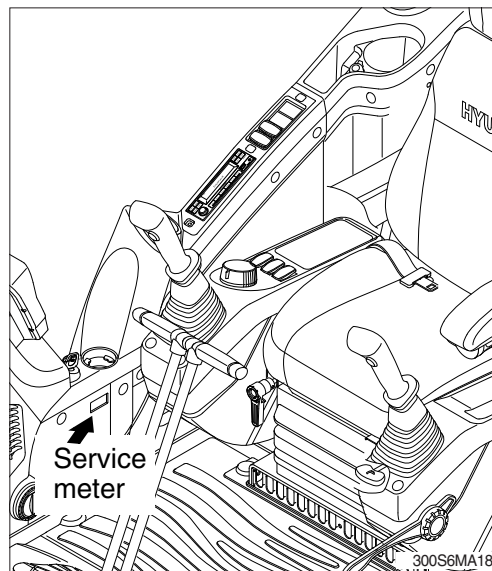


1. INSTRUCTION

1) INTERVAL OF MAINTENANCE

- (1) You may inspect and service the machine by the period as described at page 6-11 based on hour meter at control panel.
- (2) Shorten the interval of inspect and service depending on site condition. (such as dusty area, quarry, sea shore and etc.)
- (3) Practice the entire related details at the same time when the service interval is doubled.
For example, in case of 100hours, carry out all the maintenance 「Each 100hours, each 50 hours and daily service」 at the same time.



2) PRECAUTION

- (1) Start to maintenance after you have the full knowledge of machine.
- (2) The monitor installed on this machine does not entirely guarantee the condition of the machine.
Daily inspection should be performed according to clause 4, maintenance check list.
- (3) Engine and hydraulic components have been preset in the factory.
Do not allow unauthorized personnel to reset them.
- (4) Drain the used oil and coolant in a container and handle according to the method of handling for industrial waste to meet with regulations of each province or country.
- ▲ **Hot oil and hot components can cause personal injury. Do not allow hot oil or hot components to contact skin.**
- △ **Accumulated grease and oil on the machine is a fire hazard. Remove this debris with steam cleaning or high pressure water, at least every 1000 hours.**
- △ **Inspect the engine compartment for any trash build up. Remove any trash build up from the engine compartment.**
- (5) Ask to your local dealer or HD Hyundai Construction Equipment for the maintenance advice if unknown.

3) PROPER MAINTENANCE

(1) Replace and repair of parts

It is required to replace the wearable and consumable parts such as bucket tooth, side cutter, filter and etc., regularly.

Replace damaged or worn parts at proper time to keep the performance of machine.

(2) Use genuine parts.

(3) Use the recommended oil.

(4) Remove the dust or water around the inlet of oil tank before supplying oil.

(5) Drain oil when the temperature of oil is warm.

(6) Do not repair anything while operating the engine.

Stop the engine when you fill the oil.

(7) Relieve hydraulic system of the pressure before repairing the hydraulic system.

(8) Confirm if the cluster is in the normal condition after completion of service.

(9) For more detail information of maintenance, please contact local HD Hyundai Construction Equipment dealer.

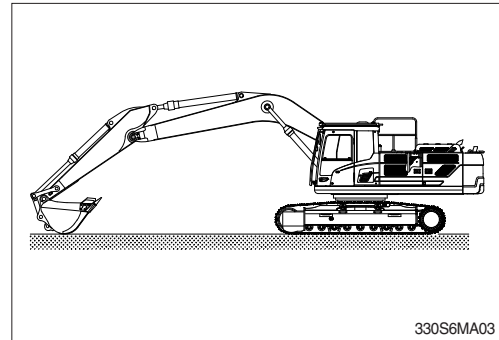
※ **Be sure to start the maintenance after fully understand the chapter 1, safety hints.**

4) RELIEVING THE PRESSURE IN THE HYDRAULIC SYSTEM

※ Spouting of oil can cause the accident when loosening the cap or hose right after the operating of machine as the machine or oil is on the high pressure on the condition.

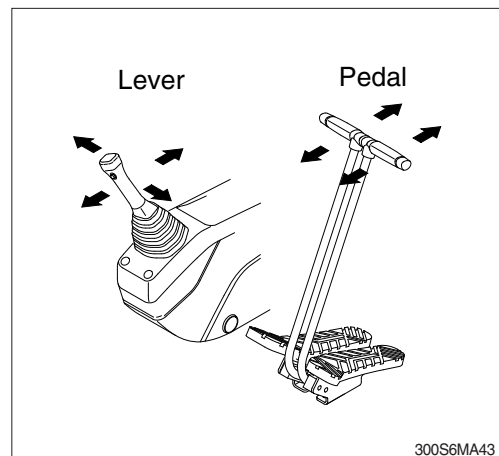
Be sure to relieve the pressure in the system before repairing hydraulic system.

- (1) Place machine in parking position, and stop the engine.

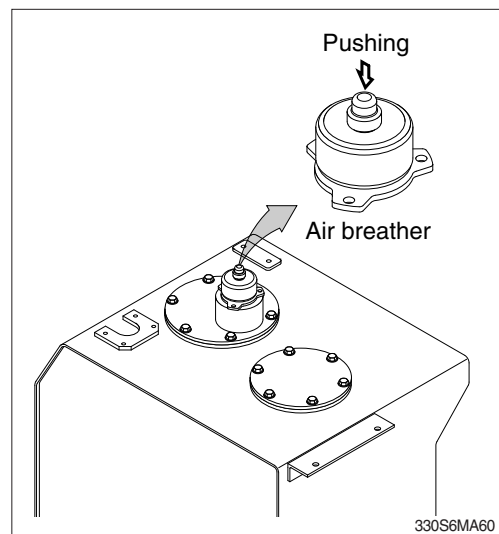


- (2) Set the safety knob completely in the UNLOCK position, operate the control levers and pedals fully to the front, rear, left and right, to release the pressure in the hydraulic circuit.

※ This does not completely release the pressure, so when serving hydraulic component, loosen the connections slowly and do not stand in the direction where the oil spurt out.



- (3) Relieve the pressure in the tank by pushing the top of the air breather.



5) PRECAUTION WHEN INSTALLING HYDRAULIC HOSES OR PIPES

- (1) Be particularly careful that the joint of hose, pipe and functioning item are not damaged.
Avoid contamination.
- (2) Assemble after cleaning the hose, pipe and joint of functioning item.
- (3) Use genuine parts.
- (4) Do not assemble the hose in the condition of twisted or sharp radius.
- (5) Keep the specified tighten torque.

6) PERIODICAL REPLACEMENT OF SAFETY PARTS

- (1) It is desirable to do periodic maintenance the machine for using the machine safely for a long time.

However, recommend to replace regularly the parts related safety not only safety but maintain satisfied performance.

- (2) These parts can cause the disaster of life and material as the quality changes by passing time and it is worn, diluted, and gets fatigued by using repeatedly.

These are the parts which the operator can not judge the remained lifetime of them by visual inspection.

- (3) Repair or replace if an abnormality of these parts is found even before the recommended replacement interval.

Periodical replacement of safety parts			Interval
Engine		Fuel hose (tank-engine)	Every 2 years
		Heater hose (heater-engine)	
Hydraulic system	Main circuit	Pump suction hose	Every 2 years
		Pump delivery hose	
		Swing hose	
	Working device	Boom cylinder line hose	Every 2 years
		Arm cylinder line hose	
		Bucket cylinder line hose	

※ 1. Replace O-ring and gasket at the same time when replacing the hose.

2. Replace clamp at the same time if the hose clamp is cracked when checking and replacing the hose.

2. TIGHTENING TORQUE

Use following table for unspecified torque.

1) BOLT AND NUT

(1) Coarse thread

Bolt size	8.8T		10.9T		12.9T	
	kgf · m	lbf · ft	kgf · m	lbf · ft	kgf · m	lbf · ft
M 6×1.0	0.8 ~ 1.2	5.8 ~ 8.6	1.2 ~ 1.8	8.7 ~ 13.0	1.5 ~ 2.1	10.9 ~ 15.1
M 8×1.25	2.0 ~ 3.0	14.5 ~ 21.6	2.8 ~ 4.2	20.3 ~ 30.4	3.4 ~ 5.0	24.6 ~ 36.1
M10×1.5	4.0 ~ 6.0	29.0 ~ 43.3	5.6 ~ 8.4	40.5 ~ 60.8	6.8 ~ 10.0	49.2 ~ 72.3
M12×1.75	6.8 ~ 10.2	50.0 ~ 73.7	9.6 ~ 14.4	69.5 ~ 104	12.3 ~ 16.5	89.0 ~ 119
M14×2.0	10.9 ~ 16.3	78.9 ~ 117	16.3 ~ 21.9	118 ~ 158	19.5 ~ 26.3	141 ~ 190
M16×2.0	17.9 ~ 24.1	130 ~ 174	25.1 ~ 33.9	182 ~ 245	30.2 ~ 40.8	141 ~ 295
M18×2.5	24.8 ~ 33.4	180 ~ 241	34.8 ~ 47.0	252 ~ 340	41.8 ~ 56.4	302 ~ 407
M20×2.5	34.9 ~ 47.1	253 ~ 340	49.1 ~ 66.3	355 ~ 479	58.9 ~ 79.5	426 ~ 575
M22×2.5	46.8 ~ 63.2	339 ~ 457	65.8 ~ 88.8	476 ~ 642	78.9 ~ 106	570 ~ 766
M24×3.0	60.2 ~ 81.4	436 ~ 588	84.6 ~ 114	612 ~ 824	102 ~ 137	738 ~ 991
M30×3.5	120 ~ 161	868 ~ 1164	168 ~ 227	1216 ~ 1641	202 ~ 272	1461 ~ 1967

(2) Fine thread

Bolt size	8.8T		10.9T		12.9T	
	kgf · m	lbf · ft	kgf · m	lbf · ft	kgf · m	lbf · ft
M 8×1.0	2.1 ~ 3.1	15.2 ~ 22.4	3.0 ~ 4.4	21.7 ~ 31.8	3.6 ~ 5.4	26.1 ~ 39.0
M10×1.25	4.2 ~ 6.2	30.4 ~ 44.9	5.9 ~ 8.7	42.7 ~ 62.9	7.0 ~ 10.4	50.1 ~ 75.2
M12×1.25	7.3 ~ 10.9	52.8 ~ 78.8	10.3 ~ 15.3	74.5 ~ 110	13.1 ~ 17.7	94.8 ~ 128
M14×1.5	12.4 ~ 16.6	89.7 ~ 120	17.4 ~ 23.4	126 ~ 169	20.8 ~ 28.0	151 ~ 202
M16×1.5	18.7 ~ 25.3	136 ~ 182	26.3 ~ 35.5	191 ~ 256	31.6 ~ 42.6	229 ~ 308
M18×1.5	27.1 ~ 36.5	196 ~ 264	38.0 ~ 51.4	275 ~ 371	45.7 ~ 61.7	331 ~ 446
M20×1.5	37.7 ~ 50.9	273 ~ 368	53.1 ~ 71.7	384 ~ 518	63.6 ~ 86.0	460 ~ 622
M22×1.5	51.2 ~ 69.2	370 ~ 500	72.0 ~ 97.2	521 ~ 703	86.4 ~ 116	625 ~ 839
M24×2.0	64.1 ~ 86.5	464 ~ 625	90.1 ~ 121	652 ~ 875	108 ~ 146	782 ~ 1056
M30×2.0	129 ~ 174	933 ~ 1258	181 ~ 245	1310 ~ 1772	217 ~ 294	1570 ~ 2126

2) PIPE AND HOSE (FLARE type)

Thread size (PF)	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130
1"	41	21	152
1-1/4"	50	35	253

3) PIPE AND HOSE (ORFS type)

Thread size (UNF)	Width across flat (mm)	kgf · m	lbf · ft
9/16-18	19	4	28.9
11/16-16	22	5	36.2
13/16-16	27	9.5	68.7
1-3/16-12	36	18	130
1-7/16-12	41	21	152
1-11/16-12	50	35	253

4) FITTING

Thread size	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130
1"	41	21	152
1-1/4"	50	35	253

5) TIGHTENING TORQUE OF MAJOR COMPONENT

No.	Descriptions		Bolt size	Torque	
				kgf · m	lbf · ft
1	Engine	Engine mounting bolt (engine-bracket)	M12 × 1.75	11.5 ± 1.0	83.2 ± 7.2
2		Engine mounting bolt (bracket-frame, FR)	M24 × 3.0	90 ± 9.0	651 ± 65.1
3		Engine mounting bolt (bracket-frame, RR)	M24 × 3.0	90 ± 9.0	651 ± 65.1
4		Radiator mounting bolt	M16 × 2.0	29.7 ± 4.5	215 ± 32.5
5		Coupling mounting socket bolt	M18 × 2.5	46.5 ± 2.5	336 ± 18.1
6		Fuel tank mounting bolt	M20 × 2.5	57.9 ± 8.7	419 ± 62.9
7	Hydraulic system	Main pump housing mounting bolt	M10 × 1.5	6.5 ± 0.7	47 ± 5.1
8		Main pump mounting socket bolt	M20 × 2.5	57.9 ± 8.7	419 ± 62.9
9		Main control valve mounting nut	M12 × 1.75	12.3 ± 1.3	89.0 ± 9.4
10		Hydraulic oil tank mounting bolt	M20 × 2.5	57.9 ± 8.7	419 ± 62.9
11		Turning joint mounting bolt, nut	M12 × 1.75	12.3 ± 1.3	89.0 ± 9.4
12	Power train system	Swing motor mounting bolt	M20 × 2.5	57.9 ± 5.8	419 ± 42
13		Swing bearing upper part mounting bolt	M24 × 3.0	100 ± 10	723 ± 72.3
14		Swing bearing lower part mounting bolt	M24 × 3.0	100 ± 10	723 ± 72.3
15		Travel motor mounting bolt	M24 × 3.0	84 ± 8.0	608 ± 57.9
16		Sprocket mounting bolt	M20 × 2.5	57.9 ± 6.0	419 ± 43.4
17	Under carriage	Carrier roller mounting bolt, nut	M16 × 2.0	29.7 ± 3.0	215 ± 21.7
18		Track roller mounting bolt	M20 × 2.5	57.9 ± 6.0	419 ± 43.4
19		Track tension cylinder mounting bolt	M16 × 2.0	29.7 ± 4.5	215 ± 32.5
20		Track shoe mounting bolt, nut	M22 × 1.5	78 ± 8.0	564 ± 57.9
21		Track guard mounting bolt	M20 × 2.5	57.9 ± 8.7	419 ± 62.9
22	Others	Counterweight mounting bolt	M36 × 3.0	337 ± 33	2440 ± 239
23		Cab mounting bolt	M12 × 1.75	12.8 ± 3.0	92.6 ± 21.7
24		Operator's seat mounting bolt	M 8 × 1.25	4.05 ± 0.8	29.3 ± 5.8

※ For tightening torque of engine and hydraulic components, see engine maintenance guide and service manual.

3. FUEL, COOLANT AND LUBRICANTS

1) NEW MACHINE

New machine used and filled with following lubricants.

Description	Specification
Engine oil (API CH-4)	SAE 15W-40, ★SAE 5W-40
Hydraulic oil	HD Hyundai Construction Equipment genuine long life (ISO VG 32, VG 46, VG 68) Conventional hydraulic oil (ISO VG 15★)
Swing and travel reduction gear	SAE 80W-90 (GL-4/GL-5)
Grease	Lithium base grease NLGI No. 2
Fuel	ASTM D975-No. 2
Coolant	Mixture of 50% ethylene glycol base antifreeze and 50% water. Mixture of 60% ethylene glycol base antifreeze and 40% water. ★

SAE : Society of Automotive Engineers

★ Cold region

API : American Petroleum Institute

Russia, CIS, Mongolia

ISO : International Organization for Standardization

NLGI : National Lubricating Grease Institute

ASTM : American Society of Testing and Material

2) RECOMMENDED OILS

HD Hyundai Construction Equipment genuine lubricating oils have been developed to offer the best performance and service life for your equipment. These oils have been tested according to the specifications of HD Hyundai Construction Equipment and, therefore, will meet the highest safety and quality requirements.

We recommend that you use only HD Hyundai Construction Equipment genuine lubricating oils and grease officially approved by HD Hyundai Construction Equipment.

Service point	Kind of fluid	Capacity ℓ (U.S. gal)	Ambient temperature °C (° F)							
			-50 (-58)	-30 (-22)	-20 (-4)	-10 (14)	0 (32)	10 (50)	20 (68)	30 (86)
Engine oil pan	Engine oil★ ¹	26.5 (7.0)	★SAE 0W-40							
			★SAE 0W-30							
			SAE 5W-30							
			SAE 10W-30							
			SAE 15W-40							
Swing drive	Gear oil	11 (2.91)	★SAE 75W-90							
Final drive		7.8×2 (2.1×2)	SAE 80W-90							
Hydraulic tank	Hydraulic oil	Tank : 210 (55.5)	★ISO VG 15							
		System : 414 (109.4)	ISO VG 32							
			ISO VG 46, HBHO VG 46★ ³							
			ISO VG 68							
Fuel tank	Diesel fuel	600 (158.5)	★ASTM D975 NO.1							
			ASTM D975 NO.2							
Fitting (grease nipple)	Grease	As required	★NLGI NO.1							
			NLGI NO.2							
Radiator (reservoir tank)	Mixture of antifreeze and soft water★ ²	27 (7.1)	Ethylene glycol base permanent type (50 : 50)							
			★Ethylene glycol base permanent type (60 : 40)							

SAE : Society of Automotive Engineers

API : American Petroleum Institute

ISO : International Organization for Standardization

NLGI : National Lubricating Grease Institute

ASTM : American Society of Testing and Material

★ : Cold region

Russia, CIS, Mongolia

★¹ : Meet or exceeds API CH-4 grade

★² : Soft water

City water or distilled water

★³ : HD Hyundai Construction Equipment
Bio Hydraulic Oil

※ Using any lubricating oils other than HD Hyundai Construction Equipment genuine products may lead to a deterioration of performance and cause damage to major components.

