SECTION 3 POWER TRAIN SYSTEM

GROUP 1 STRUCTURE AND OPERATION

1. POWER TRAIN DIAGRAM

1) STRUCTURE



15D9SPT01

- 1 Engine
- 2 Transmission
- 3 Drive shaft4 Drive axle
- 5 Brake

2) SPECIFICATION

Item			Specification	
	Model		KAPEC 280 DB	
Torque converter	Туре		3 Element, 1 stage, 2 phase	
	Stall ratio		2.9 : 1	
	Туре		Full auto, power shift	
	Gear shift (FR/RR)		1/1	
Transmission	Control		Electrical single lever type, kick-down system	
	Overhaul ratio	FR	1:1	
		RR	1:1	
	Туре		Front-wheel drive type, fixed location	
Axle	Gear ratio		14.2 : 1	
	Gear		Ring & pinion gear type	
Q'ty (FR/RR)			2/2	
Wheels	Front (drive)		6.50-10-14 PR	
	Rear (steer)		5.00-8-8 PR	
Brakes	Travel		Front wheel, wet disc brake	
	Parking		Wet disk (negative brake)	
Staaring	Туре		Hydro static, power steering	
Sieering	Steering angle		80.8° to both right and left angle, respectively	

2. TORQUE CONVERTER

1) STRUCTURE



20D7PT03

- 1 Bolt
- 2 Plate
- 3 Flexible plate
- 4 Torque converter assembly
- 5 Bolt
- 6 O-ring
- 7 Oil level gauge
- 8 Oil level gauge guide

- 9 Bolt
- 10 Torque converter housing cover
- 11 Temperature sensor
- 12 Inner oil strainer
- 13 Oil strainer spring
- 14 O-ring
- 15 Oil strainer plug
- 16 Torque converter housing

2) OPERATION

The torque converter is connected with a flywheel by a flexible plate, engine output is delivered from the flywheel to the flexible plate.

The exterior of the torque converter is protected by the torque converter housing.

The torque converter housing forms the oil path for the oil pump, it includes the oil strainer filtering sucked oil through this oil path and the oil level gauge measuring oil level of the transmission inside.

3) TORQUE CONVERTER HYDRAULIC CIRCUIT



20D7PT04

3. TRANSMISSION

1) STRUCTURE



15L7APT28

- 1 Control valve
- 2 Torque converter
- 3 Turbine wheel
- 4 Impeller wheel
- 5 Stator wheel
- 6 Forward clutch gear
- 7 Oil pump
- 8 Reverse clutch gear

- 9 Output gear
- 10 Temperature sensor
- 11 Oil strainer
- 12 Idle gear
- 13 Forward clutch pack
- 14 Input shaft
- 15 Reverse clutch pack

2) INSTALLATION VIEW



- 1 Torque converter
- 2 Control valve
- 3 Oil level pipe and dipstick

- 4 Air breather
- 5 Transmission oil filter
- 6 Transmission output (Universal joint link part)

3) OPERATION

The torque converter is an automatic fluid drive.

It transmits engine torque by means of hydraulic force.

The torque converter leads and the power which is delivered rotated the charging pump.

Oil is drawn from the transmission reservoir by the charging pump.

The pump delivers its entire output to a full-flow oil filter for cleaning.

From the oil filter, the oil supply is sent to the control valve.

The main pressure regulator valve provides pressure for clutch pack, directs oil to the solenoid valve.

Moving the solenoid valve allows oil to charge the selected (forward or reverse) clutch line and to engage that clutch.

The remaining oil appropriating clutch pressure flows into the torque converter.

A converter pressure regulator valve in the converter-in line limits the oil pressure there.

The oil pressure input to the torque converter is adjusted 4~7 kgf/cm² (57~100 psi).

The oil pressure output from the torque converter is adjusted below 2~4.5 kgf/cm² (28.4~64 psi). The torque converter is continuously filled with oil during operation.

Rotation of the converter impeller imparts energy to the oil which, in turn, drives the turbines.

The oil then flows between the stator vanes which redirect it to the impeller.

At this time, torque is increased.

The oil from the torque converter enters the cooler.

The cooler is a heat exchanger in which the oil flows through air cooled passages.

After refrigerated, it is in charge of clutch lubrication through the lubrication oil path of the clutch shaft. A lubrication valve between the cooler and lubrication system returns all excess oil to the transmission reservoir.

4) OPERATING MODES

(1) Forward



15L7APT29

(2) Reverse



15L7APT30

5) TRANSMISSION CASE AND CONTROL VALVE

(1) Structure



4 Spring

1

- 5 O-ring
- 6 Plug
- 7 Plug
- 8 Bolt
- Transmission oil filter 9
- 10 Dipstick pipe

- 14 Socket bolt
- 15 Flange bolt
- 16 Control valve
- 17 Gasket
- 18 Hexagon bolt
- 19 Plain washer

20 O-ring

- 24 Socket bolt
- 25 Dowel pin
- 26 O-ring
- 27 Speed sensor
- 28 Socket bolt
- 29 Inching link assy

(2) Operation

The transmission case includes the function of a control valve, an oil filter and a parking brake. The oil filter is charge of filtering sucked oil by an oil pump before transmitting sucked oil to a control valve and a torque converter.

Oil transmitted through an oil filter delivers oil pressure to the piston of the forward and reverse clutch through the solenoid valve.

At this time, the solenoid valve is in charge of the important function of transmitting oil pressure for forward and reverse through an electric signal by the forward and reverse selection lever of the truck.

Oil pressure chosen for forward or reverse by the solenoid valve is transmitted to the forward clutch through the formed oil path between transmission case or the reverse clutch through the pipe of transmission outside.

Parking brake works by the band brake installed on parking drum which is linked to the output shaft of the forward clutch.

6) CONTROL VALVE

(1) Operation



22D9TPT08

- 1 Modulation
- 2 Solenoid valve
- 3 Inching spool
- 4 Main relief valve
- 5 Inching valve pressure check port
- 6 Forward clutch pressure check port
- 7 Reverse clutch pressure check port
- 8 Main pressure check port
- 9 Parking solenoid valve

The control valve consists of the main relief valve, solenoid valve, modulation valve and inching valve.

The discharged oil from the gear pump enters main relief valve of the control valve and its pressure is adjusted 10.8~14.9 kgf/cm² (154~212 psi).

The oil adjusted pressure by the main relief valve is decided on the direction of forward or reverse by the solenoid valve.

The decided oil is delivered the power transferred from the torque converter to drive axle through the oil path between torque converter housing and transmission case.

The modulation valve provide a soft plugging when changing gears.

The modulation value to absorb the small shocks of rapid pressure build up and quick release during gear changes.

When full pressure builds up, the modulation valve shuts the modulation off and allows it to empty, so it is ready to function again during gear change.

The inching valve permits the clutch to partially disengage, so that engine rpm can be increased for lifting while travel speed remains low.

(2) Structure



- 6 Spring
- 7
- Piston
- 8 Socket plug
- 9 Plug
- 10 O-ring

- 15 Plate
- 16 Spool
- 17 Valve
- 18 Spring
- 19 Stopper
- 20 Nut

- 25 Piston
 - 26 Plug
- 27 Screw
- 28 Body
- 29 Gasket
- 30 Solenoid valve

7) CLUTCH

(1) Operation



15L7APT31

- 1 Forward clutch plugging pressure delivery line (------)
- 2 Reverse clutch plugging pressure delivery line (-----)
- 3 Clutch pack lubrication line (------)

When (forward/reverse) mode is selected through the solenoid valve of control valve, the flux flowed by the oil pump flows into forward (reverse) clutch pack in 10.5~14.9 kgf/cm² (149~212 psi) of pressure through the oil path of transmission inside.

