ENGINE SPECIFICATIONS

Model			D6DA
Type			Disel, 4cycle, lnline 6 cylinder,water cooled,direct injection
Aspiration Type			Turbo charge Type
Cylinder Bore x Stroke			Ø 109 x 118mm
Displacement			6.606
Compression ratio			17.6 : 1
Firing order			1-4-2-6-3-5
Direction of rotation			Counter-clockwise viewed from fly wheel
Compression pressure			36-39kgf/cm^2(280rpm)
Idle rpm			640±25rpm
Weight			Approx. 580kg
Value seat angle	Intake		30°
	Exhaust		45°
Value face angle	Intake		30°
	Exhaust		45°
Value Timing (flywheel travel)	Intake	Open	BTDC 12°
		Close	ABDC 32°
	Exhaust	Open	BBDC 59°
		Close	ATDC 13°
Value clearance (cold)	Intake		0.30mm
	Exhaust		0.50mm
Oil pump			Gear pump Type
Oil coller			Water cooled plate fin type
Injection nozzle	Type		Multi hole
	Valve opening		160/220kgf·cm2
Water pump	Type		Forced circulation by volute pump
	Drive		V-belt, Centrifugal type
Thermostat			Wax pellet and battom bypass type
Injection timing			BTDC 6° ± 1° (when compression stroke No.1 cylinder)

STANDARD BOLTS AND NUTS

Unless otherwise specified, the parts and equipment of vehicle must be tightened by the following standard bolts nuts. Tightening torques for these bolts and nuts are shown below.

NOTE:
Threads and seat surfaces must be in dry state.
When there is a difference between the nut and bolt (stud) identification marks, tighten to the torque corresponding to the bolt (stud) identification mark.

Standard bolts and nuts

Unit: Nm (kgf m)

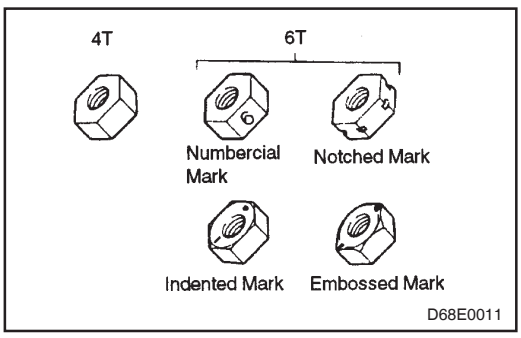
Dia. mm	Pitch mm	4T (Head mark 4 or O)	7T (Head mark 7 or Θ)	8T (Head mark 4 or ⊕)
5	0.8	2.0 to 2.9 (0.2 to 0.3)	3.9 to 5.9 (0.4 to 0.6)	4.9 to 6.9 (0.5 to 0.7)
6	1.0	3.9 to 5.9 (0.4 to 0.6)	6.9 to 10.8 (0.7 to 1.1)	7.8 to 11.8 (0.8 to 1.2)
8	1.25	8.8 to 13.7 (0.9 to 1.4)	16.7 to 25.5 (1.7 to 2.6)	19.6 to 29.4 (2.0 to 3.0)
10	1.25	18.6 to 27.5 (1.9 to 2.8)	34.3 to 53.9 (3.5 to 5.5)	44.1 to 58.8 (4.5 to 6.0)
	1.5	17.7 to 26.5 (1.8 to 2.7)	32.4 to 49.0 (3.3 to 5.0)	42.1 to 58.8 (4.3 to 6.0)
12	1.25	33.3 to 49.0 (3.4 to 5.0)	68.6 to 93.2 (7.0 to 9.5)	83.4 to 108 (8.5 to 11)
	1.75	30.4 to 46.1 (3.1 to 4.7)	63.7 to 83.4 (6.5 to 8.5)	73.5 to 98.1 (7.5 to 10)
14	1.5	58.8 to 83.4 (6.0 to 8.5)	118 to 157 (12 to 16)	127 to 177 (13 to 18)
	2.0	53.9 to 73.5 (5.5 to 7.5)	108 to 137 (11 to 14)	118 to 167 (12 to 17)
16	1.5	93.2 to 127 (9.5 to 13)	177 to 235 (18 to 24)	196 to 265 (20 to 27)
	2.0	88.3 to 118 (9.0 to 12)	157 to 216 (16 to 22)	186 to 255 (19 to 26)

Flange bolts and nuts

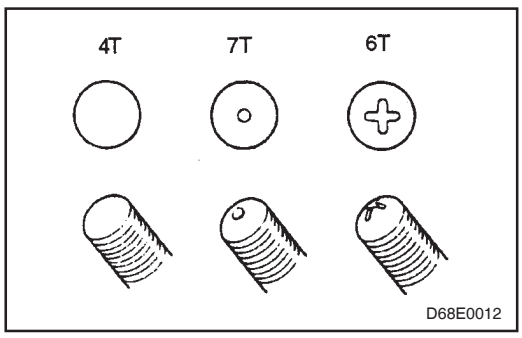
Unit: Nm (kgf m)

Dia. mm	Pitch mm	4T (Head mark 4 or O)	7T (Head mark 7 or Θ)	8T (Head mark 8 or ⊕)
6	1.0	3.9 to 5.9 (0.4 to 0.6)	7.8 to 11.8 (0.8 to 1.2)	8.8 to 13.7 (0.9 to 1.4)
8	1.25	9.8 to 14.7 (1.0 to 1.5)	18.6 to 27.5 (1.9 to 2.8)	21.6 to 32.4 (2.2 to 3.3)
10	1.25	20.6 to 30.4 (2.1 to 3.1)	38.2 to 58.8 (3.9 to 6.0)	49.0 to 63.7 (5.0 to 6.5)
	1.5	18.6 to 28.4 (1.9 to 2.9)	35.3 to 53.0 (3.6 to 5.4)	44.1 to 63.7 (4.5 to 6.5)
12	1.25	37.3 to 53.9 (3.8 to 5.5)	78.5 to 108 (8.0 to 11)	88.3 to 118 (9.0 to 12)
	1.75	33.3 to 51.0 (3.4 to 5.2)	68.6 to 93.2 (7.0 to 9.5)	83.4 to 108 (8.5 to 11)

