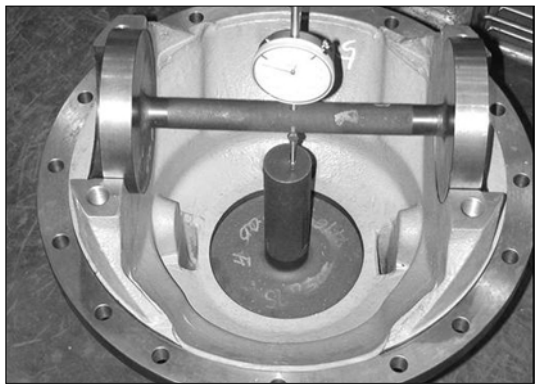
② Both the pinion-bevel and the gear-bevel are marked with a number. Confirmed the some numbers both the pinion-bevel and gear-bevel.

※ Number location of bevel set
Bevel pinion : Head surface
Bevel ring : Outer cutting side

AX044

③ Measure the carrier height **A** by the special tool.

※ Standard value of **A**
· Front axle : 287.5㎜
· Rear axle : 263.0㎜



AX045

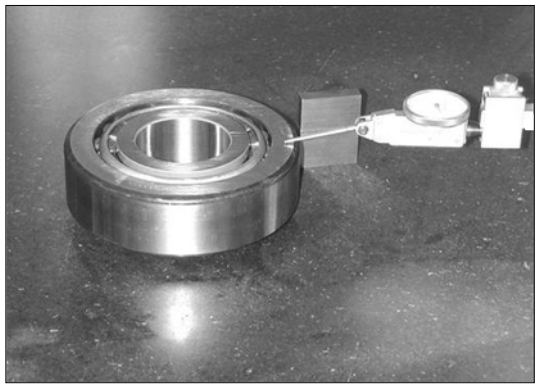
④ Decide a value **B** by the carved value of pinion-bevel head.
· Front axle : B = 231.7±carved value
· Rear axle : B = 208.0±carved value

※ In case, the carved value is -10, **B** of
Front axle =231.7 - 0.1 = 231.6㎜

AX046

⑤ Measure the width of bearing **C**.

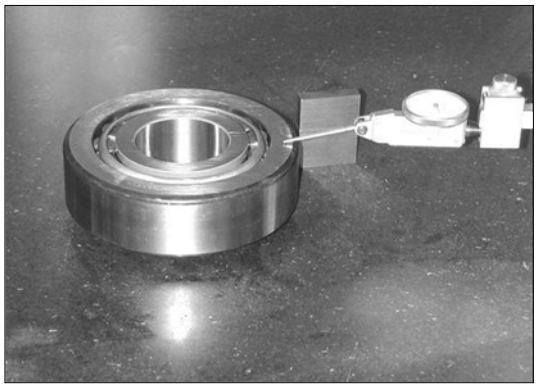
※ Standard value of **C**
· Front axle : 54.77㎜
· Rear axle : 54.0㎜



AX047

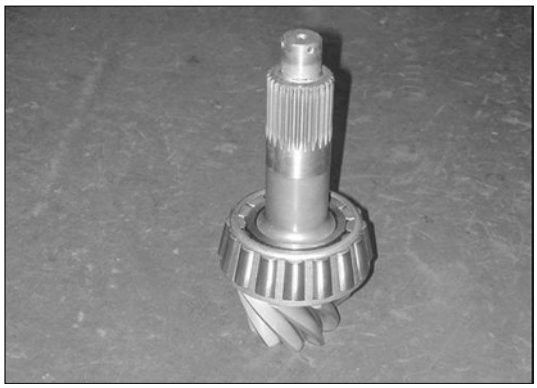
⑥ Determine shim X thickness for correct axial position of pinion-bevel.
X = A - (B + C)

※ Round up or down to the nearest tenth of millimeter the computed thickness.
2.12 rounded down to = 2.1㎜
2.18 rounded up to =2.2㎜



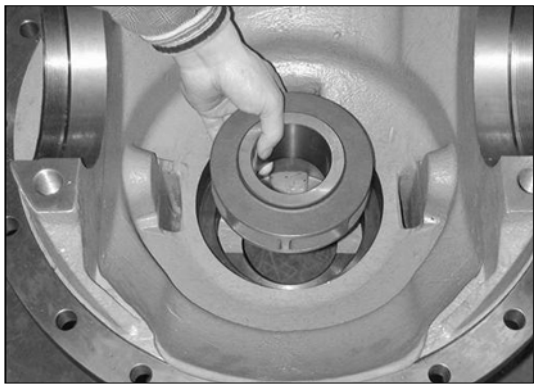
AX047

⑦ Fit in pinion shank inner race of under head bearing, heat or press-in part by installer.



