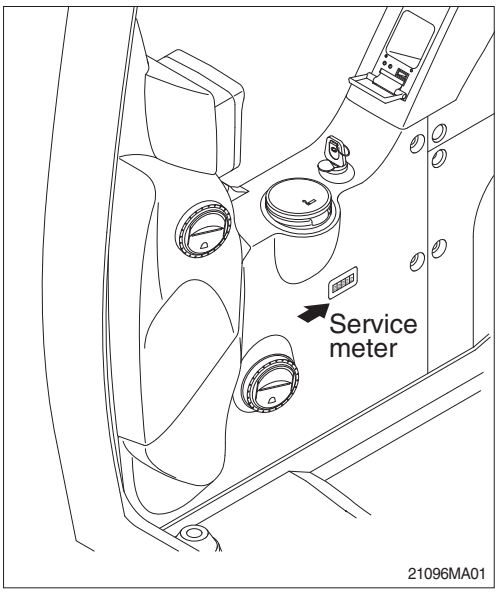
1. INSTRUCTION

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) Ask to your local dealer or Hyundai for the maintenance advice if unknown.

(5) 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.

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.

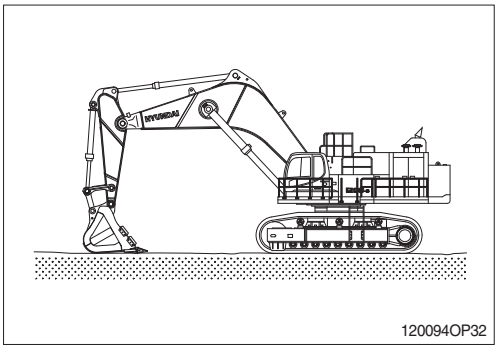
(9) For more detail information of maintenance, please contact local Hyundai dealer.

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

4) RELIEVING THE PRESSURE IN THE HYDRAULIC SYSTEM

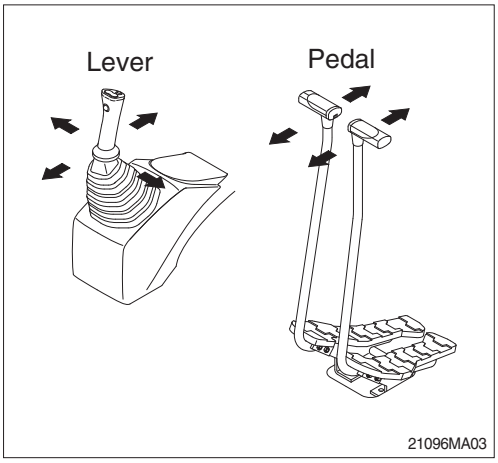
※ **Spouting of oil can cause the accident when loosening the cap or hose right after the operating of machine as the machine or oil is on the high pressure on the condition.**
Be sure to relieve the pressure in the system before repairing hydraulic system.

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

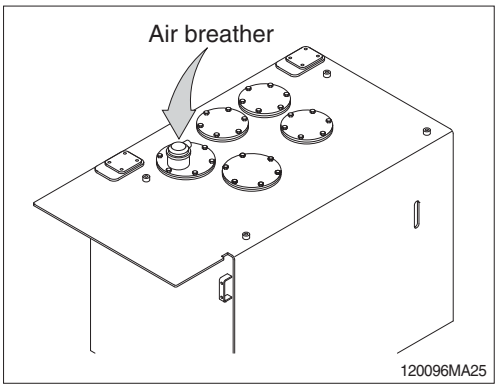


(2) Set the safety lever completely in the release position, operate the control levers and pedals fully to the front, rear, left and right, to release the pressure in the hydraulic circuit.

