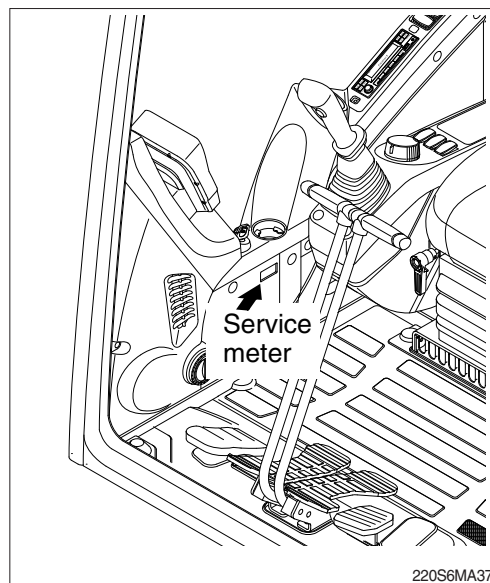


1. INSTRUCTION

1) INTERVAL OF MAINTENANCE

- (1) Inspect and service machine as described on page 4-10.
- (2) Shorten intervals of inspection and service depending on site conditions. (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 100 hours, carry out all the maintenance 「Each 100 hours, each 50 hours and daily service」 at the same time.



2) PRECAUTION

- (1) Do not perform maintenance on the machine until you have read the operator's manual and are familiar with the machine.
- (2) Daily inspection should be performed according to section, Maintenance check list.
- (3) Engine and hydraulic components have been preset from the factory.
Do not allow unauthorized personnel to reset them.
- (4) Drain the used oil and coolant (always in separate containers). Handle and dispose of the waste per regulation of each province/country as well as any local laws.
- ▲ **Hot oil and hot components can cause serious injury or death. Do not allow hot oil or hot components to contact skin. Failure to comply may result in serious injury or death.**
- △ **Accumulated grease and oil on the machine is a fire hazard. Remove any coating/film of fuel, oil or grease by steam cleaning the machine with high pressure water. Perform this at minimum of 1000 hours.**
- △ **Inspect the engine compartment for any trash build up. Remove any trash build up from the engine compartment.**
- (5) Ask your local dealer or HD Hyundai Construction Equipment for the maintenance advice if unknown.

3) PROPER MAINTENANCE

(1) Replace and repair of parts

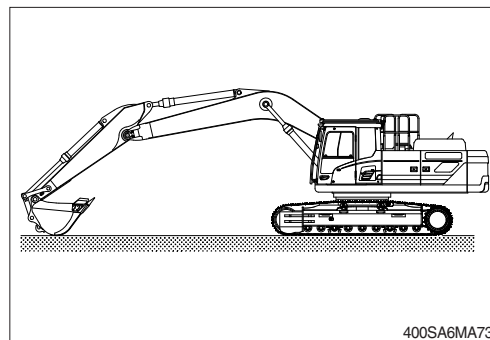
It is required to replace the wearable and consumable parts such as bucket tooth, side cutter, filter and etc., regularly. Replace damaged or worn parts before or at the required time to maintain machine performance.

- (2) Always use only HD Hyundai Construction Equipment genuine parts.
 - (3) Use the recommended oil.
 - (4) Do not perform repairs while the machine is running. Stop the engine when you fill the oil.
 - (5) Always wear protective goggles, protective gloves and other personal protective equipment.
 - (6) Clean around the inlet of oil tank before adding oil.
 - (7) Drain oil when the temperature of oil is warm.
 - (8) Relieve hydraulic system of pressure before repairing the hydraulic system.
 - (9) Confirm if cluster has any warnings present after completion of service.
 - (10) For more detail information of maintenance, please contact your local HD Hyundai Construction Equipment dealer.
- ※ **Read chapter 1 of this manual for safety instructions prior to performing any maintenance on the machine.**

4) RELIEVING THE PRESSURE IN THE HYDRAULIC SYSTEM

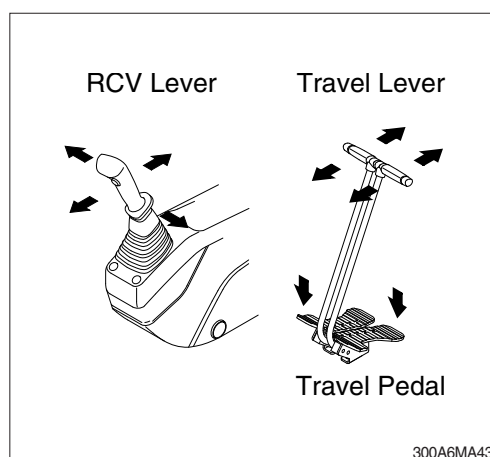
※ Spewing of oil can cause an severe personal injury. Before you loosen hydraulic cap or any hydraulic line on the machine, always make sure machine of off, cooled down and that pressure is relived of the hydraulic system.

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

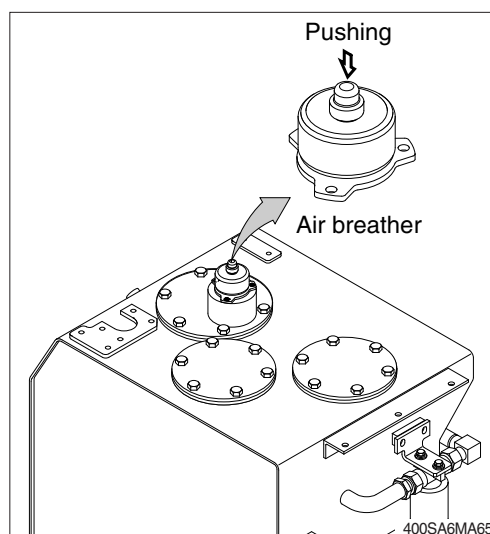


- (2) Set the safety knob completely in the UNLOCK position. Refer to section Levers and pedals. Operate the control levers and pedals fully to the front, rear, left and right, to release the pressure in the hydraulic circuit.

※ This does not completely release the pressure, so when servicing hydraulic component, loosen the connections slowly and do not stand in the direction where the oil may shoot 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 install hose in a twisted, bent or crimped way.
- (5) Always maintain the specified torque.

6) PERIODIC REPLACEMENT OF PARTS

- (1) Perform periodic maintenance of the machine to prolong its useful life. This will assure and allow you to use the machine safely for a long time.
It is recommended to replace any parts related to safety (as needed), not only for safety but in order to maintain performance as well.
- (2) These parts can shorten the life of the machine.
The life span of such parts cannot be viewed visually and judged by the operator.
- (3) Repair or replace if any 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	

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

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
3		Engine mounting bolt (bracket-frame)	M24 × 3.0	90 ± 9.0	651 ± 65
4		Radiator, oil cooler mounting bolt	M16 × 2.0	29.7 ± 4.5	215 ± 32.5
5		Coupling mounting socket bolt	M20 × 2.5	46.5 ± 2.5	336 ± 18.1
6		Fuel tank mounting bolt	M20 × 2.5	57.8 ± 5.8	418 ± 42.0
7	Hydraulic system	Main pump housing mounting bolt	M10 × 1.5	6.5 ± 0.7	47.0 ± 5.1
8		Main pump mounting socket bolt	M20 × 2.5	57.9 ± 8.7	419 ± 62.9
9		Main control valve mounting nut	M20 × 2.5	57.9 ± 8.7	419 ± 62.9
10		Hydraulic oil tank mounting bolt	M20 × 2.5	57.9 ± 5.8	419 ± 42
11		Turning joint mounting bolt, nut	M12 × 1.75	12.8 ± 3.0	92.6 ± 21.7
12	Power train system	Swing motor mounting bolt	M24 × 3.0	97.8 ± 15	707 ± 108
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	M20 × 2.5	57.9 ± 8.7	419 ± 62.9
16		Sprocket mounting bolt	M20 × 2.5	57.9 ± 6.0	419 ± 43.4
17	Under carriage	Upper roller mounting bolt, nut	M16 × 2.0	29.7 ± 3.0	215 ± 21.7
18		Lower roller mounting bolt	M24 × 3.0	100 ± 10.0	723 ± 72.3
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	123 ± 6.0	890 ± 43.4
21		Track guard mounting bolt	M24 × 3.0	100 ± 15	723 ± 108
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
25		Under cover mounting bolt	M12 × 1.75	12.8 ± 3.0	92.6 ± 21.7

※ 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 (DCA4)	ASTM D6210 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

API : American Petroleum Institute

ISO : International Organization for Standardization

NLGI : National Lubricating Grease Institute

ASTM : American Society of Testing and Material

DCA4 : Brand name of Chemical Additive
manufactured by the Cummins Fleetguard Co.

★ Cold region

Russia, CIS, Mongolia

※ Refer to page 7-31 for further information of recommended oils.

4. MAINTENANCE CHECK LIST

1) DAILY SERVICE BEFORE STARTING

Check items	Service	Page
Visual check		
· Charge air piping	Check	4-31
· Cooling fan	Check	4-27
· Air intake piping	Check	-
· Air cleaner dust ejection valve	Check	-
· Crankcase breather tube	Check	-
Fuel tank	Check, Refill	4-31
Hydraulic oil level	Check, Add	4-39
Engine oil level	Check, Add	4-18
Radiator coolant level	Check, Add	4-21
Control panel & pilot lamp	Check, Clean	4-50
Fuel pre-filter element (water)	Check, Drain	4-30
Fan belt tension and damage	Check, Adjust	4-27, 28
★ Attachment pin and bushing	Lubricate	4-49
· 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	4-31
Track tension	Check, Adjust	4-45
Swing reduction gear oil	Check, Add	4-42
Attachment pin and bushing	Lubricate	4-49
· 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 <ul style="list-style-type: none">· Sprocket mounting bolts· Upper roller mounting bolt· Lower roller mounting bolt· 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· Track guard mounting bolts· Hydraulic pump mounting bolts· Under cover mounting bolts	Check, Tight	4-8

4) EVERY 200 HOURS SERVICE

Check items	Service	Page
★ Hydraulic oil return filter	Replace	4-41
★ Pilot line filter element	Replace	4-42
★ Drain filter	Replace	4-41

★ **Replace 3 filters for continuous hydraulic breaker operation only.**

5) INITIAL 250 HOURS SERVICE

Check items	Service	Page
Engine oil	Change	4-18, 19
Engine oil filter	Replace	4-18, 19
Fuel pre-filter element	Replace	4-30
Fuel filter element	Replace	4-32
Pilot line filter element	Replace	4-42
Hydraulic oil return filter	Replace	4-41
Drain filter	Replace	4-41
Swing reduction gear oil	Change	4-42
Swing reduction gear grease	Check, Add	4-43
Travel reduction gear oil	Change	4-44

6) EVERY 250 HOURS SERVICE

Check items	Service	Page
Charge air piping	Check	4-31
Charge air cooler	Check	4-26
Battery (voltage), battery cable and connections	Check, Clean	4-50, 51
Swing bearing grease	Lubricate	4-43
Bolts & Nuts	Check, Tight	4-8
· Sprocket mounting bolts		
· Upper roller mounting bolt		
· Lower roller mounting bolt		
· 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		
· Track guard mounting bolts		
· Hydraulic pump mounting bolts		
· Under cover mounting bolts		
Attachment pin and bushing	Lubricate	4-49
· 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		

7) EVERY 500 HOURS SERVICE

Check items	Service	Page
Engine oil ★	Change	4-18, 19
Engine oil filter ★	Replace	4-18, 19
Fuel pre-filter element	Replace	4-30
Fuel filter element	Replace	4-32
Coolant filter	Replace	4-20
Radiator, cooler fin and charge air cooler	Check, Clean	4-26
Aircon and heater outer filter	Replace	4-53
Aircon and heater inner filter	Replace	4-53
Air cleaner element (primary) ★ ¹	Check, Clean	4-29

★ 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
Drive belt, cooling fan	Check	4-27
Cooling fan belt tensioner	Check	4-28
Travel motor reduction gear oil	Change	4-44
Swing reduction gear oil	Change	4-42
Swing reduction gear grease	Check, Add	4-43
Swing gear and pinion grease	Change	4-43
Hydraulic oil return filter	Replace	4-41
Drain filter	Replace	4-41
Pilot line filter element	Replace	4-42
Hydraulic oil air breather element	Replace	4-41

9) EVERY 2000 HOURS SERVICE

Check items	Service	Page
Engine cleaning	Clean	4-33
Vibration damper (rubber)	Check	4-34
Vibration damper (viscous)	Check	4-34
Coolant, cooling system and antifreeze ^{★2}	Change, Flush	4-22, 23, 24, 25, 26, 27
Hydraulic oil ^{★2}	Change	4-39
Hydraulic oil suction strainer	Check, Clean	4-40
Air cleaner element (primary, safety) ^{★3}	Replace	4-29
RCV lever	Check, Lubricate	4-44
Hoses, fittings, clamps (fuel, coolant, hydraulic)	Check, Retighten, Replace	-

^{★2} Conventional

^{★3} When working in dusty environments, more frequent replacing is highly recommended.

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

10) EVERY 5000 HOURS SERVICE

Check items	Service	Page
Overhead set (shop inspection)	Adjust	4-35, 36, 37
Hydraulic oil ^{★4}	Change	4-40

^{★4} 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, cooling system and antifreeze ^{★4}	Change, Flush	4-22, 23, 24, 25, 26, 27

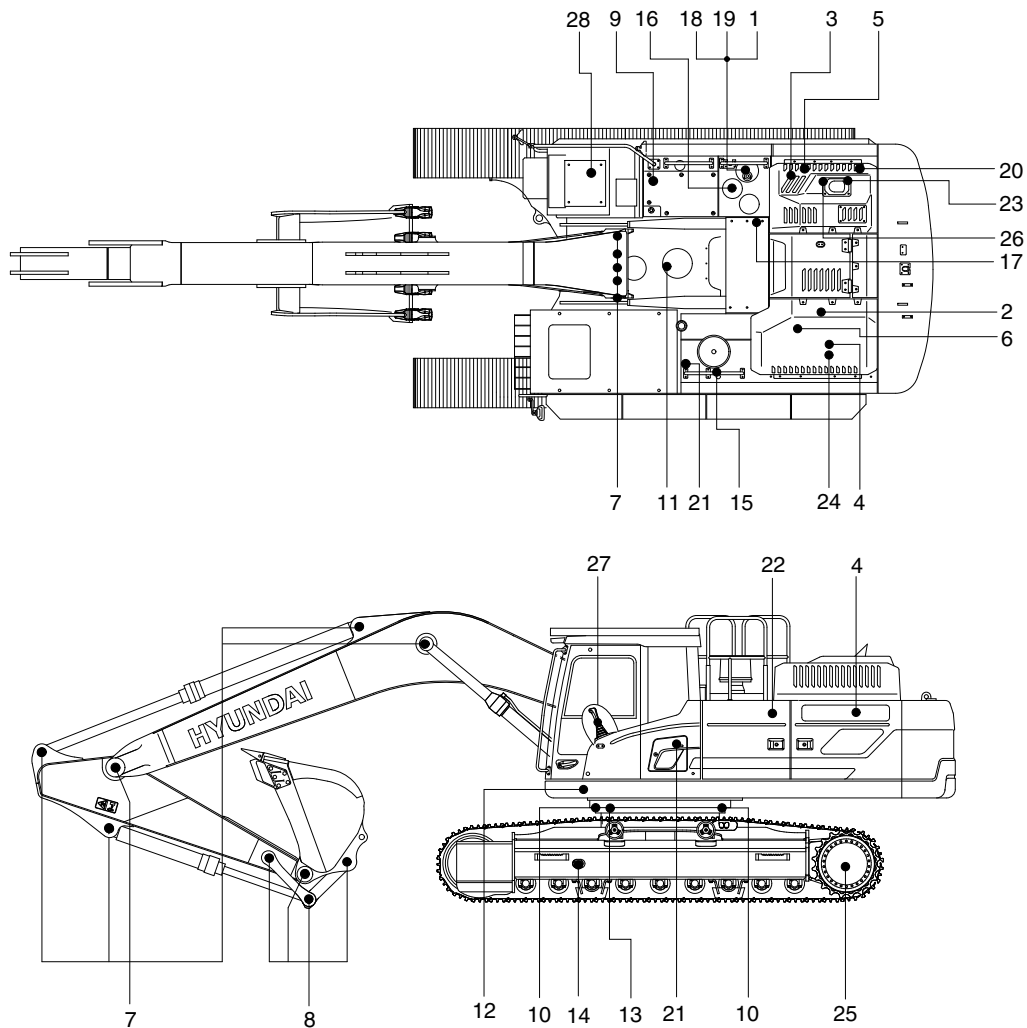
^{★4} HD Hyundai Construction Equipment genuine long life

12) WHEN REQUIRED

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

Check items	Service	Page
Fuel system		
· Fuel tank	Drain or Clean	4-31
· Fuel pre-filter element	Replace	4-30
· Fuel filter element	Replace	4-32
· Fuel filler pump filter	Clean, Replace	4-38
Engine lubrication system		
· Engine oil	Change	4-18, 19
· Engine oil filter	Replace	4-18, 19
Engine cooling system		
· Radiator coolant	Add or Change	4-22, 24, 25, 26, 27
· Radiator	Clean or Flush	4-22, 24, 25, 26, 27
· Charge air cooler	Check, Clean	4-27
· Coolant filter	Replace	4-20
Engine air system		
· Air cleaner element (primary)	Clean or Replace	4-29
· Air cleaner element (safety)	Replace	4-29
Hydraulic system		
· Hydraulic oil	Add or Change	4-39, 40
· Hydraulic oil return filter	Replace	4-41
· Drain filter	Replace	4-41
· Pilot line filter element	Replace	4-42
· Hydraulic tank air breather element	Replace	4-41
· Hydraulic oil suction strainer	Clean	4-40
· RCV lever	Lubricate	4-44
Undercarriage		
· Track tension	Check, Adjust	4-45
Bucket		
· Tooth	Replace	4-47
· Side cutter	Replace	4-47
· Linkage	Adjust	4-48
· Bucket assy	Replace	4-46
Air conditioner and heater		
· Outer filter	Replace	4-53
· Inner filter	Replace	4-53

5. MAINTENANCE CHART



93KA-10711

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 do not allow any open flames near the machine.

