

GROUP 4 DISASSEMBLY AND ASSEMBLY

1. CONTROL VALVE

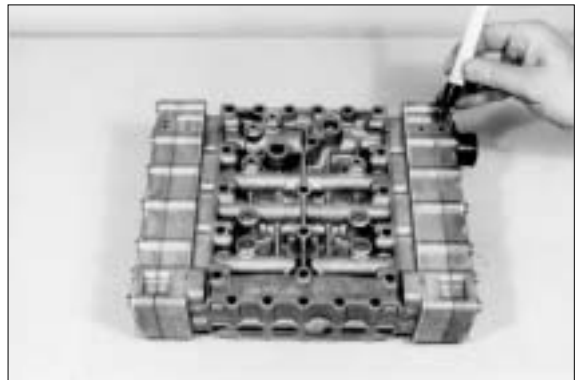
1) DISASSEMBLY

- (1) Illustration on the right shows the complete control unit.



73073CV001

- (2) Mark the installation position of the different covers, the housing and cable harness with the valve housing.

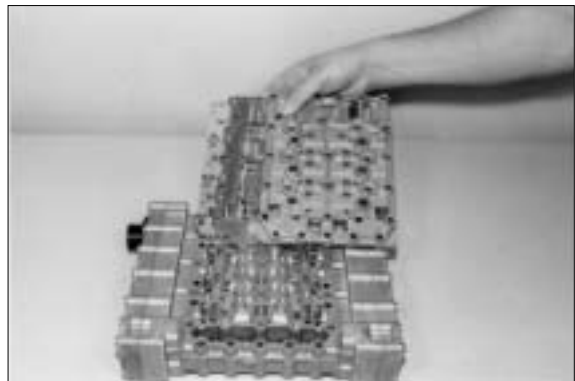


73073CV002

- (3) Loosen socket head screws.
Separate duct plate, 1st gasket, intermediate plate and 2nd gasket from the valve housing.

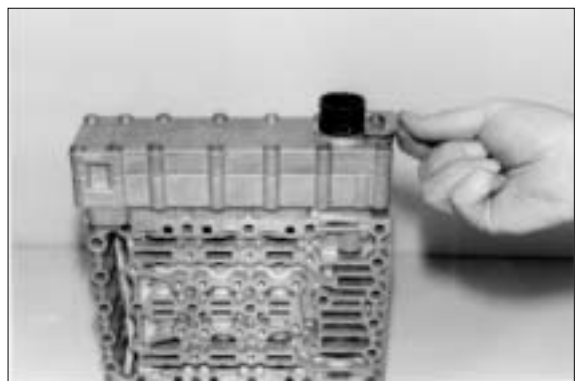
※ Special tool
Box spanner

5873 042 002



73073CV003

- (4) Remove retaining clip.

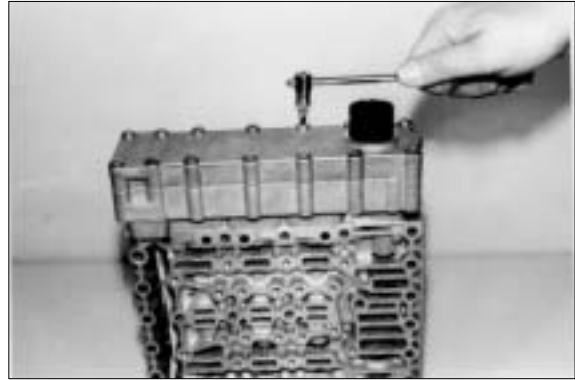


73073CV004

- (5) Loosen socket head screws.
Separate cover from housing and cable harness.

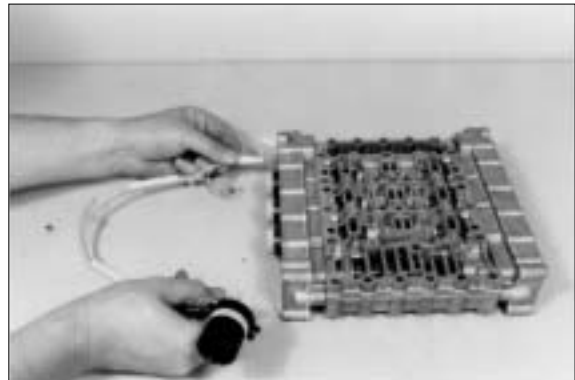
※ Special tool
Box spanner

5873 042 002



73073CV005

- (6) Disassemble opposite cover.
Disconnect pressure regulator and remove cable harness.



73073CV006

- (7) Loosen socket head screws, remove fixing plate and pressure regulators(3EA).

※ Special tool
Box spanner

5873 042 002



73073CV007

- (8) Loosen two socket head screws and locate housing provisionally, using adjusting screws(Housing is under spring preload).
Now, loosen remaining socket head screws.

※ Special tool
Box spanner
Adjusting screws

5873 042 002

5870 204 036

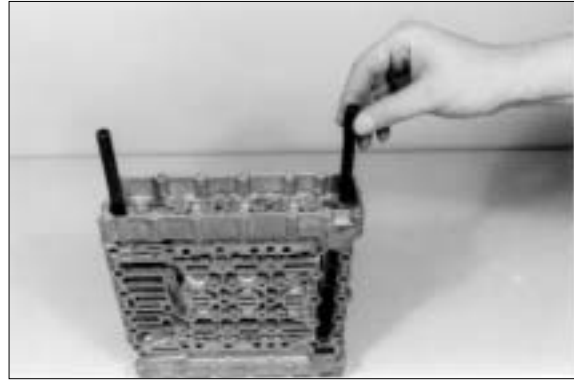


73073CV008

(9) Separate housing from valve housing by loosening the adjusting screws uniformly.

※ Special tool

Adjusting screws 5870 204 036



73073CV009

(10) Remove components.



73073CV010

(11) Remove opposite pressure regulators, housing as well as components accordingly.



73073CV011

2) ASSEMBLY

※ Check all components for damage and renew if necessary.

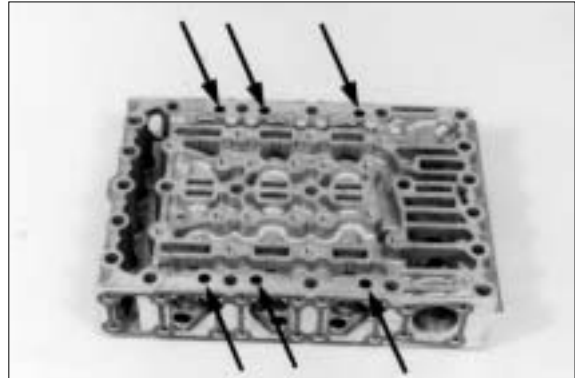
Prior to the installation, check free travel of all moving parts in the housing.

Spools can be exchanged individually.

Oil the components prior to the assembly.

Insert diaphragms with the concave side showing upward until contact is obtained.

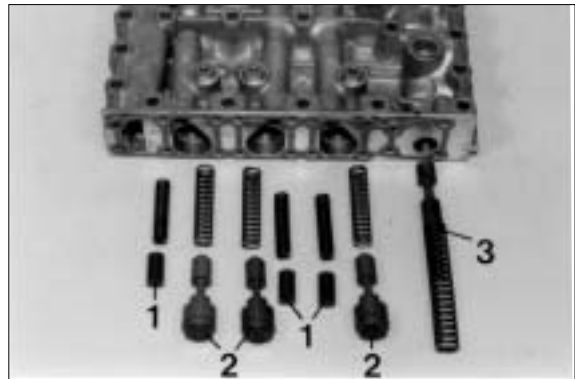
※ Installation position, see arrows.



73073CV015

(1) Illustration on the right shows the following components.

- 1 Vibration damper
- 2 Follow-on slide
- 3 Pressure reducing valve



73073CV016

(2) Install components according to figure (1).

※ Preload compression spring of the follow-on slides and locate spool provisionally by means of cylindrical pins $\varnothing 5.0\text{mm}$ (Assembly aid), see arrows.



73073CV017

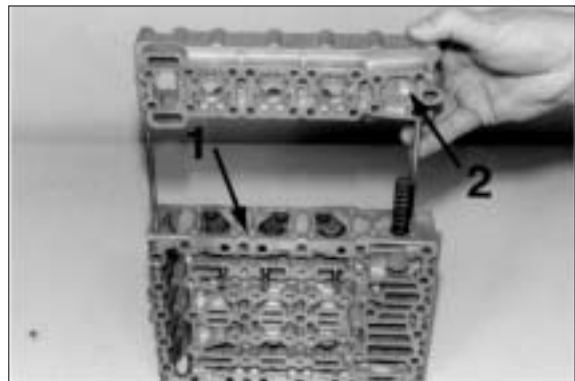
(3) Install two adjusting screws.

Assemble gasket (Arrow 1) and housing cover. Now, position the housing cover uniformly, using adjusting screws, until contact is obtained and remove cylindrical pins (Assembly aid) again (See the next figure).

※ Pay attention to the different housing covers. Install recess $\varnothing 15\text{mm}$ (Arrow 2), facing the spring of the pressure reducing valve.

※ Special tool

Adjusting screws 5870 204 036



73073CV018



73073CV019

(4) Fasten housing cover by means of socket head screws.

· Torque limit : 0.56kgf · m(4.06lbf · ft)

※ Special tool

Box spanner 5873 042 002



73073CV020

(5) Introduce pressure regulators and fix by means of fixing plates and socket head screws.

※ Install fixing plate, with the claw showing downward.

※ Pay attention to the radial installation position of the pressure regulators, see figure.

· Torque limit : 0.56kgf · m(4.06lbf · ft)

※ Special tool

Box spanner 5873 042 002

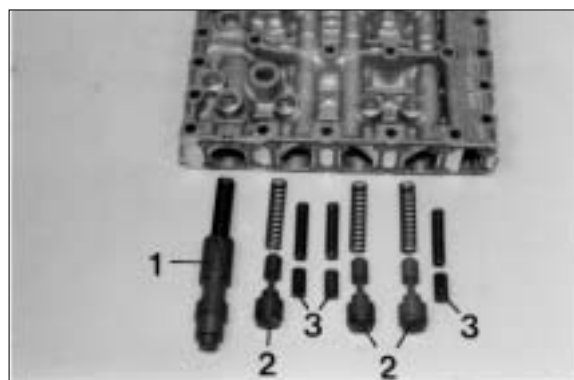


73073CV021

Pre assemble opposite side

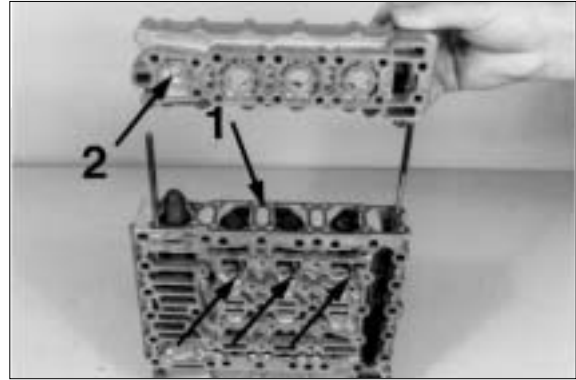
(6) Illustration on the right shows the following components.

- 1 Main pressure valve
- 2 Follow on slide
- 3 Vibration damper



73073CV022

- (7) Install components according to figure (6).
 Preload compression springs of the follow-on slides and locate spool provisionally by means of cylindrical pins \varnothing 5.0mm (Assembly aid), see arrows.
 Install two adjusting screws.
 Assemble gasket(Arrow 1) and housing cover, and position them uniformly against shoulder, using adjusting screws.



73073CV023

- ※ Pay attention to the different housing covers-install the recess \varnothing 19mm(Arrow 2), facing the main pressure valve.
 Now, fasten housing cover by means of socket head screws.

· Torque limit : 0.56kgf · m(4.06lbf · ft)

Remove cylindrical pins(Assembly aid) again.

- ※ Special tool

Adjusting screws 5870 204 036

Box spanner 5873 042 002

- (8) Introduce pressure regulators and fix by means of fixing plates and socket head screws.



73073CV024

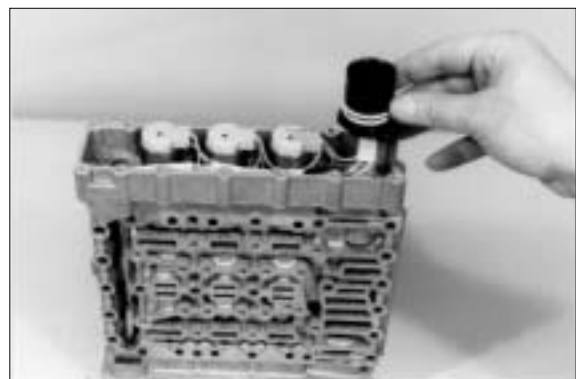
- ※ Install fixing plates, with the claw showing downward.
- ※ Pay attention to the radial installation position of the pressure regulators, see figure.

· Torque limit : 0.56kgf · m(4.06lbf · ft)

- ※ Special tool

Box spanner 5873 042 002

- (9) Introduce cable harness and connect pressure regulators(6EA).



73073CV025

- ※ Pay attention to the installation position of the cable harness, also markings (See figure(2), page 3-73).

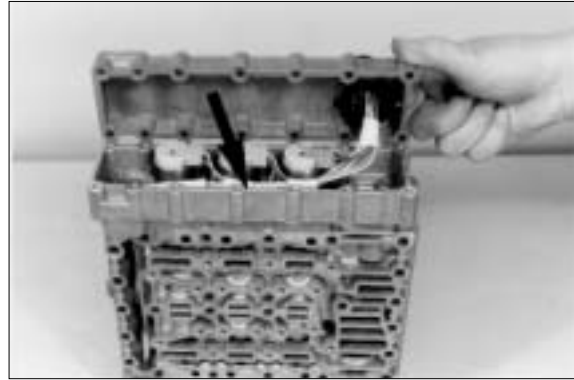
(10) Introduce female connector against shoulder, with the groove facing the guide nose of the cover.

Install gasket(Arrow) and fasten cover by means of socket head screws.

· Torque limit : 0.56kgf · m(4.06lbf · ft)

※ Special tool

Box spanner 5873 042 002



73073CV026

(11) Fix female connector by means of retaining clamp, see figure.

Install opposite cover.



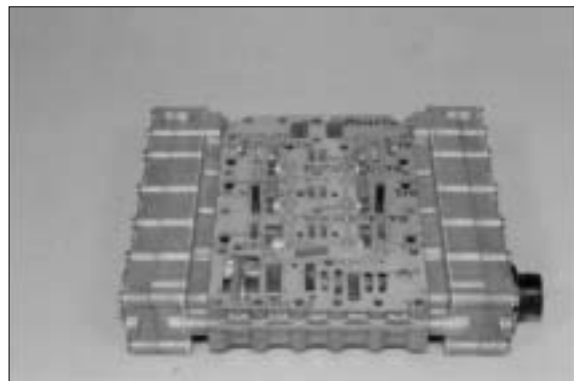
73073CV027

(12) Install two adjusting screws and mount gasket I.

※ Pay attention to the different gaskets, see on the right figure and (15).

※ Special tool

Adjusting screws 5870 204 063

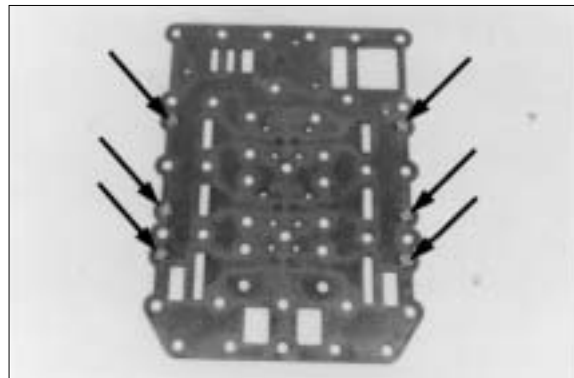


73073CV028

Intermediate plate-Version with screens

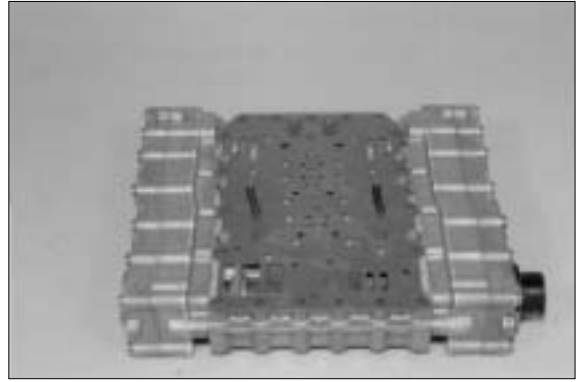
(13) Insert screens(6EA) flush mounted into the bore of the intermediate plate, see arrow.

※ Pay attention to the installation position-screens are showing upward(Facing the duct plate).



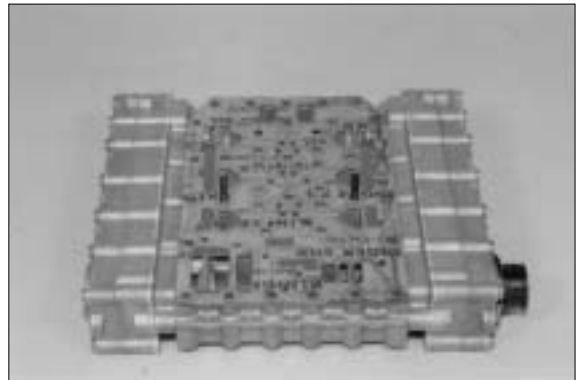
73073CV029

- (14) Mount intermediate plate, with the screens showing upward.



73073CV030

- (15) Mount gasket II.



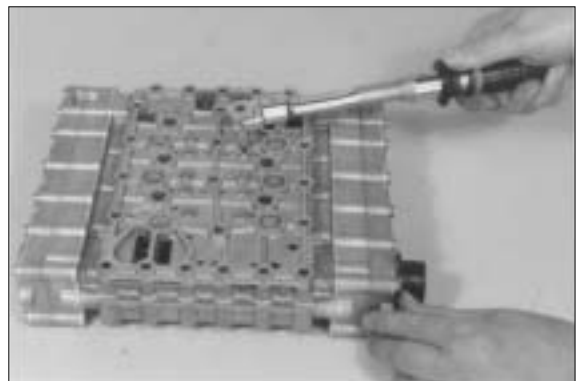
73073CV031

- (16) Mount duct plate and fasten it uniformly by means of socket head screws.

· Torque limit : 0.97kgf · m(7.0lbf · ft)

※ Special tool

Box spanner 5873 042 002

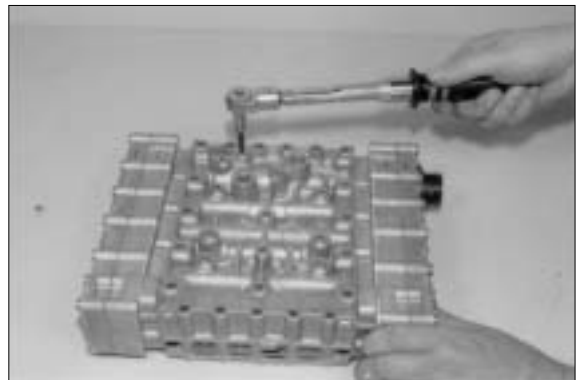


73073CV032

- (17) Equip screw plugs(8EA) with new O-rings and install them.

· Torque limit : 0.56kgf · m(4.06lbf · ft)

※ The installation of the hydraulic control unit is described, starting from page 3-153.



73073CV033

2. GEARBOX

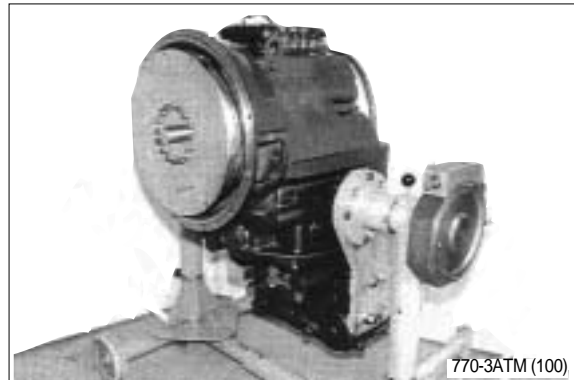
1) DISASSEMBLY

Fasten transmission on assembly car.

※ Special tool

Assembly car 5870 350 000

Clamping bracket 5870 350 071



Disassemble complete shift control, remove pressure lines and duct plate.



(1) Converter-input

① Separate torque converter from transmission, using lifting device.

※ Special tool

Set of eye bolts 5870 240 002

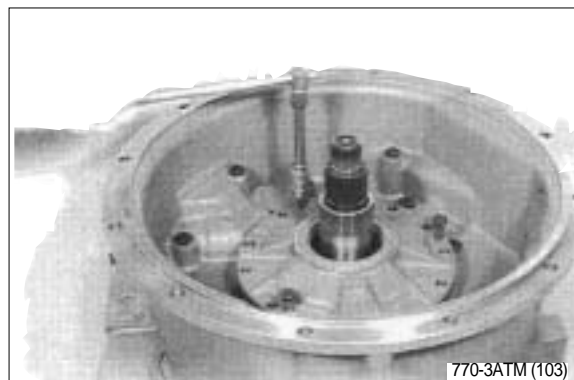


② Loosen screw connection.

Separate bearing cover from converter bell, using forcing screws(3EA).

※ Special tool

Forcing screws(M10) 5870 204 005



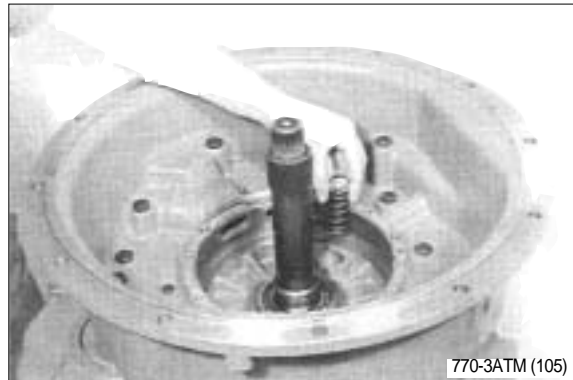
③ Pull oil feed flange out of the converter bell, using special device.

※ Special tool

Puller device 5870 000 089



④ Remove converter safety valve (Composed of ball, spring and disk).

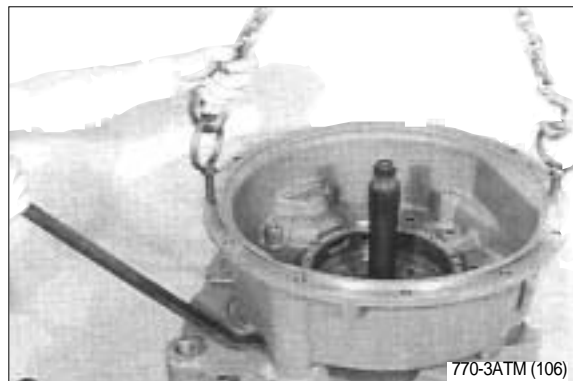


⑤ Separate converter bell from gearbox housing, using lifting device and pry bar.

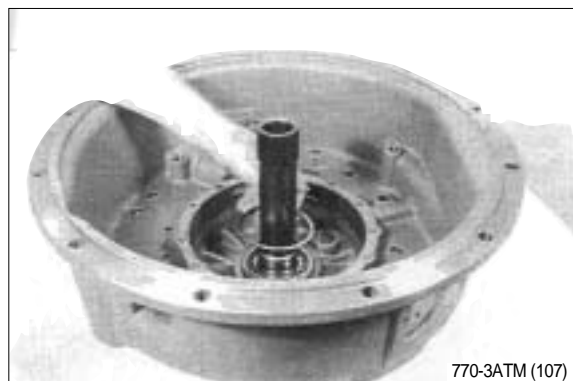
※ Special tool

Set of eye bolts 5870 204 002

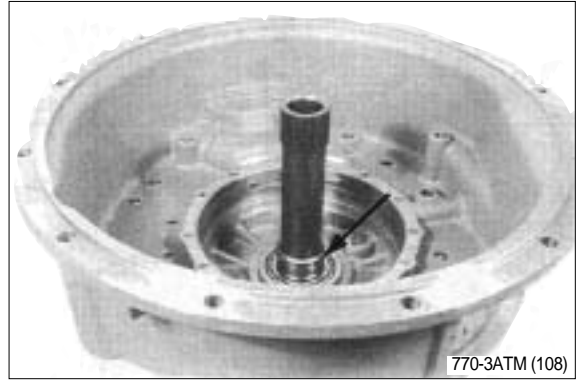
Pry bar 5870 345 036



⑥ Remove shim.



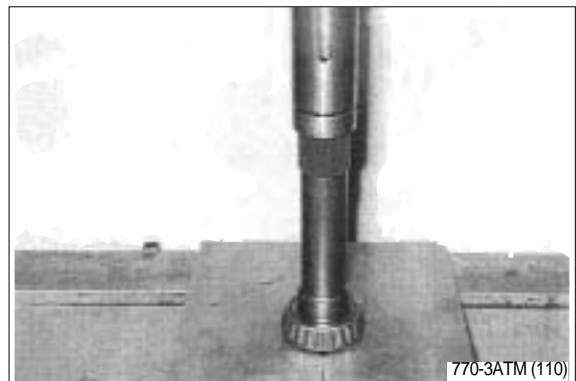
- ⑦ Remove rectangular ring(Arrow).



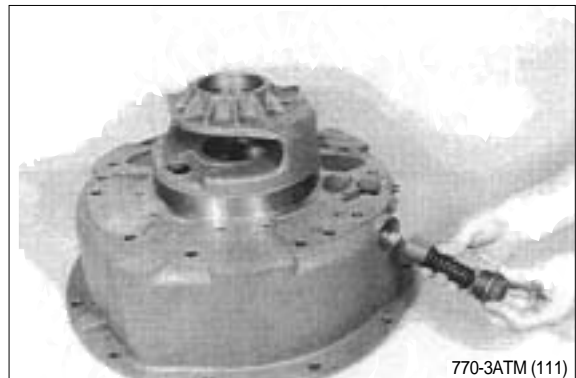
- ⑧ Press drive shaft out of the spur gear bearing.
Remove released bearing inner race and spur gear.
If necessary, drive bearing outer race out of the housing bores.



- ⑨ Press bearing inner race from drive shaft.

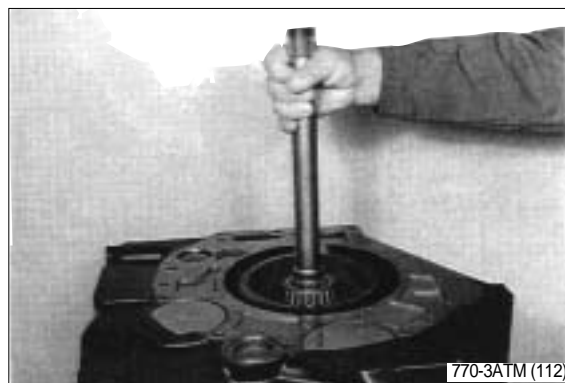


- ⑩ Remove converter pressure valve.

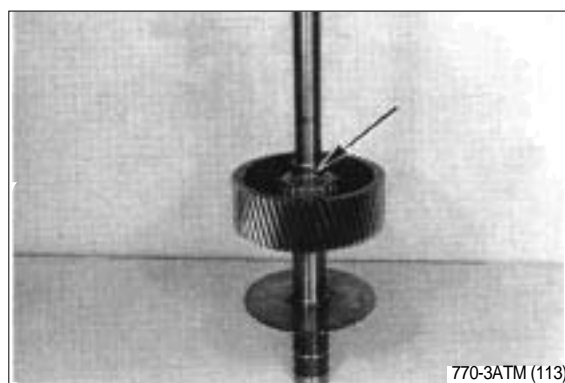


(2) Drive shaft, pump, power take-off

- ① Pull complete drive shaft out of the gearbox housing(Pump).