※ Do not mix HD Hyundai Construction Equipment genuine oil with any other lubricating oil as it may result in damage to the systems of major components.

※ Do not use any engine oil other than that specified above.

※ For HD Hyundai Construction Equipment genuine lubricating oils and grease for use in regions with extremely low temperatures, please contact HD Hyundai Construction Equipment dealers.

4. MAINTENANCE CHECK LIST

1) DAILY SERVICE BEFORE STARTING

Check items	Service	Page
Visual check		
Fuel tank	Check, Refill	6-27
Hydraulic oil level	Check, Add	6-34
Engine oil level	Check, Add	6-18
Coolant level	Check, Add	6-20
Control panel & pilot lamp	Check, Clean	6-44
Prefilter (water)	Check, Drain	6-31
Fan belt tension and damage	Check, Adjust	6-24, 25, 26
Attachment pin and bushing ★	Lubricate	6-43
· Boom cylinder tube end		
· Boom foot		
· Boom cylinder rod end		
· Arm cylinder tube end		
· Arm cylinder rod end		
· Boom + Arm connecting		
· Bucket cylinder tube end		

★ Lubricate every 10 hours or daily for initial 100 hours.

2) EVERY 50 HOURS SERVICE

Check items	Service	Page
Fuel tank (water, sediment)	Drain	6-27
Track tension	Check, Adjust	6-39
Swing reduction gear oil	Check, Add	6-37
Attachment pin and bushing	Lubricate	6-43
· Bucket cylinder rod end		
· Bucket + Arm connecting		
· Bucket control link + Arm		
· Bucket control rod		

3) INITIAL 50 HOURS SERVICE

Check items	Service	Page
Bolts & Nuts · Sprocket mounting bolts · Travel motor mounting bolts · Swing motor mounting bolts · Swing bearing mounting bolts · Engine mounting bolts · Counterweight mounting bolts · Turning joint locating bolts · Track shoe mounting bolts and nuts · Carrier roller mounting bolts · Track roller mounting bolts · Hydraulic pump mounting bolts	Check, Tight	6-8

4) EVERY 200 HOURS SERVICE

Check items	Service	Page
Return filter ★	Replace	6-36
Pilot line filter element ★	Replace	6-37
Drain filter cartridge ★	Replace	6-36

★ Replace 3 filters for continuous hydraulic breaker operation only.

5) INITIAL 250 HOURS SERVICE

Check items	Service	Page
Engine oil	Change	6-18, 19
Engine oil filter	Replace	6-18, 19
Prefilter (element)	Replace	6-31
Fuel filter element	Replace	6-28
Pilot line filter element	Replace	6-37
Hydraulic oil return filter	Replace	6-36
Drain filter cartridge	Replace	6-36
Swing reduction gear oil	Change	6-37
Travel reduction gear oil	Change	6-38

6) EVERY 250 HOURS SERVICE

Check items	Service	Page
★ Engine oil	Change	6-18, 19
★ Engine oil filter	Replace	6-18, 19
★ Fuel filter element	Replace	6-28
★ Prefilter	Replace	6-31
Battery (voltage)	Check, Clean	6-44
Swing bearing grease	Check, Add	6-37
Bolts & Nuts	Check, Tight	6-8
· Sprocket mounting bolts		
· Travel motor mounting bolts		
· Swing motor mounting bolts		
· Swing bearing mounting bolts		
· Engine mounting bolts		
· Counterweight mounting bolts		
· Turning joint locating bolts		
· Track shoe mounting bolts and nuts		
· Carrier roller mounting bolts		
· Track roller mounting bolts		
· Hydraulic pump mounting bolts		
Attachment pin and bushing	Lubricate	6-43
· Boom cylinder tube end		
· Boom foot		
· Boom cylinder rod end		
· Arm cylinder tube end		
· Arm cylinder rod end		
· Boom + Arm connecting		
· Bucket cylinder tube end		

★ When using a biodiesel fuel

7) EVERY 500 HOURS SERVICE

Check items	Service	Page
Engine oil *	Change	6-18, 19
Engine oil filter *	Replace	6-18, 19
Radiator, cooler fin and charge air cooler	Check, Clean	6-23
Fuel filter element	Replace	6-28
Prefilter	Replace	6-31
Aircon & heater filter (fresh air)	Clean	6-47
Air cleaner element (primary) * ¹	Check, Clean	6-27
Coolant filter	Replace	6-32

* If you use high sulfur containing fuel above than 0.5% or use low grade of engine oil reduce change interval.

*¹ When working in dusty environments, more frequent cleaning is highly recommended.

8) EVERY 1000 HOURS SERVICE

Check items	Service	Page
Hydraulic tank air breather element	Replace	6-36
Travel motor reduction gear oil	Change	6-38
Swing reduction gear oil	Change	6-37
Grease in swing gear and pinion	Change	6-38
Hydraulic oil return filter	Replace	6-36
Drain filter cartridge	Replace	6-36
Pilot line filter element	Replace	6-37
Overhead set (shop inspection)	Adjust	6-43-1

9) EVERY 2000 HOURS SERVICE

Check items	Service	Page
Coolant	Change	6-20, 21, 22, 23
Air cleaner element (primary, safety) ^{★1}	Replace	6-27
Hydraulic oil ^{★2}	Change	6-34
Hydraulic tank suction strainer	Check, Clean	6-35
RCV lever	Check, Lubricate	6-39
Hoses, fittings, clamps (fuel, coolant, hydraulic)	Check, Retighten, Replace	-

^{★1} When working in dusty environments, more frequent replacing is highly recommended.

^{★2} Conventional

※ **Change hydraulic oil every 600 hours of continuous hydraulic breaker operation.**

10) EVERY 5000 HOURS SERVICE

Check items	Service	Page
Hydraulic oil ^{★3}	Change	6-35

^{★3} HD Hyundai Construction Equipment genuine long life

※ **Change hydraulic oil every 1000 hours of continuous hydraulic breaker operation.**

11) EVERY 6000 HOURS SERVICE

Check items	Service	Page
Coolant ^{★3}	Change	6-20, 21, 22, 23

^{★3} HD Hyundai Construction Equipment genuine long life

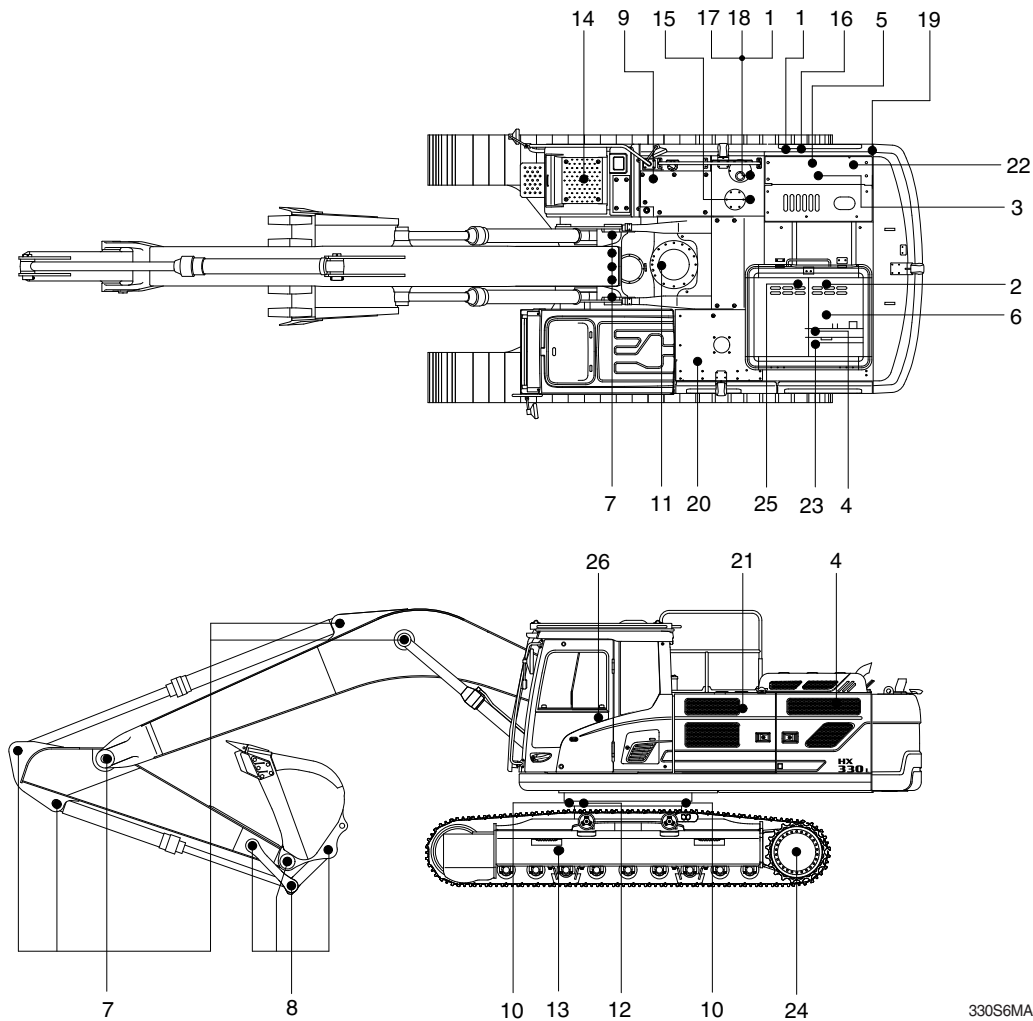
※ **Change hydraulic oil every 1000 hours of continuous hydraulic breaker operation.**

12) WHEN REQUIRED

Whenever you have trouble in the machine, you must perform the service of related items, system by system.

Check items	Service	Page
Fuel system		
· Fuel tank	Drain or Clean	6-27
· Prefilter (water, element)	Drain or Replace	6-31
· Fuel filter element	Replace	6-28
Engine lubrication system		
· Engine oil	Change	6-18, 19
· Engine oil filter	Replace	6-18, 19
Engine cooling system		
· Coolant	Add or Change	6-20, 21, 22, 23
· Radiator	Clean or Flush	6-20, 21, 22, 23
· Charge air cooler	Check	6-23
Engine air system		
· Air cleaner element (primary)	Clean or Replace	6-27
· Air cleaner element (safety)	Replace	6-27
Hydraulic system		
· Hydraulic oil	Add or Change	6-34, 35
· Return filter	Replace	6-36
· Drain line filter	Replace	6-36
· Pilot line filter	Replace	6-37
· Element of breather	Replace	6-36
· Suction strainer	Clean	6-35
· RCV lever	Lubricate	6-39
Undercarriage		
· Track tension	Check, Adjust	6-39
Bucket		
· Tooth	Replace	6-41
· Side cutter	Replace	6-41
· Linkage	Adjust	6-40
· Bucket assy	Replace	6-40
Air conditioner and heater		
· Fresh air filter	Replace	6-47
· Recirculation filter	Clean, Replace	6-47, 48

5. MAINTENANCE CHART



330S6MA46

Caution

1. Service intervals are based on the hour meter reading.
2. The number of each item shows the lubrication point on the machine.
3. Stop engine while filling oil, and use no open flames.

Service interval	No.	Description	Service action	Oil symbol	Capacity ℓ (U.S.gal)	Service points No.
10 Hours or daily	1	Hydraulic oil level	Check, Add	HO	210 (55.5)	1
	2	Engine oil level	Check, Add	EO	26.5 (7.0)	1
	4	Radiator coolant	Check, Add	C	27 (7.1)	1
	5	Prefilter (water)	Check, Drain	-	-	1
	6	Fan belt tension and damage	Check, Adjust	-	-	1
	7	*Attachment pin & bushing	Check, Lubricate	PGL	-	11
	9	Fuel tank	Check, Refill	DF	600 (158.5)	1
50 Hours or weekly	8	Bucket linkage pins	Check, Lubricate	PGL	-	6
	9	Fuel tank (water, sediment)	Check, Drain	-	-	1
	11	Swing reduction gear oil	Check, Add	GO	11 (2.9)	1
	13	Track tension	Check, Adjust	PGL	-	2

* For initial 100 hours.

Service interval	No.	Description	Service action	Oil symbol	Capacity ℓ (U.S.gal)	Service points No.
250 Hours	2	Engine oil* ³	Change	EO	26.5 (7.0)	1
	3	Engine oil filter* ³	Replace	-	-	1
	5	Prefilter (element)* ³	Replace	-	-	1
	7	Attachment pins & bushings	Check, Lubricate	PGL	-	11
	10	Swing bearing grease	Check, Add	PGL	-	2
	14	Battery (voltage)	Check	-	-	1
	22	Fuel filter element* ³	Replace	-	-	1
Initial 250 Hours	2	Engine oil	Change	EO	26.5 (7.0)	1
	3	Engine oil filter	Replace	-	-	1
	5	Prefilter (element)	Replace	-	-	1
	11	Swing reduction gear oil	Change	GO	11 (2.9)	1
	15	Hydraulic oil return filter	Replace	-	-	1
	16	Drain filter cartridge	Replace	-	-	1
	19	Pilot line filter element	Replace	-	-	1
	22	Fuel filter element	Replace	-	-	1
500 Hours	2	Engine oil	Change	EO	26.5 (7.0)	1
	3	Engine oil filter	Replace	-	-	1
	5	Prefilter (element)	Replace	-	-	1
	20	Aircon & heater filter (fresh air & recirculation)	Replace	-	-	2
	21	Air cleaner element (primary)	Check, Clean	-	-	1
	22	Fuel filter element	Replace	-	-	1
	23	Radiator, oil cooler, charge air cooler	Check, Clean	-	-	3
	25	Coolant filter	Replace	-	-	1
1000 Hours	2	Overhead set (shop inspection)	Adjust	-	-	1
	11	Swing reduction gear oil	Change	GO	11 (2.9)	1
	12	Swing gear and pinion grease	Change	PGL	11.4 kg (25.1 lb)	1
	15	Hydraulic oil return filter	Replace	-	-	1
	16	Drain filter cartridge	Replace	-	-	1
	17	Air breather element	Replace	-	-	1
	19	Pilot line filter	Replace	-	-	1
	24	Travel reduction gear oil	Change	GO	7.8 (2.1)	2
2000 Hours	1	Hydraulic oil* ¹	Change	HO	210 (55.5)	1
	4	Radiator coolant* ¹	Change	C	27 (7.1)	1
	18	Hydraulic oil suction strainer	Check, Clean	-	-	1
	21	Air cleaner element (primary, safety)	Replace	-	-	2
	26	RCV lever	Check, Lubricate	PGL	-	2
	-	Hoses, fittings, clamps (fuel, coolant, hydraulic)	Check, Retighten, Replace	-	-	-
5000 Hours	1	Hydraulic oil* ²	Change	HO	210 (55.5)	1
6000 Hours	4	Radiator coolant* ²	Change	C	27 (7.1)	1

*¹ Conventional *² HD Hyundai Construction Equipment genuine long life *³ When using a biodiesel fuel

※ Oil symbol

Please refer to the recommended lubricants for specification.

DF : Diesel fuel GO : Gear oil HO : Hydraulic oil C : Coolant
PGL : Grease EO : Engine oil

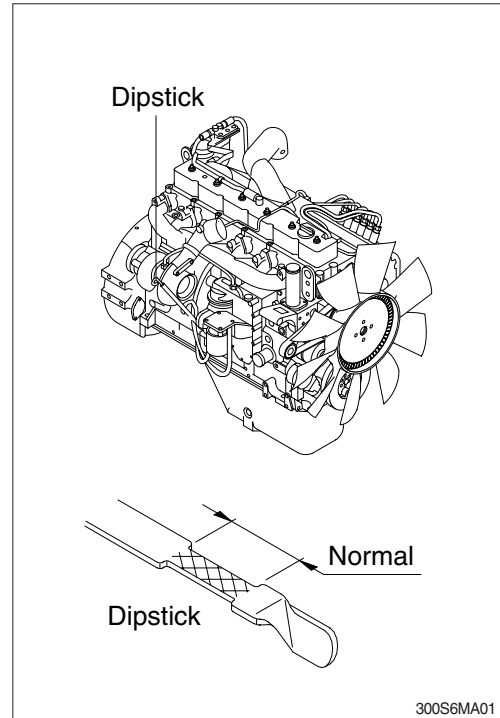
Service interval	No.	Description	Service action	Oil symbol	Capacity ℓ (U.S.gal)	Service points No.
As required	20	Aircon & heater fresh filter	Replace	-	-	1
	20	Aircon & heater recirculation filter	Replace	-	-	1
	21	Air cleaner element (primary)	Clean, Replace	-	-	1
	21	Air cleaner element (safety)	Replace	-	-	1

6. SERVICE INSTRUCTION

1) CHECK ENGINE OIL LEVEL

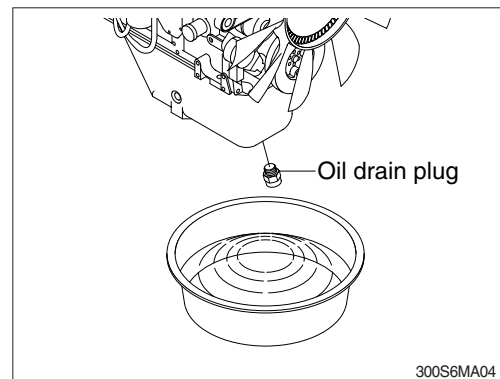
Check the oil level with the machine on a flat ground before starting engine.