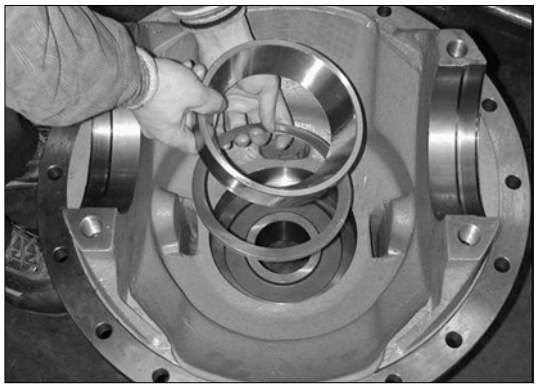
AX049

⑧ Place correctly pump in relevant seat on differential support.



AX050

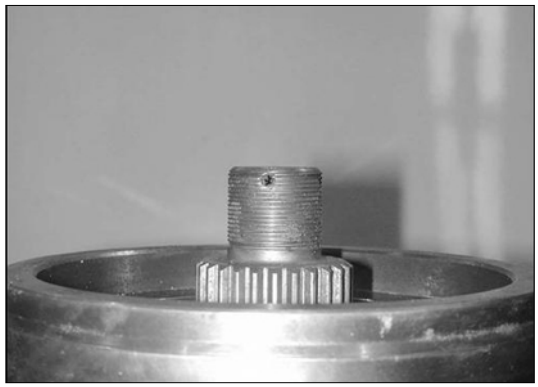
⑨ Insert adjustment shim for axial position of pinion.
Its value was computed previously ; also, fit outer races of pinion under head and shank bearings.



AX051

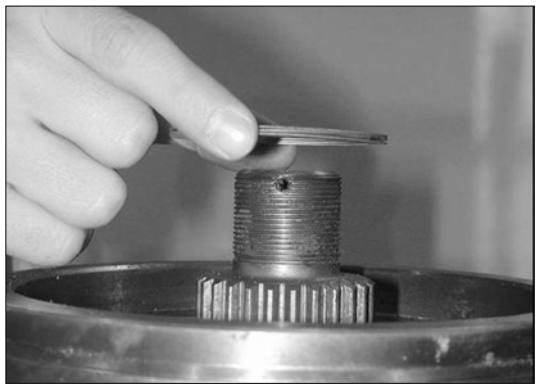
⑩ Turn the carrier upside down and assemble the bevel pinion assembly.

※ In order to contact between the bearing cone in pinion bevel and the bearing-cup of carrier perfectly, support the pinion-bevel by preferable tool.



AX052

⑪ Assemble the shims(3EA)

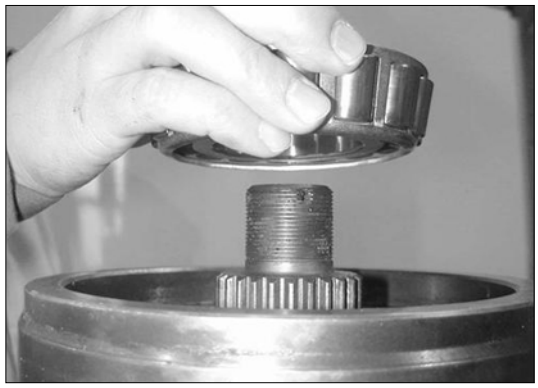


AX053

⑫ Assemble the spacer and shims(2EA).

AX054

⑬ Fit in bearing-cone by heating or pressing.

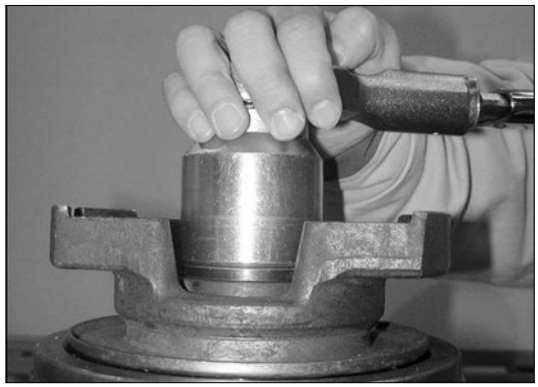


AX055

⑭ Assemble flange and holder in pinion-bevel, and tighten nut-pinion.