※ **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) Loosen the cap and 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	8T		10T	
	kg · m	lb · ft	kg · m	lb · ft
M 6 × 1.0	0.85 ~ 1.25	6.15 ~ 9.04	1.14 ~ 1.74	8.2 ~ 12.6
M 8 × 1.25	2.0 ~ 3.0	14.5 ~ 21.7	2.7 ~ 4.1	19.5 ~ 29.7
M10 × 1.5	4.0 ~ 6.0	28.9 ~ 43.4	5.5 ~ 8.3	39.8 ~ 60
M12 × 1.75	7.4 ~ 11.2	53.5 ~ 81.0	9.8 ~ 15.8	70.9 ~ 114
M14 × 2.0	12.2 ~ 16.6	88.2 ~ 120	16.7 ~ 22.5	121 ~ 163
M16 × 2.0	18.6 ~ 25.2	135 ~ 182	25.2 ~ 34.2	182 ~ 247
M18 × 2.5	25.8 ~ 35.0	187 ~ 253	35.1 ~ 47.5	254 ~ 344
M20 × 2.5	36.2 ~ 49.0	262 ~ 354	49.2 ~ 66.6	356 ~ 482
M22 × 2.5	48.3 ~ 63.3	349 ~ 458	65.8 ~ 98.0	476 ~ 709
M24 × 3.0	62.5 ~ 84.5	452 ~ 611	85.0 ~ 115	615 ~ 832
M30 × 3.0	124 ~ 168	898 ~ 1214	169 ~ 229	1223 ~ 1656
M36 × 4.0	174 ~ 236	1261 ~ 1704	250 ~ 310	1808 ~ 2242

(2) Fine thread

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

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

4) TIGHTENING TORQUE OF MAJOR COMPONENT

No.	Descriptions		Bolt size	Torque	
				kgf · m	lbf · ft
1	Engine	Engine mounting bolt, nut (FR)	M22 × 2.5	70 ± 7.0	506 ± 50.6
2		Engine mounting bolt, nut (RR, bracket)	M18 × 2.5	39 ± 4.0	282 ± 28.9
3		Engine mounting bolt, nut (RR, frame)	M24 × 3.0	90 ± 9.0	650 ± 65
4		Gear box mounting bolt	M12 × 1.75	12.3 ± 1.0	89 ± 7.2
5		Radiator mounting bolt	M20 × 2.5	57.9 ± 8.7	419 ± 63
6		Oil cooler mounting bolt	M20 × 2.5	57.9 ± 8.7	419 ± 63
7		Coupling mounting socket bolt	M10 × 1.5	27.0 ± 3.0	195 ± 21.7
8		Fan pump mounting bolt	M16 × 2.0	29.7 ± 4.5	215 ± 32.5
9	Hydraulic system	Main pump mounting socket bolt	M20 × 2.5	57.9 ± 8.7	419 ± 63
10		Main control valve 1 mounting bolt	M20 × 2.5	42.6 ± 4.2	308 ± 30.3
11		Main control valve 2 mounting bolt	M16 × 2.0	29.7 ± 4.5	215 ± 32.5
12		Fuel tank mounting bolt	M20 × 2.5	58 ± 6.0	420 ± 43.4
13		Hydraulic oil tank mounting bolt	M20 × 2.5	58 ± 6.0	420 ± 43.4
14		Turning joint mounting bolt, nut	M16 × 2.0	29.7 ± 4.5	215 ± 32.5
15	Power train system	Swing motor mounting bolt	M24 × 3.0	100 ± 15	723 ± 108
16		Swing bearing upper part mounting bolt	M30 × 3.5	199 ± 10	1439 ± 72.3
17		Swing bearing lower part mounting bolt	M30 × 3.5	199 ± 10	1439 ± 72.3
18		Travel motor mounting bolt	M30 × 3.5	150 ± 10	1085 ± 72.3
19		Sprocket mounting bolt	M30 × 3.5	199 ± 10	1439 ± 72.3
20	Under carriage	Carrier roller mounting bolt, nut	M20 × 2.5	57.9 ± 8.7	419 ± 63
21		Track roller mounting bolt	M27 × 3.0	140 ± 7.0	1013 ± 50.6
22		Track tension cylinder mounting bolt	M24 × 3.0	100 ± 10	723 ± 72.3
23		Track shoe mounting bolt, nut	M24 × 1.5	240 ± 2.0	1736 ± 145
24		Track guard mounting bolt	M27 × 3.0	140 ± 7.0	1013 ± 50.6
25	Others	Counterweight mounting bolt	M42 × 3.0	390 ± 40	2821 ± 289
26		Cab mounting bolt	M12 × 1.75	12.8 ± 3.0	92.6 ± 21.7
27		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	SAE 10W-30 (API CH-4), ★SAE 5W-40 (API CH-4)
Hydraulic oil	Hyundai genuine long life hydraulic oil (ISO VG 32, VG 46, VG 68) Conventional hydraulic oil (ISO VG 15★)
Swing and travel reduction gear	SAE 80W-90 (API 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

