CONTENTS

SECTION 1 GENERAL

5. TORQUE CHART

Use following table for unspecified torque.

1) BOLT AND NUT - Coarse thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · ft
M 6 × 1.0	0.85 ~ 1.25	6.15 ~ 9.04	1.14 ~ 1.74	8.2 ~ 12.6
M 8 × 1.25	2.0 ~ 3.0	14.5 ~ 21.7	2.7 ~ 4.1	19.5 ~ 29.7
M10 × 1.5	4.0 ~ 6.0	28.9 ~ 43.4	5.5 ~ 8.3	39.8 ~ 60.0
M12 × 1.75	7.4 ~ 11.2	53.5 ~ 81.0	9.8 ~ 15.8	70.9 ~ 114
M14 × 2.0	12.2 ~ 16.6	88.2 ~ 120	16.7 ~ 22.5	121 ~ 163
M16 × 2.0	18.6 ~ 25.2	135 ~ 182	25.2 ~ 34.2	182 ~ 247
M18 × 2.0	25.8 ~ 35.0	187 ~ 253	35.1 ~ 47.5	254 ~ 344
M20 × 2.5	36.2 ~ 49.0	262 ~ 354	49.2 ~ 66.6	356 ~ 482
M22 × 2.5	48.3 ~ 63.3	349 ~ 458	65.8 ~ 98.0	476 ~ 709
M24 × 3.0	62.5 ~ 84.5	452 ~ 611	85.0 ~ 115	615 ~ 832
M30 × 3.0	124 ~ 168	898 ~ 1214	169 ~ 229	1223 ~ 1656
M36 × 4.0	174 ~ 236	1261 ~ 1704	250 ~ 310	1808 ~ 2242

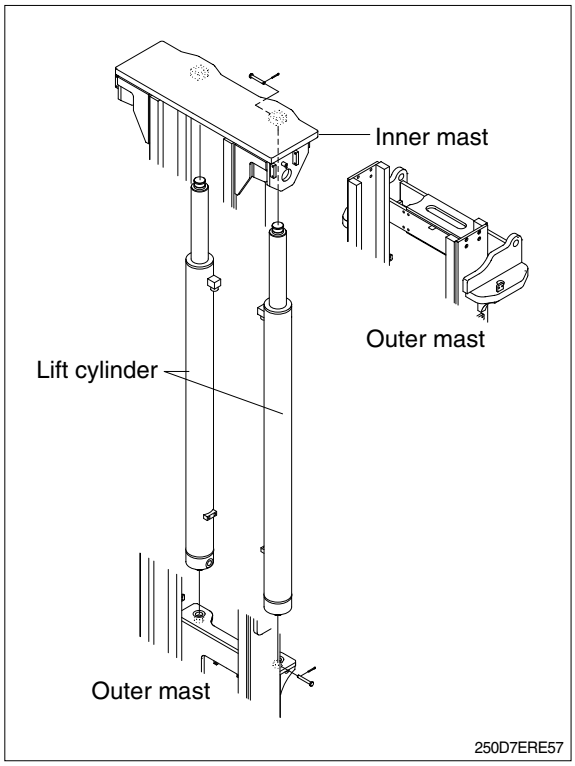
(1) Fine thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · ft
M 8 × 1.0	2.2 ~ 3.4	15.9 ~ 24.6	3.0 ~ 4.4	21.7 ~ 31.8
M10 × 1.2	4.5 ~ 6.7	32.5 ~ 48.5	5.9 ~ 8.9	42.7 ~ 64.4
M12 × 1.25	7.8 ~ 11.6	56.4 ~ 83.9	10.6 ~ 16.0	76.7 ~ 116
M14 × 1.5	13.3 ~ 18.1	96.2 ~ 131	17.9 ~ 24.1	130 ~ 174
M16 × 1.5	19.9 ~ 26.9	144 ~ 195	26.6 ~ 36.0	192 ~ 260
M18 × 1.5	28.6 ~ 43.6	207 ~ 315	38.4 ~ 52.0	278 ~ 376
M20 × 1.5	40.0 ~ 54.0	289 ~ 391	53.4 ~ 72.2	386 ~ 522
M22 × 1.5	52.7 ~ 71.3	381 ~ 516	70.7 ~ 95.7	511 ~ 692
M24 × 2.0	67.9 ~ 91.9	491 ~ 665	90.9 ~ 123	658 ~ 890
M30 × 2.0	137 ~ 185	990 ~ 1339	182 ~ 248	1314 ~ 1796
M36 × 3.0	192 ~ 260	1390 ~ 1880	262 ~ 354	1894 ~ 2562

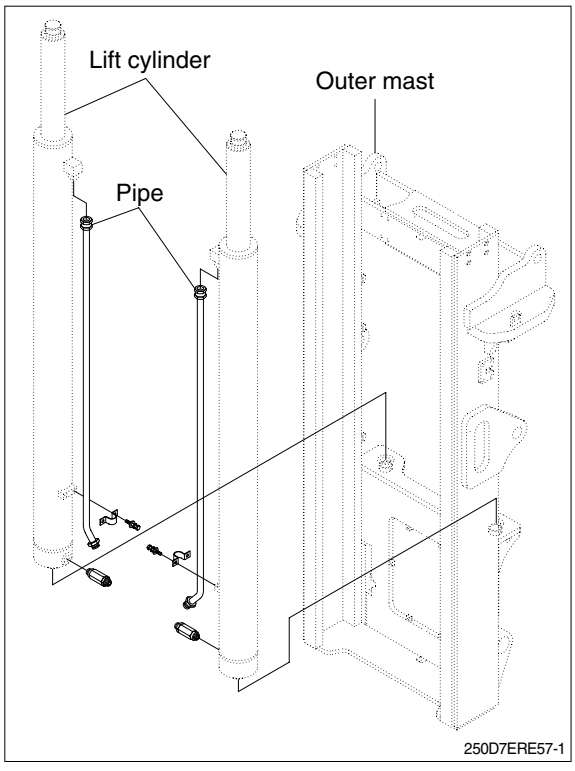
(3) PIPING

① Remove the hoses and clamps attached to the cylinder.

※ Put blind plugs in the piping immediately after removing hoses.
This prevents the hydraulic oil from flowing out and also prevents dust and dirt from getting in.



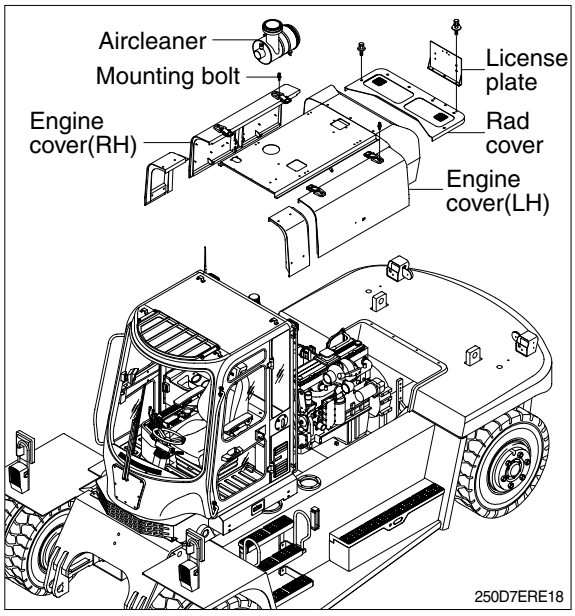
③ Remove the lubrication pipes and clamps.



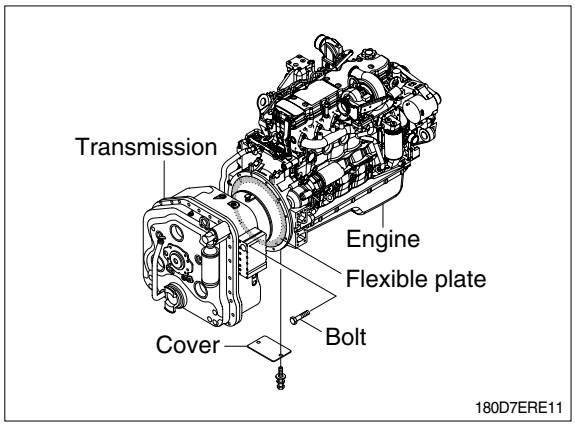
② **Engine cover(center)**

a. Pull upside the precleaner by loosening the bolts and seal in the air intake hole of air cleaner.

b. Remove engine cover and radiator cover upward.



(2) Torque converter housing cover and mounting bolts. See page 2-12.



(3) Engine accessory

Remove all wiring harnesses, cables and hoses around the engine, dashboard and frame.

① Wiring harness to alternator and starter.

② Wiring harness for oil pressure and engine water temperature gauges.

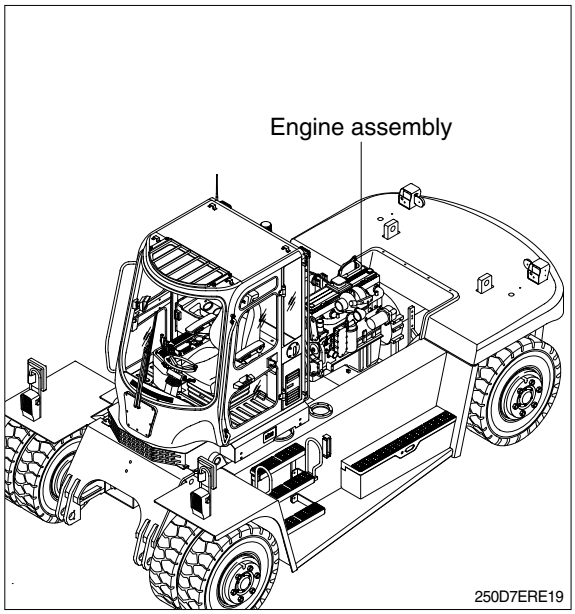
③ Cables for meters, buttons and accelerator pedal.

④ Hoses to fuel tank and air cleaner.

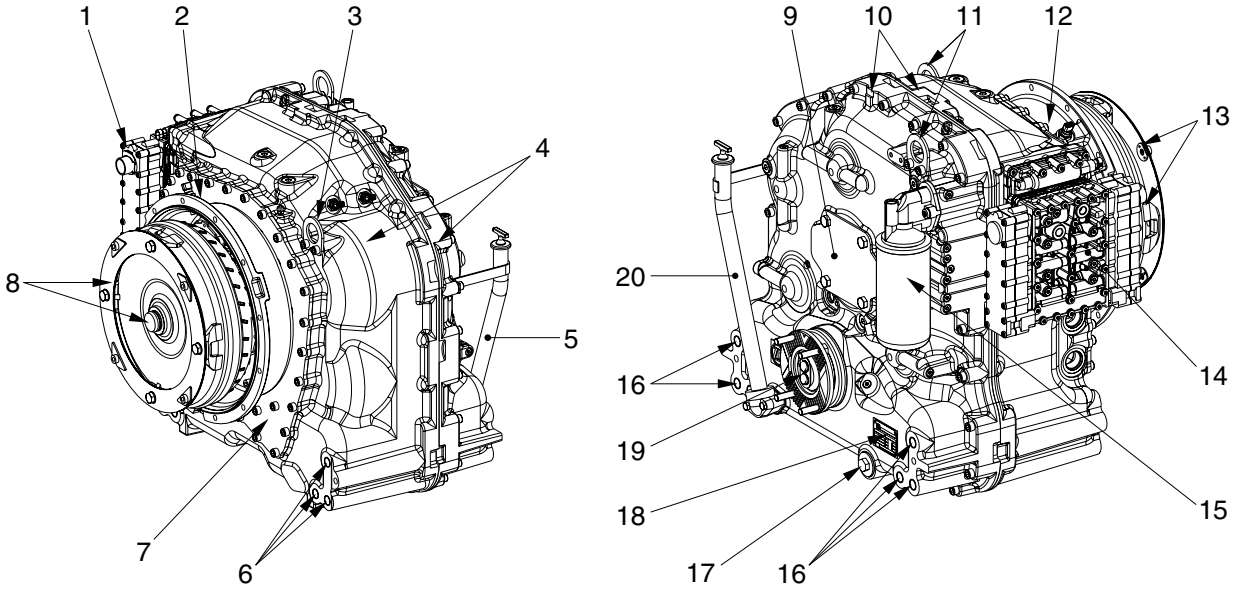
⑤ Exhaust pipe.

(4) Radiator hose

Open the drain valve of the radiator and drain the cooling water, then remove the radiator hose.



2) INSTALLATION VIEW



180D7EPT26

1 Electro - hydraulic control
2 Converter bell
3 Lifting lugs
4 Gearbox housing front and rear section
5 Oil level tube with oil dipstick (rear side)
6 Transmission suspension holes M20
7 Plate
8 Converter with diaphragm - direct mounting
9 Power take - off; coaxial, engine - dependent
10 Gearbox housing front and rear section
11 Lifting lugs
12 Converter bell
13 Converter with diaphragm - direct mounting
14 Converter with diaphragm
15 Exchange filter with filter head
16 Transmission suspension holes M20
17 Oil drain plug M38 × 1.5
18 Type plate
19 Output flange
20 Oil level tube with oil dipstick (rear side)

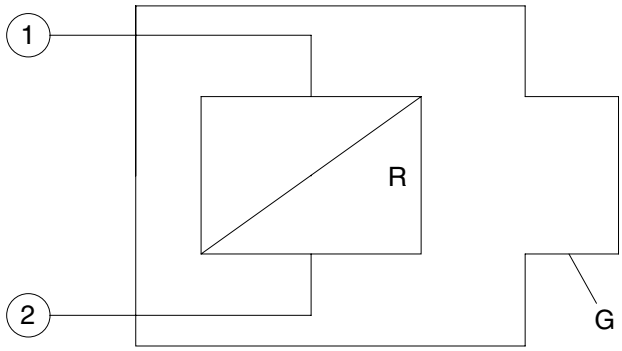
(4) Transmission error codes

Fault code (Hex)	Meaning of the fault code possible reason for fault detection	Reaction of the TCU	Possible steps to repair
11	**Logical error at gear range signal** TCU detected a wrong signal combination for the gear range · Cable from shift lever to TCU is broken · Cable is defective and is contacted to battery voltage or vehicle ground · Shift lever is defective	TCU shifts transmission to neutral OP-mode : Transmission shutdown	· Check the cables from TCU to shift lever · Check signal combinations of shift lever positions for gear range ※ Failure cannot be detected in systems with DW2/DW3 shift lever. Fault is taken back if TCU detects a valid signal for the position
12	**Logical error at direction select signal** TCU detected a wrong signal combination for the direction · Cable from shift lever to TCU is broken · Cable is defective and is contacted to battery voltage or vehicle ground · Shift lever is defective	TCU shifts transmission to neutral OP-Mode : Transmission shutdown	· Check the cables from TCU to shift lever · Check signal combinations of shift lever positions F-N-R ※ Fault is taken back if TCU detects a valid signal for the direction at the shift lever
13	**Logical error at engine derating device** TCU detected no reaction of engine while derating device active	After selecting neutral, TCU change to OP mode limp home	· Check engine derating device ※ This fault is reset after power up of TCU
15	**Logical error at direction select signal 2 shift lever** TCU detected a wrong signal combination for the direction · Cable from shift lever 2 to TCU is broken · Cable is defective and is contacted to battery voltage or vehicle ground · Shift lever is defective	TCU shifts transmission to neutral if selector active OP mode : Transmission shutdown if elector active	· Check the cables from TCU to shift lever 2 · Check signal combinations of shift lever positions F-N-R ※ Fault is taken back if TCU detects a valid neutral signal for the direction at the shift lever
16	**Logical error at axle connection** Feedback axle connection measured by TCU and output signal axle connection don't fit · Axle can't be connected or disconnected due to mechanical problem · One of the cables from feedback axle connection switch to TCU is broken	OP mode : Normal	· Check the cables from TCU to feedback axle connection switch · Check signals of the feedback axle connection switch
21	**S.C. to battery voltage at clutch cut off input** The measured voltage is too high: · Cable is defective and is contacted to battery voltage · Clutch cut off sensor has an internal defect · Connector pin is contacted to battery voltage	Clutch cut off function is disabled OP mode : Normal	· Check the cable from TCU to the sensor · Check the connectors · Check the clutch cut off sensor
22	**S.C. to ground or O.C. at clutch cut off input** The measured voltage is too low: · Cable is defective and is contacted to vehicle ground · Cable has no connection to TCU · Clutch cut off sensor has an internal defect · Connector pin is contacted to vehicle ground or is broken	Clutch cut off function is disabled OP mode : Normal	· Check the cable from TCU to the sensor · Check the connectors · Check the clutch cut off sensor