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	30 (7.9)	1
	4	Radiator coolant	Check, Add	C	33 (8.7)	1
	5	Fuel pre-filter element (water)	Check, Drain	-	-	1
	6	Fan belt tension and damage	Check, Adjust	-	-	1
	7	* Attachment pin & bushing	Check, Lubricate	PGL	-	12
	9	Fuel tank	Check, Refill	DF	600 (159)	1

* For initial 100 hours.

※ 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.
50 Hours or weekly	8	Bucket linkage pins	Check, Lubricate	PGL	-	8
	9	Fuel tank (water, sediment)	Check, Drain	-	-	1
	11	Swing reduction gear oil	Check, Add	GO	7.4 (1.95)	1
	14	Track tension	Check, Adjust	PGL	-	2
250 Hours	4	Charge air cooler and piping	Check	-	-	1
	4	Cooling fan	Check	-	-	1
	7	Attachment pins & bushings	Check, Lubricate	PGL	-	12
	10	Swing bearing grease	Check, Add	PGL	-	2
	15	Battery (voltage), battery cable and connections	Check, Replace	-	-	1
Initial 250 Hours	2	Engine oil	Change	EO	30 (7.9)	1
	3	Engine oil filter	Replace	-	-	1
	5	Fuel pre-filter element	Replace	-	-	1
	11	Swing reduction gear oil	Change	GO	7.4 (1.95)	1
	12	Swing reduction gear grease	Check, Add	PGL	1.6 (0.42)	1
	16	Hydraulic oil return filter	Replace	-	-	1
	17	Drain filter	Replace	-	-	1
	20	Pilot line filter element	Replace	-	-	1
	23	Fuel filter element	Replace	-	-	1
500 Hours	2	Engine oil	Change	EO	30 (7.9)	1
	3	Engine oil filter	Replace	-	-	1
	5	Fuel pre-filter element	Replace	-	-	1
	21	Aircon & heater outer filter	Replace	-	-	1
	21	Aircon & heater inner filter	Replace	-	-	1
	22	Air cleaner element (primary)	Check, Clean	-	-	1
	23	Fuel filter element	Replace	-	-	1
	24	Radiator, oil cooler, charge air cooler	Check, Clean	-	-	3
	26	Coolant filter	Replace	-	-	1
1000 Hours	6	Drive belt, cooling fan hub	Check, Replace	-	-	2
	6	Cooling fan belt tensioner	Check, Replace	-	-	1
	11	Swing reduction gear oil	Change	GO	7.4 (1.95)	1
	12	Swing reduction gear grease	Check, Add	PGL	1.6 (0.42)	1
	13	Swing gear and pinion grease	Change	PGL	11.4 kg (25.1 lb)	1
	16	Hydraulic oil return filter	Replace	-	-	1
	17	Drain filter	Replace	-	-	1
	18	Hydraulic tank air breather element	Replace	-	-	1
	20	Pilot line filter element	Replace	-	-	1
	25	Travel reduction gear oil	Change	GO	5.5 (1.45)	2

※ 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.
2000 Hours	1	Hydraulic oil ^{*1}	Change	HO	210 (55.5)	1
	2	Engine cleaning	Clean	-	-	1
	2	Vibration damper (rubber)	Check, Replace	-	-	4
	2	Vibration damper (viscous)	Check, Replace	-	-	4
	4	Coolant, cooling system and antifreeze ^{*1}	Change	C	33 (8.7)	1
	19	Hydraulic oil suction strainer	Check, Clean	-	-	1
	22	Air cleaner element (primary, safety)	Replace	-	-	2
	27	RCV lever	Check, Lubricate	PGL	-	2
5000 Hours	-	Hoses, fittings, clamps (fuel, coolant, hydraulic)	Check, Retighten, Replace	-	-	-
	1	Hydraulic oil ^{*2}	Change	HO	210 (55.5)	1
6000 Hours	2	Overhead set (shop inspection)	Adjust	-	-	1
	4	Coolant, cooling system and antifreeze ^{*2}	Change	C	33 (8.7)	1
As required	21	Aircon & heater outer filter	Replace	-	-	1
	21	Aircon & heater inner filter	Clean, Replace	-	-	1
	22	Air cleaner element (primary)	Clean, Replace	-	-	1
	22	Air cleaner element (safety)	Replace	-	-	1
	28	Fuel filler pump filter	Clean, Replace	-	-	1

^{*1} Conventional

^{*2} HD Hyundai Construction Equipment genuine long life

※ Oil symbol

Please refer to the recommended lubricants for specification.

DF : Diesel fuel

GO : Gear oil

HO : Hydraulic oil

C : Coolant

PGL : Grease

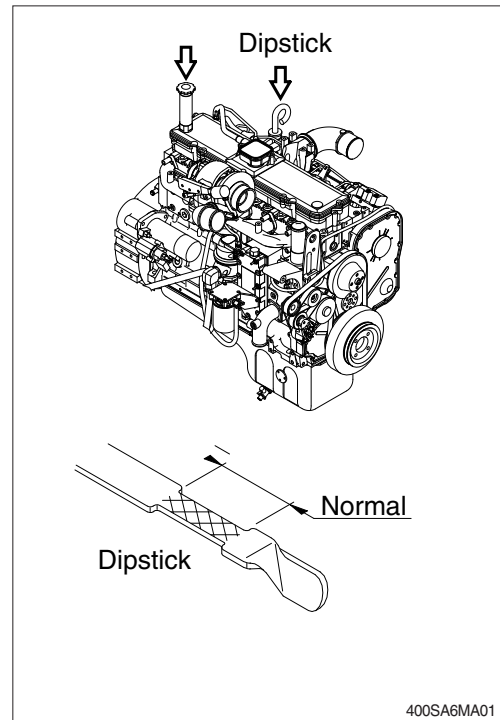
EO : Engine oil

6. SERVICE INSTRUCTION

1) CHECK ENGINE OIL LEVEL

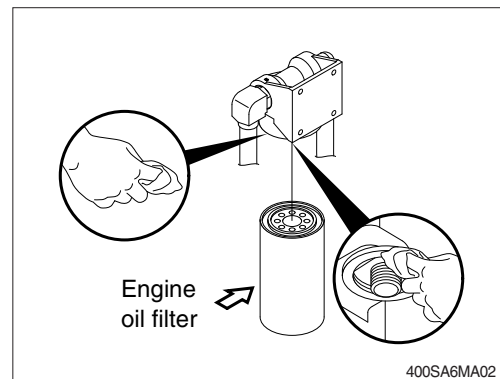
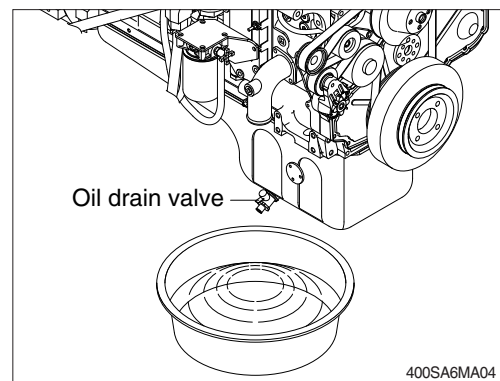
Check the oil level with the machine on flat ground before starting engine.

- (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.**
 - ※ **Keep all parts clean from contaminants. Contaminants may cause rapid wear and shortened component life.**

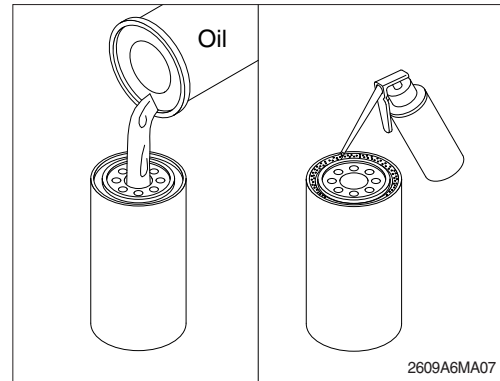


2) REPLACEMENT OF ENGINE OIL AND OIL FILTER

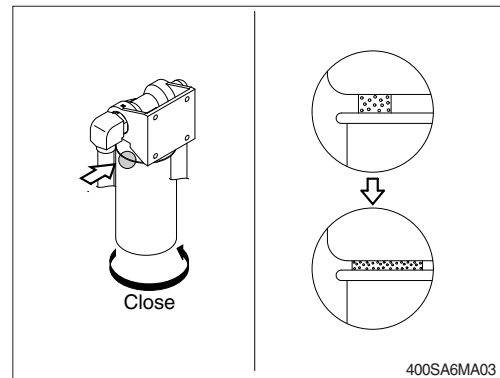
- (1) Operate the engine until the coolant temperature reaches 60°C (140°F). Shut off the engine.
 - (2) Remove the oil drain valve. Drain the oil immediately to be sure all the oil and suspended contaminants are removed from the engine.
- ※ **A drain pan with a capacity of 35 liters (9.2 U.S. gallons) will be adequate.**
 - ※ **Dispose of the waste oil in accordance with local regulations.**
- (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.**



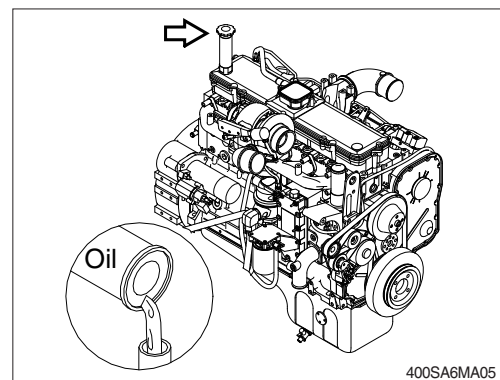
- (6) Apply a light film of lubricating oil to the gasket sealing surface before installing the filter.
 ※ **Fill the filter with clean lubricating oil.**



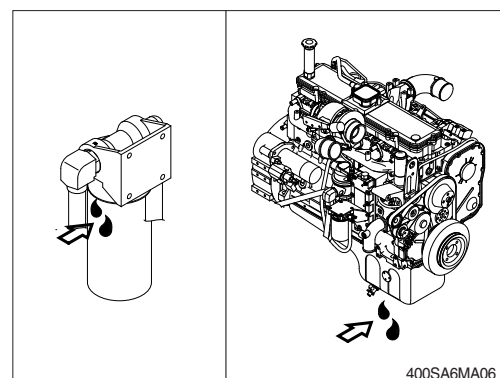
- (7) Install the filter to the filter head.
 Tighten the filter until the gasket contacts the filter head surface.
 Tighten 3/4 to 1 turn after the gasket makes contact with the filter head.
 ※ **Mechanical over-tightening may distort the threads or damage the filter element seal.**



- (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 : 30 ℓ (7.9 U.S.gallons)



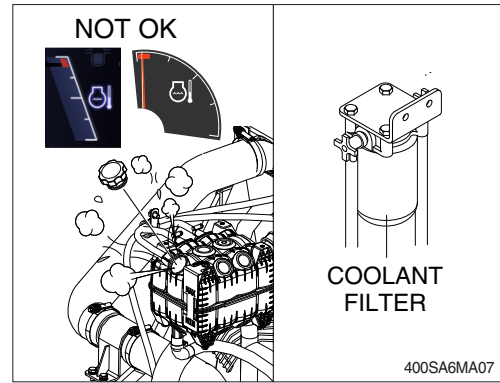
- (10) Operate the engine at low idle and inspect for leaks at the filters and the drain plug.
 Shut the engine off and check the oil level with the dipstick. Allow 15 minutes for oil to drain down before checking.



3) COOLANT FILTER

- ⚠ **Do not remove the rad 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.

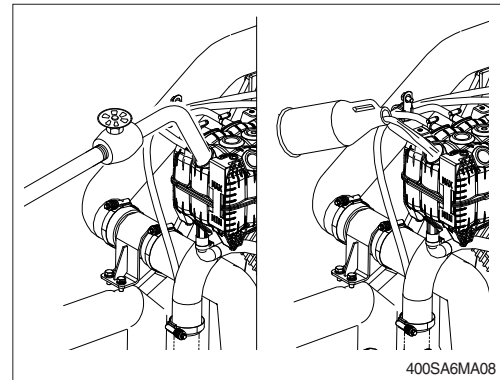


(2) Turn the valve to the OFF position.

(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 the 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.**

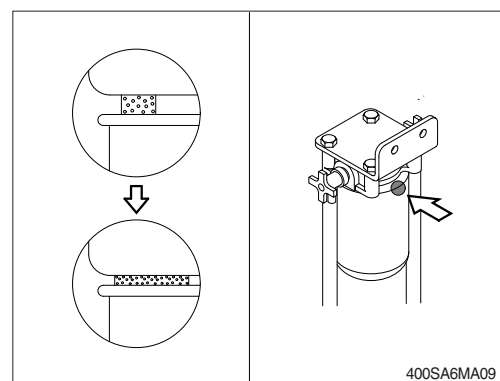


(5) Install a new filter on the filter head.

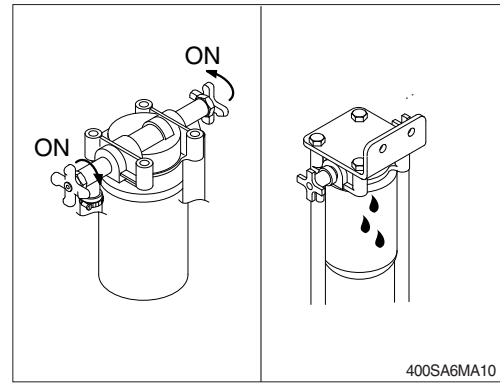
Tighten the filter until the gasket contacts the filter head surface.

