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TEMPERATURE

Fahrenheit-Centigrade Conversion.

A simple way to convert a fahrenheit temperature reading into a centigrade temperature reading or vice verse is to enter the accompanying table in the center or boldface column of figures.

These figures refer to the temperature in either Fahrenheit or Centigrade degrees.

If it is desired to convert from Fahrenheit to Centigrade degrees, consider the center column as a table of Fahrenheit temperatures and read the corresponding Centigrade temperature in the column at the left.

If it is desired to convert from Centigrade to Fahrenheit degrees, consider the center column as a table of Centigrade values, and read the corresponding Fahrenheit temperature on the right.

˚C		˚F	˚C		˚F	˚C		˚F	˚C		˚F
-40.4	-40	-40.0	-11.7	11	51.8	7.8	46	114.8	27.2	81	117.8
-37.2	-35	-31.0	-11.1	12	53.6	8.3	47	116.6	27.8	82	179.6
-34.4	-30	-22.0	-10.6	13	55.4	8.9	48	118.4	28.3	83	181.4
-31.7	-25	-13.0	-10.0	14	57.2	9.4	49	120.2	28.9	84	183.2
-28.9	-20	-4.0	-9.4	15	59.0	10.0	50	122.0	29.4	85	185.0
-28.3	-19	-2.2	-8.9	16	60.8	10.6	51	123.8	30.0	86	186.8
-27.8	-18	-0.4	-8.3	17	62.6	11.1	52	125.6	30.6	87	188.6
-27.2	-17	1.4	-7.8	18	64.4	11.7	53	127.4	31.1	88	190.4
-26.7	-16	3.2	-6.7	20	68.0	12.8	55	131.0	32.2	90	194.0
-26.1	-15	5.0	-6.7	20	68.0	12.8	55	131.0	32.2	90	194.0
-25.6	-14	6.8	-6.1	21	69.8	13.3	56	132.8	32.8	91	195.8
-25.0	-13	8.6	-5.6	22	71.6	13.9	57	134.6	33.3	92	197.6
-24.4	-12	10.4	-5.0	23	73.4	14.4	58	136.4	33.9	93	199.4
-23.9	-11	12.2	-4.4	24	75.2	15.0	59	138.2	34.4	94	201.2
-23.3	-10	14.0	-3.9	25	77.0	15.6	60	140.0	35.0	95	203.0
-22.8	-9	15.8	-3.3	26	78.8	16.1	61	141.8	35.6	96	204.8
-22.2	-8	17.6	-2.8	27	80.6	16.7	62	143.6	36.1	97	206.6
-21.7	-7	19.4	-2.2	28	82.4	17.2	63	145.4	36.7	98	208.4
-21.1	-6	21.2	-1.7	29	84.2	17.8	64	147.2	37.2	99	210.2
-20.6	-5	23.0	-1.1	35	95.0	21.1	70	158.0	51.7	125	257.0
-20.0	-4	24.8	-0.6	31	87.8	18.9	66	150.8	40.6	105	221.0
-19.4	-3	26.6	0	32	89.6	19.4	67	152.6	43.3	110	230.0
-18.9	-2	28.4	0.6	33	91.4	20.0	68	154.4	46.1	115	239.0
-18.3	-1	30.2	1.1	34	93.2	20.6	69	156.2	48.9	120	248.0
-17.8	0	32.0	1.7	35	95.0	21.1	70	158.0	51.7	125	257.0
-17.2	1	33.8	2.2	36	96.8	21.7	71	159.8	54.4	130	266.0
-16.7	2	35.6	2.8	37	98.6	22.2	72	161.6	57.2	135	275.0
-16.1	3	37.4	3.3	38	100.4	22.8	73	163.4	60.0	140	284.0
-15.6	4	39.2	3.9	39	102.2	23.3	74	165.2	62.7	145	293.0
-15.0	5	41.0	4.4	40	104.0	23.9	75	167.0	65.6	150	302.0
-14.4	6	42.8	5.0	41	105.8	24.4	76	168.8	68.3	155	311.0
-13.9	7	44.6	5.6	42	107.6	25.0	77	170.6	71.1	160	320.0
-13.3	8	46.4	6.1	43	109.4	25.6	78	172.4	73.9	165	329.0
-12.8	9	48.2	6.7	44	111.2	26.1	79	174.2	76.7	170	338.0
-12.2	10	50.0	7.2	45	113.0	26.7	80	176.0	79.4	172	347.0

6) POWER TRAIN DEVICED

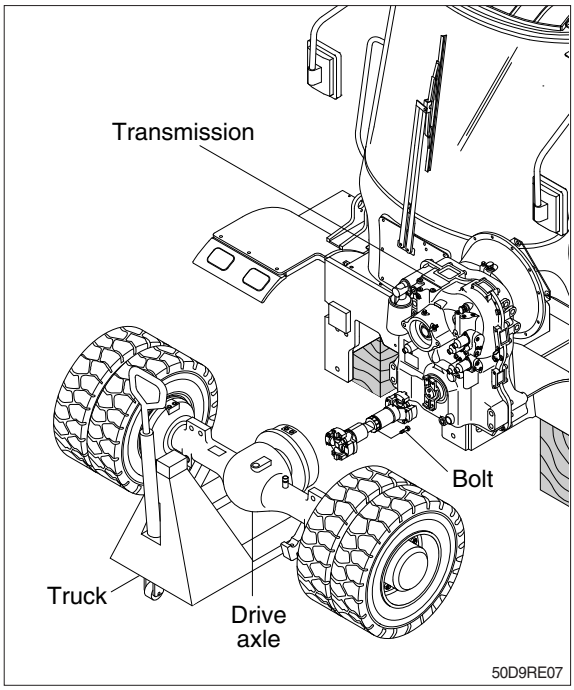
Item			Specification		
			70D-9V		80D-9V
Torque converter	Type		3 Element, 1 stage, 2 phases		
	Stall ratio		2.395 : 1		
Transmission	Model		ZF 3WG94		
	Type		Full auto, power shift		
	Gear shift (FR/RR)		3/3		
	Adjustment		Electrical single lever type		
	Overhaul ratio	FR	1 : 4.714	2 : 2.341	3 : 0.974
		RR	1 : 4.711	2 : 2.340	3 : 0.974
Axle	Type		Front-wheel drive type, fixed location		
	Gear ratio		10.668		12.332
	Gear		Ring & pinion gear type		
Wheels	Q'ty (FR/RR)		Double : 4/2		
	Front (drive)		8.25-15-14 PR		9.00-20-14 PR
	Rear (steer)		8.25-15-14 PR		9.00-20-14 PR
Brakes	Travel		Front wheel, wet disc brake		
	Parking		Wet disc (negative brake)		
Steering	Type		Full hydraulic, power steering		
	Steering angle		75.87˚ to both right and left angle, respectively		

SECTION 2 REMOVAL & INSTALLATION OF UNIT

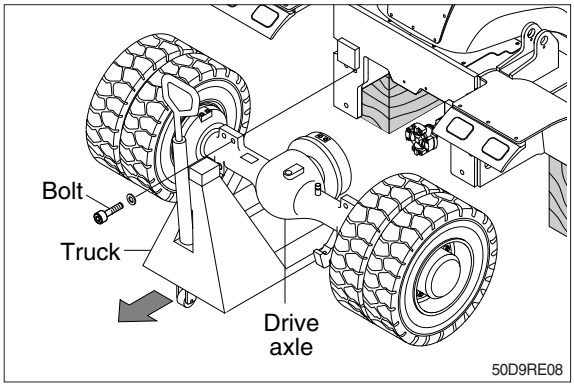
(5) Drive axle

※ Before removing the drive axle unit, drain all of the oil from the axle.

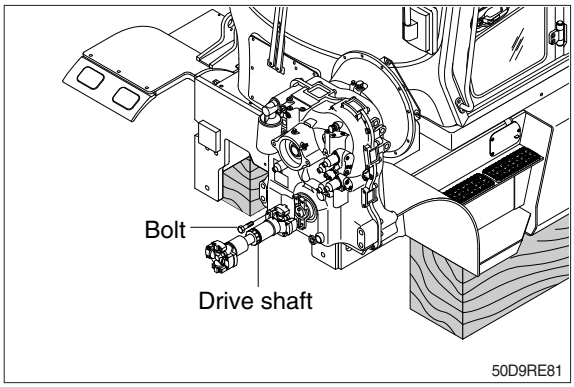
① Attach a crane to the tilt cylinder notches on the dashboard and raise the truck.
② Loosen hexagonal bolts connecting drive axle to drive shaft.
③ Put the block under the front axle and support under the drive axle with a truck.



④ Remove drive axle mounting bolts from the frame and then slowly pull out the truck with drive axle to the front.



⑤ Remove drive shaft from the transmission by loosening the mounting bolts.



(2) Rear wheel

Remove mounting bolt and hub nut with socket wrench and then carefully take out the tire assembly.

· Tightening torque

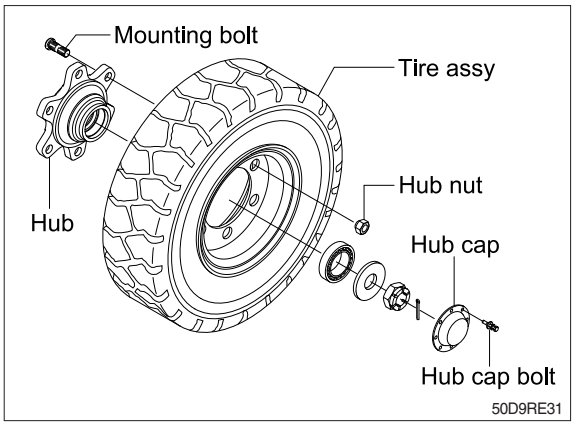
- Hub nut

  61.2±6.1 kgf·m (443±44.1 lbf·ft)

- Hub cap bolt

  2.5±0.5 kgf·m (18.0±3.6 lbf·ft)

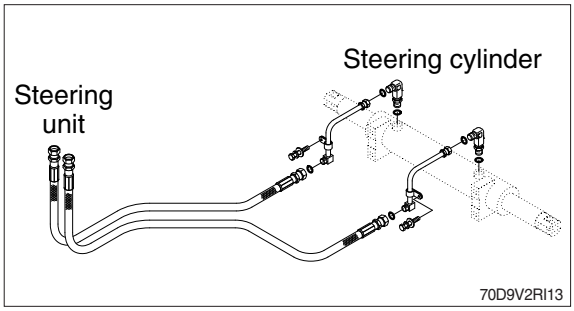
※ Keep gas tight by applying liquid gasket #1215 on the contact surface of the hub cap before assembling the hub cap.



(3) Hose and piping

① Disconnect the hoses from the steering axle and then drain out oil.

② Disconnect the pipes from the axle support.



(4) Mounting bolt

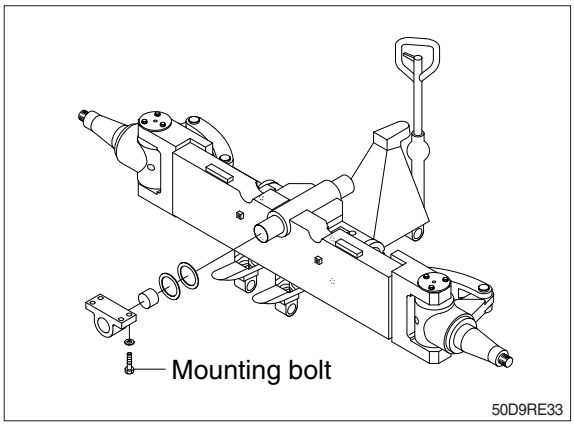
Put a block under the steering axle, support on a truck, an raise the frame with a crane. Remove the mounting bolts installing to the frame, and pull out to the rear.

There are shims between the support and steering axle to prevent play.

· Mounting bolt tightening torque

  41.3±6.2 kgf·m (299±44.8 lbf·ft)

※ Apply loctite #277 on the thread before tightening.

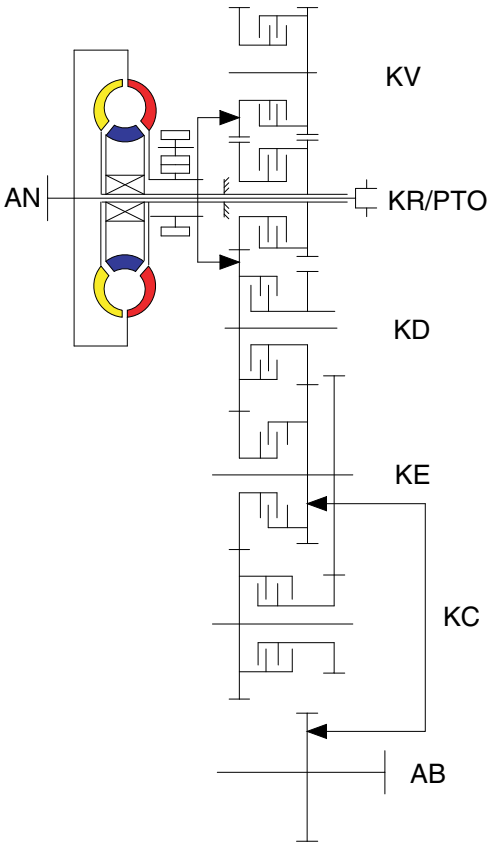


(3) Reverse

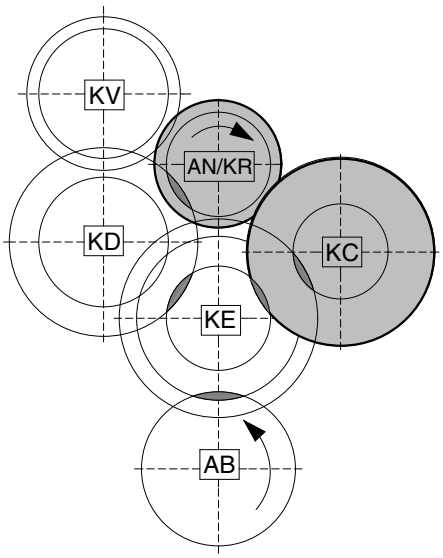
In reserve, reserve clutch and 1st, 2nd, 3rd clutch are engaged.

Reverse clutch and 1st, 2nd, 3rd are actuated by the hydraulic pressure applied to the clutch piston.