- (1) Pull out the dipstick and wipe with a clean cloth.
 - (2) Check the oil level by inserting the dipstick completely into the hole and pulling out again.
 - (3) If oil level is LOW, add oil and then check again.
- ※ If the oil is contaminated or diluted, change the oil regardless of the regular change interval.
 - ※ Check oil level after engine has been stopped for 15 minutes.
 - ▲ Do not operate unless the oil level is in the normal range.

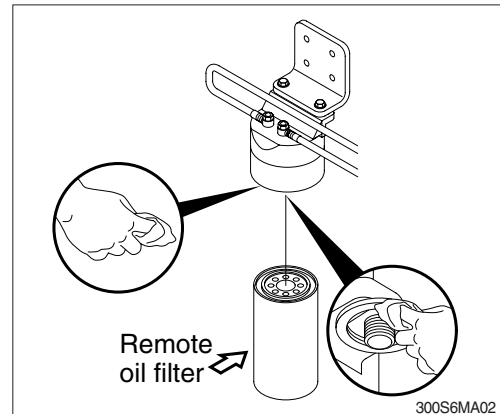


2) REPLACEMENT OF ENGINE OIL AND OIL FILTER

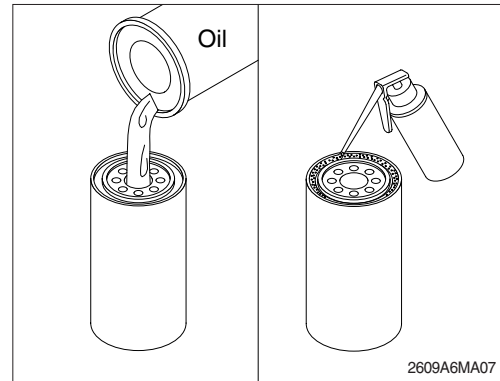
- (1) Operate the engine until the coolant temperature reaches 60°C (140°F). Shut off the engine.
 - (2) Remove the oil drain plug. Drain the oil immediately to be sure all the oil and suspended contaminants are removed from the engine.
- ※ A drain pan with a capacity of 30 liters (7.9 U.S. gallons) will be adequate.



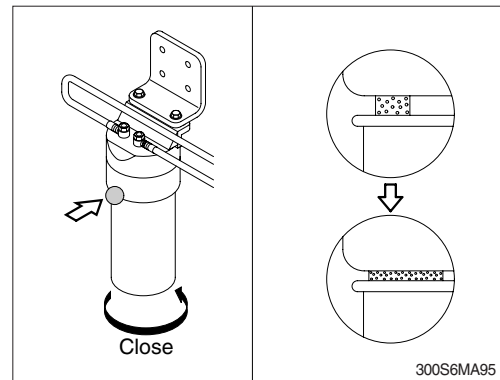
- (3) Clean the area around the lubricating oil filter head.
 - (4) Use oil filter wrench to remove the oil filter.
 - (5) Clean the gasket surface of oil filter head.
- ※ The O-ring can stick on the filter head. Be sure it is removed before installing the new filter.



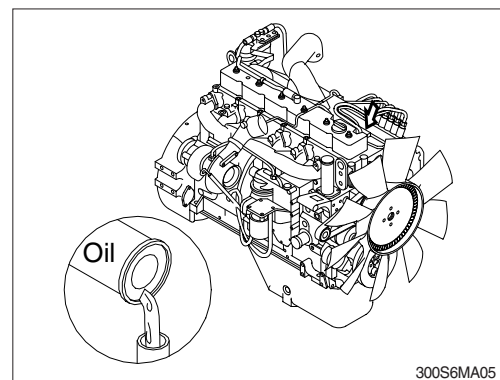
- (6) Apply a light film of lubricating oil to the gasket sealing surface before installing the filters.
- ※ **Fill the filters with clean lubricating oil.**



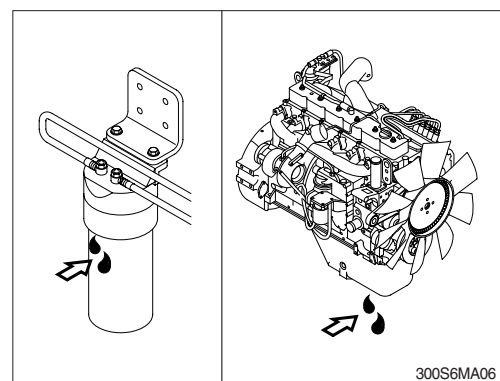
- (7) Install the filter to the filter head.
- Tighten the filter until the gasket contacts the filter head surface.
- Tighten 3/4 to 1 turn after the gasket makes contact with the filter head.
- ※ **Mechanical over-tightening may distort the threads or damage the filter element seal.**



- (8) Clean and check the lubricating oil drain plug threads and sealing surface.
- Install the lubricating oil pan drain plug.
- (9) Fill the engine with clean oil to the proper level.
- Quantity : 26.5 ℓ (7.0 U.S.gallons)



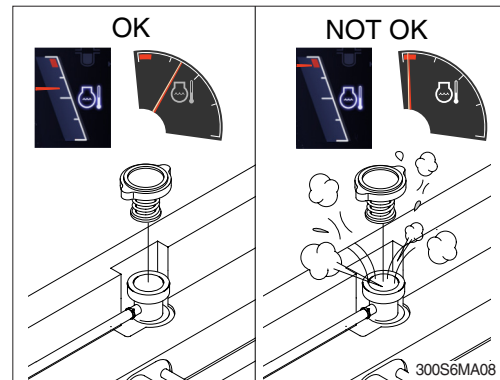
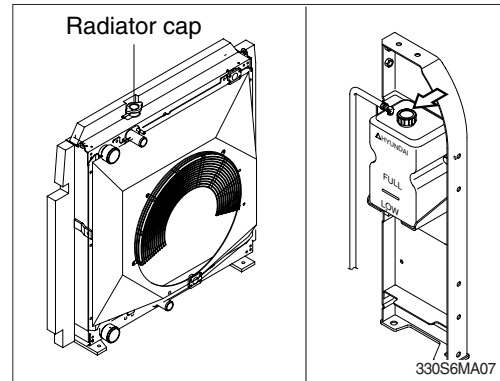
- (10) Operate the engine at low idle and inspect for leaks at the filters and the drain plug.
- Shut the engine off and check the oil level with the dipstick. Allow 15 minutes for oil to drain down before checking.



3) CHECK COOLANT

- (1) Check if the level of coolant in reservoir tank is between FULL and LOW.
- (2) Add the mixture of antifreeze and water after removing the cap of the reservoir tank if coolant is not sufficient.
- (3) Be sure to use the reservoir empty, add the coolant by opening the cap of radiator.
- (4) Replace gasket of radiator cap when it is damaged.

▲ Hot coolant can spray out if surge tank cap is removed while engine is hot. Remove the cap after the engine has cooled down.



4) FLUSHING AND REFILLING OF RADIATOR

- (1) Change coolant

▲ Avoid prolonged and repeated skin contact with used antifreeze. Such prolonged repeated contact can cause skin disorders or other bodily injury.

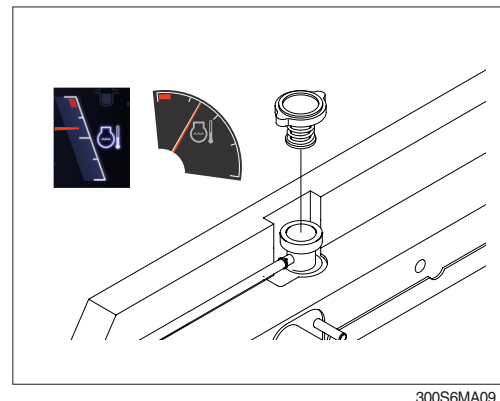
Avoid excessive contact-wash thoroughly after contact.

Keep out of reach of children.

- ※ Protect the environment : Handling and disposal of used antifreeze can be subject to federal, state, and local law regulation.

Use authorized waste disposal facilities, including civic amenity sites and garages providing authorized facilities for the receipt of used antifreeze.

If in doubt, contact your local authorities for guidance as to proper handling of used antifreeze.

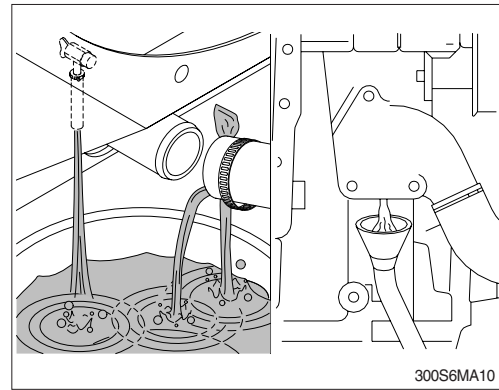


- ▲** Wait until the temperature is below 50 °C (122 °F) before removing the coolant system pressure cap.

Failure to do so can cause personal injury from heated coolant spray.

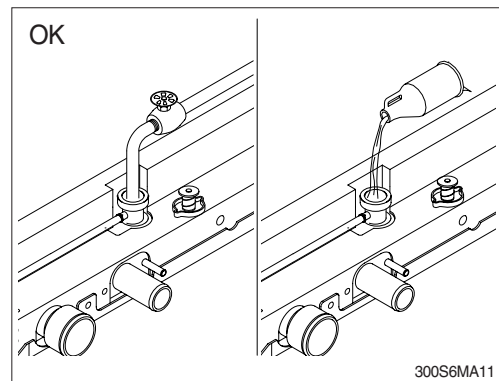
Drain the cooling system by opening the drain valve on the radiator and opening the drain valve on the bottom of the engine oil cooler housing.

A drain pan with a capacity of 40 liters (10.6 U.S. gallons) will be adequate.

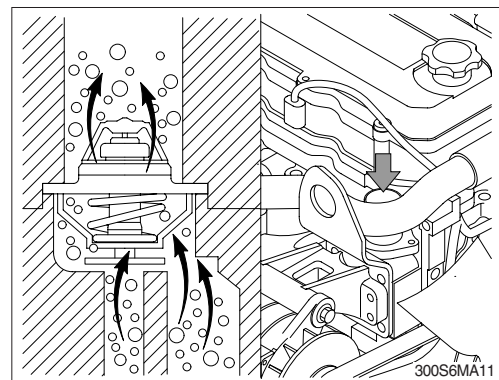


(2) Flushing of cooling system

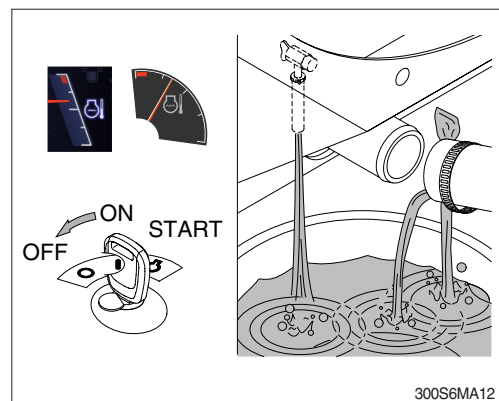
- ① Fill the system with a mixture of sodium carbonate and water (or a commercially available equivalent).
 - ※ Use 0.5kg (1.0 pound) of sodium carbonate for every 23 liters (6.0 U.S. gallons) of water.
 - ※ Do not install the radiator cap. The engine is to be operated without the cap for this process.



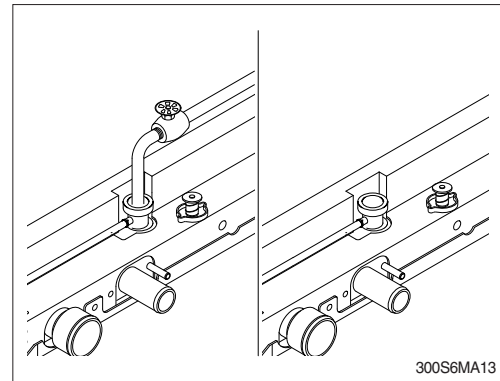
- ※ During filling, air must be vented from the engine coolant passages. The system must be filled slowly to prevent air locks or serious engine damage can result. Wait 2 to 3 minutes to allow air to be vented, then add mixture to bring the level to the top.



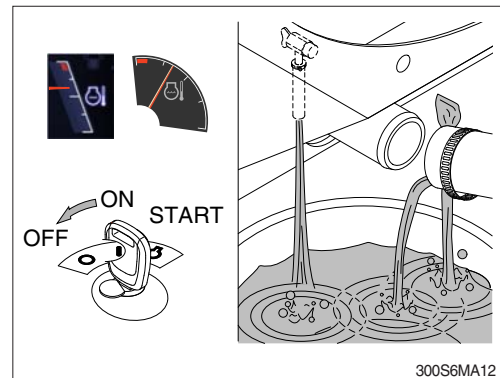
- ② Operate the engine for 5 minutes with the coolant temperature above 80°C (176°F). Shut the engine off, and drain the cooling system.



- ③ Fill the cooling system with clean water.
- ※ **Be sure to vent the engine and aftercooler for complete filling.**
 - ※ **Do not install the surge tank cap or the new coolant filter.**

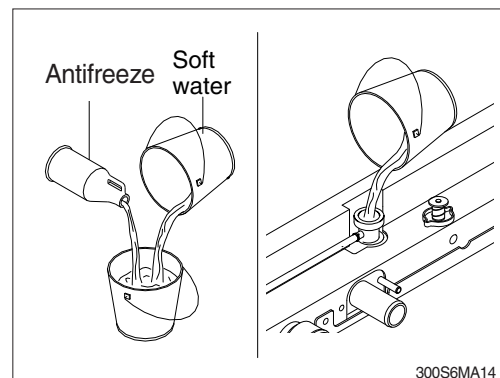


- ④ Operate the engine for 5 minutes with the coolant temperature above 80°C (176°F) . Shut the engine off, and drain the cooling system.
- ※ **If the water being drained is still dirty, the system must be flushed again until the water is clean.**

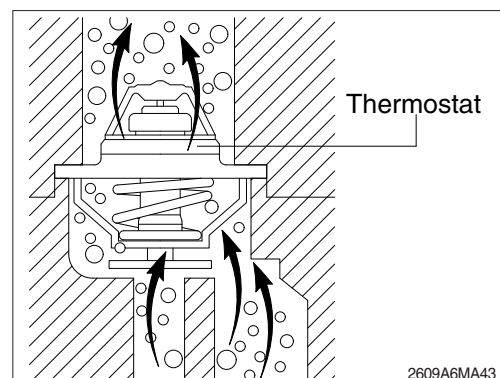


(3) Cooling system filling

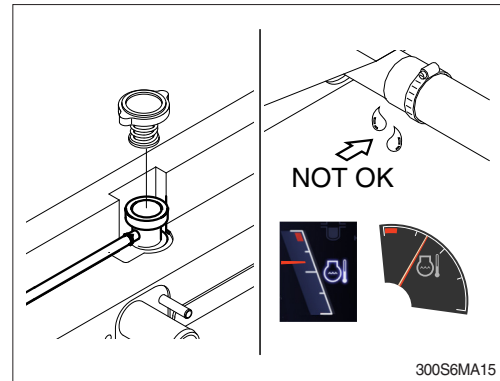
- ① Use a mixture of 50 percent soft water and 50 percent ethylene glycol antifreeze to fill the cooling system. Refer to the page 6-10. Coolant capacity (engine only) : 10 ℓ (2.6 U.S. gallons)
- ※ **Do not use hard water such as river water or well water.**



- ② The system has a maximum fill rate of 19 liters (5.0 U.S. gallons) per minute. Do not exceed this fill rate.
- ※ **The system must be filled slowly to prevent air locks.**
During filling, air must be vented from the engine coolant passage.



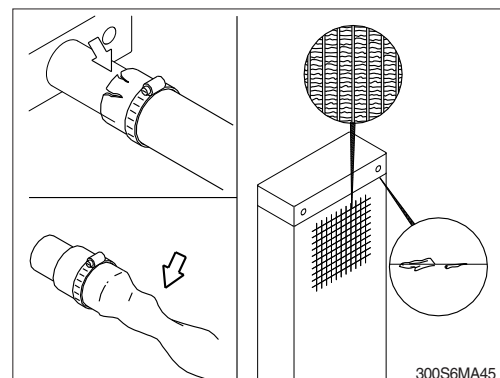
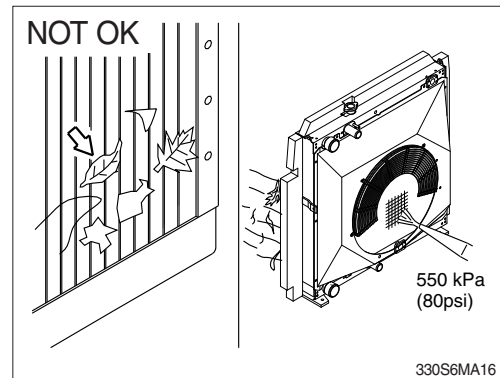
- ③ Install the pressure cap. Operate the engine until it reaches a temperature 80°C (176°F), and check for coolant leaks. Check the coolant level again to make sure the system is full of coolant.