- ② Remove rectangular ring(Arrow).



- ③ Separate spur gear from shaft and squeeze circlip(Arrow) out.



- ④ Pull bearing inner race from spur gear.

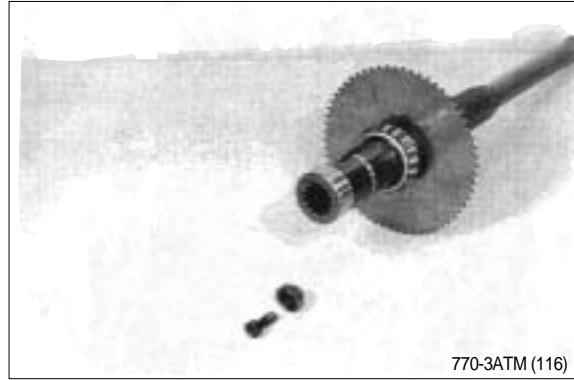
※ Special tool

Grab sleeve(Super) 5873 001 020

Basic set 5873 001 000



- ⑤ Loosen socket head screw and remove it along with clamping plate.

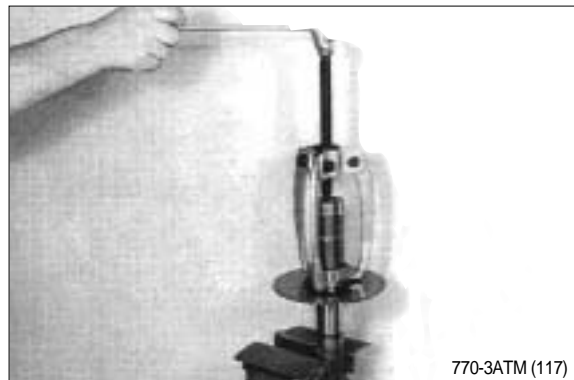


- ⑥ Pull bearing inner race and driver from the shaft.

※ Support puller on the end face/drive shaft. Pay attention to released shim.

※ Special tool

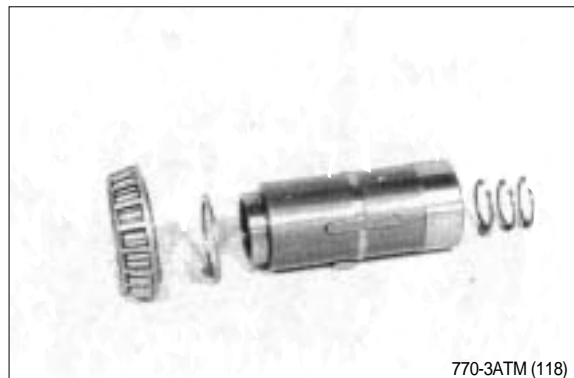
Three-leg puller 5870 971 002



- ⑦ Separate bearing inner race from driver.

※ Pay attention to released shim.

Squeeze circlips(3EA) out.



(3) Transmission pump

- ① Tilt gearbox housing 180°.

Loosen hexagon head screws and remove both pump flanges(Arrows).



- ② Loosen socket head screws(M8) and position puller device.

Pull transmission pump out of the housing bore.

- ※ Tapping on the housing face is a help during the extraction operation.

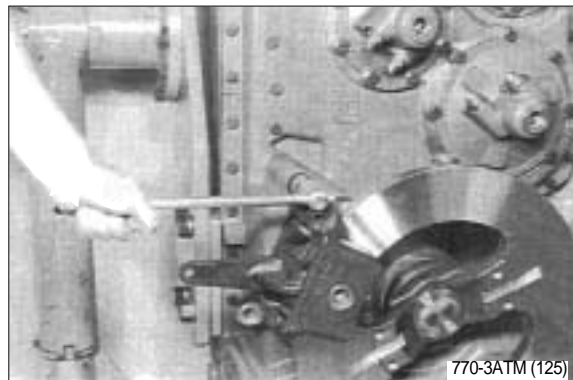
- ※ Special tool

Puller device 5870 000 089

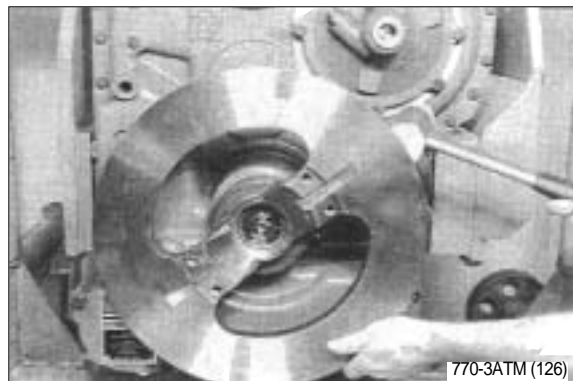


(4) Output-laysaft assembly

- ① Loosen screw connection and remove brake caliper.



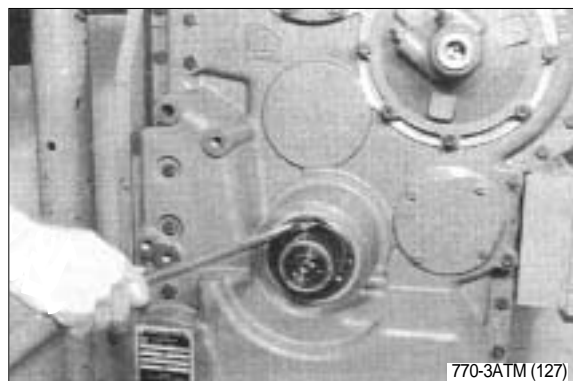
- ② Unlock and loosen hexagon head screws, tap brake disk loose and separate it from output shaft.



- ③ Pry shaft seal out of the housing bore.

- ※ Special tool

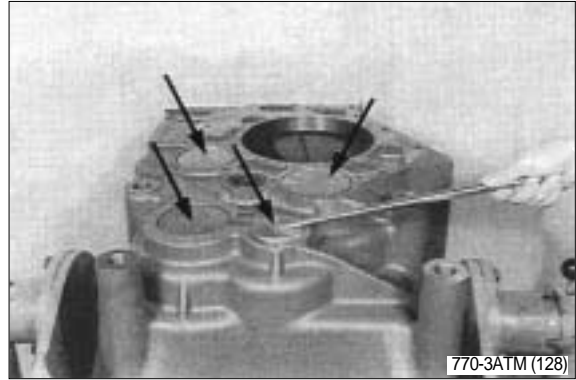
Crow bar 5870 345 071



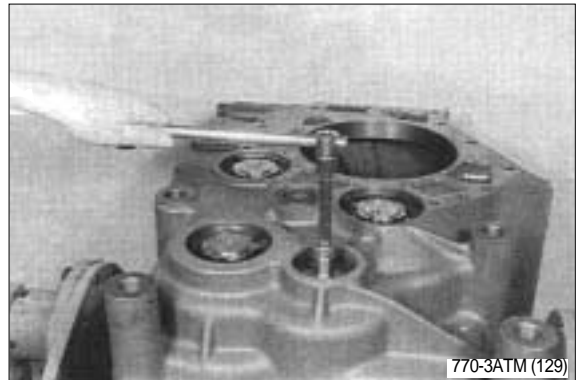
- ④ Tilt gearbox housing.
Remove sealing covers(Arrows).

※ Special tool

Crow bar 5870 345 071



- ⑤ Loosen hexagon head screws.



- ⑥ Pull idler shaft by means of puller out of the housing bore.

※ Special tool

Counter support 5870 300 020

Set screw 5870 204 048



- ⑦ Tilt gearbox housing 180°.

Loosen hexagon head screws and pull bearing cover K1/KV out of the housing bore.

※ Special tool

Counter support 5870 300 020

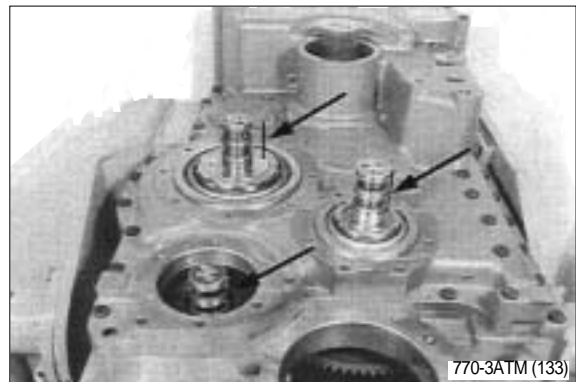
Threaded insert 5870 204 042



- ⑧ Loosen hexagon head screws and remove bearing cover KR/K2 and K3/K4.



- ⑨ Squeeze rectangular rings(3 pieces/axle) out, see arrows.



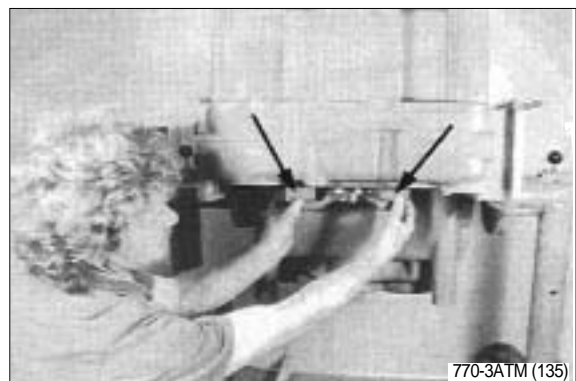
- ⑩ Squeeze circlip out and remove released washers.

※ Special tool

Set of external pliers 5870 900 015



- ⑪ Support output flange against gearbox housing, see arrows.



⑫ Loosen hexagon head screws and separate housing cover from gearbox housing, using forcing screws and lifting device.

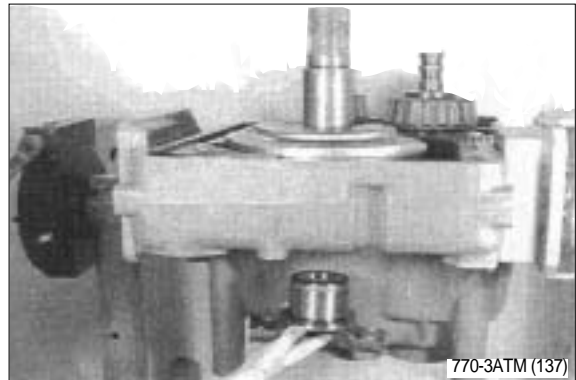
※ Special tool

Forcing screws(M10) 5870 204 005

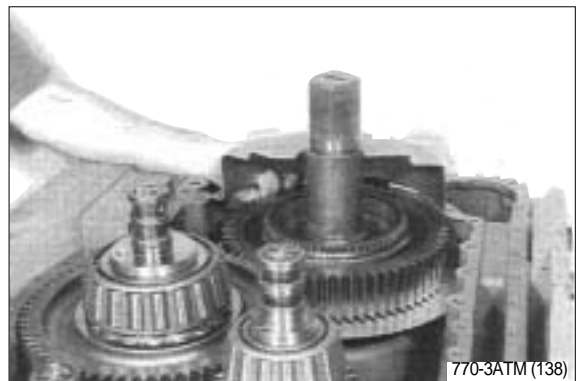
Set of eye bolts 5870 204 002



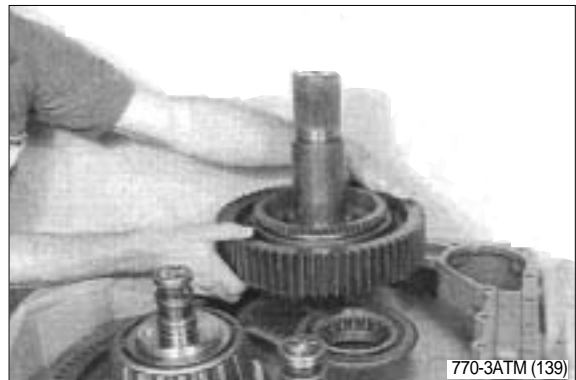
⑬ Unlock and loosen hexagon head screws. Remove output flange and pry shaft seal out of the housing bore.



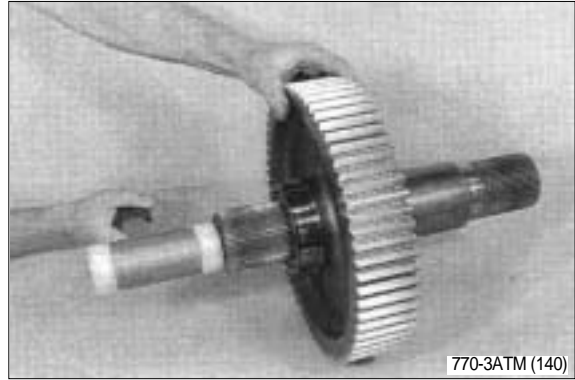
⑭ Loosen hexagon head screws and remove oil baffle.



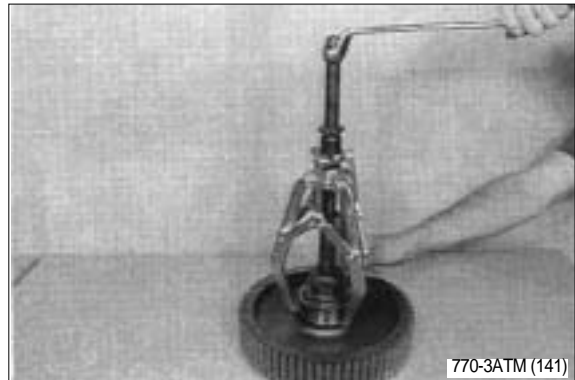
⑮ Remove output gear along with shaft.



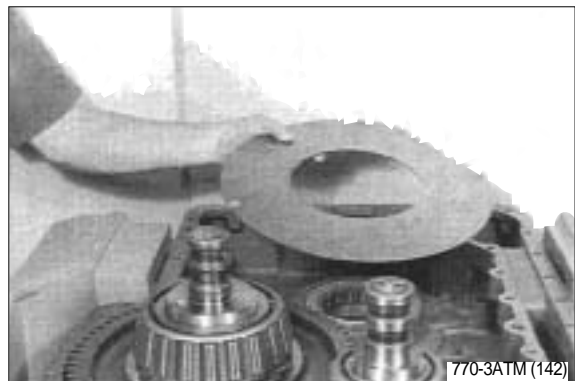
- Separate output shaft from spur gear.



- Pull bearing inner race from output gear.
※ Special tool
Three-leg puller 5870 971 003



- Remove plate.



- Drive roller bearing out of the housing bore and remove it.



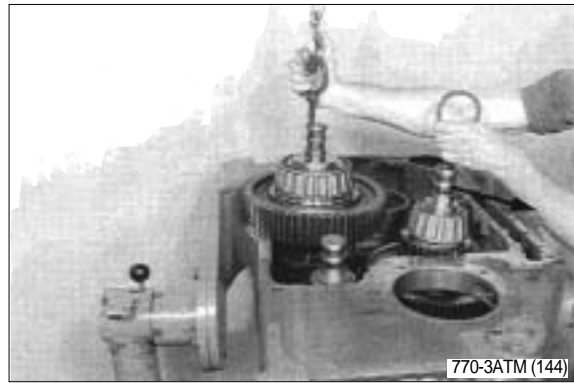
(5) Disassemble clutches and layshaft gear

① Remove clutches K3/K4, KR/K2 and KV/K1 by means of lifting device.

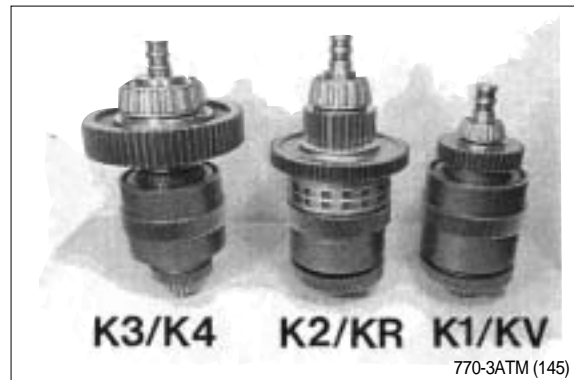
※ At the removal of the clutch K3/K4, displace clutch KR/K2 in direction of arrow, see figure on the right.

※ Special tool

Set of eye bolts 5870 204 002



② Illustration on the right shows the clutches in removed condition.



③ Remove layshaft gear.



(6) Disassemble power take-off II

① Squeeze circlip out and remove shim.

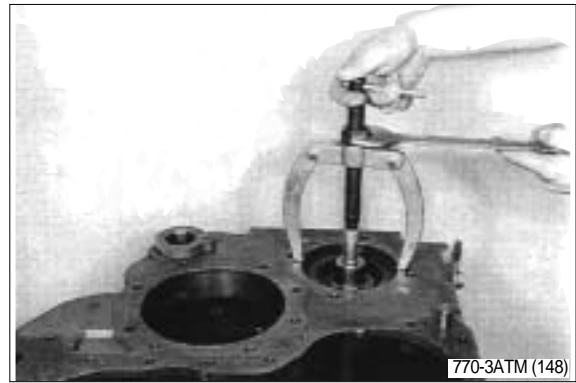


- ② Pull Pto-shaft by means of internal puller out of the housing bore until the bearing outer race is released.

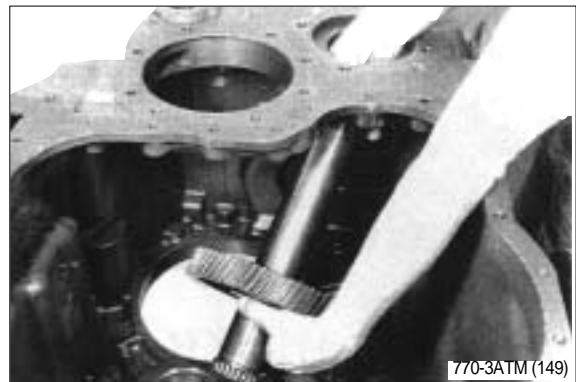
※ Special tool

Internal puller 5870 300 006

Counter support 5870 300 003



- ③ Take shaft out of the housing.



- ④ Pull bearing inner race from shaft(Figure on the right).

Press opposite bearing inner race from the shaft.

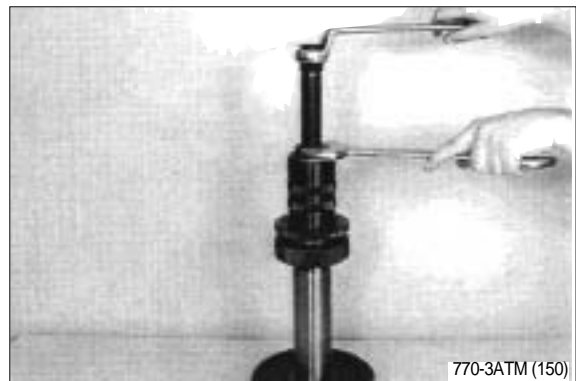
※ The separation of shaft and gear is not possible(Shrink fit).

※ Special Tool

Grab sleeve(Super) 5873 001 020

Grab sleeve(Super) 5873 001 027

Basic set 5873 001 000



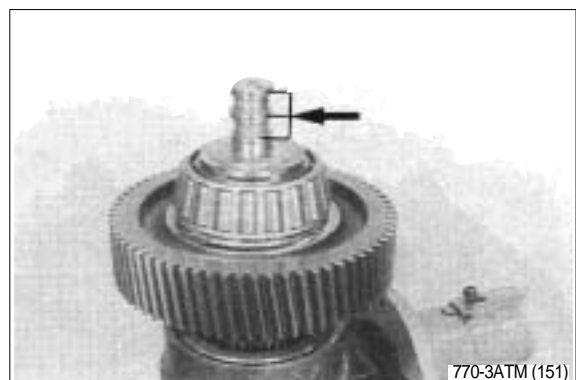
(7) Disassemble clutches

Clutch-K3/K4

- ① Locate clutch by means of special device.
Remove rectangular rings(3EA, see arrow)

※ Special tool

Clamping ring 5870 654 022



② Loosen slotted nut.

※ Slotted nut is secured with loctite.

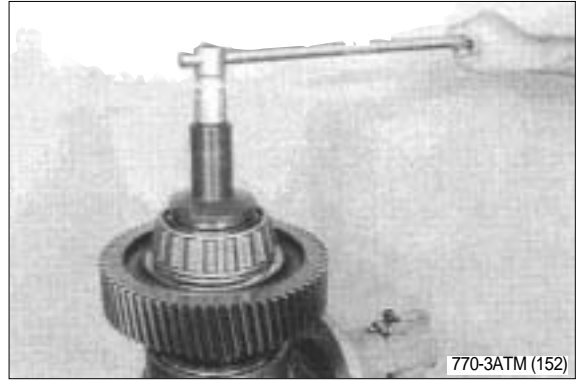
To prevent the damage of the thread,
heat slotted nut prior to loosen it(About
120°C).

※ Special tool

Hook spanner 5870 401 110

Hot-air blower 220V 5870 221 500

Hot-air blower 110V 5870 221 501



③ Pull off tapered roller bearing.

※ Special tool

Grab sleeve 5870 003 030

Reducer 5870 003 011

Basic set 5870 002 001



④ Remove flanged disk.



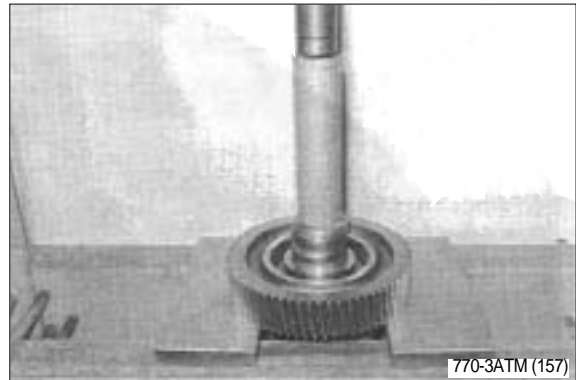
⑤ Remove upper roller bearing.



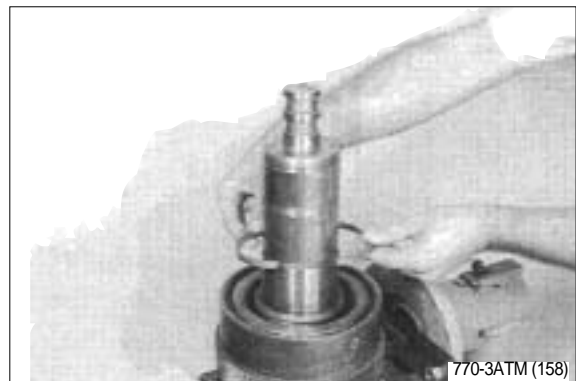
- ⑥ Remove angle ring, squeeze snap ring out and remove thrust ring.



- ⑦ Press spur gear K3 from plate carrier and remove released roller bearing.



- ⑧ Remove split ring.



- ⑨ Squeeze snap ring out and remove complete plate pack K3.



⑩ Tilt clutch 180°.

Loosen slotted nut.

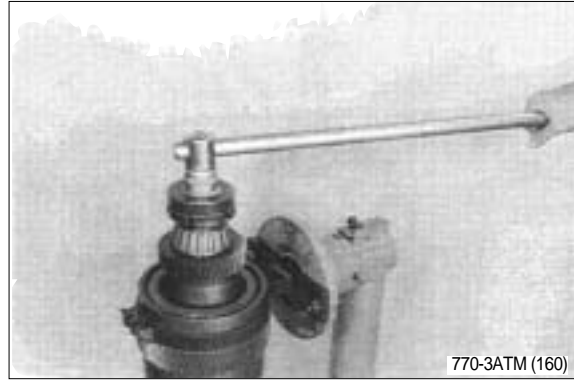
※ Slotted nut is secured with loctite.

To prevent the damage of the thread,
heat slotted nut prior to loosen it(About
120°C).

※ Special tool

Hook spanner 5870 401 115

Hook spanner 5870 401 118

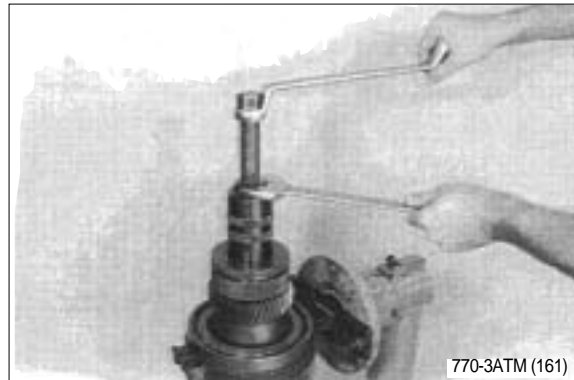


⑪ Pull off tapered roller bearing.

※ Special tool

Grab sleeve 5873 001 037

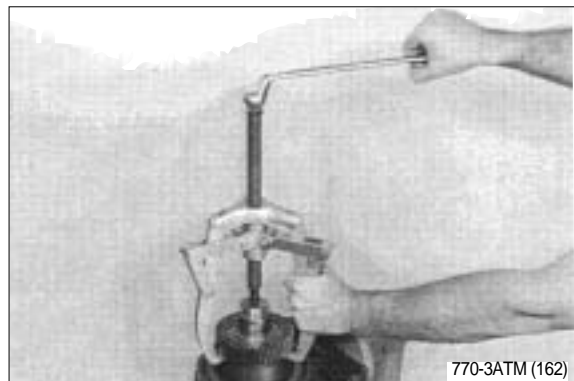
Basic set 5873 001 000



⑫ Pull spur gear K4 from plate carrier.

※ Special tool

Three-leg puller 5870 971 003



⑬ Remove oil feed ring and pull ball bearing
from plate carrier.

※ Special tool

Three-leg puller 5870 971 002

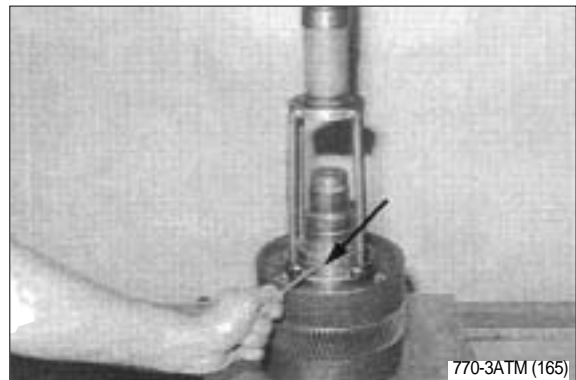


- ⑭ Squeeze snap ring out and remove complete plate pack K4.



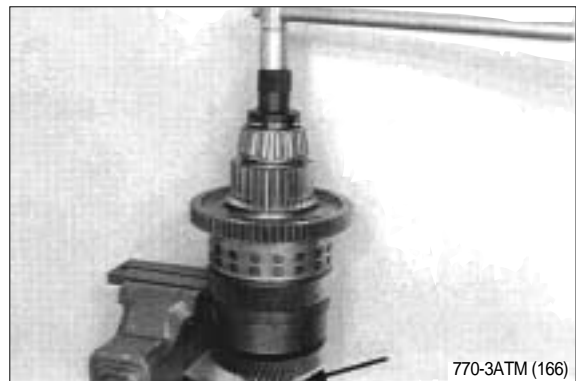
- ⑮ Preload compression spring by means of special device.
Squeeze snap ring(Arrow) out and remove released components.
Now, separate piston from plate carrier, using compressed air.
Disassemble opposite piston accordingly.