Ultra low sulfur diesel
- sulfur content ≤ 15 ppm

★Cold region
Russia, CIS, Mongolia

2) RECOMMENDED OILS

Use only oils listed below. Do not mix different brand oil.
Please use HYUNDAI genuine oil and grease.

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) 40 (104)
Engine oil pan	Engine oil	70 (18.5)	★SAE 5W-40 SAE 30 SAE 10W SAE 10W-30 SAE 15W-40
Gear box	Heavy duty gear oil	6.0 (1.6)	★SAE 75W-90 ISO VG 100~220
Swing drive	Gear oil	8.0×2 (2.1×2)	★SAE 75W-90
Final drive		20×2 (5.3×2)	SAE 80W-90
Hydraulic tank	Hydraulic oil	Tank : 670 (177) System: 1160 (306)	★ISO VG 15 ISO VG 32 ISO VG 46 ISO VG 68
Fuel tank	Diesel fuel	1475 (390)	★ASTM D975 NO.1 ASTM D975 NO.2
Lower roller	Gear oil	1.08 (0.3)	★SAE 75W-90
Upper roller		0.68 (0.18)	
Idler		0.83 (0.22)	SAE 85W-140
Fitting (grease nipple)	Grease	As required	★NLGI NO.1 NLGI NO.2
Radiator (reservoir tank)	Mixture of antifreeze and soft water★1	100 (26.4)	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 : Soft water
City water or distilled water

4. MAINTENANCE CHECK LIST

1) DAILY SERVICE BEFORE STARTING

Check items	Service	Page
Visual check		
Fuel tank	Check, Refill	6-29
Hydraulic oil level	Check, Add	6-32
Engine oil level	Check, Add	6-18
Coolant level	Check, Add	6-21
Control panel & pilot lamp	Check, Clean	6-43
Fuel filter (Machine serial No. : #0054-)	Check, Drain	6-30, 30-1
Prefilter (Machine serial No. : -#0053)	Check, Drain	6-31
Fan belt tension	Check, Adjust	6-25

2) EVERY 50 HOURS SERVICE

Check items	Service	Page
Fuel tank (water, sediment)	Drain	6-29
Track tension	Check, Adjust	6-38
Swing reduction gear oil	Check, Add	6-35
Attachment pin and bushing	Lubricate	6-42
· 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		
· Bucket cylinder rod end		
· Bucket + Arm connecting		
· Bucket control link + Arm		
· Bucket control rod		

3) INITIAL 50 HOURS SERVICE

Check items	Service	Page
Fan system 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		
· Hydraulic pump mounting bolts		

4) EVERY 200 HOURS SERVICE

Check items	Service	Page
★ Return filter	Replace	6-33
★ Pilot line filter	Replace	6-34
★ Drain filter cartridge	Replace	6-34

★ 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
Fuel filter element	Replace	6-30, 30-1, 30-2
Prefilter element (Machine serial No. : -#0053)	Replace	6-31
Pilot line filter	Replace	6-34
Hydraulic return filter element	Replace	6-33
Drain filter cartridge	Replace	6-34
Swing reduction gear oil	Change	6-35
Swing reduction gear grease	Check, Add	6-35
Gear box oil	Change	6-28
Travel reduction gear oil	Change	6-37