This oil make plugging of clutch pack by giving pressure at the piston of clutch pack.

At this time, the clutch shaft is always revolving while connected with the turbine of torque converter.

According to be plugging, the clutch gear is connected and revolved with drum.

This power is delivered with linking output gear in touch with clutch gear.



- 1 Shaft
- 2 Peek seal
- 3 Small seal ring
- 4 Reverse clutch gear
- 5 Ball bearing
- 6 Snap ring
- 7 Clutch drum
- 8 O-ring
- 9 Piston
- 10 Quad ring

- 11 Quad ring
- 12 Plate
- 13 Friction plate
- 14 Plate
- 15 Snap ring
- 16 Spring
- 17 Back plate
- 18 Wire ring
- 19 Ball bearing
- 20 Clutch drum

- 21 Spacer
- 22 Forward clutch gear
- 23 Spacer
- 24 Ball bearing
- 25 Clutch shim (0.1 t)
- 26 Clutch shim (0.15 t)
- 27 Clutch shim (0.2 t)
- 28 O-ring

8) OUTPUT GEAR

(1) Operation

The output gear is engaging the forward clutch gear and reverse clutch gear together.

If a driver selects forward, the forward clutch gets plugging, the forward clutch gear revolves and the power of forward clutch gear is delivered to output gear.

If a driver selects reverse, the reverse clutch gets plugging, the reverse clutch gear revolves and the power of reverse clutch gear is delivered to output gear.

(2) Structure



15L7APT14

- 1 Output gear
- 2 Ball bearing
- 3 Cover

- 4 Oil seal
- 5 Seal ring

4. DRIVE AXLE

1) INSTALLATION VIEW



2) STRUCTURE



The drive axle is connected with the transmission output gear and universal joint.

The power transferred by the universal joint is connected to the pinion shaft of drive axle, the pinion shaft delivers the power to the differential device through the ring gear.

The power transferred to the differential gear is delivered to final drive through the axle shaft in reduced at the hub reduction.

3) CARRIER ASSEMBLY

(1) Operation

Carrier sub assembly include spiral bevel gear for transfer the power of transmission to axle. Also, including differential device for separate power of transmission to left/right axle shaft and parking brake.



22D9TPT21A

4) DIFFERENTIAL DEVICE

(1) Operation

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

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

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

Consequently, it guarantees for safety of drivers.

(2) Structure



22D9TPT19

- 1 Differential case (RH)
- 2 Differential case (LH)
- 3 Thrust washer
- 4 Side gear
- 5 Thrust washer
- 6 Pinion gear
- 7 Differential spider
- 8 Socket bolt
- 9 Taper roller bearing

5) PARKING BRAKE (NEGATIVE BREAKE)

(1) Operation

In case of key OFF at truck, active parking brake from parking spring push parking piston, and then piston pressured friction plate. It has force distribution.

In case of key ON at truck, the main pressure at control valve on transmission main pressure supply to parking brake port, and then released pressure at piston and friction plate finally the parking brake is released.

Status of KEY OFF (Active parking brake)



22D9TPB01







- 1 Parking spline
- 2 Plate
- 3 Friction plate
- 4 Piston housing
- 5 Elbow 45
- 6 O-ring
- 7 Quad ring S
- 8 Quad ring L
- 9 Brake piston
- 10 Guide pin
- 11 Parking spline
- 12 Parking cover

GROUP 2 TROUBLESHOOTING

1. TRANSMISSION

Trouble symptom	Probable cause	Remedy
1. Output does not go up		
1) Torque converter		
- Torque converter oil	 The oil is in short supply. The oil that is not regulated is used. The air has mixed into oil. 	 Replenish oil. Change the oil to regular oil. Tighten each joint coupling and the pipe further.
	The oil filter is clogging.	Wash the oil filter or change it.
- Main body of torque converter	 The stator free wheel is broken. 	 Change the stall revolution then if the revolution is extremely low, change the free wheel inner race, free wheel cam and roller.
	 The stator free wheel is sticking. 	 Check the rise of the temperature of oil at no load. Change the free wheel inner race, free wheel cam and roller when the temperature of oil rises abnormally.
	 The wheel with blades is broken or it is touching other components. 	 Check whether the aluminum powder and the like has mixed into torque converter oil. Change the wheel with blades if the aluminum powder and the like has mixed in.
2) Transmission		
- Charging pump	 The pump does not operates normally. 	Change the pump.
	• The oil is in short supply.	• Replenish oil.
- Torque converter oil	 The oil that is not regulated is used. The air bubble occurs because the torque converter pressure decrease. The water has mixed into oil. 	 Change the oil to regular oil. Check and adjust the torque converter pressure. Check the cooler, and change all oil.
- Valve assy	The clutch oil pressure has de-creased, because the spring is setting or break.	Change the spring.
	 The valve does not move with the valve opens. 	Repair or change the valve.
	• The orifice is clogging.	Wash the orifice.
- Clutch	 The seal ring of the clutch piston are damaged. 	Change the seal ring.
	The clutch plate slips because the clutch oil pressure decrease	Measure the clutch pressure.
	 The clutch plate is worn out or damaged. The clutch piston down not operate 	Change the clutch plate.
	normally.	\cdot Repair or change the clutch piston.

Trouble symptom	Probable cause	Remedy
2. Power is not transmitted		
1) Torque converter	 The flexible plate is broken. The oil is in short supply. The shaft and spline are worn. The gear is broken. The charging pump does not operate normally. 	 Change the flexible plate. Replenish oil. Change the shaft and the spline. Change the gear. Change the charging pump.
2) Transmission		
- Hydraulic converter oil - Clutch part	 The oil is in short supply. The clutch plate is worn and broken. The clutch plate is sticking. The clutch shaft spline is worn. The clutch pressure has decreased because the seal of the clutch piston do not operate normally. 	 Replenish oil. Change the clutch plate. Change the clutch plate. Change clutch shaft. Change the clutch.
- Output gear	\cdot The gear is broken.	\cdot Change the gear.
- Solenoid valve	The solenoid lines are broken. Speel does not operate normally	Change the solenoid. Bonair or change the solenoid value.
- Valve assy	Spool does not operate normally. The clutch pressure has decreased	 Repair of change the spring. Change the spring.
3) Electric circuit	 The valve does not move with the valve opens. The orifice is clogging. The switches or the relays are broken. Wiring has come off and they are broken. 	 Repair or change the valve. Wash the orifice. Refer to the electric circuit figure and repair the broken points. Refer to the electric circuit figure and repair the broken points.
3. Oil temperature rise abnormally		
1) Torque converter		
- Torque converter oil	 Amount of oil is not appropriate. The oil that is not regulated is used. The air has mixed into oil. 	 Check the oil level. Change the oil to regular oil. Tighten each joint coupling and the pipe further.
	The water has mixed into oil.	Check the cooler and change the all oil.
2) Transmission		• wash the oil cooler of change them.
- Torque converter oil	 The clutch plate is sticking. The clutch piston does not operate normally. The pressure of clutch has decreased. The bearing are worn or sticking. 	 Change the clutch plate. Repair the clutch piston or change them. Check the clutch pressure. Change the bearing.