(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.**

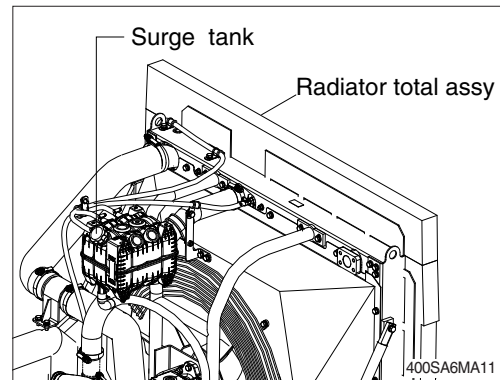


- (7) Turn the valve to the ON position, and install the radiator cap.
- (8) Operate the engine and check for leaks.
- ※ **The valve must be in the ON position to prevent engine damage.**

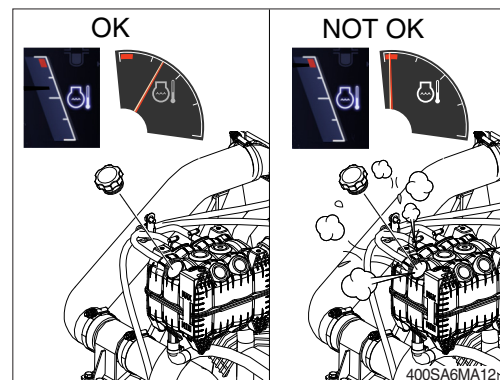


4) CHECK RADIATOR COOLANT

- (1) Check if the level of coolant in surge tank is between MAX and MIN.
- (2) Add the mixture of antifreeze and water after removing the cap of the surge tank if coolant is not sufficient.
- (3) Be sure to use the surge tank empty, add the coolant by opening the cap of surge tank.
- (4) Replace gasket of surge tank 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.**

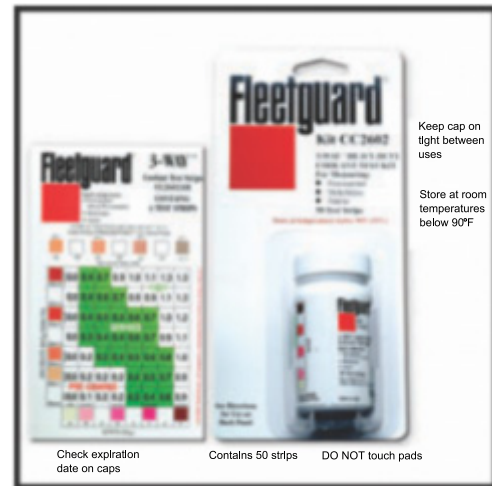


5) COOLANT TEST STRIPS INSTRUCTIONS

(1) Pre-test instruction

Recommended testing frequency - at every coolant filter change interval.

- ① Collect coolant sample from the radiator drain valve.
 - Do not collect from the coolant recovery or overflow system
 - Coolant must be between 10~54°C when tested
 - Room temperature is best.
- ② For accurate results, test must be completed within 75 seconds.
 - Follow recommended test times. Use a stopwatch.
- ③ Record and track results.

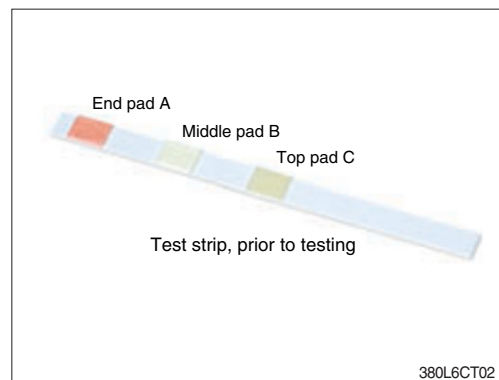


380L6CT01

(2) Test instruction

- ① Remove one strip from bottle and replace cap immediately.

Do not touch the pads on the end of the strip. Discard kit if nitrite test pads of unused strips have turned brown.
- ② Dip strip for 1 second in coolant sample, remove, and shake strip briskly to remove excess liquid.



380L6CT02

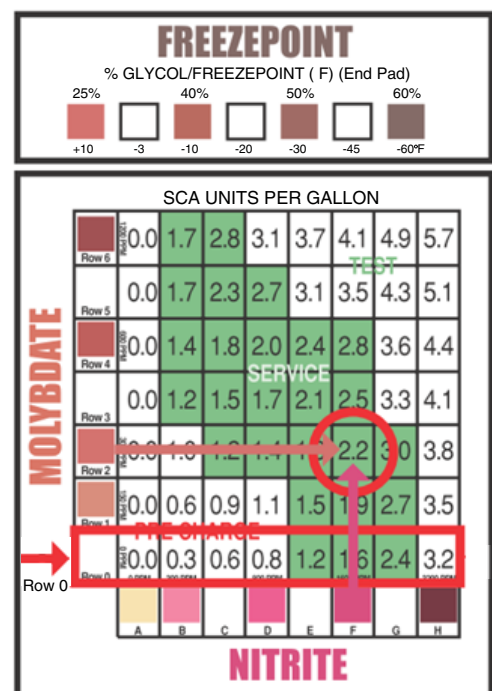
- ③ 45 seconds after dipping strip, compare results to color chart and record in the following order:

for DCA4:



- ④ All three readings must be completed no later than 75 seconds after dipping strip.
- ⑤ If uncertain about the color match, pick the low numbered block.

ex.) If nitrite color is not F, use column E.
- ⑥ Determine where the molybdate level intersect the nitrite level on the chart. The amount of SCA units per gallon in the cooling system is given where the molybdate row intersect the nitrite column.



380L6CT03

(3) Maintenance actions based on results

① Above normal

- ABOVE NORMAL**
- Do not replace the coolant filter or add DCA4 liquid until additive concentration falls below 3 units per gallon.
 - Test at every subsequent coolant filter change interval.

② Normal

- NORMAL**
- Continue to replace the coolant filter at your normal interval.

③ Below normal

- BELOW NORMAL**
- Replace the coolant filter and add 1 pint of additive per each 4 gallons of coolant.
 - Replace the coolant filter and add 40 cc of additive per each 1 liter of coolant.

※ If you need part number of Test kit or DCA4, please see Parts Manual.

0.0	1.7	2.8	3.1	3.7	4.1	4.9	5.7	ABOVE NORMAL
0.0	1.7	2.3	2.7	3.1	3.5	4.3	5.1	
0.0	1.4	1.8	2.0	2.4	2.8	3.6	4.4	NORMAL
0.0	1.2	1.5	1.7	2.1	2.5	3.3	4.1	
0.0	1.0	1.2	1.4	1.8	2.2	3.0	3.8	BELOW NORMAL
0.0	0.6	0.9	1.1	1.5	1.9	2.7	3.5	
0.0	0.3	0.6	0.8	1.2	1.6	2.4	3.2	
0 PPM	300 PPM	600 PPM	900 PPM	1200 PPM	1500 PPM	1800 PPM	2100 PPM	

380L6CT04

6) FLUSHING AND REFILLING OF RADIATOR

(1) Change radiator coolant

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

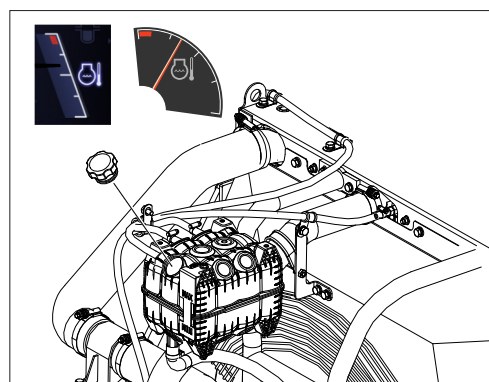
Avoid excessive contact-wash thoroughly after contact.

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.



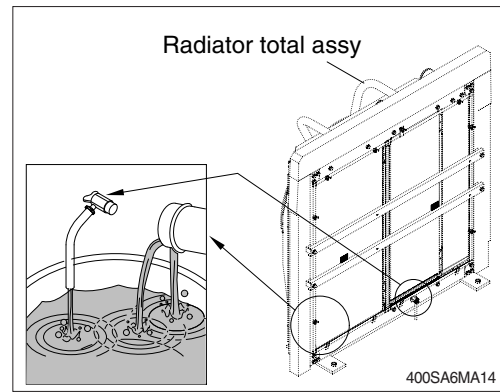
400SA6MA13

- ▲ 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.

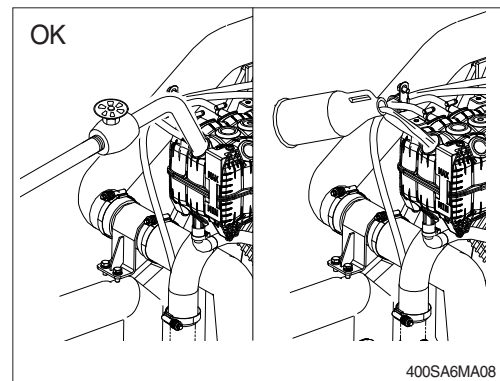
Drain the cooling system by opening the drain valve on the radiator and opening the drain valve on the bottom of the engine oil cooler housing.

A drain pan with a capacity of 57 liters (15 U.S. gallons) will be adequate.

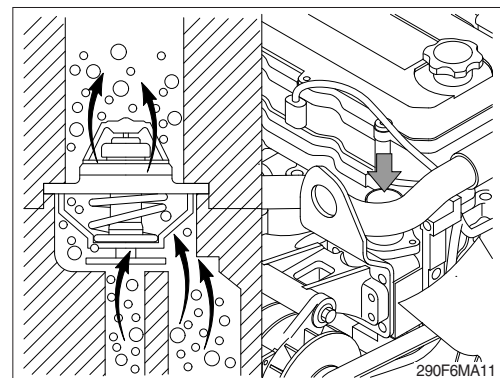


(2) Flushing of cooling system

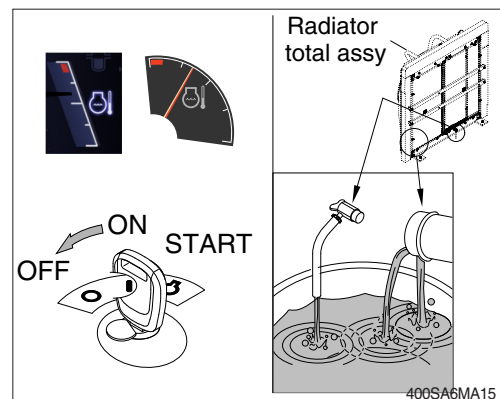
- ① Fill the system with a mixture of sodium carbonate and water (or a commercially available equivalent).
 - ※ Use 0.5 kg (1.0 pound) of sodium carbonate for every 23 liters (6.0 U.S. gallons) of water.
 - ※ Do not install the surge tank cap. The engine is to be operated without the cap for this process.



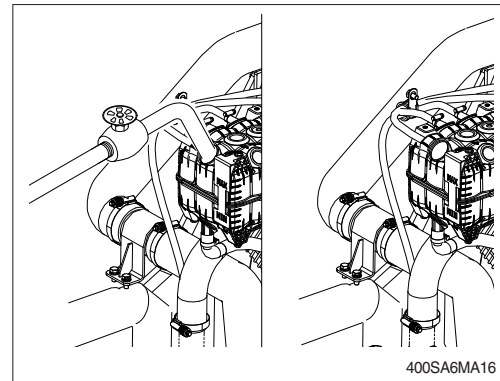
- ※ During filling, air must be vented from the engine coolant passages. The system must be filled slowly to prevent air locks or serious engine damage can result. Wait 2 to 3 minutes to allow air to be vented, then add mixture to bring the level to the top.



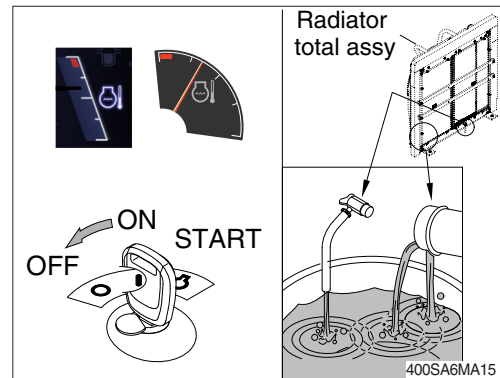
- ② Operate the engine for 5 minutes with the coolant temperature above 80°C (176°F). Shut the engine off, and drain the cooling system.



- 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.**

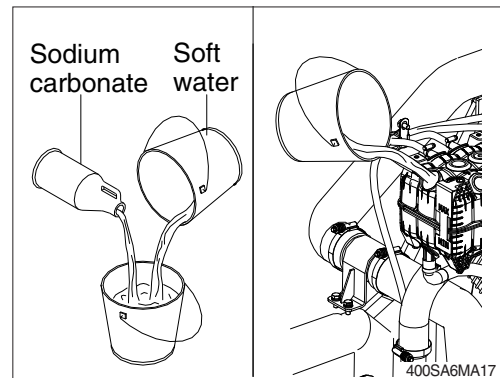


- ④ Operate the engine for 5 minutes with the coolant temperature above 80°C (176°F). Shut the engine off, and drain the cooling system.
- ※ **If the water being drained is still dirty, the system must be flushed again until the water is clean.**

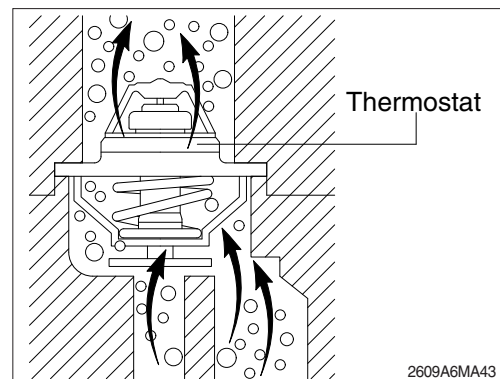


(3) Cooling system filling

- ① Use a mixture of 50 percent soft water and 50 percent ethylene glycol antifreeze to fill the cooling system. Refer to page 7-31. Coolant capacity (engine only) : 11.1 ℓ (2.9 U.S. gallons)
- ※ **Do not use hard water such as river water or well water.**



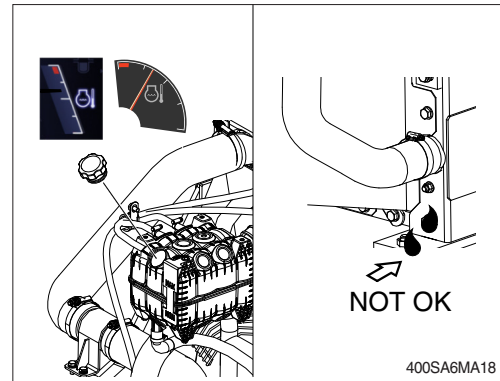
- ② The system has a maximum fill rate of 19 liters (5.0 U.S. gallons) per minute. Do not exceed this fill rate.
- ※ **The system must be filled slowly to prevent air locks.**
- During filling, air must be vented from the engine coolant passage.**



- 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 after allow engine to cool.

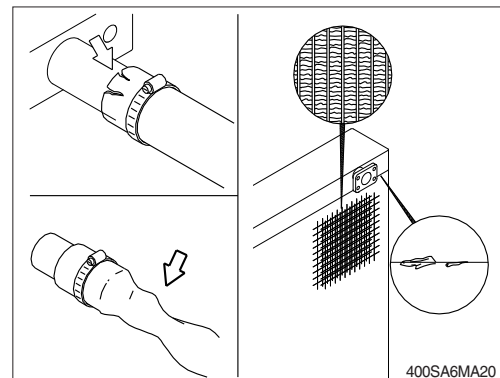
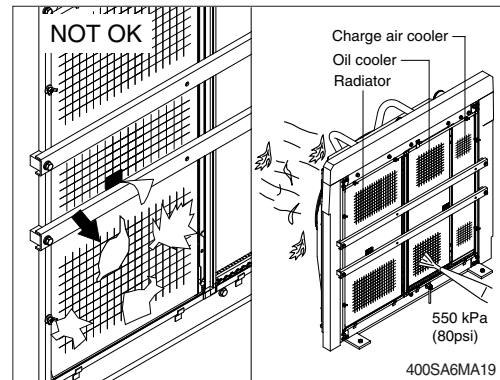
- ※ If the gasket of the surge tank cap is damaged, discard the old filler cap and install a new cap.