- ※ Special tool
Pressure piece 5870 345 072



Clutch KR/K2

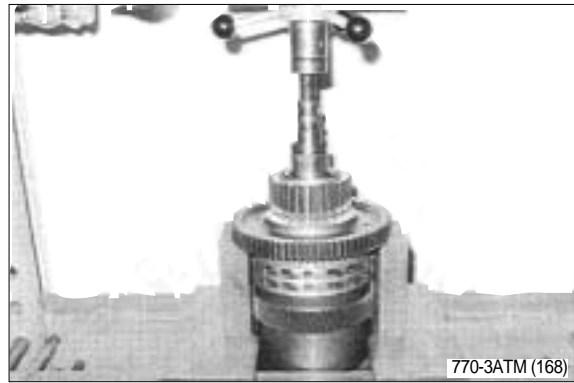
- Locate clutch by means of special device and loosen slotted nut.
Loosen opposite slotted nut(Arrow) accordingly.
- ※ The slotted nuts are secured with loctite-heat prior to loosen them.
- ※ Special tool
Clamping ring 5870 654 022
Hook spanner 5870 401 099
Hook spanner 5870 401 118
Hook spanner 5870 401 115



- Pull off tapered roller bearing.
- ※ Special tool
Grab sleeve(Super) 5873 002 039
Basic set 5873 002 001



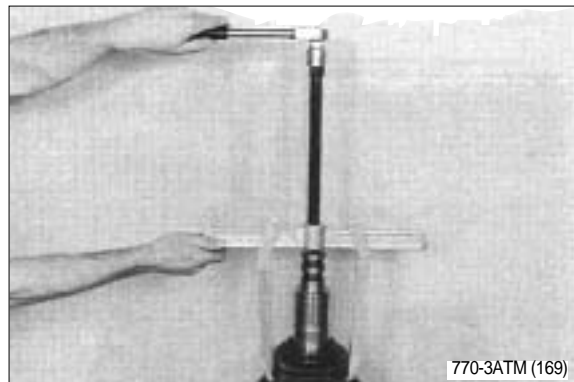
- Press spur gear K2 from the shaft.
Remove released shim and bush.



770-3ATM (168)

- Pull off tapered roller bearing.
- ※ Special tool

Grab sleeve(Super)	5873 002 038
Basic set	5873 002 001



770-3ATM (169)

- On the opposite side, pull off tapered roller bearing.
- ※ Special tool

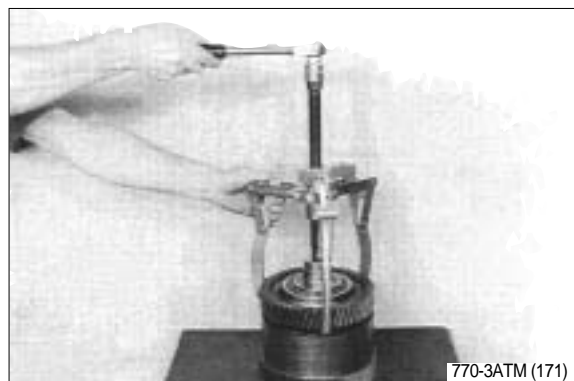
Grab sleeve(Super)	5873 002 038
Basic set	5873 002 001



770-3ATM (170)

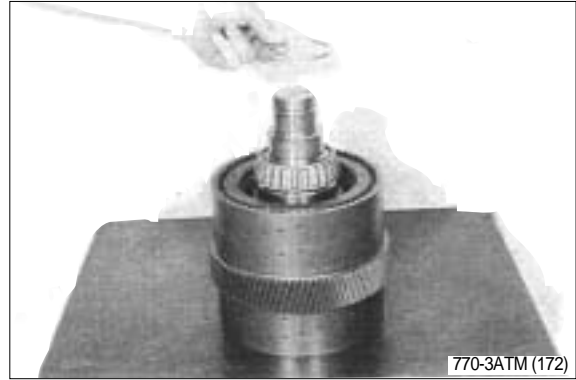
- Pull spur gear KR from the shaft.
Remove released bearing inner race,
disassemble both bearing outer races
and circlip.
- ※ Special tool

Three-leg puller	5870 971 003
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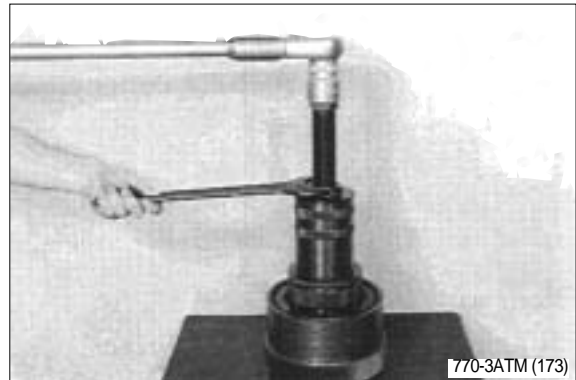
770-3ATM (171)

Remove adjusting ring.



Pull off tapered roller bearing(Spur gear bearing).

- ※ Special tool
- Grab sleeve(Super) 5873 002 035
- Basic set 5873 002 001



Disassemble plate packs KR and K2 as well as compression springs and piston (Accordingly as at clutch K3/K4).

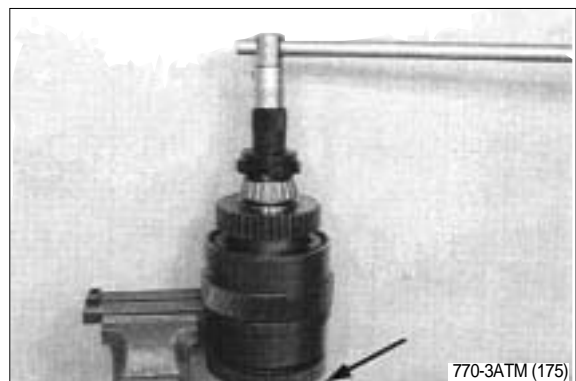


Clutch KV/K1

Locate clutch by means of special device and loosen slotted nut.

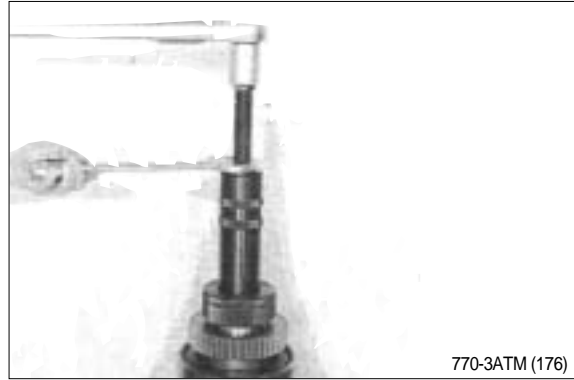
Loosen opposite slotted nut(Arrow) accordingly.

- ※ The slotted nuts are secured with loctite-heat prior to loosen them.
- ※ Special tool
- Clamping ring 5870 654 022
- Hook spanner 5870 401 118
- Hook spanner 5870 401 115



Pull off tapered roller bearing.

- ※ Special tool
- Grab sleeve(Super) 5873 001 023
- Basic set 5873 001 000

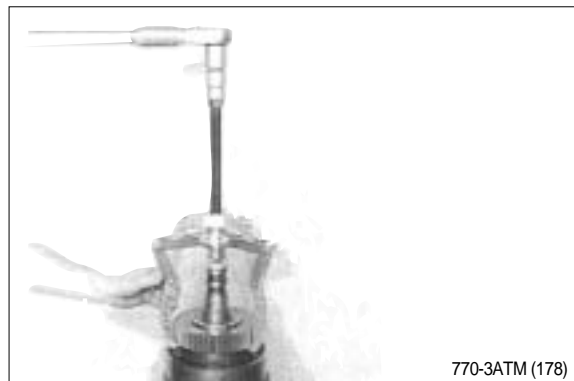


Remove shim.

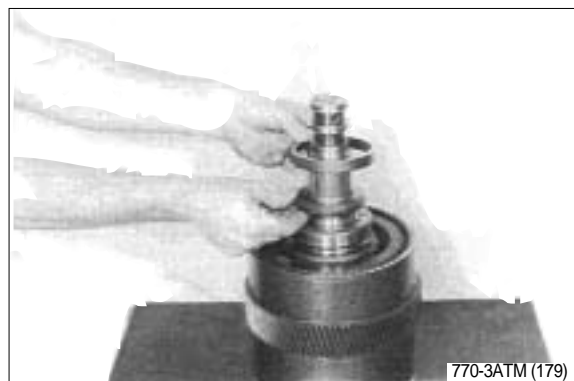


Pull off spur gear K1.
Now, squeeze circlip out and drive ball bearing out of the spur gear bore.

- ※ Special tool
- Three-leg puller 5870 971 003

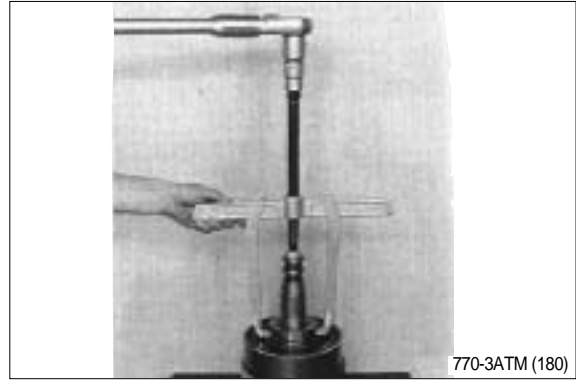


Remove both rings.



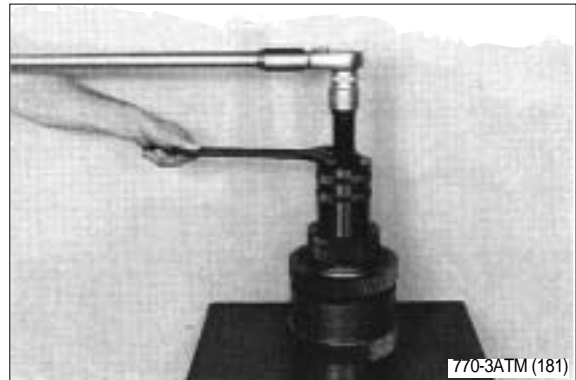
Pull off second ball bearing(Spur gear bearing).

- ※ Special tool
Two-leg puller 5870 970 006



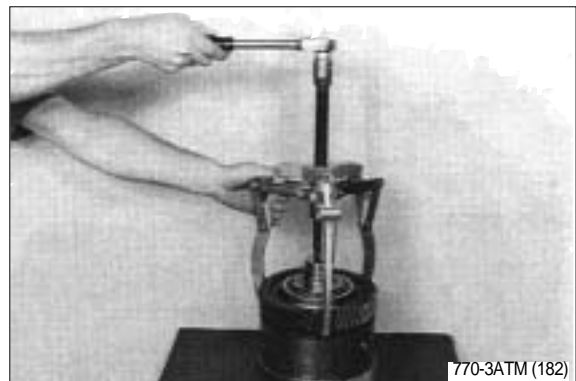
③① On the opposite side, pull off tapered roller bearing.

- ※ Special tool
Grab sleeve(Super) 5873 001 037
Basic set 5873 001 000



③② Pull spur gear KV from the shaft.
Remove released bearing inner race,
disassemble both bearing outer races
and circlip.

- ※ Special tool
Three-leg puller 5870 971 003



③③ Remove adjusting ring.



③④ Pull off tapered roller bearing(Spur gear bearing).

※ Special tool

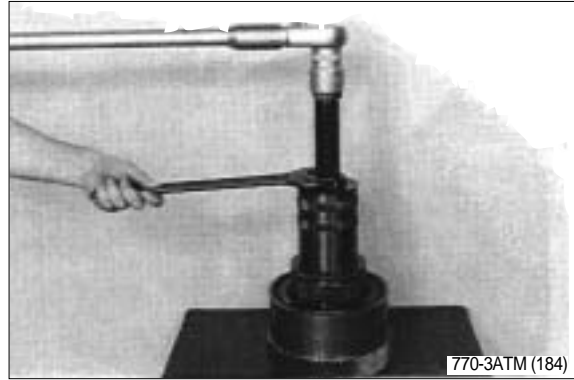
Grab sleeve(Super) 5873 002 035

Basic set 5873 002 001

Now, remove plate pack KV and K1 as well as compression springs and piston (Accordingly as at clutch K3/K4).

※ Special tool

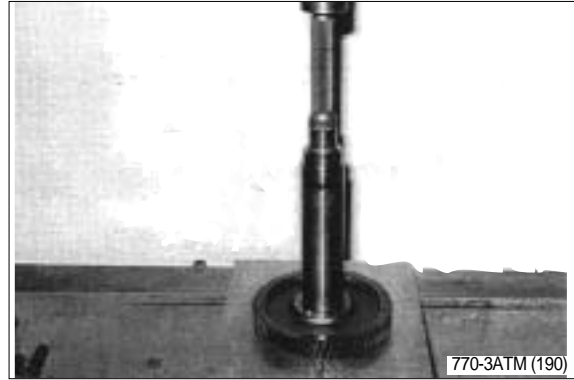
Pressure piece 5870 345 072



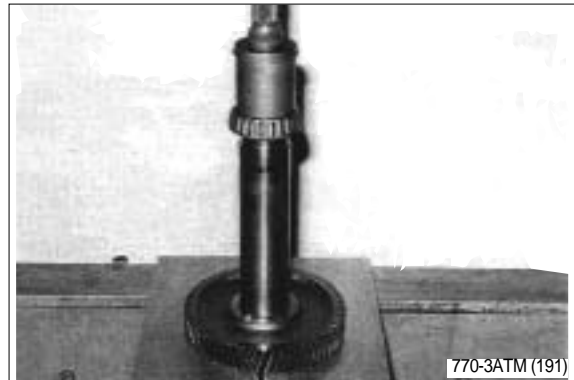
2) REASSEMBLY

(1) Power take-off II

- ① Undercool shaft(About 80°C), heat gear (About 120°C) and assemble, respectively press it against shoulder.



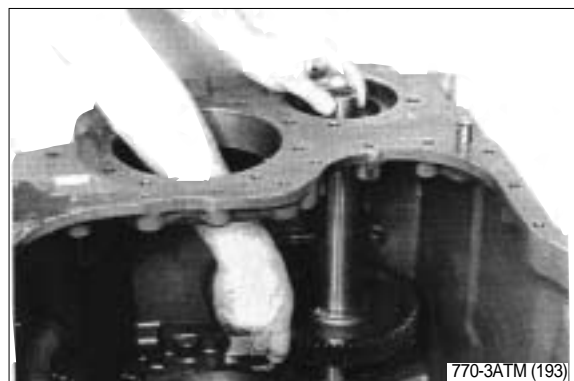
- ② Press bearing inner race against shoulder.
Press opposite bearing inner race against shoulder until contact is obtained.



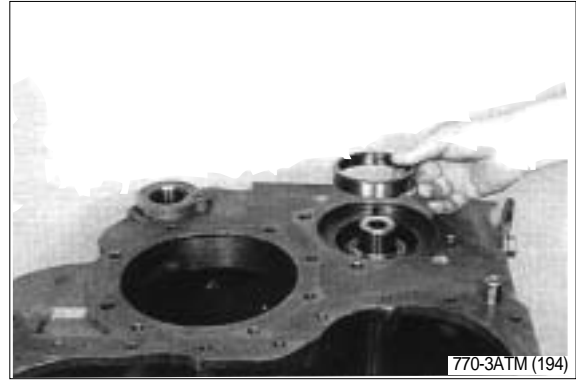
- ③ Insert bearing outer race(Arrow) into the housing bore until contact is obtained.



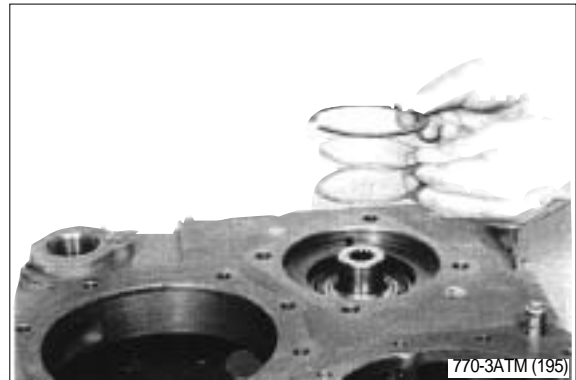
- ④ Position preassembled Pto-shaft in the housing.



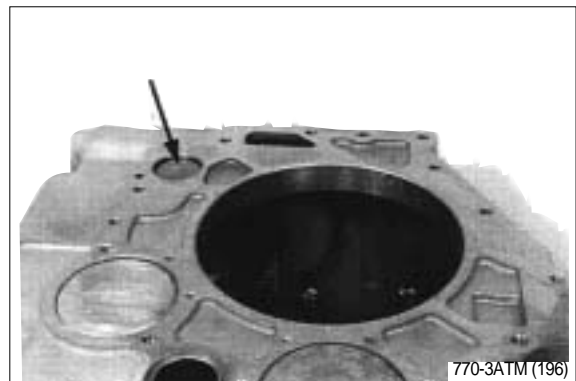
- ⑤ Insert bearing outer race until contact is obtained-bearing must be playfree.



- ⑥ Adjust Pto-bearing playfree, using disk and circlip.
 ※ Special tool
 Set of pliers 5870 900 013

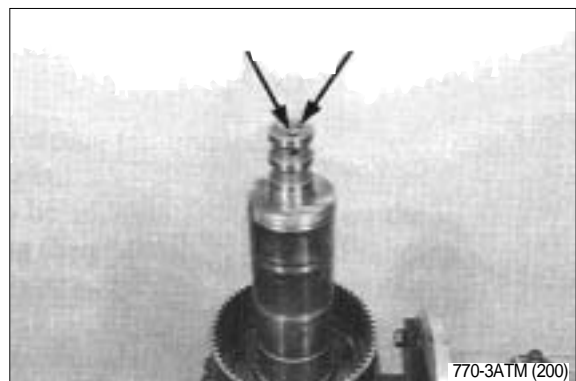


- ⑦ Tilt gearbox housing 180°.
 Insert sealing disk(Arrow) into the housing bore until contact is obtained.
 ※ Cover contact surfaces with loctite(Type No.262).
 ※ Do not damage the centric orifice hole \varnothing 0.8mm at the installation of the sealing disk.



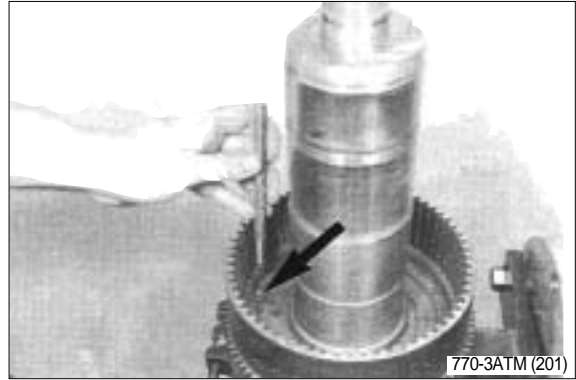
(2) Multi disk clutch K3/K4

- ① Fix plate carrier by means of clamping ring.
 Close both bores(Arrows) by means of set screws.
 ※ Insert set screws with loctite(Type No.262).
 ※ Special tool
 Clamping ring 5870 654 022

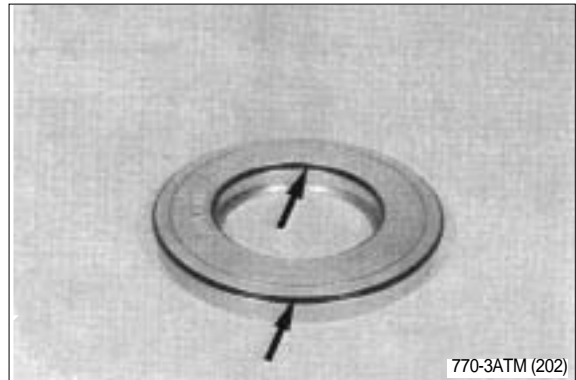


Clutch K3

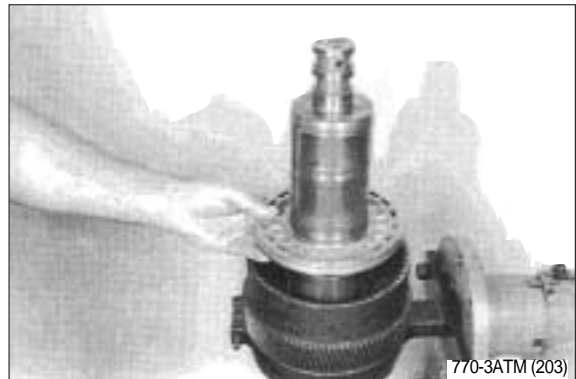
- ② Insert purge valve(Arrow) until contact is obtained.



- ③ Insert both O-ring scrollfree into the ring grooves of the piston, see arrows.



- ④ Oil O-rings and piston race, and insert piston until contact is obtained.
※ Pay attention to the installation position of the piston, see figure.



- ⑤ Install disk(Arrow) and compression spring.



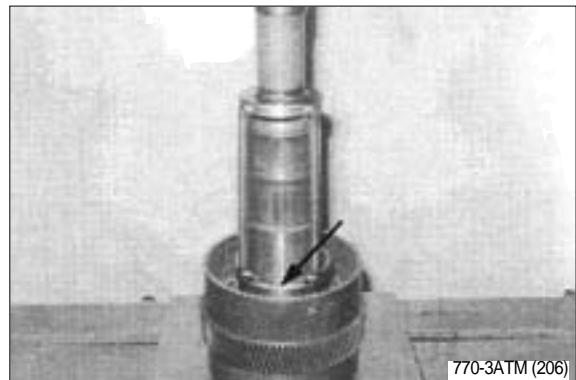
⑥ Lay guide ring upon the compression spring and assemble snap ring(Figure on the right).

※ Pay attention to the installation position of the guide ring install chamfer(Arrow) showing upward.

Now, preload compression spring by means of special device and fix it by engaging the snap ring(Arrow), see figure.

※ Special tool

Pressure piece 5870 345 072



General instructions for the plate installation

In principle, the stacking of the outer and inner plates has to be carried out alternately.

The piston side has to be started with a one sided coated outer plate.

At clutch KR and KV, a one sided coated outer plate has to be additionally installed on the end shim side. The uncoated side must be always installed facing the piston, respectively the end shim.

At plates with different thickness(Inner plates), the thinner plates must be installed on the end shim side.

The respective clutch side can be identified on the length of the plate carrier, see draft/ dimension X.

Install plate pack K3, see draft as well as figure(⑦), Example A:

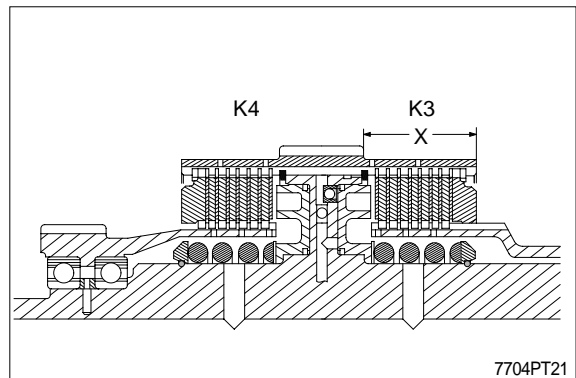
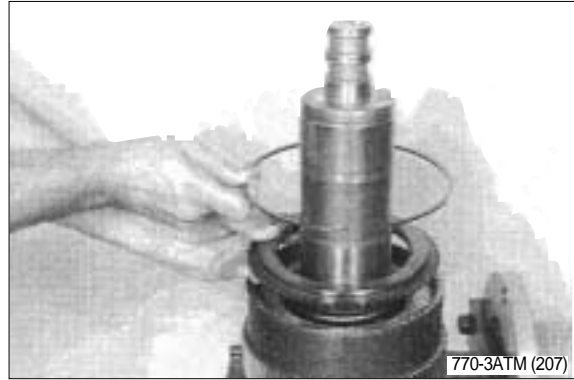


Plate arrangement K3(Long plate carrier side):

Active number of the friction surface = 14

1 Outer plate(One sided coated)	
7 Outer plates	s = 2.5mm
3 Inner plates	s = 3.5mm
3 Inner plate	s = 3.0mm
1 Inner plate(Optional)	s = 2.0~4.0mm

- ⑦ Install plate pack, mount end shim and fix it by means of snap ring.

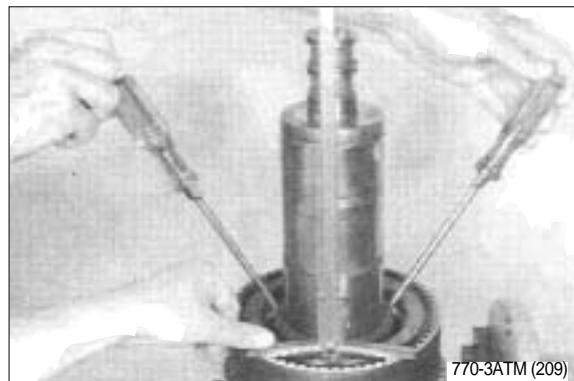


Check plate clearance $K3 = 2.2\sim 2.4\text{mm}$
(See figure, Example A):

- ⑧ Determine dimension I from the end face of the plate carrier to the end shim.
· Dimension I e.g. 2.40mm



- ⑨ Position end shim against snap ring (Toward upward) until contact is obtained and determine dimension II.
· Dimension II e.g. 0.20mm



Example A

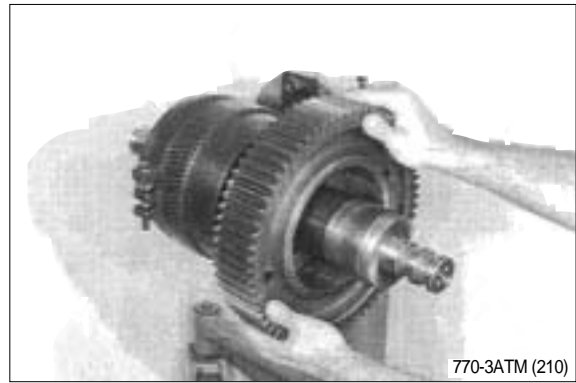
Dimension I e.g.	2.40mm
Dimension II e.g.	- 0.20mm
Difference = Plate clearance	<u>2.20mm</u>

- ※ In case of a deviation from the required plate clearance, correction can be carried out with corresponding inner plate (Optional $s=2.0\sim 4.0\text{mm}$) or with different snap rings (Figure ⑦).
Pay attention to the note, page 3-105.

⑩ Tilt clutch into horizontal position and introduce spur gear K3 until all inner plates are accommodated.

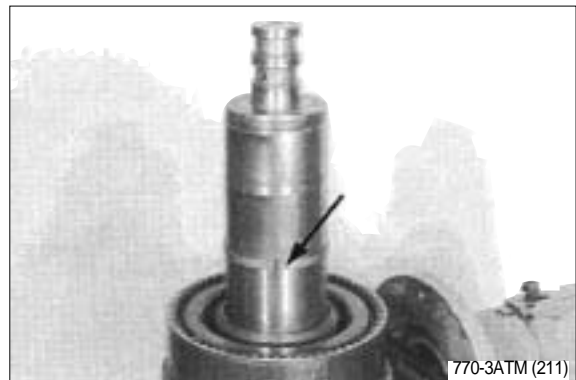
※ This step will facilitate the later spur gear installation.

Now, tilt clutch again into vertical position and pull spur gear carefully out of the plate pack.



⑪ Insert split ring(Arrow) with grease into the recess.

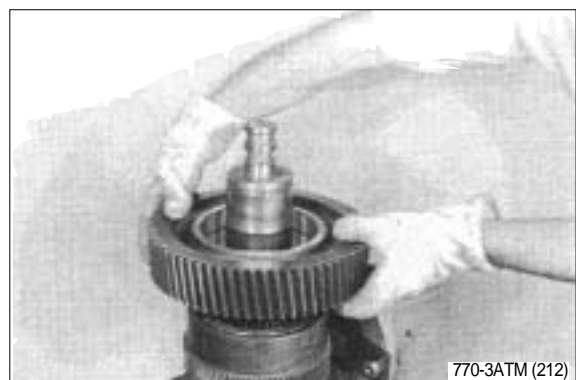
※ Pay attention to the exact contact of the split ring in the bottom of the recess.