Trouble symptom	Probable cause	Remedy
4. Clutch or converter oil pressure is too high		
1) Torque converter	 Viscosity of oil is too high (at cold time). 	• Warm up the torque converter if the temperature of torque converter oil is below outside air temperature.
	\cdot The oil that is not regulated is used.	\cdot Change the oil to regular oil.
2) Transmission		
- Valve assy	• The value does not operate normally because the valve has damage and the valve catch rubbishy in valve.	 Repair the valve assy and change them.
5. Clutch or converter oil pressure is too low		
1) Torque converter	 The oil is in short supply. The oil that isn't regulated is used. The charging pump is worn and broken. The oil seal ring or O-ring is worn. 	 Replenish oil. Change the oil to regular oil. Change the charging pump. Change the oil seal ring or the O-ring.
2) Transmission		
- Valve assy - Clutch	 The spring is setting and broken. The valve does not move with the valve opens. The orifice is clogging. The seal ring of the clutch piston are damaged. 	 Change the spring. Repair the valves or change it. Wash the orifice. Change the clutch piston.
6. Noises occurs		
1) Transmission	 The clutch is sticking and dragging. The bearings are sticking are worn. The gear is broken. The spline is worn. The bolt is loosen or broken. 	 Change the clutch. Change the bearing. Change the gear. Change the spline. Tighten the bolt or change it.

2. DRIVE AXLE

Trouble symptom	Probable cause	Remedy	
1. Noise & vibration, abnormal fever			
1) Axle	 Lubricating oil shortage Using different lubricating oil 	 Check oil level and refill lubricating oil Change lubricating oil 	
2) Spiral bevel gear	 Failure on match of spiral bevel gear Damage or fitting of spiral bevel gear Release pinion shaft taper-roller bearing (spacing) Damage of pinion shaft taper-roller bearing Release bolt of ring gear Damage of differential case Damage of differential spider 	 After disassembly and adjust (adjust match pattern of gear) After disassembly and replace the part After disassembly and adjust freeload or replace bearing After disassembly and adjust freeload or replace bearing Paste loctite #277, Check tighten torque 710~760 kgf-cm After disassembly and replace the part After disassembly and replace the part 	
3) Differential	 Damage of diff sub taper-roller bearing Release diff sub taper-roller bearing (spacing) Fitting of diff pinion or side gear Too much backlash at diff pinion and side gear Wear or damage of thrust washer 	 After disassembly and replace the part After disassembly and rearrange adjust bearing After disassembly and replace the part After disassembly and adjust or replace bearing After disassembly and replace the part 	
4) Axle shaft	 Damage of axle shaft (break or bending) Damage of gear at axle shaft 	 After disassembly and replace the part After disassembly and replace the part 	
5) Planetary gear (Wheel hub)	 Damage of needle bearing Damage of taper-roller bearing Release taper-roller bearing on wheel shaft Fitting of planetary gear Fitting of ring gear 	 After disassembly and replace bearing After disassembly and replace bearing After disassembly and adjust freeload or replace bearing After disassembly and replace the part After disassembly and replace the part 	
6) Brake	 Incorrect axle fluid and/or friction material used Incorrect volume of oil Particle (moisture) throughout the oil 	 Use only specified or approved materials Drain and flush fluid from axle. Replace with approved fluid Exchange oil 	
	Wear of friction plate	 Exchange the triction plate 	

Trouble symptom	Probable cause		Remedy
2. Oil leakage			
1) Leakage	Leakage of assembly side	 Release of bolt Damage of assembly side Damage or loose gasket (liquid) 	 After disassembly and paste loctite, check the torque After disassembly and replace the part Change the gasket
	Leakage of hub	 Damage of oil seal Damage of O-ring 	 After disassembly and replace the part After disassembly and replace the part
	Leakage of inlet	 Damage of oil seal Damage of O-ring 	 After disassembly and replace the part After disassembly and replace the part
	Leakage of air breather	 Excess oil volume Damage of air breather Use non-standard oil 	 Check oil level, set correct oil volume Wash or replace the air breather Change standard oil
	 Defect of material Release of air breather Release of input fitting or plug Damage of input fitting or plug 		 After disassembly and replace the part Check the tighten torque 150~200 kgf-cm Check the tighten torque 380~420 kgf-cm After disassembly and replace the part
2) Internal leakage	Leakage of service brake ↓ (Loss of brake reserve tank oil)	 Damage of brake seal Wrong assemble brake seal Detect of slide on seal (Axle housing, pistion) Mix particle of slide on seal Defect of material (or oil line) 	 Change piston seal After disassembly and replace the part Replace related part Wash slide part or replace piston seal After disassemble and replace part
	Leakage of parking brake ↓ TM oil transfer axle ↓ Leakage of air breather	 Damage of parking brake seal Wrong assemble parking brake seal Detect of slide on seal (Axle housing, pistion) Mix particle of slide on seal Defect of material (or oil line) 	 After disassembly and replace the part After disassembly and replace the part Replace related part Wash slide part or replace piston seal After disassembly and replace the part

* When leakage of parking brake, transmission oil move to axle. It need to exchange the oil.

Trouble symptom	Probable cause	Remedy
3. Axle does not revolution		
1) Spiral bevel gear	 Damage of spiral bevel gear Release pinion shaft taper-roller bearing (spacing) Damage of pinion shaft taper-roller bearing Release bolt of ring gear 	 After disassembly and replace the part After disassembly and adjust freeload or replace part After disassembly and replace the part After disassembly and replace the part
2) Differential	 Damage of differential pinion and side gear Damage of differential spider Damage of pinion shaft and ring gear Wear or damage of thrust washer 	 After disassembly and replace the part
3) Axle shaft	 Damage of axle shaft (break or bending) Damage of gear at axle shaft 	 After disassembly and replace the part After disassembly and replace the part
4) Planetary gear (wheel hub)	 Damage of planetary needle bearing Damage of wheel shaft taper-roller bearing Release of wheel shaft taper-roller bearing (spacing) Release lock-nut Fitting of planetary gear Fitting of ring gear Release lock-nut Release lock-nut Release bolt of hub sub 	 After disassembly and replace the bearing After disassembly and replace the bearing After disassembly and rearrange adjust bearing After disassembly and rearrange adjust part After disassembly and replace the part
5) Brake	Damage or release of bolt and nut on hub Eailure of service brake piston	After disassembly and replace the part After disassembly and rearrange adjust part
5) DIAKE	 Leakage of parking brake Damage of friction plate and plate 	After disassembly and rearrange adjust part After disassembly and rearrange adjust part After disassembly and rearrange adjust part

st Wash or check the outfit of shaft, gear, bearing

 $\, \ast \,$ Wash or check the outfit of seal

* Make clean internal housing

* Exchange of oil

Trouble symptom	Probable cause		Remedy
4. Brake does not apply			
1) Inoperation of brake	Travel brake	 Non-inject or lack of brake oil Damage of brake seal Wrong assemble brake seal Detect of slide on seal (axle housing, pistion) Mix particle of slide on seal 	 Check oil level, set correct oil volume Replace piston seal After disassembly and adjust or replace part Replace related part Wash slide part or replace piston seal
		 Damage of friction plate and plate Defect of material (or oil line) 	 After disassembly and adjust or replace part After disassembly and replace the part
	Parking brake	 Damage of parking spring Wrong assembly of parkgin spring Damage of friction plate and plate 	 After disassembly and replace the part After disassembly and adjust or replace part After disassembly and adjust or replace part
2) Impossible release of brake	Travel brake	 Failure of return at service brake piston Damage of friction plate and plate 	 After disassembly and adjust or replace part After disassembly and adjust or replace part
	Leakage of parking brake	 Damage of brake seal Wrong assemble brake seal Detect of slide on seal (axle housing, pistion) Mix particle of slide on seal Defect of material (or oil line) 	 After disassembly and replace the part After disassembly and adjust or replace part Replace related part Wash slide part or replace piston seal After disassembly and replace the part
3) Deterioration	Inadequate actuation fluid supply to brake		Supply standard oil, replace seal of brake
of brake • Inadequ		te pressure to apply brakes	 system Check or replace of brake seal and brake oil line
	\cdot Worn or d	amaged discs	After disassembly and adjust or replace part
	Air enter into brake system Deform parking spring		 Hemove air by air breather After disassembly and replace the part