7) CLEAN RADIATOR AND OIL COOLER

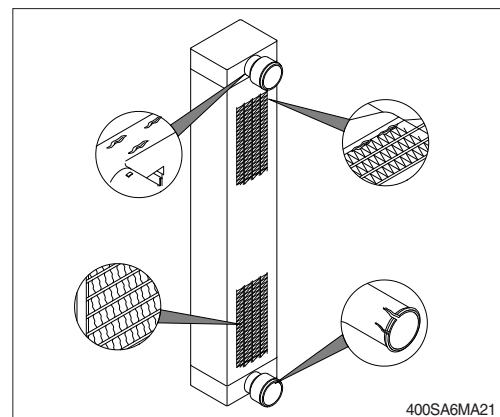
Check, and if necessary, clean and dry outside of radiator and oil cooler. After working in a dusty place, clean radiator more frequently.

- (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.



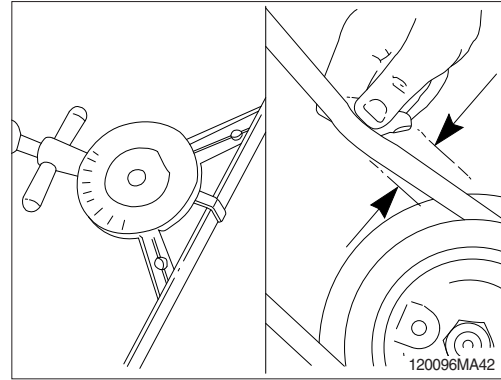
8) CHECK CHARGE AIR COOLER

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 your local HD Hyundai Construction Equipment dealer.



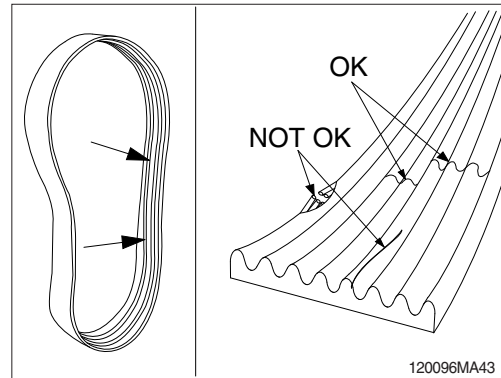
9) FAN BELT

- (1) A deflection method can be used to check belt tension by applying 11.3 kgf (25 lbf) of force between the pulleys on V-belts. If the deflection is more than one belt thickness per foot of pulley center distance, the belt tension must be adjusted.

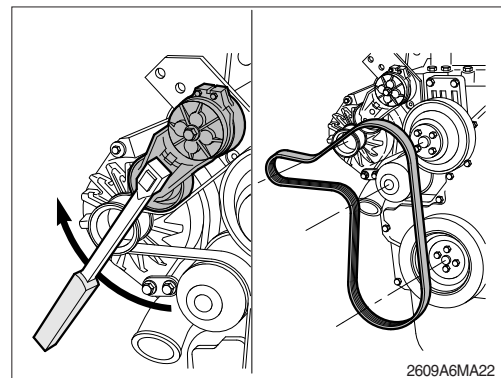


- (2) Inspect the fan belt for damage.

- ① Transverse (across the belt) cracks are acceptable.
- ② Longitudinal (direction of belt ribs) cracks that intersect with transverse cracks are not acceptable.
- ③ Replace the belt if it is frayed or has pieces of material missing.

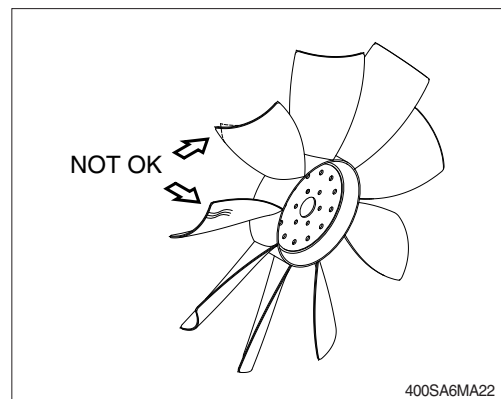


- (3) Inspect the idle and drive pulleys for wear or cracks.



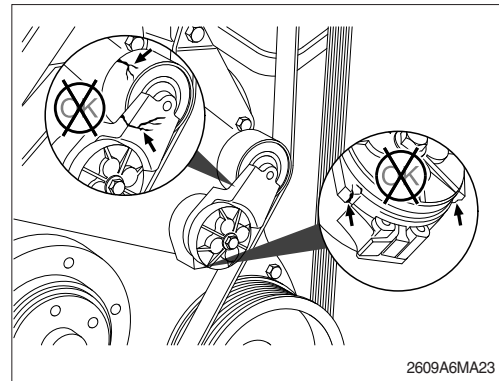
10) INSPECTION OF COOLING FAN

- ▲ **Serious 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 bearing 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.



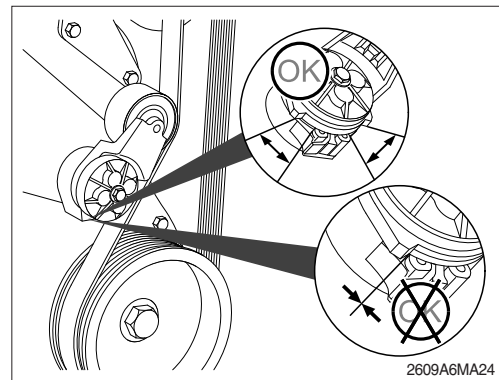
11) FAN BELT TENSIONER

- (1) With the engine stopped, check the tensioner arm, pulley, and stops for cracks. If any cracks are found, the tensioner must be replaced.

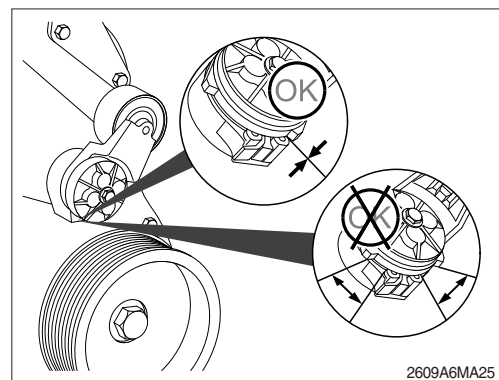


- (2) With the belt installed, verify that neither tensioner arm stop is in contact with the spring case stop.

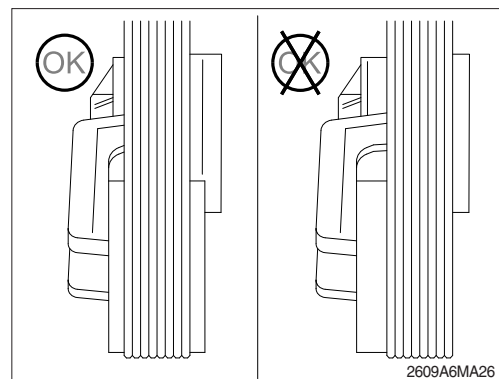
After replacing the belt, if the tensioner arm stops are still in contact with the spring case stop, replace the tensioner.



- (3) With the belt removed, verify that the tensioner arm stop is in contact with the spring case stop. If these two are not touching, the tensioner must be replaced.



- (4) Check the location of the drive belt on the belt tensioner pulley. The belt should be centered on, or close to the middle of the pulley. Misaligned belts, either too far forward or backward, can cause belt wear, belt roll-offs, or increase uneven tensioner bushing wear.



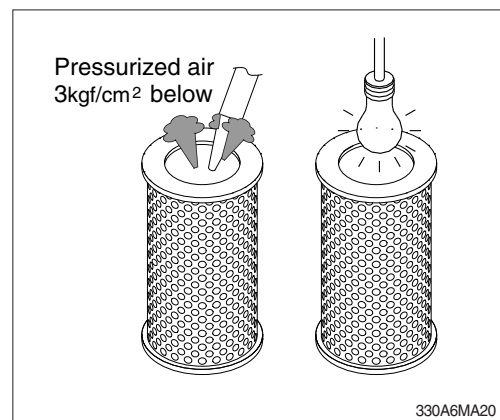
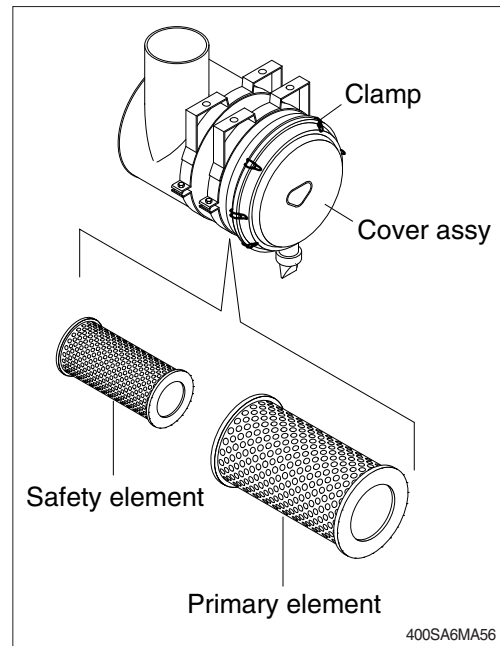
12) CLEANING OF AIR CLEANER ELEMENT

(1) Primary element

- ① Loosen the clamps and remove the cover assy.
 - ② Remove the filter elements.
 - ③ Clean the inside of the body.
 - ④ 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.
 - ⑤ Inspect for cracks or damage of element by putting a light bulb inside of the element.
 - ⑥ Insert element and tighten the clamps.
- ※ Replace the primary element after 4 cleanings.

(2) Safety element

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

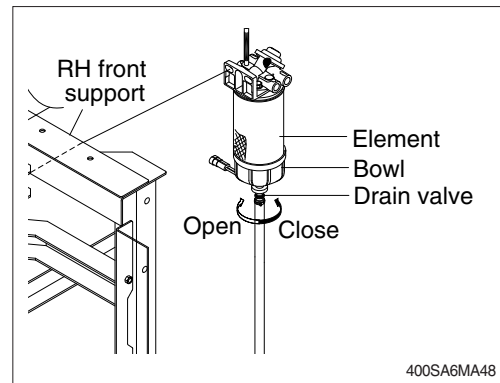


13) FUEL PRE-FILTER ELEMENT

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

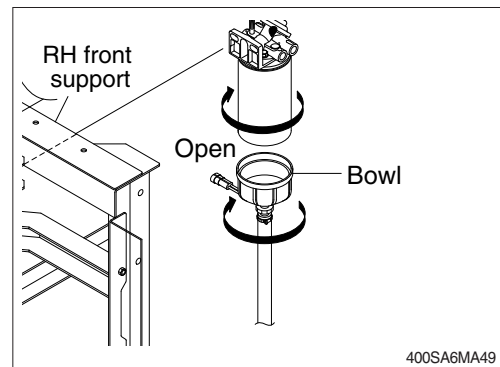
(1) Drain water

- ① Open bowl drain valve to evacuate water.
 - ② Close drain valve.
- ※ Do not overtighten drain valve.
 - ※ Please inspect and drain water frequently for remain water volume to be less than 1/3 volume of a collection bowl.

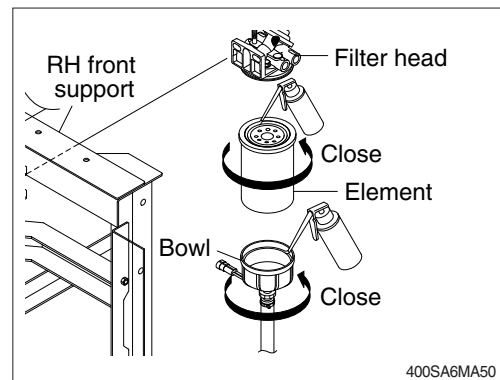


(2) Replace element

- 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.



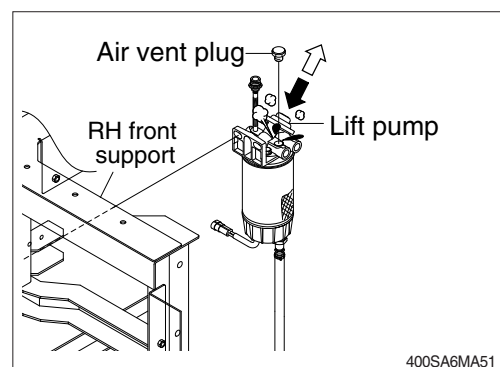
- ④ Lubricate new bowl seal with clean fuel or motor oil and place in bowl gland.
- ⑤ Attach bowl to new element firmly by hand.
- ⑥ Lubricate new element seal and place in element top gland.
- ⑦ Attach the element and bowl to the head.



(3) Air bleeding

- ① Hand-prime the lift pump repeatedly until air bubbles comes out from air vent hole completely.
- ② Tighten the air vent plug.

- ▲ The fuel pump, high-pressure fuel lines, and fuel rail contain very high-pressure fuel. Do not loosen any fittings while the engine is running. Failure to comply may result in serious injury or death. Wait at least 10 minutes after shutting down the engine before loosening any fittings in the high-pressure fuel system to allow pressure to decrease.



14) FUEL TANK

※ Remove the strainer of the fuel tank and clean it if contaminated.

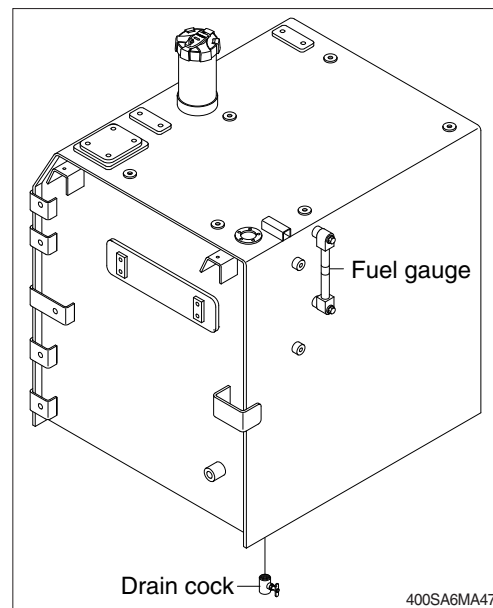
(1) Fill fuel tank fully to minimize water condensation and check the fuel gauge level before starting the machine.

(2) Drain the water and sediment in the fuel tank by opening the drain cock.

※ Be sure to LOCK the cap of fuel tank.

▲ Stop the engine when refueling.

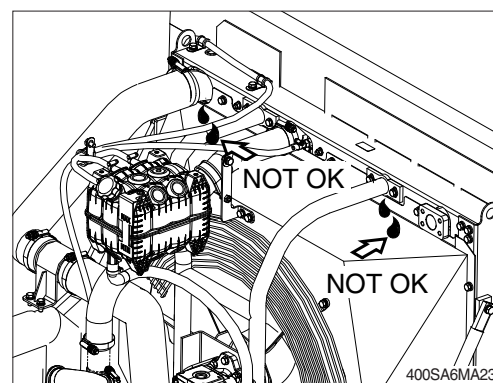
All lights and flames shall be kept at a safe distance while refueling.



15) CHARGE AIR PIPING

(1) Inspect the charge air piping and hoses for leaks, holes, cracks, or loose connections.

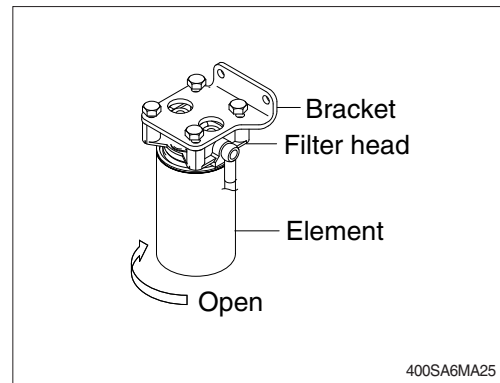
(2) Tighten the hose clamps if necessary.



16) REPLACEMENT OF FUEL FILTER ELEMENT

- (1) Clean the area around the filter head, remove the element with a fuel filter wrench and clean the O-ring surface.