※ Carry out the following steps of figure ⑫ and ⑬ immediately in chronological order to prevent a cooling down of the heated components.

Heat bearing bore of spur gear(Figure ⑬) as well as bearing inner race of the roller bearing(Figure ⑭) to about 120°C.

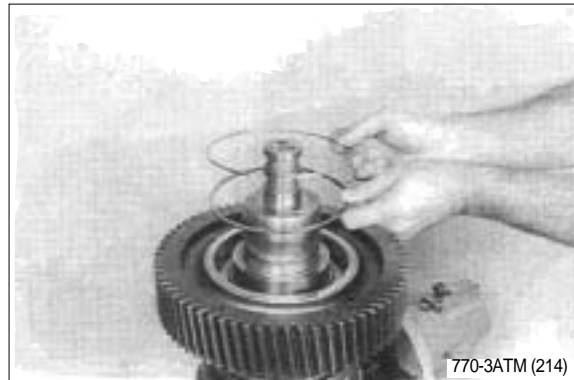
⑫ Introduce heated spur gear until all inner plates are accommodated.



- ⑬ Insert heated bearing inner race until contact is obtained.



- ⑭ Introduce disk, lift spur gear slightly and squeeze snap ring into the annular groove of the spur gear.



- ⑮ Install angle ring, with the stepped face facing the snap ring.



- Introduce bearing inner race and mount flange disk.
- ※ Install flanged disk, with the chamfer on the inner diameter showing upward.



- Heat bearing inner race and place it against shoulder.



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Clutch K4

Install purge valve, piston and compression spring accordingly as at clutch K3(Figure ②~⑥/page 3-104, 105). Install plate pack K4 and check plate clearance.

Plate arrangement K4(Short plate carrier side)

Active number of the friction surfaces = 12

1 Outer plate(One sided coated)

6 Outer plates $s = 2.5\text{mm}$

4 Inner plates $s = 3.5\text{mm}$

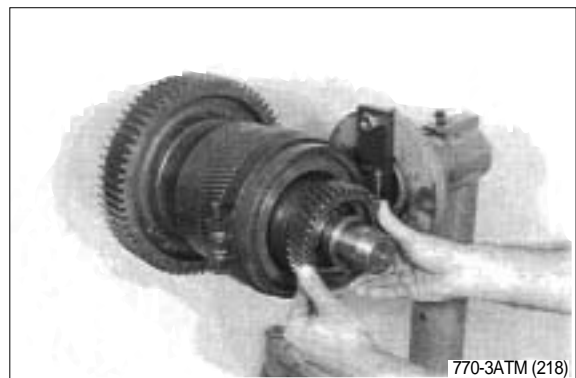
1 Inner plate $s = 3.0\text{mm}$

1 Inner plate(Optional) $s = 2.0\sim 4.0\text{mm}$

- ※ Pay attention to the general instructions for the plate installation and draft/ page 3-105.

Check plate clearance K4 = 2.2~2.4mm accordingly as at clutch K3, see page 3-106.

- Tilt clutch into horizontal position and introduce spur gear K4 until all inner plates are accommodated.
- ※ This step will facilitate the later reassembly of the spur gear. Now, tilt clutch again into vertical position and pull spur gear carefully out of the plate pack.



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□ **Spur gear K4**

The following steps(Figure □~) are describing the reassembly of the spur gear bearing K4, version with ball bearing. At the version with tapered roller bearing, the reassembly has to be carried out accordingly as at spur gear KR.

In this connection, pay attention to steps of figure((1)~(10)/page 3-114~116).

Heat ball bearing and assemble it until contact is obtained, see figure .

- ※ Prior to install the spur gear(Figure □), cool ball bearing down to room temperature.



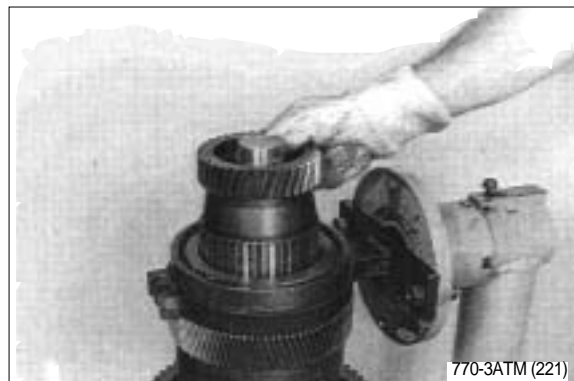
- Mount oil feed ring(Figure on the right).



- ※ Carry out steps of figure and in immediate sequence, to prevent a cooling down of the components.

Heat bearing bore of the spur gear (Figure) and ball bearing(Figure) to about 120°C.

Introduce heated spur gear until all inner plates are accommodated.



Insert heated ball bearing until contact is obtained.



Heat tapered roller bearing and assemble it until contact is obtained.

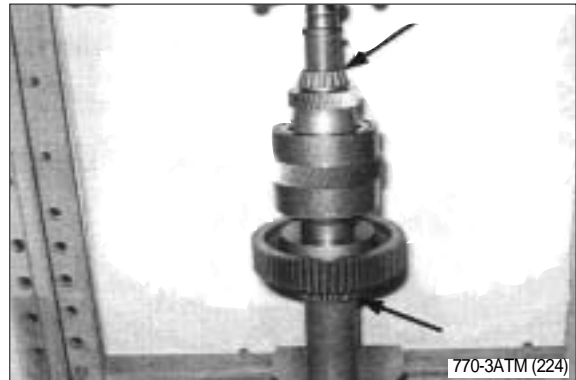


Preload complete clutch pack through both bearing inner races (Arrows) with 100000N (10ton).

In this way, the exact contact of the components, respectively the setting of the complete bearing is ensured.

※ Special tool

Pressure pieces 5870 506 096



Mount disk.

Wet thread of the slotted nut with loctite (Type No.262) and install slotted nut with the chamfer showing downward (Figure on the right).



Tighten slotted nut.

· Torque limit : 56kgf · m (550Nm)

※ Special tool

Hook spanner 5870 401 115

Hook spanner 5870 401 118



Tilt clutch 180° (K3 side).

Wet thread of the slotted nut with loctite (Type No.262) and install slotted nut with the chamfer showing downward.

· Torque limit : 82kgf · m(800Nm)

※ Special tool

Hook spanner 5870 401 110



Check function of the clutches by means of compressed air

For this purpose, squeeze rectangular rings in, engage them and assemble bearing cover.

※ At correctly installed components, the closing, respectively opening of the clutches is clearly audible.

Now, remove bearing cover again.



3) PREASSEMBLE MULTI DISK CLUTCH KR/K2

Install purge valves, piston and compression spring(Each clutch side 1 set of the components) accordingly as at multi-disk clutch K3(Figure ②~⑥/page 3-104, 105).

Install plate pack KR and K2 check plate clearance, see also right draft.

Plate arrangement KR(Long plate carrier side):

Active number of the friction surfaces = 24

2 Outer plate(One sided coated)

11 Outer plates $s = 2.5\text{mm}$

11 Inner plates $s = 2.5\text{mm}$

1 Inner plate(Optional) $s = 2.0\sim 4.0\text{mm}$

※ Pay attention to the general instructions for the plate installation, page 3-105.

Check plate clearance KR = 2.8~3.0mm accordingly as at clutch K3, see page 3-106.

Plate arrangement K2(Short plate carrier side):

Active number of the friction surfaces = 24

1 Outer plate(One sided coated)

7 Outer plates $s = 2.5\text{mm}$

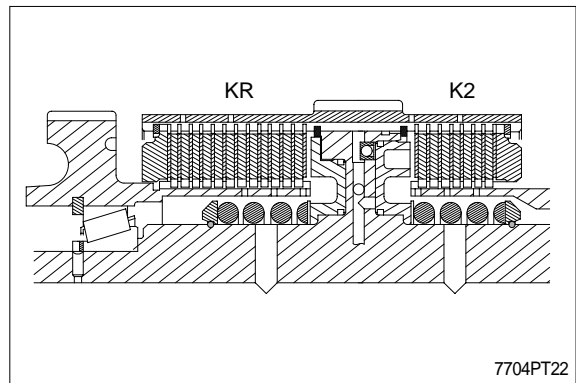
3 Inner plates $s = 3.5\text{mm}$

3 Inner plates $s = 3.0\text{mm}$

1 Inner plate(Optional) $s = 2.0\sim 4.0\text{mm}$

※ Pay attention to the general instructions for the plate installation, page 3-105.

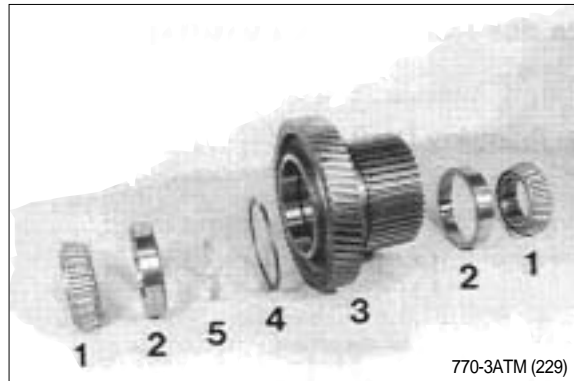
Check plate clearance K2 = 2.2~2.4mm accordingly as at clutch K3, see page 3-106.



(1) Spur gear KR

Components:

- 1 Bearing inner race
- 2 Bearing outer race
- 3 Spur gear
- 4 Circlip
- 5 Adjusting ring(Optional)



(2) Determine axial play of the spur gear bearing 0.03~0.08mm(Example B):

Squeeze circlip(4) in and place bearing outer race(2) against shoulder.

※ Special tool

Driver 5870 058 021

Handle 5870 260 002



(3) Place spur gear upon the bearing inner race.

※ Support bearing inner race.



(4) Measure dimension I from the end face of the bearing inner race.

· Dimension I e.g. 24.95mm

※ Special tool

Digital depth gauge 5870 200 072

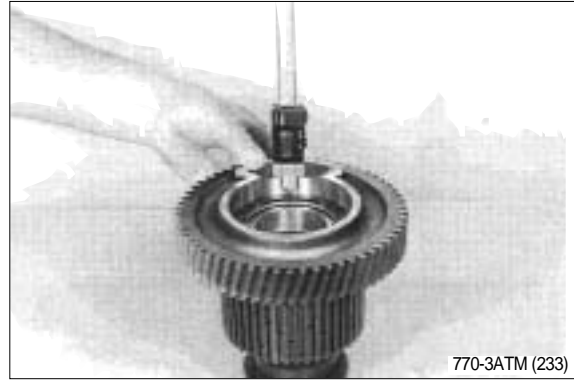


(5) Measure dimension II from the end face of the circlip.

· Dimension II e.g. ----- 20.85mm

※ Special tool

Digital depth gauge 5870 200 072

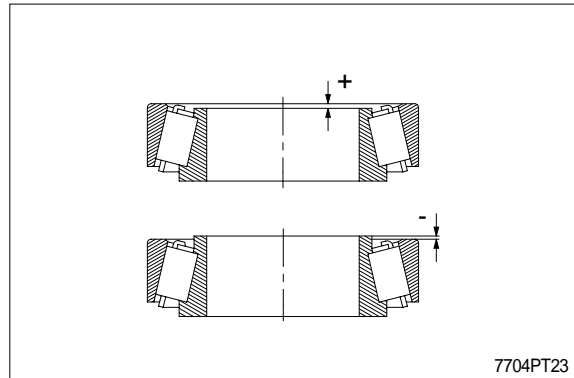


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(6) Determine differential dimension from bearing outer race to bearing inner race on the upper tapered roller bearing.

※ The draft on the right shows two tapered roller bearings with different measuring results.

· Dimension III (Differential dimension) in the actual case e.g. ----- + 0.15mm



7704PT23

Example B

Dimension I 24.95mm

Dimension II - 20.85mm

Intermediate result 4.10mm

Dimension III + 0.15mm

※ Result = Differential dimension - Zero

4.25mm

Required axial play(0.03-0.08) + 0.05mm

Result = Adjusting ring $s = 4.30\text{mm}$

Select adjusting ring with corresponding thickness.



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(7) Check axial play

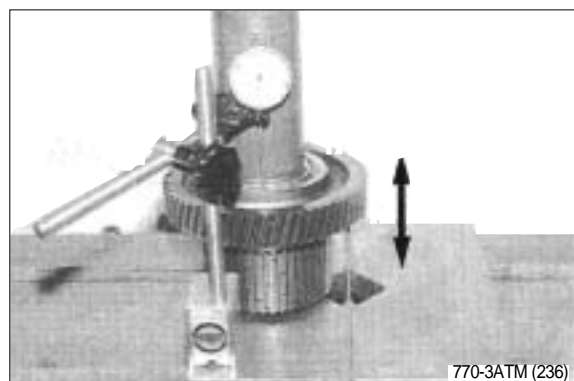
Install upper bearing outer race.

Insert adjusting ring e.g. $s = 4.30\text{mm}$ and bearing inner race.

Preload spur gear bearing with about 50000N(5ton).

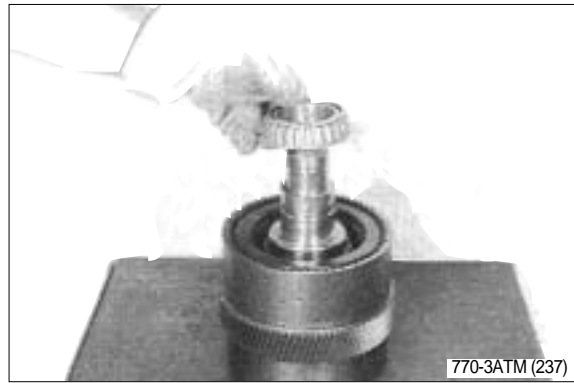
Determine axial play.

※ At deviations from the required axial play 0.03~0.08mm, correct with corresponding adjusting ring.



770-3ATM (236)

- (8) Heat lower tapered roller bearing and assemble it until contact is obtained.



- (9) Introduce spur gear KR into the preassembled plate carrier until all inner plates are accommodated.

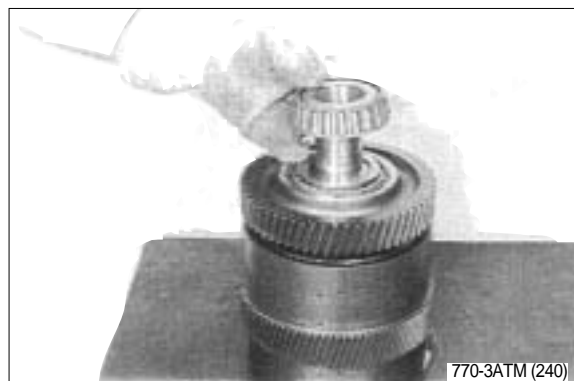


- (10) Assemble adjusting ring e.g. $s=4.30\text{mm}$
(See Example B):

- ※ Pay attention to the installation position oil feed grooves are showing upward.
- Now, heat upper bearing inner race (Spur gear bearing) and assemble it until contact is obtained.



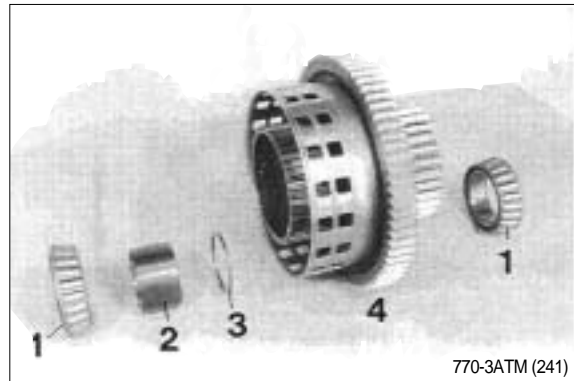
- (11) Heat bearing inner race (Clutch bearing) and assemble it until contact is obtained.



(12) Spur gear K2

Components:

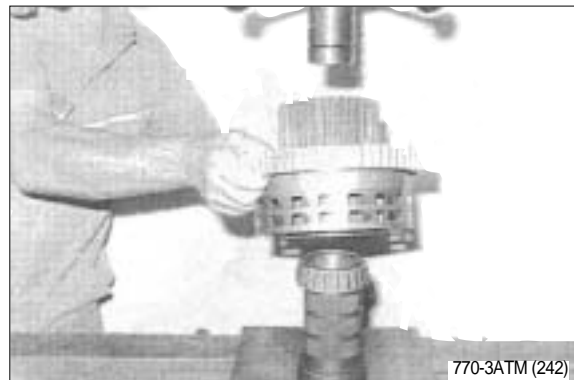
- 1 Tapered roller bearing
- 2 Bush
- 3 Shim
- 4 Spur gear



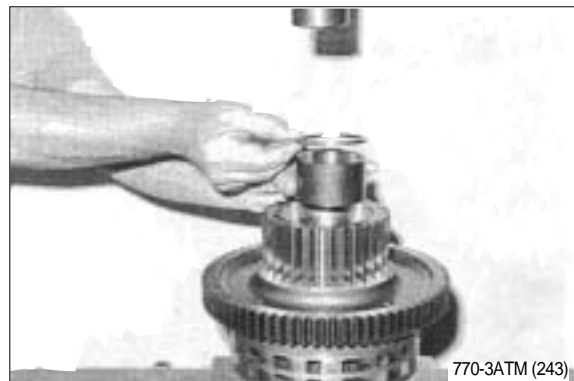
**(13) Adjust axial play of the spur gear bearing
0.05~0.15mm(Figure (13)~(16)):**

Place spur gear upon the bearing inner race.

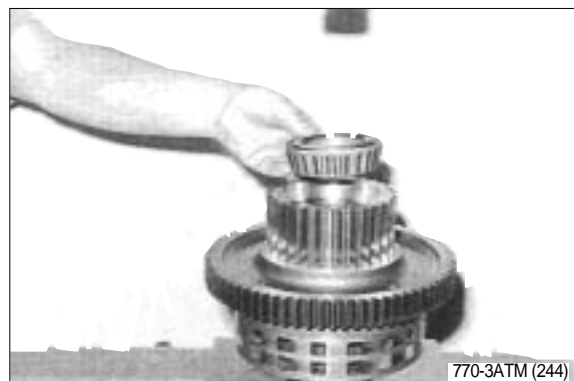
- ※ Support bearing inner race.



**(14) Introduce bush as well as shim(s=3.80mm/
empirical value) and align it centrally.**



(15) Install upper tapered roller bearing.



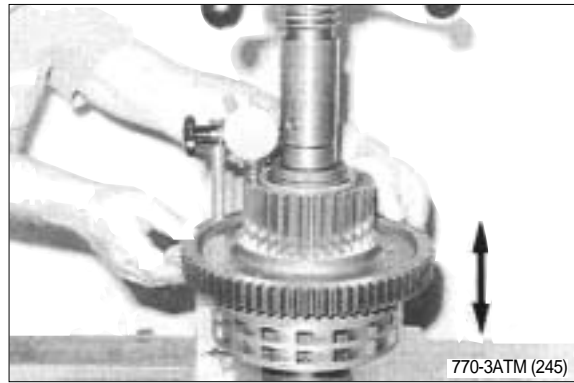
(16) Preload spur gear bearing with about 50000N(5ton) and determine axial play.

※ At a deviation from the required axial play 0.05~0.15mm, correct with corresponding shim(Figure (12)/page 3-117).

※ Special tool

Magnetic stand 5870 200 055

Dial indicator 5870 200 057



(17) Heat bearing inner race and assemble it until contact is obtained.



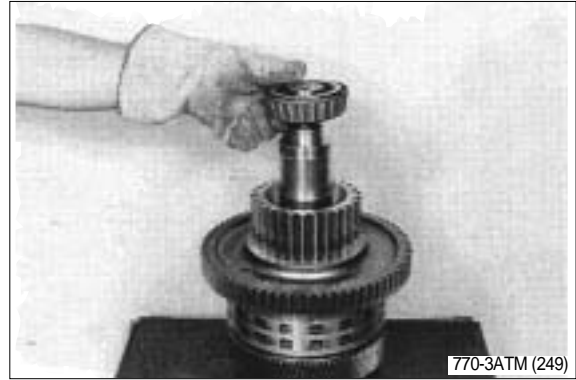
(18) Introduce spur gear K2 until all inner plates are accommodated.



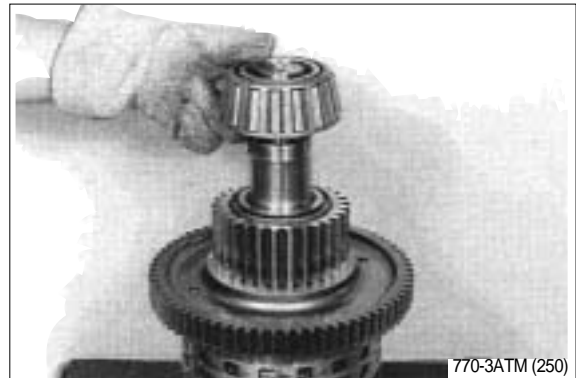
(19) Install bush and corresponding shim.



- (20) Heat second tapered roller bearing of the spur gear bearing and assemble it until contact is obtained.



- (21) Heat bearing inner race(Clutch bearing) and place it against shoulder.



- (22) Proload complete clutch pack through both bearing inner race(Arrows) with 100000N(10ton).

In this way, an exact contact of the components, respectively the settling of the complete bearing is ensured.

※ Special tool

Pressure pieces 5870 506 096



- (23) Install and tighten both slotted nuts.

· Torque limit : 82kgf · m(800Nm)

※ Pay attention to the installation position of the slotted nuts, chamfer is always facing the bearing inner race.

Secure slotted nuts with loctite(Type No.262).

※ Special tool

Clamping ring 5870 654 022

Hook spanner 5870 401 099

Hook spanner 5870 401 118

Hook spanner 5870 401 115



4) PREASSEMBLE MULTI DISK CLUTCH KV/K1

Install purge valves, piston and compression spring(Each clutch side 1 set of the components) accordingly as at multi-disk clutch K3(Figure ~ /page 3-104, 105).
Install plate pack KV and K1 and check plate clearance, see also right draft.

Plate arrangement KV(Long plate carrier side):

Active number of the friction surfaces = 24

2 Outer plate(One sided coated)

11 Outer plates $s = 2.5\text{mm}$

11 Inner plates $s = 2.5\text{mm}$

1 Inner plate(Optional) $s = 2.0\sim 4.0\text{mm}$

Pay attention to the general instructions for the plate installation, page 3-105.

Check plate clearance KV = 2.8~3.0mm accordingly as at clutch K3, see page 3-106.

Plate arrangement K1(Short plate carrier side):

Active number of the friction surfaces = 14

1 Outer plate(One sided coated)

7 Outer plates $s = 2.5\text{mm}$

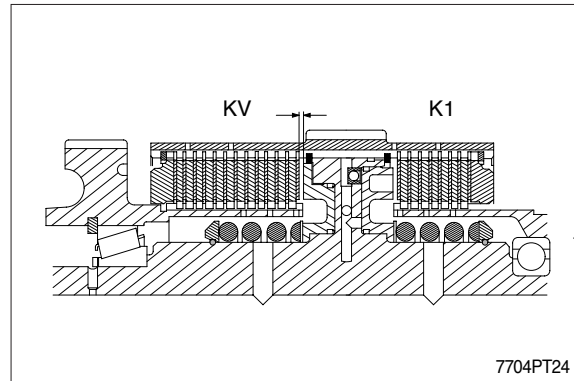
3 Inner plates $s = 3.5\text{mm}$

3 Inner plates $s = 3.0\text{mm}$

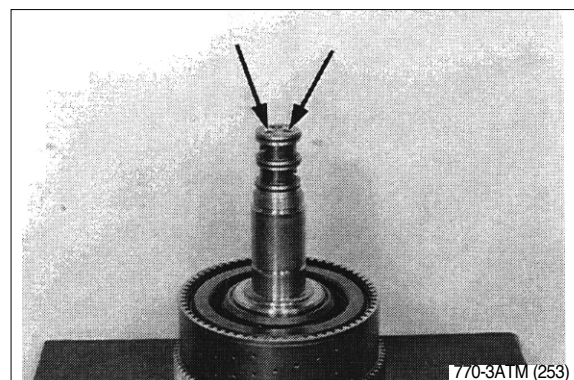
1 Inner plate(Optional) $s = 2.0\sim 4.0\text{mm}$

Pay attention to the general instructions for the plate installation, page 3-105.

Check plate clearance K1 = 2.2~2.4mm accordingly as at clutch K3, see page 3-106.



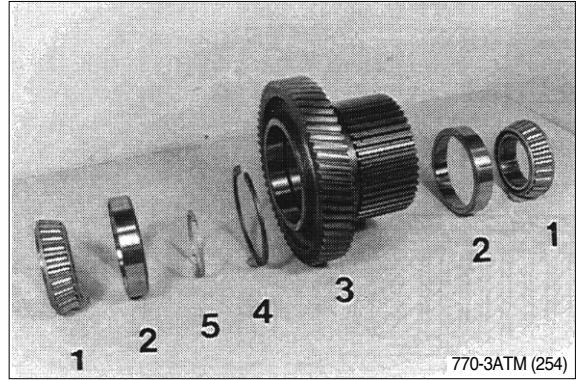
- (1) Close both bores(Arrows) by means of set screws.
Insert set screws with loctite(Type No.262).



(1) Spur gear-KV

Components:

- 1 Bearing inner race
- 2 Bearing outer race
- 3 Spur gear
- 4 Circlip
- 5 Ring(Optional)



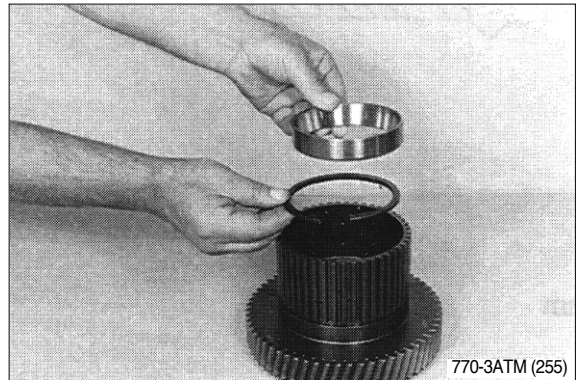
(2) Determine axial play of the spur gear bearing 0.03~0.08mm(Example C):

Squeeze circlip(4) in and place bearing outer race(2) against shoulder.

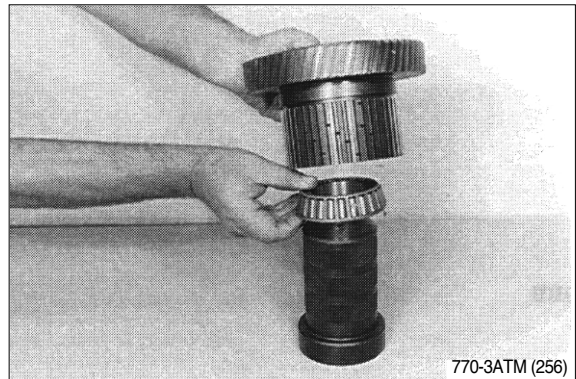
Special tool

Driver 5870 058 021

Handle 5870 260 002



(3) Place spur gear upon the bearing inner race. Support bearing inner race.

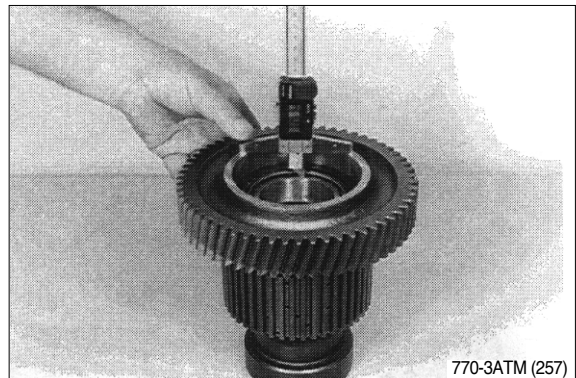


(4) Measure dimension from the end face of the bearing inner race.