6) EVERY 250 HOURS SERVICE

Check items	Service	Page
Battery (voltage)	Check, Clean	6-43
Aircon & heater fresh air filter	Check	6-46
Fuel filter element (Machine serial No. : -#0053)	Replace	6-30
Prefilter element (Machine serial No. : -#0053)	Replace	6-31
Swing bearing grease	Check, Add	6-35
Central grease pump	Check, Tight	8-1
Bolts & Nuts		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		
· Hydraulic pump mounting bolts	Lubricate	
Attachment pin and bushing		6-42
· 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	6-18, 19
★Engine oil filter	Replace	6-18, 19
Water filter (corrosion resistor)	Replace	6-20
Coolant test (DCA4 concentration)	Test, Add	6-21-1, 2
Oil cooler	Check, Clean	6-24
Radiator, cooler fin and charge air cooler	Check, Clean	6-25
☆Air cleaner element (primary)	Check, Clean	6-29
Fuel filter element (Machine serial No. : #0054-)	Replace	6-30-1, 30-2

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

☆ Clean the primary element only after 500 hours operation or when the air cleaner warning lamp blinks. Replace primary element and safety element after 4 times cleanings of primary element.

8) EVERY 1000 HOURS SERVICE

Check items	Service	Page
Travel motor reduction gear oil	Change	6-37
Swing reduction gear oil	Change	6-35
Swing reduction gear grease	Change	6-35
Grease in swing gear and pinion	Change	6-36
Hydraulic oil return filter	Replace	6-33
Drain filter cartridge	Replace	6-34
Pilot line filter	Replace	6-34
Air breather element	Replace	6-34

9) EVERY 2000 HOURS SERVICE

Check items	Service	Page
Coolant	Change	6-21, 22, 23, 24
Hydraulic tank suction strainer	Check, Clean	6-33
Gear box oil	Change	6-28
Hydraulic oil ★1	Change	6-32
Hoses, fittings, clamps (fuel, coolant, hydraulic)	Check, Retighten, Replace	-
Air cleaner element (primary, safety)	Replace	6-29