5) CLEAN RADIATOR AND OIL COOLER

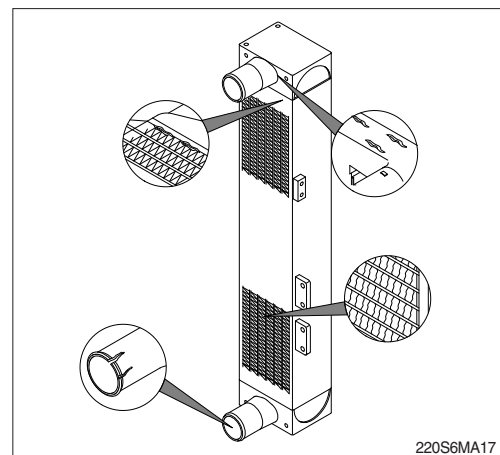
Check, and if necessary, clean and dry outside of radiator and oil cooler. After working in a dusty place, clean radiator more frequently.

- (1) Visually inspect the radiator for clogged radiator fins.
- (2) Use 550 kPa (80 psi) air pressure to blow the dirt and debris from the fins.
- (3) Visually inspect the radiator for bent or broken fins.
- ※ **If the radiator must be replaced due to bent or broken fins which can cause the engine to overheat, refer to the manufacturer's replacement procedures.**
- (4) Visually inspect the radiator for core leaks.



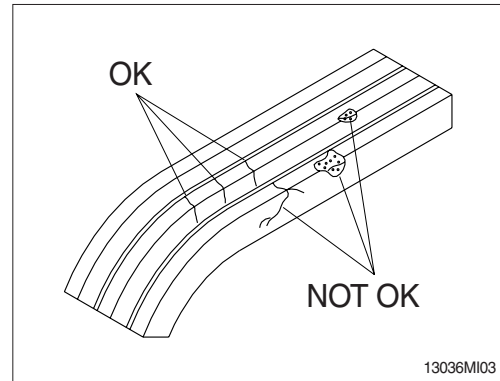
6) CHECK CHARGE AIR COOLER

Inspect the charge air cooler for dirt and debris blocking the fins. Check for cracks, holes, or other damage. If damage is found, please contact HD Hyundai Construction Equipment distributor.

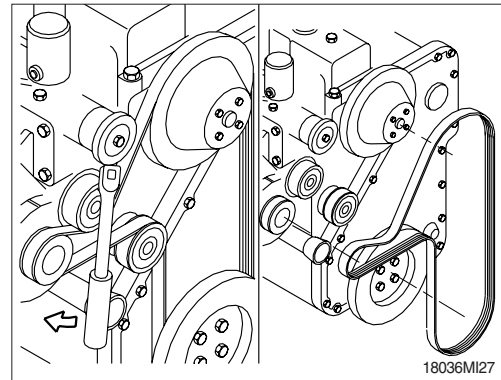


7) FAN BELT TENSION

(1) Inspect the drive for damage.



(2) Inspect the drive belt and fan hub.



8) INSPECTION OF COOLING FAN

▲ Personal injury can result from a fan blade failure. Never pull or pry on the fan. This can damage the fan blade and cause fan failure.

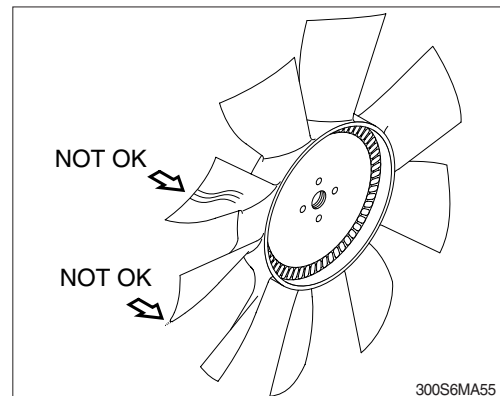
※ Rotate the crankshaft by using the engine barring gear.

※ A visual inspection of the cooling fan is required daily.

Check for cracks, loose rivets, and bent or loose blades.

Check the fan to make sure it is securely mounted. Tighten the capscrews if necessary.

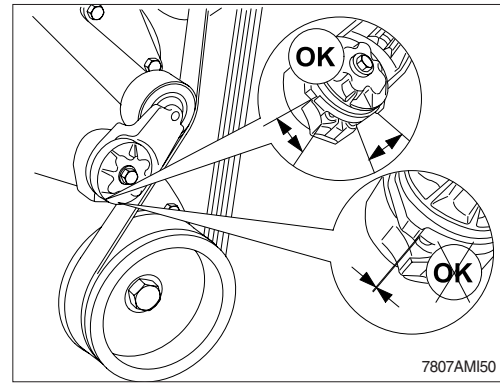
Replace any fan that is damaged.



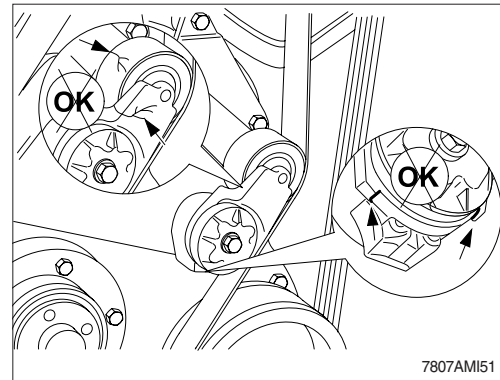
9) BELT TENSIONER, AUTOMATIC Adjustment

- (1) Every 1000hours, or 1 year, whichever occurs first, inspect the automatic belt tensioner.

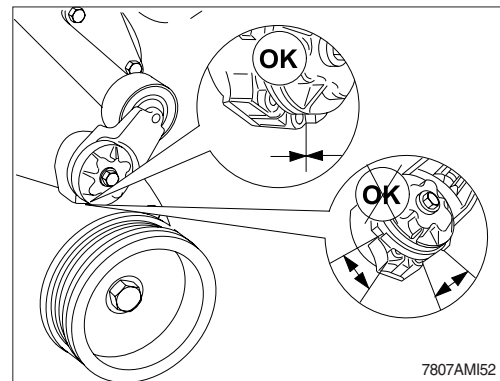
With the engine turned off, check that neither the top nor bottom tensioner arm stop is touching the cast boss on the tensioner body. If either of the stops is touching a boss, the alternator belt must be replaced. Check to make sure the correct belt part number is being used if either condition exists.



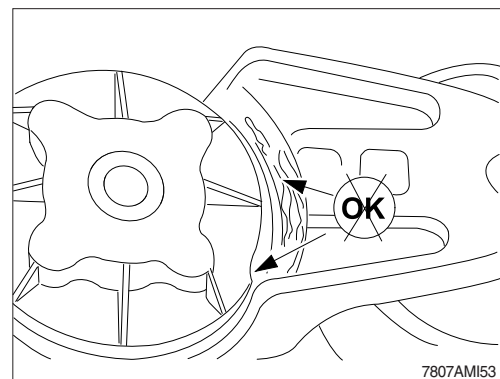
- (2) Check the tensioner pulley and body for cracks. If any cracks are noticed, the tensioner must be replaced. Refer to a Cummins Authorized Repair facility. Check the tensioner for dirt buildup. If this condition exists, the tensioner must be removed and steam-cleaned.



- (3) Check that the bottom tensioner arm stop is in contact with the bottom tensioner arm stop boss on the tensioner body. If these two are not touching, the tensioner must be replaced.



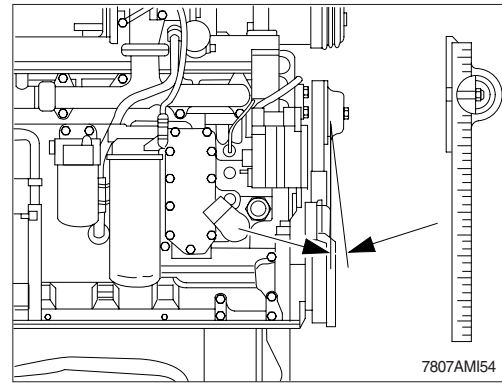
- (4) Inspect the tensioner for evidence of the pivoting tensioner arm contacting the stationary circular base. If there is evidence of these two areas touching, the pivot tube bushing has failed and the tensioner must be replaced.



(5) A worn tensioner that has play in it or a belt that "walks" off its pulley possibly indicates pulley misalignment.

※ **Maximum pulley misalignment is three degrees. This measurement can be taken with a straightedge and an inclinometer.**

(6) Install the belt.



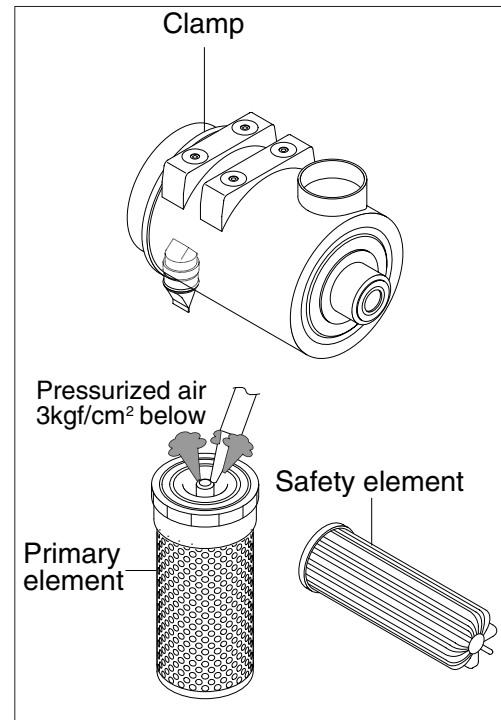
10) CLEANING OF AIR CLEANER

(1) Primary element

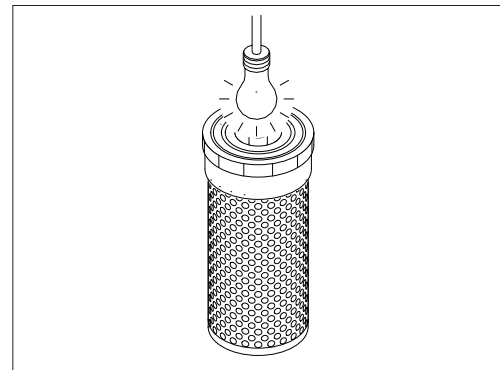
- ① Loosen the clamps and remove the element.
 - ② Clean the inside of the body.
 - ③ Clean the element with pressurized air.
 - Remove the dust inside of the element by the pressurized air (below 3 kgf/cm², 40 psi) forward and backward equally.
 - ④ Inspect for cracks or damage of element by putting a light bulb inside of the element.
 - ⑤ Insert element and tighten wing nut.
- ※ **Replace the primary element after 4 times cleanings.**

(2) Safety element

- ※ **Replace the safety element only when the primary element is cleaned for the 4 times.**
- ※ **Always replace the safety element. Never attempt to reuse the safety element by cleaning the element.**



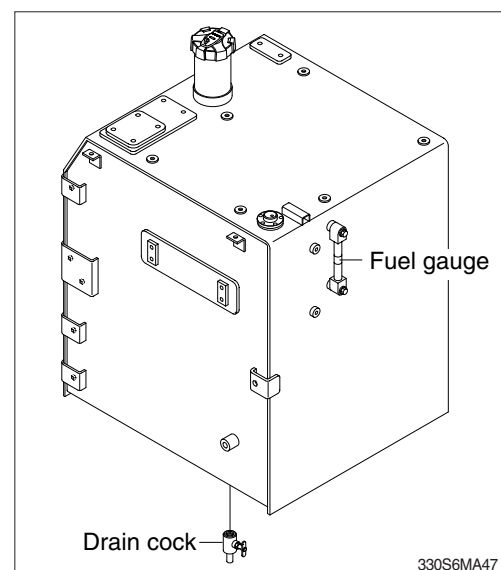
2907A6M122



300S6MA23

11) FUEL TANK

- (1) Fill fuel fully when system the operation to minimize water condensation, and check it with fuel gauge before starting the machine.
 - (2) Drain the water and sediment in the fuel tank by opening the drain cock.
 - ※ **Be sure to LOCK the cap of fuel tank.**
 - ※ **Remove the strainer of the fuel tank and clean it if contaminated.**
- ▲ **Stop the engine when refueling.**
All lights and flames shall be kept at a safe distance while refueling.



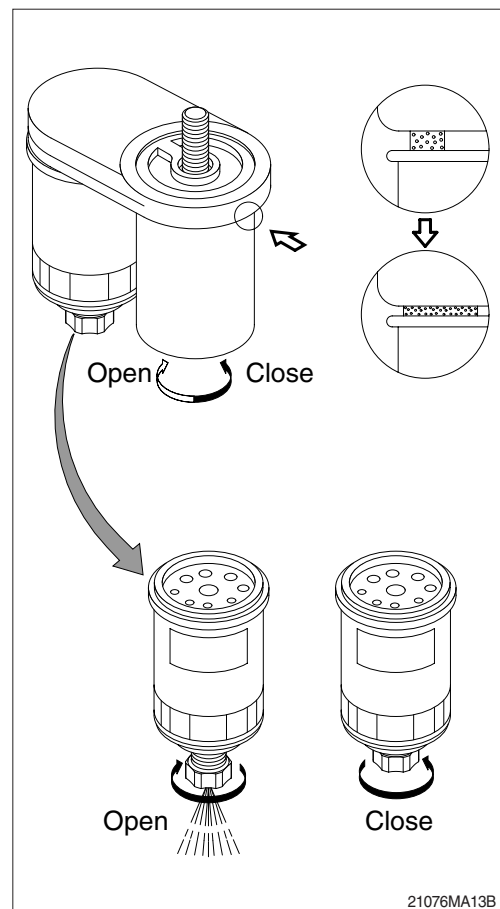
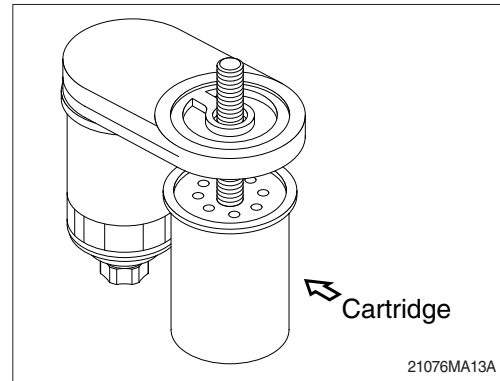
330S6MA47

12) REPLACEMENT OF FUEL FILTER

- (1) Clean around the filter head, remove the filter and clean the gasket surface.
 - Wrench size : 90~95 mm (3.5~3.8 in)
- (2) Replace the O-ring.
- (3) Fully fill fuel in the new filter.
- (4) Apply engine oil on the gasket of new filter when mounting, and tighten 3/4 to 1 turn more after the gasket touches the filter head.
- (5) Relieve the air after mounting.
 - ※ **Check for fuel leakage after the engine starts.**
 - ※ **If air is in the fuel system, the engine will not start, Start engine after bleeding the air according to the method of bleeding air.**

FUEL WATER SEPARATOR

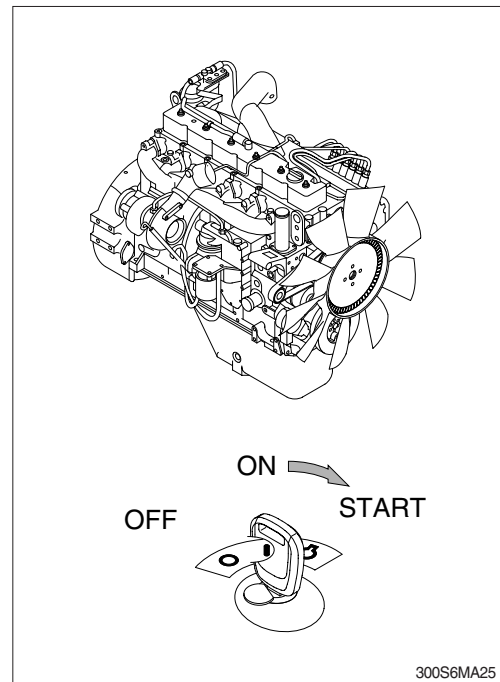
- Drain the water and sediment from the separator daily.
- Shut off the engine.
- Use your hand to open the drain valve.
- Turn the valve counterclockwise 4 complete turns until the valve drops down 1".
- Drain the filter sump of water until clear fuel is visible.
- ※ **Do not overtighten the valve.**
Overtightening can damage the threads.
- Push the valve up and turn the valve clockwise to close the drain valve.
- ※ **If more then 2 ozs is drained, refilling of the filter is required to prevent hard starting. Refer to low pressure lines and fuel filter venting clause 12)-(2).**



13) BLEEDING THE FUEL SYSTEM

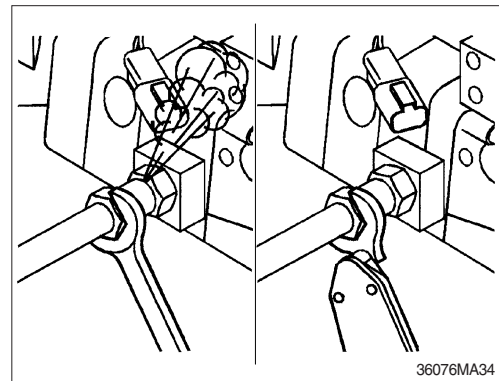
(1) Air in fuel

- ① The air bleed fitting on the fuel system creates a self bleeding system during replacement of the supply side components. High pressure fuel line removal and replacement will not require external bleeding to start the engine. The fuel pump will create high fuel pressure during cranking and purge the air in the high pressure side through the injectors.