Fault code (Hex)	Meaning of the fault code possible reason for fault detection	Reaction of the TCU	Possible steps to repair
97	**S.C. to ground at park brake solenoid** TCU detected a wrong voltage at the output pin, that looks like a S.C. to vehicle ground · Cable is defective and is connection to vehicle ground · Park brake solenoid has an internal defect · Connector pin is contacted to vehicle ground	No reaction OP mode : Normal	· Check the cable from TCU to the park brake solenoid · Check the connectors from park brake solenoid to TCU · Check the resistance* of park brake solenoid * See page 3-36
98	**S.C. to battery voltage at park brake solenoid** TCU detected a wrong voltage at the output pin, that looks like a S.C. to battery voltage · Cable is defective and is connection to battery voltage · Park brake solenoid has an internal defect · Connector pin is contacted to battery voltage	No reaction Optional : (Some customers) TCU shifts to neutral caused by park brake feed back OP mode : Normal	· Check the cable from TCU to the park brake solenoid · Check the connectors from park brake solenoid to TCU · Check the resistance* of park brake solenoid * See page 3-36
99	**O.C. at park brake solenoid** TCU detected a wrong voltage at the output pin, that looks like a O.C. for this output pin · Cable is defective and has no connection to TCU · Park brake solenoid has an internal defect · Connector has no connection to TCU	No reaction Optional : Some customers TCU shifts to neutral caused by park brake feed back OP mode : Normal	· Check the cable from TCU to the park brake solenoid · Check the connectors from park brake solenoid to TCU · Check the resistance* of park brake solenoid * See page 3-36
9A	**S.C. to ground at converter lock up clutch solenoid** TCU detected a wrong voltage at the output pin, that looks like a S.C. to vehicle ground · Cable is defective and is contacted to vehicle ground · Converter clutch solenoid has an internal defect · Connector pin is contacted to vehicle ground	No reaction OP mode : Normal	· Check the cable from TCU to the converter clutch solenoid · Check the connectors from converter clutch solenoid to TCU · Check the resistance* of park brake solenoid * See page 3-36
9B	**O.C. at converter lock up clutch solenoid** TCU detected a wrong voltage at the output pin, that looks like a O.C. for this output pin · Cable is defective and has no connection to TCU · Converter clutch solenoid has an internal defect · Connector has no connection to TCU	Converter clutch always open, retarder not available OP mode : Normal	· Check the cable from TCU to the converter clutch solenoid · Check the connectors from converter clutch solenoid to TCU · Check the resistance* of park brake solenoid * See page 3-36

(5) Measuring of resistance at actuator/sensor and cable

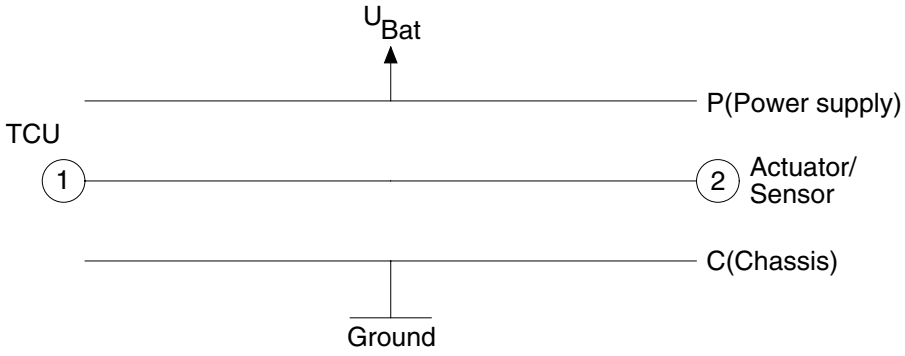
① Actuator



76043PT19

Open circuit	$R_{12} = R_{1G} = R_{2G} = \infty$
Short cut to ground	$R_{12} = R$; $R_{1G} = 0$, $R_{2G} = R$ or $R_{1G} = R$, $R_{2G} = 0$
	(For S.C. to ground, G is connected to vehicle ground)
Short cut to battery	$R_{12} = R$; $R_{1G} = 0$, $R_{2G} = R$ or $R_{1G} = R$, $R_{2G} = 0$
	(For S.C. to battery, G is connected to battery voltage)

② Cable



76043PT20

Open circuit	$R_{12} = R_{1P} = R_{1C} = R_{2P} = R_{2C} = \infty$
Short cut to ground	$R_{12} = 0$; $R_{1C} = R_{2C} = 0$, $R_{1P} = R_{2P} = \infty$
Short cut to battery	$R_{12} = 0$; $R_{1C} = R_{2C} = 0$, $R_{1P} = R_{2P} = 0$

GROUP 2 OPERATION AND MAINTENANCE

1. OPERATION

1) DRIVING PREPARATION AND MAINTENANCE

Prior to the commissioning of the transmission, take care that the prescribed oil grade will be filled in with the correct quantity. At the initial filling of the transmission has to be considered that the oil cooler, the pressure filters as well as the pipes must get filled with oil.

According to these cavities, the quantity of oil to be filled in, is greater than at the later oil fillings in the course of the usual maintenance service.

※ Because the converter and the oil cooler, installed in the vehicle, as well as the pipes can empty at standstill into the transmission, the **oil level check must be carried out at engine idling speed and operation temperature of the transmission.**

⚠ **At the oil level check, the vehicle has to be secured against rolling by blocks, articulated vehicles additionally against unintended turning-in.**

2) DRIVING AND SHIFTING

(1) Neutral position

Neutral position will be selected via the gear selector.

After the ignition is switched on, the electronics remains in the waiting state. By the position NEUTRAL of the gear selector, the TCU becomes ready for operation.

A gear can be engaged.

(2) Starting

The starting of the engine has always to be carried out in the NEUTRAL POSITION of the gear selector.

For safety reasons it is to recommend to brake the vehicle securely in position with the parking brake prior to start the engine.

After the starting of the engine and the preselection of the driving direction and the gear, the vehicle can be set in motion by acceleration.

At the start off, the converter takes over the function of a master clutch.

On a level road it is possible to start off also in higher gears.

- **Upshifting under load.**

  Upshifting under load will be then realized if the vehicle can continue to accelerate by it.

- **Downshifting under load.**

  Downshifting under load will be then realized if more traction force is needed.

5) BRAKE DOES NOT RELEASE

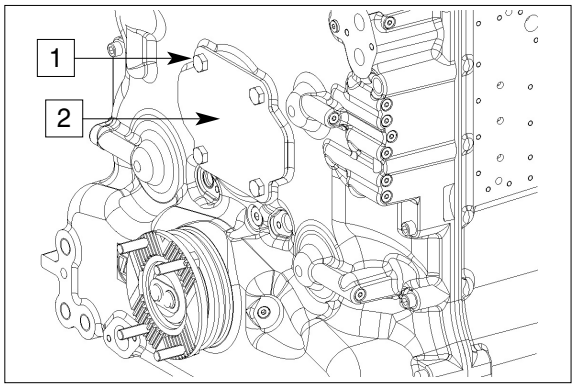
Condition	Possible cause	Correction
Vehicle does not move	Damaged hydraulic system.	Repair hydraulic system.
Brakes dragging	1. More than 1.4bar(20psi) pressure applied when brakes released.	1. Repair hydraulic system so pressure is less than 1.4bar(20psi) when brakes released and while machine is operating in any mode.
	2. Damaged piston return spring assembly.	2. Repair or replace piston return spring assembly.
	3. Piston not returning.	3. Check piston seals for swelling or damage. Replace as necessary.
	4. Wrong cooling and/or actuation fluid used.	4. Check piston seals for swelling or damage. Purge system and use specified fluid.
	5. Parking brake not adjusted properly.	5. Adjust parking brake lever as described in assembly of this manual.

6) BRAKING PERFORMANCE

Condition	Possible cause	Correction
Noticeable change or decrease in stopping performance.	1. Inadequate actuation fluid supply to brakes.	1. Replenish fluid in brake system. Check for leakage and correct cause.
	2. Inadequate pressure to apply brakes.	2. Check brakes apply system. Check for leakage in brake system or brakes, and correct cause.
	3. Worn or damaged discs.	3. Inspect and replace discs if necessary. ※As disc wear occurs, make sure brake system can supply adequate fluid to fully apply brakes.
	4. Overheated seals and/or discs.	4. Inspect and replace discs and seals if necessary.
	5. Dirty or contaminated cooling fluid.	5. Drain and flush cooling fluid from brakes and entire brake system. Replace with approved fluid. In some cases, it may necessary to replace discs. Clean or replace filter.
Brake does not fully apply.	1. Empty fluid reservoir.	1. Fill reservoir to correct level with specified fluid.
	2. Damaged hydraulic system.	2. Repair hydraulic system.
	3. Leakage of brake actuation fluid.	3. Refer to "Brake leaks actuation fluid" in this section.
Brakes fell spongy/soft.	Brakes or brake system not properly bled.	Bleed brakes and brake system.

4) DISASSEMBLY PTO

① Loosen hex screws (1) and remove lid (2).

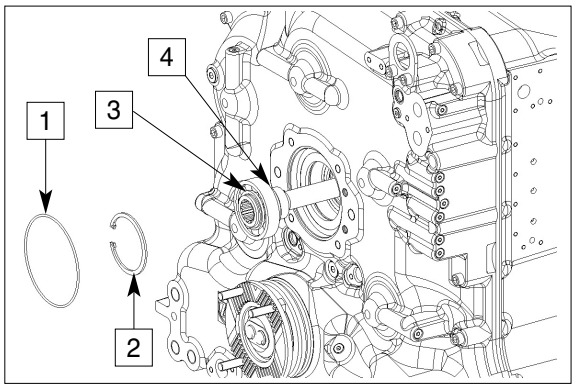


180DTM041

② Take O-ring (1) out of lid, unsnap and remove retaining ring (2).

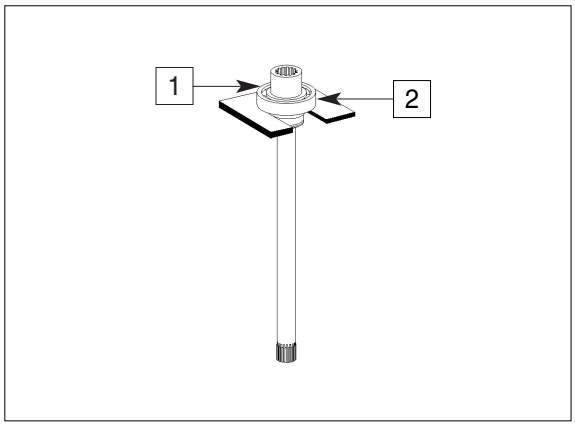
Pull pump shaft (3) out of housing hole.

Unsnap rectangular ring (4).



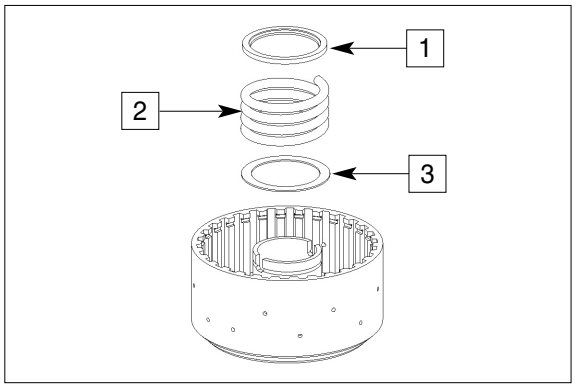
180DTM042

③ Snap out retaining ring (1) and press ball bearing (2) off the pump shaft.



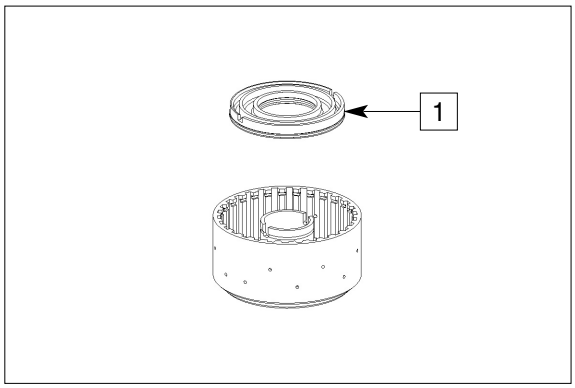
180DTM043

⑨ Remove guide ring (1), compression spring (2) and disc (3).



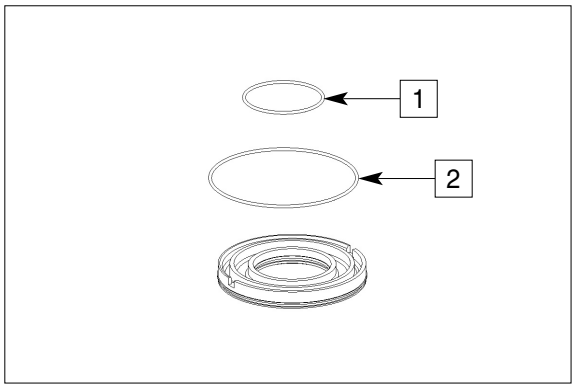
180DTM060

⑩ Lift piston (1) off the disc carrier by compressed air out of hole, and remove it.



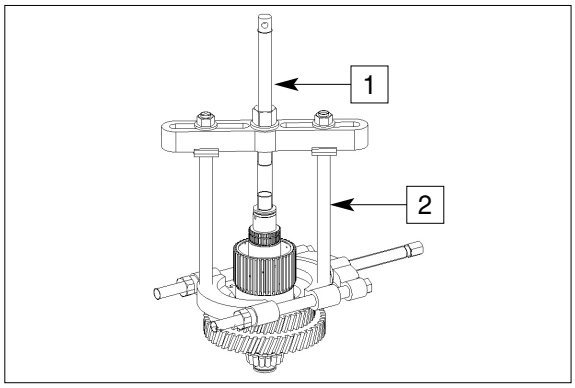
180DTM061

⑪ Remove both O-rings (1 and 2).