GROUP 3 DISASSEMBLY AND ASSEMBLY

1. DISASSEMBLY OF TRANSMISSION

1) DISASSEMBLING OF TRANSMISSION ASSY

- (1) Drain the transmission oil. Remove the drain plug at T/C housing.
- (2) Lay the wood plate (or plastic plate) on the workshop's table (bottom). And put the T/M assy on the wood plate (or plastic plate) : For an (dis) assembly at the time of damage prevent.
- A To avoid serious personal injury and possible damage to components, be very careful when using lifting devices during removal and disassembly procedures.



15L7ATM001

- (3) Removal torque converter part.
- ① Remove the torque converter sub assy.



15L7ATM002

② Remove the hexagon bolt , washer, flexible plate.



15L7ATM003





(5) Remove the socket gear. Next remove the snap-ring at socket gear.

(6) Removal the oil pump sub assy.

then remove the copper washer.



22D9TTM005

- Hex-bolt Copper washer 15L7ATM006
- * Use a plastic mallet to decomposition.

(1) Remove the hexagon bolt ($M8 \times 1.25P \times 38L$), and

22D9TTM007



22D9TTM008





0 Remove the O-ring at pump sub assy.

- (7) Removal the control valve sub assy.
- (1) Remove the hexagon bolt (M8 \times 1.25P \times 60L).



22D9TTM010

- 2 Remove the part slowly with hit the end side softly.
- * Using a plastic hammer . Do not hit steel parts with a steel hammer. Pieces of a part can break off and cause serious personal injury.
- ③ Remove the control valve assy, and then remove the gasket.

(8) Remove the oil filter, and then remove the filter adapter.

Plastic hamme 22D9TTM011



22D9TTM012



22D9TTM013

Spring

Steel ball Plug

15L7ATM014

(9) Remove the (T/C in relief, cooler relief) plug, and then remove the spring, steel ball. Next remove the O-ring at relief plug.

(10) Remove the cooler (in/out) plug.(M16)



22D9TTM015



22D9TTM016



15L7ATM017



15L7ATM018

Clamp Socket bolt

22D9TTM019

(11) Remove the air breather.

(12) Remove the hexagon bolt, and then remove the T/ C cover.

(14) Remove the socket bolt, and then remove the

(13) Remove the oil level gauge.

clamp.

3-30

(15) Remove the socket bolt, and then remove the pipe. Next remove the O-ring at the pipe.



15L7ATM020

(16) Remove the socket bolt, and then remove the speed sensor.



22D9TTM021

(17)Lay the T/M assy without damage to the T/C housing.(engine mounting surface)



22D9TTM022

(18) Remove the plug, and then remove the spring, oil strainer. Next remove the O-ring at the plug.



(19) Remove the plug.(PT 1/8 \times 4EA, PT3/8 \times 4EA)



22D9TTM024



15L7ATM025



15L7ATM026



22D9TTM027

(20) Remove the socket bolt (T/M case + T/C housing fastening bolt) 4 socket bolt exclusions.

(21) To turn over T/M assy without damage to the T/M case. (main pump mounting surface) Next remove the 4 socket bolt.

- (22) Remove the part slowly with hit the end side softly.
- * Using a plastic hammer.



15L7ATM028

(23) Remove the T/C housing.



C/L SHAFT ASS"

OUTPUT GEAR ASS'Y

00

15L7ATM029

IDLE GEAR ASS'Y

0

15L7ATM030

(24) Gear assemblies arrangements.





(26) Remove the output gear assy.



15L7ATM032

15L7ATM031

(27) Remove the idle gear assy.



15L7ATM033

- (28) Remove the clutch gear assy.
- * Store each gear assembly in separate box.



15L7ATM034

(29) Remove the oil seal.



15L7ATM035

2) DISASSEMBLING OF GEAR ASSEMBLIES

(1) Disassembling clutch gear assy.

1 Remove the peek seal and seal ring.



22D9TTM036

Peek seal x4 Seal ring

22D9TTM037

② Pull out the bearing (#6207) and spacer from the shaft.



③ Pull out the forward clutch sub assy and space.



4 Pull out the bearing (#6911) from the shaft.



22D9TTM040

⑤ Pull out the reverse clutch sub assy and remove the O-ring.



22D9TTM041

6 Forward clutch sub assy.





22D9TTM042



22D9TTM043
⑧ Remove the snap ring, and then remove the bearing.



③ Remove the snap ring, and then remove the back plate, friction disk, and steel plate.



15L7ATM045

- ① Remove the wire ring, and then remove the back plate and spring.
- ▲ When you remove the wire-ring, it might be shot out by impact of spring. Certainly fixing the spring, will have to remove.
- ① Pull out the clutch piston, and then remove the O-ring.

Next remove the glyd ring at the clutch piston.



22D9TTM046



② Reverse clutch sub assy.

(3) Remove the reverse clutch gear sub.

I Remove the snap ring, and then remove the bearing.

⑤ Remove the snap ring, and then remove the back plate, friction disk, and steel plate.

- $\scriptstyle{(\!6\!)}$ Remove the wire ring, and then remove the back plate and spring.
- When you remove the wire-ring, it might be shot out by impact of spring.
 Certainly fixing the spring, will have to remove.
- O Pull out the clutch piston, and then remove the O-ring.

Next remove the glyd ring at the clutch piston.









22D9TTM051

(2) Disassembling of Idle gear assy.



15L7ATM052

① Pull out the bearing, and then remove the idle gear upper (lower).



(3) Disassembling of output gear assy.



1 Remove the seal ring, oil seal and sealing cap.



② Pull out the bearing.



15L7ATM056

2. ASSEMBLY OF TRANSMISSION

1) ASSEMBLING OF GEAR ASSEMBLIES

- * Assemble the part with reverse the aforementioned disassemble procedure.
- · Assembling of clutch gear assembly.
- (1) Forward clutch drum sub assembly.
- ① In drum internal groove O-ring assembly.
- * Spread grease on seal ring.



22D9TTM057

Quad ring

- ② In piston groove glyd ring assembly.
- * Spread grease on glyd ring.





15L7ATM059

15L7ATM058

- ④ Assemble return spring, plate back and wire ring at the drum sub.
- ▲ When you assemble the wire ring, it might be shot out by impact of spring. Certainly fixing the spring, will have to assemble.



15L7ATM060

⑤ First insert steel plate, and then insert friction disk alternately.
Next insert the back plate, and then assemble the

Next insert the back plate, and then assemble the snap ring.

⁽⁶⁾ Assemble the bearing, and then assemble the snap ring alternately.

⑦ Arrange serration of the friction disk, and then assemble the spacer, clutch gear sub.