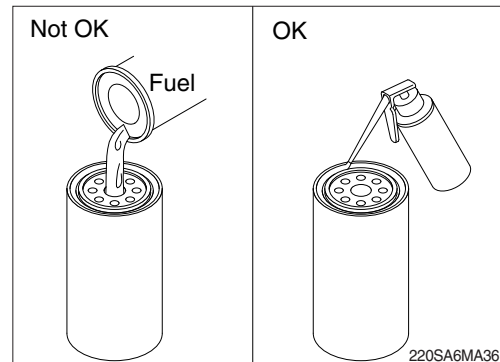
※ **Make sure O-ring does not stick to filter head. Remove O-ring with screwdriver if necessary.**



- (2) Lubricate the O-ring of a new element with clean engine oil.

※ **Do not pre-fill the new element with fuel.**

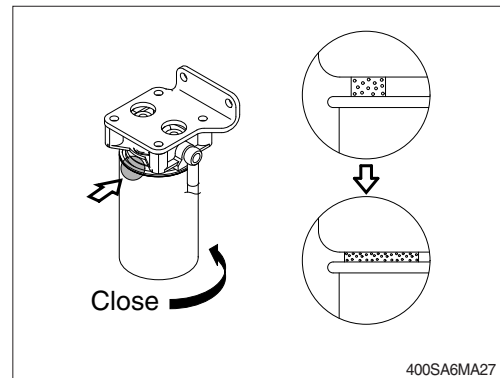
The system must be primed after the new element is installed. Pre-filling the new element can result in debris entering the fuel system and damaging fuel system components.



- (3) Install the new element on the filter head.

※ **Tighten the new element until the gasket contacts the filter head surface and tighten the new element an additional 3/4 turn more after contacts the filter head.**

※ **Mechanical overtightening can distort the threads or damage the filter element seal.**

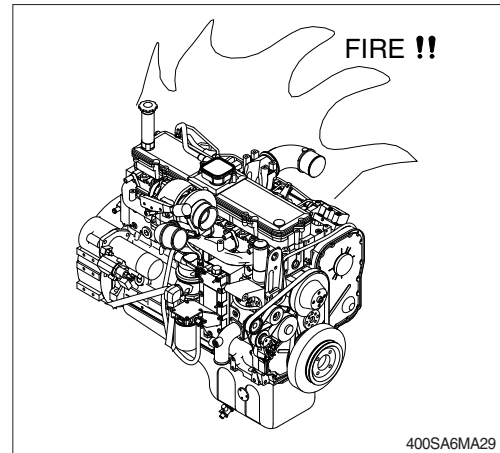


※ **Cycle the starting switch and allow the lift pump to run. The lift pump will run for 30 seconds. Afterwards, turn the starting switch off and back on again allowing the lift pump to run again.**

※ **Allow the lift pump to run for three or four 30-second cycles before attempting to start the engine.**

17) LEAKAGE OF FUEL

- ▲ Use care when cleaning the fuel hose, injection pump, fuel filter and other connections as the leakage from these parts can cause fire.



18) ENGINE CLEANING

- ▲ When using a steam cleaner, wear safety glasses or a face shield, as well as protective clothing. Hot steam can cause serious personal injury.

- ※ Turn OFF the master switch mounted electric box.
- ※ Spraying high pressure steam near or into electrical components can cause damage.

(1) Steam is the recommended method of cleaning a dirty engine or a piece of equipment.

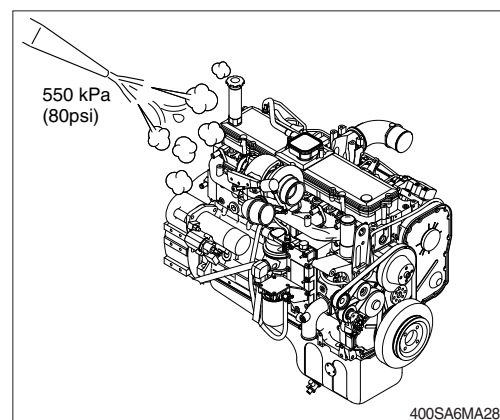
(2) Protect all electrical components, openings, and wiring from the full force of the spray nozzle.

(3) Components to protect include, but are not limited to the following:

- Electrical components and connectors
- Wiring harnesses
- Electronic control module (ECM) and connectors.
- Belts and hoses
- Bearings (ball or taper roller)

△ Soap, solvent, or water ingress into air intake system can cause engine damage.

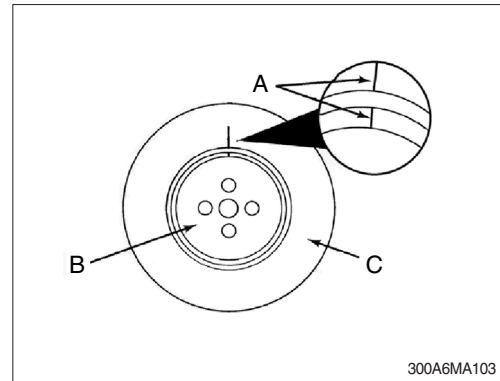
△ Do not directly spray or allow soap, solvent, or water to enter any passages, ports, or cowlings that lead to the engine air intake system.



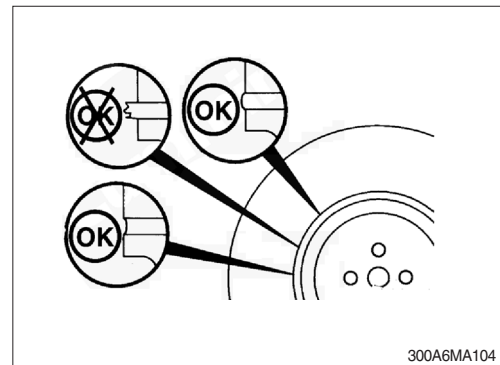
19) VIBRATION DAMPER

(1) Rubber

- ① Check the index lines (A) in the vibration damper hub (B) and the inertia member (C). If the lines are more than 1.59 mm (1/16 in) out of alignment, replace the vibration damper.
- ② Inspect the vibration damper hub (B) for cracks. Replace the damper if the hub is cracked.



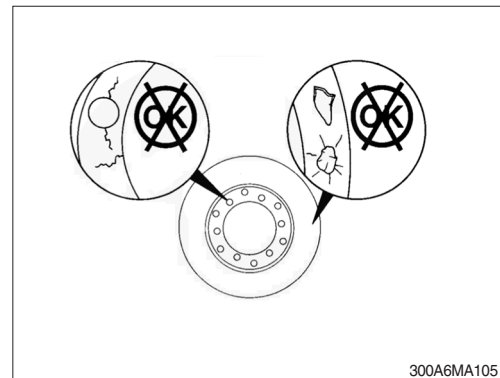
- ③ Inspect the rubber member for deterioration. If pieces of rubber are missing or if the elastic member is more than 3.18 mm (1/8 in) below the metal surface, replace the damper.
- ※ Look for forward movement of the damper ring on the hub. Replace the vibration damper if any movement is detected.



(2) Viscous

- ※ **The silicone fluid in the vibration damper will become solid after extended service and will make the damper inoperative. An inoperative vibration damper can cause major engine or drivetrain failures.**

- ① Check the vibration damper for evidence of fluid loss, dents, and wobble. Inspect the vibration damper thickness for any deformation or raising of the damper cover plate.
- ② If any of these conditions are identified, contact your local HD Hyundai Construction Equipment dealer to replace the vibration damper when movement is detected.



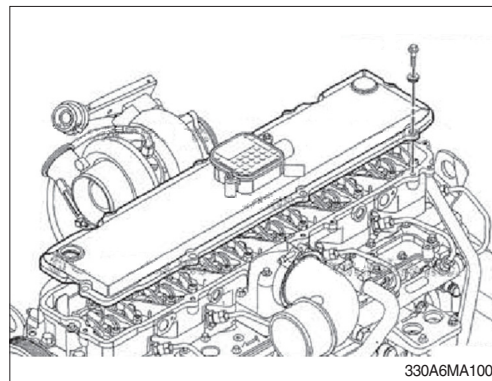
20) OVERHEAD SET ADJUSTMENT

※ This procedures are perform the repair shop.

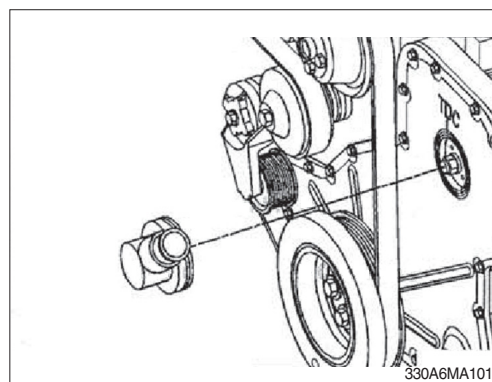
※ **Service tools**

- Cummins barring tool, p/no. 3824591
- Feeler gauge

- (1) Remove the capscrews.
- (2) Remove the rocker lever cover and gasket, refer to engine maintenance manual.

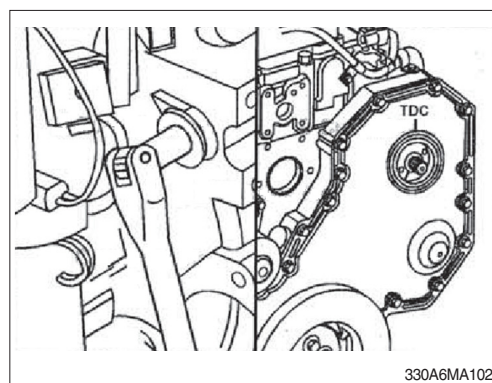


- (3) Remove the plastic fuel pump drive cover located on the front of the engine.



※ **Engine coolant temperature should be less than 60 °C (140 °F).**

- (4) Using the barring tool, rotate the crankshaft to align the top dead center marks on the gear cover and the fuel pump gear.



- (5) With the engine in this position, lash can be checked on the following rocker arms : 1I, 1E, 2I, 3E, 4I and 5E.

Lash check limits

Item		mm	inch
Intake	Min	0.152	0.006
	Max	0.559	0.022
Exhaust	Min	0.381	0.015
	Max	0.813	0.032

- ※ Lash checks are performed as part of a troubleshooting procedure, and resetting is not requires suring checks as long as the lash measurements are within the above limits.

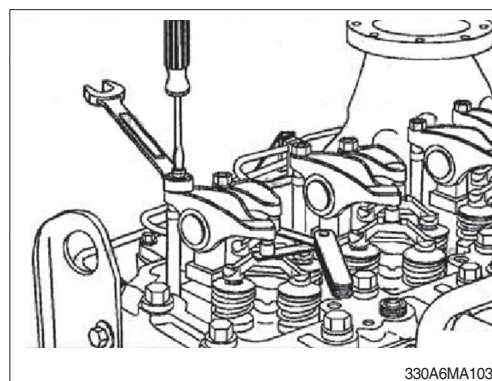
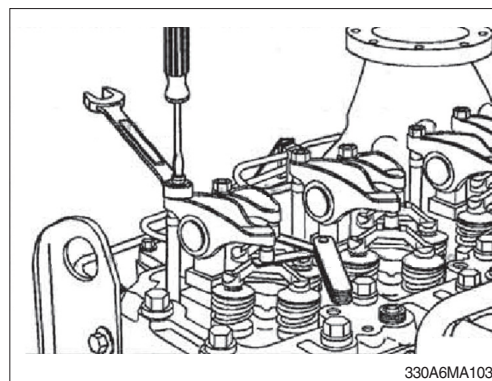
- (6) Measure lash by inserting a feeler gauge between the crosshead and the rocker lever ball insert and socket while lifting up on the end of the rocker arm. If the lash measurement is out of specifications, loosen the locknut and adjust-ment the lash to nominal specifications.

Lash reset specifications

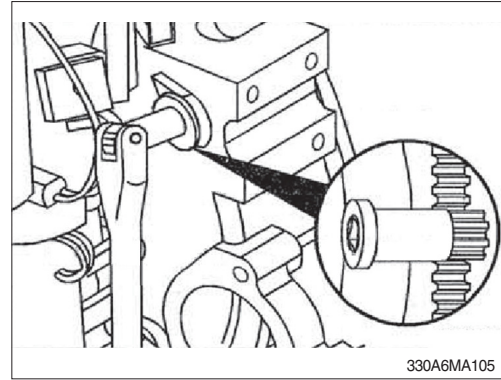
Item		mm	inch
Intake	Nominal	0.305	0.012
Exhaust	Nominal	0.559	0.022

- ※ Lash resets are only required at the interval specified in the maintenance schedule when lash is measured and found out of specification, or when engine repairs cause removal of the rocker arms and/or loosening of the adjusting screw.

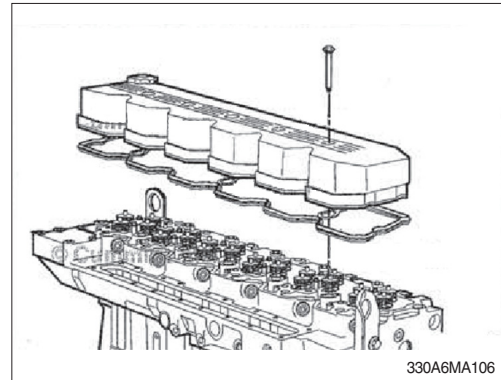
- (7) Tighten the locknut and measure again.
Tightening torque : 2.4 kgf·m (18 lbf·ft)



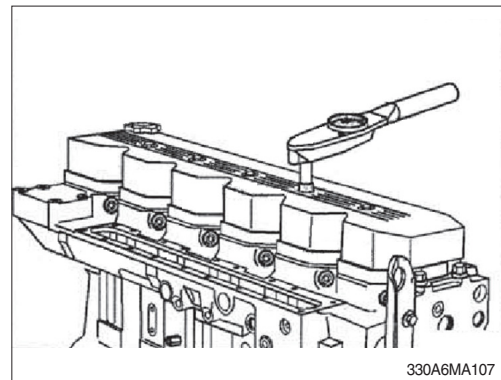
- (8) Using the barring tool, rotate the crankshaft 360 degrees and measure lash for rocker arms 2E, 3I, 4E, 5I, 6I and 6E. Reset the lash if out of specification.



- (9) Place the gasket on the cylinder head. Be sure the gasket is properly aligned around the cylinder head capscrews.
- (10) Install the rocker lever and capscrews.



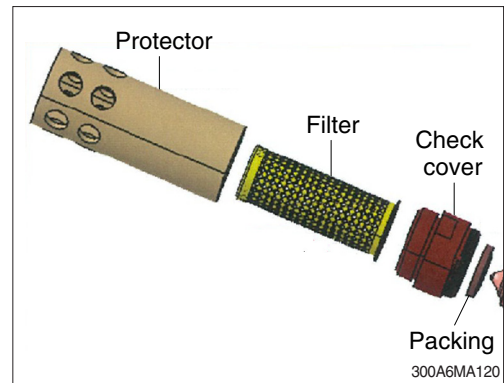
- (11) Tighten the capscrews.
Tightening torque : 1.2 kgf·m (8.9 lbf·ft)



21) FUEL FILLER PUMP FILTER

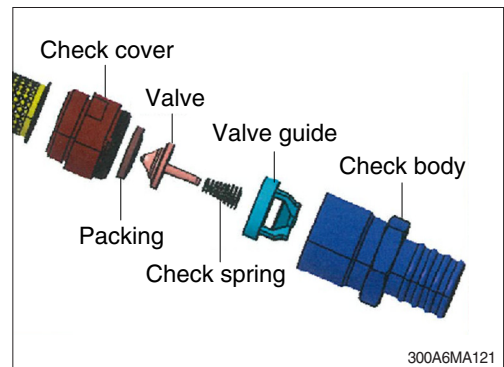
Clean the filter periodically as followings.

- (1) Clean the filter when it is required by visual inspection.
 - (2) Replace the filter when it is permanently damaged.
- ※ Clean with fuel or compressed, water should not be mixed.
 - ※ The structure can be loosened by hand.



(3) Check valve

- ① Except for maintenance, the check valve must have been equipped to the hose at all times.
- ② Clean or replace check valve when foreign material is found in valve.