180DTM062

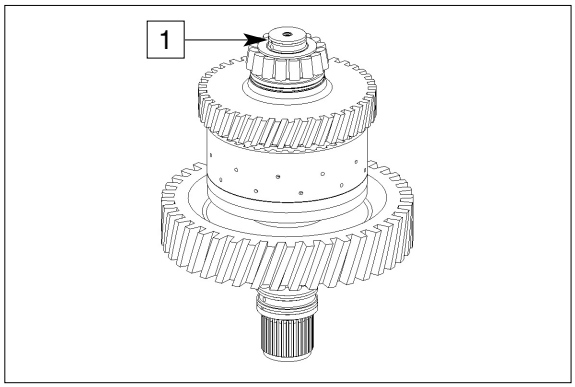
⑫ Pull off needle cage (1) off the shaft (2).



180DTM073

(5) Clutch K3

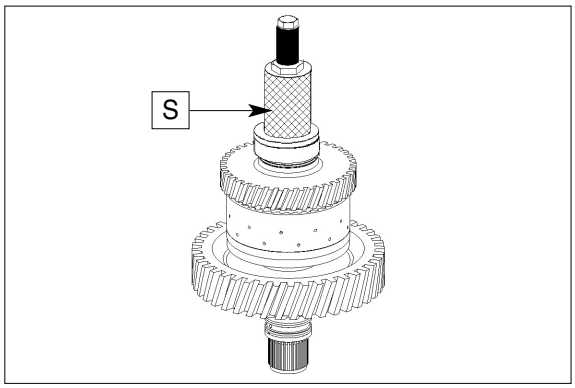
① Unsnap piston ring (1).



180DTM094

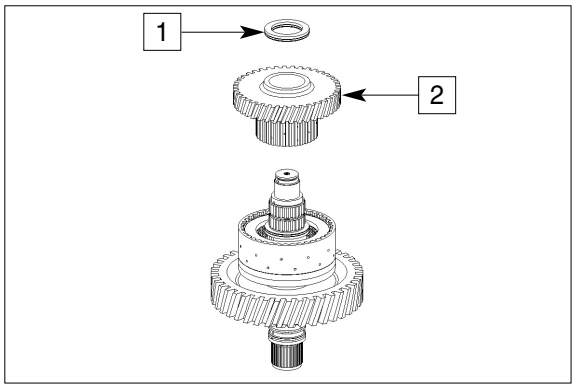
② Pull tapered roller bearing (internal ring) off the shaft.

(S)Forcing device	5870 026 100
(S)Grab sleeve	5873 001 059



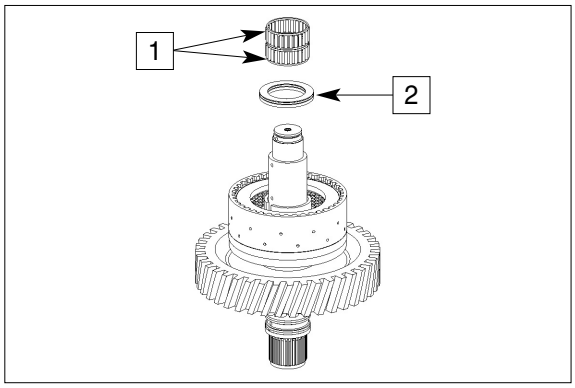
180DTM095

③ Remove cpl axial bearing (1) and idler gear (2).



180DTM096

④ Remove needle cage (1) and cpl axial bearing (2).

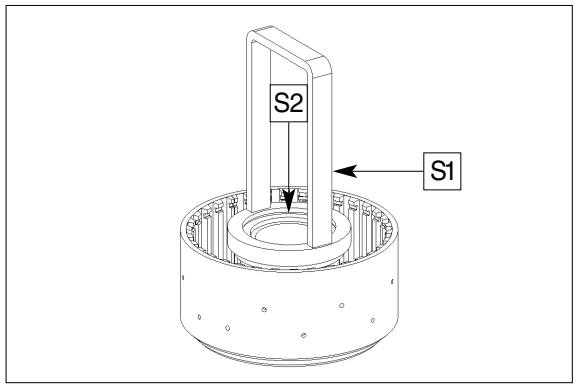


180DTM097

⑬ Preload compression spring by means of assembly aid (S1) and pressure piece (S2), until L-ring has engaged into the annular groove.

(S) Assembly aid 5870 345 088
(S) Assembly fixture 5870 345 124
(Inner installer and pressure piece)

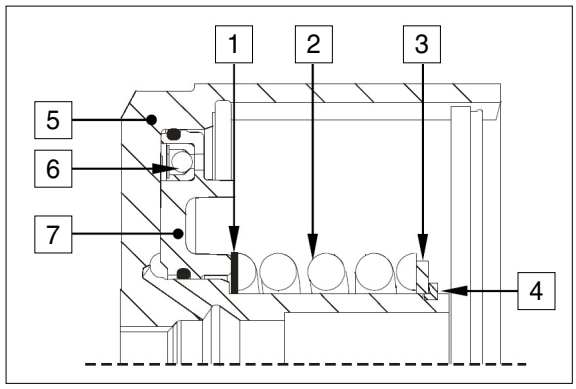
※ It is always necessary to mount a new L-ring.



180DTM120

⑭ Disk carrier with piston retraction :

Legend :
1 = Washer
2 = Compression spring
3 = Support shim
4 = L-ring
5 = Disk carrier
6 = Drain valve (piston)
7 = Piston with O-rings

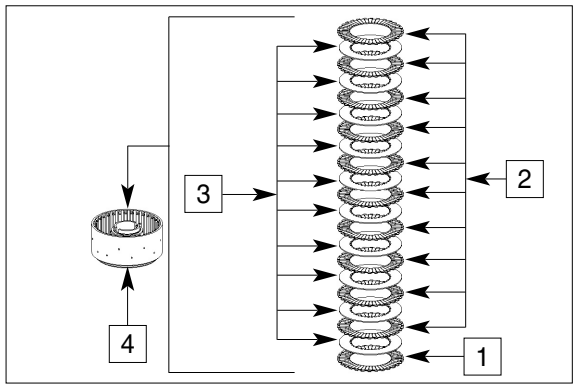


180DTM121

⑮ Install outer and inner disks alternately into the disk carrier (4) as personated in figure TM122.

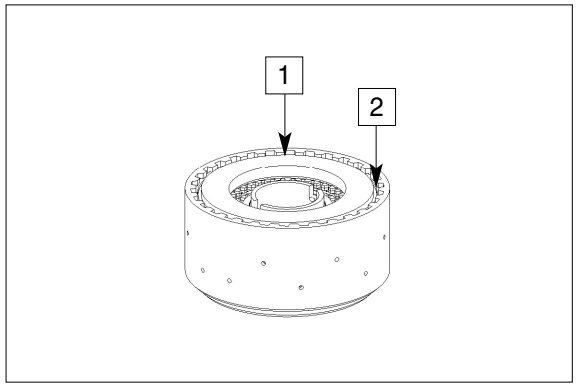
Legend :
1 = Friction disk-coated on one side (1 pcs)
2 = Outer disks (10 pcs)
3 = Inner disks (10 pcs)

※ Take care that the uncoated (blank) side of the friction disk (1) is showing towards the piston.
Number of friction surfaces : 20.



180DTM122

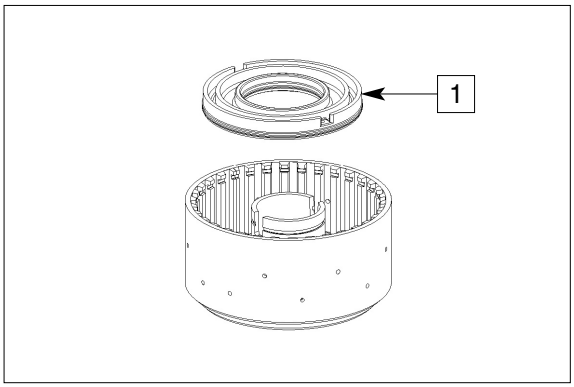
⑯ Mount end plate (1) and fix disk package by means of snap ring (2) (e.g. thickness = 2.65 mm / recommended value).



180DTM123

⑤ Insert piston (1) into disc carrier.

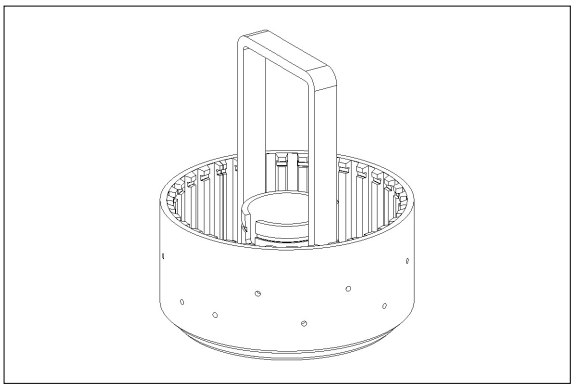
※ Observe installation position, see figure.



180DTM117

⑥ Use a hand-operated press to place piston into the disc carrier by means of the assembly aid.

(S) Assembly aid 5870 345 088



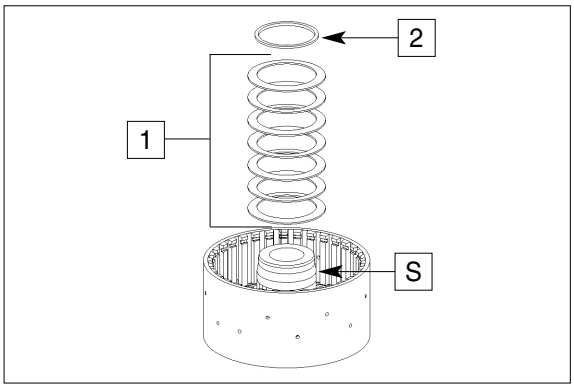
180DTM118

⑦ Mount inner installer (S) onto the disk carrier.

Install cup spring package (1) and L-ring (2).

※ Installation position cup spring package and L-ring see figure TM139.

(S) Inner installer → see figure TM120.

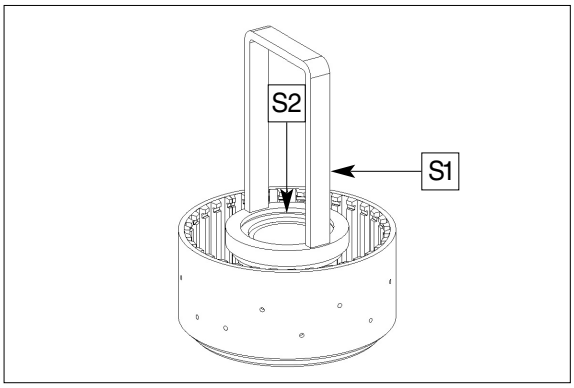


180DTM138

⑧ Preload cup spring package by means of assembly aid (S1) and pressure piece (S2), until L-ring has engaged into the annular groove.

(S) Assembly aid 5870 345 088
(S) Assembly fixture 5870 345 124
(Inner installer and pressure piece)

It is always necessary to mount a new L-ring.



180DTM120

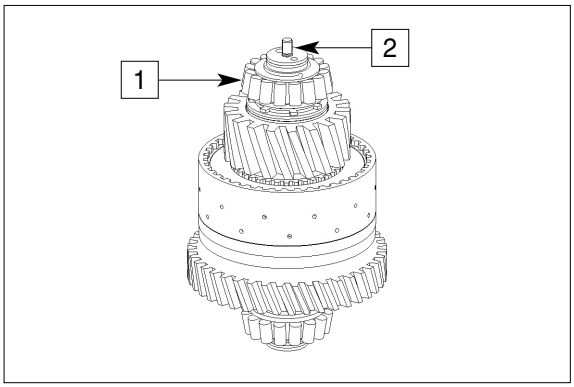
㉑ Mount bearing inner ring (1) until contact.

Mount stud bolt (1).

Tightening torque (M10/8.8 × 16) .... M_A = 17 Nm

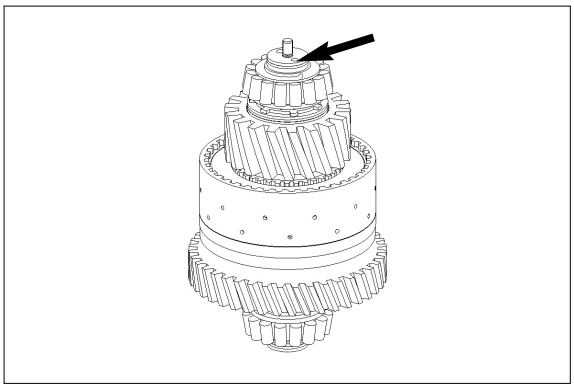
⚠ Wear protective gloves.

※ Readjust bearing inner ring after cooling down.



180DTM157

※ Check closing and opening of the clutch by means of compressed air at the hole (see arrow).
Closing and opening of the clutch must be clearly audible.



180DTM158

8) INSTALLATION OF INPUT SHAFT AND CLUTCHES

(1) Preassembly of front and rear transmission housing

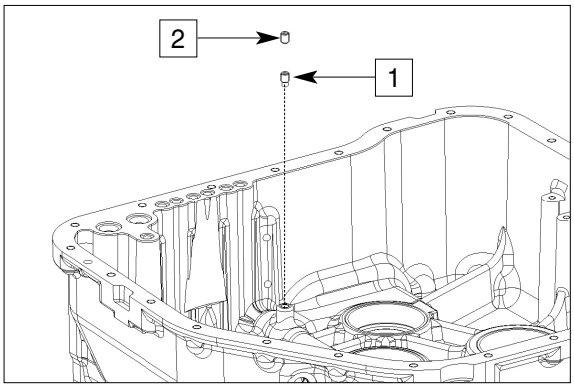
① Stop for converter outlet pressure valve.

Fit threaded pin M10 × 16 (1) with pin.

Tightening torque ..... M_A = 10 Nm

Fit threaded pin M10 × 12 (2).

Tightening torque ..... M_A = 23 Nm



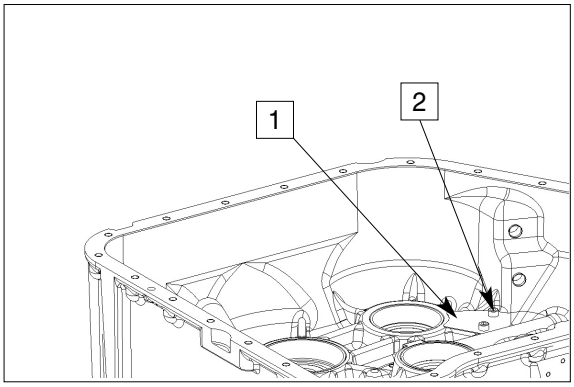
180DTM177

② Fix screen sheet (1) by means of cyl screws (2) in the transmission housing.

Oil cylinder screws before the assembly.

Tightening torque M8/8.8 × 12 .....
..... M_A = 23 Nm

※ It is always necessary to use new cylinder screws.