 \circledast Forward clutch drum sub assembly.



15L7ATM061





22D9TTM063



22D9TTM064

(2) Reverse clutch drum sub assembly.

- $(\ensuremath{\underline{1}})$ Do work as the same way like forward clutch drum sub assembly procedure 1) \bigcirc ~ \bigcirc .
- O Assemble the bearing, and then assemble the snap ring alternately.
- ③ Arrange serration of the friction disk, and then assemble the clutch gear sub.







22D9TTM066

④ Reverse clutch drum sub assembly.

1 Assemble the reverse clutch drum sub assy and

(3) Clutch gear assembly

O-ring at the shaft sub assy.



22D9TTM067

O-ring

22D9TTM068

- 0 Assemble the bearing.
 - Used method of heating bearing.

④ Assemble the spacer and bearing.Used method of heating bearing.

* All bearings should never be heated above 120°C.



15L7ATM069

③ Assemble the forward clutch drum sub assy and space at the shaft sub assy.



22D9TTM070



22D9TTM071



6 Clutch gear assy. (assemble the shim)

(5) Assemble the peek seal and seal ring.

* Spread grease on peek seal and seal ring.

* Bearing distance (191.5) - X = The amount of shim (It will manage bearing distance $191.5_{-0.1}^{0}$)

Assembling of output gear assembly.

- 1 Assemble the bearing.
 - Used method of heating bearing
- * All bearings should never be heated above 120°C

- O Assemble the oil seal, seal ring and sealing cap.
- * Spread loctite #609 on the out wheel of oil seal, spread grease on inside wheel of oil seal.
- * Spread grease on seal ring.
- * Spread loctite #592 on the out wheel of sealing cap.



15L7ATM074



③ Output gear assy.



15L7ATM076

Assembling of idle gear assembly.

- 1 Press the idle gear upper and idle gear lower at the idle gear shaft, and then assemble the bearing. - Used method of heating bearing
- * All bearings should never be heated above 120°C



② Idle gear assy.



15L7ATM078

2) ASSEMBLING OF TRANSMISSION ASSY

- (1) Press the oil seal.
- * Spread loctite #592 on the out wheel of oil seal, spread grease on inside wheel of oil seal.



15L7ATM079

- (2) Assemble the clutch gear assy.
- * When you insert the shaft after install the seal ring in the shaft, please insert the shaft with turning it into the shaft side and hole side of shaft for prevent the damage of shaft.



15L7ATM080

(3) Assemble the idle gear assy.



(4) Assemble the output gear assy.



15L7ATM082

- (5) Assemble the O-rings.
- * Spread grease on O-ring.



15L7ATM083

- (6) Press the lock-pins.
- * After the assembling, please check whether you can turn the input (output) gear lightly by your hand.



15L7ATM084

(7) Spread loctite #5127 on T/C housing space.



15L7ATM085

(8) Assemble the T/C housing.

- (9) Assemble the part slowly with hit the end side softly.
- * Using a plastic hammer.



15L7ATM086



15L7ATM087

(10) Assemble the socket bolts. (T/M case + T/C housing softly fastening)



15L7ATM088

- (11) Turn over T/M assy without damage to the T/C housing.(engine mounting surface) Next assemble the socket bolts.
 - · Socket bolt (M10 \times 1.5p \times 40 mm) \times 16EA
 - Tightening torque : $6.5 \sim 7.0 \text{ kgf} \cdot \text{m} (47 \sim 50.5 \text{ lbf} \cdot \text{ft})$
- * Spread loctite #277 on socket bolt.
- (12) Assemble the socket bolts.
 - Socket bolt (M10×1.5p×25mm)×2EA
 - Tightening torque : $6.5 \sim 7.0 \text{ kgf} \cdot \text{m} (47 \sim 50.5 \text{ lbf} \cdot \text{ft})$
- * Spread loctite #277 on socket bolt.



15L7ATM089



15L7ATM090



- · Socket bolt (M10 \times 1.5p \times 30 mm) \times 2EA
- Tightening torque : $6.5 \sim 7.0 \text{ kgf} \cdot \text{m} (47 \sim 50.5 \text{ lbf} \cdot \text{ft})$
- * Spread loctite #277 on socket bolt.



15L7ATM091

- (14) Assemble the plugs(PT 1/8, PT 3/8) \times 4EA
 - PT 1/8 Tightening torque : 1.0~1.5 kgf ⋅ m (7.0~11 lbf • ft)
 - · PT 3/8 Tightening torque : 3.0~4.5 kgf · m (21.5~29.0 lbf • ft)
- * Spread loctite #577 on plug.



22D9TTM092

(15) Assemble the O-ring at the plug.

Insert the oil strainer, spring ,and then assemble O-ring+plug assy.

 \cdot Plug tightening torque : 8~10 kgf \cdot m

(58~72 lbf • ft)

- * Spread grease on O-ring.
- (16) Assemble the speed sensor, next assemble the socket bolts.
 - \cdot Tightening torque : 0.5~0.8 kgf \cdot m (3.5~5.5 lbf \cdot ft)



15L7ATM093



22D9TTM094



15L7ATM095



22D9TTM096



22D9TTM097

(17) Assemble the O-ring at the pipe, and then assemble the pipe+O-ring assy.

Next assemble the socket bolts.

- \cdot Socket bolt (M8 \times 1.5p \times 15 mm) \times 2EA
- \cdot Tightening torque : 3.2~3.6 kgf \cdot m (23~26 lbf \cdot ft)
- * Spread grease on O-ring.
- * Spread loctite #277 on socket bolt.
- $\left(18\right) Assemble the clamp at the pipe,$
 - and then assemble the socket bolt.
 - \cdot Socket bolt (M10 \times 1.5p \times 30 mm)
 - \cdot Tightening torque : 5.5~6.5 kgf \cdot m (40~47 lbf \cdot ft)
- * Spread loctite #277 on socket bolt.

(19) Assemble the oil level gauge at the pipe.

- (20) Assemble the T/C cover and hexagon bolts.
 - \cdot Hexagon bolt (M8 \times 1.25p \times 16 mm) \times 2EA
 - Tightening torque : 3.2~3.6 kgf · m (23~26 lbf · ft)
- * Spread loctite #277 on socket bolt.



15L7ATM098



- Tightening torque : 3.0~4.0 kgf · m (21.5~29 lbf · ft)
- * Spread loctite #577 on air breather.



22D9TTM099

(22) Assemble the O-ring at the plug, and then insert steel ball, spring.

Next assemble O-ring+plug assy.

- Plug(3/4-16 UNF) × 2EA
 - Tightening torque : 3.5~4.5 kgf m (25~33 lbf ft)
- * Spread loctite #577 on plug.
- * Spread grease on O-ring.
- (23) Assemble the adapter filter, and then assemble the oil filter.
 - Adapter filter
 - \cdot Tightening torque : 3.5~4.5 kgf \cdot m (25~32 lbf \cdot ft)
- * Spread loctite #277 on adapter filter.
 - Oil filter
 - Tightening torque : 2.2~2.5 kgf · m (16~18 lbf · ft)
- (24) Install the gasket, and then install the control valve assy.
- * Spread grease on gasket.





22D9TTM101



- (25) Assemble the hex bolt.
 - · Hexagon bolt (M8 \times 1.25p \times 60 mm) \times 10EA
 - Tightening torque : 3.2~3.6 kgf · m (23~26 lbf · ft)



(26) Assemble the drive gear, driven gear and stator shaft at the pump case and assemble the bolt plate and then oil seal.