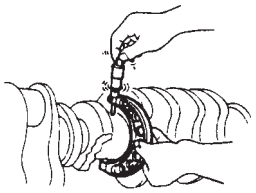
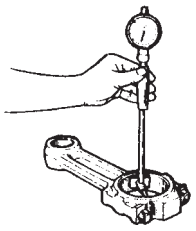
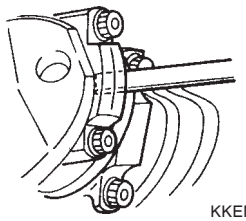
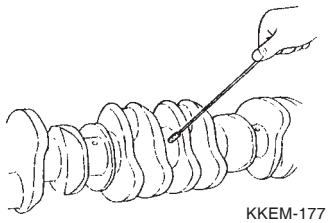
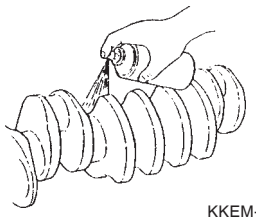
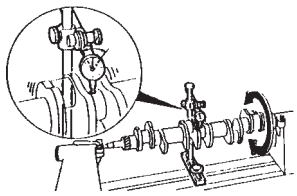
Identification marks of nut



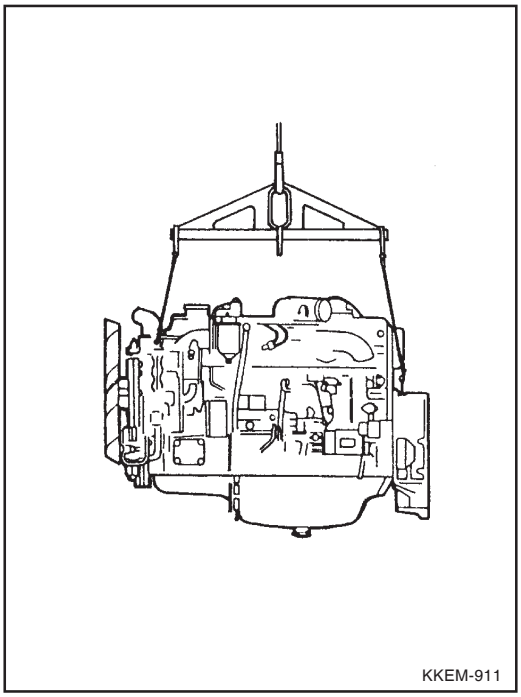
Identification marks of stud



Unit : mm

Inspection Items	Standard	Limit	Remedy	Inspection Procedure
Crankshaft pin diameter	64.94-64.96	64.80	Regrind crank-shaft and use undersize bearings	
		63.80	Replace crankshaft	
Clearance between connecting rod and crank pin	0.031-0.082	0.20	Replace bearing	 KKEM-175
Connecting rod end play	0.20-0.52	1.00	Replace connecting rod	 KKEM-176
Crankshaft oil hole clogged	-	-	Clean	 KKEM-177
Crankshaft cracks and damage	-	-	Replace	 KKEM-178
Crankshaft bend	-	0.09	Replace	 KKEM-179

10. Connect cable from the engine hanger to the hanger bracket at the front of the engine and to the hanger brackets at the upper flywheel housing at the rear of the engine. Loose the cable a bit and raise the hanger by using the hoist.
11. Remove the engine mounting nuts (both sides of front and rear).
12. Lift the engine hanger so that the cables are fully tightened, and then after checking that the cables are securely hooked on the hanger brackets, lift the engine assembly gently and remove it from the vehicle.


KKEM-911

Installation

Install engine assembly.

Install engine assembly by reversed order of dismounting.

CAUTION

Check the leaks of oil, fuel, coolant or air.

Connect the engine stop cable.

1. Turn the ignition key at “ON” position.

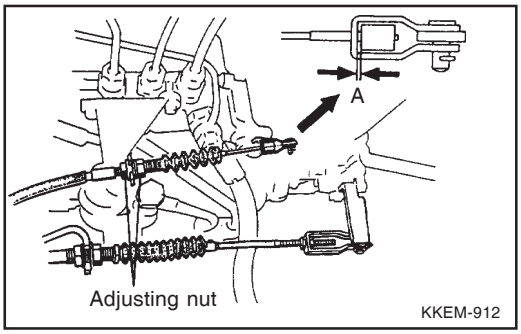
CAUTION

Do not start the engine yet.

2. Check the connector of engine stop motor harness
3. Connect the engine stop cable adjust the adjusting nut to make the gap “A” be 1-3mm, which is the distance between crevis and cable stopper.
4. Turn the ignition key to “OFF” position.

CAUTION

Check engine stop and start after adjustment.



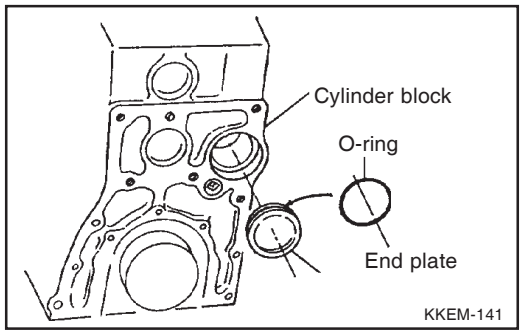
KKEM-912

Replace the camshaft seal plate, if needed.

1. Remove the seal plate.
2. Install the seal plate.
   Install O-ring to end plate and install this assembly to the cylinder block.