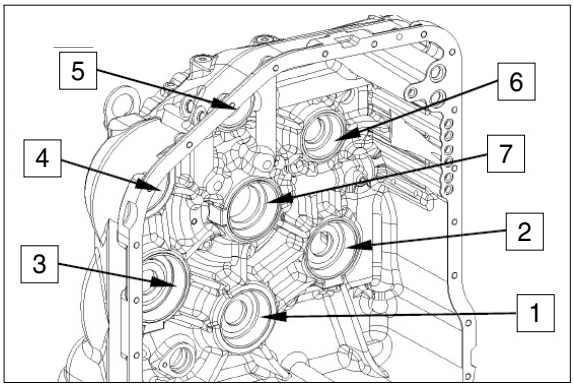
180DTM178

③ Insert all bearing outer rings into bearing holes of both housing parts.

Housing front part :

1 = "K3" Clutch - 3rd gear
2 = "K2" Clutch - 2nd gear
3 = "K1" Clutch - 1st gear
4 = "K4" Clutch - Intermediate shaft
5 = "KR" Clutch - reverse
6 = "KV" Clutch - forward
7 = "An" Input

※ K4/K2/K3 and "An" have got the same outer diameter, but merely K4/K2/K3 are fitted with the same bearings. Risk of confusing.



180DTM179

(2) Converter connection :

① Install two adjusting screws and place converter bell-housing (1), and bring into contact position evenly with 3 cylinder screws (3 × 180 offset).

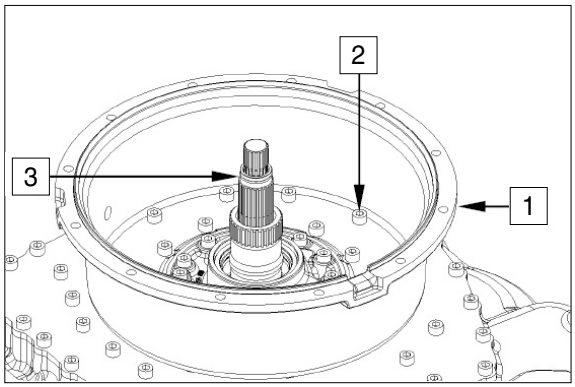
※ Make sure that O-ring will not be damaged (sheared off).

Fix converter bell-housing with cylinder screws (2).

Tightening torque (M10/8.8 × 30) .... M_A = 46 Nm

Mount, align and grease rectangular ring 36 × 2.5 (3) .

※ Wet mounting face with Loctite (type no 574).

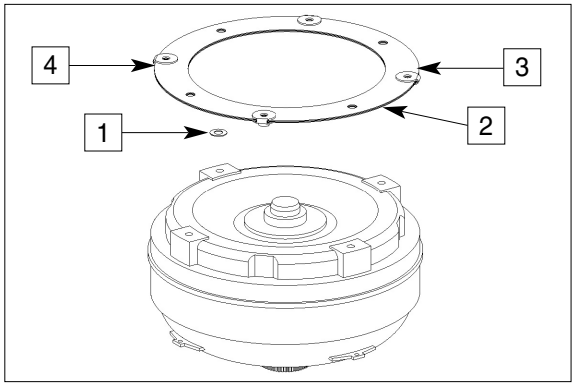


180DTM209

② Always position 1 disk 4 × (1) onto the flexplate mounting web (4 ×).

Install flexplate set (2)

Flexplate set consisting of :
3 = flexplates (3 pieces)
4 = clamps (4 pieces)



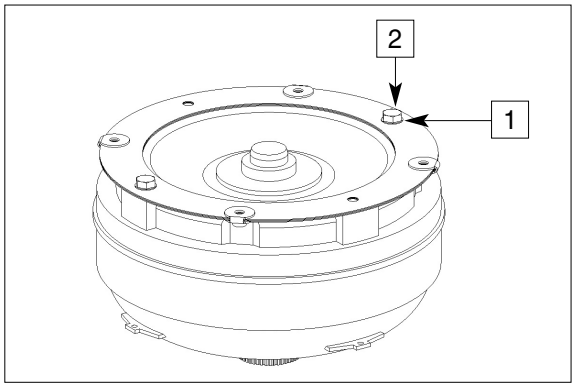
180DTM210

③ Mount disk (1) onto the hexagon screw M10x16 (2) and fix flexplates.

Mount eyebolts

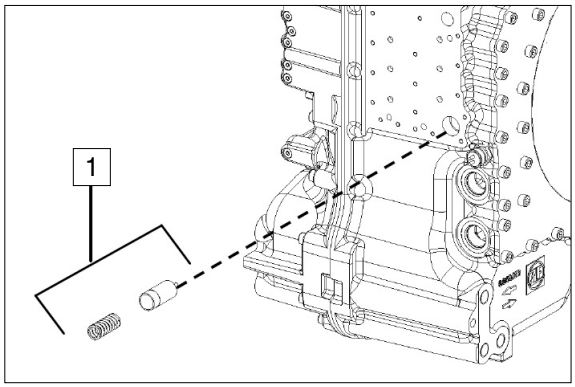
Tightening torque (M12/10.9 × 18) .... M_A = 115 Nm

※ Wet the thread with Loctite (Type no. 262).



180DTM211

⑲ Insert converter outlet pressure valve (1) into housing hole.

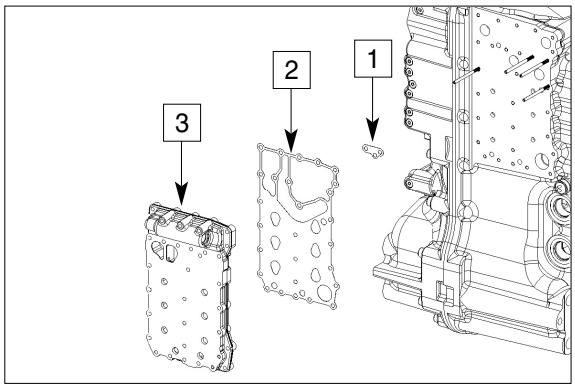


180DTM240

⑳ Fit 4 adjusting screws.

Mount sealing (1 and 2) and duct plate (3).

(S) Adjusting screws 5870 204 063

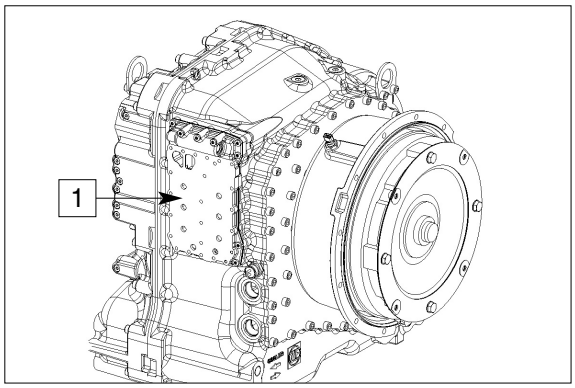


180DTM241

㉑ Fix duct plate with torx screws (1).

Tightening torque (M6/10.9 × 25) .... M_A = 9.5 Nm

Tightening torque (M6/10.9 × 60) .... M_A = 9.5 Nm



180DTM242

㉒ Mount filter differential pressure valve (1).

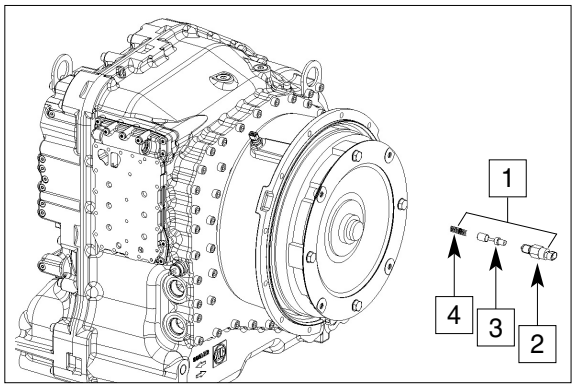
Filter differential pressure valve consists of :

2 = Switch with O-ring 13 × 2

3 = Piston

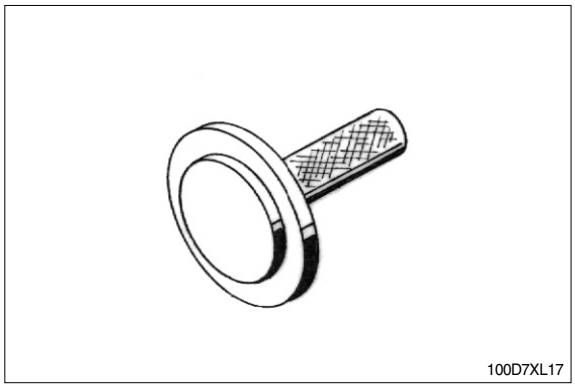
4 = Compression spring

Tightening torque ..... M_A = 30 Nm

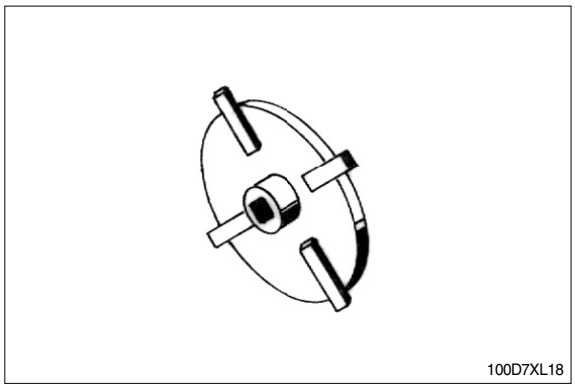


180DTM243

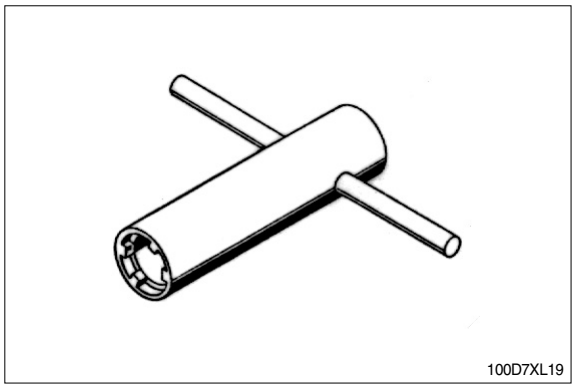
(3) Seal ring sleeve driver.



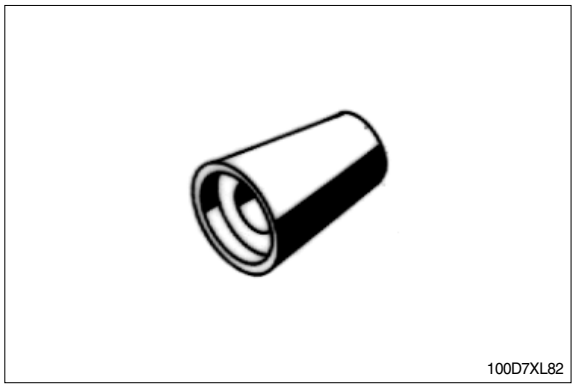
(4) Spanner for thread rings.
(Differential bearing)



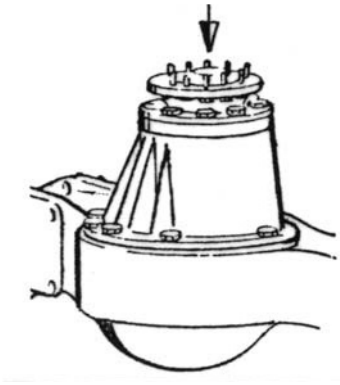
(5) Spanner for counter nut.
(Planetary gear drive)



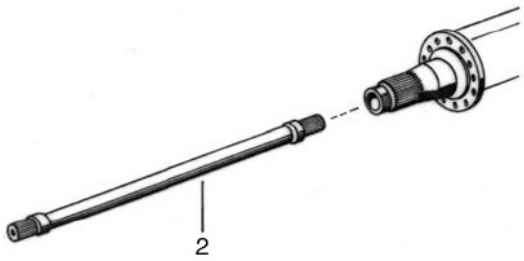
(6) Assembly cone for O-ring.
(Differential lock)



11) ASSEMBLY OF THE DRIVE ASSEMBLY ONTO THE AXLE HOUSING



100D7XL39



100D7XL40

(1) Coat the contact surface of the axle housing with Epple 33 and mount the complete drive assembly. The axle housing being placed in a horizontal position, secure the screws with Loctite 262.

(2) Engage the axle shaft into the axle housing.

(3) The axle shaft should be able to be moved easily(by hand) in the toothing of the differential side gear.

(5) Assembly hub assembly

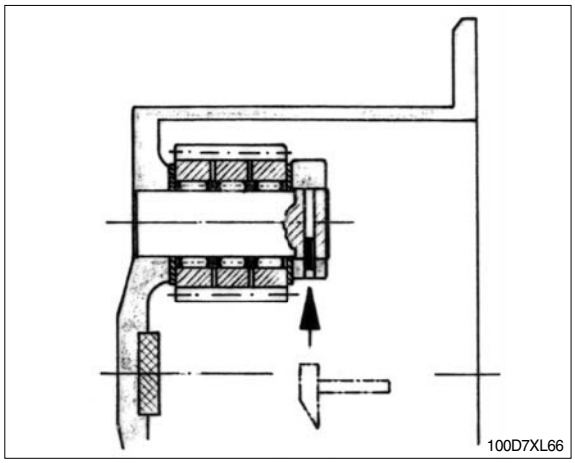
① Assembly of the spacer ring(if present) see page 3-167.
② Install the brake onto the axle spindle, be careful of the brake control position and bolt it.
At version with disk brake install the brake carrier(if present), then mount the wheel hub with the brake disk, and after this operation install the brake.
③ Prepare and mount the wheel hub see page 3-169.
Attention : Hold the wheel hub with a hoist till the outer bearing with ring gear carrier is mounted.
④ Assembly of the planetary gear drive see page 3-175.

(6) Prepare wheel hub

① Press in outer rings of taper roller bearings(1+2), do not hammer them. Install inner ring of taper roller bearing(2).
② Install the ring(3) into the wheel hub(5).
③ Press the radial seal rings(4) with Loctite 572(rubber cage) respective Loctite 270(steel cage) applied into the wheel hub(5). Fill the radial seal rings with bearing grease.
④ Install the face seal(6) into the wheel hub(5).
⑤ Push the disc carrier(7) onto the wheel hub and bolt it, secure the screws with Loctite 262.
⑥ Screw the wheel studs (8) until they contact to the thread ground into the wheel hub.

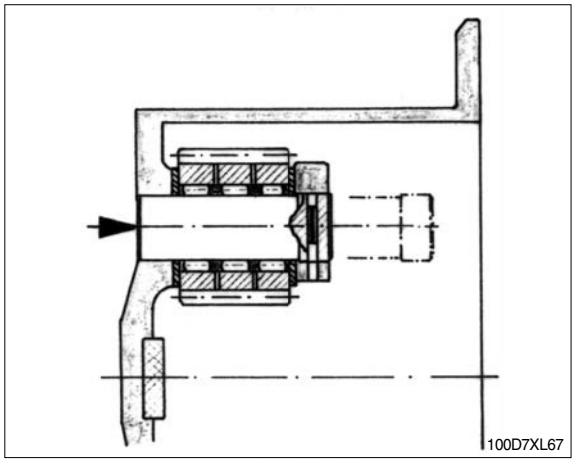
(6) Disassembly of planetary gear

① Knock the locking pin(20, 21) completely to the inner side of the planetary pin.