※ Pinion nut tightening torque
- Front axle : 72~78kgf · m
- Rear axle : 58~64kgf · m

※ Don't assemble seal.

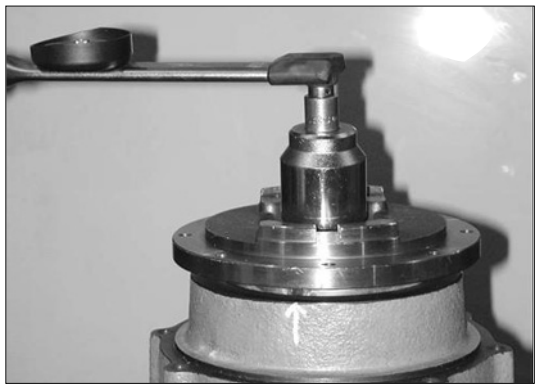


AX056

⑮ Measure prelood and confirm the follow value.

※ Bearing preload
- Front axle : 0.2~0.4kg · m
- Rear axle : 0.2~0.4kg · m

※ Before measuring preload, rotate two or three times. Disassemble and change adjustment shims to eliminate all end play up to reach a pre-load.



AX057

As bearing pre-load has been determined, remove drive flange and nut-pinion holder.

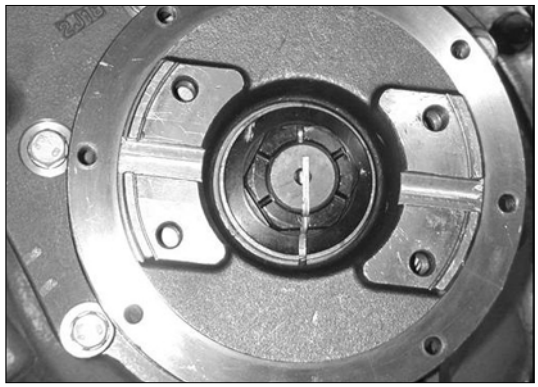
AX058

Assemble seal.

※ Cover the seal with retaining compound. Cover the seal lip and the flange with oil.

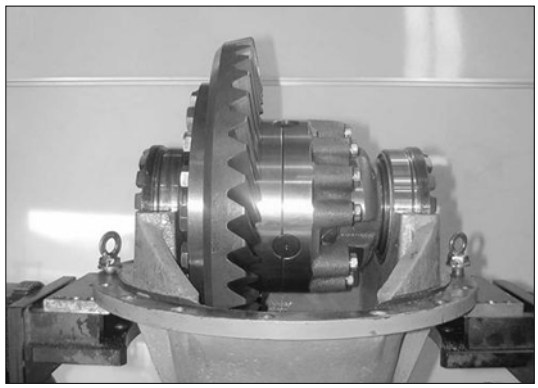
AX059

14. Assemble the flange and the holder on the pinion-bevel, and tighten the nut-pinion and the split pin.



AX060

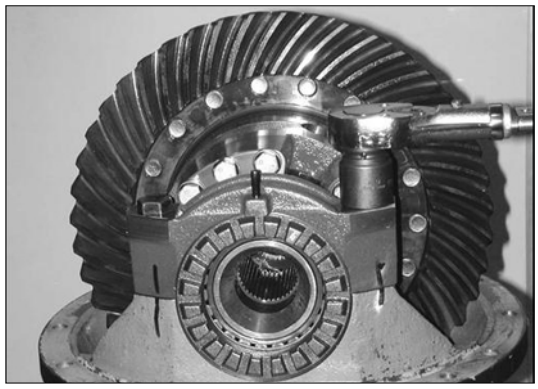
15. Fit in the differential assembly on the carrier, and assemble nut-adjusting temporary.