- Bolt plate

- Tightening torque : 3.0~4.0 kgf · m (21~29 lbf · ft)
- Spread Loctite #592 on the out wheel of oil seal, spread grease on inside wheel of oil seal.
- (27) Assemble the o-ring at the charging pump assy.
- * Spread grease on O-ring.



22D9TTM104



15L7ATM104

- (28) Install the gasket at the T/C housing, and then install the charging pump assy.Next assemble the hexagon bolt and bronze washer.
- * Spread grease on gasket.
 - Hexagon bolt (M8 \times 1.25p \times 38L) \times 6EA
 - Tightening torque : 3.2~3.6 kgf · m (23~26 lbf · ft)
- * Spread loctite #242 on hexagon bolt.
- (29) Assemble the snap ring at the socket gear, and then insert the socket gear sub assy at the cylinder gear assy.



22D9TTM105



22D9TTM106

(30) Insert the PTO shaft.



Flexible plate

Hex bolt

Washer

15L7ATM107

Torque converter

15L7ATM108

- (31) Install the flexible plate at the torque converter, and then install the hexagon bolt and washer.
 - \cdot Hexagon bolt (3/8-24UNF-2B) \times 6EA
 - Tightening torque : 3.0~3.5 kgf m (21.6~25.3 lbf • ft)
 - (2110 2010 121
- * Spread loctite #277 on hexagon bolt

(32) Insert the T/C sub assy at the T/M sub assy.



15L7ATM109





15L7ATM110

3. DISASSEMBLY OF DRIVE AXLE

1) DISASSEMBLY

(1) Disassembling of drive axle assy.



15L7ADA001

- (2) Remove bolts of hub sub assembly.
- ▲ To avoid serious personal injury and possible damage to components, be very careful when using lifting devices during removal and disassembly procedures.
 - Inspect to make sure that neither lifting strap is damaged.
 - Do not subject lifting straps to any shock or drop loading.
- (3) After support hub sub assembly by lifting device, make hub sub assembly separate at the same intervals by tightening two jack screw.
- ▲ Use care when you remove the hub assembly to prevent the hub assembly from falling off of the lifting device. Do not drop the hub assembly. Damage to the hub assembly and serious personal injury can result.
- (4) Disassemble in order of separate plate → friction plate.



15L7ADA002



15L7ADA003



22D9TDA004

(5) Disassemble in order of special bolt \rightarrow return spring.



22D9TDA006

- (6) Remove the brake pistion.
- * Caution of the quad ring damage.



22D9TDA007

- (7) After remove retaining ring, pull out left axle shaft.(Do work as the same way like right axle shaft)
- Lose a brass, leather or rubber mallet for assembly and disassembly procedures.
 Do not hit steel parts with a steel hammer.
 Pieces of a part can break off and cause serious personal injury.



22D9TDA008

(8) Disassembling of hub sub assy.



J91DA009

(9) Remove all snap rings.



- (10) Remove all each parts in order of thrust washer \rightarrow planet gear \rightarrow needle bearing \rightarrow thrust washer.
- * Check to be sure that the needle roller quantity. (19 EA/1 gear)





Thrust washer (1) Thrust washer (2)

(11) Disassemble the set screw.

When hard to disassemble by loctite, heating the set screw on 1 min by heating device. And then try to disassemble.

Mark the position, before disassemble.

When the bearings, wheel shaft, housing is not replaced, use the replaced shim.

(12) Loose lock nut by using jig.







22D9TDA011A



- (13) Extract planet carrier. Disassemble hub sub.
- * Extract using a gear puller.





(14) Extract carrier housing with bearing.



22D9TDA014

(15) Remove bolts and spring wahser.



22D9TDA015

shem spacer o-ring

22D9TDA016



(17) Extract the fixing bolt of carrier assembly.

(16) Remove flange hub, shim, spacer and O-ring.

If you do not replace the bearing or spacer, disassemble and reassemble the shim to accept.

- (18) Extract carrier assembly.
- * Using lifting device.



22D9TDA018





(20) Remove carrier cap bolt.

(21) Extract the carrier cap (apply marking a match).





22D9TDA021

- (22) Remove adjusting ring of both sides bearing cup.
- * Using dedicated fixtures and brass drift punch.



22D9TDA022

(23) Extract differential assembly.



22D9TDA023

(24) After turn over carrier assy and fix it, remove nut.



22D9TDA024



22D9TDA025

(26) Remove carrier case cover bolts.

(25) Remove U-joint flange.

Disassemble slowly and follow the No. in regular.
 It prevent to jump out the cover by inner spring



22D9TDA026





22D9TDA027

(28) Remove spring and guide pin.



(29) Disassemble the piston. When disassembling, apply oil or air pressure at brake port. Caution of damage on quad ring





22D9TDA029





22D9TDA030

- (31) Disassemble the pinion shaft. Hit the pinion shaft by rubber hammer.
- * To avoid personal injury and possible damage to component. Be very carefully to disassemble.

22D9TDA031

(32) Disassemble shim, spacer, and bearing.If do not replace the spacer and bearing, it use original shim.



22D9TDA032





(34) Extract piston housing.



22D9TDA034

(35) Remove parking friction plate and separate plate.



22D9TDA035





(37) Remove bearing cup and shim.



22D9TDA037

(38) Bearing cup and shim parts.



22D9TDA038

2) ASSEMBLY

bolt.

(1) Carrier sub assembly

Differential device assembly

① Prepare parts for assembly of differential.

After paste loctite #277 on spiral of bolt.

Confirm torque : 7.1~7.6 kgf ⋅ m



② Fix differential case RH and spiral ring gear with

22D9TDA139

③ Assemble the carrier sub of a sequential development. Differential case RH and LH with bolt After paste loctite #277 on spiral of bolt. Confirm torque : 1.6~1.7 kgf · m



22D9TDA140

- ④ Assemble bearing. Heating pressurize bearing cone.
- * Control the heating temperature 100°C or less.



Adjusting shim and pinion shaft assembly

- 1 Fix carrier case to the jig.
- Read the following information before installing new gear set in the carrier. Always inspect the gear set for correct marks to make sure the gears are a matched set.

22D9TDA036A

The locations of the gear set marks are shown in right figure.

- · Part number
- a. Examples of gear set part numbers
 - Conventional ring gear, 21DA-20041
 - Conventional pinion shaft, 21DA-20051
- * Part No. : Refer to parts manual.
- b. Location on pinion shaft : Shaft end
- c. Location on ring gear : Front face or outer diameter
- · Tooth combination number
- a. Example of a tooth combination number : 13-32
 (An 13-32 gear set has an 13-tooth drive pinion and a 32-tooth ring gear)
- b. Location on pinion shaft : Shaft end
- c. Location on ring gear : Front face or outer diameter
- · Pinion cone variation number

(The pinion cone variation number is not used when checking for a matched gear set. The number is used when you adjust the depth of the pinion in the carrier.)

- a. Examples Pinion cone variation numbers
 - · +2 : +0.02 mm
 - · -1 : -0.01 mm
- b. Location on gear set

End of pinion shaft head or outer diameter of ring gear



- c. Decide thickness of shim by gauge and measuring apparatus (Standard gap between bearing and carrier case step : A) (Mounting distance (MD) of pinion shaft : B)
- * Thickness of shim
 - · X = A B + Carrier case bearing step depth ex1) A=0.35, B=-0.1, Bearing step depth= +0.1 X=0.35 + 0.1 + 0.1 = 0.55 mm
 - ex2) A=0.35, B=+0.1, Bearing step depth= -0.1 X=0.35 - 0.1 - 0.1 = 0.15 mm
- ② Assemble shim and bearing cup.
- * Using dedicated fixtures.