Transmission diagram



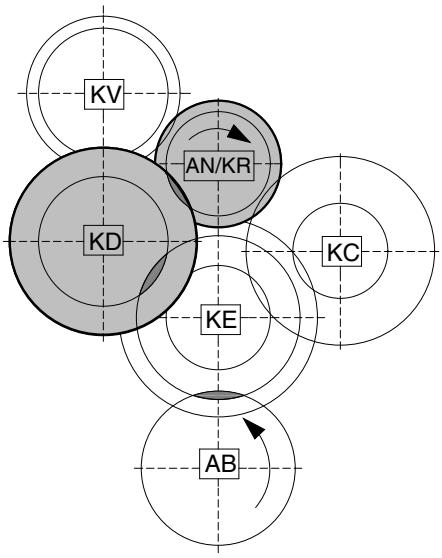
1st gear reverse



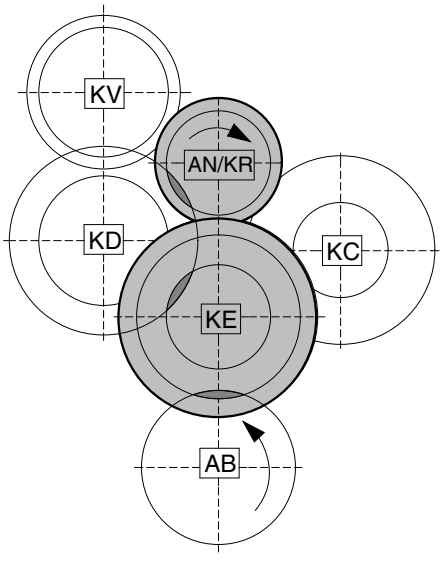
Legend:

AN = Input
KV = Clutch forward
KR = Clutch reverse
KC = Clutch 1st speed
KD = Clutch 2nd speed
KE = Clutch 3rd speed
PTO = Power take-off
AB = Output

2nd gear reverse



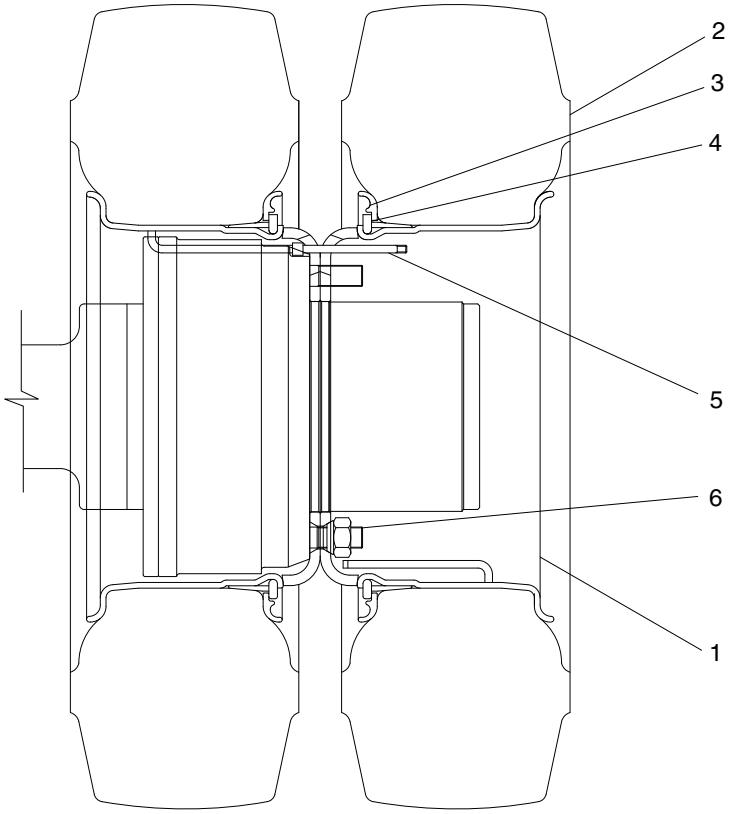
3rd gear reverse



50DS7EPT34

Number	Meaning of error code
B1 hex	Slippage at clutch KC
B2 hex	Slippage at clutch KD
B3 hex	Slippage at clutch KE
B5 hex	Slippage at clutch KV
B6 hex	Slippage at clutch KR
D1 hex	Short circuit to battery voltage at power supply for sensors
D2 hex	Short circuit to ground at power supply for sensors
D3 hex	Low voltage at battery
D4 hex	High voltage at battery
D5 hex	Error at valve power supply 1
D6 hex	Error at valve power supply 2
E5 hex	Communication failure on devicenet
F1 hex	General EEPROM fault
F2 hex	Configuration lost
F3 hex	Application error

6. TIRE AND WHEEL



B507AX68

1	Wheel rim	3	Lock ring	5	Valve assembly
2	Tire	4	Side ring	6	Wheel nut

1) The tire acts to absorb the shock from the ground surface to the machine, and at the same time they must rotate in contact with the ground to gain the power which drives the machine.

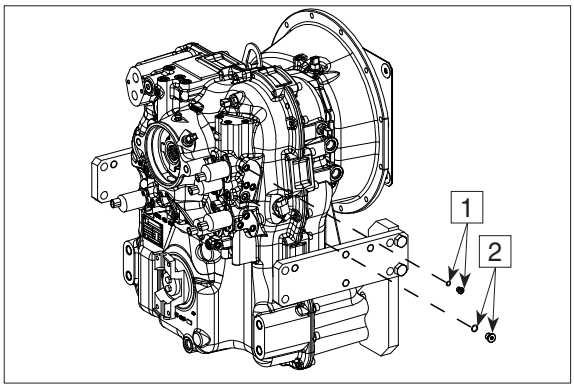
2) Various types of tires are available to suit the purpose. Therefore it is very important to select the correct tires for the type of work.

No	Problem	Cause
4	Slow clutch meshing or failure	1. Low oil pressure. 2. Low converter oil pressure. 3. Air mixed with oil 1) Air mixed through the pump input port. 2) Low oil level 4. Abnormal adjustment of inching valve linkage.
5	Reverse gear shift failure	1. Excessive wear of disk and plate at reverse clutch. 2. Oil leakage from seal. 3. Reverse clutch components defect. 1) Metal sealing wear or defect. 2) Clutch piston seal wear or defect. 3) Another components damaged. 4. Malfunction of solenoid or related electric parts.
6	Forward gear shift failure	1. Excessive wear of disk and plate at forward clutch. 2. Oil leakage from seal. 3. Forward clutch components defect. 1) Metal sealing wear or defect. 2) Clutch piston seal wear or defect. 3) Another components damaged. 4. Malfunction of solenoid or related electric parts.
7	Low stall speed	1. Incorrect engine performance. 2. Torque converter stator failure.
8	High stall speed at all of gear stage	1. Low oil level. 2. Air mixed with oil. 3. Clutch slip. 4. T/C malfunctioning.
9	High stall speed at partial direction or speed	1. Clutch line leakage. 2. Clutch defect.
10	Slow clutch meshing and rough gear shift	1. Incorrect adjustment of inching valve. 2. Inching valve not closed or clogged orifice. 3. Low main pressure. 4. Low pressure of direction clutch. 5. Oil leakage. 6. Valve spool spring weakened or damaged.
11	Abnormal movement to the specified direction at neutral	1. Clutch defect, clutch disk and plate damaged. 2. Valve spool defect or spool sticked.

Fault code (Hex)	Meaning of the fault code possible reason for fault detection	Reaction of the TCU	Possible steps to repair
89	**O.C. at clutch KR** The measured resistance value of the valve is out of limit · Cable/connector is defective and has no contact to TCU · Regulator has an internal defect	TCU shifts to neutral OP mode : Limp home If failure at another clutch is pending TCU shifts to neutral OP mode : TCU shutdown	· Check the cable from TCU to the gearbox · Check the connectors from gearbox to TCU · Check the regulator resistance* · Check internal wire harness of the gearbox * See page 3-56
B1	**Slippage at clutch KC** TCU calculates a differential speed at closed clutch KC. If this calculated value is out of range, TCU interprets this as slipping clutch · Low pressure at clutch KC · Low main pressure · Wrong signal at internal speed sensor · Wrong signal at output speed sensor · Wrong size of the sensor gap · Clutch is defective	TCU shifts to neutral OP mode : Limp home If failure at another clutch is pending TCU shifts to neutral OP mode : TCU shutdown	· Check pressure at clutch KC · Check main pressure in the system · Check sensor gap at internal speed sensor · Check sensor gap at output speed sensor · Check signal at internal speed sensor · Check signal at output speed sensor Replace clutch ·
B2	**Slippage at clutch KD** TCU calculates a differential speed at closed clutch KD. If this calculated value is out of range, TCU interprets this as slipping clutch · Low pressure at clutch KD · Low main pressure · Wrong signal at internal speed sensor · Wrong signal at output speed sensor · Wrong size of the sensor gap · Clutch is defective	TCU shifts to neutral OP mode : Limp home If failure at another clutch is pending TCU shifts to neutral OP mode : TCU shutdown	· Check pressure at clutch KD · Check main pressure in the system · Check sensor gap at internal speed sensor · Check sensor gap at output speed sensor · Check signal at internal speed sensor · Check signal at output speed sensor Replace clutc ·
B3	**Slippage at clutch KE / KB** TCU calculates a differential speed at closed clutch KE / KB. If this calculated value is out of range, TCU interprets this as slipping clutch · Low pressure at clutch KE / KB · Low main pressure · Wrong signal at internal speed sensor · Wrong signal at output speed sensor · Wrong size of the sensor gap · Clutch is defective	TCU shifts to neutral OP mode : Limp home If failure at another clutch is pending TCU shifts to neutral OP mode : TCU shutdown	· Check pressure at clutch KE · Check main pressure in the system · Check sensor gap at internal speed sensor · Check sensor gap at output speed sensor · Check signal at internal speed sensor · Check signal at output speed sensor Replace clutch ·

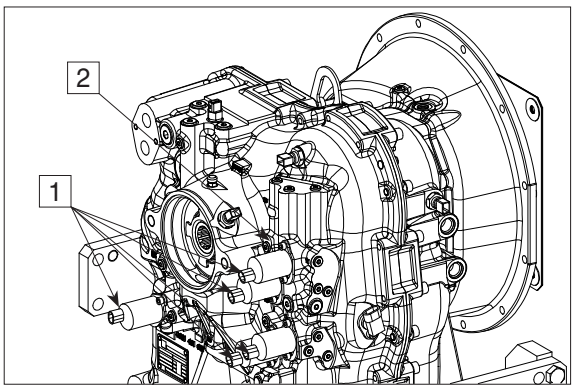
2) DISASSEMBLY PRESSURE CONTROLLER (PROPORTIONAL VALVES), INDUCTIVE SENSOR, SPEED SENSOR (HALL SENSOR), TEMPERATURE SENSOR, BREATHER AND SCREW PLUGS

① Remove all screw plugs with O-ring (1 and 2).



50DS7ETM18

② Loosen cylindrical screws (1) and remove pressure controller (proportional valves, 2).

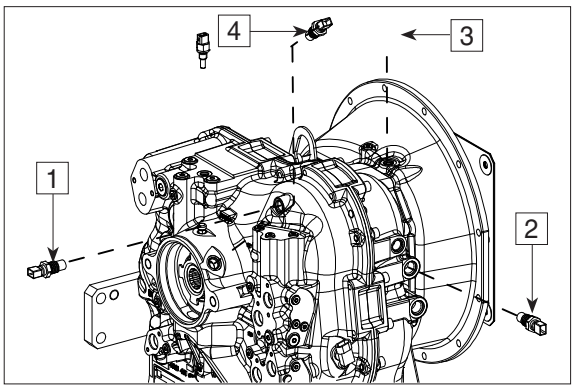


50DS7ETM19

③ Remove positioned parts.

1 = Inductive sensor-n turbine
2 = Inductive sensor-n central gear chain
3 = Temperature sensor, measuring point "63" after converter
4 = Inductive sensor

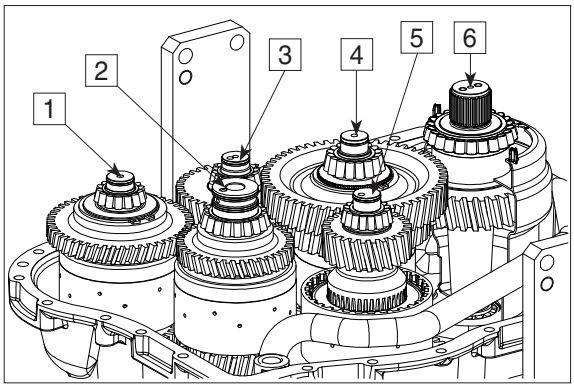
※ Remove O-rings.



50DS7ETM20

7) DISASSEMBLY CLUTCHES :

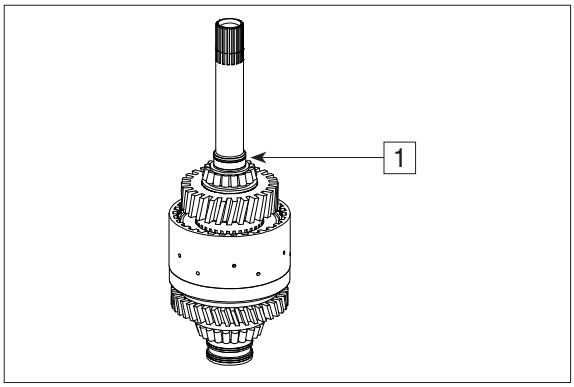
1 = Clutch KV(Clutch-forward)
2 = Clutch KR(Clutch-reverse and input)
3 = Clutch KD(Clutch-2nd gear)
4 = Clutch KE(Clutch-3rd gear)
5 = Clutch KC(Clutch-1st gear)
6 = Output



50DS7ETM50

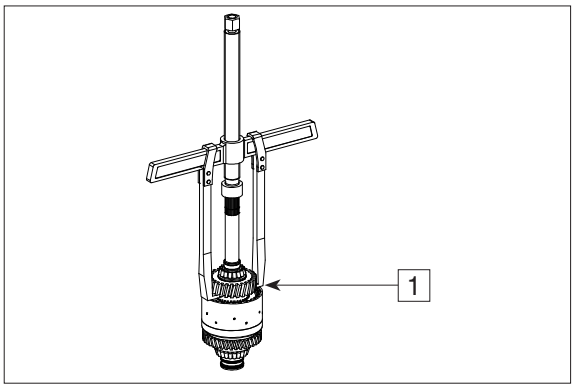
(1) Clutch KR/input

① Disengage rectangular ring (1).



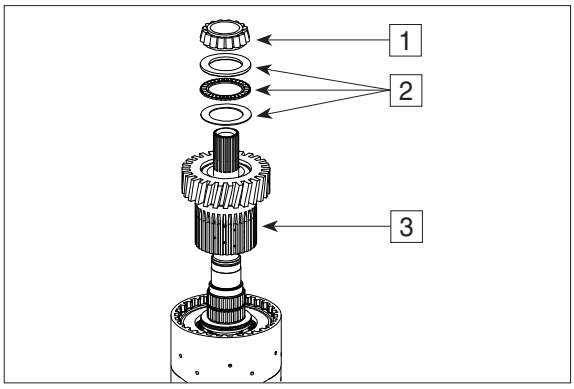
50DS7ETM51

② Pull off bearing inner ring with inner disk carrier (1).