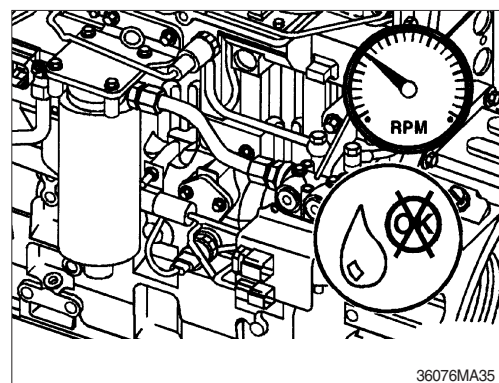


※ If an excessive amount of air has entered the system, the system will need to be bled.

- ② Loosen the fuel supply line at the pump. Run the electric fuel lift pump until the air has been bled. When all the air has been bled, tighten the fitting.



- ③ Supply line leaks from the lift pump to the fuel pump can be located by operating the lift pump or keyswitch cycling, to build pressure in the fuel lines. Inspect all lines and connections, as well as the fuel filter assembly, for an external fuel leak.

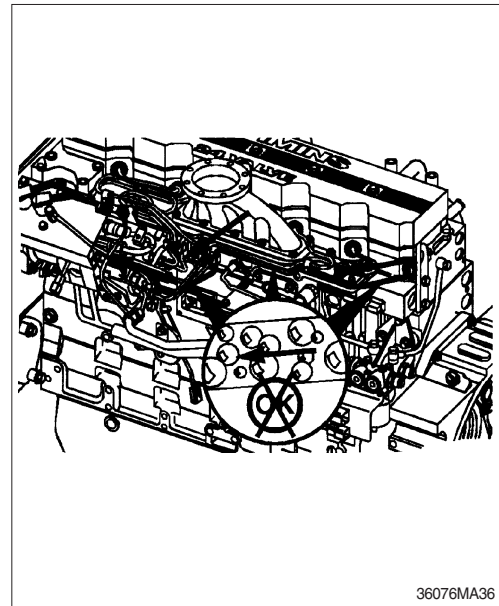


- ④ A stuck open injector can also blow combustion gas back into the pump and cause air to be present in the overflow.

If the engine seems to be misfiring or running rough, break all the injector supply lines loose at the pump end. Crank the engine and observe the lines. If combustion gas seems to be blowing back through the line, the injector is stuck open.

- ※ Use two wrenches when loosening the lines at the fuel pump, one to hold the delivery valve and one to loosen the line.

- Wrench size : 19 mm
- Tightening torque : 2.45 kgf·m (18 lbf·ft)



(2) Venting the high pressure lines

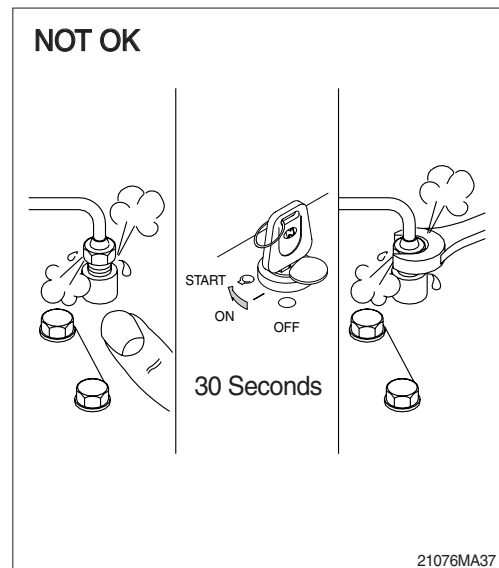
- ▲ The pressure of the fuel in the line is sufficient to penetrate the skin and cause serious bodily harm.

- ① Loosen the fittings at the cylinder head and crank the engine to allow entrapped air to bleed from the line. Tighten the fittings.

- Wrench size : 19mm
- Torque : 3.9 kgf·m (28 lbf·ft)

- ② Start the engine and vent one line at a time until the engine runs smoothly.

- ▲ Do not bleed a hot engine as this can cause fuel to spill onto a hot exhaust manifold, creating a danger of fire.



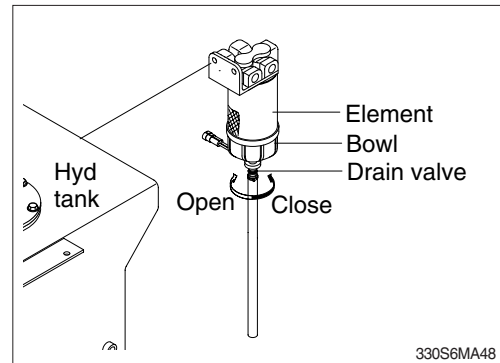
14) PREFILTER

- ※ Inspect or drain the collection bowl of water daily and replace the element every 500 hours.

(1) Drain water

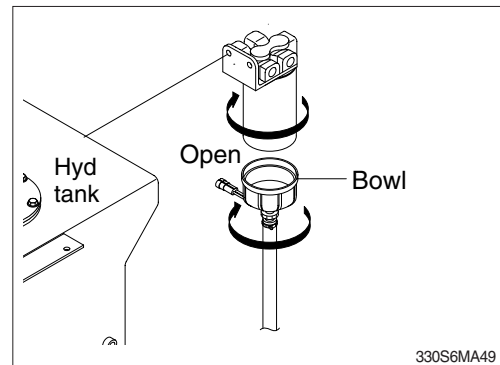
- ① Open bowl drain valve to evacuate water.
- ② Close drain valve.

- ※ **Don't tighten up a drain valve so strong.**
Please inspect and drain water frequently for remain water volume to be less than 1/3 volume of a collection bowl.

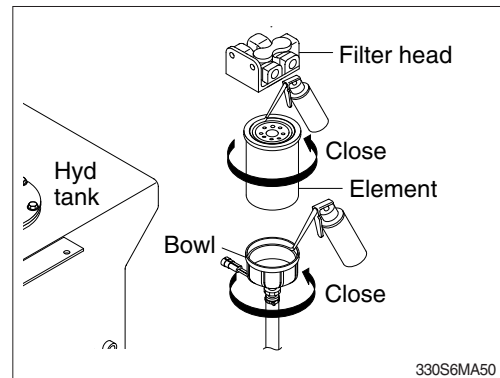


(2) Replace element

- ① Drain the unit of fuel. Follow "Drain water" instructions above.
 - ② Remove element and bowl from filter head.
- ※ **The bowl is reusable, do not damage or discard.**
- ③ Separate element from bowl. Clean bowl and seal gland.



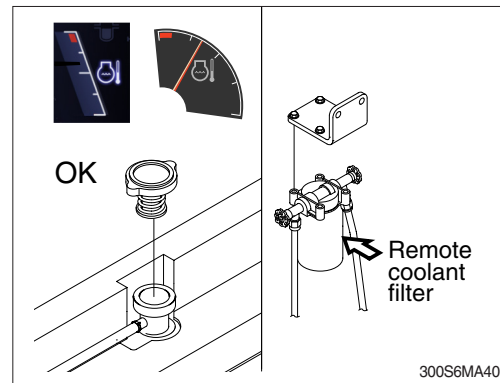
- ④ Lubricate new bowl seal with clean fuel or motor oil and place in bowl gland.
- ⑤ Attach bowl to new element firmly by hand.
- ⑥ Lubricate new element seal and place in element top gland.
- ⑦ Attach the element and bowl to the head.



16) COOLANT FILTER

⚠ Do not remove the radiator cap from a hot engine. Wait until the coolant temperature is below 50°C (120°F) before removing the radiator cap. Heated coolant spray or steam can cause personal injury

(1) Remove the radiator cap.

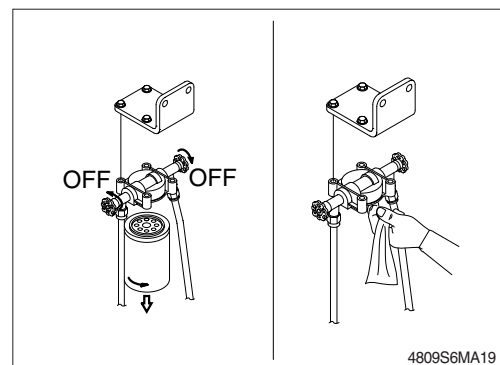


(2) Turn the valve to the OFF position.

(3) Remove and discard the filter.

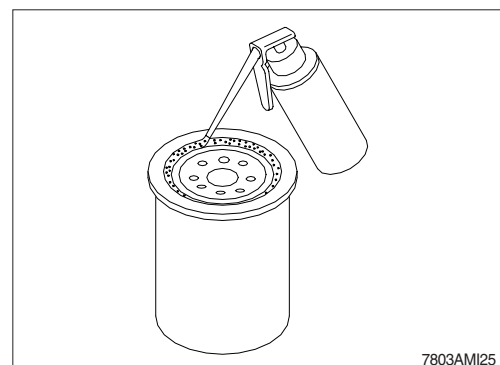
Clean the coolant filter head gasket's surface.

⚠ A small amount of coolant can leak when servicing the filter with the shutoff valve in the OFF position. To avoid personal injury, avoid contact with hot coolant.



(4) Apply a thin film of clean engine oil to the gasket sealing surface before installing a new filter.

※ If the filter canister is damaged in any way, do not use it. Dents or scrapes can lead to a rupture or premature failure of the filter.

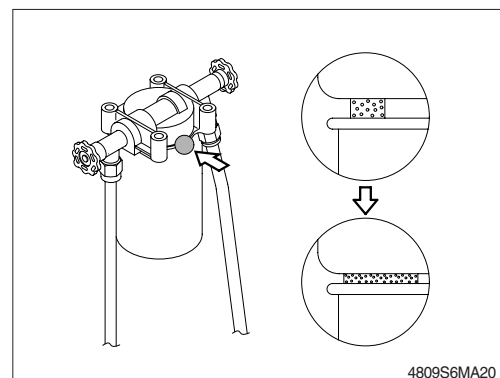


(5) Install a new filter on the filter head.

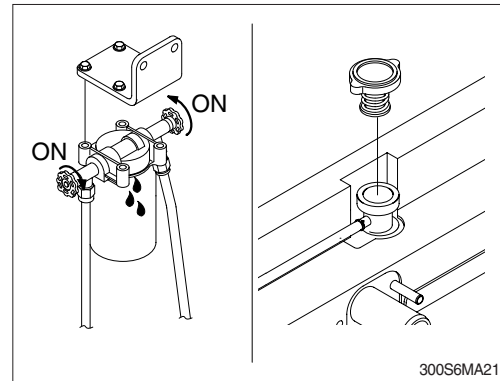
Tighten the filter until the gasket contacts the filter head surface.

(6) Tighten the filter an additional 1/2 to 3/4 of a turn.

※ Mechanical over tightening can distort the filter threads or damage the filter head.

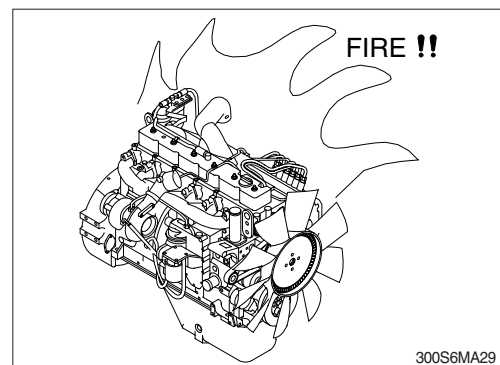


- (7) Turn the valve to the ON position, and install the radiator cap.
- (8) Operate the engine and check for leaks.
- ※ The valve must be in the ON position to prevent engine damage.



16) LEAKAGE OF FUEL

- ▲ Be careful and clean the fuel hose, injection pump, fuel filter and other connections as the leakage from these part can cause fire.

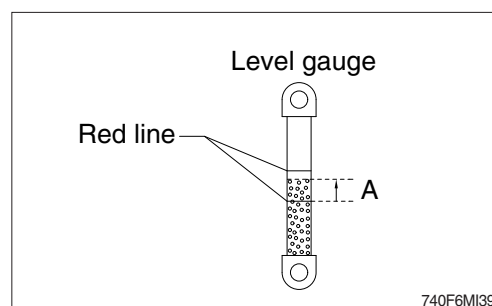
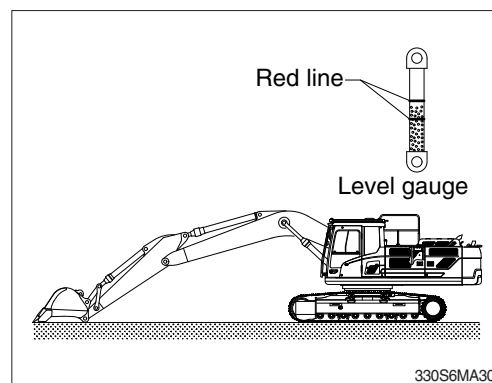


17) HYDRAULIC OIL CHECK

- (1) Position the machine as shown in the illustration on the right. Please stop the engine and wait for about 5 minutes.
- (2) Check the oil level at the level gauge of hydraulic oil tank.
- (3) The oil level is normal if the oil is between the red lines. The oil level depends on the temperature of the hydraulic oil. Refer to the height (A) in the below table to check the level gauge.

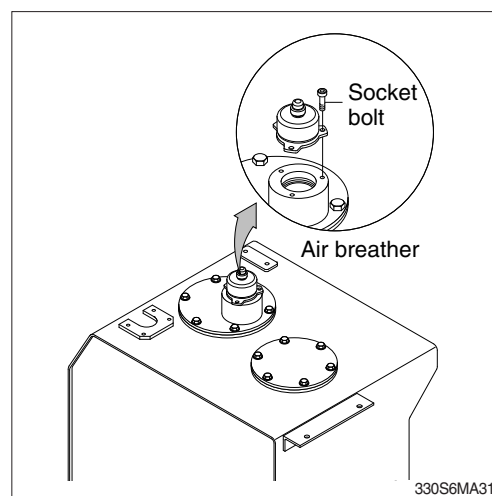
Temperature		Height A	
°C	°F	mm	inch
0	32	15	0.6
10	50	25	1.0
20	68	30	1.2
30	86	35	1.4
40	104	40	1.6

- ※ Refer to page 3-22 for checking the temperature of the hydraulic oil.
- ※ Add the hydraulic oil, if necessary.



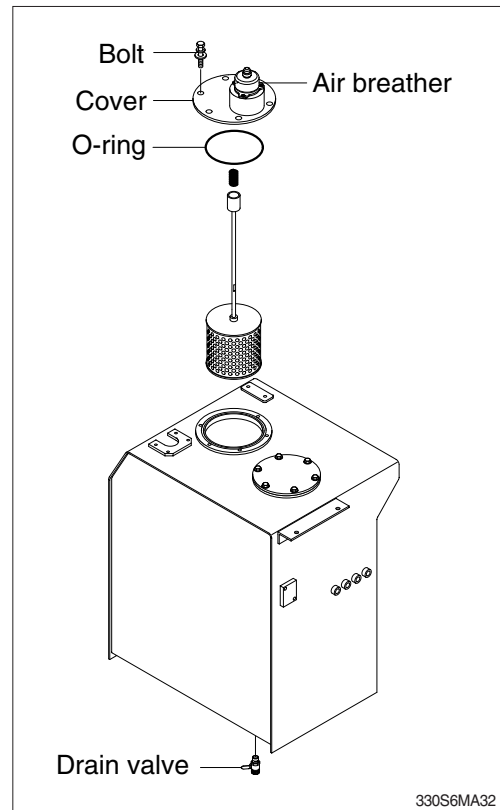
18) FILLING HYDRAULIC OIL

- (1) Stop the engine to the position of level check.
- (2) Relieve the pressure in the tank by pushing the top of the air breather.
- (3) Loosen the socket bolts and remove the air breather on the top of oil tank and fill the oil to the specified level.
 - Tightening torque : $4.05 \pm 0.8 \text{ kgf} \cdot \text{m}$
($29.3 \pm 5.8 \text{ lbf} \cdot \text{ft}$)
- (4) Start engine after filling and operate the work equipment several times.
- (5) Check the oil level at the level check position after engine stops.



19) CHANGE HYDRAULIC OIL

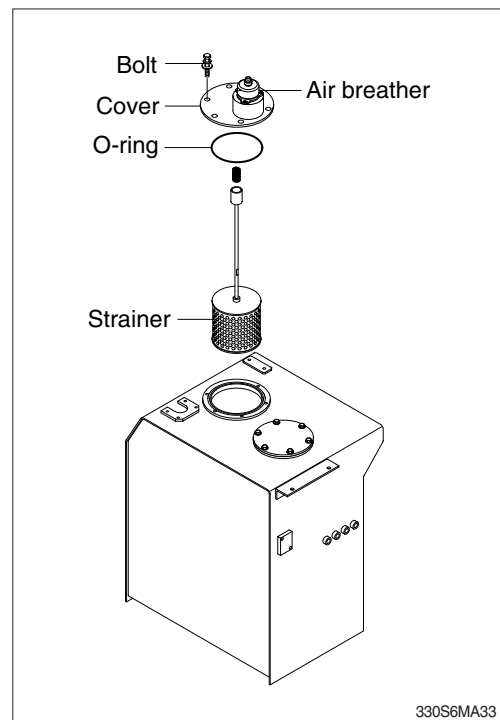
- (1) Lower the bucket on the ground pulling the arm and bucket cylinder to the maximum.
- (2) Relieve the pressure in the tank by pushing the top of the air breather.
- (3) Remove the cover.
 - Tightening torque : $6.9 \pm 1.4 \text{ kgf} \cdot \text{m}$
($50 \pm 10 \text{ lbf} \cdot \text{ft}$)
- (4) Prepare a suitable container.
- (5) To drain the oil open the drain valve at the bottom of the oil tank.
- (6) Fill proper amount of recommended oil.
- (7) Put the breather in the right position.
- (8) Bleed air hydraulic pump loosen the air breather at top of hydraulic pump assembly.
- (9) Start engine and run continually. Release the air by full stroke of each control lever.