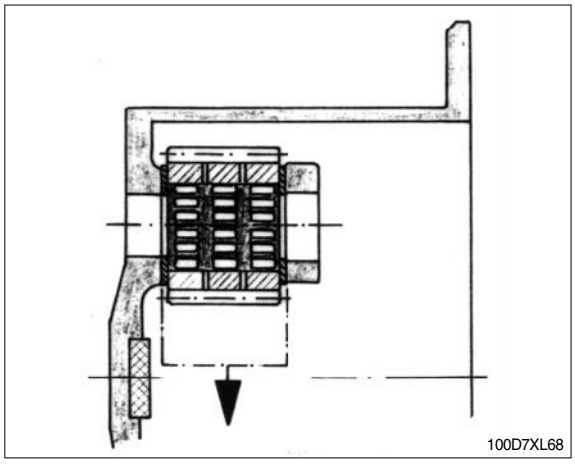


② Press the planetary pin in direction of arrow out of the planetary housing.

※ Because of the difference of diameter of 0.1mm do not press the planetary pin against the direction of arrow out of the planetary housing, to prevent damaging the bore.



③ Remove the planetary gears with the thrust disks and needle bearings.



2. ADJUSTING THE GEARSET BACKLASH

Backlash specification : 0.13~0.18㎜
(0.005-0.007inch)

If the old gearset is installed, adjust the backlash to the setting that was measured before the carrier was disassembled.

If a new gearset is installed, adjust the backlash to the correct specification for new gearsets.

1) Attach a dial indicator on the mounting flange of the carrier.

2) Adjust the dial indicator so that the plunger or pointer is against the tooth surface, near the heel end of the gear tooth. Set the indicator dial to zero(0).

3) Hold the drive pinion in position.

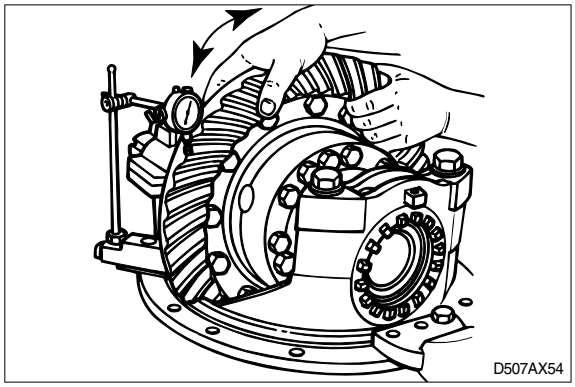
4) Read the dial indicator, while rotating the ring gear a small amount in both directions, against the drive pinion teeth.

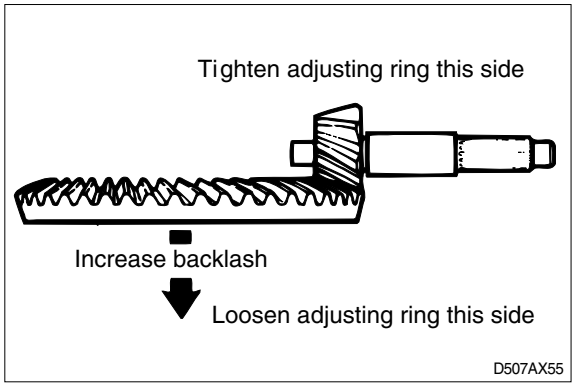
※ When you adjust backlash, move the ring gear ONLY. DO NOT move the drive pinion.

5) If the backlash reading is within specification, continue checking tooth contact patterns.
Otherwise, adjust backlash. Refer to step 6), and check, following steps 1)-4).

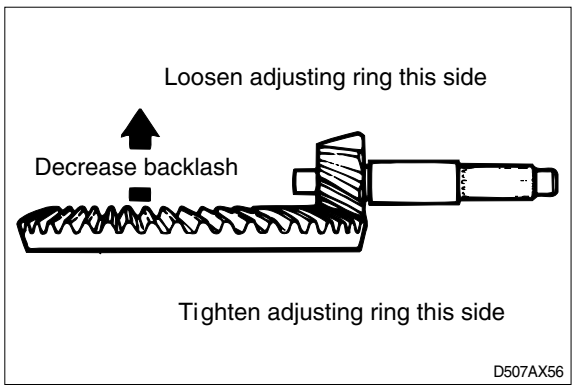
※ Backlash is increased by moving the ring gear away from the drive pinion. Backlash is decreased by moving the ring gear toward the drive pinion.

6) Loosen one bearing adjusting ring one notch, then tighten the opposite ring the same amount.


D507AX54

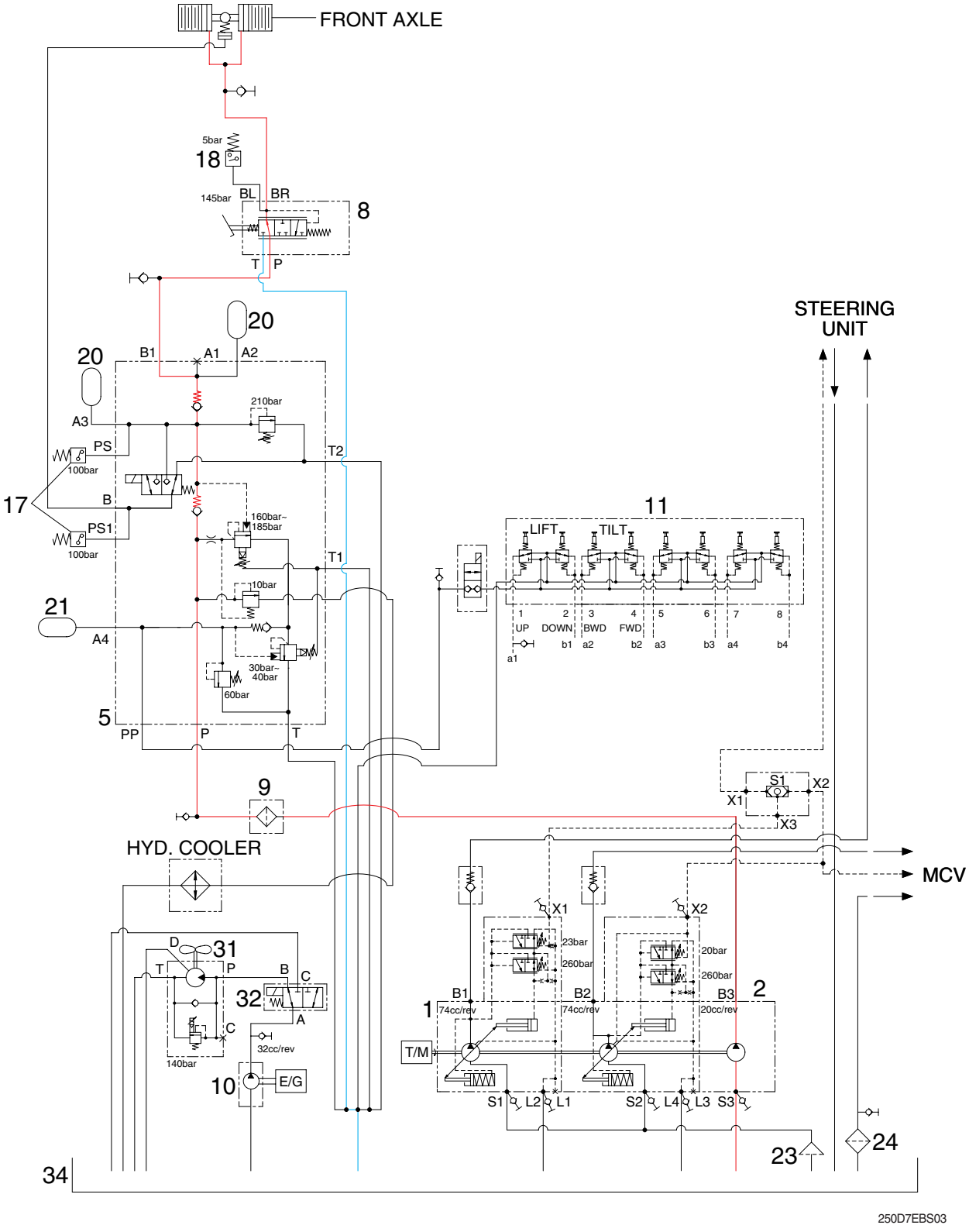


D507AX55



D507AX56

2) SERVICE BRAKE OPERATED

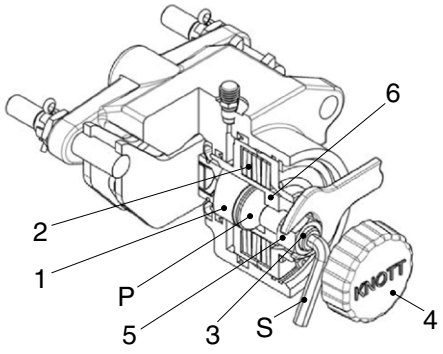


250D7EBS03

When the pedal of brake valve(8) is depressed, the operating force overcomes the force of the spring, and is transmitted to the spool. When the spool moves down, the inlet port is opened, and at the same time the hydraulic oil controlled the pressure level by the cut-off valve(5) enters the piston in the front and rear axles. Therefore, the service brake is applied.

4) EMERGENCY RELEASE OF THE PARKING BRAKE

After the failure of the pressure release the parking brake by using following manual procedure.



100D7BS117

1	Thrust bolt	4	Screw cap	P	Even surface
2	Bank of cup springs	5	Lock nut	S	Socket wrench
3	Adjusting screw	6	Piston		

(1) The vehicle has to be secured against rolling away.
(2) Release the screw cap and unscrew
(3) Release the lock nut(size 24 or 30) and turn the adjusting screw with socket wrench size 8 or 10 manually counter-clockwise until the brake disc is free.

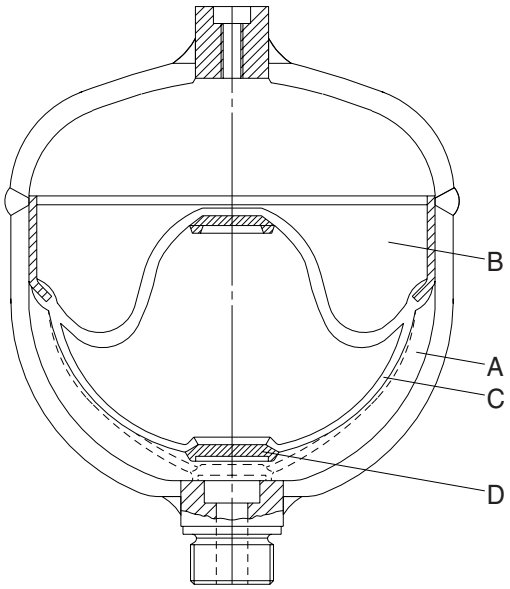
⚠ **For the emergency release is an actuation torque of 40Nm respectively 70Nm required.**

(4) Mount the lock nut and the screw cap and tighten both as far as possible manually.(protection against dirt)

⚠ **Now, the vehicle do not have any brake function. The vehicle must be secured against moving away with proper means. Before putting the vehicle into operation again, the brake has to be adjusted again. Refer to previous page. "Assembly and basic setting regulations".**

7. BRAKE ACCUMULATOR

1) STRUCTURE



(770-3ATM) 4-22

Item	81L1-0004	31E3-3187
Diameter	110mm	90mm
Mounting height	164mm	140mm
Nominal volume	0.7 ℓ	0.35 ℓ
Priming pressure	50kgf/cm²	15kgf/cm²
Operating medium	Oil	Oil
Operating pressure	Max 150kgf/cm²	Max 170kgf/cm²
Thread	M18 × 1.5	PF1/2
Priming gas	Nitrogen	Nitrogen

A Fluid portion C Diaphragm
B Gas portion D Valve disk

2) OPERATION

(1) Purpose

Fluids are practically incompressible and are thus incapable of accumulating pressure energy. In hydropneumatic accumulators, the compressibility of a gas is utilized to accumulate fluid. The compressible medium used in the accumulators is nitrogen.

In braking systems, the purpose of the accumulators is to store the energy supplied by the hydraulic pump. They are also used as an energy reserve when the pump is not working, as a compensator for any losses through leakage, and as oscillation dampers.

(2) Operation

The accumulator consists of a fluid portion (A) and a gas portion (B) with a diaphragm (C) as a gas-tight dividing element. The fluid portion (A) is connected to the hydraulic circuit, causing the diaphragm accumulator to be filled and the gas volume to be compressed as the pressure rises.

When the pressure falls, the compressed gas volume will expand, thus displacing the accumulated pressure fluid into the circuit.

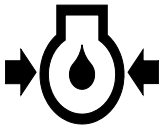
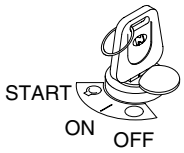
The diaphragm bottom contains a valve disk (D) which, if the diaphragm accumulator is completely empty, closes the hydraulic outlet, thus preventing damage to the diaphragm.

(3) Installation requirements

The accumulators can be fitted in the hydraulic circuit, directly on a component or in blocks on suitable consoles.

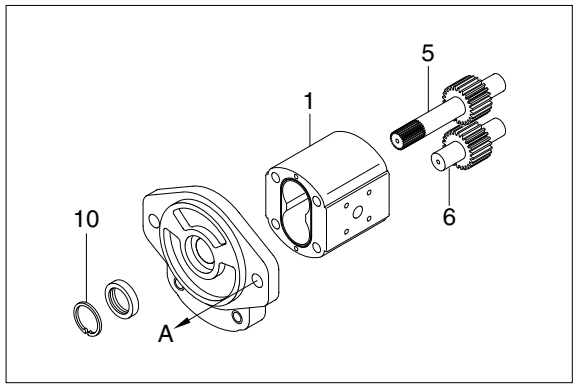
They should be fitted in as cool a location as possible.

Installation can be in any position.

Item	Description	Service action
Brake accumulator precharge check ※ The axles and hydraulic oil must be at operating temperature for this check.	 Start and run engine for 30 seconds. Stop engine and turn start switch to ON and wait 5 seconds. **NOTE** : Engine oil pressure lamp will be on due to no engine oil pressure.  Count the number of times the brake pedal can be fully depressed before the low brake pressure warning lamp comes ON. **LOOK** : Warning lamp must come on over 20 times of applications. Start engine and operate at low idle. Observe cluster while applying brake pedal with maximum force. **LOOK/LISTEN** : Brake pressure indicator must not come ON.	**OK** Check completed. **NOT OK** Make sure brake pedal is not binding and keeping brakes partially engaged. Bleed brakes in group 3. Check brake system pressure. **NOT OK** If light comes on with engine running, accumulator has lost it's charge. Inspect and recharge accumulator.
Brake system leakage check	 Start engine and wait 30 seconds. Stop engine. Wait 2 minutes. Turn start switch to ON and wait 5 seconds. **LOOK** : Brake oil pressure warning lamp must not come on within 2 minutes after stopping engine. 	**OK** Check completed. **NOT OK** If brake leakage is indicated with brakes released, check leakage at accumulator inlet check valve and brake valve. If brake leakage is indicated with brakes applied, check for leakage at brake valve and brake pistons. Check individual component leakage.