50DS7ETM52

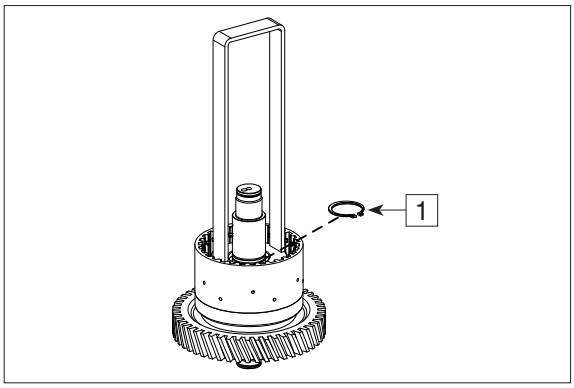
③ Remove bearing inner ring (1), axial bearing assy (2) and inner disk carrier (3).



50DS7ETM53

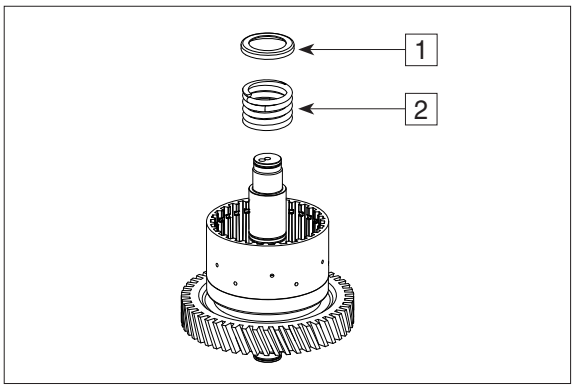
⑨ Preload compression spring and remove snap ring (1).

(S) Assembly aid 5870 345 114



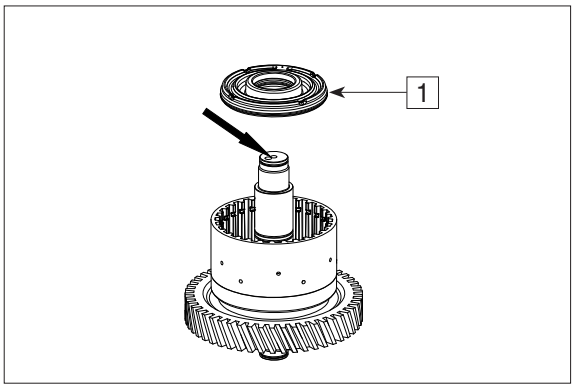
50DS7ETM89

⑩ Remove spring cup (1) and compression spring (2).



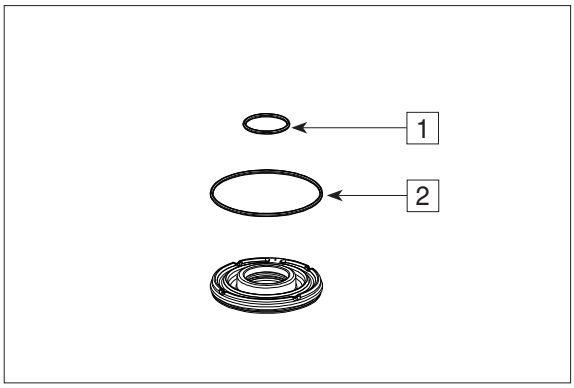
50DS7ETM90

⑪ By means of compressed air (see arrow), press piston (1) off the shaft/disk carrier and remove it.



50DS7ETM91

⑫ Remove both O-rings (1 and 2).

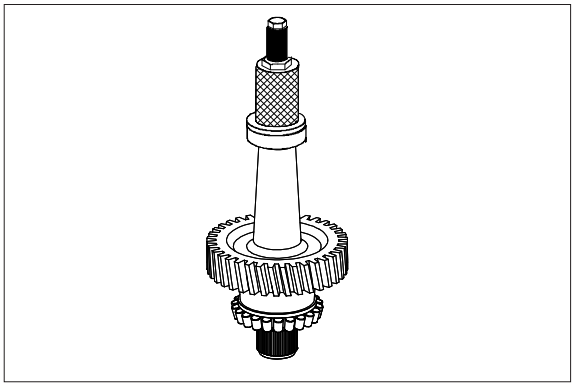


50DS7ETM62

(6) Output shaft

① Pull the bearing inner ring off the output shaft.

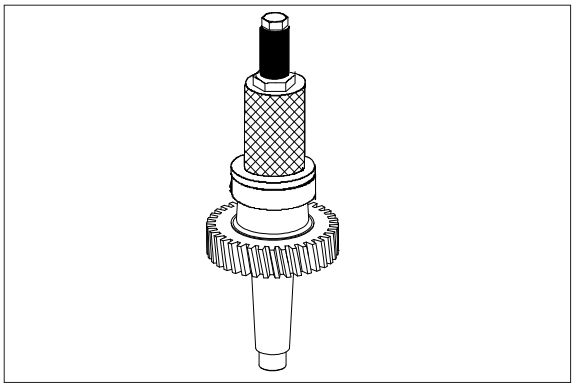
(S) Grab sleeve 5873 000 029
(S) Basic tool 5873 000 001



50DS7ETM125

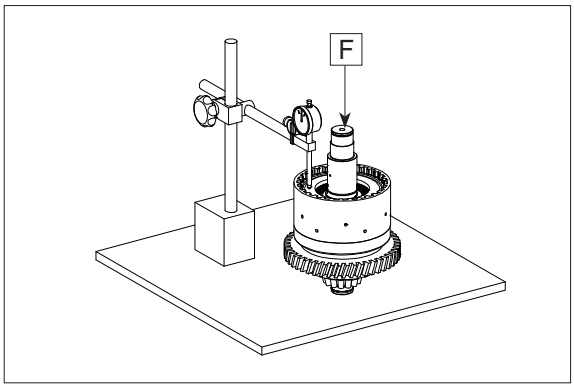
② Rotate output shaft 180°and pull off bearing inner ring.

(S) Grab sleeve 5873 002 035
or
(S) Rapid grip 5873 012 011
(S) Basic tool 5873 002 000



50DS7ETM126

⑫ Equally press on end plate with F (approx. 100N = 10kg) and set dial indicator to "zero".

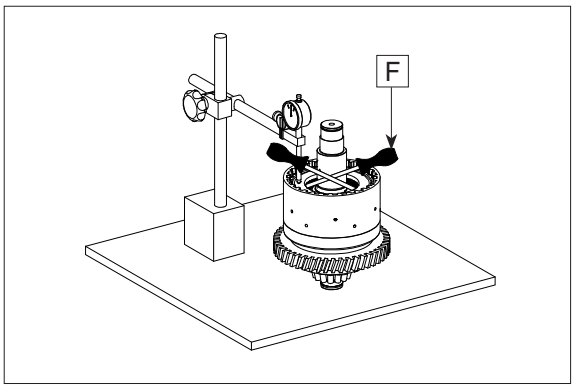


50DS7ETM161

⑬ Then press end plate against the snap ring (upwards) and read the disk clearance.

※ Disk clearance : 2.2 to 2.6 mm

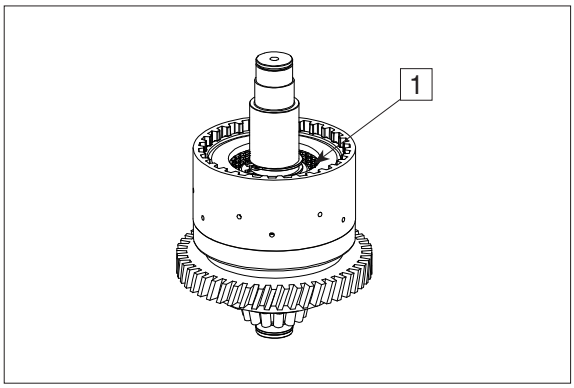
※ In case of deviations, the disk clearance must be corrected with an appropriate snap ring(optional thickness = 2.0~3.5 mm/available in steps of 0.25 mm).



50DS7ETM162

⑭ Snap retaining ring 40×1.75 (1) into the groove.

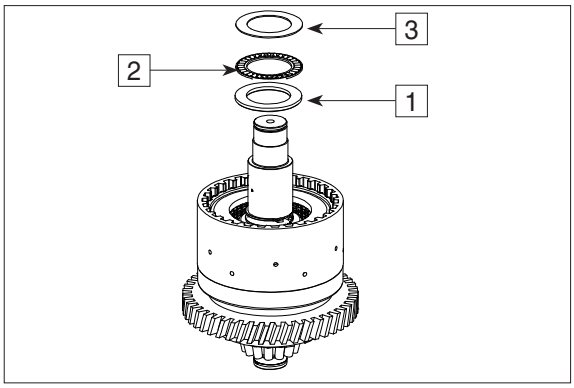
※ Contact for axial bearing-see below figure.



50DS7ETM163

⑮ Mount running disk 40×60×3.5 (1), axial needle cage 40×60×3 (2) and axial washer 40×60×1 (3) and oil them.

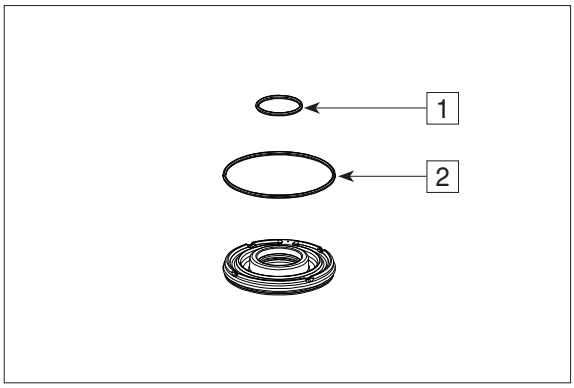
※ Fit running disk (1), with the chamfer showing towards the retaining ring.



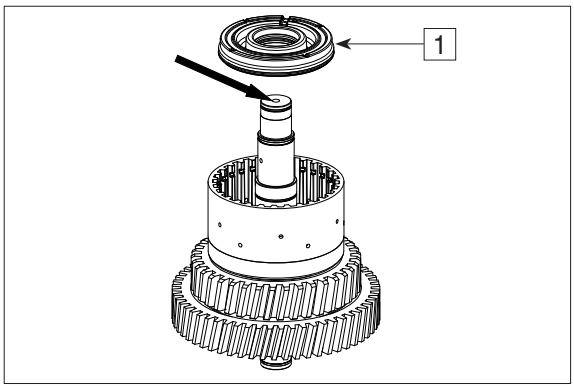
50DS7ETM164

④ Insert both O-rings (1 and 2) into the piston grooves and oil them.

1 = 40×3
2 = 104.5×3



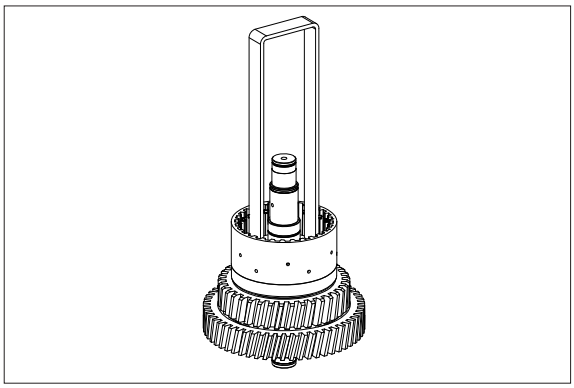
50DS7ETM62



50DS7ETM107

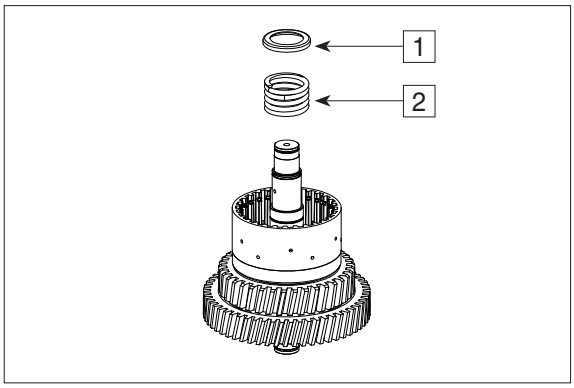
⑤ Use a hand-operated press to place piston into the disk carrier by means of the assembly aid.

(S) Assembly aid 5870 345 114



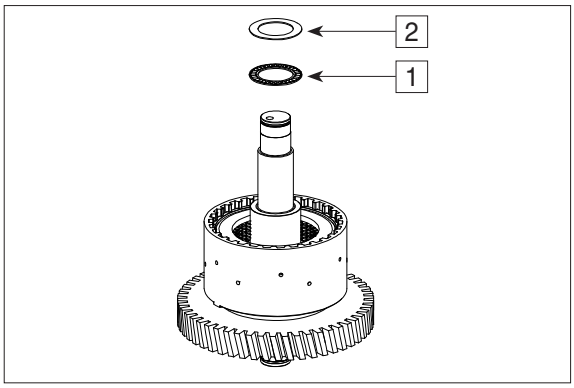
50DS7ETM188

⑥ Mount compression spring (1) and spring cup (2).



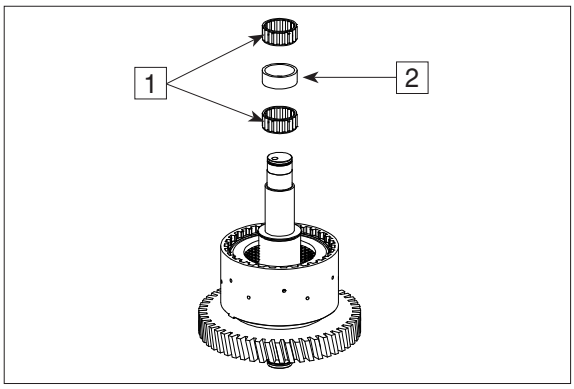
50DS7ETM106

⑫ Mount axial needle cage 35×52×2 (1) and axial disk 35×52×1 (1) and oil them.



50DS7ETM116

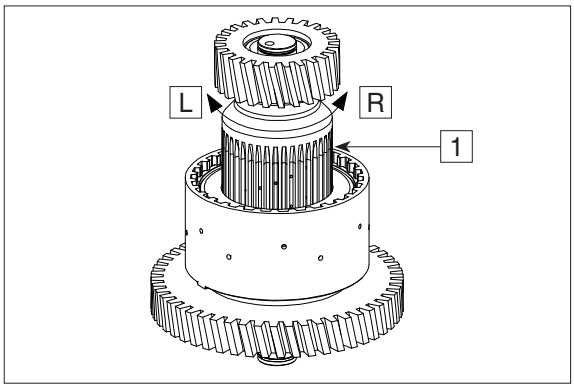
⑬ Mount needle cage 35×42×18 (1) and bush (2) and oil it.