20) CLEAN SUCTION STRAINER

Clean suction strainer as follows paying attention to the cause to be kept during oil filling.

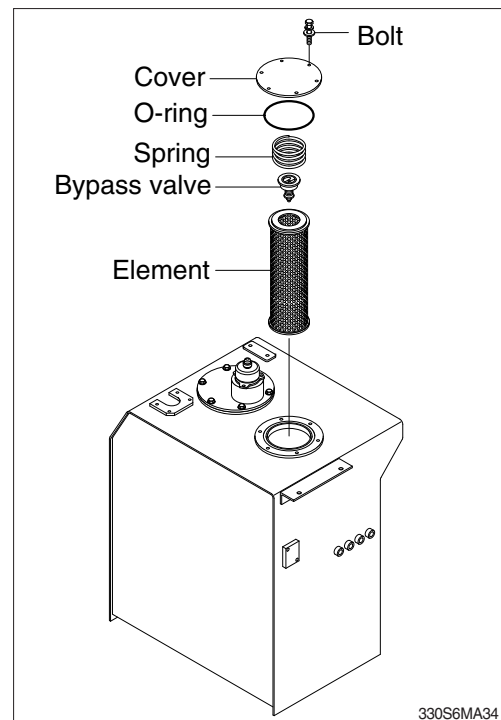
- (1) Remove the cover.
 - Tightening torque : $6.9 \pm 1.4 \text{ kgf} \cdot \text{m}$
($50 \pm 10 \text{ lbf} \cdot \text{ft}$)
 - (2) Pull out the strainer in the tank.
 - (3) Wash the foreign material on the suction strainer with gasoline or cleaning oil.
 - (4) Replace the suction strainer if it is damaged.
 - (5) Assemble with reverse order of disassembly.
Be sure to install a new O-ring and reinsert in the oil tank.
- ※ Loosen the bolt slowly at the cover can be spring out by the spring when removing it.



21) REPLACEMENT OF RETURN FILTER

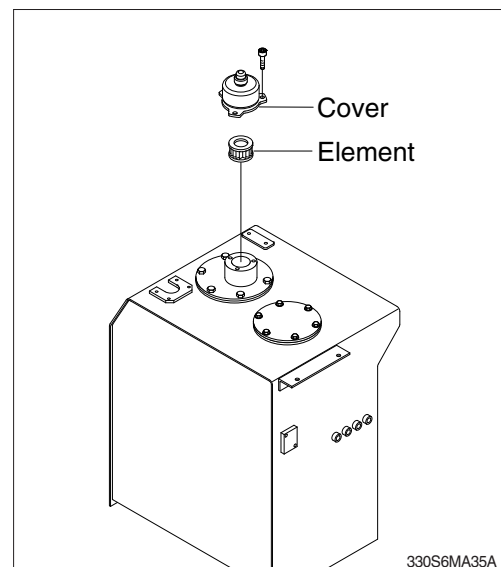
Replace as follows paying attention to the cause to be kept during the replacement.

- (1) Remove the cover.
 - Tightening torque : $6.9 \pm 1.4 \text{ kgf} \cdot \text{m}$
($50 \pm 10 \text{ lbf} \cdot \text{ft}$)
- (2) Remove the spring, by-pass valve and return filter in the tank.
- (3) Replace the element with new one.



22) REPLACEMENT OF ELEMENT IN HYDRAULIC TANK BREATHER

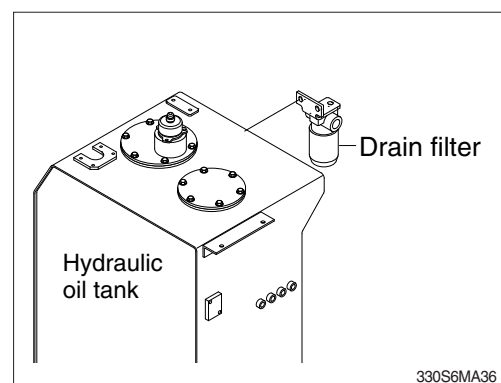
- (1) Relieve the pressure in the tank by pushing the top of the air breather.
- (2) Loosen the bolt and remove the cover.
- (3) Pull out the filter element.
- (4) Replace the filter element new one.
- (5) Reassemble by reverse order of disassembly.
 - Tightening torque : $0.8 \sim 1.0 \text{ kgf} \cdot \text{m}$
($5.9 \sim 7.4 \text{ lbf} \cdot \text{ft}$)



23) REPLACE OF DRAIN FILTER CARTRIDGE

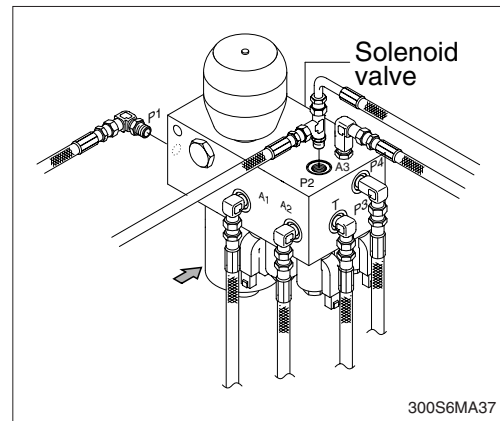
Clean the dust around filter and replace with new one after removing the cartridge.

- ※ Tighten about 2/3 turn more after the gasket of cartridge contacts seal side of filter body for mounting.
- ※ Change cartridge after initial 250 hours of operation. Thereafter, change cartridge every 1000 hours.



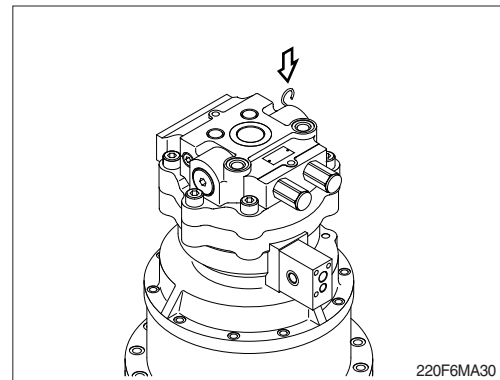
24) REPLACE OF PILOT LINE FILTER

- (1) Loosen the nut positioned on the filter body.
 - (2) Pull out the filter element and clean filter housing.
 - (3) Install the new element and tighten using specified torque.
- ※ Change cartridge after initial 250 hours of operation. Thereafter, change cartridge every 1000 hours.



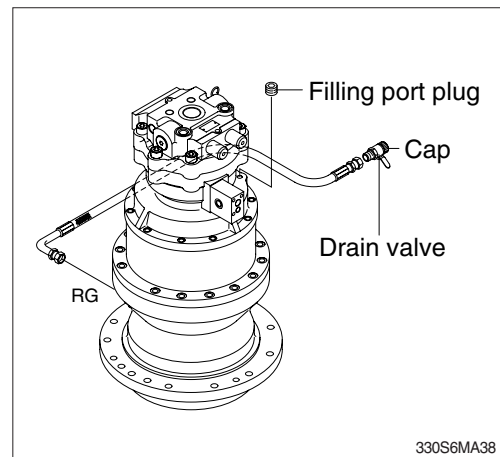
25) CHECK THE SWING REDUCTION GEAR OIL

- (1) Pull out the dipstick and clean it.
- (2) Insert it again.
- (3) Pull out one more time to check the oil level and fill the oil if the level is not sufficient.



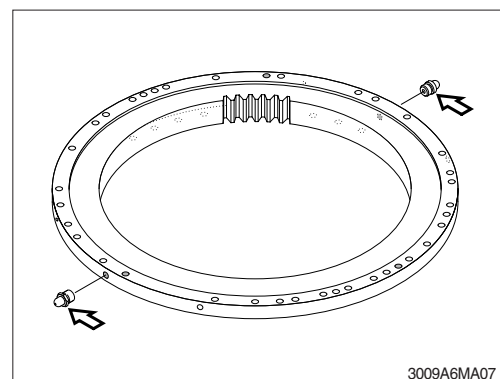
26) CHANGE SWING REDUCTION GEAR OIL

- (1) Raise the temperature of oil by swinging the machine before replace the oil and park the machine on the flat ground.
 - (2) Prepare a proper container.
 - (3) Open the cap and loosen the drain valve.
 - (4) Clean around the valve and close the drain valve and cap.
- Fill proper amount of recommended oil.
- Amount of oil : 6.2 ℓ (1.6 U.S.gal)



27) LUBRICATE SWING BEARING

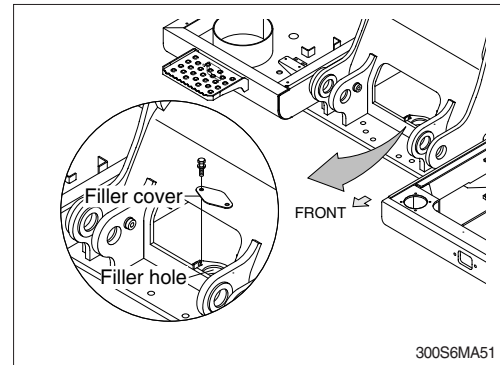
- (1) Grease at 2 fitting.
- ※ Lubricate every 250 hours..



28) SWING GEAR AND PINION

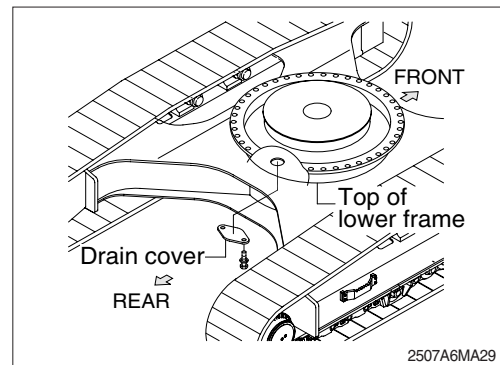
(1) Drain old grease

- ① Remove under cover of lower frame.
- ② Remove drain cover of lower frame.
- ③ Remove filler cover of upper frame.
- ④ Operate full turn (360°) of swing several times.



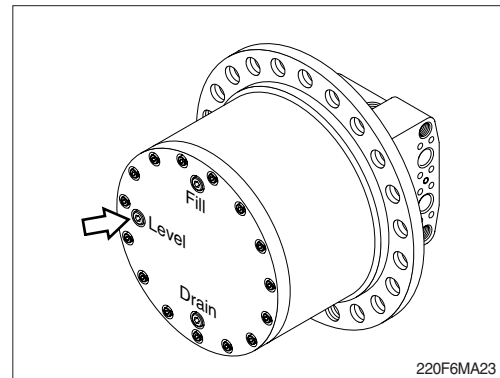
(2) Refill new grease

- ① Install drain cover.
 - ② Fill with new grease.
 - ③ Install filler cover.
- Capacity : 11.4 kg (25.1 lb)



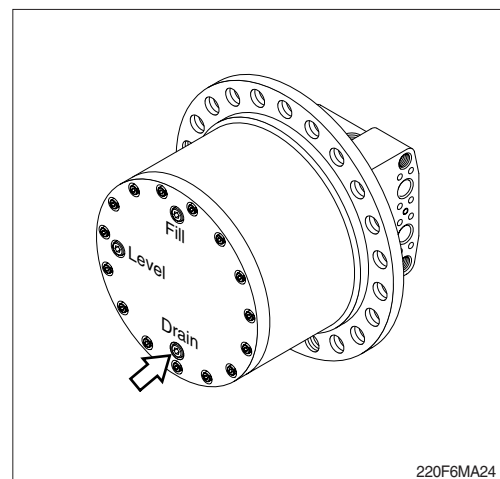
29) CHECK THE TRAVEL REDUCTION GEAR OIL

- (1) Operate the machine to the position of drain plug down to the flat ground.
 - (2) Loosen the level plug and check the oil level.
If the level is at the hole of the plug, it is normal.
Fill the oil if it is not sufficient.
- Amount of oil : 7.8 ℓ (2.1 U.S.gal)



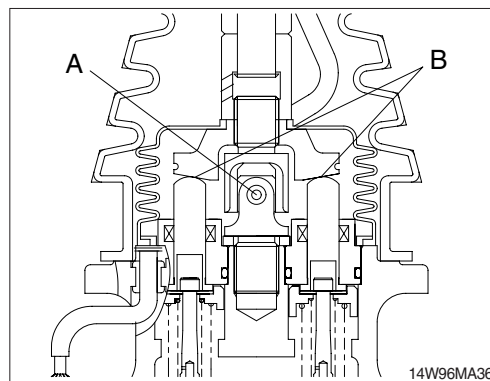
30) CHANGE OF THE TRAVEL REDUCTION GEAR OIL

- (1) Raise the temperature of the oil by traveling machine first.
- (2) Stop when the position of the drain plug is down.
- (3) Loosen the level plug and then the drain plug.
- (4) Drain the oil to adequate container.
- (5) Tighten the drain plug and fill specified amount of oil at filling port.
- (6) Tighten the level plug and travel slowly to check if there is any leakage of oil.



31) LUBRICATE RCV LEVER

Remove the bellows and with a grease gun grease the joint part (A) and sliding parts (B).



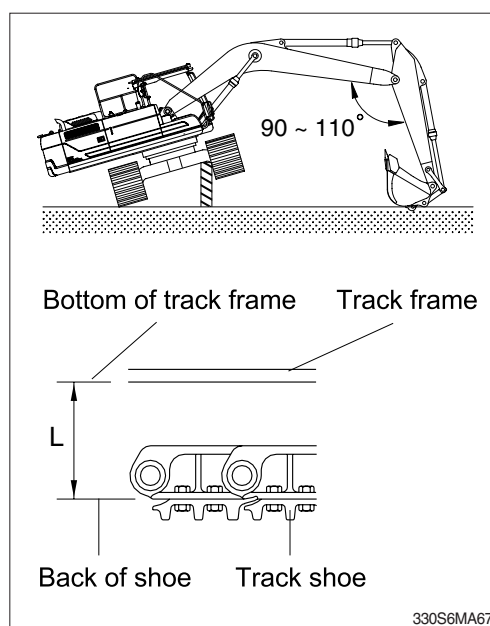
32) ADJUSTMENT OF TRACK TENSION

※ It is important to adjust the tension of track properly to extend the lifetime of track and traveling device.

※ The wear of pins and bushings on the undercarriage will vary with the working conditions and soil properties.

It is thus necessary to continually inspect the track tension so as to maintain the standard tension on it.

- (1) Raise the chassis with the boom and arm.
 - (2) Measure the distance between bottom of track frame on track center and track of shoe.
- ※ Remove mud with rotating the track before measuring.



- (3) If the tension is tight, drain the grease in the grease nipple and if the tension is loose, charge the grease.

▲ Personal injury or death can result from grease under pressure.

▲ Unscrew the grease nipple after release the tension by pushing the poppet only when necessarily required.

Grease leaking hole is not existing. So, while unscrew the grease nipple, grease is not leaking until the grease nipple is completely coming out. If the tension is not released in advance, the grease nipple can be suddenly popped out by pressurized grease.

※ When the grease is drained, move the track to the forward and backward slightly.

If the track tension is loose even after the grease is charged to the maximum, change the pins and bushings as there are worn seriously.

Length (L)	
360~390 mm	14.2~15.5"

33) REPLACEMENT OF BUCKET

△ When knocking the pin in with a hammer, metal particles may fly and cause serious injury, particularly if they get into your eyes. When carrying out this operation, always wear goggles, helmet, gloves, and other protective equipment.

- ※ When the bucket is removed, place it in a stable condition.
- ※ When performing joint work, make sure signals to each other and work carefully for safety's sake.

(1) Lower the bucket on the ground as the picture shown in the right.

(2) Lock the safety knob to the LOCK position and stop the engine.

(3) Remove the stopper bolts(1) and nuts(2), then remove pins(3, 4) and remove the bucket.

※ When removing the pins, place the bucket so that it is in light contact with the ground.

※ If the bucket is lowered strongly to the ground, the resistance will be increased and it will be difficult to remove the pins.