· Dimension e.g. 24.95mm

Special tool

Digital depth gauge 5870 200 072

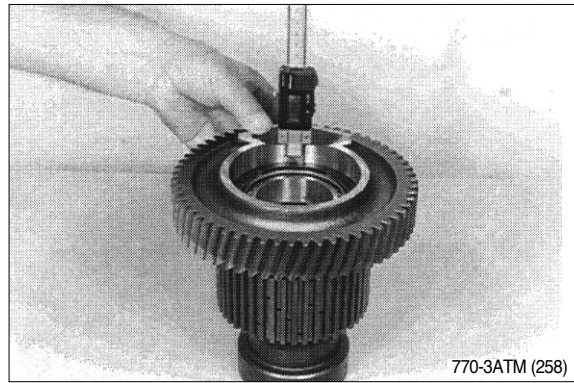


(5) Determine dimension from the end face of the circlip.

· Dimension e.g. 20.85mm

Special tool

Digital depth gauge 5870 200 072



(6) Determine differential dimension from bearing outer race to bearing inner race on the upper tapered roller bearing.

The draft on the right shows two tapered roller bearings with different measuring results.

· Dimension (Differential dimension) in the actual case e.g. + 0.15mm

Example C

Dimension 24.95mm

Dimension - 20.85mm

Result A 4.10mm

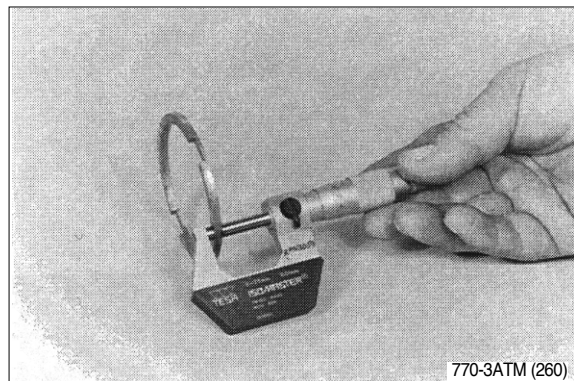
Dimension + 0.15mm

Result = Differential dimension - Zero
4.25mm

Required axial play(0.03-0.08) + 0.05mm

Result = Adjusting ring s = 4.30mm

Select adjusting ring with corresponding thickness.



(7) Check axial play

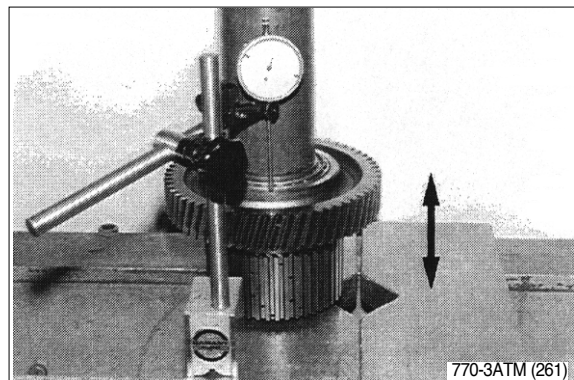
Install upper bearing outer race.

Insert adjusting ring e.g. s = 4.30mm and bearing inner race.

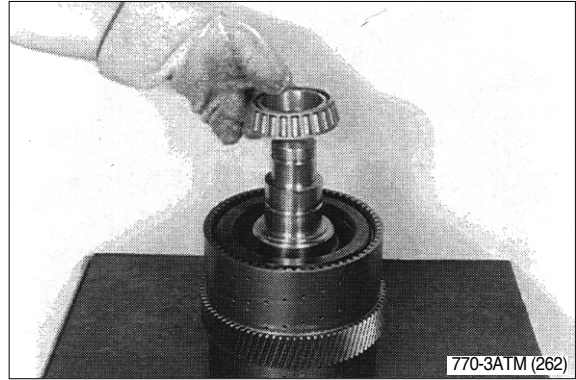
Preload spur gear bearing with about 50000N(5ton).

Determine axial play.

At deviations from the required axial play 0.03~0.08mm, correct with corresponding adjusting ring.



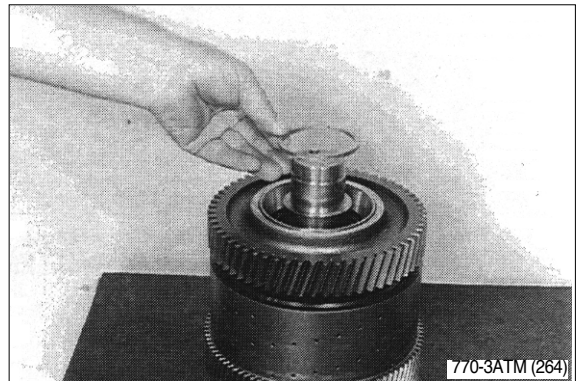
- (8) Heat lower bearing inner race and assemble it until contact is obtained.



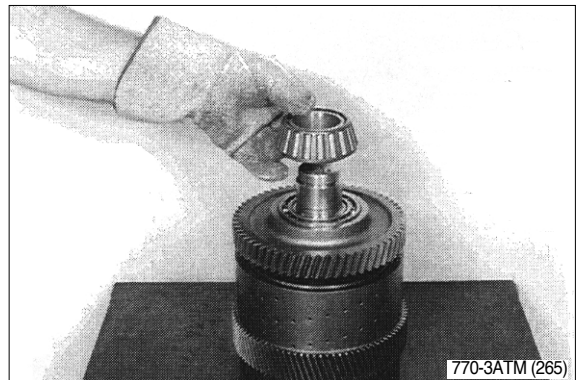
- (9) Introduce spur gear KR into the preassembled plate carrier until all inner plates are accommodated.



- (10) Assemble adjusting ring e.g. $s=4.30\text{mm}$ (See Example C).
Pay attention to the installation position oil feed grooves are showing upward.
Now, heat upper bearing inner race (Spur gear bearing) and assemble it until contact is obtained.

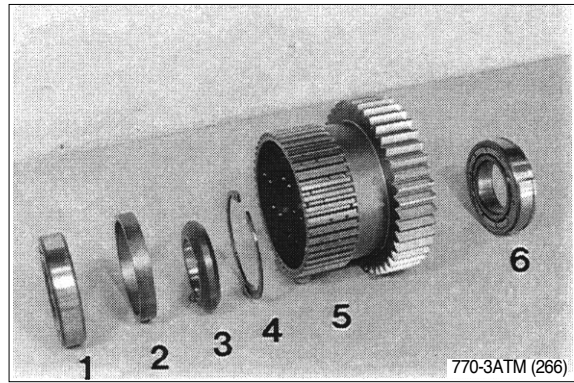


- (11) Heat bearing inner race (Clutch bearing) and assemble it until contact is obtained.



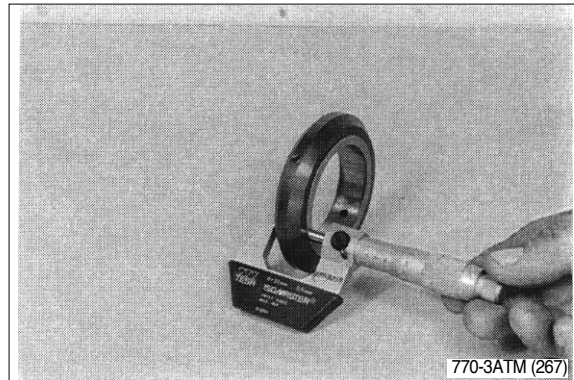
(12) Spur gear K1

- 1 Ball bearing
- 2 Ring(Optional)
- 3 Splash ring
- 4 Circlip
- 5 Spur gear
- 6 Ball bearing



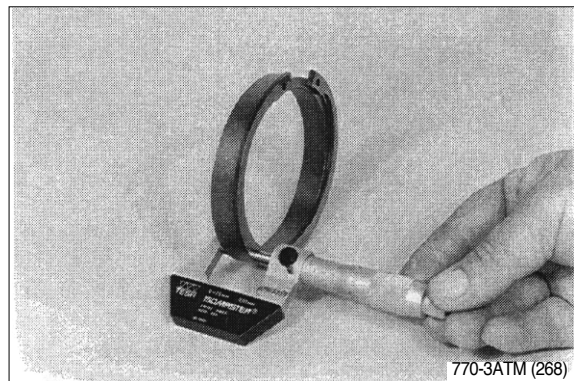
(13) Adjust axial play of the spur gear bearing 0.01~0.04mm

- Determine thickness of splash ring(3) e.g.
s=17.15mm



Total dimension of circlip 4 and ring 2 (Optional) must be selected 0.01~0.04mm thinner.

- Total dimension of circlip and ring therefore 17.14~17.11mm

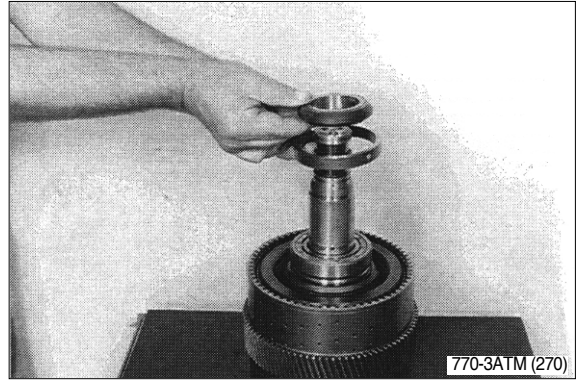


(14) Heat ball bearing and assemble it until contact is obtained.

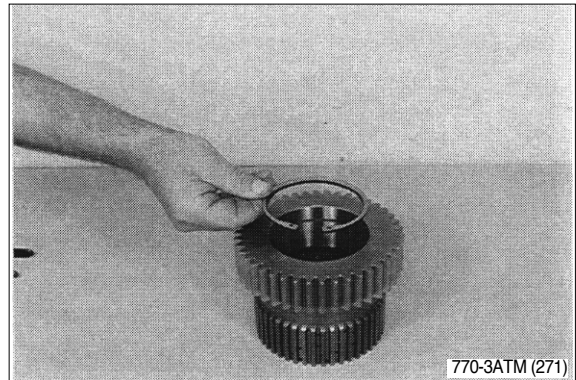
Now, cool ball bearing down to room temperature, to allow the later installation of the spur gear(Figure (17)/page 3-125).



(15) Assemble ring(Optional) and splash ring.

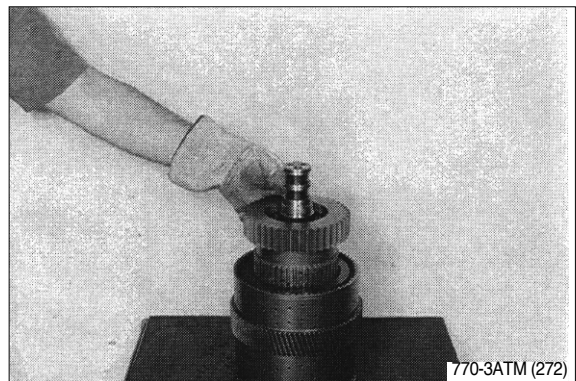


(16) Squeeze circlip into the annular groove of the spur gear.



Carry out steps of figure (17) and (18) in immediate sequence to prevent the cooling down of the components.

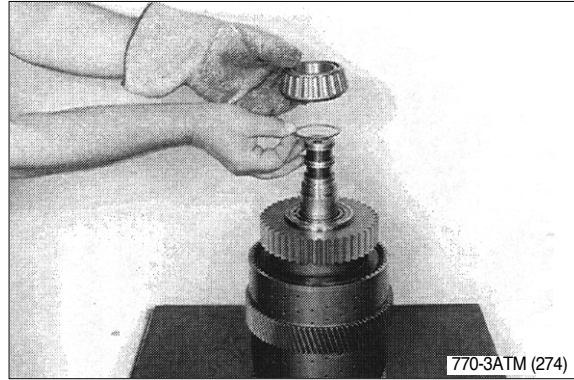
(17) Heat bearing bores of the spur gear (Figure on the right) and ball bearing (Figure (18)).
Introduce spur gear until all inner plates are accommodated.



(18) Introduce heated ball bearing until contact is obtained.



- (19) Assemble spacer(s=1.50mm).
Heat tapered roller bearing and place it against shoulder.

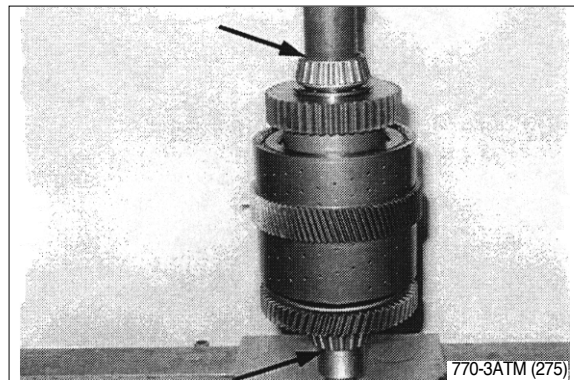


- (20) Preload complete clutch pack through both bearing inner races(Arrows) with 100000N(10ton).

In this way, an exact contact of the components, respectively the settling of the complete bearing is ensured.

Special tool

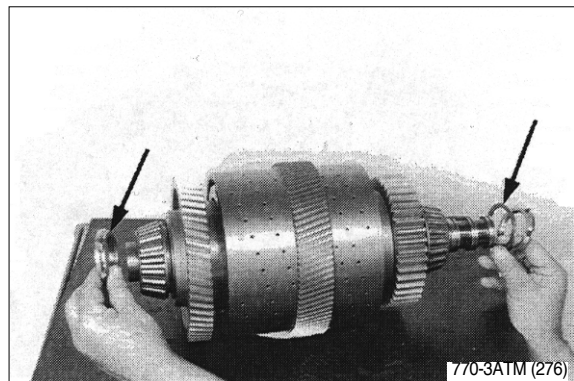
Pressure pieces 5870 506 096



- (21) Fix clutch pack by means of disks(Arrows) and slotted nuts.

Pay attention to the installation position of the slotted nuts, chamfer is always facing the bearing inner race.

Wet thread of the slotted nuts with loctite (Type No.262).



- (22) Tighten both slotted nuts.

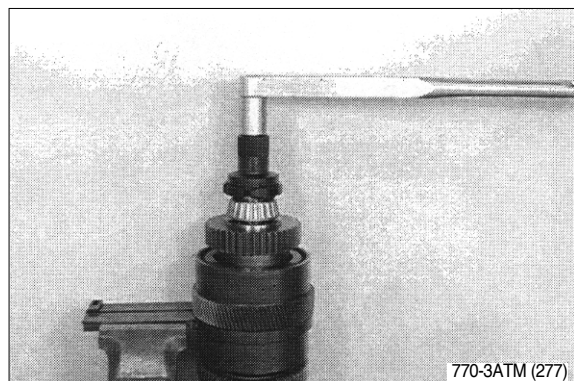
· Torque limit : 56kgf · m(550Nm)

Special tool

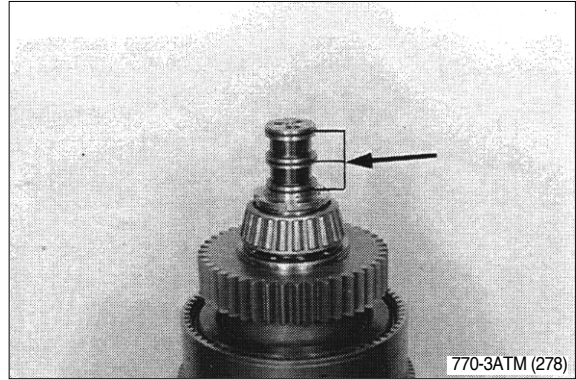
Clamping ring 5870 654 022

Hook spanner 5870 401 118

Hook spanner 5870 401 115



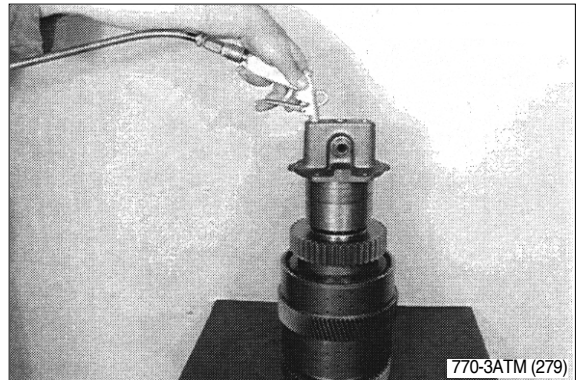
(23) Squeeze in and engage rectangular ring (3EA, See arrows).



(24) Assemble bearing cover and check function of the clutches by means of compressed air.

At correctly installed components, the closing, respectively opening of the clutches is clearly audible.

Now, remove bearing cover again.



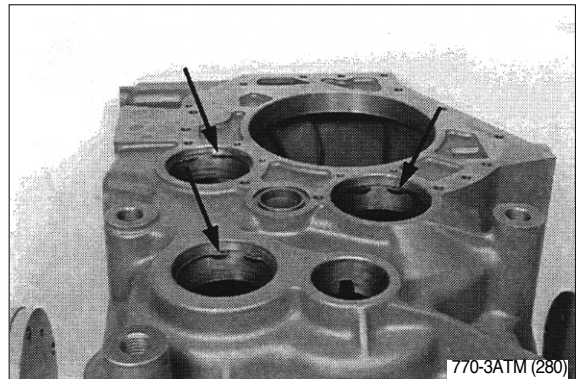
5) INSTALL MULTI DISK CLUTCHES, LAYSHAFT GEAR AND OUTPUT GEAR

(1) Squeeze circlips in, see arrows.

Special tool

Set of external snap ring pliers

5870 900 015



(2) Introduce spacer ring.



(3) Insert bearing outer race until contact is obtained.

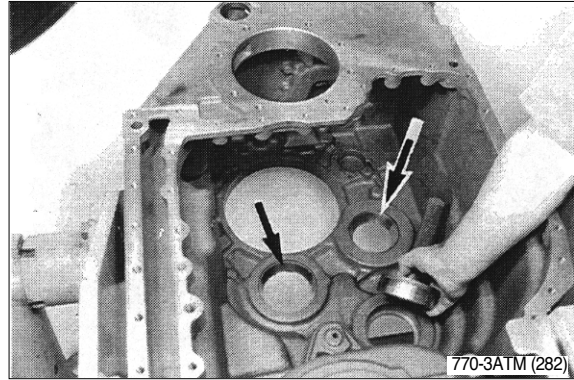
Install spacer rings, respectively bearing outer races of clutch KR/K2 and KV/K1 accordingly, see arrows.

Special tool

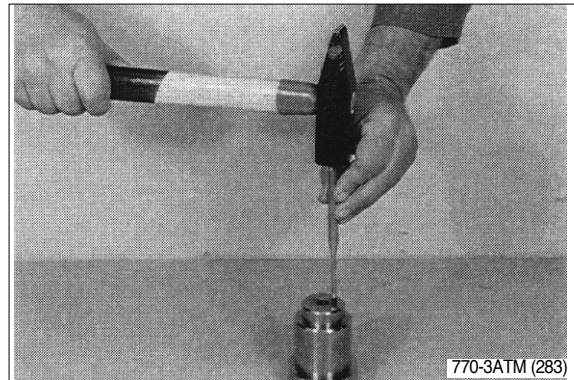
Driver 5870 058 078

Driver 5870 058 050

Handle 5870 260 002



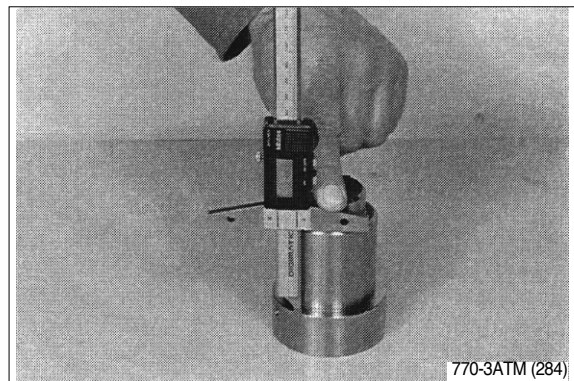
(4) Install roll pin.



(5) **Adjust axial play of the layshaft gear bearing = 0.0~0.05mm(Example D):**

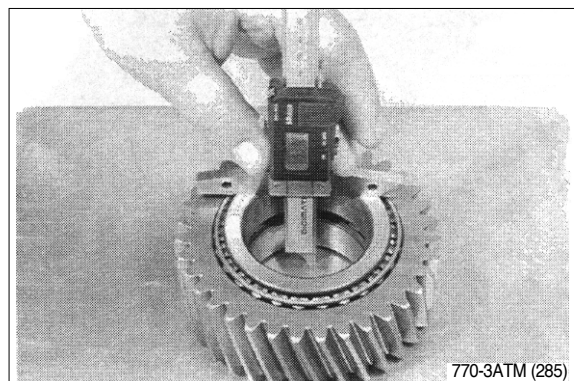
Determine dimension , see figure.

· Dimension e.g. 57.10mm



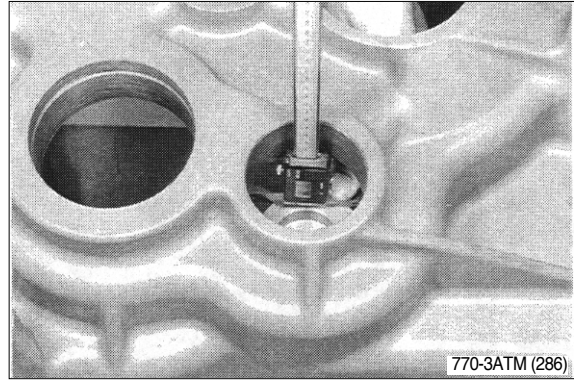
(6) Install both bearing inner races and determine dimension (Total height of the layshaft bearing).

· Dimension e.g. 53.95mm



- (7) Determine dimension from the contact face of the bearing inner race to the contact face of the axle.

· Dimension e.g. 0.60mm



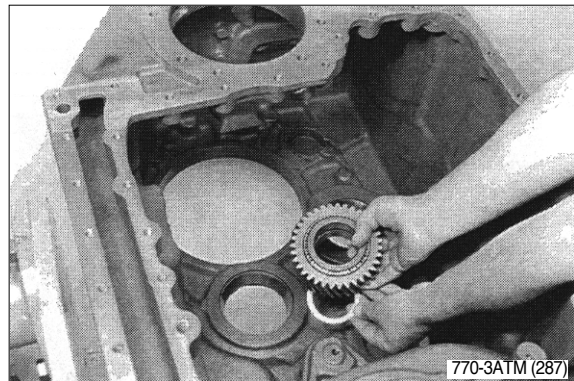
Example D

Dimension	53.95mm
Dimension	+ 0.60mm
Intermediate result A	54.55mm
Dimension	57.10mm
Intermediate result A	- 54.55mm
Result = Differential dimension - Zero	2.55mm

At a required axial play of 0.0~0.05mm, the shim has therefore to be selected thinner for max 0.05mm.

Shim thickness therefore 2.55~2.50mm

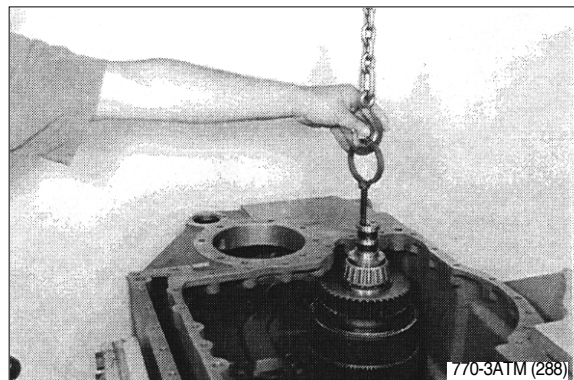
- (8) Position shim and layshaft gear.
The fixing of the layshaft gear can be carried out only after the installation of the clutch.



- (9) Position clutch KV/K1 by means of lifting device.

Special tool

Set of eye bolts 5870 204 002

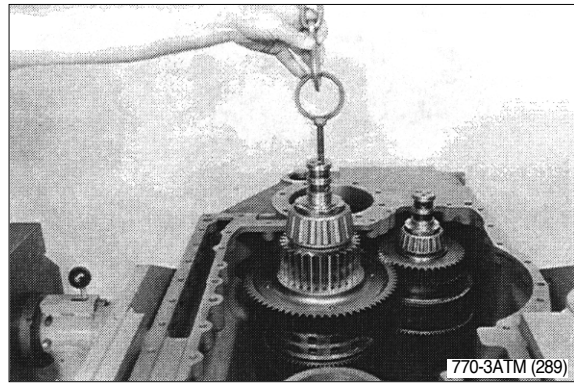


(10) Install clutch KR/K2.

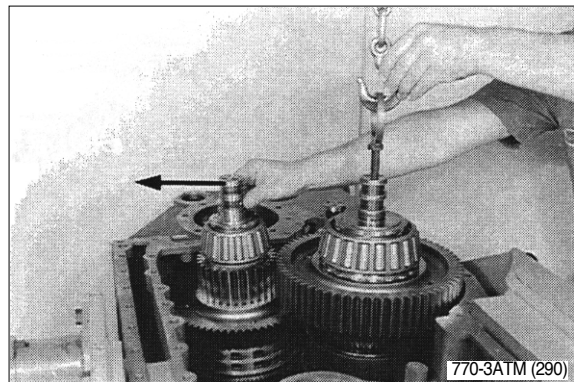
Special tool

Set of eye bolts

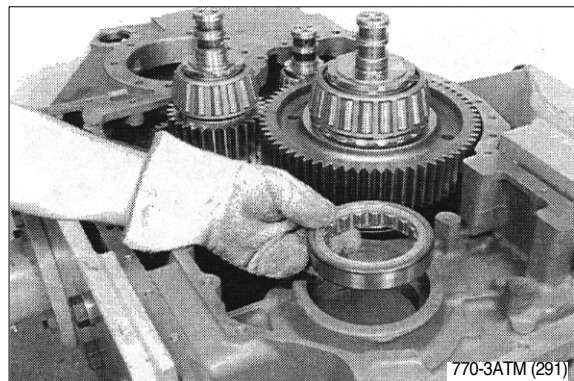
5870 204 002



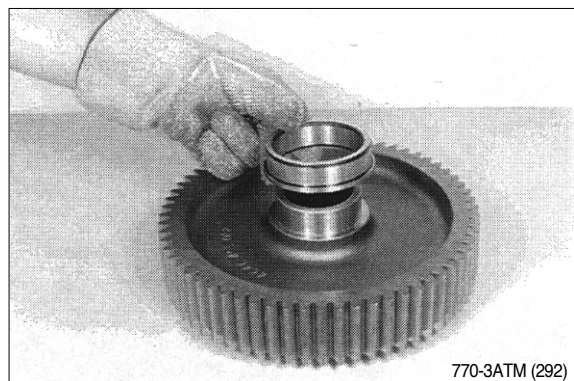
(11) Displace clutch KR/K2 in direction of arrow and position clutch K3/K4.



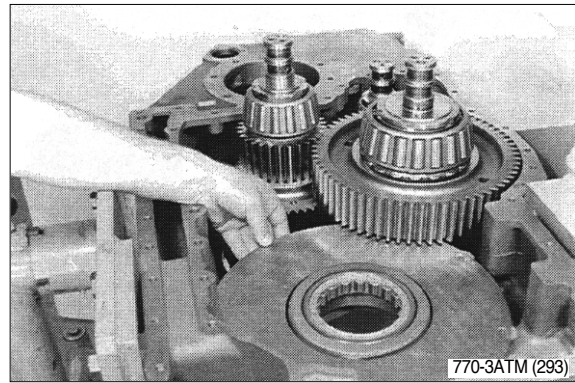
(12) Undercool bearing outer race and insert it into the housing bore until contact is obtained.