★1 Conventional hydraulic oil

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

10) EVERY 5000 HOURS SERVICE

Check items	Service	Page
Hydraulic oil ★2	Change	6-32

★2 Hyundai genuine long life hydraulic oil

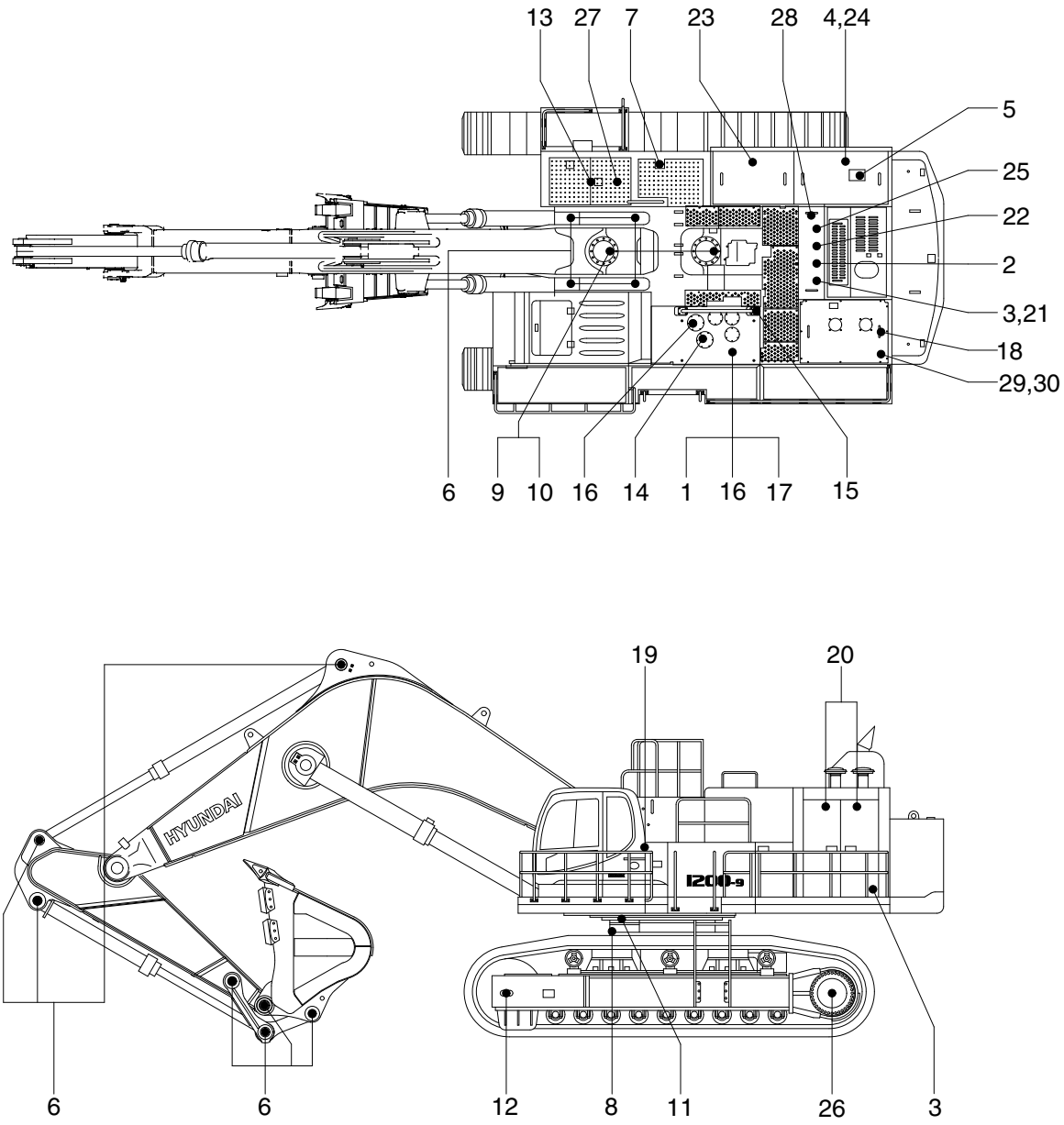
★ Change oil every 1000 hours of continuous hydraulic breaker operation.

11) 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	6-29
· Prefilter (Machine serial No. : -#0053)	Drain, Replace	6-31
· Fuel filter element (Machine serial No. : -#0053)	Replace	6-30
· Fuel filter (Machine serial No. : #0054-)	Drain, Replace	6-30-1, 30-2
Engine lubrication system		
· Engine oil	Change	6-18, 19
· Engine oil filter	Replace	6-18, 19
· Gear box oil	Change	6-28
· Fan system grease	Check, Add	6-37
Engine cooling system		
· Coolant	Add or Change	6-21, 22, 23, 24
· Radiator	Clean or Flush	6-21, 22, 23, 24
· Charge air cooler	Check	6-25
· Water filter (corrosion resistor)	Replace	6-20
Engine air system		
· Air cleaner element	Replace	6-29
Hydraulic system		
· Hydraulic oil	Add or Change	6-32
· Return filter	Replace	6-33
· Drain line filter	Replace	6-34
· Pilot line filter	Replace	6-34
· Element of breather	Replace	6-34
· Suction strainer	Clean	6-33
Under carriage		
· Track tension	Check, Adjust	6-38
Bucket		
· Tooth	Replace	6-40
· Linkage	Adjust	6-41
· Bucket assy	Replace	6-39
Air conditioner and heater		
· Fresh air filter	Clean, Replace	6-46
· Recirculation filter	Clean	6-47
Attachment lubrication system		
· Central grease pump	Check, Add	8-1