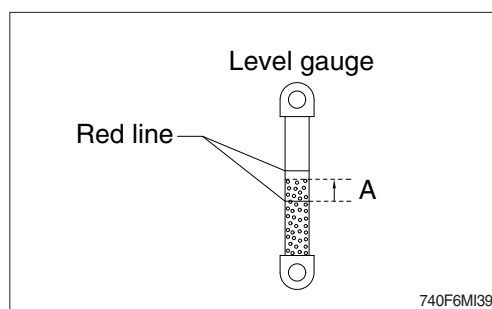
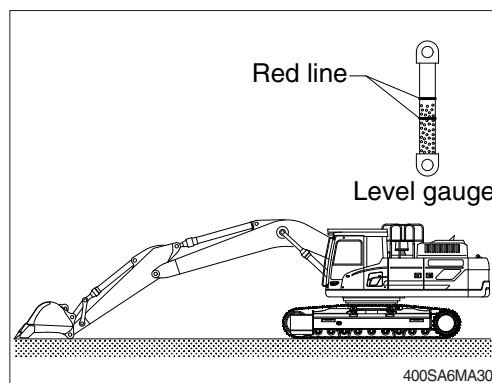


22) HYDRAULIC OIL CHECK

- (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.

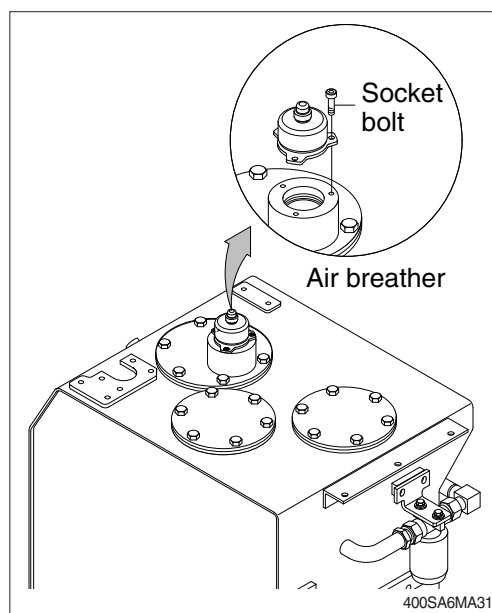
Temperature		Height A	
°C	°F	mm	inch
0	32	15	0.6
10	50	25	1.0
20	68	30	1.2
30	86	35	1.4
40	104	40	1.6

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



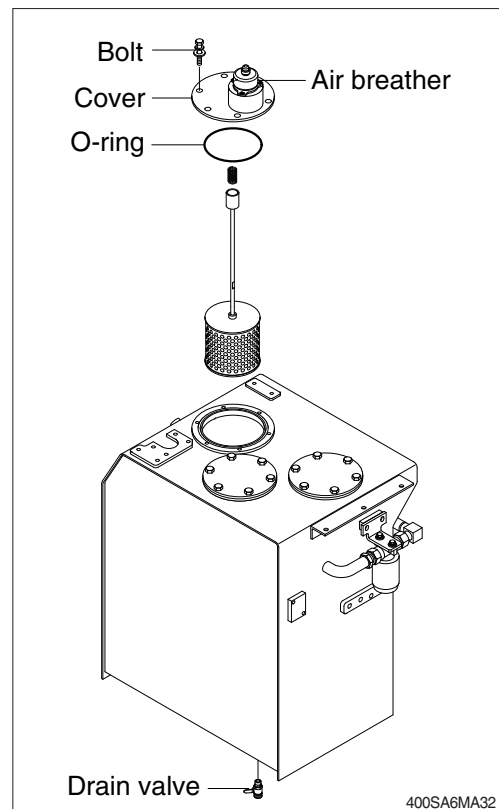
23) FILLING HYDRAULIC OIL

- (1) Position the machine like the hydraulic oil check. Then stop engine.
- (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.



24) CHANGE HYDRAULIC OIL

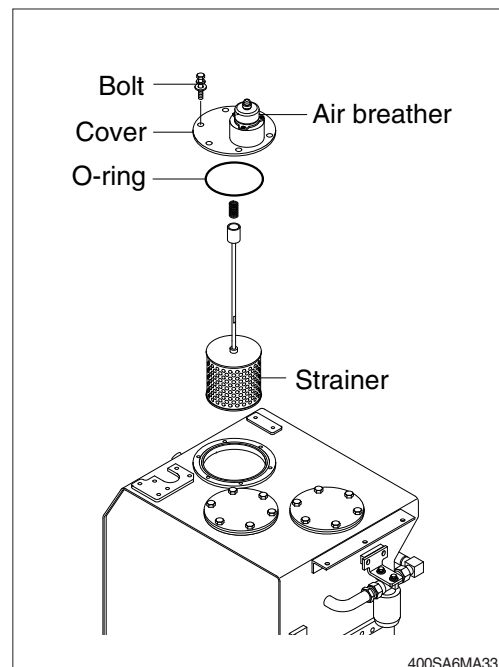
- (1) Position the machine like the hydraulic oil check. Then stop engine.
- (2) Relieve the pressure in the tank by pushing the top of the air breather.
- (3) Remove the cover.
 - Tightening torque : $6.9 \pm 1.4 \text{ kgf} \cdot \text{m}$
($50 \pm 10 \text{ lbf} \cdot \text{ft}$)
- (4) Prepare a suitable container with a capacity of 330 ℓ (87.2 U.S. gal).
- (5) To drain the oil open the drain valve at the bottom of the oil tank.
- (6) Close the drain valve and fill proper amount of recommended oil.
- (7) Put the breather in the right position.
- (8) To bleed air from 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.



25) CLEAN SUCTION STRAINER

Clean suction stainer as follows.

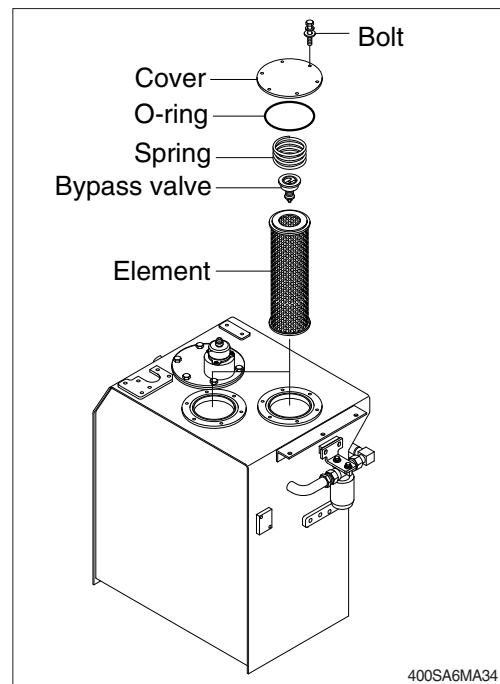
- (1) Remove the cover.
 - Tightening torque : $6.9 \pm 1.4 \text{ kgf} \cdot \text{m}$
($50 \pm 10 \text{ lbf} \cdot \text{ft}$)
 - (2) Pull out the strainer in the tank.
 - (3) Wash the suction strainer with gasoline or cleaning oil (mineral spirits).
 - (4) Replace the suction strainer if it is damaged.
 - (5) Assemble with reverse order of disassembly. Be sure to install a new O-ring.
- ※ Loosen bolts on the cover slowly as the cover has spring force applied. This will prevent cover from popping off without notice.



26) REPLACEMENT OF RETURN FILTER

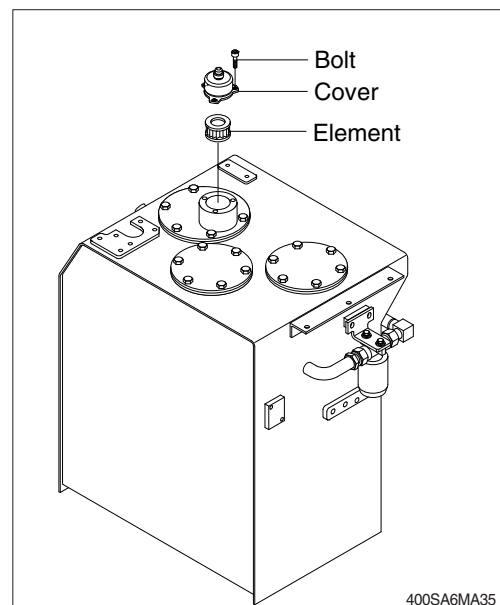
Replace return filters as follows.

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



27) REPLACEMENT OF ELEMENT IN HYDRAULIC TANK BREATHER

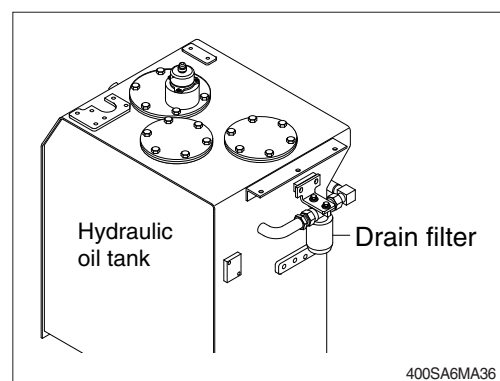
- (1) Relieve the pressure in the tank by pushing the top of the air breather.
- (2) Loosen the bolt and remove the cover.
- (3) Pull out the air breather element.
- (4) Replace the air breather element with a new one.
- (5) Reassemble by reverse order of disassembly.
 - Tightening torque : $0.8 \sim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



28) REPLACEMENT OF DRAIN FILTER

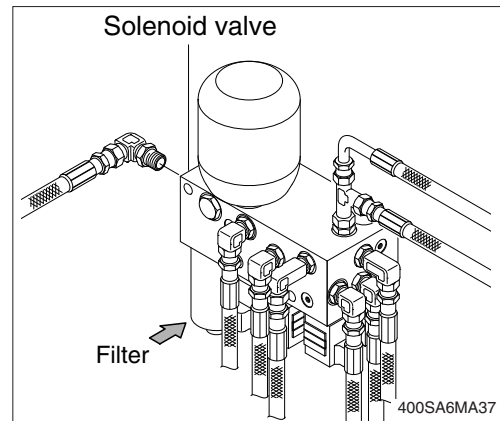
Clean the dust around filter and replace with new one after removing the drain filter.

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



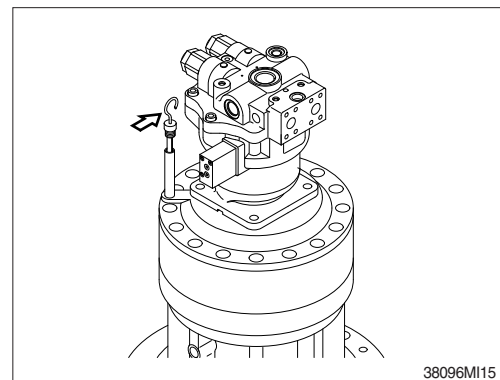
29) REPLACEMENT OF PILOT LINE FILTER

- (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.
 - Tightening torque : 2.5 kgf·m (18.1 lbf·ft)
- ※ **Change the element after initial 250 hours of operation. Thereafter, change the element every 1000 hours.**



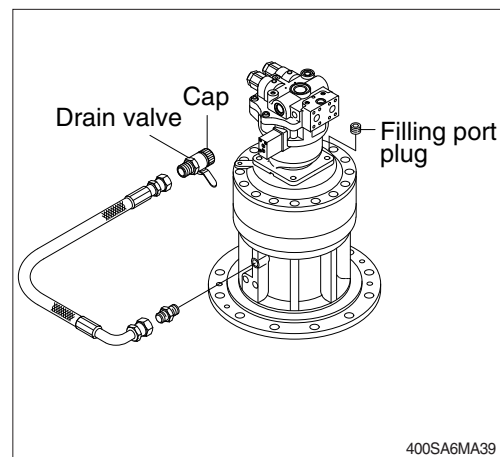
30) CHECK THE SWING REDUCTION GEAR OIL

- (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.



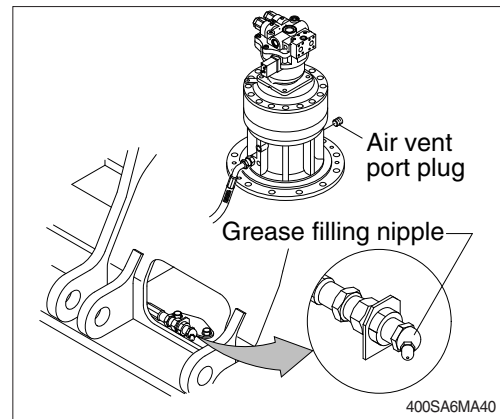
31) CHANGE SWING REDUCTION GEAR OIL

- (1) Raise the temperature of oil by swinging the machine and park the machine on the flat ground.
- (2) Prepare a proper container with a capacity of 10 ℓ (2.6 U.S. gal).
- (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 : 7.4 ℓ (1.95 U.S. gal)



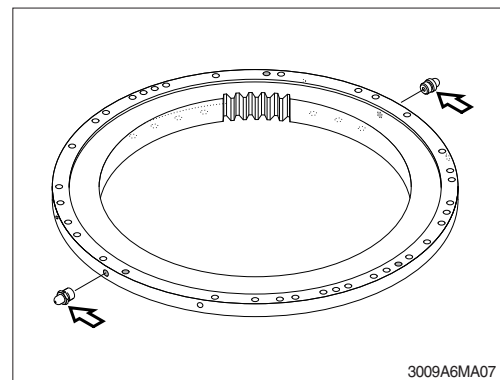
32) LUBRICATE BEARING OF OUTPUT SHAFT IN REDUCTION GEAR

- (1) Remove air vent plug.
 - (2) Lubricate NLGI No.2 with grease gun until comes out new grease from air vent port.
- Amount of oil : 1.6 ℓ (0.42 U.S. gal)



33) LUBRICATE SWING BEARING

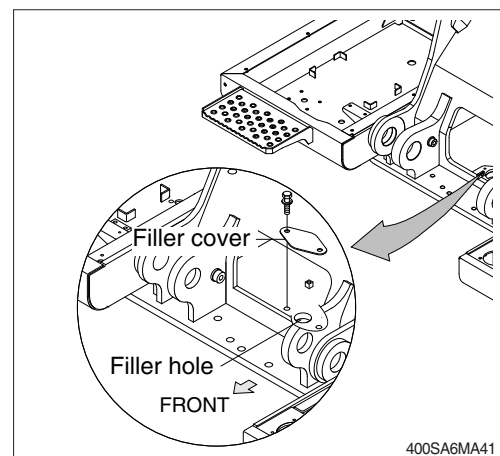
- (1) Grease at the 2 fittings shown in the photo.
- ※ Lubricate every 250 hours.



34) SWING GEAR AND PINION

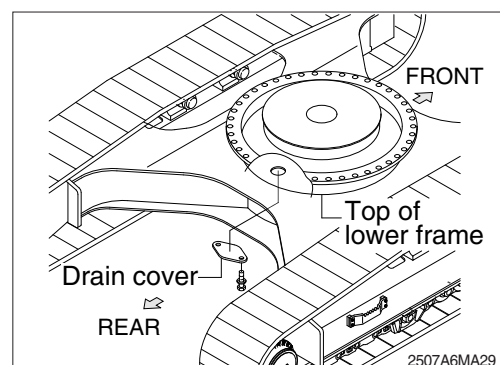
(1) Drain old grease

- 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.