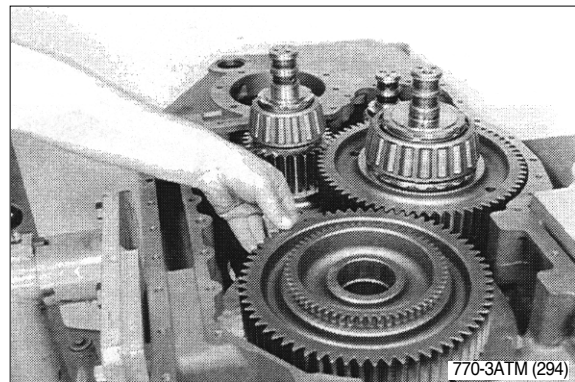
(13) Heat bearing inner race and assemble it until contact is obtained.



(14) Position oil baffle.

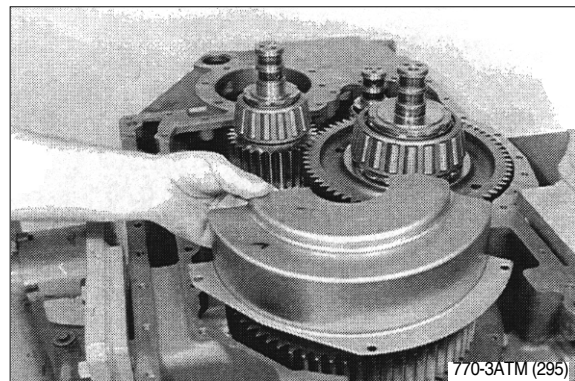


(15) Install output gear.



(16) Insert second oil baffle and fasten both plates by means of hexagon head screws (Mount plain washers).

- Torque limit(M8/8.8) : 2.3kgf · m(23Nm)
- Secure hexagon head screws with loctite (Type No.262).



(17) Undercool output shaft and introduce it until contact is obtained.
Pay attention to the installation position, see figure.



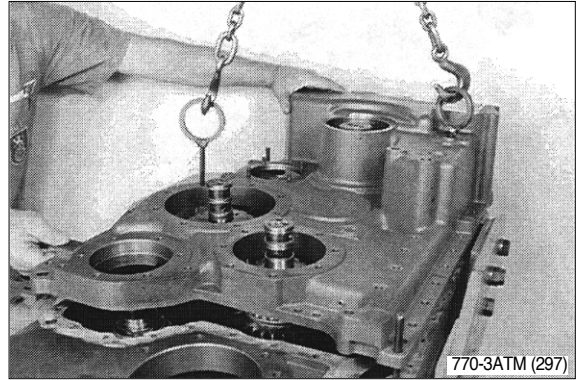
(18) Wet mounting face with sealing compound (Loctite, type No.574).

Install two adjusting screws and position housing cover by means of lifting device on the gearbox housing until contact is obtained.

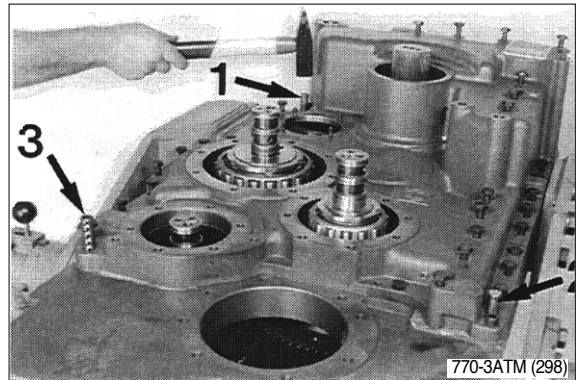
Special tool

Set of eye bolts 5870 204 002

Adjusting screws(M10) 5870 204 007



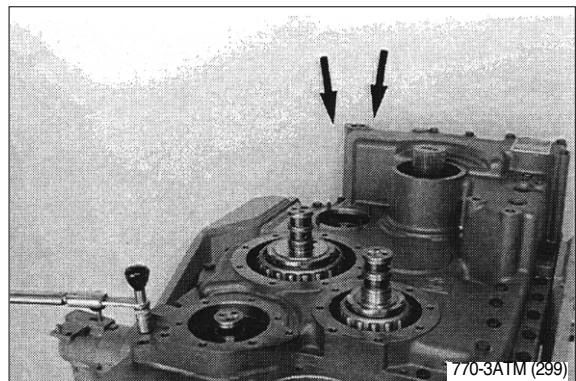
(19) Install both cylindrical pins(Arrow 1 and 2) and roll pin(Arrow 3).



(20) Fasten housing cover by means of socket head screws(2 pieces) and hexagon head screws.

· Torque limit(M10/8.8) : 4.7kgf · m(46Nm)

Pay attention to the position of the two socket head screws, see arrows.



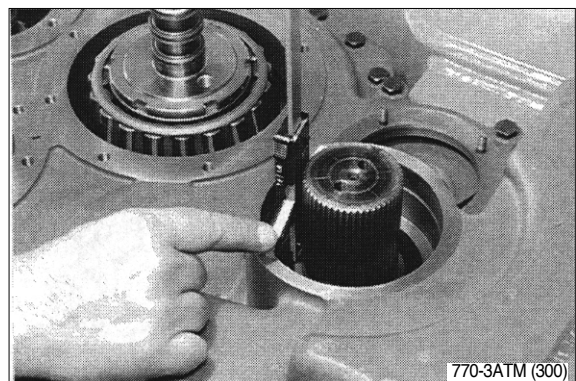
(21) Adjust axial play of the output bearing = 0.3~0.5mm(Figure (21)~(23))

Determine dimension from the plane face/housing to the end face/output shaft.

· Dimension e.g. 53.20mm

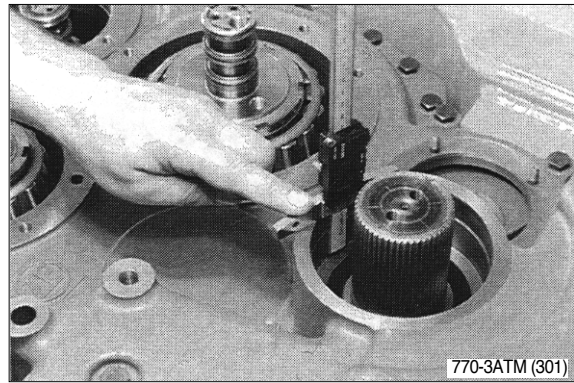
Special tool

Digital depth gauge 5870 200 072



(22) Measure dimension from the plane face/housing to the contact face of the ball bearing.

· Dimension e.g. 50.40mm



Example E

Dimension 53.20mm

Dimension - 50.40mm

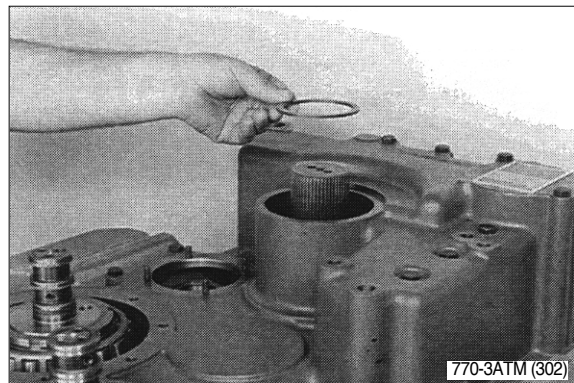
Difference = 2.80mm

Required axial play(0.3~0.5)

e.g. - 0.40mm

Gives shim s = 2.40mm

(23) Assemble shim(e.g. s = 2.40mm).



(24) Insert ball bearing until contact is obtained.

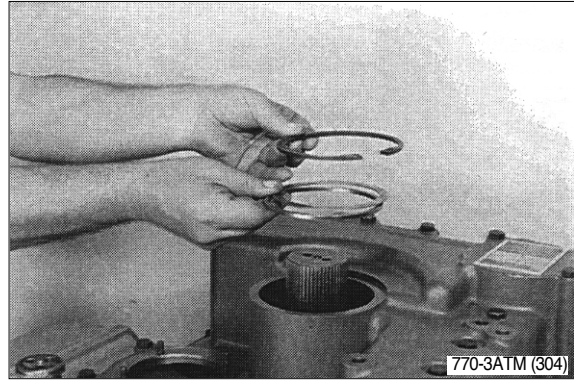


(25) Fix ball bearing by means of disk($s=4.00\text{mm}$), shim(Optional) and circlip playfree.

Special tool

Set of external snap ring pliers

5870 900 021



(26) Install shaft seal, with the sealing lip showing downward.

At the use of the prescribed driver, the exact installation depth is obtained.

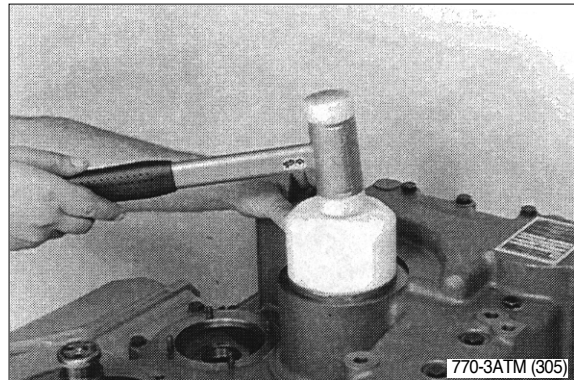
Cover outer diameter with sealing compound(Loctite, type No.574).

Grease sealing lip.

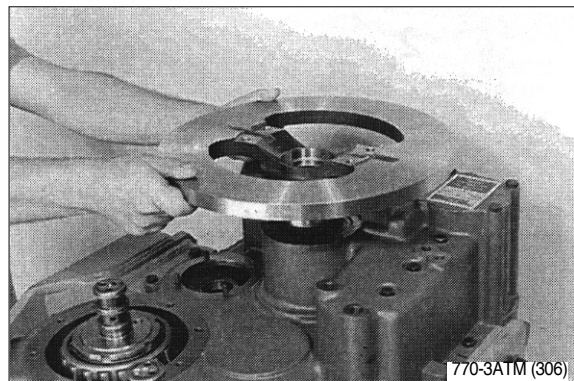
Special tool

Driver

5870 048 150



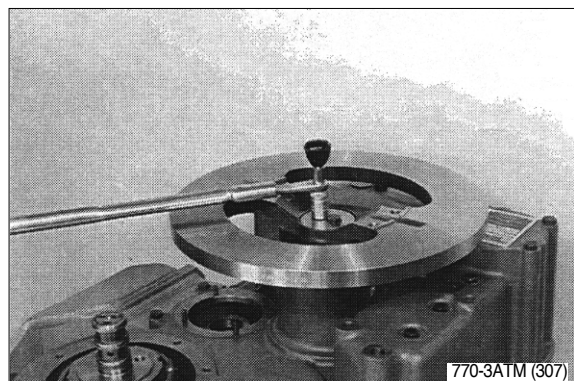
(27) Assemble output flange.



(28) Wet contact face of the disk with sealing compound.

Mount disk and fasten output flange by means of hexagon head screws.

· Torque limit(M10/8.8) : $4.7\text{kgf} \cdot \text{m}$ (46Nm)

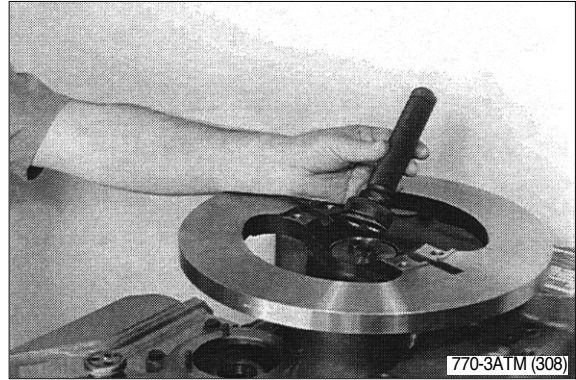


(29) Fix hexagon head screws by means of lock plate.

Special tool

Driver 5870 057 009

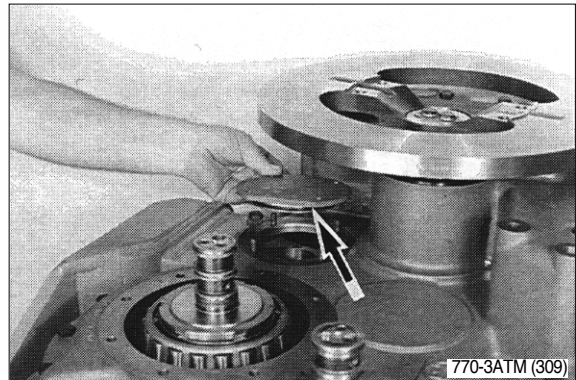
Handle 5870 260 002



(30) If necessary, install studs, insert O-ring into the annular groove (Arrow) and fasten cover by means of hexagon nuts.

· Torque limit(M8/8.8) : 2.3kgf · m(23Nm)

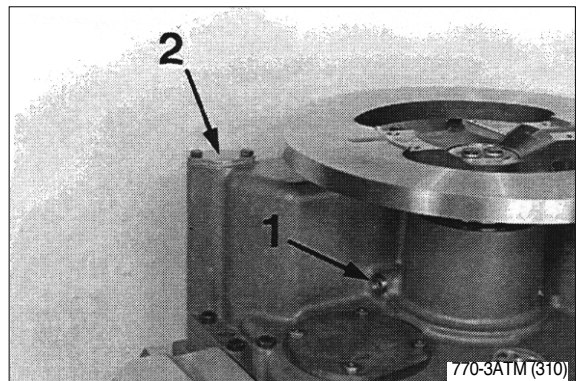
Insert studs with loctite (Type No.262).



(31) Install screws plug (Arrow 1).

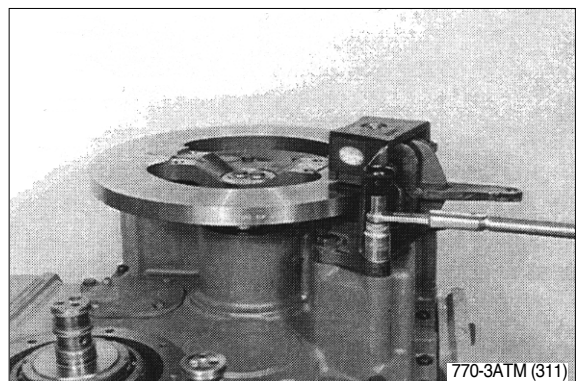
Mount gasket and fasten cover (Arrow 2) by means of hexagon head screws.

· Torque limit(M8/8.8) : 2.3kgf · m(23Nm)

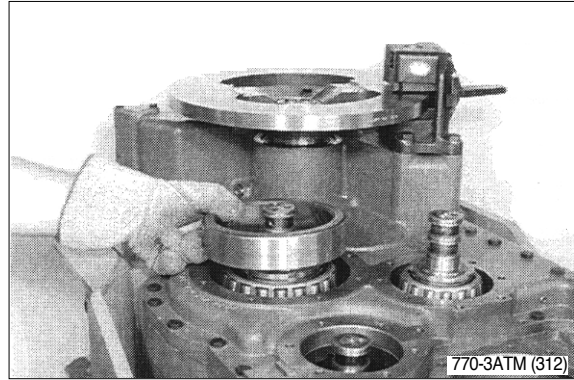


(32) Fasten brake assembly (According to the version) on the housing, using hexagon head screws.

· Torque limit(M14/10.9) : 18.9kgf · m
(185Nm)



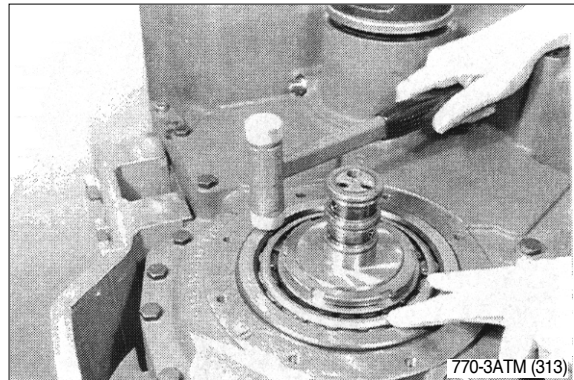
(33) Undercool bearing outer race(Clutches K3/K4 and KR/K2) and insert them into the housing bores until contact is obtained.



(34) Adjust bearing preload-Clutch K3/K4 = 0.15~0.20mm(Figure (34)~(36))

Align clutched centrally by rotating the output flange and place bearing outer race carefully against shoulder.

Bearing must not be preloaded - Bearing cage, respectively bearing rollers are still easy to be moved.



(35) Determine dimension from the bearing outer race to the mounting face.

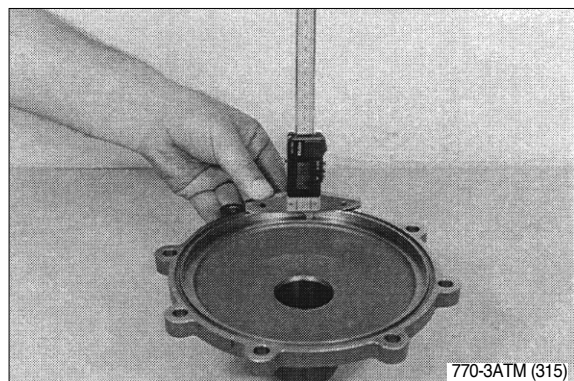
· Dimension e.g. 5.70mm

Apply several measuring points and determine the average.



(36) Measure dimension from the mounting face/cover to the contact face/bearing outer race.

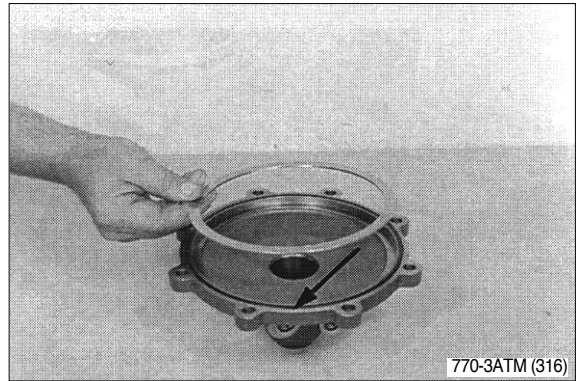
· Dimension e.g. 7.13mm



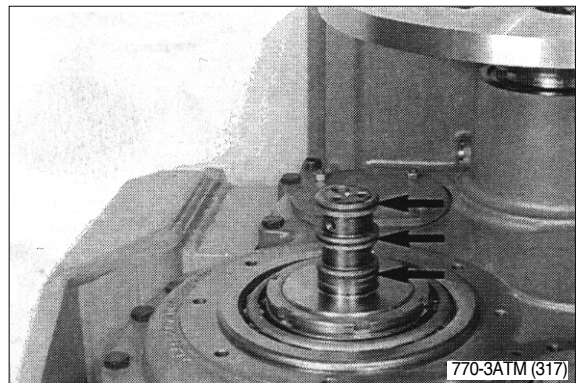
Example F

Dimension	7.13mm
Dimension	- 5.70mm
Difference	= 1.43mm
Required bearing preload(0.15~0.20)	e.g.+ 0.17mm
Result = Shim	s = 1.60mm

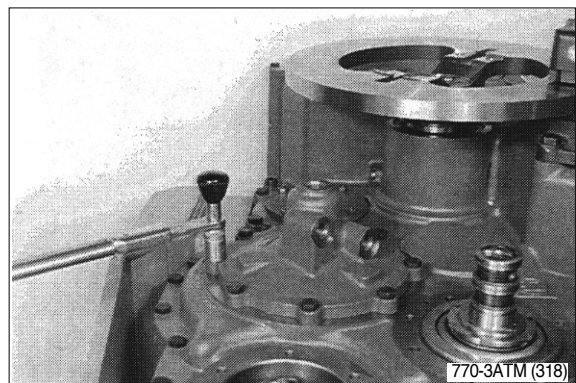
- (37) Insert shim(e.g. s=1.60mm) with grease into the bearing cover.
Insert O-ring into the annular groove (Arrow) and grease it.



- (38) Squeeze rectangular rings(3 pieces, see arrows) in and engage them.
Now, grease rectangular rings and align them centrally.

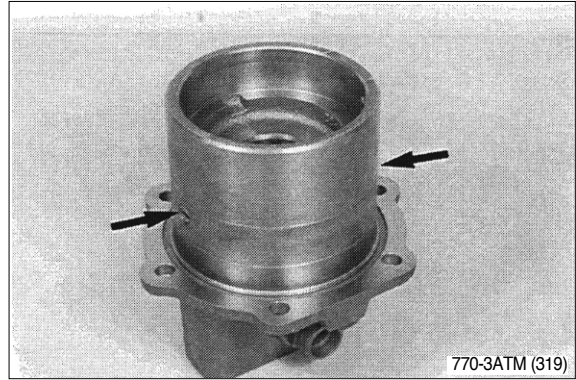


- (39) Pull cover by means of hexagon head screws uniformly against shoulder.
· Torque limit(M10/8.8) : 4.7kgf · m(46Nm)
Special tool
Adjusting screws(M10) 5870 204 007

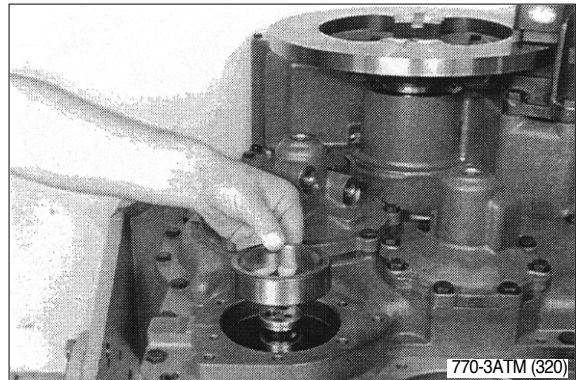


Mounting bearing cover-KR/K2 accordingly.
Bearing preload KR/K2 = 0.20~0.25mm

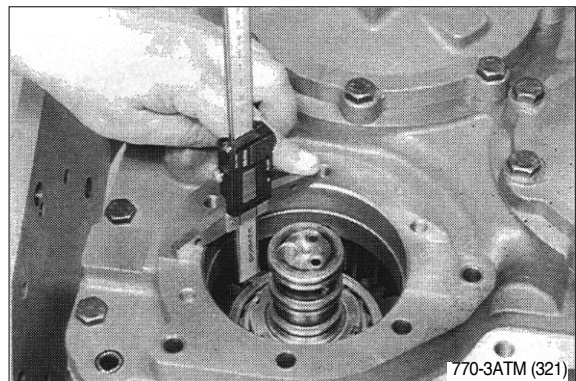
- (40) Close both bores of the bearing cover - KV/K1 by means of slotted plug.
Insert slotted plug with loctite (Type No.262).



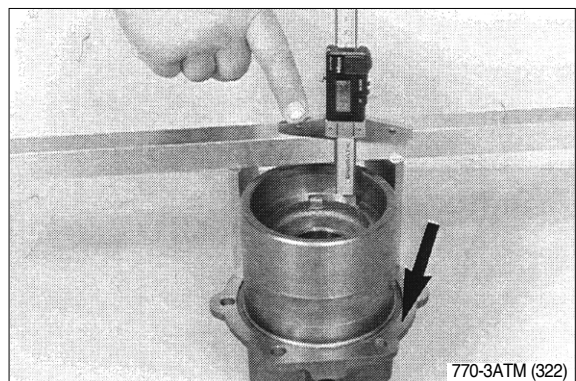
- (41) **Adjust bearing preload- Clutch KV/K1 = 0.15~0.20mm (Example G)**
Install bearing outer race.



- (42) Press the bearing outer race uniformly on and determine the dimension from the mounting face to the bearing outer race.
· Dimension e.g. 64.95mm
Special tool
Digital depth gauge 5870 200 072
Apply several measuring points and determine the average.



- (43) Measure dimension from the mounting face of the cover (Arrow) to the contact face/bearing outer race.
· Dimension e.g. 63.90mm



Example G

Dimension	64.95mm
Dimension	- 63.90mm
Difference	= 1.05mm
Required bearing preload(0.15~0.20)	e.g. + 0.15mm
Result = Shim	s = 1.20mm

(44) Install shim(e.g. s=1.20mm).

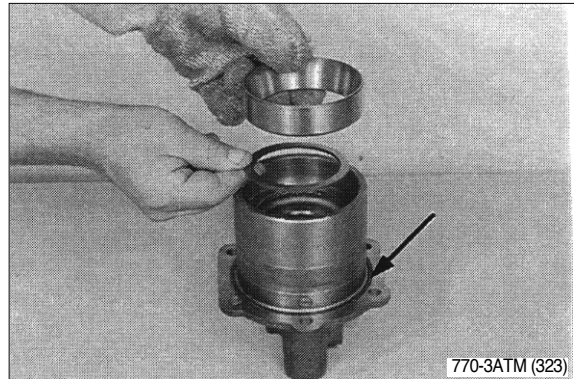
Undercool bearing outer race and insert it until contact is obtained.

Insert O-ring into the annular groove (Arrow) and grease it.

Special tool

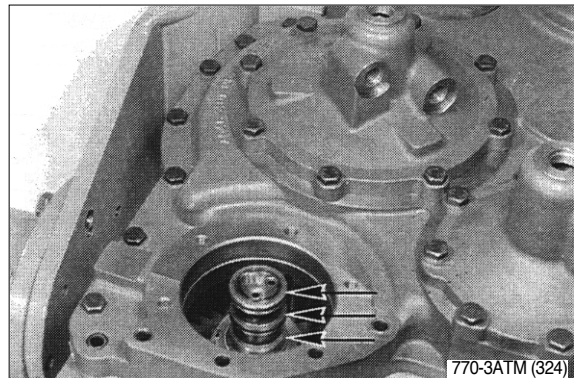
Driver 5870 058 051

Handle 5870 260 002



(45) Squeeze rectangular rings(3 pieces) into the annular grooves of the clutch shaft (Arrow) and engage them.

Now, grease rectangular rings and align them centrally.

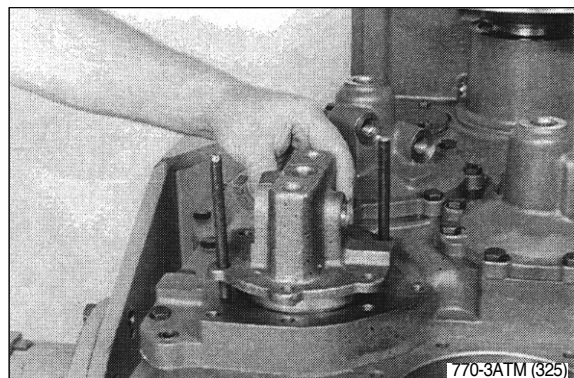


(46) Install two adjusting screws, introduce bearing cover and pull it uniformly against shoulder, using hexagon head screws.

· Torque limit(M10/8.8) : 4.7kgf · m(46Nm)

Special tool

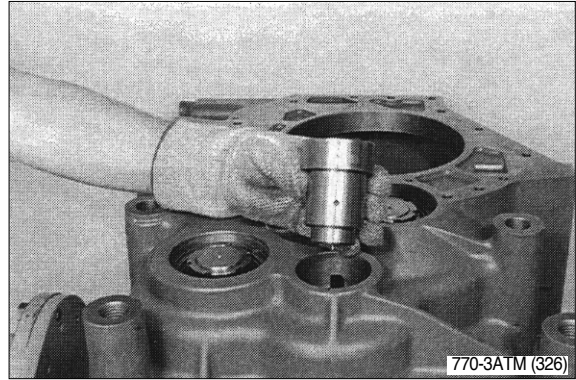
Adjusting screws(M10) 5870 204 007



(47) Tilt housing 180°.

Align layshaft gear and shim centrally, undercool preassembled bolt and insert it until contact is obtained.