50DS7ETM115

⑭ Mount inner disk carrier until contact is obtained.

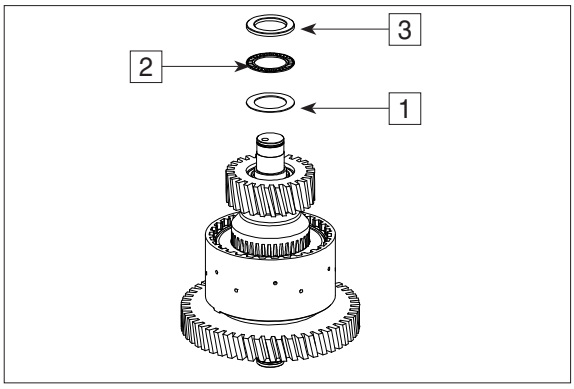
Install inner disks by short ccw/cw rotations of the inner disk carrier (1).



50DS7ETM216

⑮ Mount axial washer 35×60×1 (1), axial needle cage 40×60×3 (2) and running disk (3) 40×60×3.5 and oil them.

※ Fit running disk (3), with the chamfer showing towards the tapered roller bearing.



50DS7ETM217

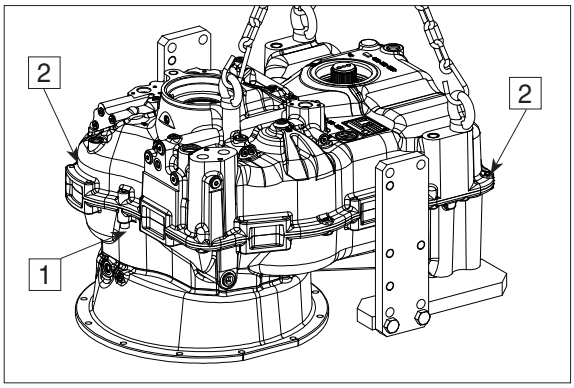
⑨ Hand-tighten the transmission housings crosswise with 2 cylindrical screws (1).

Fit cylindrical pins 12×24 (2) centrically to the mounting face.

Tighten the transmission housing front and rear part crosswise with 4 cylindrical screws M10 (1).

Tightening torque ---------- M_A = 46 Nm

⚠ Transmission rear part is not fixed to the holding fixture and could get loose after turning.
Secure the connection with cylindrical screws.



50DS7ETM247

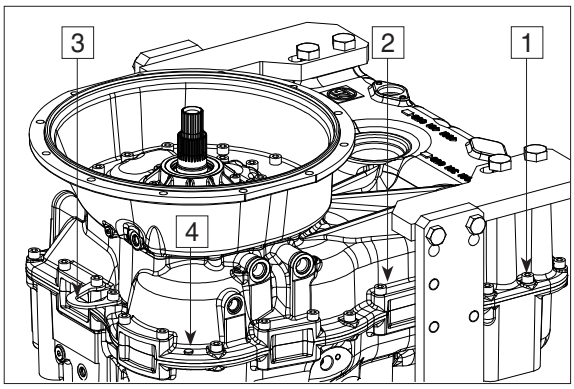
⑩ Fix transmission housing front and rear part by means of cylindrical screws (1 and 2).

Fit bracket (3).

Cylindrical screws (1) M10×30 (11EA)
Cylindrical screws (1) M10×50 (17EA)

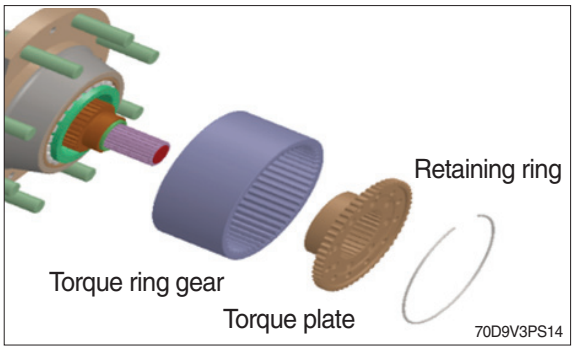
Tightening torque (M10/8.8×30) ·····M_A = 46 Nm
Tightening torque (M10/8.8×50) ···· M_A = 46 Nm

4 = cylindrical pin 12×24



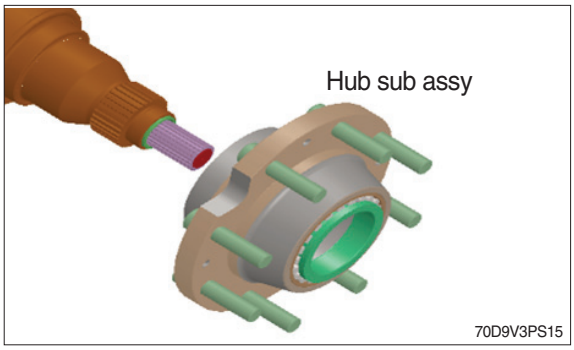
50DS7ETM248

(5) Disassemble retaining ring, torque plate, and torque ring gear.

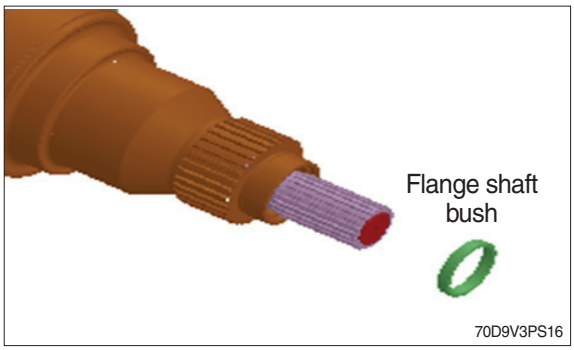


(6) Disassemble hub sub assy.

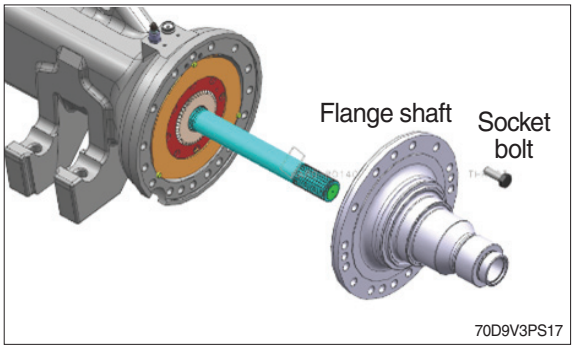
△ **When you disassemble hub sub assembly, the hub sub assembly will be prevention of falling from lift system. Falling of hub sub assembly will make engineers harm and product damage. You must be careful.**



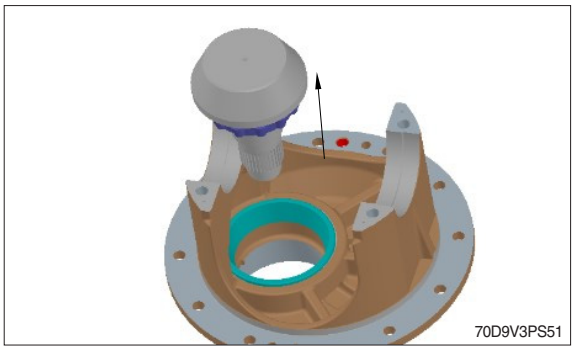
(7) Disassemble flange shaft bush.



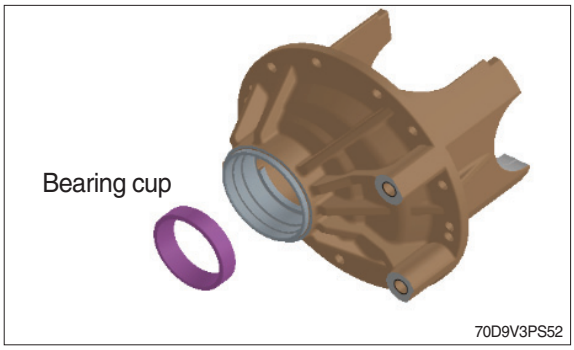
(8) Disassemble flange shaft and socket bolt.



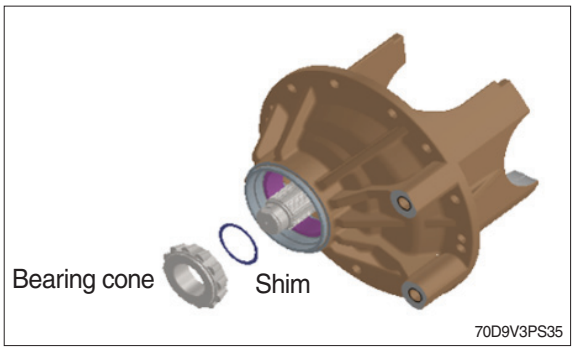
⑧ Disassemble pinion shaft from carrier case.



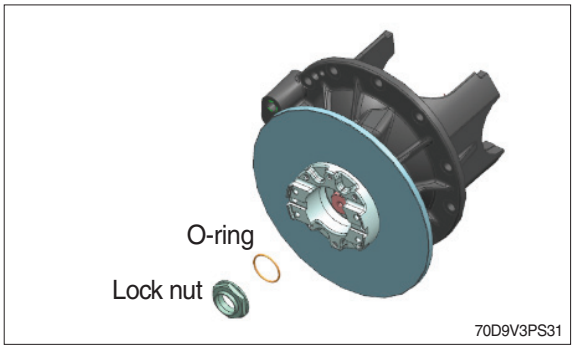
⑨ Assemble bearing cup.



⑩ Reassemble pinion shaft and assemble shim and master bearing.
· Sort of shim : 0.1 , 0.15 , 0.3 mm



⑪ Assemble flange yoke sub, o-ring, and lock nut.



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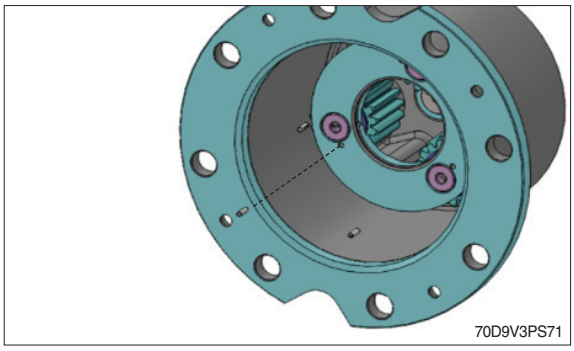
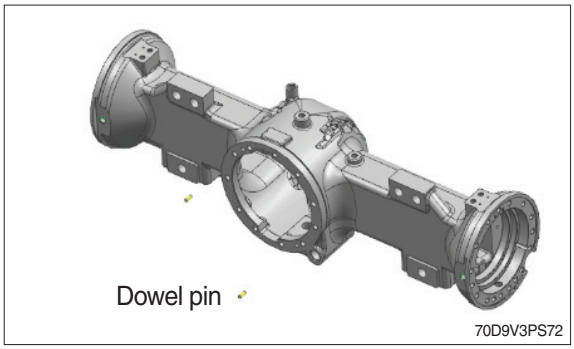
(6) Assemble spring pin (3 EA).



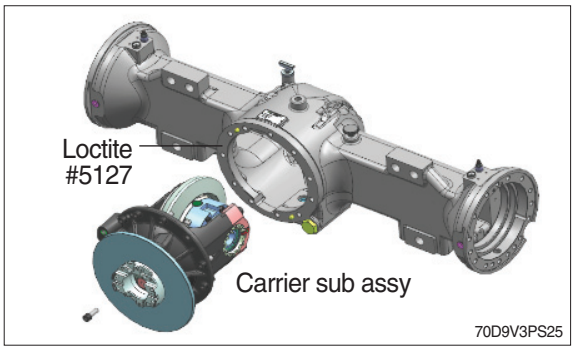
5) ASSEMBLY OF DRIVE AXLE

(1) Assemble dowel pin on axle housing.



(2) Assemble carrier assy.

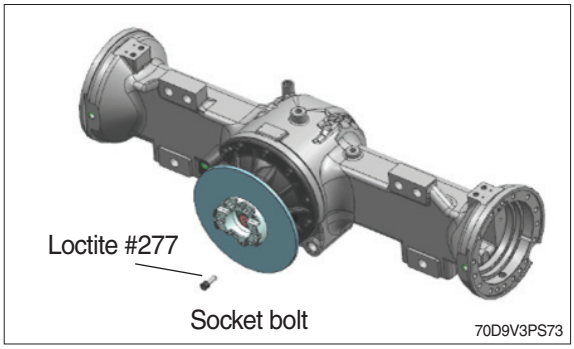
※ **Cover loctite #5127 on axle housing.**



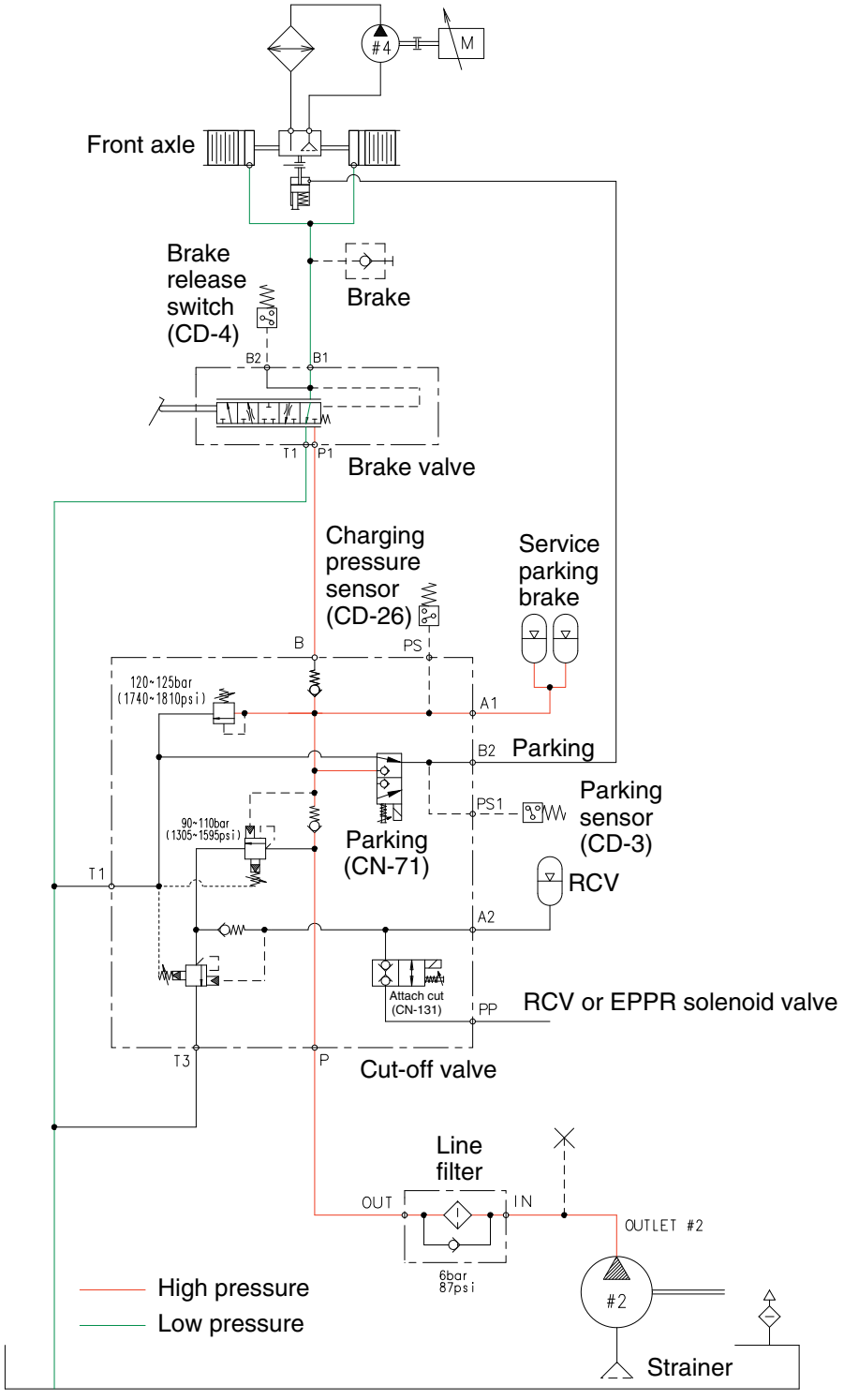
(3) Assemble socket bolt.