AX061

16. Install caps, care not to reverse position and lock screws fixing to differential support with belows.

※ Cap tightening torque
- Front axle : 63~69Kgf · m(456~499lbf · ft)
- Rear axle : 63~69Kgf · m(456~499lbf · ft)



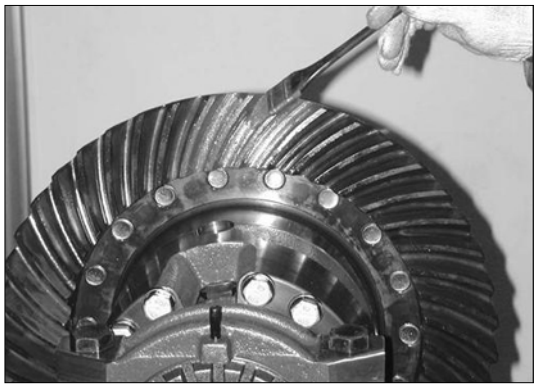
AX062

) Position a dial gauge perpendicular than ring gear tooth and check, with pinion steady, backlash that has to be of 0.25 ~ 0.33mm (rear) and 0.39~0.54mm(front).
Otherwise rotate both ring nuts by displacing them of the same number of notches and nearing ring gear to pinion if backlash is excessive, by moving away on the contrary.

※ Bevel set back lash
- Front axle : 0.39~0.54mm
- Rear axle : 0.25~0.33mm

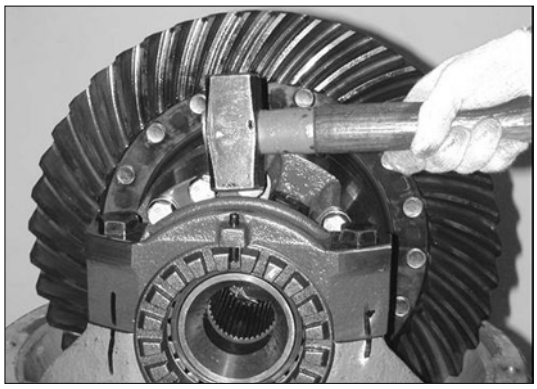
AX063

) Brush red lead on some ring tooth, rotate to mesh pinion and ring gear repeatedly, so to make evident tooth contact. Proper and correct tooth contact marks are visible on a new bevel gear set as a result of an optimum contact approached on the tester, consequently, a proper axial position of pinion against ring gear will emphasise remarking of previous tester contact markings.



AX064

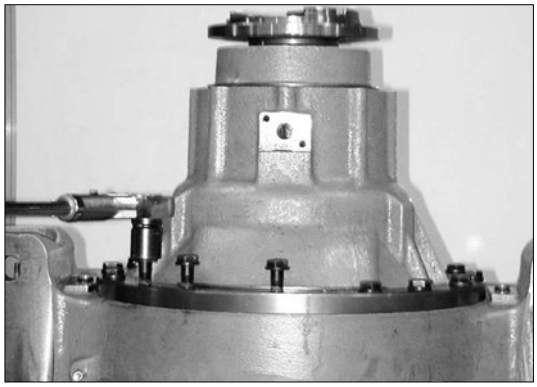
) Fit spring pins locking threaded rings of differential unit.



AX065

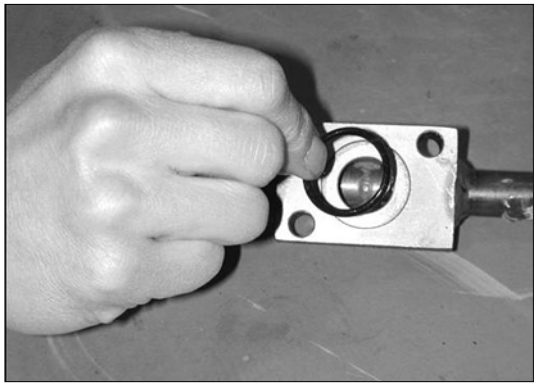
(4) HOUSING AND DIFFERENTIAL MOUNTING

① Perform two securing notches on pinion nut. Clean with care contact surfaces, apply hard locking compound and then install the differential unit on axle case ; lock the connecting screws with a torque of 31.3~34.5Kgf · m(226~250lbf · ft).