22D9TDA038A



22D9TDA039

- ③ Put with heating bearing cone on pinion shaft.
- * The heating temperature below 100°C or less administration.



22D9TDA041

- ④ Put into pinion shaft.
- * Applied oil or grease on the bearing roller area.



5 Set a ball.

6 Equip jig for fixing.

⑦ Fasten the ball.

⑧ Put into spacer.



15L7ADA043



15L7ADA044



15L7ADA045

22D9TDA047

- Decide thickness of shim by depth gauge (thickness : A)
- If there is no set work-related replacement parts required. Re-use the existing parts.

Thickness of shim = A - $(0.03 \sim 0.06)$

A : short distance between the bearing assembly and spacer



① Assemble shim.



22D9TDA052

- ① Assemble bearing.
- * Bearing cup is assembled using a dedicated jig.
- * Put heated bearing inner ring, and control heating temperature 100°C or less.



22D9TDA053

Assemble of parking sub assembly

1 Assemble spline parking.

② Assemble O-ring





22D9TDA055

③ Assemble in order of separate plate (plate \rightarrow friction plate).



22D9TDA056

④ Assemble the piston housing. (paste loctite #5127)



22D9TDA057





- (5) Assemble O-ring, air bleeder and elbow 45°.
 (when assemble O-ring, paste oil or greace).
 - Tightening torque of elbow 45° : 3.8~4.2 kgf·m
 - Tightening torque of air bleeder : 1.5~2.0 kgf·cm



22D9TDA058

* Attention of direction on assembly.



22D9TDA058A

6 Assemble piston.Check twist of quad ring.Paste oil or greace on surrounding of quad ring.



- * AssemIdy direction
 - : Top of parking release
 - : Assembly of guide pin



22D9TDA059A



22D9TDA060

22D9TDA061

 \bigcirc Guide pin + spring assembly.

8 Parking cover + oil seal assembly. (Match the parking position tap and cover hole)

③ Assemble bolt. Paste loctite #5127 on side assembling. Paste loctite #277 on bolt, tightening torque 3~ 4 kgf ⋅ m.



* Follow the direction at the cover assembly symmetry, for proper seating of the spring.



- 1 Check the performance of parking brake.
- * The following procedure describes how to test brake oil leakage, return state of piston.
- a. Remove residual air in brake line.
- b. Actuate the piston at least five times with 10 bar. Check the performance of brake.
- c. Preset 10 bar at piston, blank the oil line. If it has variation of pressure under 2 bar in 3 min, It is normal condition.
- d. When oil leakage, disassemble parking cover, check brake oil leakage and solve the problem from inspection.
- * Major inspection part
 - · Check damage of wet movement.
 - · Check damage of brake seal.
 - · Check incorrect assembly at brake seal.
- ① Assemble flange U-joint.

Oil or grease before assemble oil seal inner ring part application.



22D9TDA063

- 12 Fasten nut. Assemble paste loctite #242. Confirm torque : 26~29.5 kgf · m
- ※ Preload : 10~19 kgf ⋅ cm



- Preload measurement. (Spec : 10~19 kgf · cm)
 If preload is over the spec, follow the procedure.
 (refer to (9), (10) page 3-66, 3-67)
 Adjust the thickness of shim.
- Always remember that the hydraulic oil circuit is under pressure.
 When carring out inspection and maintenance,

release the pressure first. (Using release bolt)

Gaulking. (2 EA)Brass drift punch used.



22D9TDA065



22D9TDA066



22D9TDA066A

(5) Assemble plug.Applied, Loctite 577 tightening torque 1.0~1.5 kgf·m



Adjusting the gear set backlash

① Assemble differential sub in carrier case.



22D9TDA076

② Sub-assembly differential carrier case de suffren. Threaded steel ball assembly for positioning.



22D9TDA077



22D9TDA078



22D9TDA079

5 Measure again backlash.

③ Fit carrier cap with steel ball.

Confirm torque : 11.7~13.1 kgf · m

Bolt : paste loctite #277

④ Fasten bearing adjust ring.

contact.

* Backlash of pinion and ring gear : 0.15~0.20 mm

Lightly tighten bearing only about to be in close

If backlash is wrong, carry out adjusting work. Adjust the left/right of ring bearing adjust by one and one clip.


* When the ring gear away from the pinion shaft will increase the backlash.

Backlash reduction methods



How to increase backlash





22D9TDA083



15L7ADA084

 Apply marking compound to approximately 5~6 teeth of the ring gear.

Adjusting tooth contact pattern of the gear set

* After assembling, adjust pattern of the gear and

If pattern is not adjusted, take a measure as measuring backlash again and then reassemble. * Always check tooth contact pattern on the drive

pinion shaft figure.

side of the gear teeth.



15L7ADA085

- ② Rotate ring gear forward and backward so that the 6 marked teeth go past the drive pinion six time to get a good contact pattern.
- ③ Compare the contact patterns.
- In new gear sets, a good contact pattern is toward the toe of the tooth, and centered between the top and bottom of the tooth.





15L7ADA087



 In used gear sets, a good contact pattern fills approximately the full length of the tooth.
 The top of the pattern is near the top of the tooth.
 The location should match the wear pattern on the tooth.



15L7ADA089

- If the contact patterns require adjustment along the width of tooth (top/bottom), follow steps (a)-(b).
 If the contact patterns require adjustment along the length of tooth (toe/heel), follow steps (c)-(d).
- (a) High pattern : A high contact pattern indicates that the pinion was installed too shallow into the carrier. Figure DA087.

To correct, move the pinion toward the ring gear by decreasing the shim pack between pinion spigot and inner bearing cone. Figure DA090.

b Low pattern : A high contact pattern indicates that the pinion was installed too deep into that the pinion was installed too deep into the carrier. Figure DA088.

To correct, move the pinion away from the ring gear by increasing the shim pack between pinion spigot and inner bearing cone. Figure DA091.

- © Heel pattern : Decrease the gear set backlash (within specified range) to move contact pattern toward toe and away from heel. Refer to page 3-72 "Adjusting the gear set backlash". Figure DA092.
- Increase the gearset backlash (within specified range) to move contact pattern toward heel and away from toe.
 Defor to the pate 2, 70 "Adjusting the seer set

Refer to the pate 3-72 "Adjusting the gear set backlash". Figure DA093.



15L7ADA090







5 Fix spring pin with ring bearing adjust. And assemble them.



15L7ADA094

6 After completion of the pattern adjustment, the spring pin assembly. Adjust the bearing ring to be fixed.



22D9TDA096



15L7ADA095

(2) Assemble of carrier assembly

① Paste sealant on axle housing. (Loctite #5127)



22D9TDA097

O Assemble carrier assembly on axle housing.



22D9TDA098

③ Fasten bolt. Assemble bolt after spread loctite #277. Confirm torque : 6.1~6.5 kgf · m



(3) Traveling brake system assembly

Axle shaft assembly

① Insert snap ring on the axle shaft.



22D9TDA100

② After put the ball bearing, fix it with snap ring.



22D9TDA101

③ After put axle shaft into axle housing fix with snap ring.