(4) After removing the snap ring (10), take out the shaft gear (5) and the drive gear (6) from the housing (1).

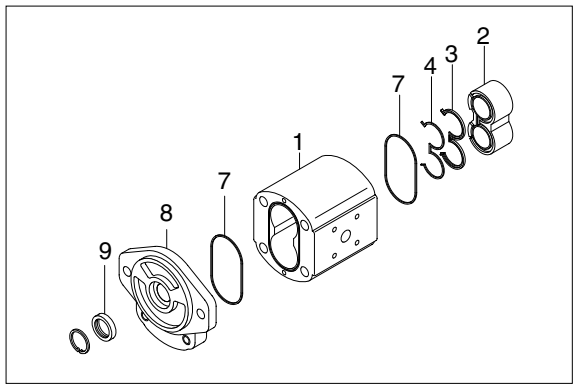
※ For the gear face of the shaft gear (5) and the driven gear (6), inspect for excessive wear, scoring or crack.



180D7EBP51

(5) Remove bush block (2), back up seal (3), channel seal (4) and O-ring (7) from the housing (1).

※ After removing the bush block (2) from the housing (1), inspect whether it is happened scratch or damage for inner surface of the housing (1).



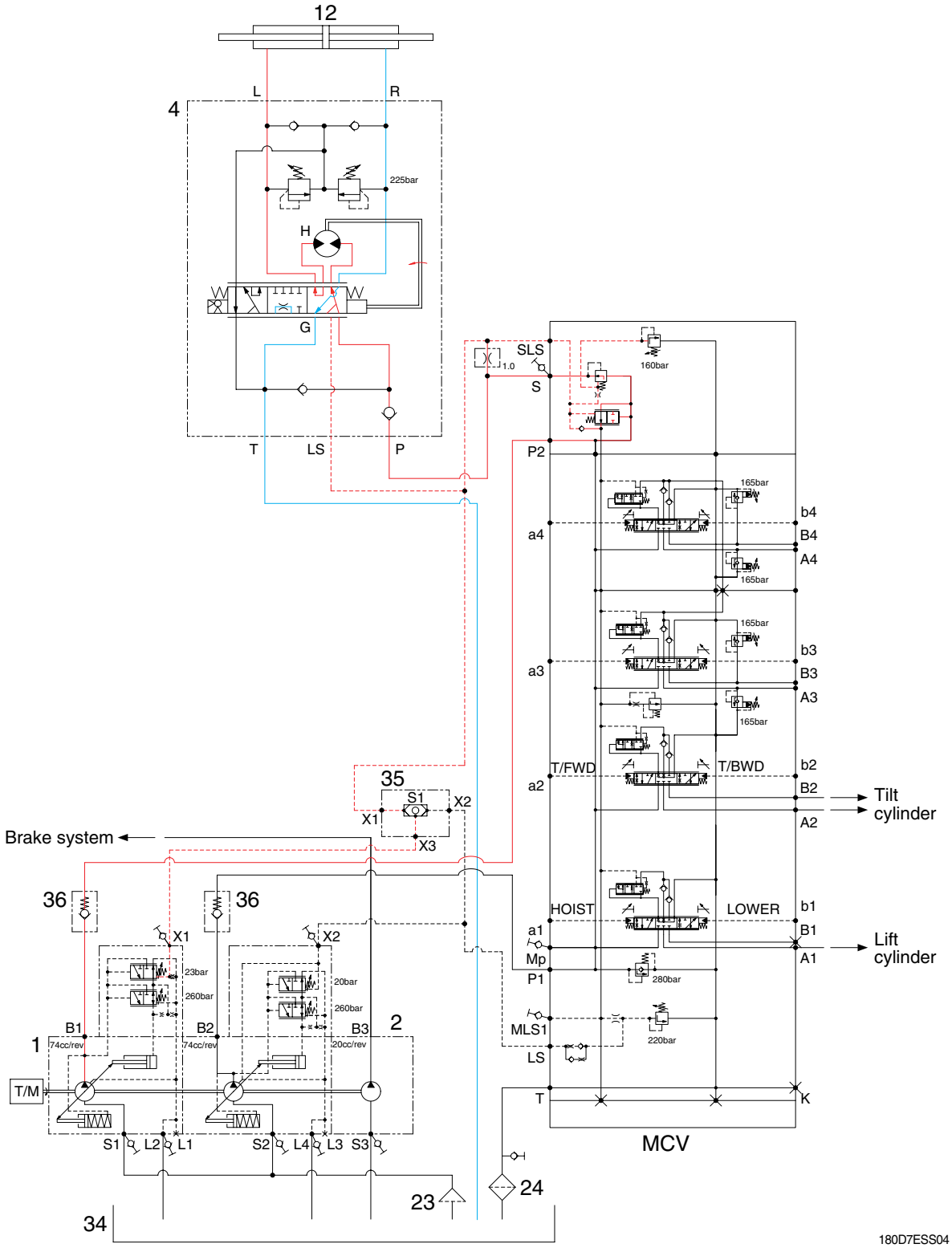
180D7EBP52

(6) Remove the retainer seal (9) from the front cover (8).

4) ASSEMBLY

Assembly procedure of the pump is the reverse order of the disassembly procedure.

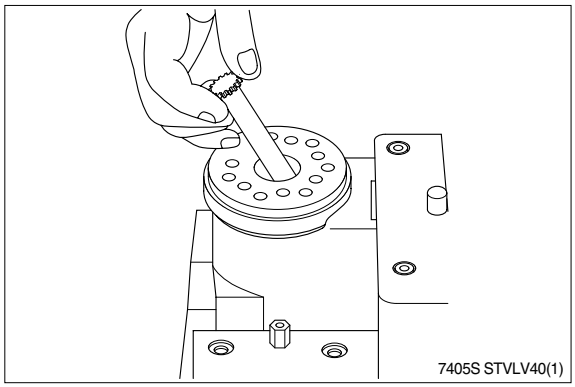
2) LEFT TURN



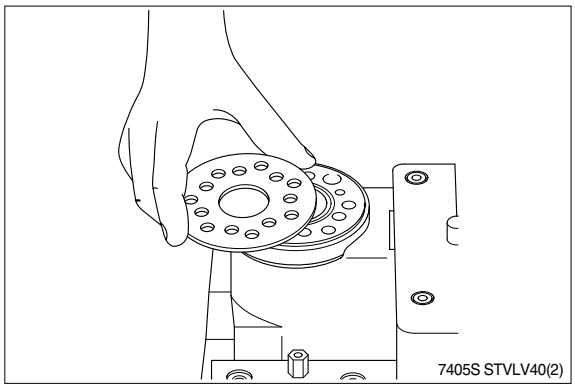
- When the steering wheel is turned to the left, the spool(G) within the steering unit(4) connected with steering column turns in left hand direction.
- At this time, the oil discharged from the main pump(1) flows into the spool(G) in the steering unit and flows the gerotor(H).
- Oil flow from the gerotor(H) flows back into the spool(G) where it is directed out the left work port(L).
- Oil returned from cylinder returns to hydraulic tank(34).
- When the above operation is completed, the machine turns to the left.

Problem	Cause	Remedy
"Motoring" effect. The steering wheel can turn on its own.	Leaf springs are stuck or broken and have therefore reduced spring force	Replace leaf springs.
	Inner and outer spools pinch, possibly due to dirt	Clean steering unit or contact the nearest service shop.
	Return pressure in connection with the reaction between differential cylinder and steering unit too high	Reduce return pressure.
	Oil is needed in the tank	Fill with clean oil and bleed the system.
	Steering cylinder worn	Replace or repair cylinder.
	Gear wheel set worn	Replace gear wheel set.
	Spacer across cardan shaft forgotten	Install spacer.

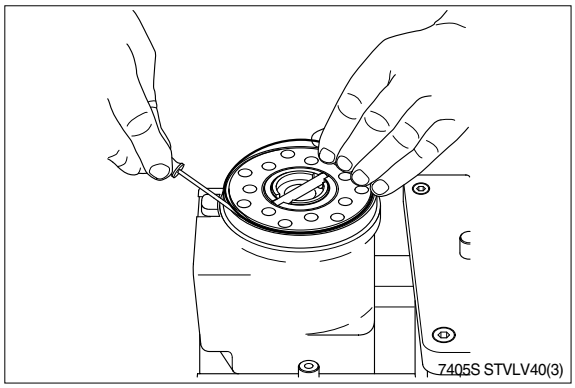
(5) Remove cardan shaft.



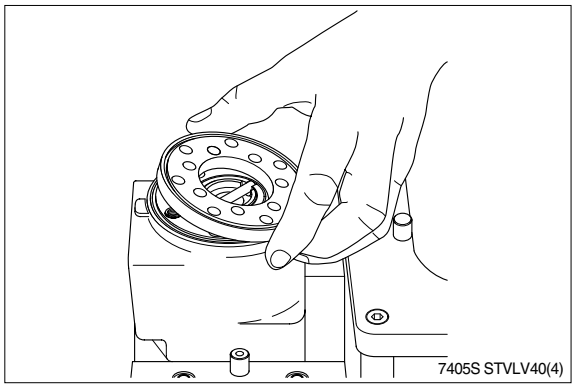
(6) Remove distributor plate.



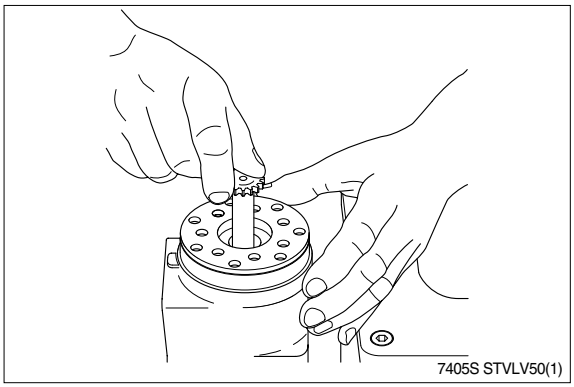
(7) Remove O-ring.



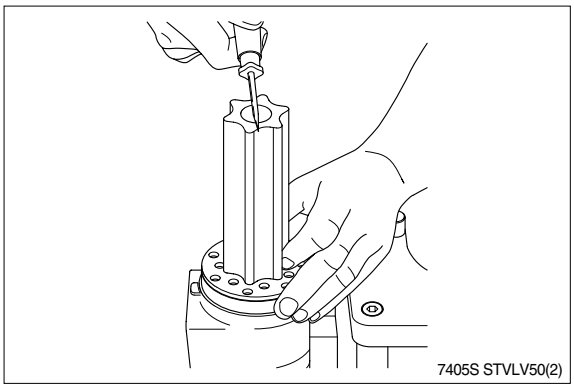
(8) Lift off intermediate plate.



(23) Guide the cardan shaft down into the bore so that the slot is parallel with the connection flange.

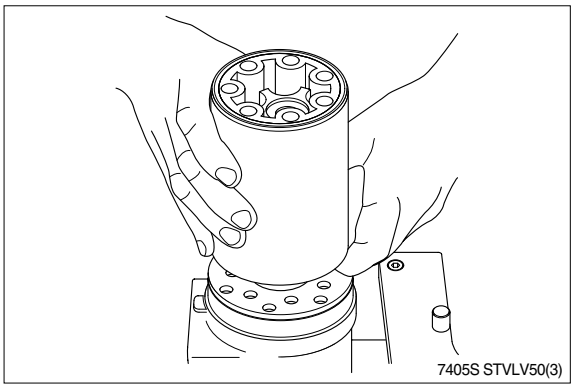


(24) Place the gear wheel (rotor) so that the cross pin from item 33 is positioned in relation to two tooth bases - as the screw driver indicates.

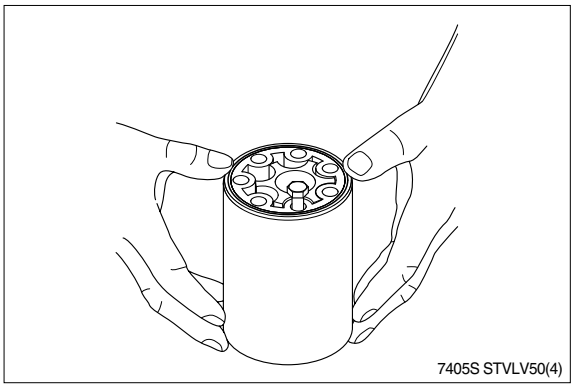


(25) Grease the two O-rings with mineral oil approximate viscosity 500 cSt at 20°C and place them in the two grooves in the gear rim. Fit the gear rim so that the seven through holes match the holes in the distributor plate.

※ Turn the gear rim so that the smaller diameter of the holes face the distributor plate.



(26) Orientate the holes with a single screw.



GROUP 1 STRUCTURE AND FUNCTION

1. HYDRAULIC SYSTEM OUTLINE

The hydraulic system is a pilot operated, ciosed center system which is supplied with flow from the fixed displacement main hydraulic pump.

The pilot control system is a low pressure, system which is supplied with flow from the auxiliary pump.

The hydraulic system components are :

- Main pump
- Auxiliary pump
- Main control valve
- Lift cylinder
- Tilt cylinders
- Remote control valve(Pilot control valve)
- OPSS solenoid valve
- Cut-off valve

The oil from the B2 main pump via the priority spool built in the main control valve is combined with oil from the B1 main pump by parallel passage and flows the main control valve.

The main control valve is a parallel circuit type, closed center valve which routes flow to the lift, tilt and or auxiliary cylinders when the respective spools are shifted.