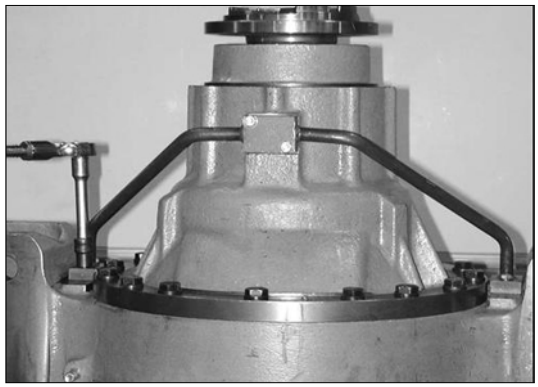
AX082

② Assemble O-ring on tube assembly port(3EA). (Front axle only)



AX083

③ Position the tube assembly, fit screws and lock with a torque of 3.0~3.5Kgf · m(21.7~25.3lbf · ft). (Front axle only)

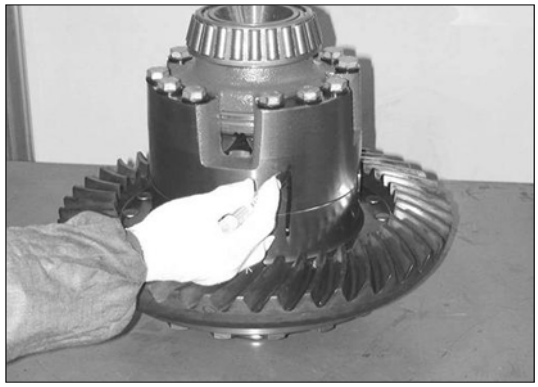


AX084

5) SUPER MAX TRAC

(1) DISASSEMBLY

① Mark the two half cases(LH/RH).



AX066

② Unscrew and remove the screws and open them.

AX067

③ Remove the planetary gear with relevant intermediate and shim discs and clutch discs.

AX068

④ Remove spider with the four side gears and relevant bevel thrust washers.

AX069

⑤ Remove the planetary gear with relevant intermediate and shim discs and clutch discs, in half case on bevel gear side.

AX070

⑥ Loosen bevel gear fixing screws.

AX071

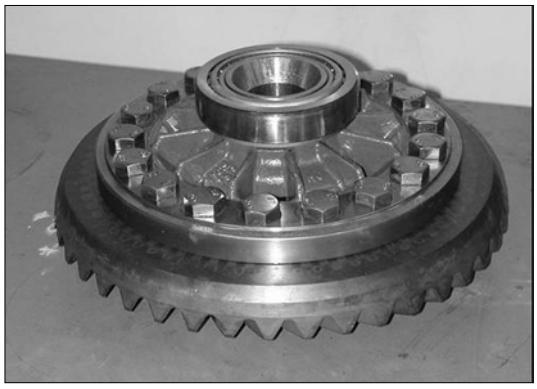
(2) ASSEMBLY

① Install gear-bevel on case-LH by bolts.

※ Tightening torque

· Front axle : 87~95kgf · m(629~687lbf · ft)

· Rear axle : 46~50kgf · m(333~362lbf · ft)



AX072

② Before assembling, each smooth face have to be lubricated with oil.

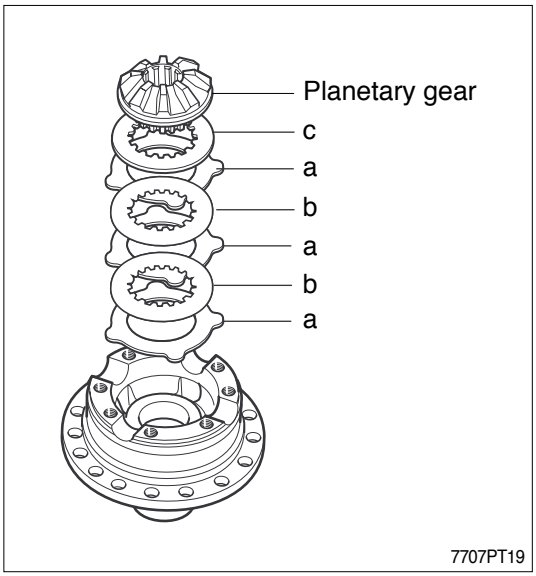
· Insert a lug disc(**a**) (with outer lugs) into half case.

· Insert an intermediate disc(**b**) (with inner lugs), then another disc(**a**), a disc (**b**), still lug disc(**a**).

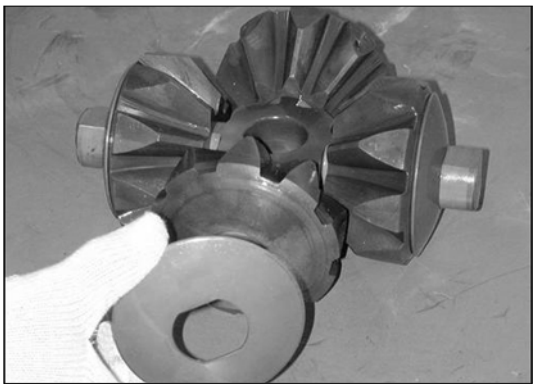
※ Discs(**b**) are thin with lining on both faces, disc(**c**) is thick and lined on one face only.