22D9TDA102

Brake piston assembly

- ① Assemble ring (large and small) at piston brake.
 - * When assembling Quad ring, pay attend to chopping.
 - * Before assemble quad ring, coating oil or grease.



22D9TDA103



22D9TDA104

3-78

② Assemble shim.

- * When assembling the shim, you calculate the value of the shim and then assemble it.
- "L" : Piston assembling part axle housing stage depth (standard : 56.9mm)
- · "C" : Carrier housing stage height (standard : 9mm)
- "F" : The total thickness of friction plate and separate plate (standard : 20.5mm)
- · "P" : Piston thickness (standard : 27mm)
- · "S" : Brake stroke (standard : 0.4mm)
- \cdot "T" : Shim

S = L-(C+F+P)

- T = S-0.4 (basis stroke)
- ex) if S = 0.5, T = S-0.4 (basis stroke) = 0.5-0.4 = 0.1mm assemble for shim 0.1mm
- (3) Assemble in order pistion \rightarrow spring \rightarrow special bolt.
 - · Special Bolt : Spread loctite
- · Confirm torque : 140~160 kgf · cm





22D9TDA106A

(4) Assemble in order of separate plate \rightarrow Friction plate \rightarrow cone spring. But Assemble separate plate lastly. (Separate plate : 4EA, friction plate : 3EA)

Friction Plate

(4) Hub assembly

Hub sub assembly

① Assemble hub bolt. (Use jig and press)



22D9TDA110

Assemble direction example.
 Careful assemble with head of bolt and hub flange.



22D9TDA110A

If you do not press or dedicated fixtures. Assemble the hub nuts, hub bolt assembly can be tightened.

To prevent damage to the bearing surface between the hub and the hub nut. Bore $\emptyset 20$, $\emptyset 40 \sim \emptyset 50$ diameter flat washer insert.

Pressurize oil seal with loctite #592.
 Spread grease inside of oil seal.





22D9TDA111

③ Put with heating bearing cone on wheel shaft. Assemble after paste axle oil on roll of bearing cone.



22D9TDA112

④ Assemble O-ring coated grease at wheel shaft.



22D9TDA113



* Paste loctite #5127 Confirm torque : 6.0~7.0 kgf · m Bolt : Spread loctite #277



O Assemble oil seal at carrier housing. Oil seal with loctite #592.









15L7ADA116

8 Assemble bearing cup at carrier housing.



(9) Assemble bearing cup at upper side of carrier housing.



22D9TDA118

22D9TDA118A

grease

- 1 Hub + wheel shaft assemble in grease charge. ·Charge amount : Grease outer ring of wealth space 60~80%. ※Recommended Grease : Shell Retinax 0419
- (1) Assemble the carrier housing on flange hub and wheel shaft.
- Oil seal+ The bearing cup assembly Housing 22D9TDA119

12 Adjust preload for fix shim. ·Preload : 40~50 kgf·cm

22D9TDA120

- 13 Put into shim. (Basic shim : 0.65 mm)
- * Sort of shim : 0.1, 0.12, 0.15, 0.25, 0.5 (mm)



(1) Pressurize bearing cone. Before assembling, paste axle oil on roller of bearing cone.



(15) Assemble planet carrier.



22D9TDA123

- (6) Assemble the locknut to confirm the bearing preload. Use designated jig or brass drift punch. Loosen and tighten repeatedly 2~3 time with 35~38 kgf • m
- * If there is no parts replacement from bearing, shaft, housing and spacer, initially assembled shims can be re-used.
- * When brass drift punch is used, assemble the locknut in accordance with its initially marked position.
- (17) Preload check.
- * Preload setting price = Oil seal resistance price + Bearing preload
 - (12) Process check price $\pm 40 \sim 50$ kgf \cdot cm
- * If measurements are not satisfied with the preloaded.

Decomposition (2) to (4) and proceeds to step, measured value is greater than the preload thickness of shim set to increase.

Measured value is less than the preload is set to decrease thickness of shim.

After the completion of the assembly (1) to (6) proceeds the process again.

* If hub bearing preload is wrong. It should cause damage to the shaft. In order to prevent major accent, should be sure the preload.





22D9TDA124A

18 Fasten lock nut.

Spread the Loctite #277 on screw.

 \cdot Confirm torque : 3.5~3.8 kgf \cdot m

Mate lock nut slot and planet carrier's hole.

 • Preload : 40~50 kgf ⋅ cm



22D9TDA124B

(B) Fasten set screw. Spread the Loctite #277.

 \cdot Confirm torque : 105~150 kgf \cdot cm



Before assembling washer, paste oil, spread grease on needle bearing.

* Needle roller quantity check : 19 EA/1 gear





Thrust washer (1) Thrust washer (2)

(2) Fix snap ring.



22D9TDA124C





(5) Assemble of hub sub assembly

① Paste loctite #5127 on axle housing.

Lifting device or the guide bolts.

Can be easily assembled.

Field, using the following guide bolt.

* About 3 mm wide circle around the front of the application.

② Assemble the hub assembly on the axle housing.





22D9TDA127A

- ③ Assemble hub sub assembly. Bolt : Assemble after spread loctite #277. Confirm torque : 11.7~13.1 kgf · m Plug : Assemble after spread loctite #577 Confirm torque : 1.0~1.5 kgf · m
- * Assemble hub sub assembly after support it by lifting device as like the same way of disassembling.



15L7ADA128

(6) The rest part assembly

- ① Assemble O-ring and fitting bleeder for LH and RH.
 - · Confirm torque : 3.8~4.2 kgf · m



22D9TDA129

② Assemble bleeder and cap. Screw : Assemble after spread loctite #577. Confirm torque : 1.5~2.0 kgf · m



22D9TDA130

③ Assemble air breather. Screw : Assemble after spread loctite #577. Confirm torque : 0.5~0.7 kgf · m

④ Assemble drain plug (magnetic). Screw : Assemble after spread loctite #577. Confirm torque : 7.0~9.0 kgf ⋅ m





22D9TDA132

(5) Assemble drain plug (magnetic). Screw : Assemble after spread loctite #577. Confirm torque : 3.0~4.1 kgf · m



22D9TDA133

- ⑥ Put in dipstick.
- * Fill axle oil as much as standard. Standard between the upper limit and the lowest limit.



oil level

22D9TDA134

⑦ Assemble dipstick gauge.

(8) Finish drive axle assembly.





(7) Functional test of hydraulic apply brake

- The following procedure describes how to test the hydraulic apply brake system only.
 To perform this test, use a device that allows you to observe possible leaks through oil seals and that also allows you to verify that the piston return system works correctly . For an accurate evaluation, the device must allow piston displacement of 0.4~0.6 mm.
- Brake bleeder valve while supplying hydraulic oil to the pressure inlet. Pump oil through the brake until oil coming out of the bleeder does not contain air bubbles.

Close the brake bleeder valve.

- ② Actuate the piston at least five times with 60 bar. Check for leaks and free movement of piston.
- ③ If you find a leak : Disassemble the hub sub assembly. Determine the cause of the leak and correct the problem. Check the seal surfaces for sharp edges, nicks and burrs.
- ④ Wait five minutes. Apply 60 bar to the piston and lock pressure on. Pressure must not drop after one minute.
- ⑤ If pressure drops off : Disassemble the hub sub assembly. Determine the cause of the leak and correct the problem. Repeat step ① - ⑤.
- You must check that the brake completely releases after you apply the brake.
 Do not operate the brake system with the brake partially released. Damage to brake components can result.