CAUTION

- **Take care not to damage the cylinder block and end plate in installing. Besides, apply the liquid gasket around the O-ring (three bond 1215).**
- **Don't reuse the O-ring after removal.**

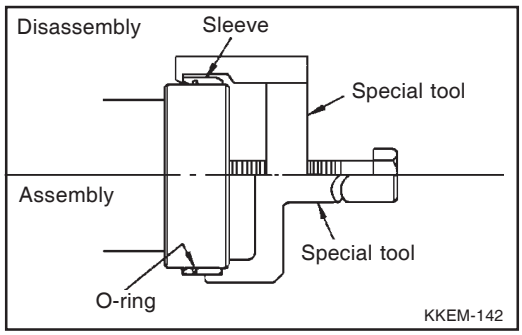


Replace the crankshaft rear oil seal sleeve, if needed.

1. Remove the crankshaft sleeve using special tool.
   (Rear oil seal sleeve remover: 09231 – 8Y300)

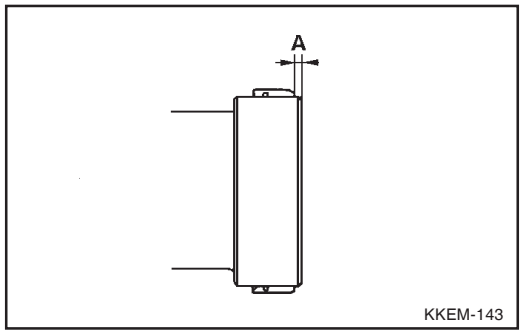
CAUTION

Do not disassemble the crankshaft, if necessary.



2. Install the new sleeve.
   (Special tool – rear oil seal sleeve installer: 09231 – 8Y600)
   Install the new O-ring to the sleeve and apply enough oil to crankshaft.
   Use the crankshaft sleeve press in installing crankshaft sleeve.
   Take care not to damage the O-ring.

Special tool: Press
Dimension: 4.3 – 4.7 mm



Grind the crankshaft pin or journal and use the undersize bearing, if necessary.

Unit: mm

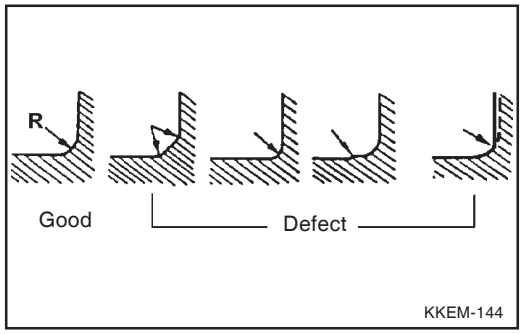
Undersize	Outer diameter	
	Pin	Journal
0.25US	64.69-64.71	79.69-79.71
0.50US	64.44-64.46	79.44-79.46
0.75US	64.19-64.21	79.19-79.21
1.00US	63.94-63.96	78.94-78.96

CAUTION

- **When crankshaft pin or journal is worn out, 4 different types of under size bearing can be used.**
  0.25 mm, 0.50 mm, 0.75 mm, 1.00 mm
- **Bearing set consists of upper and lower bearing. So it should be replaced by the set.**

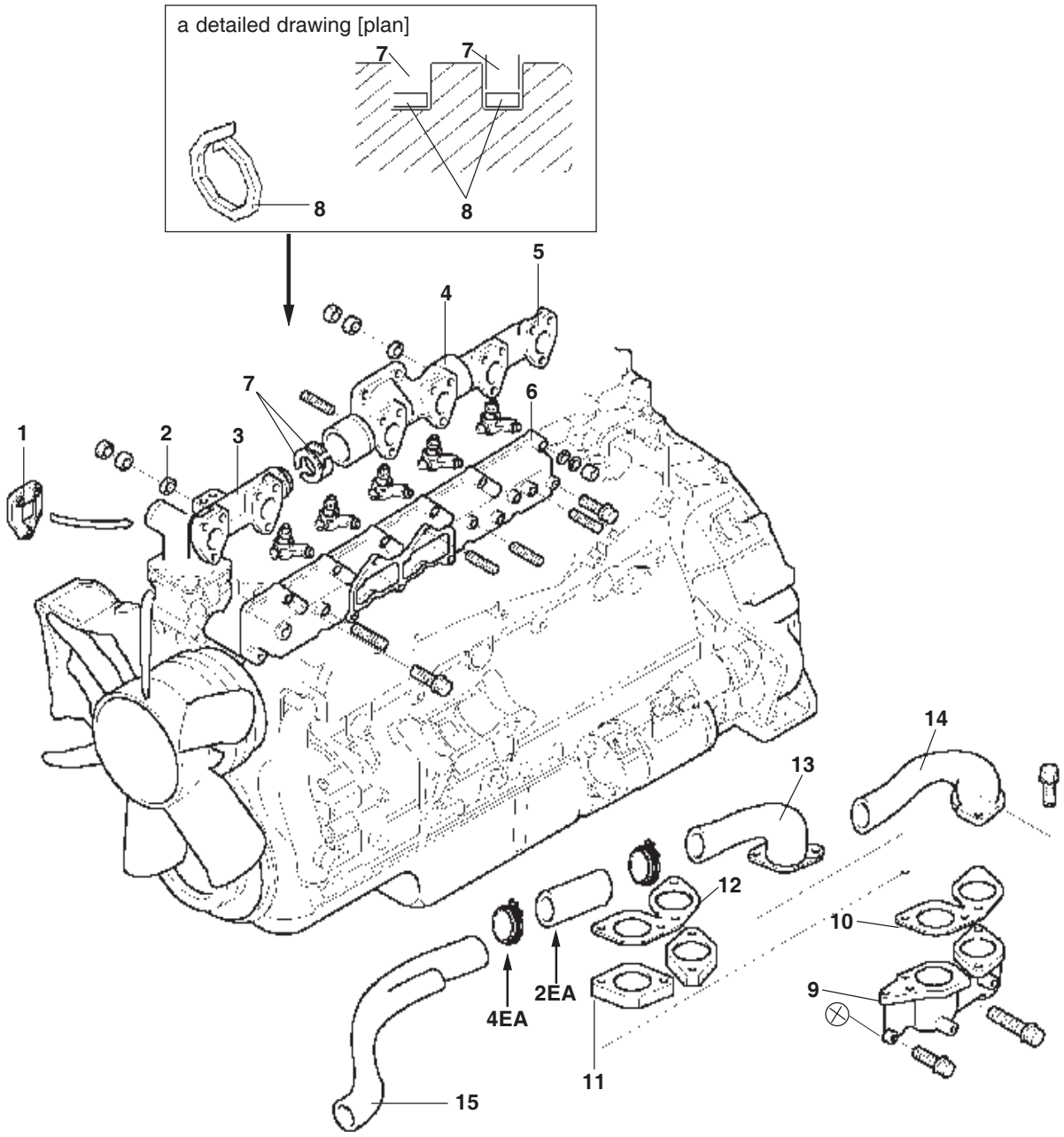
Filler dimension (R)