· Tightening torque : 10.2 ~ 11.2 kgf·m
(73.3 ~ 80.6 lbf·ft)

※ **Cover loctite #277 on the screw side of bolt.**



1) SERVICE BRAKE RELEASED



70D9V5BS03

When the pedal of brake valve is released, the operating force is eliminated by the force of the spring, and the spool is returned.

When the spool removes up, the drain port is opened and the hydraulic oil in the piston of axles return to the tank.

Therefore, the service brake is kept released.

No.		Part name	Hex. (mm)	Tightening torque		Remark (bar)
				kgf·m	lbf·ft	
1		Manifold	-	-		-
2	a	Solenoid valve (RCV)	27	5.0 ± 0.6	36.9 ± 4.4	Attach (RCV)
	b	O-Ring (2 EA)	-	-		
	c	Cap		0.6 ± 0.1	4.4 ± 0.7	
3	a	Solenoid valve (parking)	27	5.0 ± 0.6	36.9 ± 4.4	Parking
	b	O-Ring (2 EA)	-	-		
	c	Cap	-	0.6 ± 0.1	4.4 ± 0.7	
4		12V Coil (2 EA)	-	-		12V
5		Check valve (2 EA)	22	3.8 ± 0.25	28 ± 1.8	-
6		Check valve	22	3.8 ± 0.25	28 ± 1.8	-
7	a	Cut-off valve (RCV)	27	4.8 ± 0.25	35.4 ± 1.8	Set pressure (OFF : 40 ~ 45, ON : 25 ~ 30)
	b	Lock nut	13	1.0 ± 0.1	7.4 ± 0.7	
8	a	Cut-off valve (brake)	27	4.8 ± 0.25	35.4 ± 1.8	Set pressure (OFF : 105 ~ 110, ON : 90 ~ 95)
	b	Lock nut	13	1.0 ± 0.1	7.4 ± 0.7	
9	a	Relief valve	27	4.8 ± 0.25	35.4 ± 1.8	System (120 ~ 125)
	b	Lock nut	13	1.0 ± 0.1	7.4 ± 0.7	
	c	Screw	SW 6	-		-
10		Plug (M7, 18 EA)	3	0.6 ± 0.1	4.4 ± 0.7	-

2) OPERATION

When the pump works, the oil under the pressure flows into P port.

The oil in P port is stored in the accumulator on A1 port.

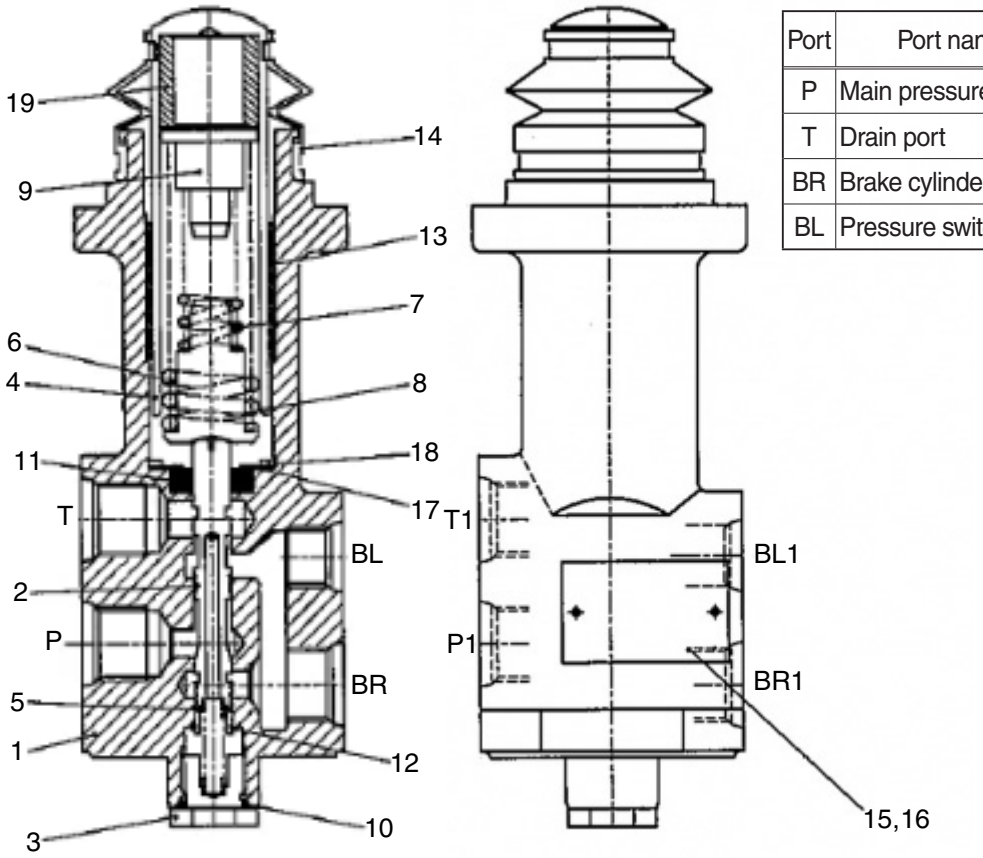
As the pressure on P line rises to 95 bar, the cut off valve (7) starts cut-offing and the oil in the P port is unloaded. The pressure on P line goes down 80 bar by the minute leakage from valve and other factors.

At this pressure, the cut-off valve starts cutting.

This process is repeated in the regular period of 30~40 seconds.

1. BRAKE VALVE

1) STRUCTURE

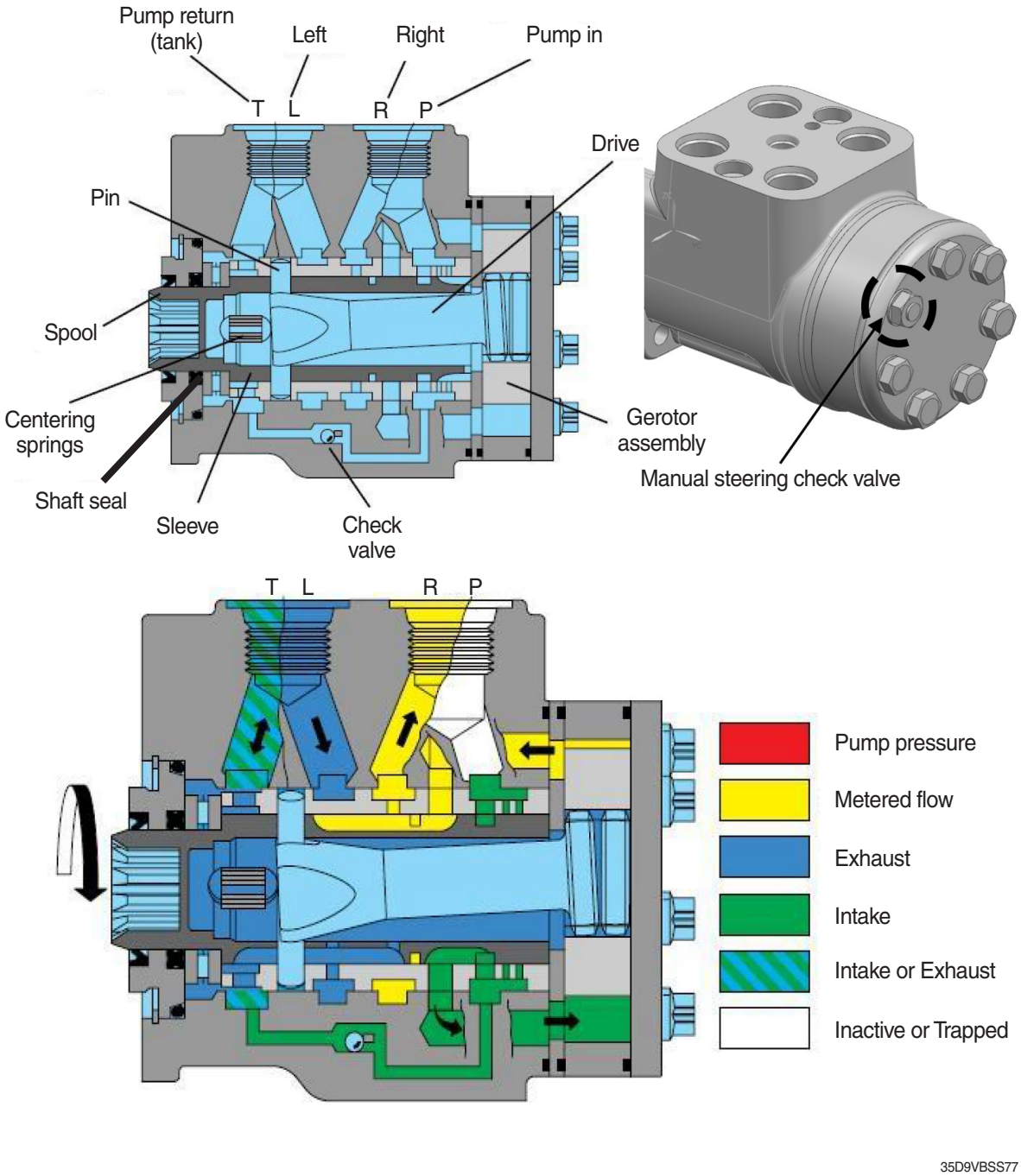


Port	Port name	Port size
P	Main pressure port	PF 3/8
T	Drain port	PF 3/8
BR	Brake cylinder port	PF 3/8
BL	Pressure switch port	PF 1/4

70D9V5BS07

1	Body	8	Retainer spring	15	Name plate
2	Spool	9	Retainer spring	16	Drive screw
3	Plug	10	O-ring	17	Plate washer
4	Brake holder	11	Oil seal	18	Snap ring
5	Lower spring	12	Snap ring	19	Spacer
6	Main spring	13	Du bushing		
7	Reatiner spring	14	Rubber cover		

3) MANUAL STEERING (EMERGENCY)

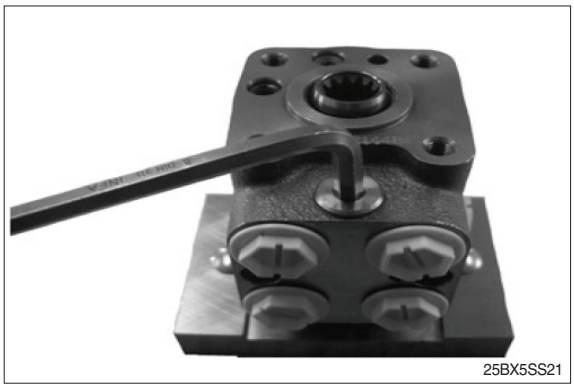


35D9VBSS77

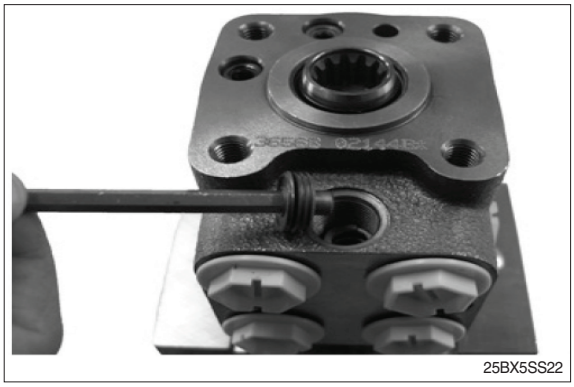
When the engine is not running and the steering wheel is being turned, the priority divider valve spool is pushed against the end stop by spring force. In this position, oil flow opens to the spool and sleeve set. As the steering wheel turns, a vacuum is created in the supply line between the priority valve and the steering unit spool and sleeve set. As the spool and sleeve set rotates, a passage opens to allow oil to flow to the inner gerotor gear set of the steering unit. Oil trapped in the steering port passes through the manual steering check valve and feeds through the gerotor gear to the opposite side of the steering cylinder, enabling manual steering.

4) DISASSEMBLY

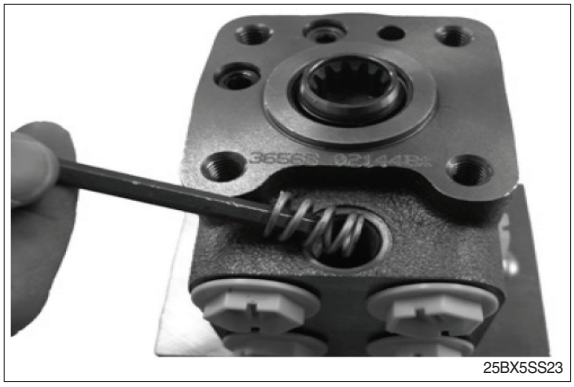
(1) Screw out the plug (42) for relief valve using an 8 mm allen key. Sealing washer is crimped on the plug.