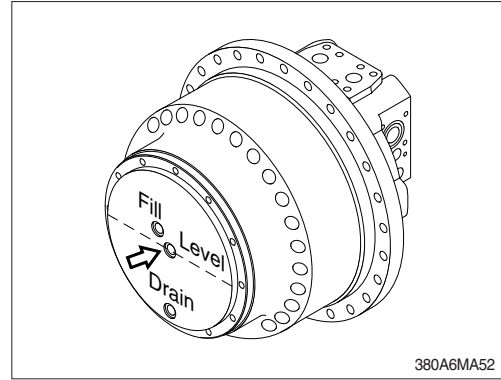
(2) Refill new grease

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



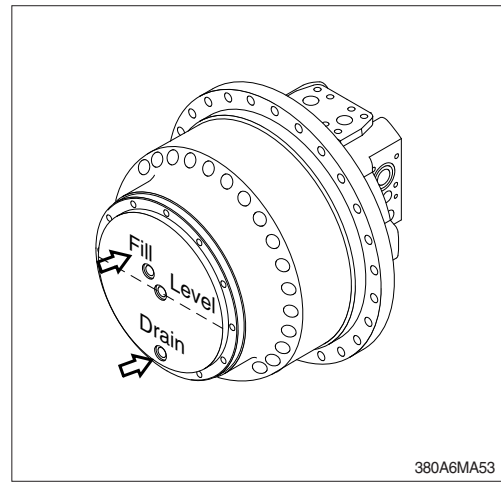
35) CHECK THE TRAVEL REDUCTION GEAR OIL

- (1) Position the travel motor as shown in the illustration and make sure the machine is on 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.
 - Tightening torque : 10 ± 1.0 kgf·m
(72.3 ± 7.2 lbf·ft)



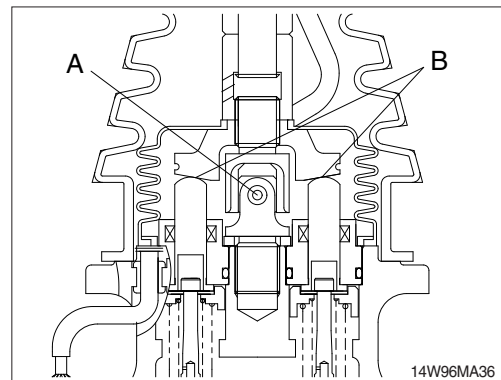
36) CHANGE OF THE TRAVEL REDUCTION GEAR OIL

- (1) Raise the temperature of the oil by operating the machine first.
- (2) Position the travel motor as shown in the illustration and make sure the machine is on flat ground.
- (3) Loosen the level plug, then the drain plug .
- (4) Drain the oil to adequate container with a capacity of 10 ℓ (2.6 U.S. gal).
- (5) Tighten the drain plug and fill specified amount of oil at filling port.
 - Amount of oil : 5.5 ℓ (1.45 U.S. gal)
 - Tightening torque : 10 ± 1.0 kgf·m
(72.3 ± 7.2 lbf·ft)
- (6) Tighten the level plug and travel slowly to check if there is any leakage of oil.



37) LUBRICATE RCV LEVER

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



38) ADJUSTMENT OF TRACK TENSION

(Machine Serial No. : -#0068)

- ▲ Serious injury or death can result from grease under pressure. Keep face, hands and body away from the nipple and valve.
- ※ It is important to adjust the tension of track properly to extend the life of track and traveling components.
- ※ 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 as shown in the illustration.
- (2) Measure the distance between bottom of track frame on track center and back of shoe.
- ※ **Remove mud by rotating the track before measuring.**

- (3) If the tension is tight, loosen the valve (B) gradually to drain the grease, but not more than one turn.

If the tension is loose, fill the grease through grease nipple (C) using a grease gun.

- (4) When the proper track tension is obtained, close grease valve (B) but do not tighten excessively as the fitting may be damaged.

· Valve tightening torque : 13 kgf·m (94 lb·ft)

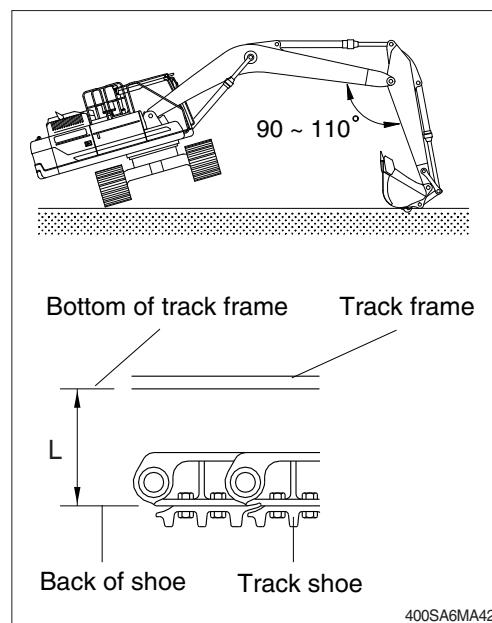
- ※ **Remove the mud and sand on the assembly face in order to prevent damage to seal (A) before assembling grease valve (B).**

If seal (A) is damaged, replace with a new one and assemble.

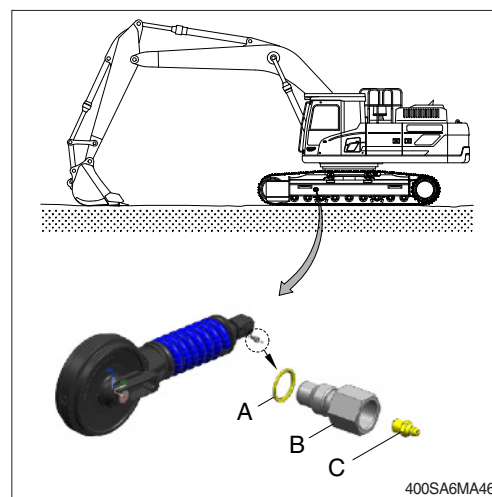
- ▲ When loosening the grease valve (B), do not loosen more than one turn as there is danger of a spring coming out of the valve (B) because of the high pressure inside.

- ※ When the grease does not drained smoothly, move the machine to forward and backward a short distance.

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



Length (L)	
390~420 mm	15.4~16"



38) ADJUSTMENT OF TRACK TENSION

(Machine Serial No. : #0069-)

▲ Serious injury or death can result from grease under pressure. Keep face, hands and body away from the fitting valve.

※ It is important to adjust the tension of track properly to extend the life of track and traveling components.

※ 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 as shown in the illustration.

(2) Measure the distance between bottom of track frame on track center and back of shoe.

※ Remove mud by rotating the track before measuring.

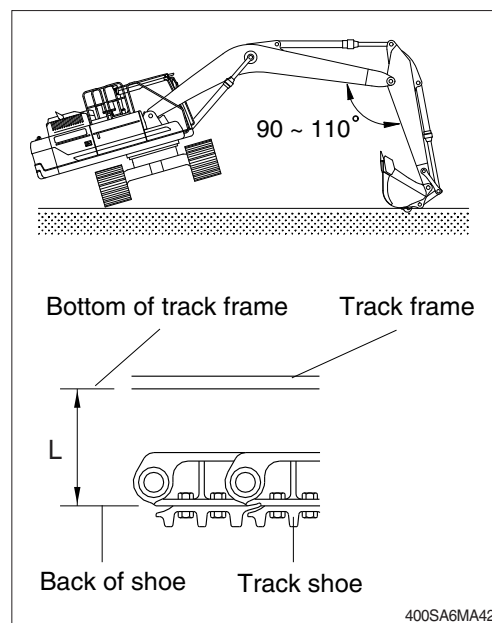
(3) The track tension can be adjusted using the grease fitting valve (A) and handle screws (B) located in the center of each side frame. When you fill the grease fittings with grease, it increases the length of the adjustable cylinders. As the adjustable cylinders become longer, pressure builds up in the tension springs, causing them to expand beyond the track idlers.

(4) If the tracks and adjustment devices expand to the point where there is insufficient deflection or space between parts, turn the handle screw clockwise once or twice to release some of the grease. Once the track tension is suitable, tighten the handle screw in the counterclockwise direction.

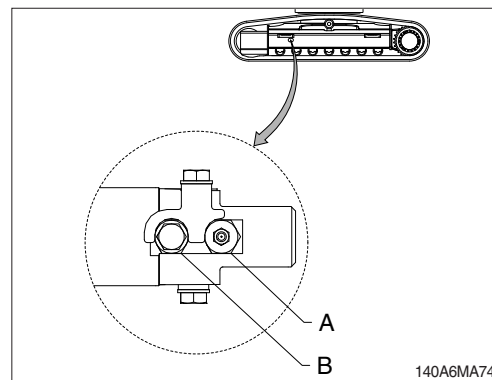
· Valve tightening torque : 7 ± 1 kgf·m (5.2 ± 0.7 lb·ft)

※ Check the tension again after rotating the track 3~4 times.

▲ After draining, if the handle screw can not be turned counterclockwise, the grease will continue to drain. Moreover, excessive counterclockwise turning may damage the screw's stopper. Rotate the handle screw by no more than one or two turns.



Length (L)	
390~420 mm	15.4~16"



39) 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 to signal clearly to each other and work carefully to avoid serious injury.

(1) Lower the bucket on the ground as shown in the illustration on the top 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 removing the pins, make sure that they do not become contaminated with sand or mud and that the seals of bushings on both sides do not become damaged.

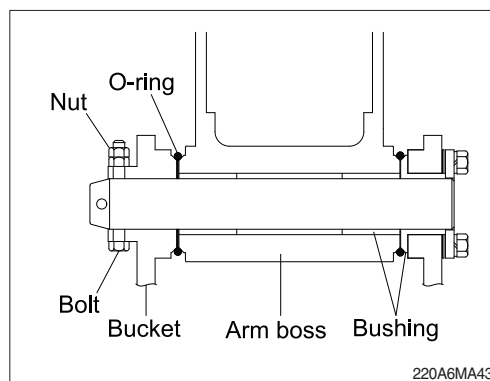
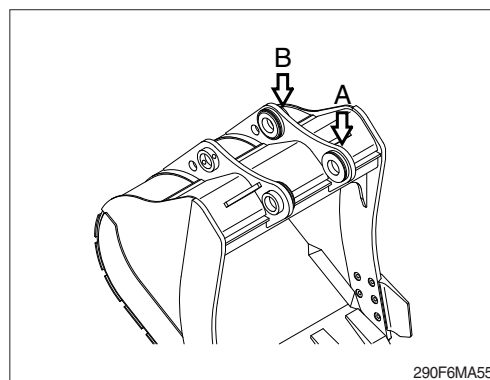
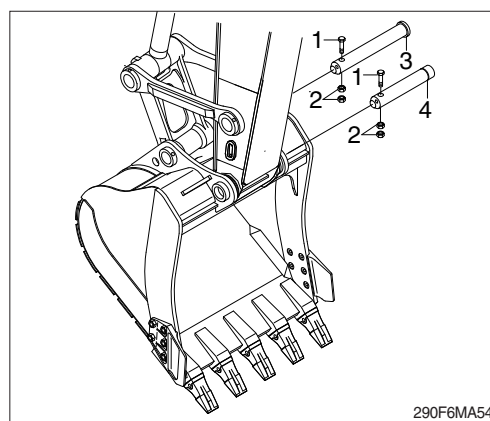
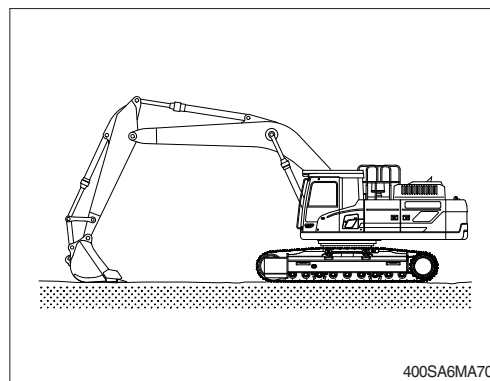
(4) Align the arm with holes (A) and the link with holes (B), then coat with grease and install pins (3, 4)

※ 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 hitting 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.

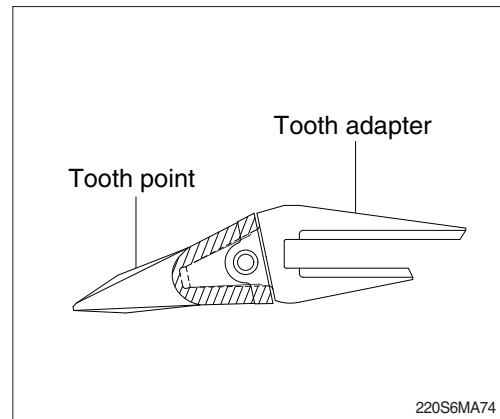
· Tightening torque : $57.9 \pm 8.7 \text{ kgf} \cdot \text{m}$
 $(419 \pm 62.9 \text{ lbf} \cdot \text{ft})$



40) 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 In case of excessive use and tooth adapter has worn excessively, replacement may become impossible.



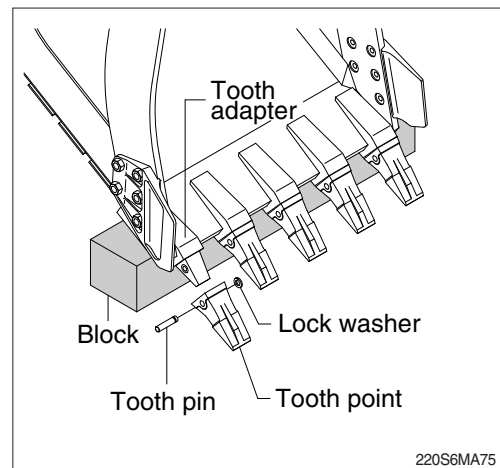
(2) Instructions for replacement

- 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 point to adapter.
- ④ Insert pin until lock washer is positioned at tooth pin groove.

▲ Serious injury or death can result from bucket falling.

▲ Block the bucket before changing tooth points or side cutters.

▲ The operator should wear clothes and personal protection gear that are appropriate for the work environment. Protects the eyes from dust, particles and airborne materials with a protection gear like goggle.



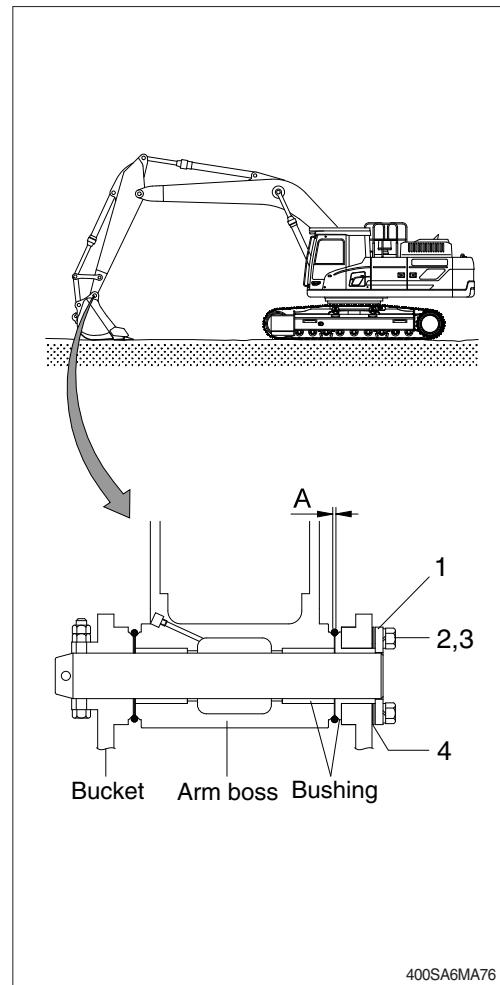
41) ADJUSTMENT OF BUCKET CLEARANCE

- (1) Lower the bucket on the ground as shown in the illustration.
- (2) Swing to the left and keep arm boss in contact with the left bucket ear.
- (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 : $57.9 \pm 8.7 \text{ kgf} \cdot \text{m}$
($419 \pm 62.9 \text{ lbf} \cdot \text{ft}$)
 - 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 will occur. This will also cause damage to O-ring and bushings prematurely.



42) 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.