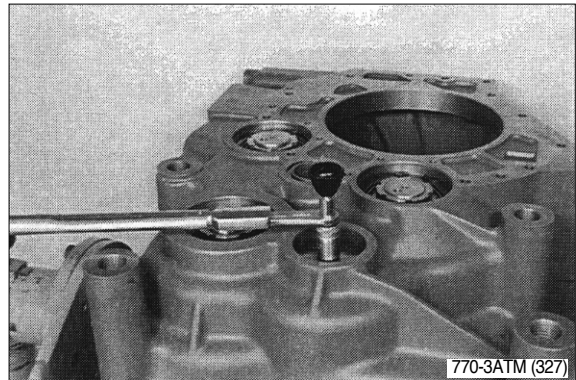
Pay attention to the overlapping of the roll pin with the bore in the housing.



(48) Fix bolt axially by means of hexagon head screws.

· Torque limit(M10/8.8) : 4.7kgf · m(46Nm)

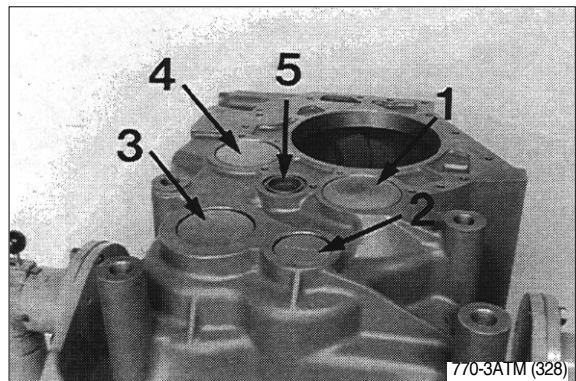
Wet thread of hexagon head screw with Loctite(Type No.243).



(49) Drive in the sealing covers(1,2,3 and 4) flush mounted, with the end face showing downward.

Install sealing cover(5), with the recess showing upward.

Wet sealing surface with loctite(Type No. 262).



(50) Install shaft seal(Arrow), with the sealing lip showing downward.

At the use of the prescribed driver, the exact installation position is obtained.

Cover outer diameter with sealing compound(Loctite, type No.574).

Grease sealing lip.

Special tool

Driver

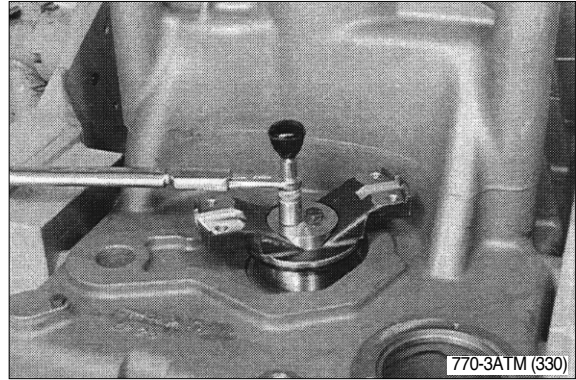
5870 048 150



(51) Assemble output flange.

Wet contact face of the disk with sealing compound(Loctite, type No.574) and fix output flange by means of hexagon head screws.

· Torque limit(M10/8.8) : 4.7kgf · m(46Nm)



(52) Fix hexagon head screws by means of lock plate.

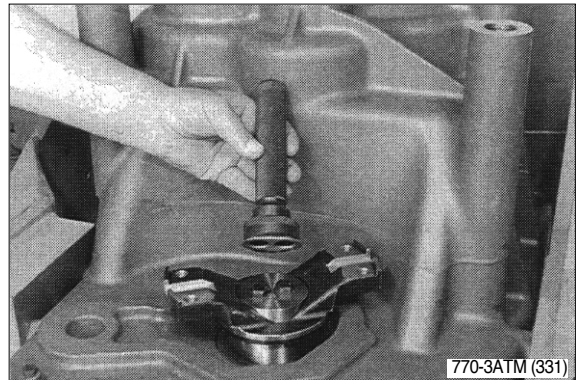
Special tool

Driver

5870 057 009

Handle

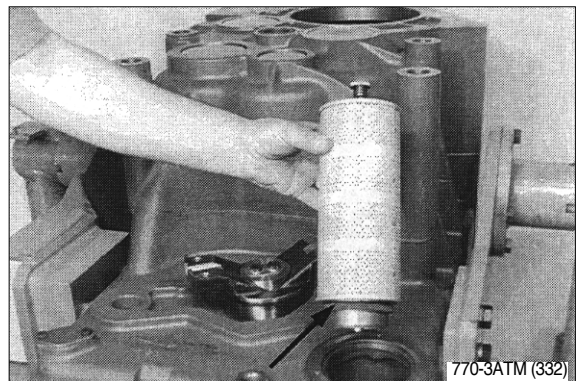
5870 260 002



6) INSTALL FILTER

(1) Mount filter(Complete)

Grease sealing ring(Arrow).



(2) Fasten cover by means of hexagon head screws(Mount plain washers).

Install new O-ring(Arrow).

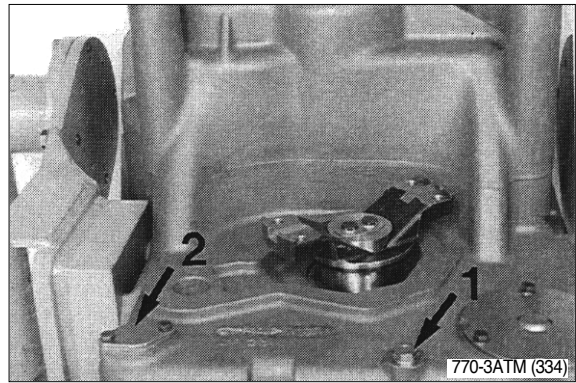
· Torque limit(M8/8.8) : 2.3kgf · m(23Nm)



- (3) Equip screw plug(Arrow 1) with new O-ring and install it.

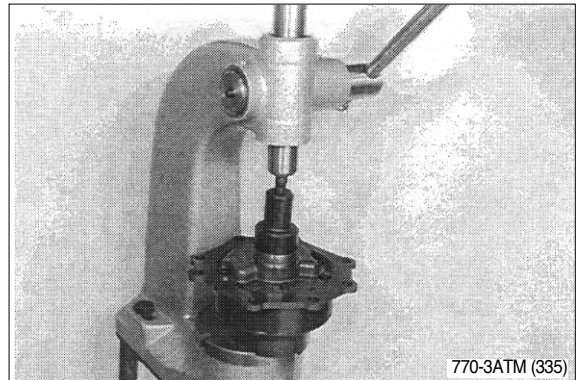
Mount gasket and fasten cover plate by means of hexagon head screws, see arrow 2.

- Torque limit(Screw plug / M22 × 1.5)
: 6.1kgf · m(60Nm)
- Torque limit(M8/8.8) : 2.3kgf · m(23Nm)



7) HYDRAULIC PUMP

- (1) Press needle sleeve in, with the reinforced shell facing the press-in tool until contact is obtained.

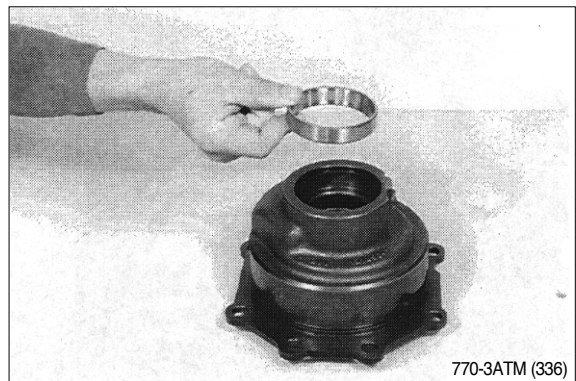


- (2) Insert bearing outer race until contact is obtained.

Special tool

Driver 5870 058 084

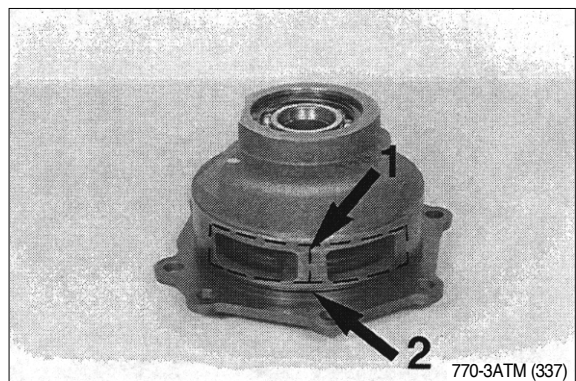
Handle 5870 260 002



- (3) Undercool pump-about -80°C.

Clean area of suction and pressure port (Arrow 1) again and wet it with loctite (Type No.262).

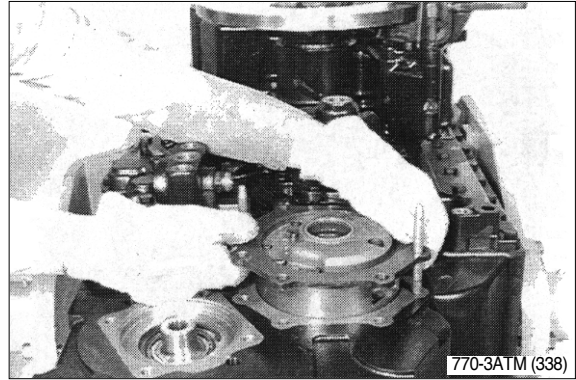
Assemble and oil O-ring(Arrow 2).



- (4) Install two adjusting screws and introduce pump until contact is obtained.
Pay attention to the radial installation position.

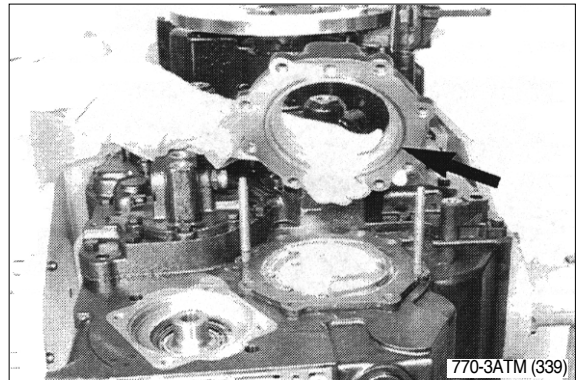
Special tool

Adjusting screw 5870 204 021



- (5) Install O-ring(Arrow) and fasten pump flange, respectively pump by means of hexagon head screws.

· Torque limit(M12/8.8) : 8.1kgf · m(79Nm)



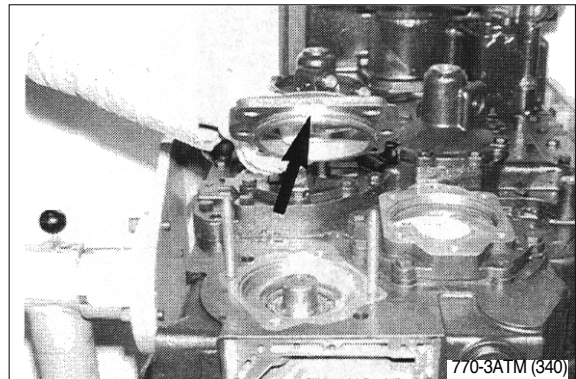
- (6) Insert O-ring(Arrow) into the annular groove of the pump flange(Power take-off) and oil it.

Mount two adjusting screws and fasten flange by means of hexagon head screws.

· Torque limit(M14/8.8) : 12.7kgf · m
(125Nm)

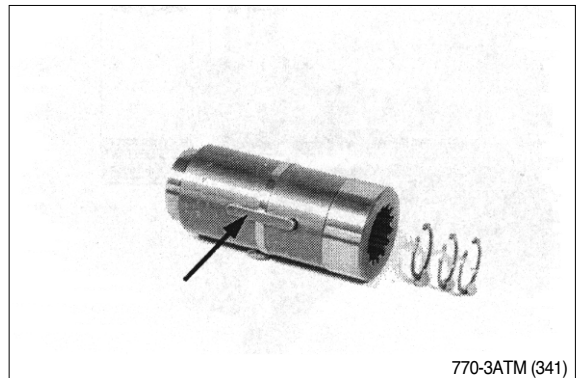
Special tool

Adjusting screw 5870 204 022

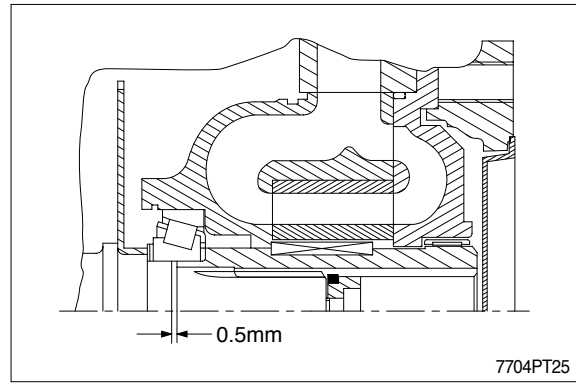


8) DRIVE SHAFT(Power take-off pump)

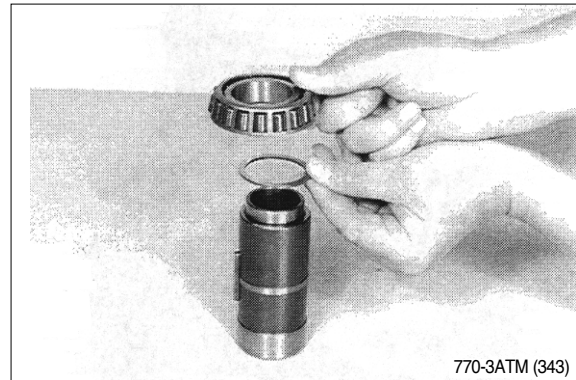
- (1) Squeeze V-rings(3EA) into the recess of the driver(Internal gearing). Mount fitting key(Arrow).



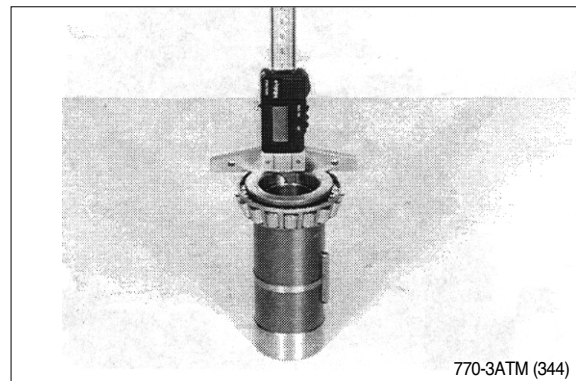
- (2) Adjust gap = 0.5mm(Driver - Drive shaft)
(Figure (2)~(6)).



- (3) Assemble disk $s=1.90\text{mm}$ and place bearing inner race against shoulder.



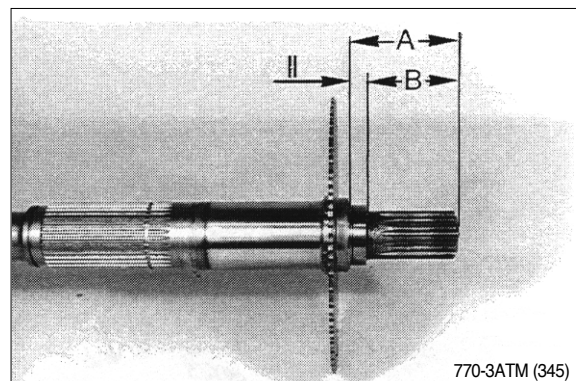
- (4) Determine dimension from the bearing inner race to the end face/driver.
· Dimension e.g. 9.60mm



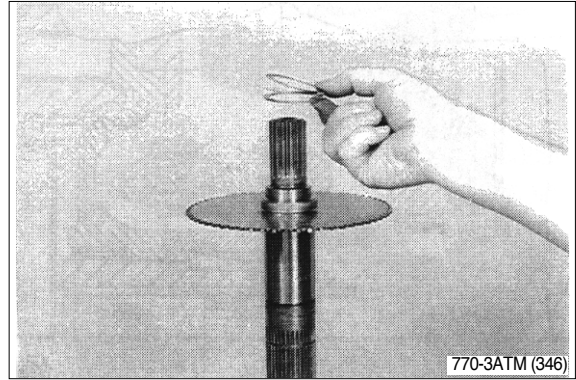
- (5) Determine dimension (A-B).
· Dimension e.g. 10.60mm

Example H

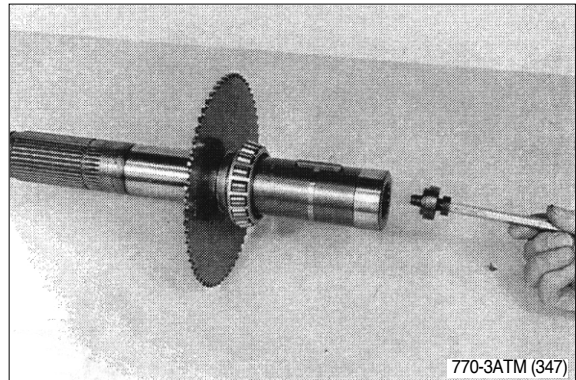
Dimension	10.60mm
Dimension	- 9.60mm
Difference	1.00mm
Required gap	+ 0.50mm
Gives shim(s)	$s = 1.50\text{mm}$



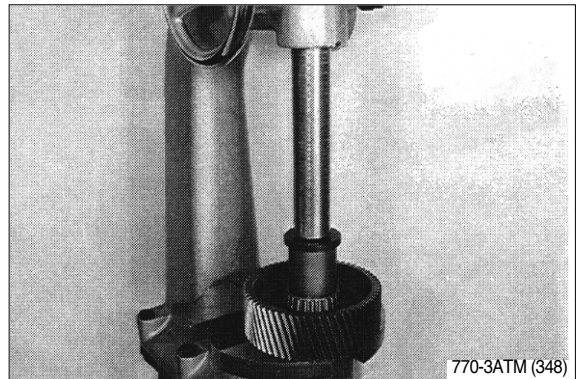
- (6) Assemble shim e.g.=1.50mm and position driver, respectively bearing inner race against shoulder.



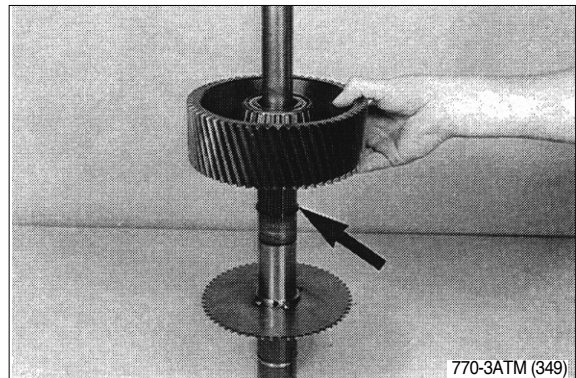
- (7) Fix driver by means of clamping disk and socket head screw.
Insert socket head screw with loctite(Type No.242).
· Torque limit(M10/8.8 DIN 6912)
: 3.3kgf · m(32Nm)



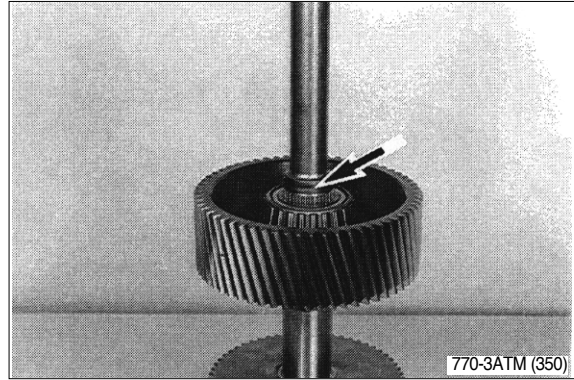
- (8) Press bearing inner race upon the collar of the drive gear power take-off.



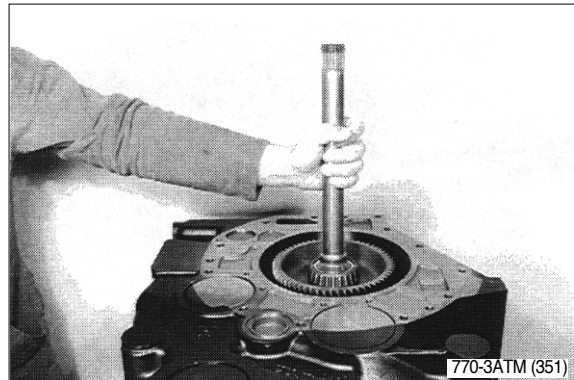
- (9) Squeeze circlip in(Arrow) and assemble drive gear.



(10) Squeeze in and engage rectangular ring (Arrow).



(11) Introduce preassembled drive shaft until contact is obtained.
Pay attention to the overlapping of fitting key / fitting key groove.



(12) **Adjust axial play of the drive shaft bearing = 0.0~0.05mm**(Figure (12)~(14)).

Mount gasket.

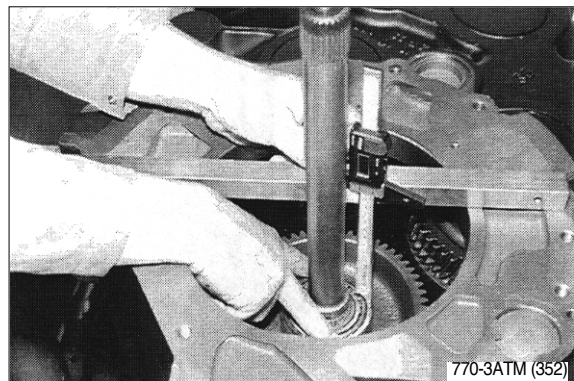
Mount bearing outer race, press it uniformly on and determine dimension from the mounting face(Gasket) to the bearing outer race.

· Dimension e.g. 129.55mm
Apply several measuring points and determine the average.

Special tool

Straightedge 5870 200 022

Digital depth gauge 5870 200 072

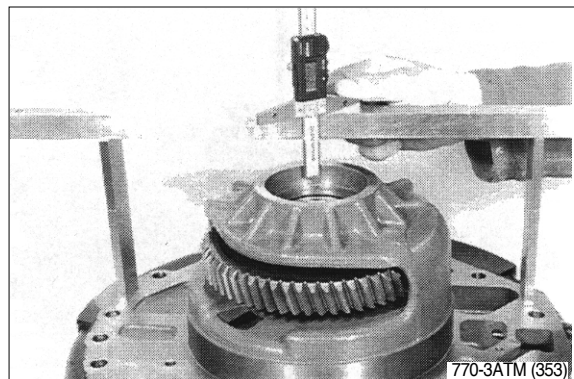


(13) Measure dimension from the mounting face/converter bell to the contact face/bearing outer race.

· Dimension e.g. 127.43mm

Special tool

Gauge blocks 5870 200 080

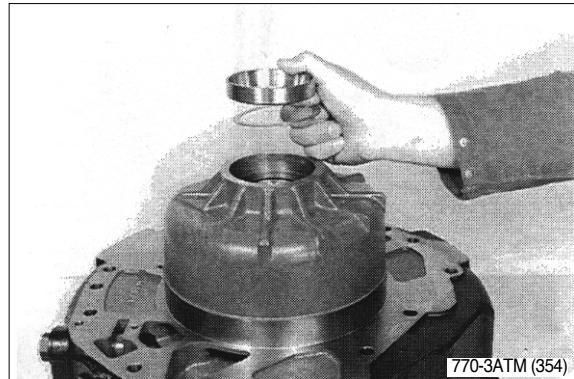


Example J

Dimension	129.55mm
Dimension	- 127.43mm
Difference	2.12mm
Axial play(0.0~0.05) e.g.	- 0.02mm
Gives shim	<u>s = 2.10mm</u>

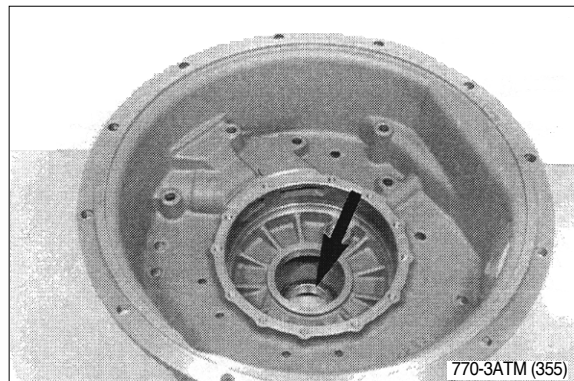
Shims are available in 0.05mm gradation.

- (14) Insert shim e.g. $s=2.10\text{mm}$ and position bearing outer race against shoulder.

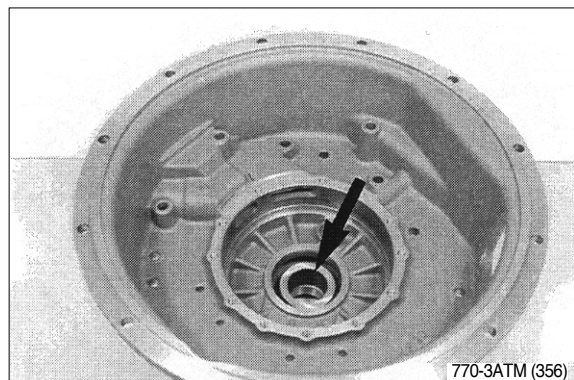


9) INPUT-CONVERTER BELL

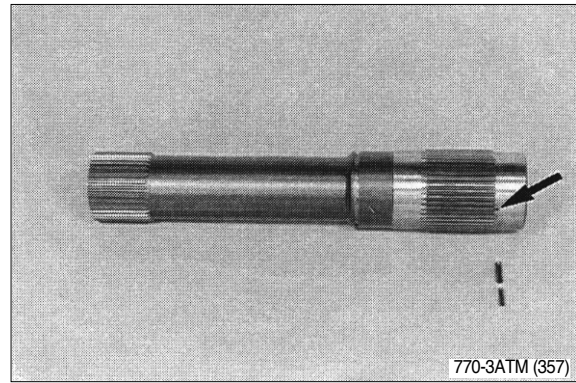
- (1) Insert bearing outer race into the housing bore until contact is obtained and install bearing inner race, see arrow.



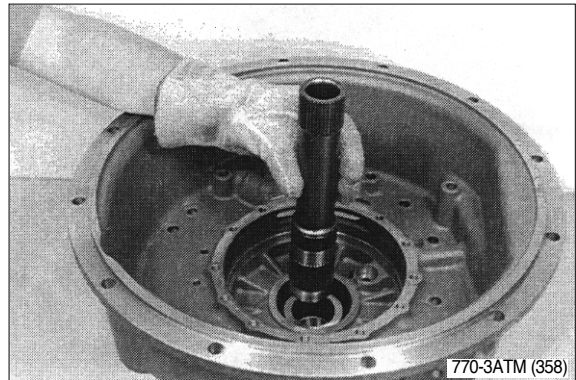
- (2) Introduce spur gear(Arrow), starting from the side, with the long collar showing upward, and position it.



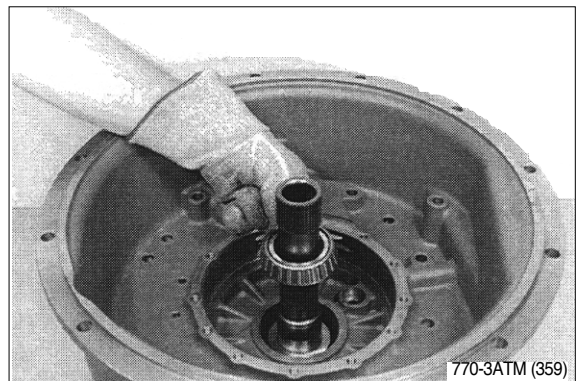
- (3) Insert both roll pins($\varnothing 2.5$ and $\varnothing 1.5$ mm) flush mounted into the bore(Arrow) of the drive shaft.