25BX5SS21

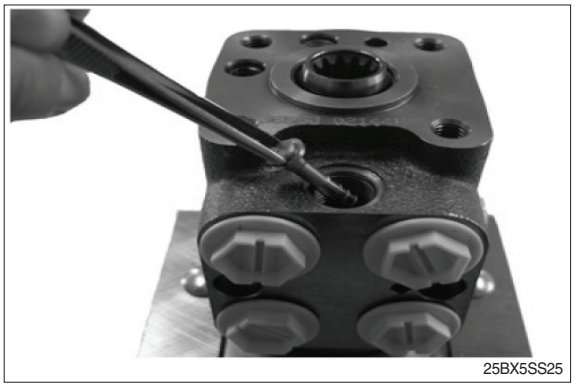
(2) Screw out the adjusting screw (30) using a 6 mm allen key.


25BX5SS22

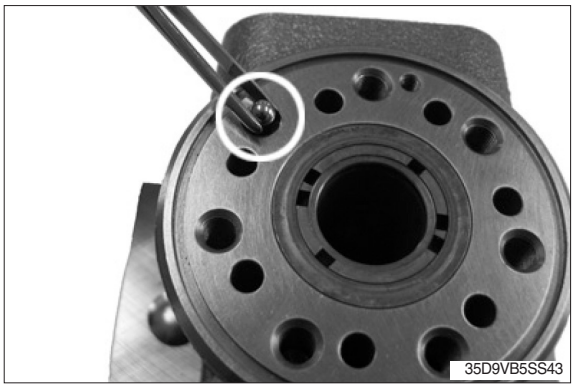
(3) Remove the spring for relief valve (31).


25BX5SS23

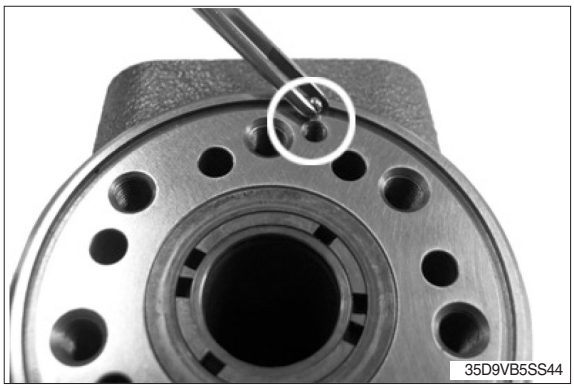
(4) Remove the piston for relief valve (32).


25BX5SS25

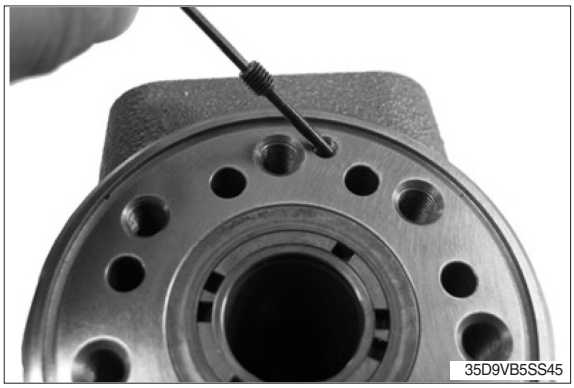
(18) Place the steering unit housing on the holding tool on the steering column end. Put the check valve ball (3) into the hole indicated by the circle.



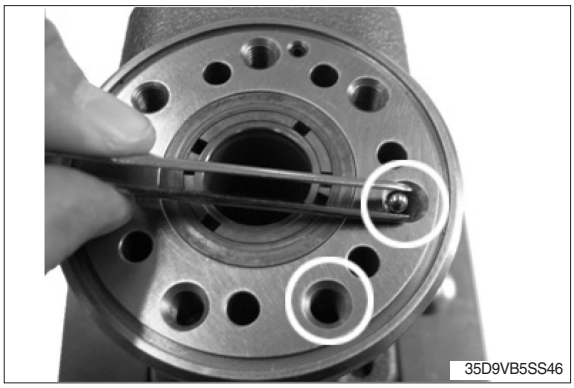
(19) Place the ball for LS check valve (36) into the hole indicated by the circle.



(20) Screw the ball stop (35) into the LS check valve bore using a 2 mm allen key.
· Tightening torque : 0.1±0.01 kgf·m
(0.72±0.072 lbf·ft)



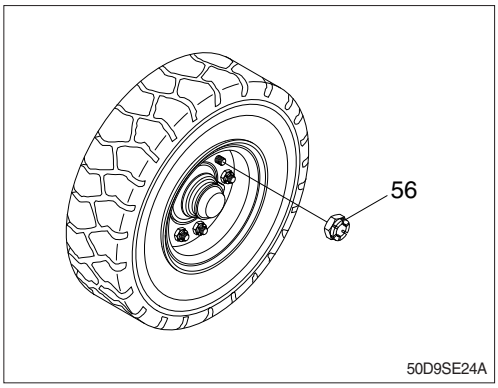
(21) Place a ball (33) in the two bolt holes indicated by the circles.



3) DISASSEMBLY

※ Servicing work on the knuckle part can be carried out without removing the axle assy from chassis. The work can be done by jacking up the balance weight part of the truck.

(1) Loosen the hub nut (56) and take off the steering wheel tire.



(2) Remove Hub cap (32).

(3) Pull out split pin (31) and remove slotted nut (30), washer (29).

(4) Using the puller, take off the hub (24) together with the taper roller bearing (26, 27).

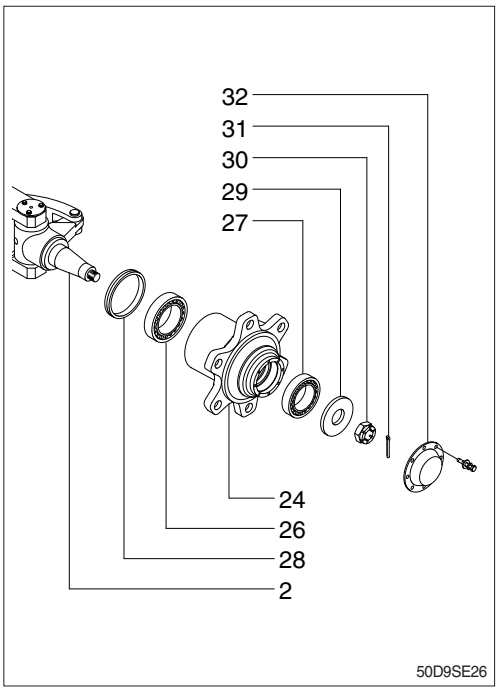
※ Be very careful because just before the hub comes off, tapered roller bearing will fall out.

(5) After hub (24) is removed take off the inner race of taper roller bearing (26, 27).

(6) Pull out oil seal (28).

※ Don't use same oil seal twice.

(7) Repeat the same procedure for the other side. Moreover, when disassembling is completed, part the slotted nut in the knuckle to protect the threaded portion.



(8) Loosen set screw (10) and nut (11).

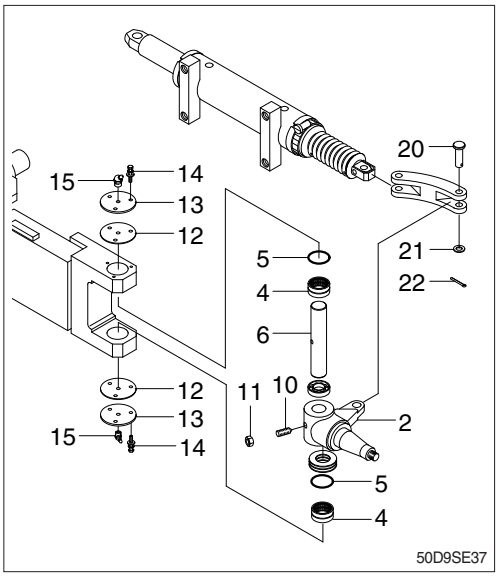
(9) Loosen with washer bolt (14) and remove cover (13), gasket (12). Remove grease nipple (15).

(10) Push out the king pin (6) without damaging the knuckle arm (2).

(11) At the same time the king pin is removed, pull out the oil seal (5).

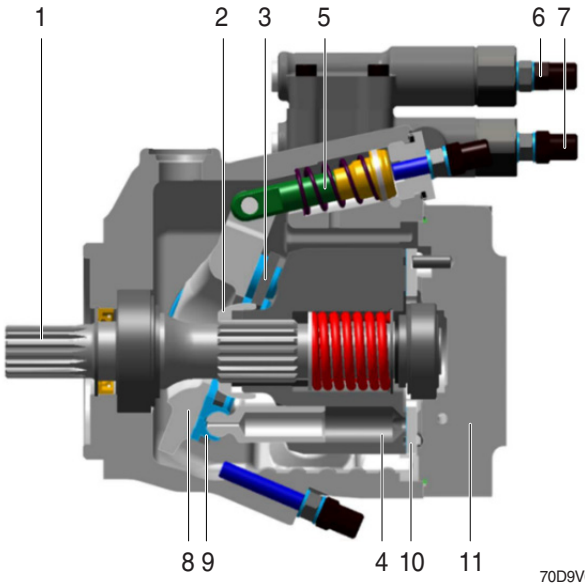
(12) If defect is observed in needle bearing (4), pull it out by using extractor.

(13) Remove spilt pin (22), special washer (21) and link pin (20).

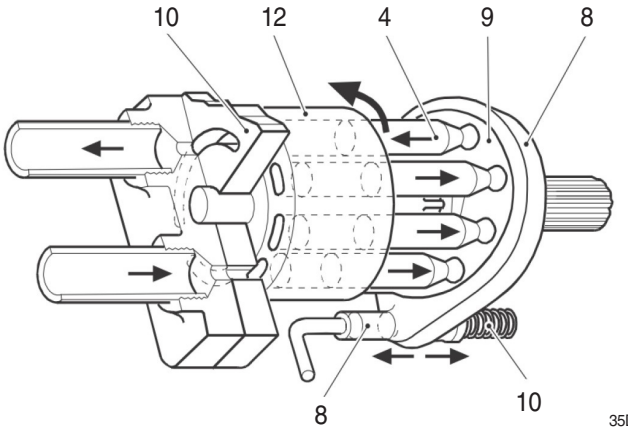


2) OPERATION

(1) General



70D9V6HS61



35D9VB6HS62

1 Drive shaft
2 Sleeve (retaining ball)
3 Slider
4 Piston
5 Regualting piston
6 Pressure compensator
(adusting screw, max. Pressure)
7 Flow compensator
(adjusting screw, stand-by pressure)
8 Swash plate
9 Regualting plate
10 Valve palte (distributor plate)
11 Connection plate
12 Cyclinder rotor
13 Return spring

These pumps are the variable axial piston pump type and are controlled with load signals from the flow demand for each respective function. They pump oil with 9 pistons (4) that are located in a cylindrical cylinder block (cylinder rotor). The pistons (4) are tubular sleeves with a ball-shaped top. There are T-shaped sliders (3) on the piston top. The sliders are fixed in the swash plate (8).

The swash plate secures the piston tops so that the pistons run straight in the cylinder bores. The swash plate is forced against the regulating plate by a ball-shaped sleeve (2) on the pump shaft. The cylinder rotor (12), pistons (4), sliders (3) and swash plate (8) rotate with the pump shaft.

The sliders (3) slide against the regulating plate (9). On the other side of the cylinder rotor, there is a valve plate (10) which controls oil to and from the cylinder rotor. The regulating plate (9) angles in relation to the pump's shaft with a regulating piston (5) to change the pump's capacity. A return spring (13) acts against the regulating piston (5). The pressure regulator (7) limits max. pressure and min. pressure (stand-by pressure).

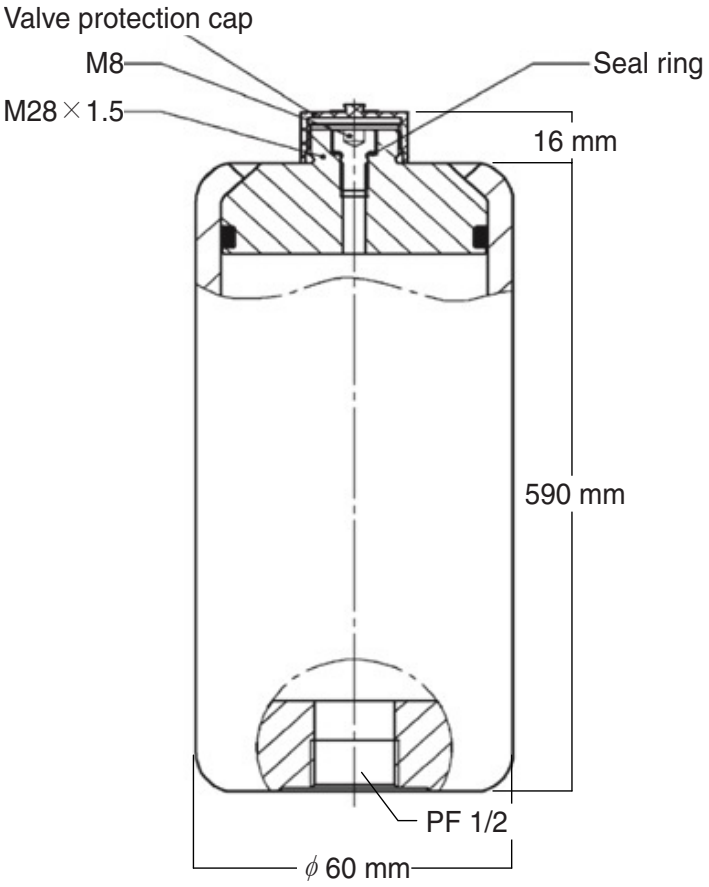
The pressure regulator (7) limits max. pressure and min. pressure (stand-by pressure).

When the shaft turns, the cylinder rotor (12) will rotate. The angle of the regulating plate (9) results in the pistons being pulled in and out of the cylinder rotor by the sliders. The pistons' (4) stroke is changed by changing the angle of the yoke.