Crank pin: 3.75 – 4.25 mm
Journal: 3.00 – 3.50 mm



SERVICE PROCEDURE

Air Intake and Exhaust System



1. Exhaust manifold gasket
2. Spacer
3. Exhaust manifold front
4. Exhaust manifold middle
5. Exhaust manifold rear
6. Intake manifold
7. Exhaust manifold seal ring
8. Expand ring
9. Intake pipe joint
10. Air heater gasket (wire mash)
11. Air heater
12. Air heater gasket
13. Intake elbow 1
14. Intake elbow 2
15. Intake elbow pipe

GENERAL

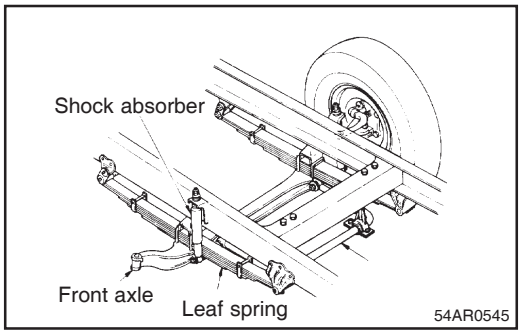
The suspension consists of semi-elliptical piled leaf springs and shock absorbers. The suspension supports the weight of the body and absorbs the vibration and shock from the road surface, thereby preventing their direct transmission to the body for effective protection of he body, passengers and cargo. The suspension also supresses irregular vibrations of the wheels to assure stable operation.

Construction and operation

Depending on the road surface condition and load weight, the leaf springs deflect to provide buffering function. Any change in the span caused by the load is coped with by movement of the spring shackle at the rear end.

Shock absorber adequately damps axle vibration.

In addition, stabilizers are provided to reduce the rolling which occurs when the vehicle markes a turn.



SPECIFICATIONS

Item \ Vehicle model	HD120	
Leaf spring L x Width x t - No. of leaves	1300 x 70 x 11 - 7	
Shock absorber Model	SA301	SA401
Max. O.D.	54	63.5
Cylinder I.D.	30	35
Stroke	210	210
Damping force when extended	1960N (200kgf)	