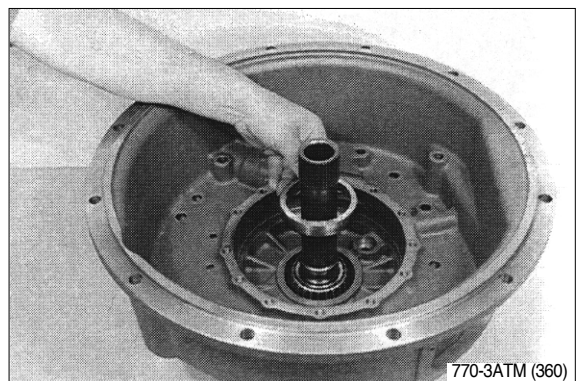
- (4) Undercool drive shaft and introduce it until contact is obtained.



- (5) Heat bearing inner race and assemble it until contact is obtained.



- (6) Place bearing outer race against shoulder. Spur gear bearing must be playfree.



Adjust bearing preload of drive gear bearing 0.0~0.07mm(Example K)

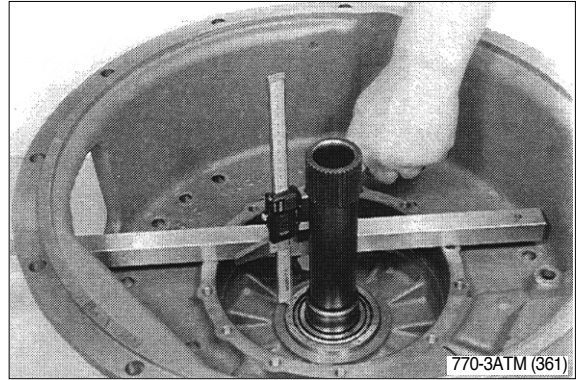
(7) Measure dimension from the mounting face to the bearing outer race.

· Dimension e.g. 62.10mm

Special tool

Straightedge 5870 200 022

Digital depth gauge 5870 200 072



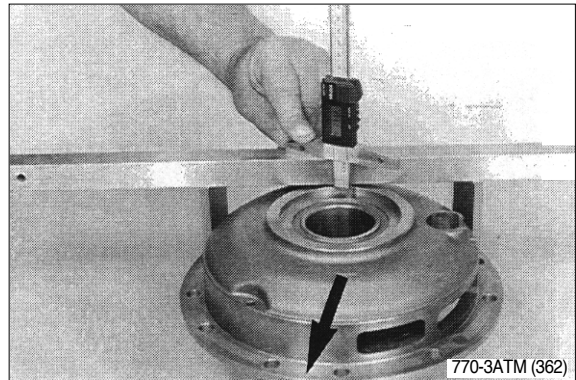
(8) Mount gasket(Arrow) and determine dimension from the mounting face to the contact face of the bearing outer race.

· Dimension e.g. 60.85mm

Special tool

Gauge blocks 5870 200 067

Straightedge 5870 200 022



Example K

Dimension 62.10mm

Dimension - 60.85mm

Difference 1.25mm

Bearing preload(0.0~0.07) e.g.+ 0.05mm

Gives shim $s = 1.30\text{mm}$

Reassembly of the shim, see figure(12).

(9) Insert needle bearing until contact is obtained.

Install shaft seal flush mounted, with the sealing lip showing downward.

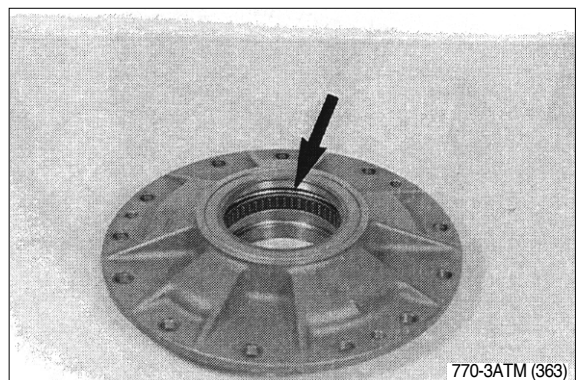
Wet outer diameter of shaft seal with sealing compound(Loctite, type No.574).

Grease sealing lip.

Special tool

Driver 5870 055 031

Handle 5870 260 002



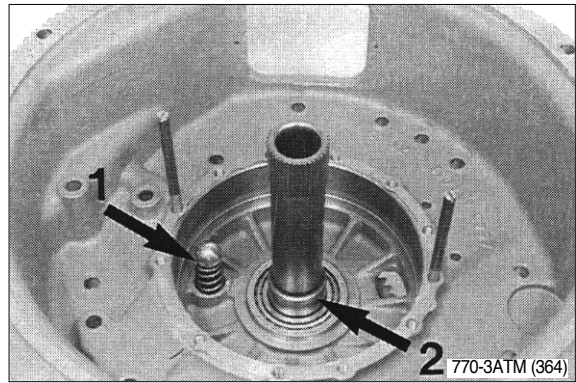
- (10) Install two adjusting screws and mount gasket.

Install converter safety valve, composed of disk, compression spring and ball (Arrow 1). Squeeze rectangular ring into the annular groove of the drive shaft and engage it (Arrow 2).

Now, grease rectangular ring and align it centrally.

Special tool

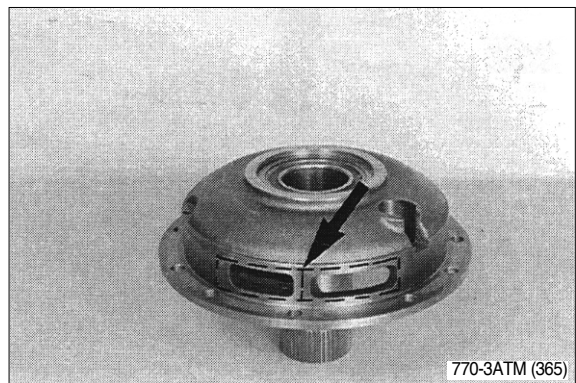
Adjusting screws(M12) 5870 204 021



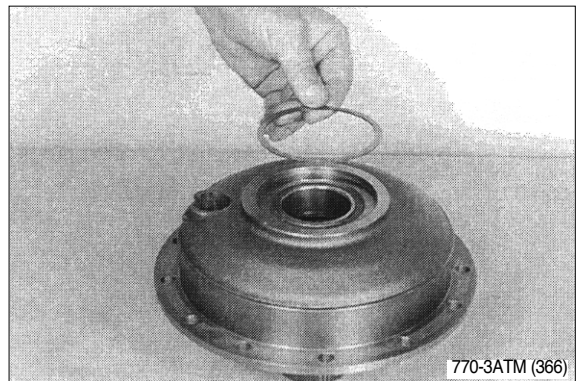
Carry out the following steps (Figure (11)~(14)) immediately within short chronological order.

- (11) Undercool oil feed flange about -80°C.

Clean area of suction and pressure port (Arrow) again and wet it with loctite (Type No.241).



- (12) Make shim e.g. $s=1.30\text{mm}$ (See example K) adhere with grease in the bearing bore.

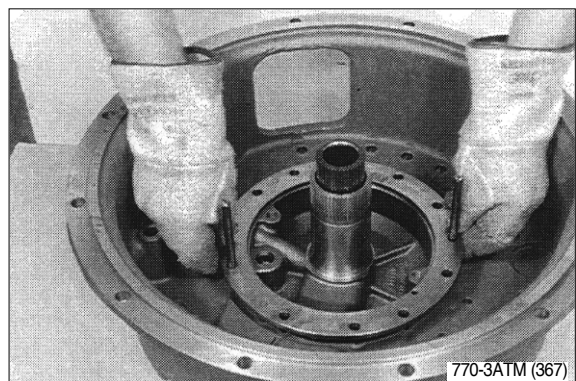


- (13) Introduce oil feed flange until contact is obtained.

Pay attention to the radial installation position.

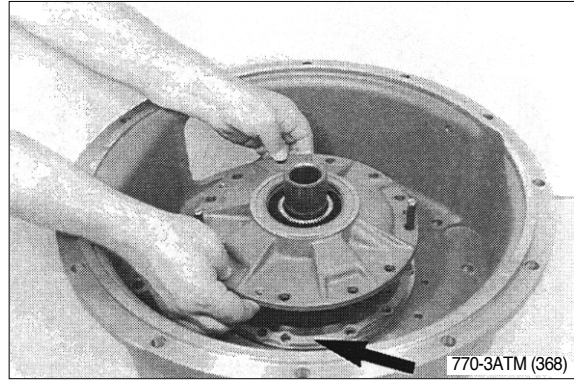
Special tool

Adjusting screws 5870 204 007

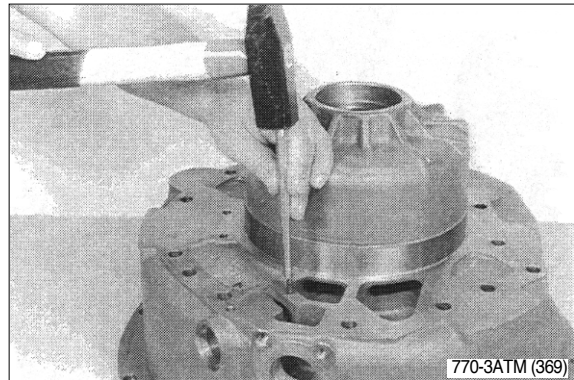


(14) Mount gasket(Arrow) and install bearing cover.

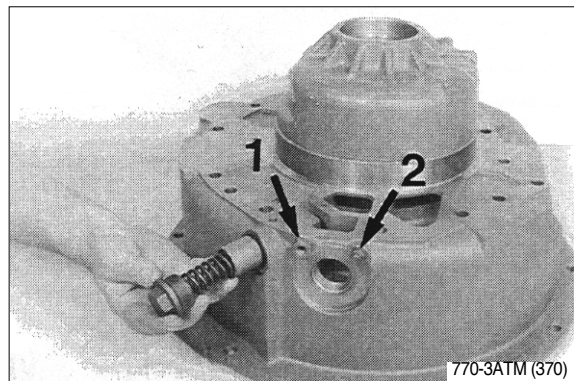
- Torque limit(M10/8.8) : 4.7kgf · m(46Nm)
- Pay attention to the radial installation position.



(15) Insert roll pin until contact is obtained.

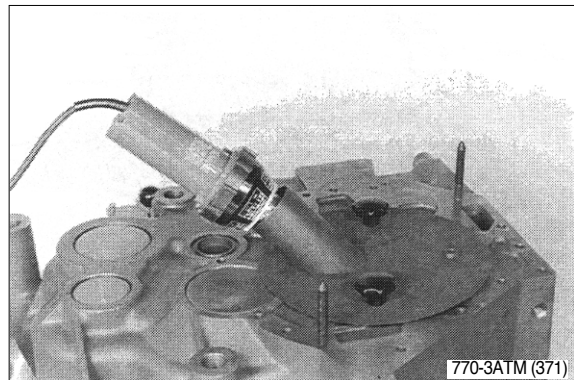


(16) Install converter pressure valve.
Install temperature sensor(Arrow 1) and screw plug(Arrow 2).
Install new O-rings each time.



(17) Heat housing bore(About 120.C).

- Special tool
- Preheating sleeve 5870 801 003
- Hot air blower(220V) 5870 221 500
- Hot air blower(110V) 5870 221 501



(18) Install two adjusting screws and mount gasket(Arrow 1).

Introduce converter bell by means of lifting device until contact is obtained and fasten it by means of hexagon head screws.

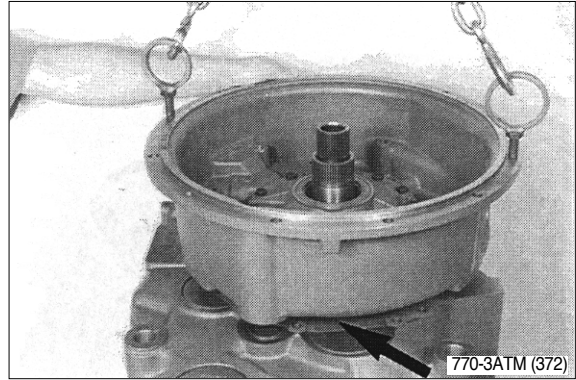
Pay attention to the radial installation position.

Slight rotary motions of the drive shaft will facilitate the insertion.

- Torque limit(M8/10.9) : 3.5kgf · m(34Nm)
- Torque limit(M12/10.9) : 11.7kgf · m(115Nm)

Special tool

Adjusting screws(M12) 5870 204 021



10) CONVERTER

(1) Fasten diaphragms(3EA) on the converter, using hexagon head screws(Mount plain washers).

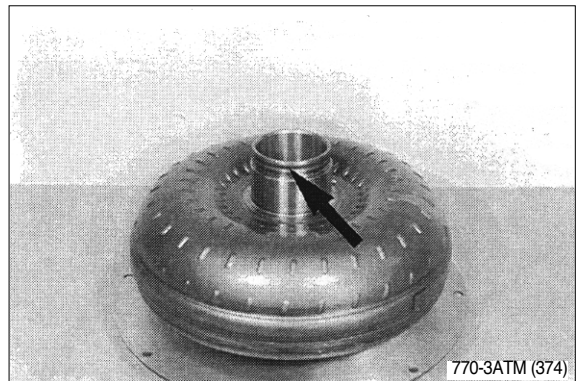
Insert hexagon head screws with loctite (Type No.243).

- Torque limit(M10/8.8) : 4.7kgf · m(46Nm)

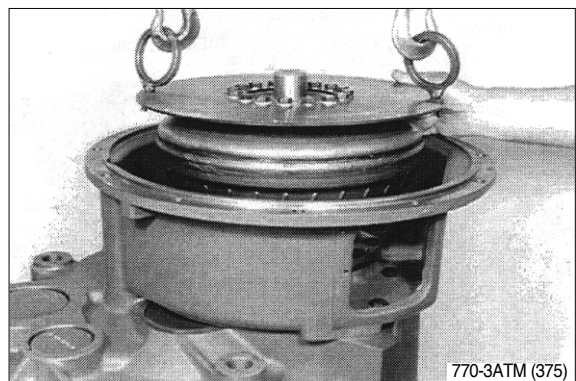


(2) Squeeze in and engage rectangular ring (Arrow).

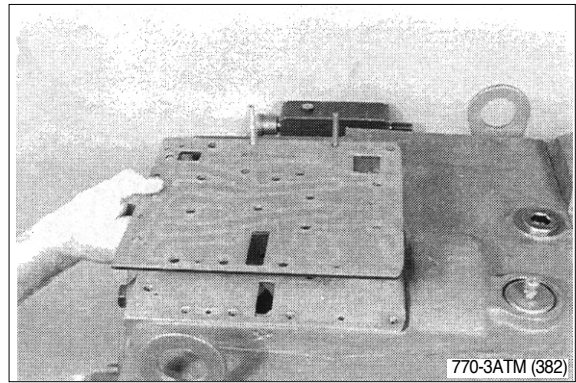
Now, grease rectangular ring and align it centrally.



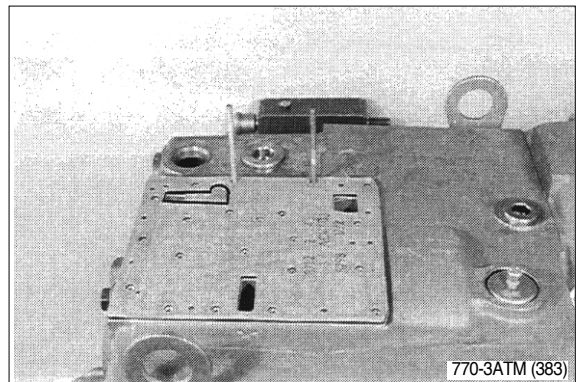
(3) Introduce converter by means of lifting device until contact is obtained.



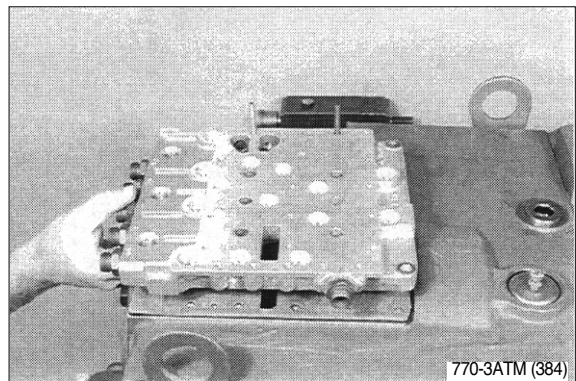
(3) Mount intermediate plate.



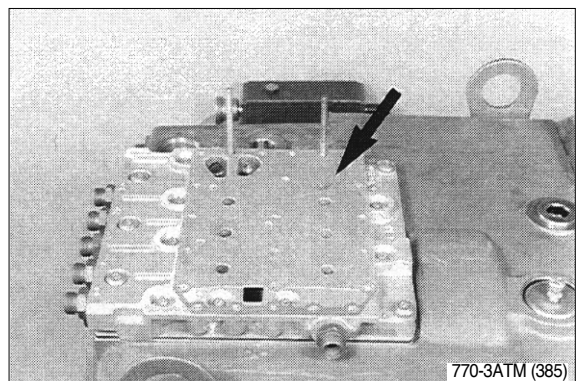
(4) Mount 2nd gasket.



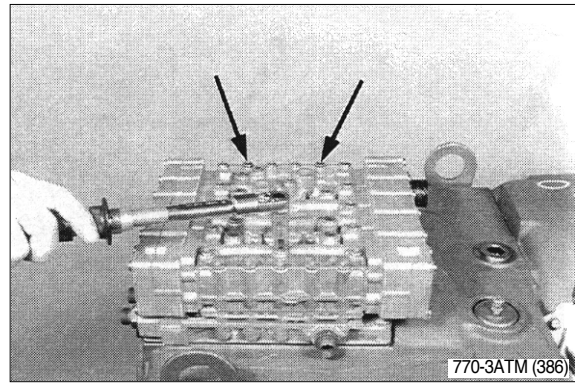
(5) Mount plate and fasten it uniformly by means of socket head screws.
· Torque limit : 2.3kgf · m(23Nm)



(6) Mount gasket.



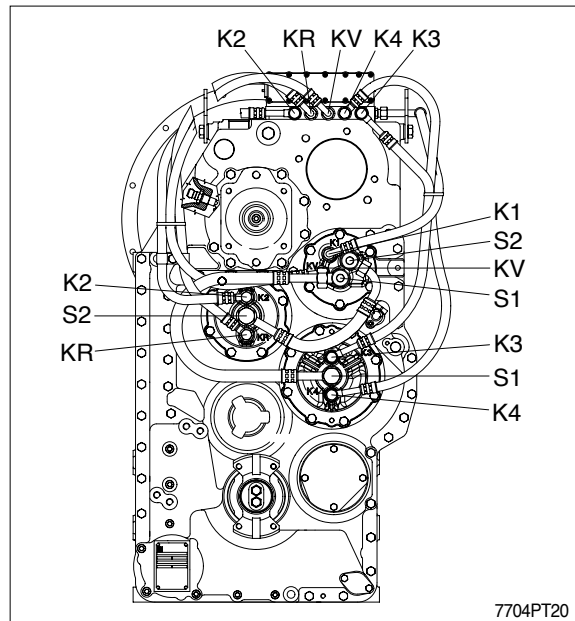
- (7) Assemble complete control unit and fasten it uniformly by means of socket head screw (2 × M6 × 105 and 21 × M6 × 80mm).
 Pay attention to the position of the two socket head screws M6 × 105, see arrows.
 • Torque limit : 0.97kgf · m(9.5Nm)



- (8) Install pressure lines according to the following draft.

Ref. draft

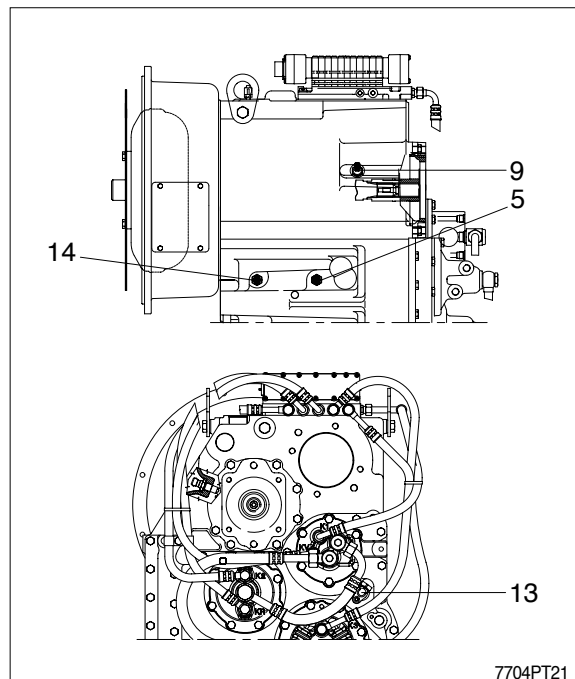
KV = Hydraulic line	Clutch KV
KR = Hydraulic line	Clutch KR
K1 = Hydraulic line	Clutch K1
K2 = Hydraulic line	Clutch K2
K3 = Hydraulic line	Clutch K3
K4 = Hydraulic line	Clutch K4
S1 = Lubricating oil line	Clutch KR/K2
S2 = Lubricating oil line	Clutch K4/K3



12) INDUCTIVE TRANSMITTER AND SPEED SENSOR

- (1) The following drafts show the installation position of the single inductive transmitters and the speed sensor.

5 = Inductive transmitters	n Central gear train
9 = Inductive transmitters	n Engine
14 = Inductive transmitters	n Turbine
13 = Speed sensor	n Output and speedometer



(2) Setting-Inductive transmitter

The following figures are describing the reassembly, respectively the setting of the inductive transmitter n Engine(9).

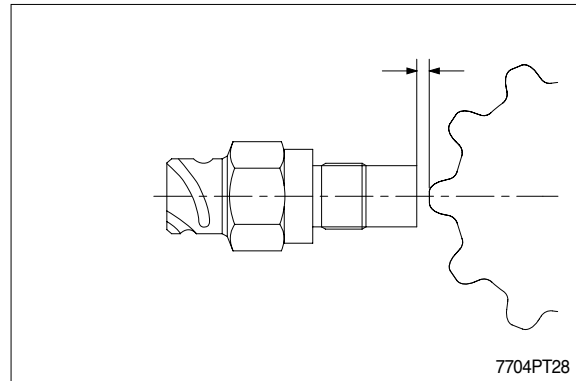
The reassembly of the inductive transmitters n Turbine(14) and n Central gear train(5) has to be carried out accordingly.

Pay attention to the different setting dimensions.

Setting dimension corresponds to the distance between contact face-Inductive transmitter and tooth tip, see figure.

Setting dimension - Inductive transmitter n Engine(9) and n Turbine(14) = $0.5^{+0.3}$ mm

Setting dimension - Inductive transmitter n Central gear train(5) = $0.3^{+0.1}$ mm

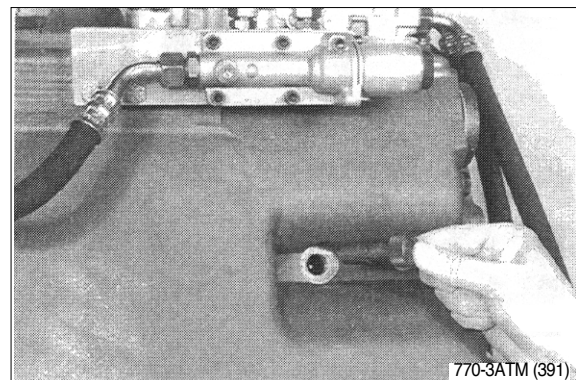


- (3) Turn counting disk radially until one tooth tip is situated centrally to the inductive transmitter hole.

Insert measuring pin until the end face has got contact on the tooth tip, respectively the circlip on the screw in face of the housing.

Special tool

Measuring pin 5870 200 040

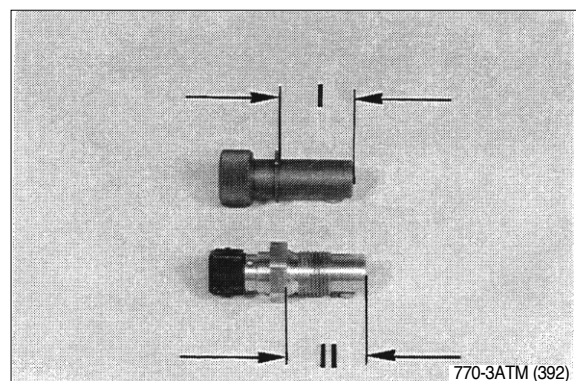


- (4) Remove measuring pin and measure dimension from the end face/measuring pin to the circlip.

· Dimension e.g. 30.10mm

Measure dimension from the contact face - inductive transmitter to the contact face.

· Dimension e.g. 30.00mm



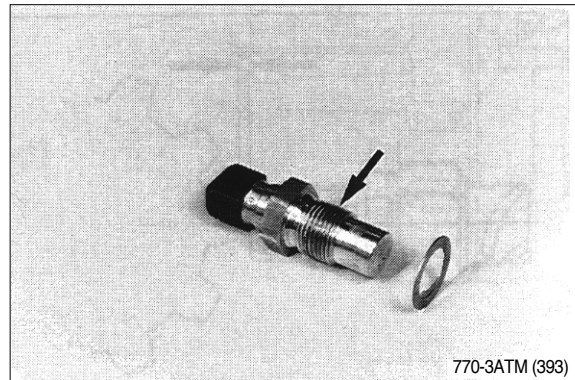
Example L1

Dimension	30.10mm
Required gap(0.5 ^{+0.3} mm)e.g.	- 0.60mm
Gives installation dimension	29.50mm

Example L2

Dimension	30.00mm
Installation dimension	- 29.50mm
Difference = Shim	s = 0.50mm

- (5) Assemble corresponding shim and wet thread(Arrow) with loctite(Type No.574).



- (6) Install inductive transmitter n Engine(9), n Turbine(14) and n Central gear train(5).

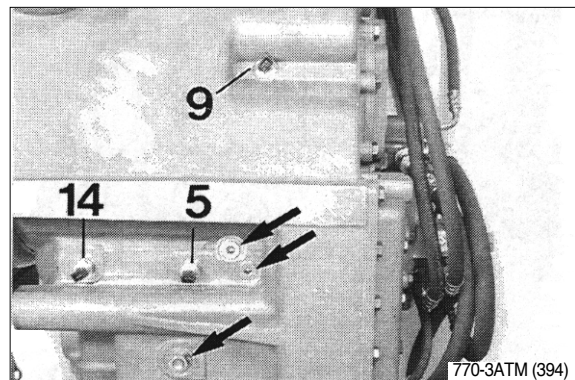
· Torque limit : 3.1kgf · m(30Nm)

Now, install screw plugs(Arrows).

Equip screw plugs with new O-rings.

· Torque limit(M26 × 1.5) : 8.2kgf · m
(80Nm)

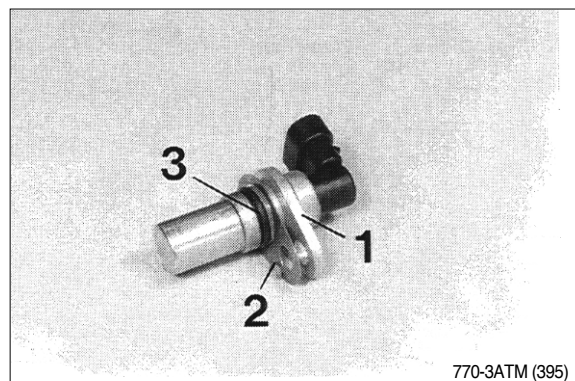
· Torque limit(M18 × 1.5) : 5.1kgf · m
(50Nm)



- (7) **Speed sensor(Hall sensor) n Output and speedometer**

Illustration on the right shows the speed sensor 13.

- 1 Speed sensor
- 2 Plate
- 3 O-ring



- (7) Grease O-ring and fasten speed sensor (Arrow) by means of socket head screw.
- Torque limit(M8/8.8) : 2.3kgf · m(23Nm)
- Prior to the commissioning of the transmission, carry out the oil filling according to the operating instructions.