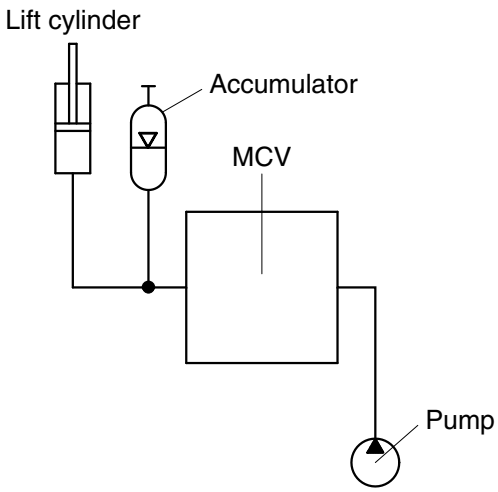
8. MAST ACCUMULATOR

1) STRUCTURE

· Tightening torque : 2 kgf·m (14.7 lbf·ft)



35D9VB6HS52



35D9VB6HS59

Parts No.	Normal volume	Pre-charging pressure at 20 ℃ (68 °F)	Gas	Weight
35FV-05000	0.5 ℓ (0.13 U.S. gal)	25 bar (363 psi)	Nitrogen gas N_2	4. 8 kg (10.6 lb)

※ Max. working pressure : 280 bar (4000 psi), shell, rod material : carbon steel

※ Permitted operating temperature : -20 ~ +80 ℃ (-4 ~ +176 °F), seal material : NBR/PUR

The mast accumulator is installed in the hydraulic line of the lift cylinder to absorb fork vibration and reduce hydraulic pulsation, which acts as a shock absorber to reduce vibration that may occur when climbing slopes or driving on rough road surfaces. This helps to prevent damage to fragile items such as glass or ceramics (porcelain) by ensuring the stability of the truck. In addition, when applied to hydraulic attachments (e.g. paper roll clamps, carton clamps, etc.), it can be configured and utilized to help reduce damage to the load through "prevent slipping of loads".

※ The accumulator works effectively under light and heavy loads. The higher the load, the smaller the absorption effect.

※ Compared with the case without the accumulator, this device can repeat overrun and underrun for a certain period of time when the fork stops. The phenomenon is slightly different depending on the load conditions, so please understand its characteristics before operation.

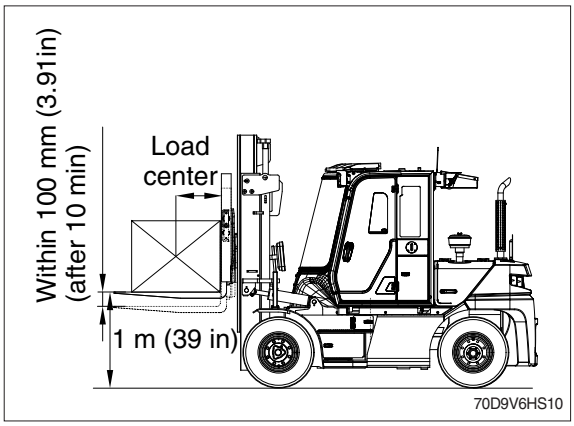
GROUP 2 OPERATIONAL CHECKS AND TROUBLESHOOTING

1. OPERATIONAL CHECKS

1) CHECK ITEM

(1) Check visually for deformation, cracks or damage of rod.

(2) Set mast vertical and raise 1 m (39 inch) from ground. Wait for 10 minutes and measure hydraulic drift (amount forks move down and amount mast tilts forward).

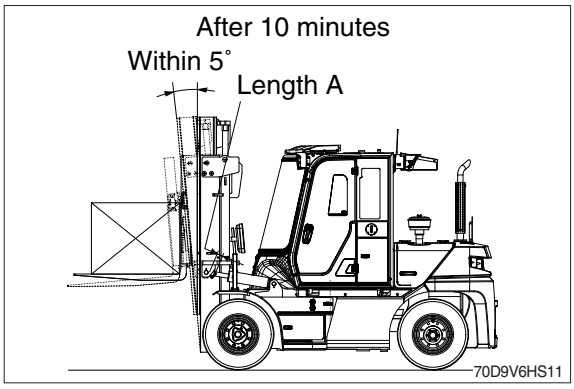


· **Check condition**

- Hydraulic oil : 45±5 ℃ (113±41 ℉)
- Rated capacity load
- Mast substantially vertical
- Key OFF, operator non-existence

· **Hydraulic drift**

- Down (Downward movement of forks)
  : Within 100 mm (3.9 in)
- Forward (Extension of tilt cylinder)
  : Within 5° or length A
  70D-9V : 67.5 mm (2. 7in)
  80D-9V : 73.5 mm (2.9 in)



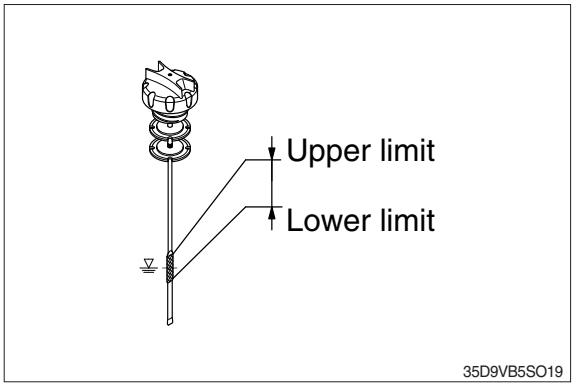
(3) If the hydraulic drift is more than the specified value, replace the control valve or cylinder packing.

2) HYDRAULIC OIL

(1) Using dipstick, measure oil level, and oil if necessary.

(2) When changing hydraulic oil, clean suction strainer (screwed into outlet port pipe) and return filter (screwed into inlet pipe).

· Dipstick length = 260 mm (7.9 in)



3) CONTROL VALVE

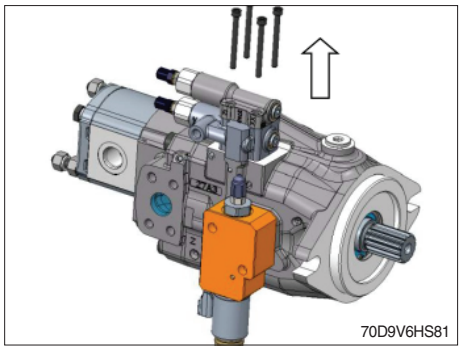
(1) Raise forks to maximum height and measure oil pressure. Check the oil pressure.

Model	Unit	Pressure
70/80D-9V	bar (psi)	210 ± 3 (3050 ± 43)
★70D-9V		★185 ± 3 (2680 ± 43)

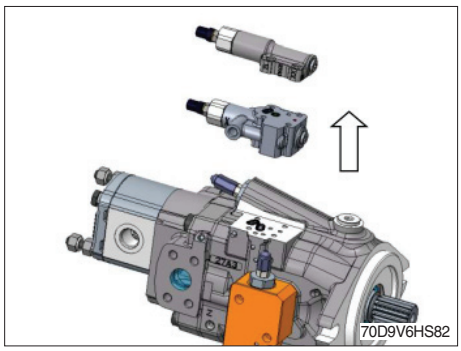
★ : EU, AN coporate sales equipment

4) COMPENSATOR SEALS REPLACEMENT

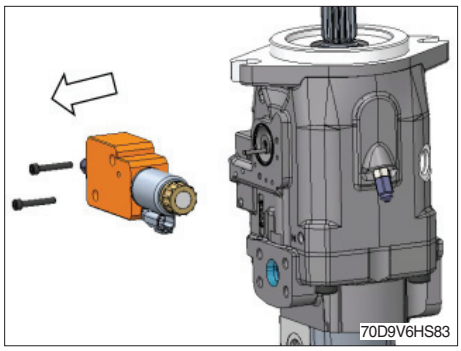
(1) Remove the screws of the compensators.



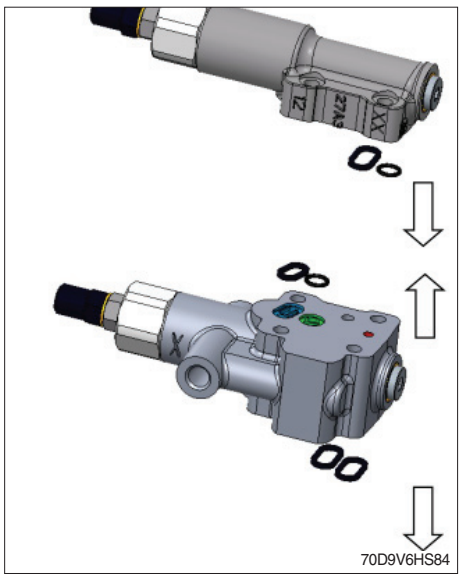
(2) Remove the pressure and the flow compensators.



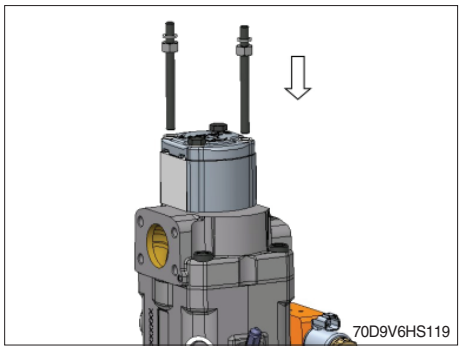
(3) Remove the DEC (Displacement Electronic Control).



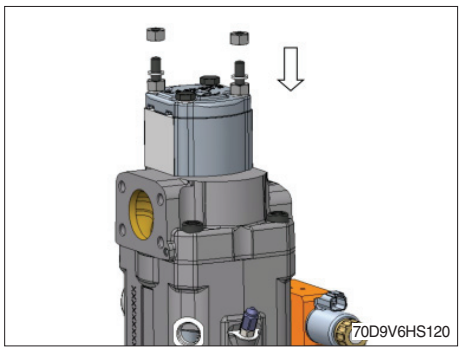
(4) Remove the O-ring seals.



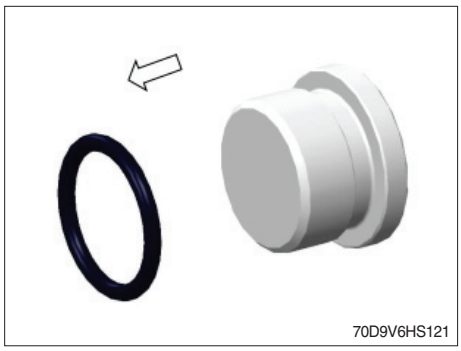
(23) Reassemble the nut, washers and stud bolt.
· Tightening torque : 4.6 kgf·m (33.3 lbf·ft)



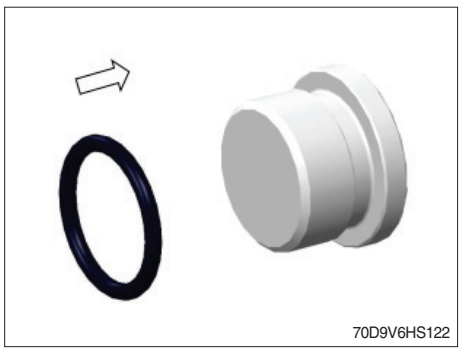
(24) Reassemble the nut from stud bolt.



(25) Remove the O-ring from the drain plugs.

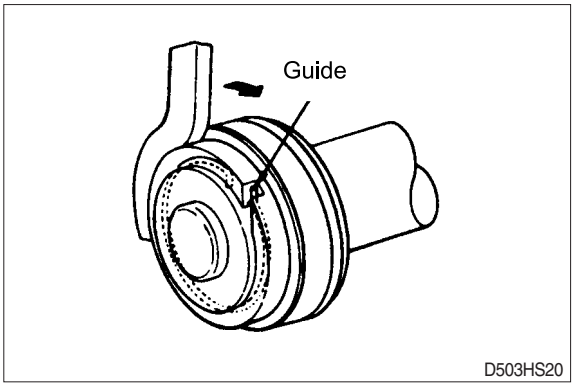


(26) Insert the new O-ring.



2) DISASSEMBLY

(1) Hold the cylinder tube in a vice, loosen the cylinder head and remove it.
Remove the spacer from the cylinder tube and knock out the bushing. Hook a wrench in the hole in the retainer at the piston end and turn. Lever up the edge of the guide, then turn the guide in again and the guide can be removed.



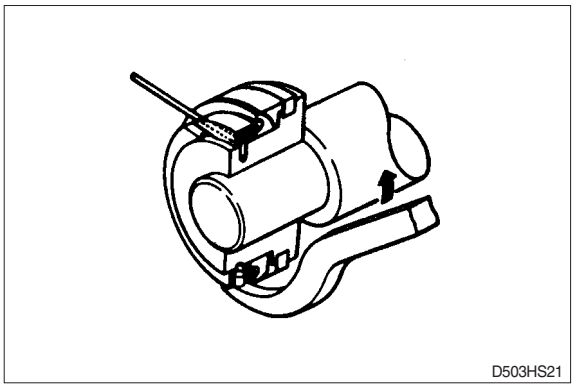
3) CHECK AND INSPECTION

mm (in)

Check item	Standard size	Repair limit	Remedy
Clearance between cylinder rod & bushing	0.05~0.25 (0.002~0.01)	0.4 (0.0015)	Replace bushing
Clearance between piston ring & tube	0.05~0.35 (0.002~0.013)	0.5 (0.02)	Replace piston ring

4) ASSEMBLY

(1) Soak the piston ring in hydraulic oil at a temperature of 40 to 50℃, expand the inside diameter and assemble on the piston. Install a piston seal.
Bend the edge of the guide and rotate it to install the guide completely.



1. POWER CIRCUIT

The negative terminal of the battery is grounded to the machine chassis.
When the start switch is in the off position, the current flows from the positive battery terminal.