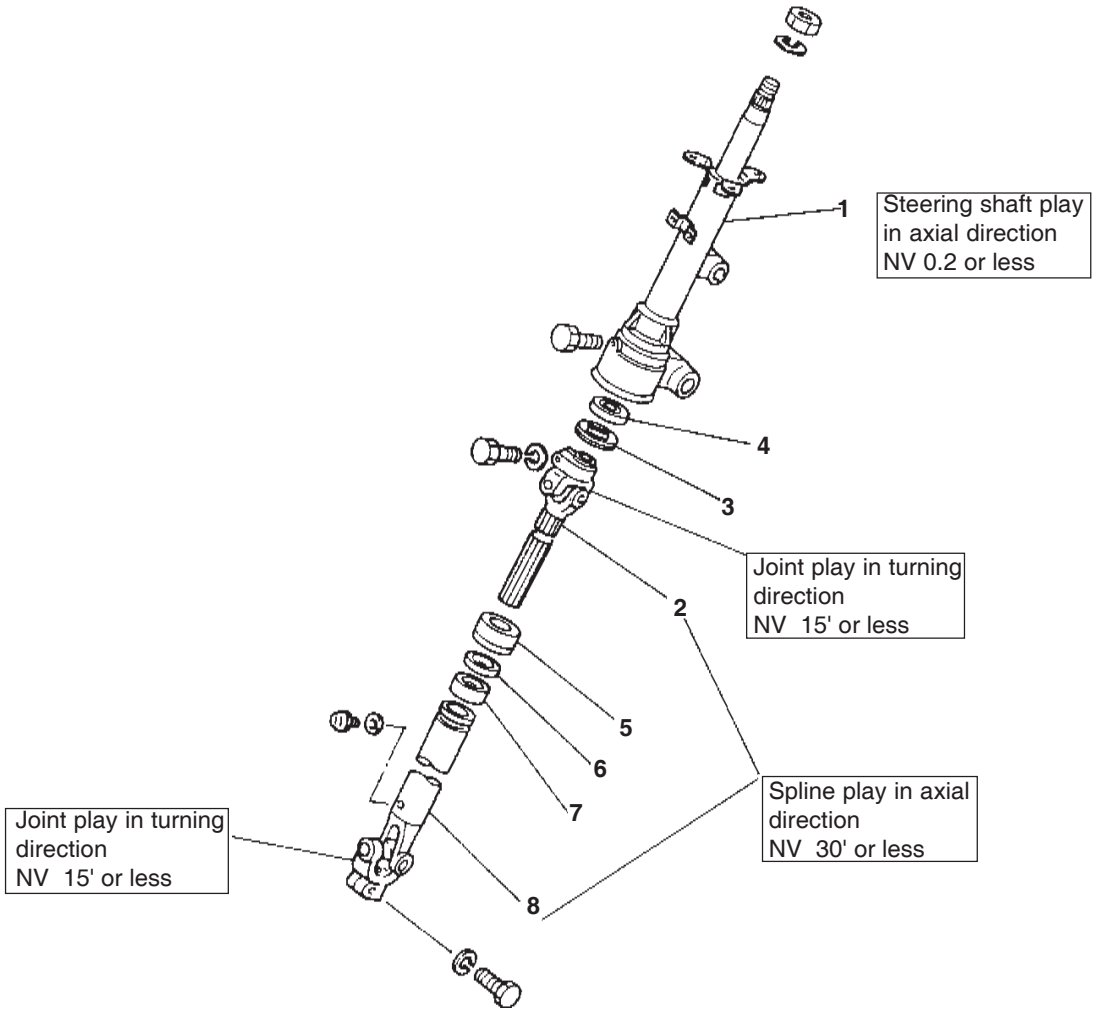
SERVICE STANDARDS

Service Standards Table

Unit:mm

Maintenance item		Nominal Value (Basic dimeter in [ ])	Limit	Remedy
Leaf spring suspension	Spring bracket to shackle pin clearance (Front side)	0 to 0.05	0.3	Replace shackle pin
	Spring bushing to shackle pin clearance	0.075 to 0.15	0.3	Replace bushing
	Spring bracket to shackle pin clearance (Rear side)	0 to 0.05	0.3	Replace shackle pin
	Shackle bushing to shackle pin clearance (Rear side)	0.025 to 0.15	0.3	Replace bushing
	Shackle link to shackle pin clearance	0.025 to 0.15	0.3	Replace shackle link or shackle pin
	Spring bushing to shackle pin clearance (Front side)	0.075 to0.15	0.3	Replace bushing

Disassembly, inspection and correction



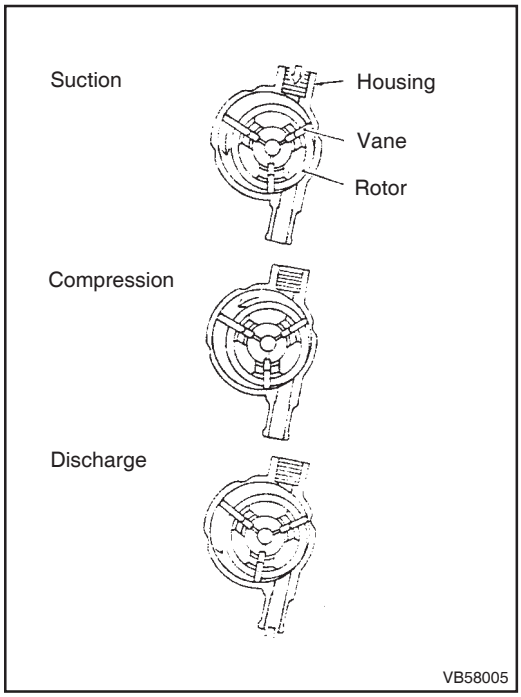
NV ... Nominal Value

Disassembly sequence

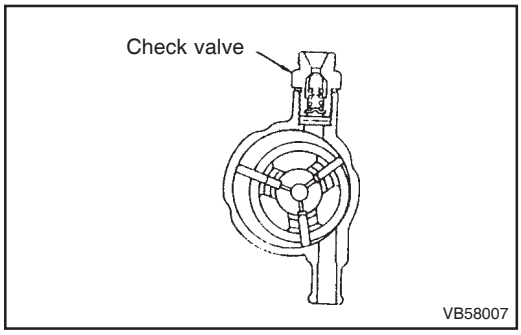
1. Steering upper shaft assembly
2. Spline shaft assembly
3. Lock plate
4. Bearing
5. Dust cover
6. Dust seal
7. Rubber cover
8. Spline tube assembly

56AR1283

2) The rotor and housing cylinder are eccentrically arranged and air from the vacuum tank is taken through the inlet port into the pump and gradually compressed before it is discharged from the outlet port. Engine oil enters the pump through the oil port and keeps the housing oil tight and lubricates and cools the housing inside. The oil is then discharged from the outlet port with compressed air and returns to the oil pan.



3) A check valve is provided at the inlet port to prevent air and engine oil from flowing back from the vacuum pump to the vacuum tank when the engine is stopped.



BRAKE BOOSTER (Hydromaster)

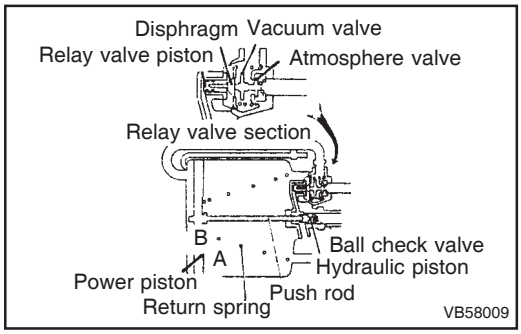
1) When brake booster is not operated

Since no fluid pressure acts on the relay valve piston, the vacuum valve is in opened position and the atmosphere valve in closed position.

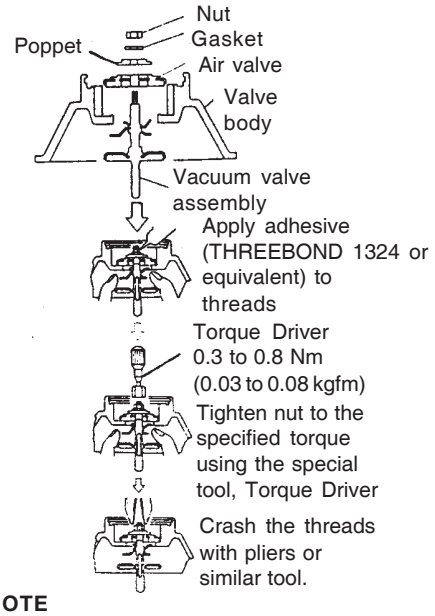
Since the diaphragm air hole is clear, both chambers A and B of the power cylinder are evacuated and the power piston pressed toward the chamber B by the return spring.