· Insert a disc(**c**) with unlined face turned upward.

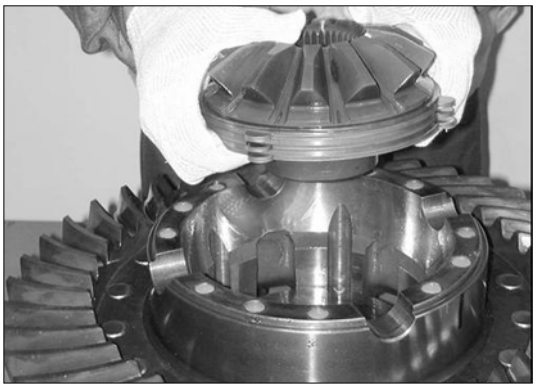
· Smear oil on planetary gear and insert taking care to mesh shaft splines with inner lugs of clutch discs.



③ Assemble side gears with relevant bevel thrust washers on spider and position them on the half case.


AX074

④ Insert gear side assembly in case-LH.


AX078

⑤ Assemble spider and gear-side according to procedure.

AX079

⑥ Mount the cover aligned against the lugs of lug disks, taking care to align the reference marked done before disassembling ; close the two half casings.

Screw in fixing screws and lock a torgue of ;

· Front axle : 21~23kgf · m(152~166lbf · ft)

· Rear axle : 11.5~12.5kgf · m
(83.2~90.4lbf · ft)

AX080

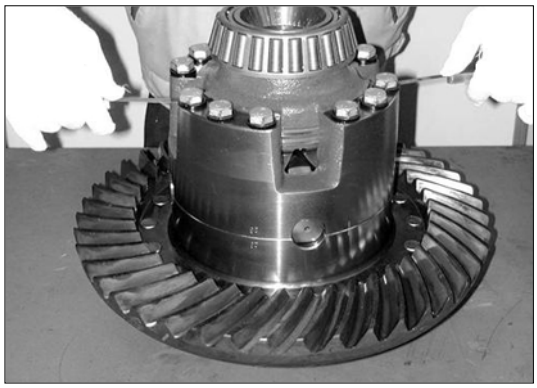
⑦ As assembling is done, play of each clutch pack have to be included between 0.05 and 0.1mm.

Check has to perform with 180。 at the same time on both clutch packs to prevent that play between side gears and spider would mislead reading.

Make sure of proper gear rotation.

If play value of clutches results different than specified one, differential has to be disassembled again, rearrange clutch pack again, select proper disc shims.

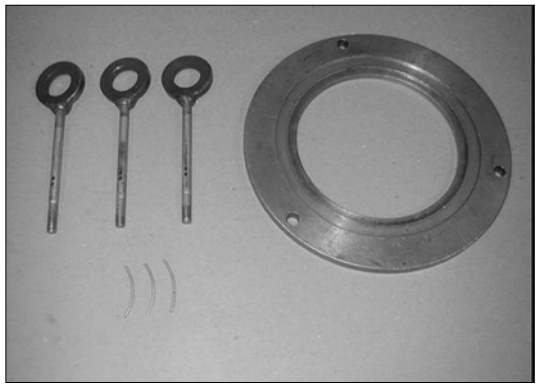
Reassemble and check all over again.



AX081

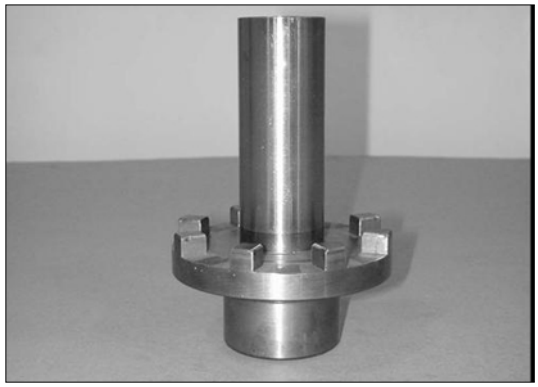
6) TOOLS

① Spring compression tool.



AX124

② Nut adjusting tool of reduction assembly.



AX125