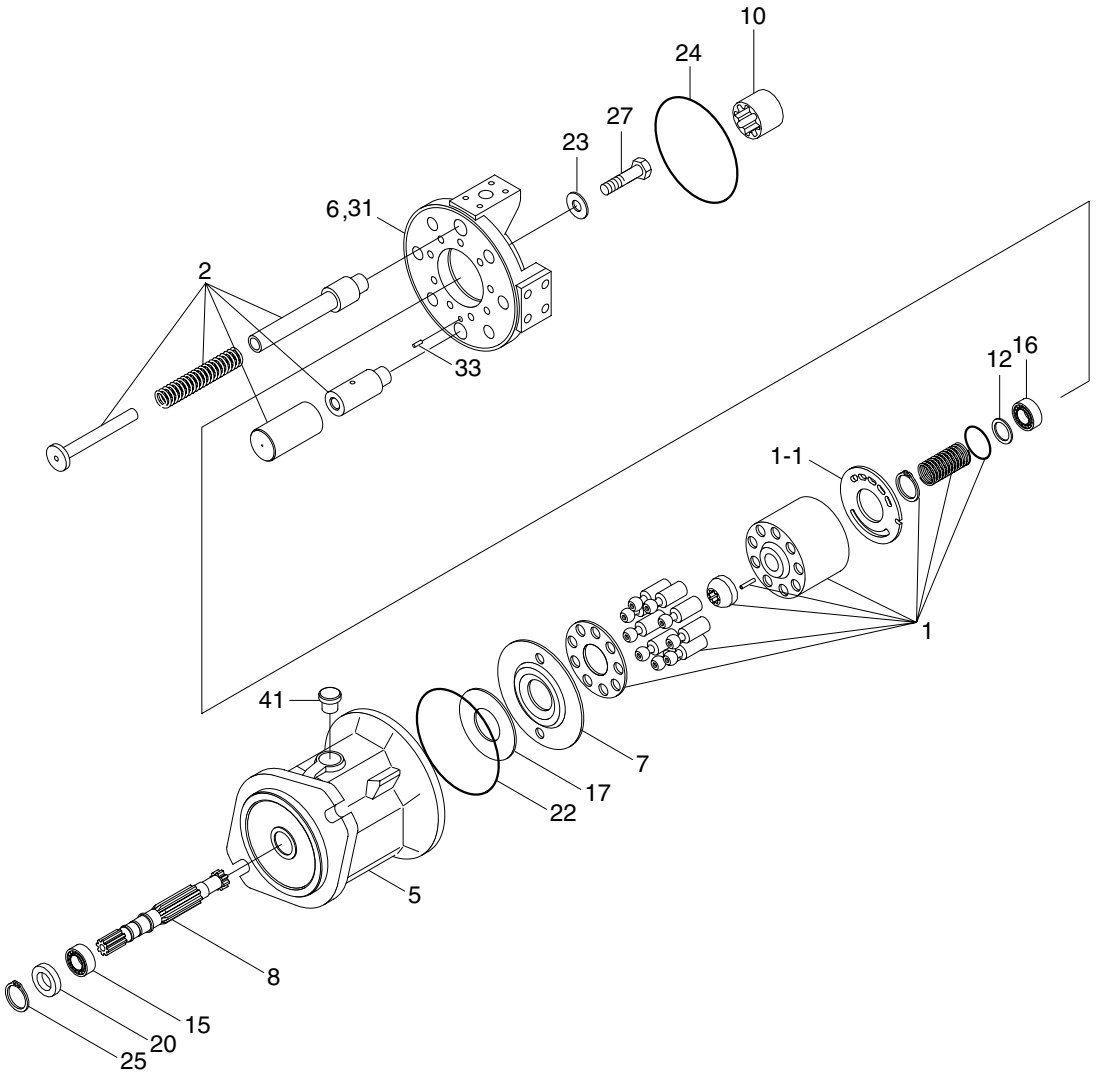
Flow from the brake pump is routed to the cut-off valve that charges the pressure in accumulators. After charging the pressure in accumulators for braking, the flow gose to accumulators for RCV. The cut-off valve flow either to the brake valve or to the remote control valve.

The remote control valve routed flow to either end of each spool valve section in the main control valve to control spool stroke.

A accumulator mounted on pilot supply unit supplies a secondary pressure source to operate remote control valve so the boom can be lowered if the engine is off.

The return circuit for the main hydraulic system have return filter inside the hydraulic tank. The return filter uses a filter element and a bypass valve. The bypass valve is located in the upside of filter.

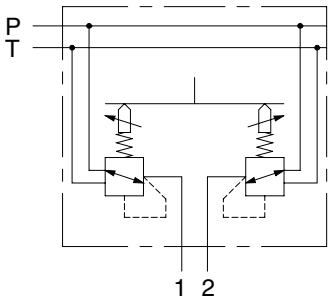
· REAR PUMP



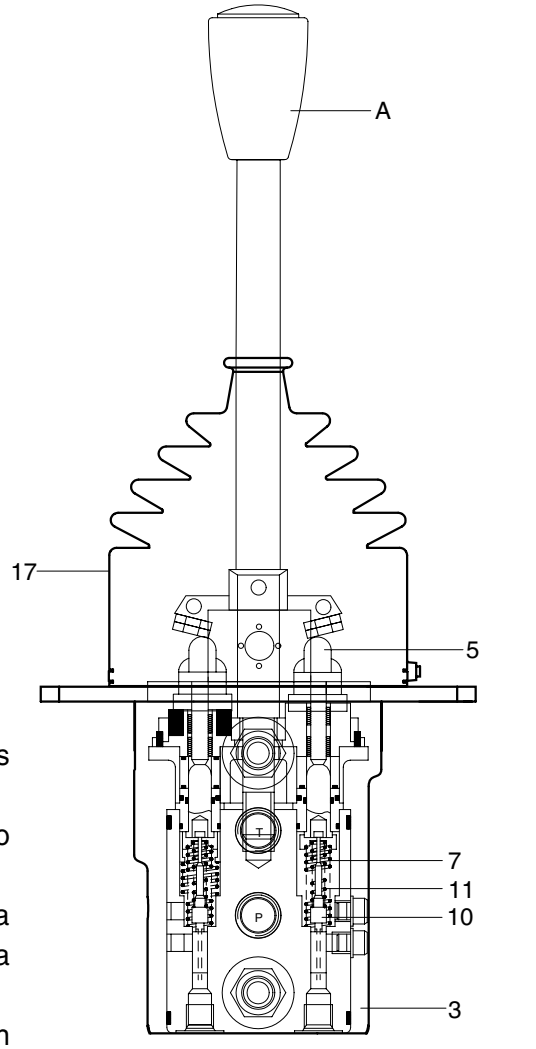
180D7EMP02

55-1	High speed rotary	62	Shim	71	Locking screw
55-2	Control plate	63	Taper roller bearing	72	Locking screw
56	Adjusting piece	64	Taper roller bearing	73	Cylinder pin
57	Pump housing	65	Bearing liner	89	Control valve
58	Port plate	66	Shaft seal ring	90	Flange cover
59	Swash plate	68	O-ring	93	Set screw
60	Drive shaft	69	Retaining ring		
61	Shim	70	Socket screw		

2) OPERATION



HYDRAULIC CIRCUIT



(1) Hydraulic functional principle

Pilot devices with end position locks operate as direct operated pressure reducing valves.

They basically comprise of control lever(A), two pressure reducing valves, body(3) and locks.

Each pressure reducing valve comprises of a plunger kit(5), a metering spring(7) and a spring(11).

At rest, control lever(A) is held in its neutral position by return springs(11). Ports(1, 2) are connected to tank port T.

When control lever(A) is deflected, plunger kit(5) is pressed against return spring(11) and metering spring(7).

Metering spring(7) initially moves docking rod(10) downwards and closes the connection between the relevant port and tank port T. At the same time the relevant port is connected to port P. The control phase starts as soon as docking rod(10) finds its balance between the force from metering spring(7) and the force, which results from the hydraulic pressure in the relevant port(ports 1, 2).

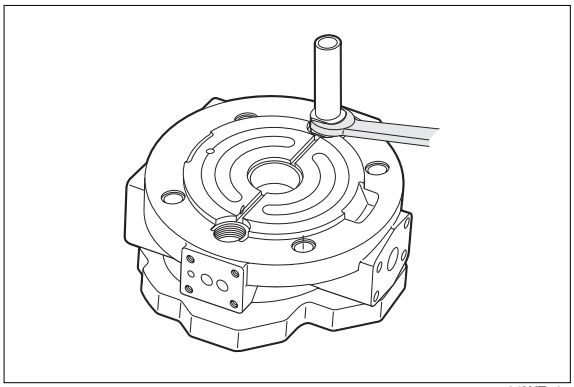
Due to the interaction between docking rod(10) and metering spring(7) the pressure in the relevant port is proportional to the stroke of plunger(5) and hence to the position of control lever(A).

This pressure control which is dependent on the position of the control lever and the characteristics of the control spring permits the proportional hydraulic control of the main directional valves and high response valves for hydraulic pumps.

A rubber bellows(17) protects the mechanical components in the housing from contamination.

Problem	Cause	Remedy
Actuator(cylinder or motor) works slowly or does not operate.	· Shortage of oil in oil tank. · Decrease of relief valve pressure. · Spool got stuck. · Shortage of oil flow to the valve.	· Check the oil level in the oil tank. · Install pressure gauge on the circuit, and check the pressure with it by handling the lever. · Check that manual lever moves smoothly. · Check that lever stroke is enough. · Check that oil flow of the pump is within specified rate.
Cylinder lowers considerably under normal circumstance.	· Internal leakage of cylinder happens frequently. · Excessive leakage from spool of the valve. · Spool got stuck. · Leakage in a part of the circuit.	· Fit the stop valve on the pipe between valve and cylinder, observe the internal leakage of cylinder. · Check the oil viscosity is not too low. · Check that manual lever moves smoothly. · Check the circuit. · Observe leakage from pipes.
Pressure does not increase sufficiently.	· Defect of relief valve. · Leakage in a part of the circuit.	· Check the relief valve. · Check the circuit. · Observe leakage from pipes.
Temperature rising of the hydraulic oil.	· Working with higher pressure than rated pressure. · Low viscosity of oil. · Leakage from a part of the circuit. · Oil leakage in the pump. · Insufficient suction of the pump.	· Check the flow pressure. · Check the sort of oil and viscosity. · Check if the circuit is relieved at all times. · Check if the temperature of pump surface higher 30°C than oil temperature. · Check the oil tank volume. · Check if the suction strainer is blocked.
Steering force is heavy.	· Defect of steering relief valve.	· Check the steering relief valve.

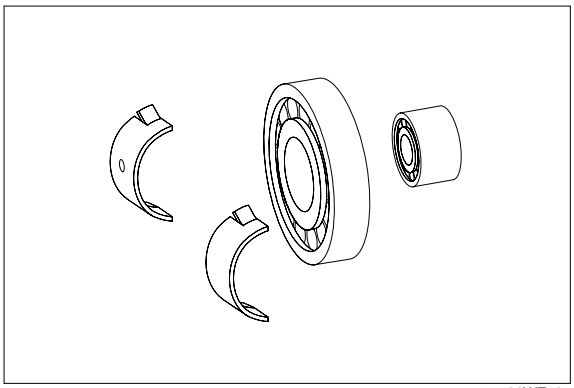
(14) Disassemble the guide of the opposite piston.



75796WE78

6) INSPECT HINTS

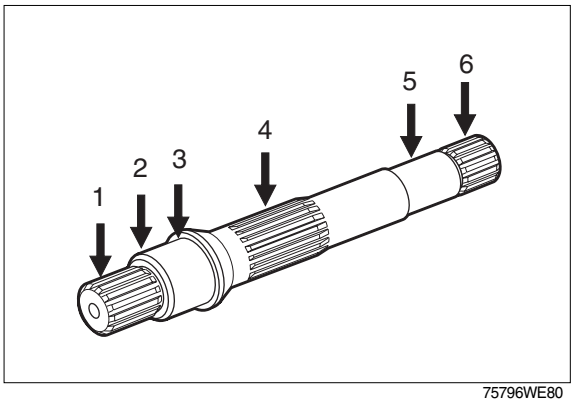
(1) Renew all bearings.



75796WE79

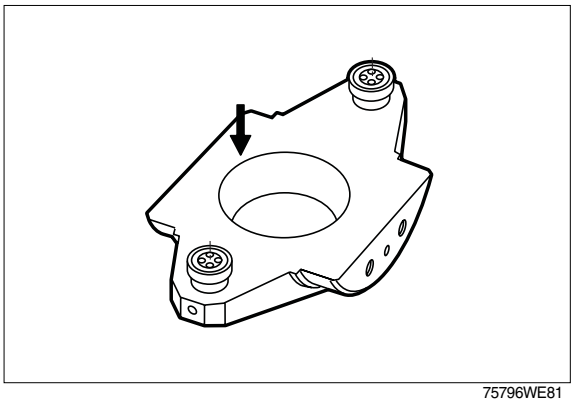
(2) Check :

1 Wear on splines, rust
2 Drive shaft seal wear grooves
3 Bearing seat
4 Splines for cylinder drive
5 Bearing seat



75796WE80

(3) Check :
Sliding surface free of grooves.

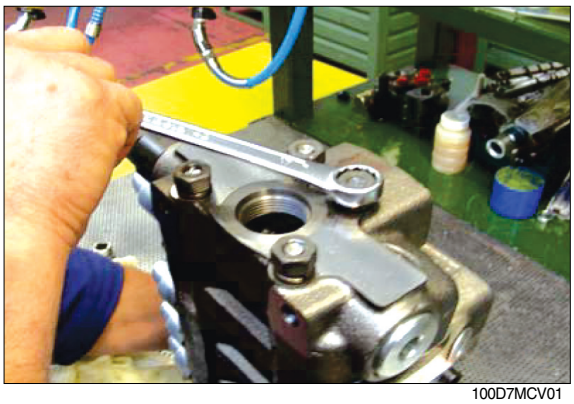


75796WE81

6) DISASSEMBLY & ASSEMBLY

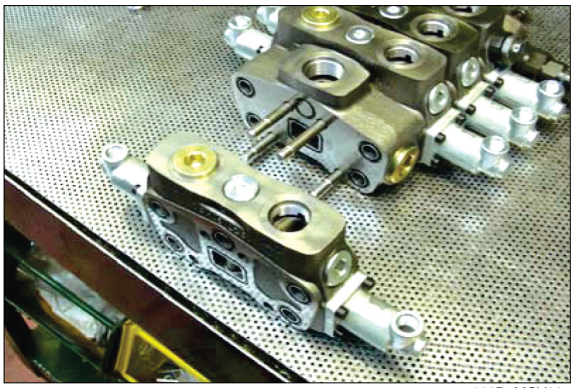
(1) Replacing complete working section

Loosen tightening two bolts with 17mm spanner.



100D7MCV01

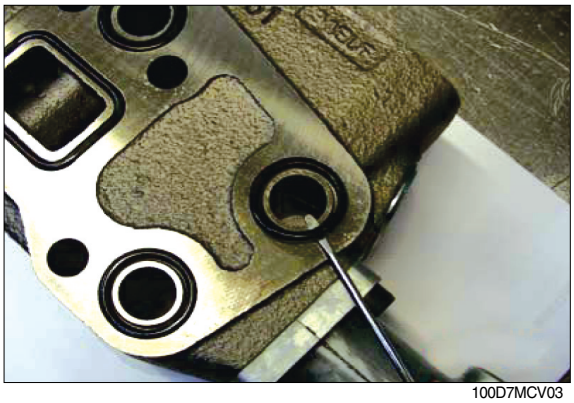
Taking out working section one by one.



100D7MCV02

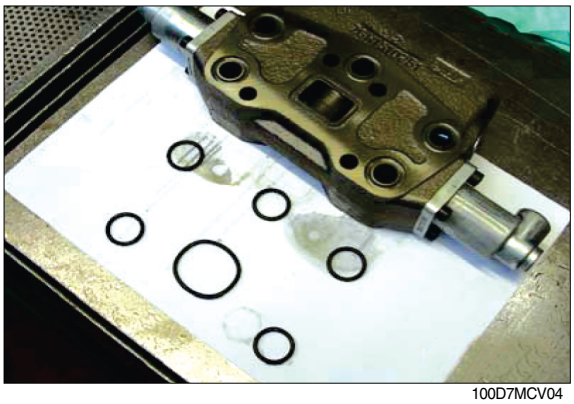
Remove O-rings on the surface of working section properly.

Pay special attention not to give any scratch on the surface.