With the hydraulic piston also pulled an the ball check valve opened, the brake fluid passes through the center hole of the hydraulic piston and flows into the hydraulic cylinder.

When the brake booster is not in operation, therefore, the hydraulic piston serves only as a fluid path.



5) Installation of poppet valve to relay valve section



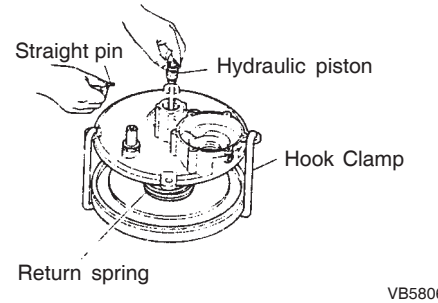
NOTE
Be sure to use a new poppet valve assembly

VB58067

6) Installation of hydraulic piston

a) When compressed air is not used

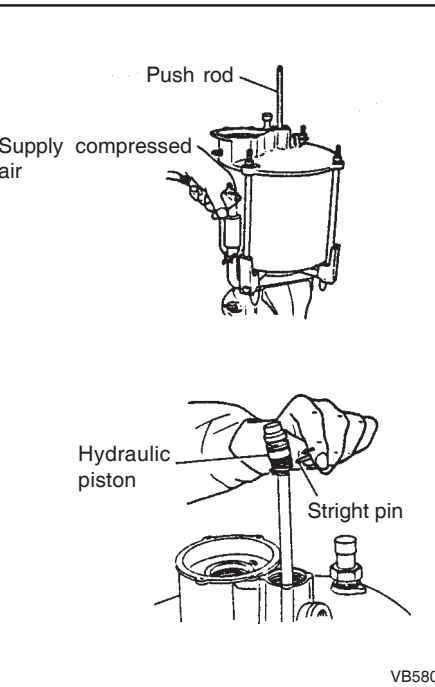
With the return spring compressed by the special tool, Hook Clamp, and the hydraulic piston and push rod holes aligned, insert the straight pin.



VB58069

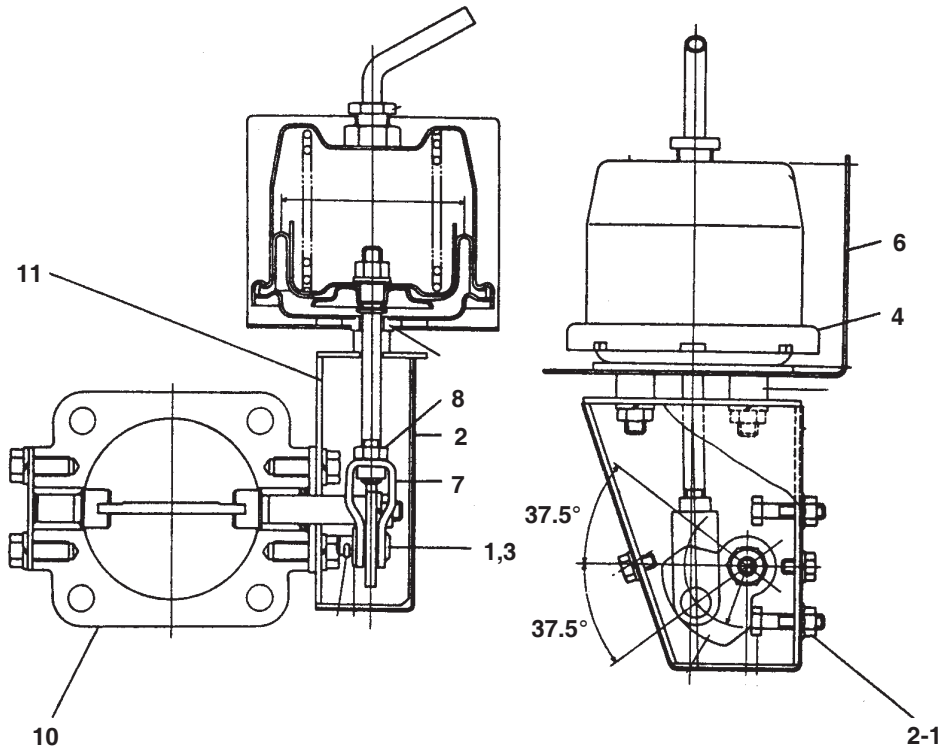
b) When compressed air is used

With the push rod pushed up by compressed air supplied through the cylinder shell pipe, align the hydraulic piston and push rod holes and insert the straight pin.