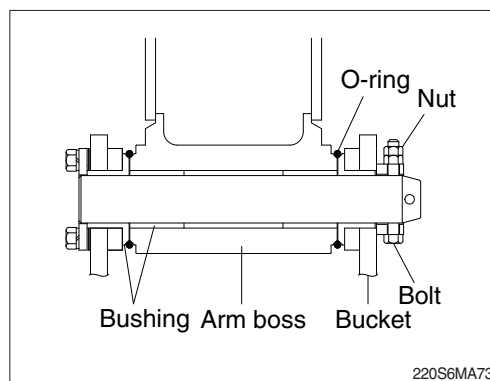
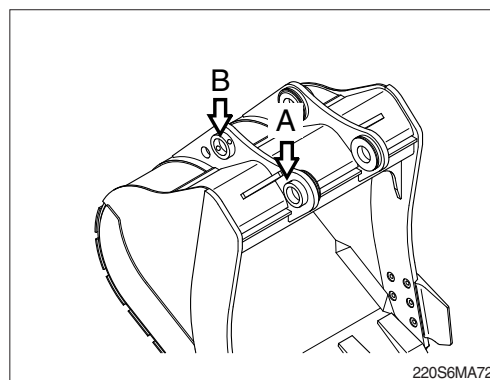
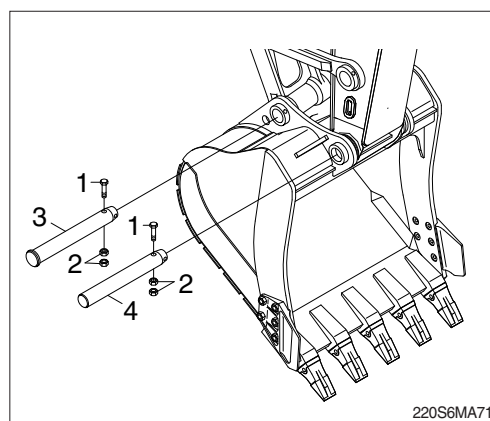
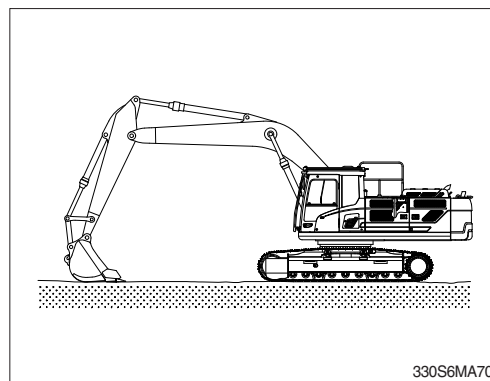
※ After remove the pins, make sure that they do not become contaminated with sand or mud and that the seals of bushing on both sides do not become damaged.

(4) Align the arm with holes (A) and the link with holes (B), then coat with grease and install pins (3, 4)

※ When installing the bucket, the O-rings are easily damaged, so fit the O-rings on the boss of the bucket as shown in the picture. After knocking the pin, move the O-ring down to the regular groove.

(5) Install the stopper bolt (1) and nuts (2) for each pin, then grease the pin.

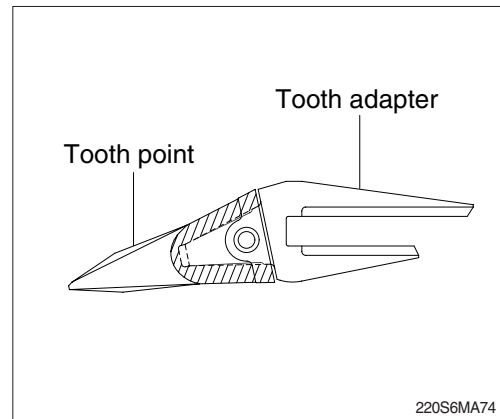
- Tightening torque : $29.7 \pm 4.5 \text{ kgf} \cdot \text{m}$
($215 \pm 32.5 \text{ lbf} \cdot \text{ft}$)



34) REPLACEMENT OF BUCKET TOOTH

(1) Timing of replacement

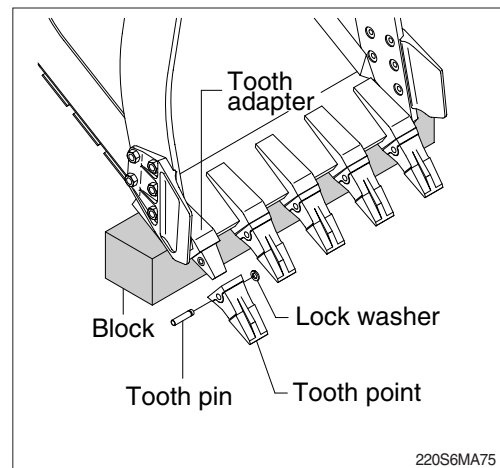
- ① Check wearing condition as shown in the illustration and replace tooth point before adapter starts to wear.
- ② If excessive use, tooth adapter has worn out, replacement may become impossible.



(2) Instructions for replacement

- ① Pull out pin by striking pin with punch or hammer, avoiding damage to lock washer.
- ② Remove dust and mud from surface of tooth adapter by using knife.
- ③ Place lock washer in its proper place, and fit tooth tip to adapter.
- ④ Insert pin until lock washer is positioned at tooth point groove.

- ▲ Personal injury can result from bucket falling.
- ▲ Block the bucket before changing tooth points or side cutters.



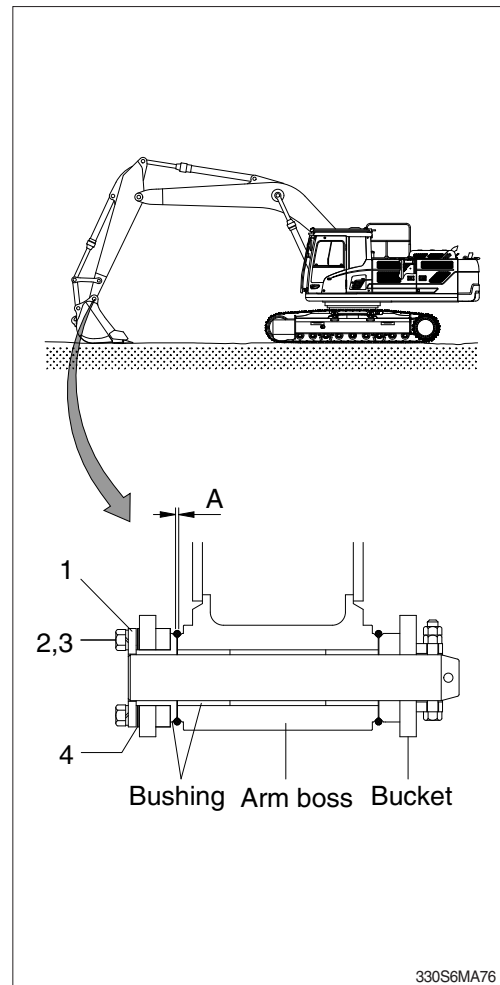
35) ADJUSTMENT OF BUCKET CLEARANCE

- (1) Lower the bucket on the ground as the picture shown in the right.
- (2) Swing to the right and keep the arm boss to be contact to the bucket left.
- (3) Lock the safety knob to the LOCK position and stop the engine.
- (4) Measure the clearance (A) between bucket and arm boss. This is the total clearance.

(5) Adjusting

- ① Loosen bolt (2), and remove washer (3), plate (1) and shim (4).
- ② Remove the shim equivalent value with measuring value.
- ③ Assemble the parts in the reverse order of removal.
 - Tightening torque : $29.6 \pm 3.2 \text{ kgf} \cdot \text{m}$
($214.0 \pm 23.1 \text{ lbf} \cdot \text{ft}$)
 - Normal clearance : $0.5 \sim 1.0 \text{ mm}$
($0.02 \sim 0.04 \text{ in}$)

※ If the bucket is not adjusted correctly, noise and vibration created during operation, and damaged O-ring, pin and bushing quickly.



36) LUBRICATE PIN AND BUSHING

(1) Lubricate to each pin of working device

Lubricate the grease to the grease nipple according to the lubricating interval.

No.	Description	Qty
1	Lubrication manifold at boom	5
2	Boom cylinder pin (head)	2
3	Lubrication manifold at arm	3
4	Bucket cylinder pin (rod)	1
	Bucket link (control rod)	2
	Arm and bucket connection pin	1
	Bucket and control rod connection pin	1
	Arm and control link connection pin	1
5	Boom rear bearing center ★	1

※ Shorten lubricating interval when working in water or dusty places.

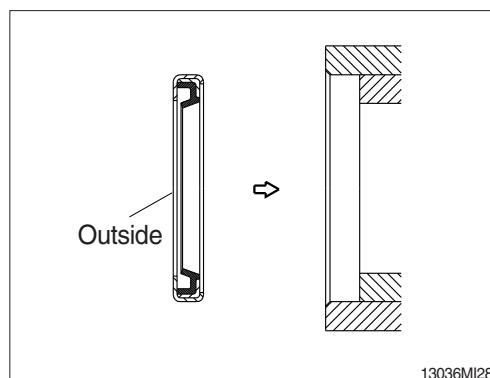
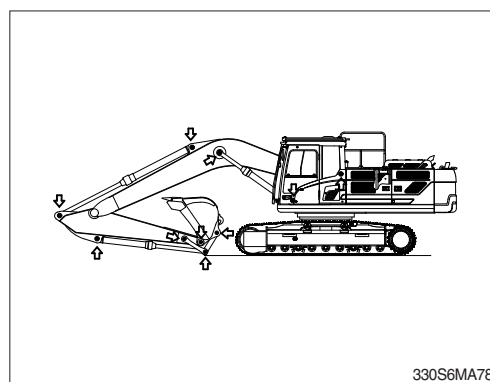
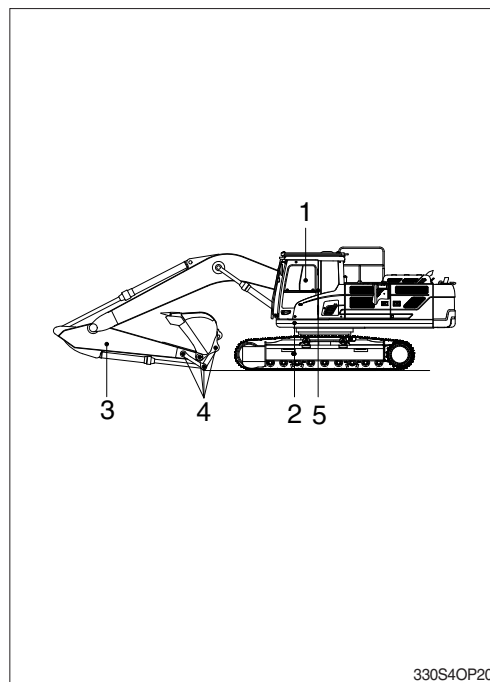
★ Not required : If necessary, lubricate the grease.

(2) Dust seals are mounted on the rotating part of working device to extend the lubricating interval.

※ Mount the lip to be faced outside when replace the dust seal.

※ If it is assembled in wrong direction, it will cause fast wear of pin and bushing, and create noise and vibration during operation.

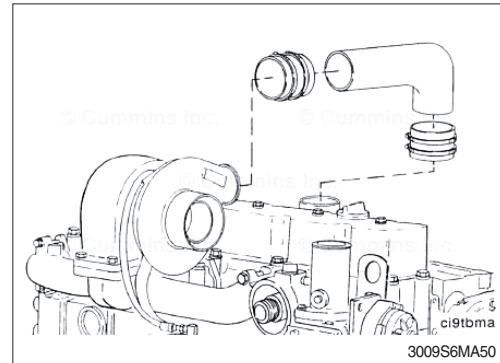
※ Assemble the seal same direction with picture and use with plastic hammer when replace.



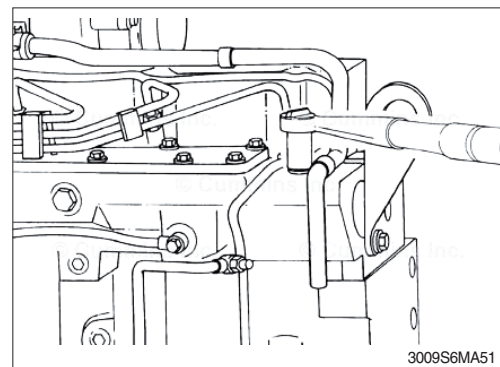
37) OVERHEAD SET ADJUSTMENT

This procedures are performed at the repair shop.

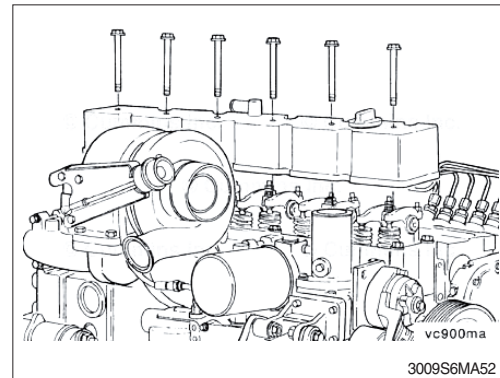
- (1) Remove the air crossover tube from the engine if equipped.



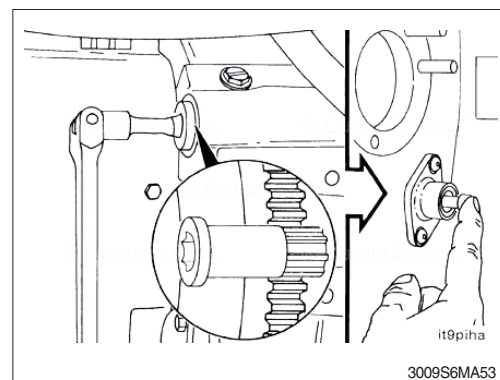
- (2) Disconnect the support clamps, hose clamp and wastegate sensing line. Remove the crankcase vent tube and any other parts that would prevent removal of the valve cover.



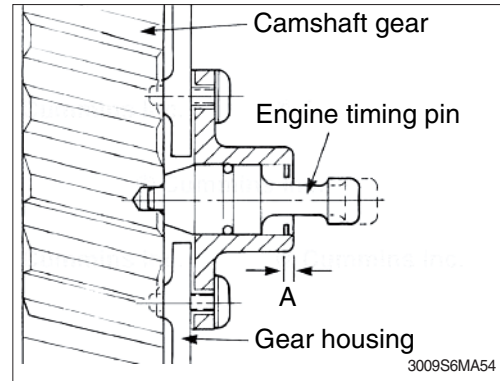
- (3) Remove valve cover.



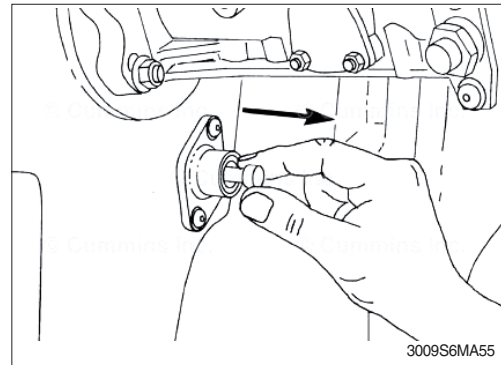
- (4) Locate top dead center for cylinder number 1 by rotating the crankshaft slowly while pressing on the engine timing pin.
- (5) The barring gear inserts into the flywheel housing and engages the flywheel ring gear. The engine can then be rotated by hand using a 127 mm (1/2 in) ratchet or breaker bar.



- (6) When the engine timing pin center engages the hole in the camshaft gear, cylinder number 1 is at top dead center on the compression stroke.



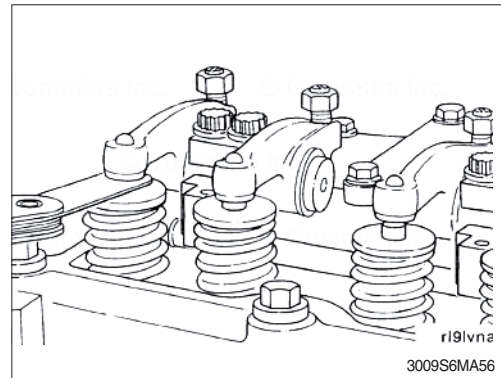
- ※ Be sure to disengage the engine timing pin after locating top dead center to prevent damage to the engine timing pin.



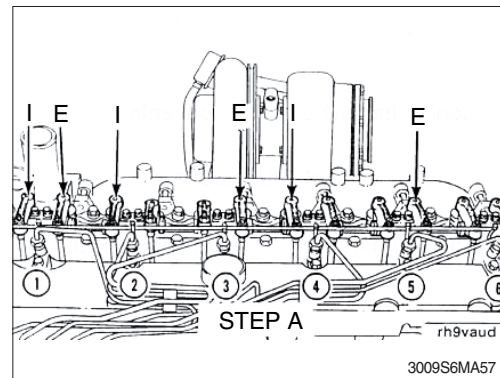
- (7) Check/set valves with engine cold-below 60°C (140°F).

- Intake clearance : 0.30 mm (0.012 in)
- Exhaust clearance : 0.61 mm (0.024 in)

- ※ The clearance is correct when some resistance is "felt" when the feeler gauge is slipped between the valve stem and the rocker lever.

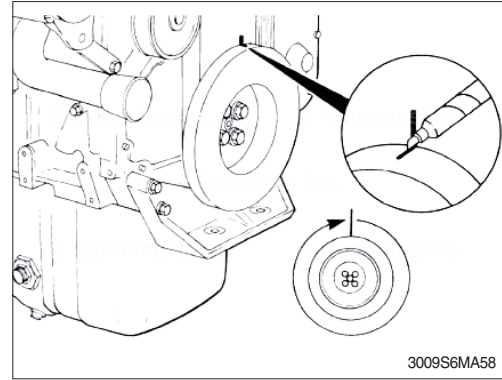


- (8) Locate top dead center for cylinder number 1.
- (9) Check/adjust the valves indicated for STEP A (I=intake, E=exhaust).
- (10) After tightening the rocker lever locknut, check the valve clearance to make sure the valve clearance has not changed.
- Tightening torque : 2.45 kgf·m (18 lbf·ft)



※ Be sure the engine timing pin disengage to prevent damage to the engine timing pin.