1) OPERATING FLOW

Battery(+) → Start motor [CN-45 (B+)] → Fusible link [CN-20, CN-21] → Tilting motor [CN-147]
→ Midi fuse [CN-43] → Glow controller [CR-24 (6)]
→ Alternator [CN-74 (B+)]

Battery(+) → I/conn [CN-6 (1)] → I/conn [CN-4 (1)] → Start key switch [CS-2 (1)]
→ I/conn [CN-6 (2)] → I/conn [CN-4 (2)] → Fuse box [CN-37]
→ [No. 1] → [No. 36 → 33] → C/horn switch [CS-5 (1)]
→ I/conn [CN-413 (3)] → Horn switch [CN-15 (1)]
→ I/conn [CN-13 (2)] → Cabin tilt switch [CS-77 (2)]
→ [No. 2] → DCU relay [CR-73 (1, 3)]
→ [No. 4] → Main fuel heater relay [CR-49 (3)]
→ [No. 5] → Diagnosis port [CN-134 (16)]
→ I/conn [CN-14 (28)] → I/conn [CN-151 (13)] → Engine harness
→ [No. 7] → RMCU [CN-125 (1)]
→ Warning buzzer [CN-113 (2)]
→ Cluster [CN-56 (73)]
→ User device [CN-92 (1)]
→ [No. 8] → Gear selector switch [CS-13 (11)]
→ TCU [CN-50 (2, 5)]
→ [No. 9] → NOx sensor relay [CR-59 (30)]
→ [No. 10] → I/conn [CN-90 (11)] → Room lamp RH/H [CL-51 (2), CL-1 (2)]
→ Flasher unit [CR-11 (B)]
→ Brake switch [CD-4]
→ Brake relay [CR-16 (30, 86)]
→ [No. 11] → Fuel pump relay [CR-55 (3)]
→ [No. 12] → I/conn [CN-90 (17)] → Radio and USB player [CN-27 (8)]
→ Aircon harness [CN-31 (1)]
→ [No. 13] → Aircon harness [CN-31 (2)]

2) CHECK POINT

Engine	Key switch	Check point	Voltage
OFF	OFF	① - GND (Battery (+)) ② - GND (Fusible link) ③ - GND (Fuse No. 33) ④ - GND (Start key)	14V

※ GND : Ground

6. WIPER AND WASHER CIRCUIT

1) OPERATING FLOW

Fuse box [No. 22] → Front wiper motor [CN-21 (8)]
→ Wiper relay Hi [CR-39 (3)]
→ Wiper relay Lo [CR-4 (1)]
→ Multi function switch [CS-12 (6)]
→ Rear wiper and washer switch [CS-3 (3, 6)]
→ I/conn [CN-90 (27)] → Rear wiper motor [CN-102 (3)]

Fuse box [No. 21] → Top wiper and washer switch [CS-103 (3, 6)]
→ I/conn [CN-90 (3)] → Top wiper motor [CN-70 (3)]

(1) Front washer switch ON

① Washer switch ON [CS-12 (6) → (2)] → I/conn [CN-14 (40)] → Front washer pump [CN-22 (2)] → Wiper relay [CR-26 (1) → (4)] → Wiper relay Lo [CR-4 (2) → (3)] → Front wiper motor [CN-21 (2)]

(2) Front wiper switch ON

① **INT position**

Wiper switch ON [CS-12 (6) → (1)] → Int wiper relay [CR-6 (3) → (2)] → Wiper relay Lo [CR-4 (2) → (3)] → Front wiper motor [CN-21 (2)] → Front wiper motor intermittently operating

② **Lo position**

Wiper switch ON [CS-12 (6) → (4)] → Wiper relay Lo [CR-4 (5) → (3)] → Front wiper motor [CN-21 (2)] → Front wiper motor operating (low)

③ **Hi position**

Wiper switch ON [CS-12 (6) → (3)] → Wiper relay Hi [CR-39 (1) → (4)] → Front wiper motor [CN-21 (4)] → Front wiper motor operating (high)

(3) Auto-parking (when switch OFF)

Switch OFF [CS-12 (3)] → Wiper relay Lo [CR-4 (5)→(3)] → Front wiper motor [CN-21 (2)] → Wiper motor stop

(4) Rear wiper and washer switch

① **Wiper switch ON** (1st step)

Wiper switch ON [CS-3 (3) → (2)] → I/conn [CN-90 (28)] → Rear wiper motor [CN-102 (4)] → Rear wiper motor operating

② **Washer switch ON** (2nd step)

Washer switch ON [CS-3 (6) → (5)] → I/conn [CN-14 (41)] → Rear washer pump [CN-103 (2)] → Washer operating

Wiper switch ON [CS-3 (3) → (2)] → I/conn [CN-90 (28)] → Rear wiper motor [CN-102 (4)] → Rear wiper motor operating

(5) Top wiper and washer switch

① **Wiper switch ON** (1st step)

Wiper switch ON [CS-103 (3) → (2)] → I/conn [CN-90 (34)] → Top wiper motor [CN-70 (4)] → Top wiper motor operating

② **Washer switch ON** (2nd step)

Washer switch ON [CS-103 (6)→(5)] → I/conn [CN-14 (42)] → Top washer pump [CN-202 (2)] → Washer operating

Wiper switch ON [CS-103 (3)→(2)] → I/conn [CN-90 (34)] → Top wiper motor [CN-70 (4)] → Top wiper motor operating

② Inhibit regeneration switch : ON

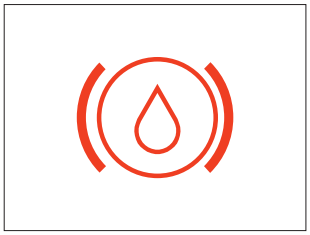
Level	Warning lamp				Stage of regeneration
	DPF inhibit	DPF regeneration	DPF high temp	Engine check	
Level 0 (No need regeneration)	On				Regeneration is not required.
Level 1 (Auto regeneration)	On				Automatic regeneration inhibit.
Level 2 (Request parked regeneration)	On	Blink			ECU requests parked regeneration. Operator needs to follow parked regeneration method. (Automatic regeneration inhibit)
Level 3 (Parked regeneration)	On	Blink		On	Operator had better park the machine and start parked regeneration as soon as possible. During parked regeneration, machine operation is restricted. Engine output will be limited from Level 3.
Level 4 (Regeneration with service tools)	On	Blink		Blink	Parked regeneration is impossible. Regeneration is possible with service tools only.

(14) DEF (Diesel Exhaust Fluid) low warning lamp

· This warning lamp indicates, when illuminated or flashing, that the diesel exhaust fluid level is low.

※ **Add the diesel exhaust fluid into DEF tank.**

(15) Brake fail warning lamp



· The lamp lights ON when the oil pressure of service brake drops below the nomal range.

· When the lamp is ON, stop the engine and check for its cause.

※ **Do not operate untill andy problems are corrected.**

② Tilt Setting

a. **Setting (Check under the start switch ON status.)**

※ **The tilt sensor has already been initialized when deliver the truck from factory.**

※ **Tilt reset if the tilt sensor figure or truck tilt is not horizontal in the flatland.**

⚠ **You must set tilt in the flatland since this is a horizontal set up.**

※ **If tilt sensor for mast is mounted (option), locates the mast vertically.**

※ **Mast maximum angle depends on the truck.**

· Truck that has not applied the mast angle sensor

· Truck that has applied the mast angle sensor (option)

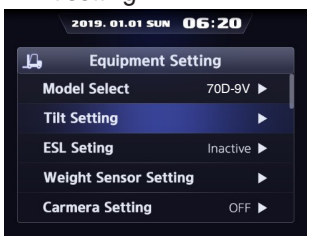
70D9V3KY49

1. Equipment

35D9VB3KY47

Enter to Equipment.

2. Tilt setting



70D9V3KY50

Choose Tilt Setting and enter.

3. Instruction

70D9V3KY51

Follow the instruction showing in the screen.

4. Completion

70D9V3KY52

Setting has been completed.

b. **Check functions**

a) Check the real time operation by changing angles of truck tilt and mast tilt.

b) Auto-leveling (if installed)

(a) Tilt mast forward or backward.

(b) Start tilting mast toward its vertical position, pushing the auto tilt leveling switch.

(c) Check if the mast stops traveling when it becomes vertical to ground.

c) Forward or backward truck tilt warning (red)

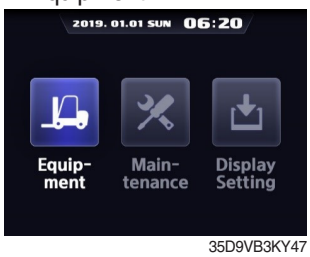
· Stop : ±2.3° (1.5 tons ~ 5.0 tons)

· Driving : ±10.2° (1.5 tons ~ 5.0 tons)

⑩ HAC (Hill Assist Control) Setting (if installed)

If you are trying to drive in stop status on the hill, the truck does not move backward when the HAC setting is ON.

1. Equipment



35D9VB3KY47

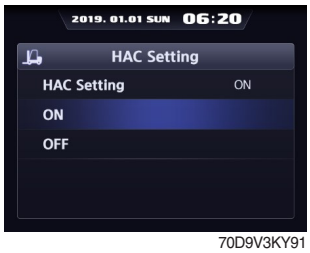
Enter to Equipment.

2. HAC Setting

70D9V3KY90

Choose DCSR setting and enter.

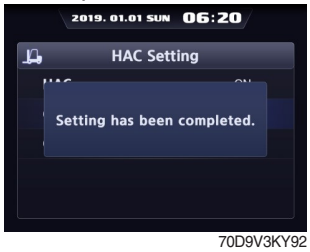
3. Select



70D9V3KY91

Select ON or OFF.

5. Completion

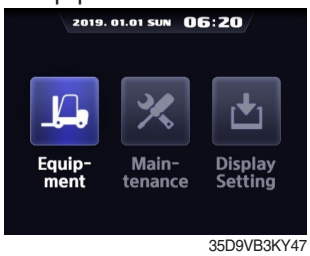


70D9V3KY92

Setting has been completed.

⑪ Vehicle Max Speed Limit

1. Equipment



35D9VB3KY47

Enter to Equipment.

2. Vehicle Max Speed Limit

70D9V3KY93

Choose Vehicle Max Speed Limit and enter.

3. Mode

70D9V3KY94

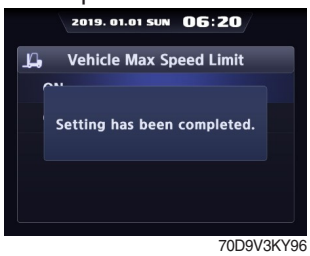
Enter to Mode.

4. Select

70D9V3KY95

Select ON or OFF.

5. Completion



70D9V3KY96

Setting has been completed.

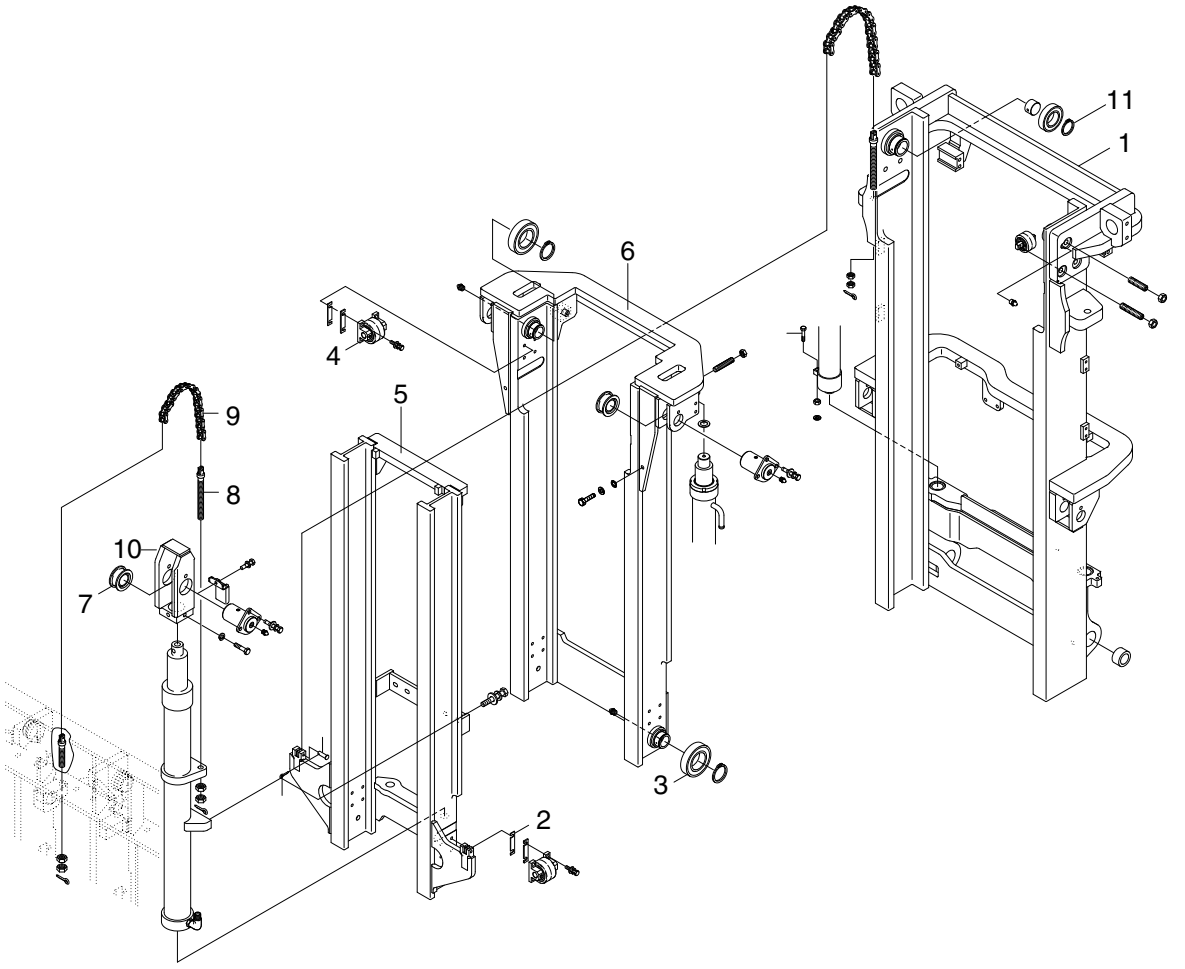
· Limit speed : 10 km/h

70D9V3KY96

The truck does not exceed the limit speed.

No.	Warning lamp types	Symbol	Warning and indicator lamp	Causes and correction
13	Battery charging warning		Battery charging warning lamp	Battery is not being charged. Please check alternator and wiring.
14	Tilt lock indicator (if installed)		Tilt lock indicator lamp	Auto-leveling is the operational status.
15	OPSS indicator		OPSS indicator lamp	OPSS is working : Driving, lifting, and tilting is locked or the truck is parked status.
16	Fuel level warning			
				
			Clutch protection warming lamp	Clutch protection warning operation
19	Consumables replacement indicator		Consumables replacement indicator lamp	Consumables replacement cycle has been passed.
20	LH Turn indicator		LH Turning indicator lamp	-
21	RH Turn indicator		RH Turning indicator lamp	-
22	Forward gear		Forward gear, 1 gear, 2 gear, and 3 gear indicator lamp	-
23	Reverse first gear		Reverse gear, 1 gear, 2 gear, and 3 gear indicator lamp	-
24	Communication error warning (ECU)		Communication error warning lamp	Communication between cluster-CI and ECU has been failed. Check communication line.
25	Communication error warning (TCU)		Communication error warning lamp	Communication between cluster-CI and TCU has been failed. Check communication line.
26	DEF low warning		DEF low warning lamp	DEF levle is low. Please fill the DEF.
27	SCR defect warning		SCR defect warning lamp	Check the SCR system.

3. 3 STAGE MAST (TS MAST)



70D9V8MS01

1	Outer mast	5	Inner mast	9	Chain
2	Shim	6	Middle mast	10	Sheave bracket
3	Load roller bearing	7	Sheave	11	Retainer ring
4	Side roller bearing	8	Anchor bolt		

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