VB58071

Reassembly



Reassembly sequence

10→11→3→2
2→1
4→6→9→⑧→⑦

VB58145

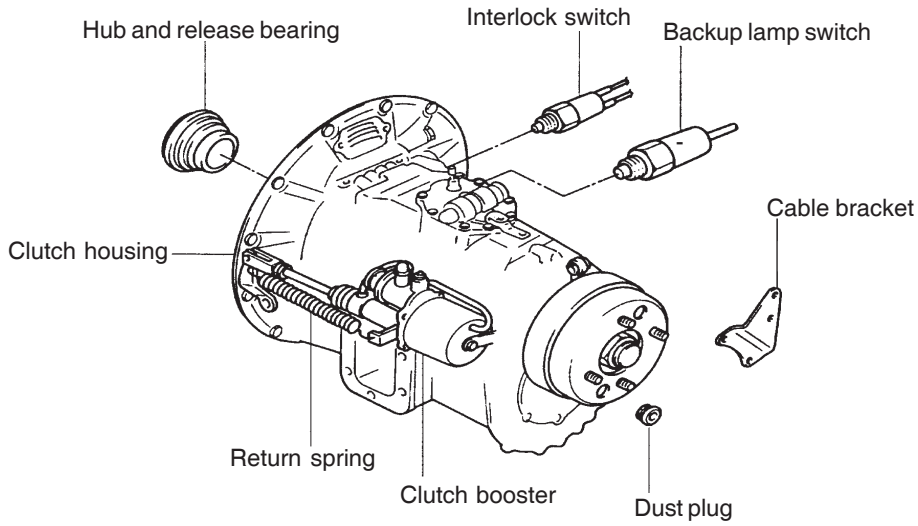
Fault location	Faulty Description	Fault Code	System reaction	Remedy type	Remarks
WSS 3RD LH	Air gap	35	ABS :	1	
	Tire size	55	Doesn't active at specific	2	
	Short at power supply	45	wheel	3	
	Short at ground	45		4	
	Circuit cut	45	ATC :	5	
	Circuit short	45	Doesn't active	6	
	Pulse ring	65		7	
	Slip	35		8	
	Circuit problem	55		9	
	Speed signal poor	35		10	
	Abnormal speed(Chattering)	55		11	
	Abnormal frequency	55		12	
WSS 3RD RH	Air gap	33	ABS :	1	
	Tire size	53	Doesn't active at specific	2	
	Short at power supply	43	wheel	3	
	Short at ground	43		4	
	Circuit cut	43	ATC :	5	
	Circuit short	43	Doesn't active	6	
	Pulse ring	63		7	
	Slip	33		8	
	Circuit problem	53		9	
	Speed signal poor	33		10	
	Abnormal speed(Chattering)	53		11	
	Abnormal frequency	53		12	
MODULATOR FRT LH	Inlet,outlet valve circuit cut	22	ABS :	13	
	Circuit cut	22	Doesn't active at specific	15	
	Short at ground	22	wheel	16	
	Short at power supply	22	Does'nt active at FRT RH, REAR LH(3RD LH),ATC	14	
MODULATOR FRT RH	Inlet,outlet valve circuit cut	21	ABS :	13	
	Circuit cut	21	Doesn't active at specific	15	
	Short at ground	21	wheel	16	
	Short at power supply	21	Does'nt active at FRT RH, REAR LH(3RD LH),ATC	14	
MODULATOR REAR LH	Inlet,outlet valve circuit cut	24	ABS :	13	
	Circuit cut	24	Doesn't active at specific	15	
	Short at ground	24	wheel	16	
	Short at power supply	24	Does'nt active at FRT RH, REAR LH(3RD LH),ATC	14	
MODULATOR REAR RH	Inlet,outlet valve circuit cut	23	ABS :	13	
	Circuit cut	23	Doesn't active at specific	15	
	Short at ground	23	wheel	16	
	Short at power supply	23	Does'nt active at FRT RH, REAR LH(3RD LH),ATC	14	
MODULATOR 3RD LH	Inlet,outlet valve circuit cut	26	ABS :	13	
	Circuit cut	26	Doesn't active at specific	15	
	Short at ground	26	wheel	16	
	Short at power supply	26	Does'nt active at FRT RH, REAR LH(3RD LH),ATC	14	

SERVICE PROCEDURE

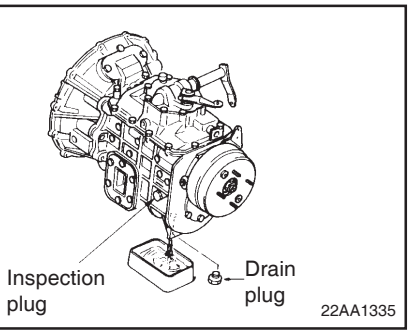
REMOVAL AND INSTALLATION OF TRANSMISSION

Key points for removal

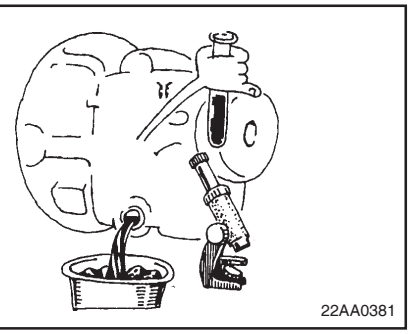
1) Detach the control rod and associated parts around the transmission.
2) Remove the power cylinder with hoses and pipes left attached.
3) Remove the propeller shaft.



4) Remove the drain plug and inspection plug to remove transmission oil. On vehicles with full-power PTO, remove transmission oil also from the PTO case.



5) When draining the transmission oil, check the oil for quantity, quality, and metal chips and particles.
The drain plug is magnet and metal particles adhering to it should be removed after the inspection.