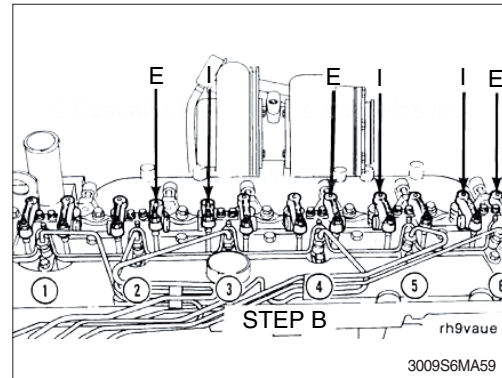
- (11) Mark vibration damper and rotate the crankshaft 360 degrees.



- (12) Set the valves indicated for STEP B.

- (13) After tightening the rocker lever locknut, check the valve clearance to make sure the valve clearance has not changed.

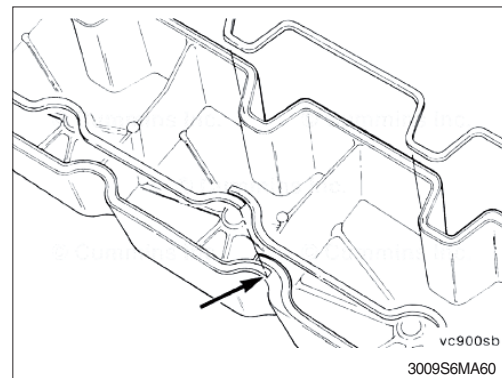
· Tightening torque : 2.45 kgf·m (18 lbf·ft)



※ If the seal is not damaged, it can be used again.
If the seal is damaged, install a new seal.

- (14) Install the rubber seal into the groove in the valve cover.

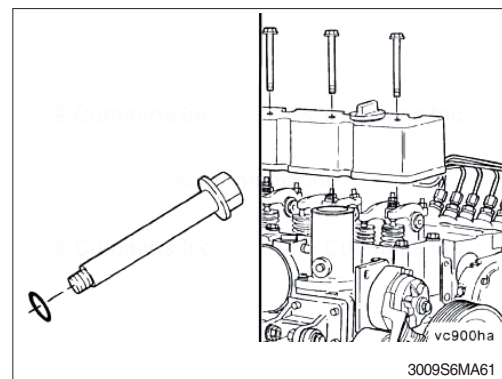
Start the installation at the overlap area shown in the illustration. Do not stretch the rubber seal.
If the seal has more overlap than shown in the illustration, trim the length to provide the correct overlap.



- (15) Install new sealing O-rings on the capscrews.

- (16) Install the valve cover and wastegate sensing tube.

· Tightening torque : 2.45 kgf·m (18 lbf·ft)

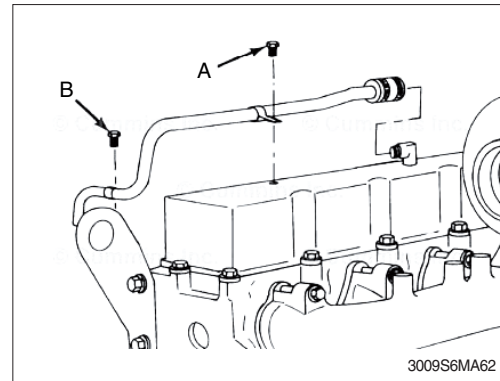


(17) Install the crankcase vent tube, and secure with the support clamps and hose clamp.

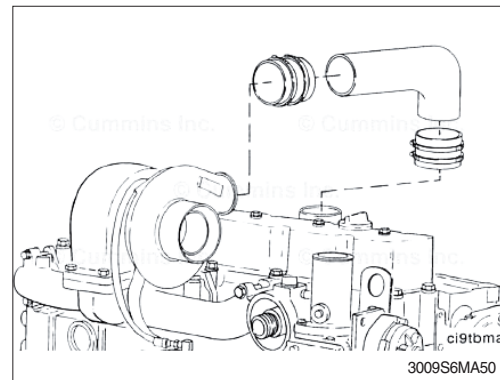
· Tightening torque

- A = 2.45 kgf·m (18 lbf·ft)

- B = 4.38 kgf·m (31.7 lbf·ft)



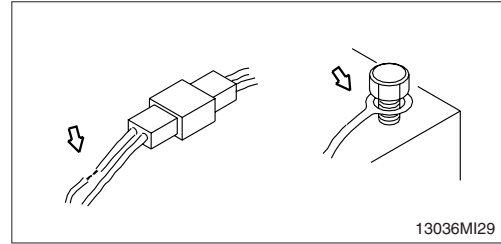
(18) Install the air crossover tube and any other parts previously removed to gain access to the valve cover.



7. ELECTRICAL SYSTEM

1) WIRING, GAUGES

Check regularly and repair loose or malfunctioning gauges when found.



2) BATTERY

(1) Clean

- ① Wash the terminal with hot water if it is contaminated, and apply grease to the terminals after washing.

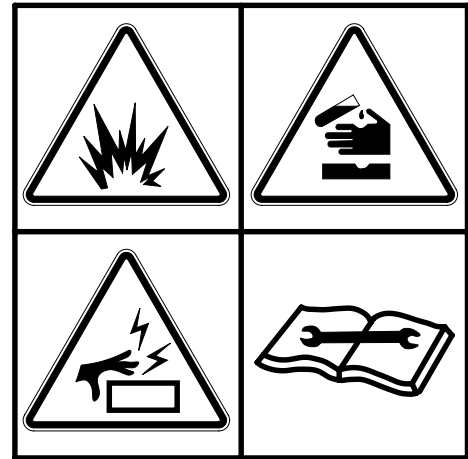
⚠ **Battery gas can explode. Keep sparks and flames away from batteries.**

⚠ **Always wear protective glasses when working with batteries.**

⚠ **Do not stain clothes or skin with electrolyte as it is acid.**

Be careful not to get the electrolyte in eyes.

Wash with clean water and go to the doctor if it enters the eyes.



36070FW05

(2) Recycle

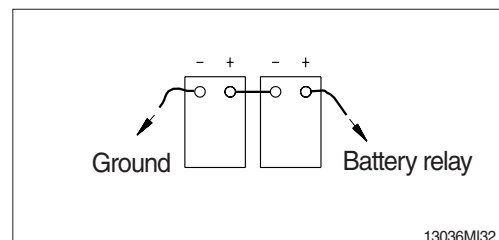
Never discard a battery.

Always return used batteries to one of the following locations.

- A battery supplier
- An authorized battery collection facility
- Recycling facility

(3) Method of removing the battery cable

Remove the cable from the ground connection first (⊖ terminal side) and reconnect it last when reassembling.



3) STARTING THE ENGINE WITH A BOOSTER CABLE

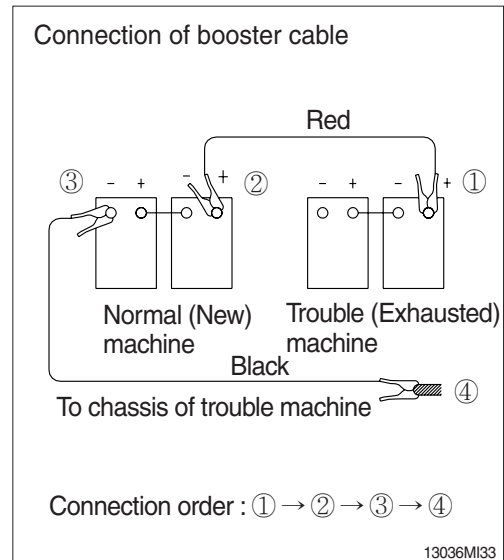
Keep following order when you are going to start engine using booster cable.

(1) Connection of booster cable

※ **Use the same capacity of battery for starting.**

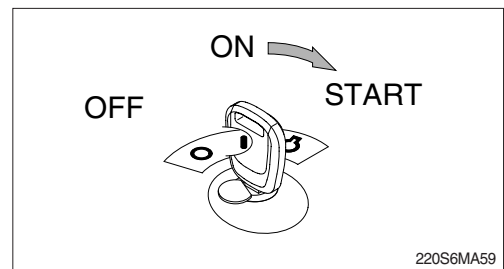
- ① Make sure that the starting switches of the normal machine and trouble machine are both at the OFF position.
- ② Connect the red terminal of booster cable to the battery (+) terminal between exhausted and new battery.
- ③ Connect the black terminal of the booster cable between new battery (-) terminal and chassis of trouble machine.

※ **Keep firmly all connection, the spark will be caused when connecting finally.**



(2) Starting the engine

- ① Starting the engine of the normal machine and keep it to run at high idle.
- ② Start engine of the trouble machine with starting switch.
- ③ If you can not start it by one time, restart the engine after 2 minutes.



(3) Taking off the booster cable

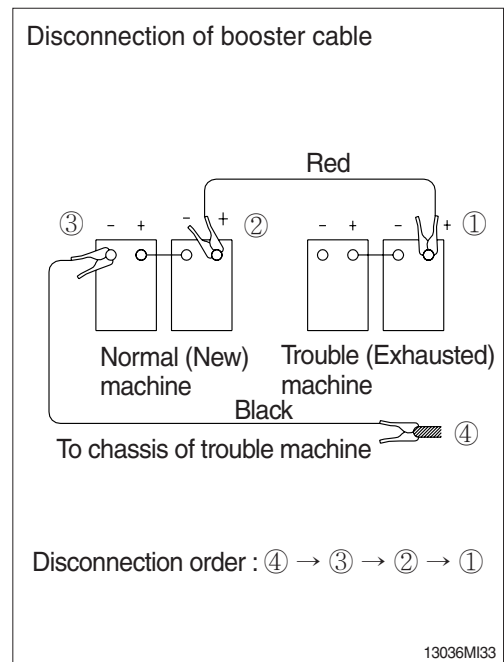
- ① Take off the booster cable (black).
- ② Take off the booster cable (red) connected to the (+) terminal.
- ③ Run engine with high idle until charging the exhausted battery by alternator, fully.

▲ **Explosive gas is generated while using the battery or charging it. Keep away flame and be careful not to cause the spark.**

※ **Charge the battery in the well ventilated place.**

※ **Place the machine on the earth or concrete. Avoid charging the machine on the steel plate.**

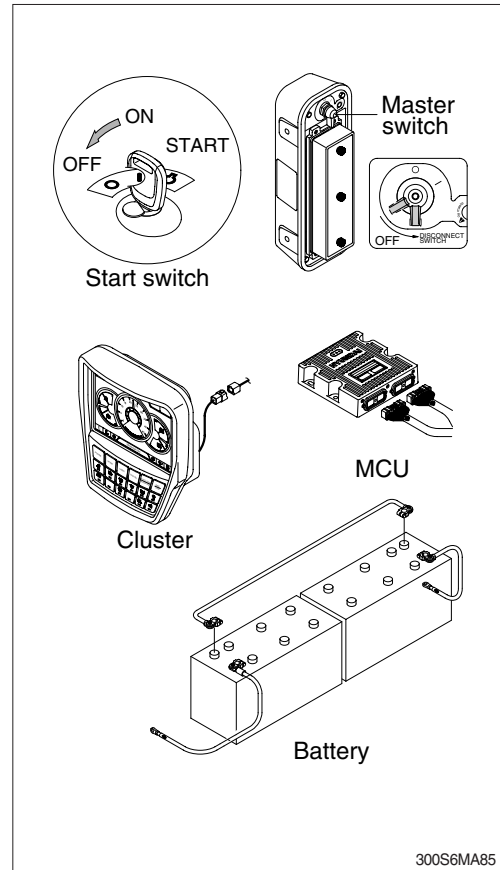
※ **Do not connect (+) terminal and (-) terminal when connecting booster cable because it will be shorted.**



(4) Welding repair

Before start to welding, follow the below procedure.

- ① Shut off the engine and remove the starting switch.
 - ② Disconnect ground cable from battery by master switch.
 - ③ Before carrying out any electric welding on the machine, the battery cables should be disconnected and the connectors pulled out of the electronic control units (MCU, cluster etc).
 - ④ Connect the earth (ground) lead of the welding equipment as close to the welding point as possible.
- ※ Do not weld or flame cut on pipes or tubes that contain flammable fluids. Clean them thoroughly with nonflammable solvent before welding or flame cutting on them.
- ▲ Do not attempt to welding work before carry out the above.
If not, it will caused serious damage at electric system.

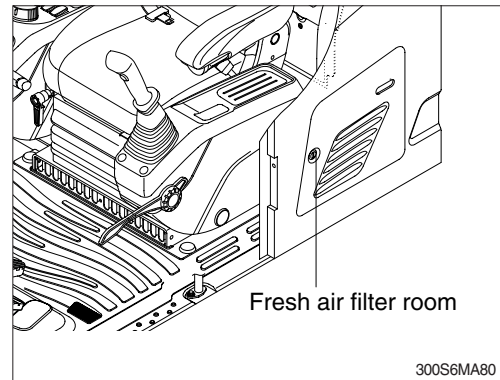


8. AIR CONDITIONER AND HEATER

1) CLEAN AND REPLACE OF FRESH AIR FILTER

※ **Always stop the engine before servicing.**

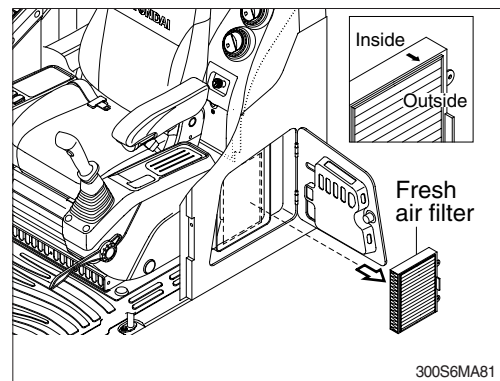
- (1) Open the fresh air filter room.



- (2) Remove the fresh air filter.

※ **When installing a filter, be careful not to change the filter direction.**

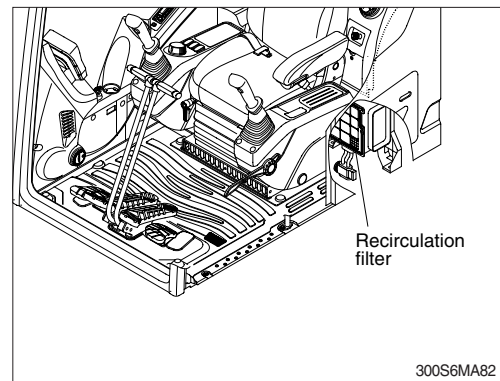
- (3) If filter is damaged or badly contaminated, use a new filter.



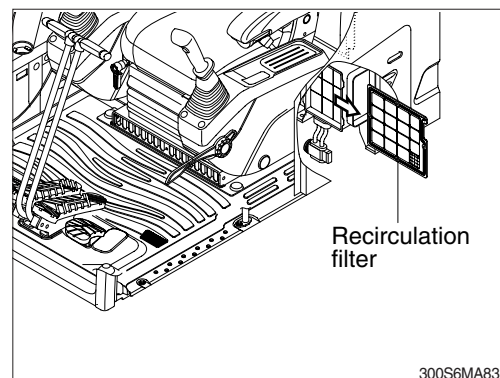
2) CLEAN AND REPLACE OF RECIRCULATION FILTER

※ **Always stop the engine before servicing.**

- (1) Move seat and console box to arrow direction using the adjust knob.



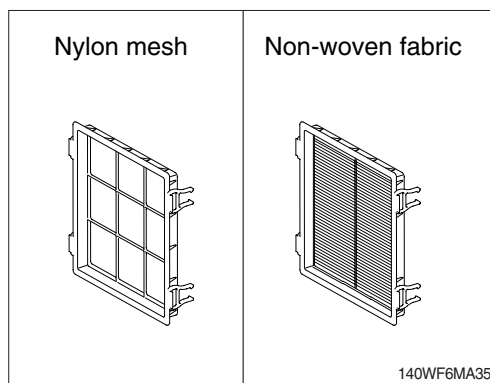
- (2) Remove recirculation filter.



(3) Check the recirculation filter type.

(4) Non-woven fabric type (if equipped)

- If filter is damaged or badly contaminated, use a new filter.

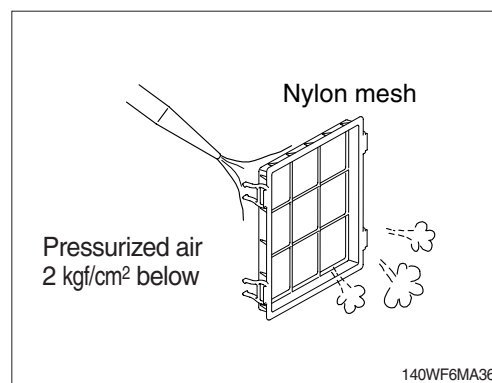


(5) Clean the recirculation filter using a pressurized air (below 2 kgf/cm², 28 psi) or washing with water.

△ **When using pressurized air, be sure to wear safety glasses.**

※ **Dry off after washing with water.**

(6) Inspect the filter after cleaning. If it is damaged or badly contaminated, use a new filter.



3) PRECAUTIONS FOR USING AIR CONDITIONER

(1) When using the air conditioner for a long time, open the window once every one hour.

(2) Be careful not to overcool the cab.

(3) The cab is properly cooled if the operator feels cool when entering there from outside (about 5°C lower than the outside temperature).

(4) When cooling, change air occasionally.

4) CHECK DURING SEASON

Ask the service center for replenishment of refrigerant or other maintenance service so that the cooling performance is not damaged.

5) CHECK DURING OFF-SEASON

Operate the air conditioner 2 or 3 times a month (each for a few minutes) to avoid loss of oil film in the compressor.