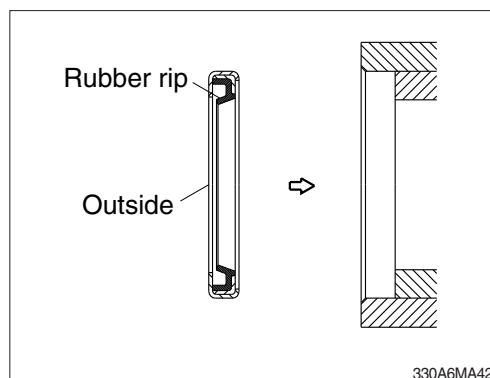
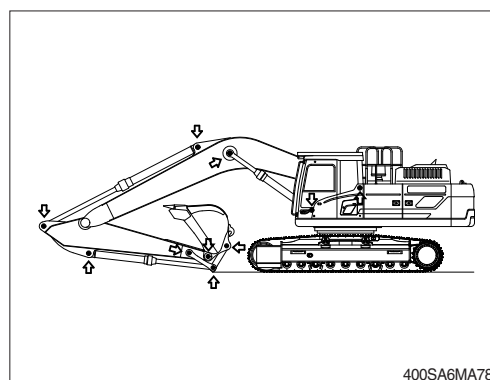
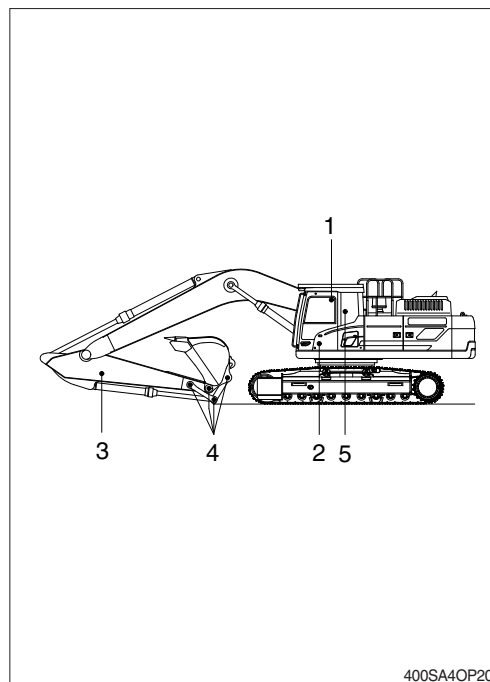
★ Not required : If necessary, lubricate the grease.

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

※ Mount the lip so it is facing outside when replacing dust seals.

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

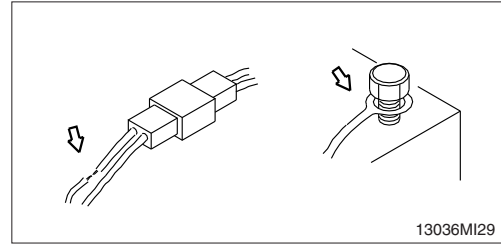
※ Install seal in the same manner as shown in the illustration. Use a plastic hammer to lightly and evenly tap the seal into place.



7. ELECTRICAL SYSTEM

1) WIRING, GAUGES

Check regularly and repair loose or malfunctioning gauges when found.



2) BATTERY

(1) Clean

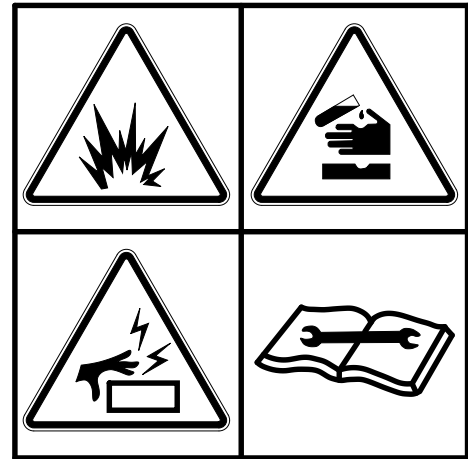
① Wash the terminal with hot water if it is contaminated, and apply grease to the terminals after washing.

⚠ 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.
If eyes are affected, flush with clean water or eye solution and seek immediate medical attention.



(2) Recycle

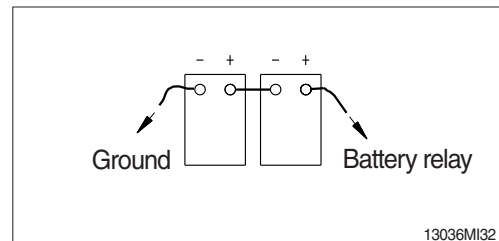
Never discard a battery.

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

Follow these procedures when starting.

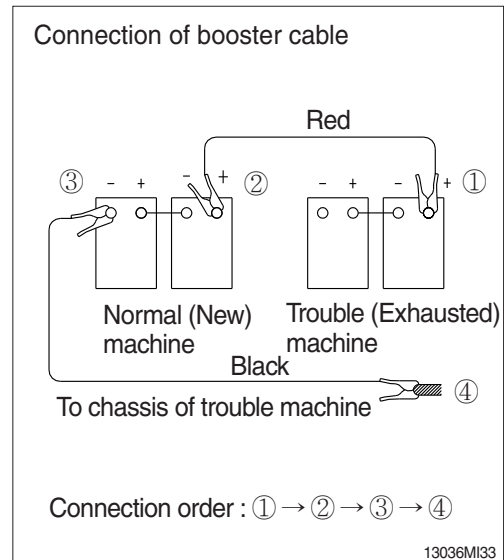
(1) Connection of booster cable

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

- ① Make sure that the starting switches of the normal machine and trouble machine are both in 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.

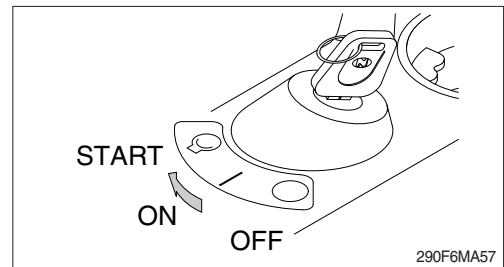
※ **Make and maintain a firm connection.**

※ **Sparks will occur slightly when making the final connection.**



(2) Starting the engine

- ① Start the engine of the normal machine and keep it running at high idle.
- ② Start engine of the troubled machine with starting switch.
- ③ If you can not start it with the first attempt, try again after 2 minutes.



(3) Taking off the booster cable

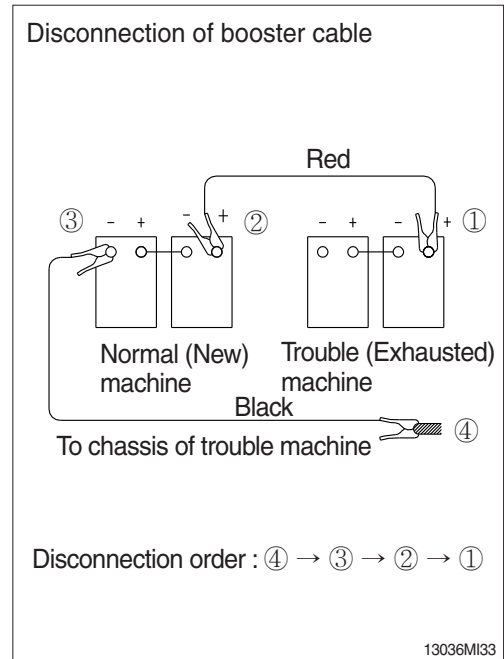
- ① Take off the booster cable (black).
- ② Take off the booster cable (red) connected to the (+) terminal.
- ③ Run engine at high idle until charging of the exhausted battery is complete.

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

※ **Charge the battery in a well ventilated area.**

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

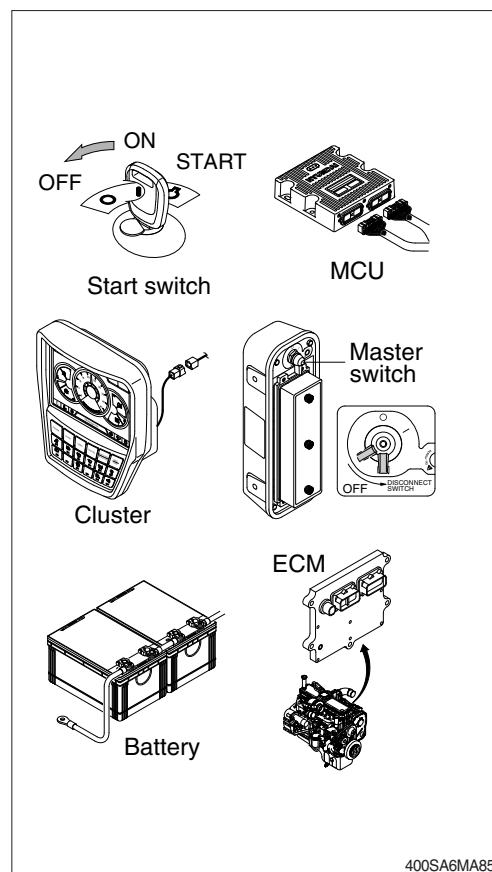
※ **Do not connect (+) terminal and (-) terminal when connecting booster cable because it will be shorted.**



4) WELDING REPAIR

Before welding, follow the below procedure.

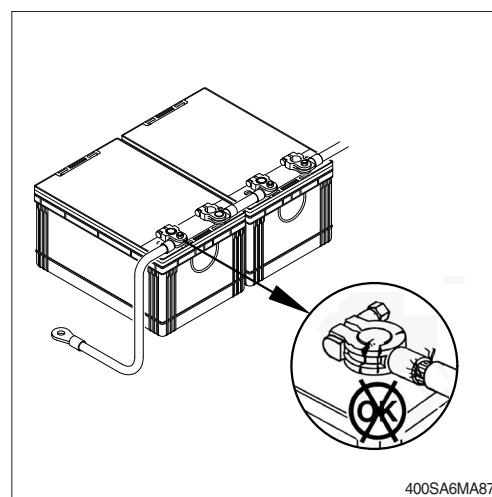
- (1) Shut off the engine and remove the key.
 - (2) Disconnect ground cable from battery by master switch.
 - (3) Before carrying out any electric welding on the machine, the battery cables should be disconnected and the connectors pulled out of the electronic control units (MCU, ECM, cluster etc).
 - (4) Connect the earth (ground) lead of the welding equipment as close to the welding point as possible.
- ※ **Remove all paint to ensure a solid ground is achieved.**
 - ※ **Do not weld or use cutting torch on pipes or tubes that contain flammable fluids. Clean them thoroughly with nonflammable solvent before welding or cutting on them.**
 - ▲ **Do not attempt to weld before carrying out the above.**
If not, it will cause serious damage to electric system.



5) BATTERY CABLE AND CONNECTIONS

▲ **Batteries can emit explosive gases. To reduce the possibility of personal injury, always ventilate the compartment before servicing the batteries.**

- (1) Remove and inspect the battery cables and connections for cracks or corrosion.
- (2) Replace broken terminals, connectors, or cables.
- (3) If the connections are corroded, use a battery brush or wire brush to clean the connections.
- (4) Make sure all debris are removed from the connecting surfaces.
- (5) Install the cables and tighten the battery connections.
- (6) Coat the terminals with grease to prevent corrosion.

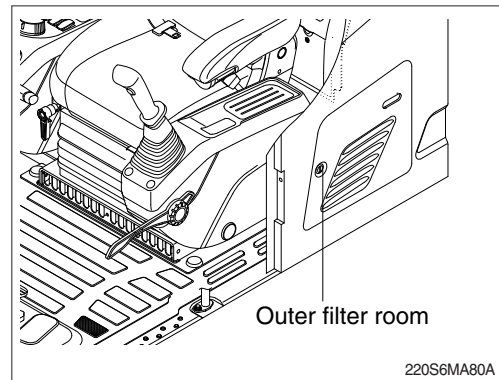


8. AIR CONDITIONER AND HEATER

1) CLEANING AND REPLACEMENT OF OUTER FILTER

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

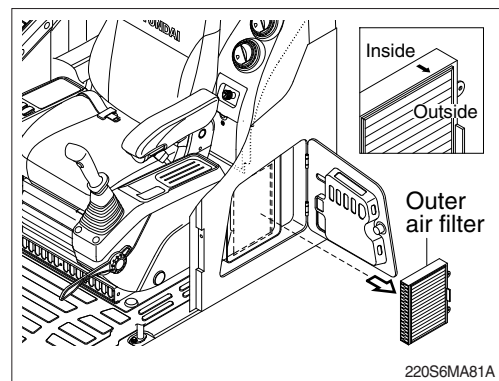
- (1) Open the outer filter room.



- (2) Remove the outer filter.

※ **When installing a filter, be careful not to install the filter in the wrong direction.**

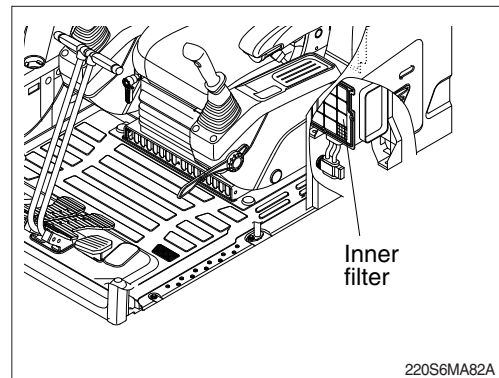
- (3) If the filter is damaged or badly contaminated, use a new filter.



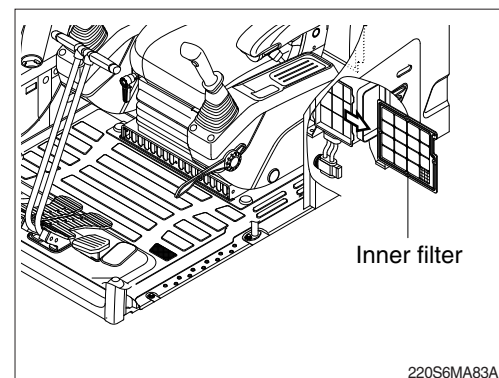
2) CLEANING AND REPLACEMENT OF INNER FILTER

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

- (1) Move seat and console box forward by using the adjust knob.



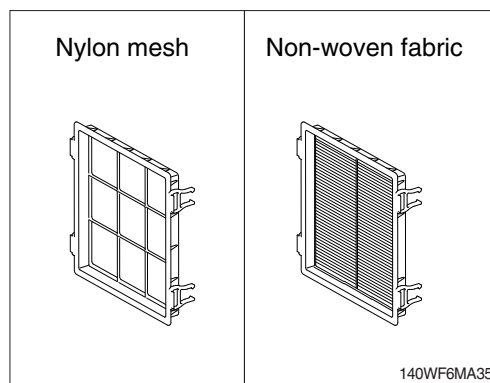
- (2) Remove the inner filter.



(3) Check the inner filter type.

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

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

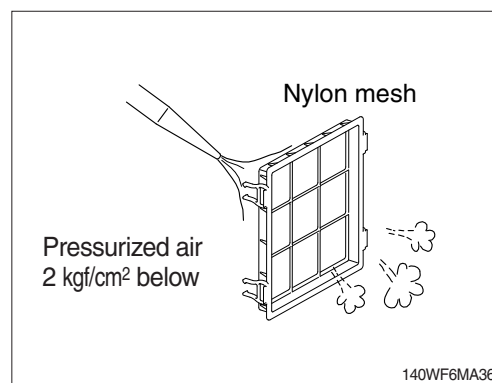


(5) Clean the inner filter using pressurized air (below 2 kgf/cm², 28 psi) or washing with water.

△ **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 or ventilate by using the fresh air function.

(2) Be careful not to overcool the cab.

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

4) CHECK DURING SEASON

Ask the service center for replenishment of refrigerant or other maintenance service so that the cooling performance does not wear prematurely.

5) CHECK DURING OFF-SEASON

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

6) REFRIGERANT

(1) Equipment contains fluorinated greenhouse gas.

Model	Type	Quantity	GWP : 1430
HX400LT3	HFC-134a	0.85 kg (1.87 lb)	CO ₂ eq. : 1.22t

※ GWP

Global warming potential (GWP) is a measure of how much heat a gas traps in the atmosphere relative to that of carbon dioxide (CO₂). GWP is calculated in terms of the 100-year warming potential of 1 kg of a greenhouse gas relative to 1 kg of CO₂.

(2) Environmental precautions

The air conditioning system of the machine is filled with HFC-134a refrigerant at the factory.

HFC-134a refrigerant is a fluorinated greenhouse gas and contributes to global warming.

Do not release refrigerant into the environment.

(3) Safety precautions

Work on the air conditioning system must only be performed by a qualified service technician.

Do not attempt to perform work on the air conditioning system.

Wear safety goggles, chemical resistant gloves and appropriate personal protective equipment to protect bare skin when there is a risk of contact with refrigerant.

(4) Action in case of exposure

① Eye contact / Limited skin contact

Rinse with warm water and apply a light bandage. Seek medical attention immediately.

② Extensive skin contact

Rinse with warm water and carefully heat the area with warm water or warm clothing.

Seek medical attention immediately.

③ Inhalation

Leave the area and find fresh air. Seek medical attention immediately.