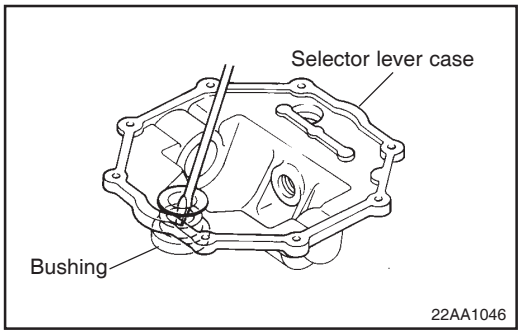


Disassembly Procedure

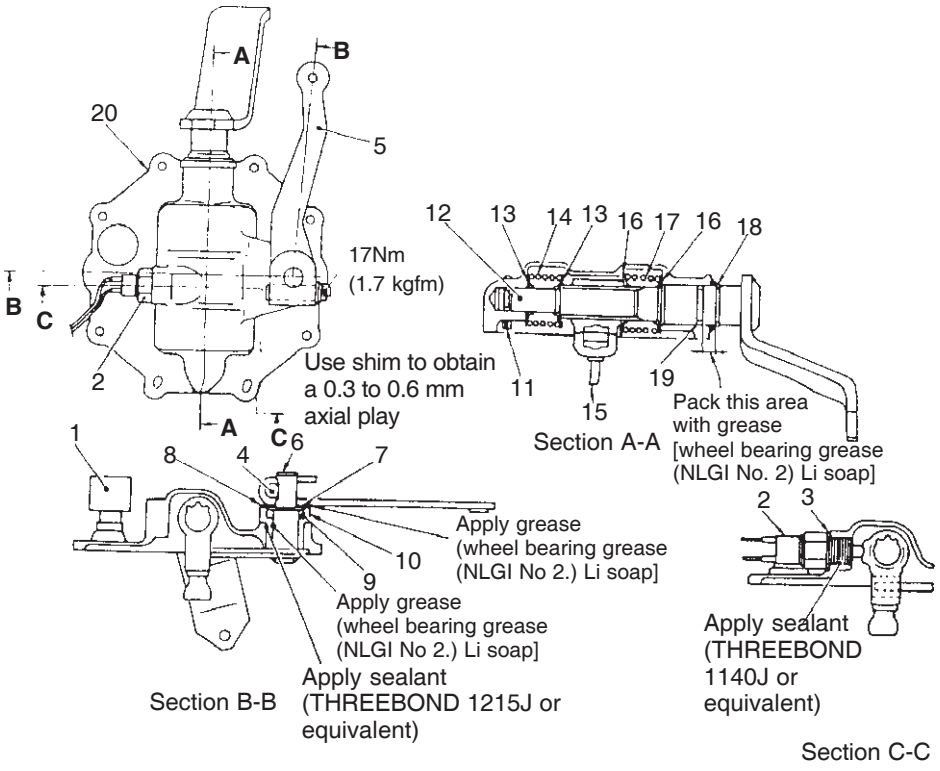
To remove the bushing press-fitted into the selector lever case, use a screwdriver.

NOTE

When removing the bushing, use utmost care to prevent damage to the selector lever case.



Reassembly



Assembly sequence

20→10→9→16→17→16→15→13→14→13→11→6→8→7→5→4→3→2→1

12→18→19

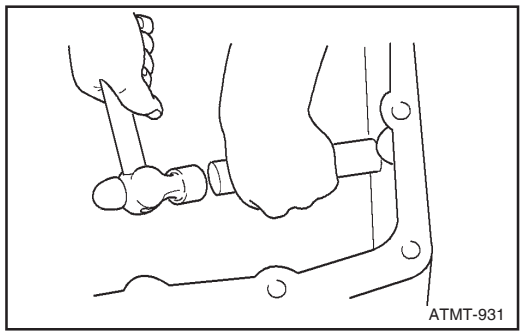
For part with an encircled number, refer to Reassembly Procedure that followings.

NOTE

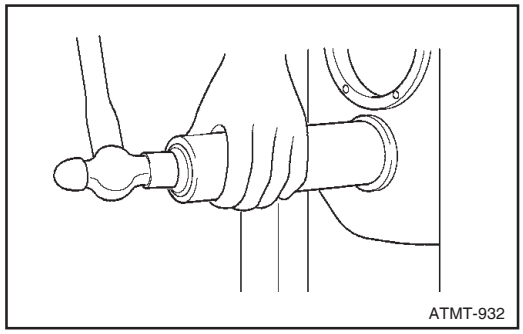
When installing gear selecting lever A, turn the lever as may be required to prevent oil seal lips from being damaged.

22AA1369

7. Using a tapping rod and a hammer, remove the bearing cover.

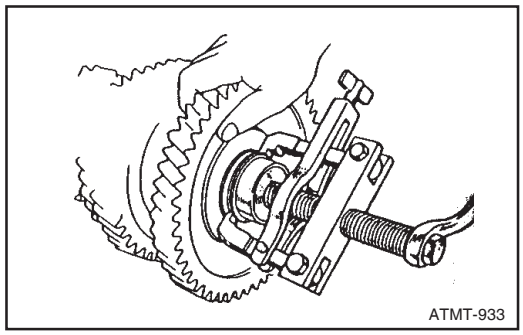

ATMT-931

8. Remove the front cylindrical bearing.


ATMT-932

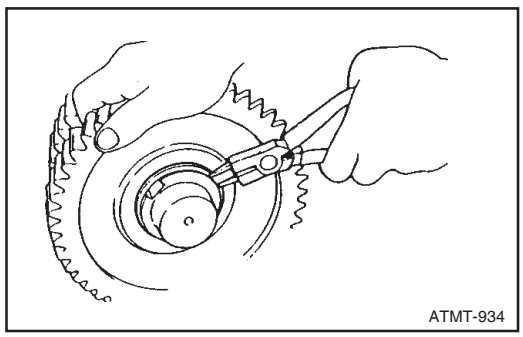
9. Remove the inner race.
   Using a special tool, pull out the cylindrical bearing inner race.

   Special Tool : Puller (09650-1101)

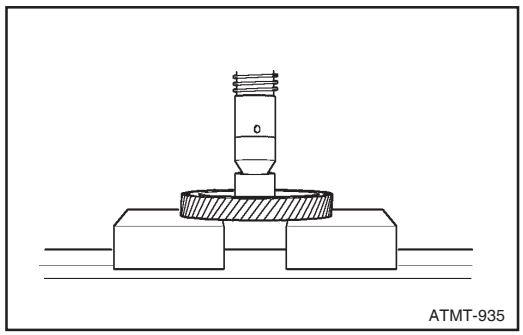

ATMT-933

10. Remove the retainer ring

    NOTE
    - **The retainer ring may pop out of the groove during removal.**


ATMT-934

11. Using a press, remove the counter shaft drive gear.


ATMT-935