100D7MCV03

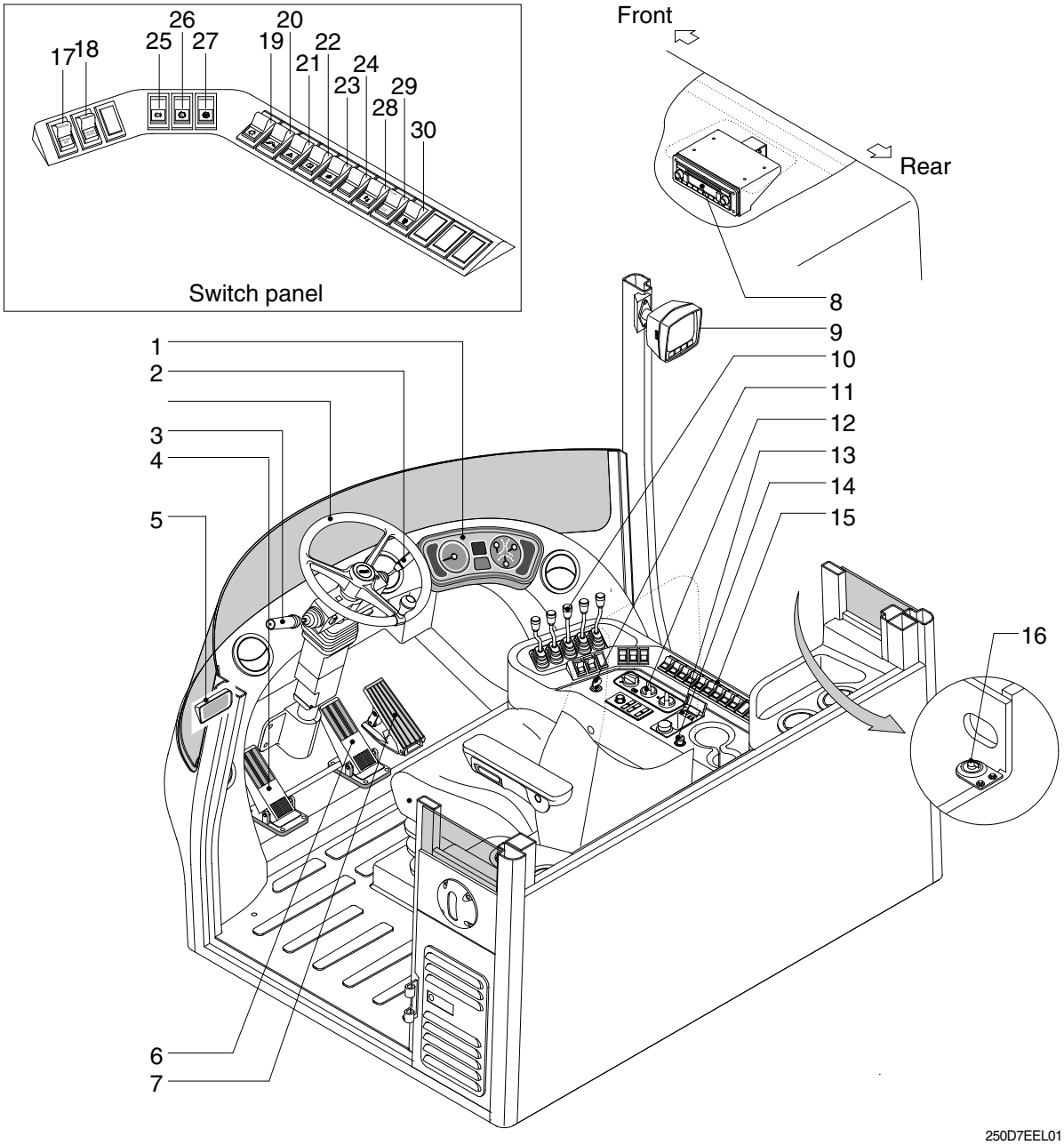
Prepare two sizes of O-rings.
And fix the O-rings on the right positions with some grease in order to avoid separation from the surface while moving.



100D7MCV04

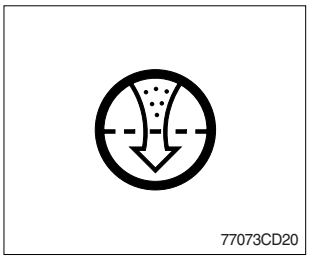
GROUP 1 COMPONENT LOCATION

1. LOCATION 1



1	Cluster	11	Starting switch	21	Hazard switch
2	Multi function switch	12	Aircon & heater switch	22	Rear wiper/washer switch
3	Gear selector lever	13	Handsfree(opt)	23	Aircon switch
4	Inching pedal	14	Cigar lighter	24	Seat heat switch
5	Transmission error display	15	Switch board	25	Parking brake switch
6	Brake pedal	16	Master switch	26	Auto/Manual select switch
7	Accelerator pedal	17	Cruise set-resume switch	27	Inching switch
8	Radio and CD/MP3 player	18	Cruise switch	28	Inc/Dec switch
9	Monitor(opt)	19	Main light switch	29	Engine mode switch
10	Remote control lever	20	Work lamp swich	30	Fuel heater switch

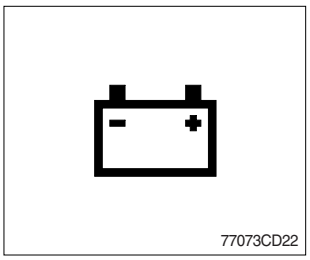
(12) Air cleaner warning lamp



① This lamp operates by the vacuum caused inside when the filter of air cleaner is clogged.

② Check the filter and clean or replace it when the lamp is ON.

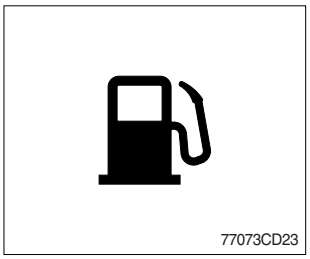
(13) Battery charging warning lamp



① This lamp is ON after key switch is turned ON.

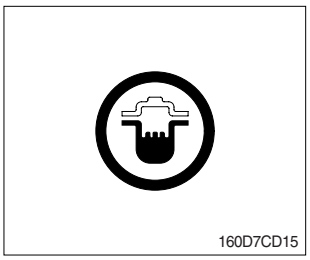
② Check the battery charging circuit when this lamp comes ON during engine operation.

(14) Fuel low level warning lamp



① Fill the fuel immediately when the lamp is turned ON.

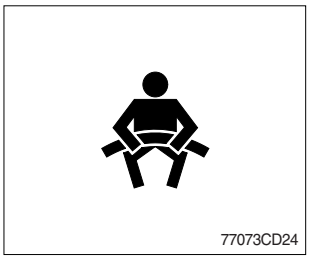
(15) Water in fuel warning lamp



① This lamp lights up when the water separatoris full of water or malfunctioning.

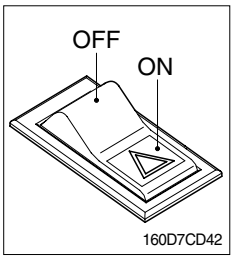
※ **When this lamp lights up, stop the truck and spill water out of the separator.**

(16) Seat belt warning lamp



① This lamp lights ON for the first five seconds after starting the truck.

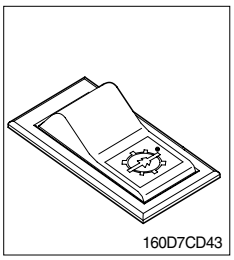
2) HAZARD SWITCH



(1) Use for parking, or loading truck.

※ **If the switch is left ON for a long time, the battery may be discharged.**

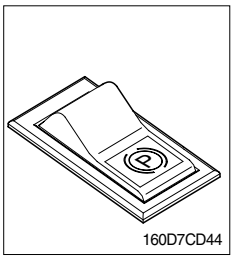
3) INCHING SWITCH



(1) If this switch is pressed, inching operation is applied to inching pedal.

(2) Also, inching lamp on the cluster is illuminated.

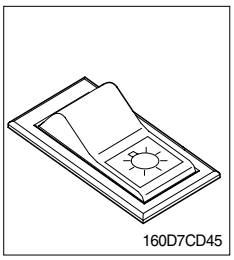
4) PARKING BRAKE SWITCH



(1) If this switch is pressed, the parking brake is applied and the gauge panel warning lamp will comes ON.

※ **When operating the gear selector lever, be sure to release the parking brake. If the truck is operated with the parking brake engaged, the brake will overheat and may cause the brake system to go out of order.**

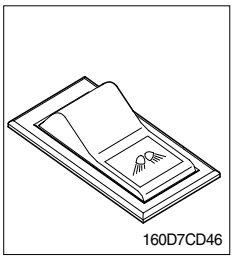
5) MAIN LIGHT SWITCH



(1) This switch is used to operate the clearance lamp and head light by two steps.

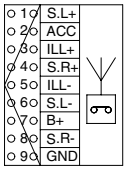
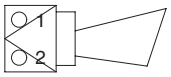
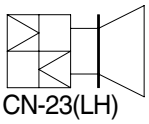
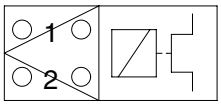
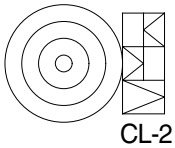
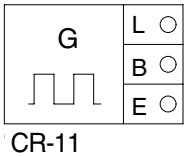
- First step : Clearance lamp and cluster illumination lamp comes ON. Also, all of the indicator lamps of switches come ON.
- Second step : Head light comes ON.

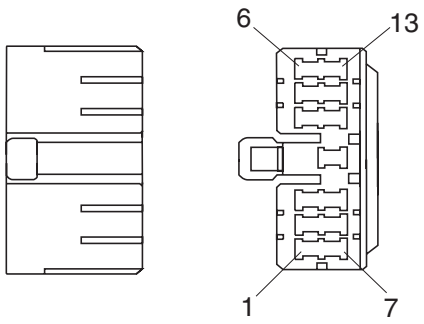
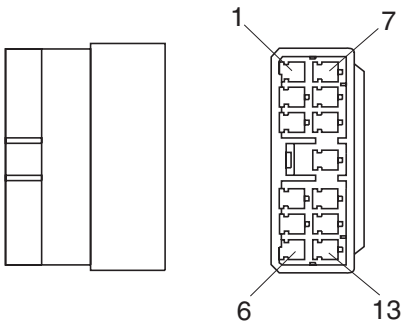
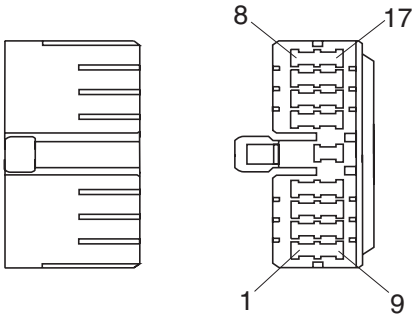
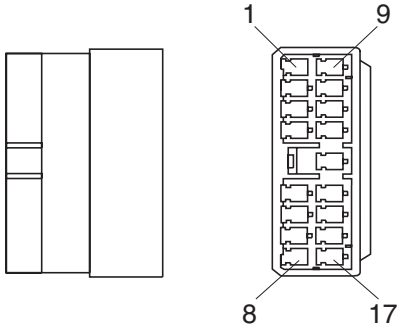
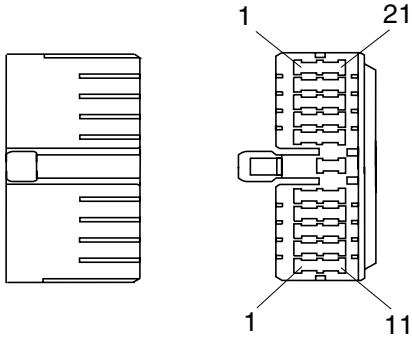
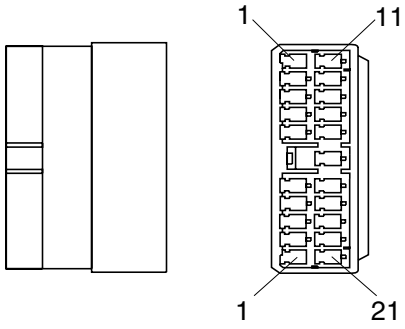
6) WORK LAMP SWITCH

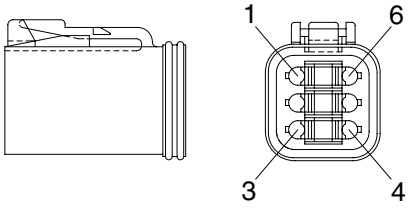
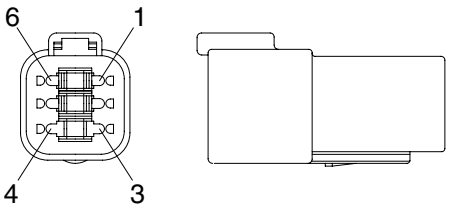
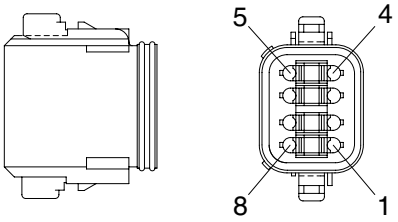
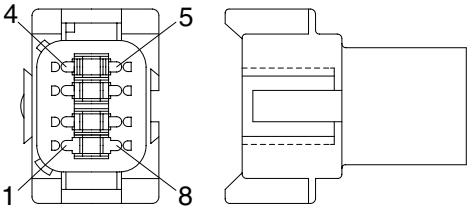
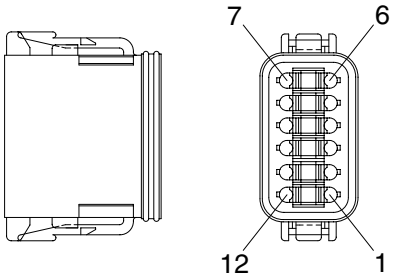
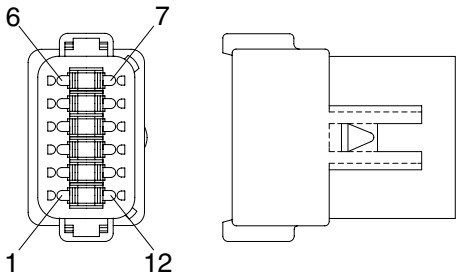


(1) This switch is used to operate the front and rear work lamps by two steps.

- First step : Front work lamp comes ON.
- Second step : Rear work lamp comes ON.

Part name	Symbol	Specifications	Check
Radio/USB player	 CN-27	DC28V 40Ohm × 2	※ Check resistance Power ON : 4 Ω + 4 Ω (For terminal 1-6, 4-8)
Horn	 CN-25 CN-25 CN-65	20~28V 100~115dB (A) (at 25V 2m) Max. 1.5A (at 24V)	※ Check operation Supply power(24V) to each terminal and connect ground.
Speaker	 CN-23(LH) CN-24(RH)	4 Ω 20W	※ Check resistance Normal : 50 Ω
Air conditioner compressor	 CN-30	24V 79W	※ Check contact Normal : 13.4 Ω
Cigar lighter	 CL-2	24V 5A	-
Flasher	 CR-11	24V 85~190 C/M 50dB	-

No. of pin	Receptacle connector(Female)	Plug connector(Male)
13	 S811-013002	 S811-113002
17	 S811-017002	 S811-117002
21	 S811-021002	 S811-121002

No. of pin	Receptacle connector(Female)	Plug connector(Male)
6	 DT06-6S	 DT04-6P
8	 DT06-8S	 DT04-8P
12	 DT06-12S	 DT04-12P