5. MAINTENANCE CHART



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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	670 (177)	1
	2	Engine oil level	Check, Add	EO	70 (18.5)	1
	4	Radiator coolant	Check, Add	C	100 (26.4)	1
	5	Fan belt tension and damage	Check, Adjust	-	-	1
	7	Fuel tank	Check, Refill	DF	1475 (390)	1
	21	Prefilter (Machine serial No. : -#0053)	Check, Drain	-	-	1
	30	Fuel filter (Machine serial No. : #0054-)	Check. Drain	-	-	1

Service interval	No.	Description	Service action	Oil symbol	Capacity ℓ (U.S.gal)	Service points No.
50 Hours or weekly	6	Attachment pin	Check, Add	PGL	-	16
	7	Fuel tank (water, sediment)	Check, Clean	-	1475 (390)	1
	9	Swing reduction gear case	Check, Add	GO	8.0 (2.1)	2
	12	Track tension	Check, Adjust	PGL	-	2
250 Hours	8	Swing bearing grease	Check, Add	PGL	-	4
	13	Battery (voltage)	Check, Clean	-	-	1
	19	Aircon and heater fresh air filter	Check, Clean	-	-	1
	21	Prefilter element (Machine serial No. : -#0053)	Replace	-	-	1
	22	Fuel filter element (Machine serial No. : -#0053)	Replace	-	-	2
	27	Central grease pump	Check, Add	PGL	8 kg(18.6 lb)	1
500 Hours	2	Engine oil	Change	EO	70 (18.5)	1
	3	Engine oil filter	Replace	-	-	2
	20	Air cleaner element (primary)	Check, Clean	-	-	1
	30	Fuel filter element (Machine serial No. : #0054-)	Replace	-	-	1
	23	Oil cooler	Check, Clean	-	-	1
	24	Radiator, charge air cooler	Check, Clean	-	-	1
	25	Water filter (corrosion resistor)	Replace	-	-	1
	25	Coolant test (DCA4 concentration)	Test, Add	DCA4	-	1
1000 Hours	9	Swing reduction gear case	Change	GO	8.0 (2.1)	2
	10	Swing reduction gear grease	Check, Add	PGL	1.6 (0.4)	2
	11	Swing gear and pinion grease	Change	PGL	50 kg (110 lb)	1
	14	Hydraulic oil return filter	Replace	-	-	3
	15	Drain filter cartridge	Replace	-	-	2
	16	Air breather element	Replace	-	-	1
	18	Pilot line filter element	Replace	-	-	1
	26	Travel reduction gear case	Change	GO	20 (5)	2
2000 Hours	1	Hydraulic oil ★1	Change	HO	670 (177)	1
	4	Radiator coolant	Change	C	100 (26.4)	1
	17	Hydraulic oil suction strainer	Check, Clean	-	-	2
	20	Air cleaner element (primary, safety)	Replace	-	-	2
	29	Gear box	Change	GO3	6 (1.6)	1
	-	Hoses, fittings, clamps (fuel, coolant, hydraulic)	Check, Retighten, Replace	-	-	-
5000 Hours	1	Hydraulic oil ★2	Change	HO	670 (177)	1
As required	19	Aircon & heater fresh filter	Replace	-	-	1
	19	Aircon & heater recirculation filter	Clean, Replace	-	-	1
	20	Air cleaner element (primary, safety)	Replace	-	-	2
	27	Center grease pump	Check, Add	PGL	8 kg (18.6 lb)	1
	28	Fan system grease	Check, Add	PGL	0.2 (0.05)	2

★1 Conventional hydraulic oil ★2 Hyundai genuine long life hydraulic oil

※ Oil symbol

Please refer to the recommended lubricants for specification.

DF : Diesel fuel GO : Gear oil HO : Hydraulic oil GO3 : Heavy duty gear oil
C : Coolant PGL : Grease EO : Engine oil (ISO VG 100~220)

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.

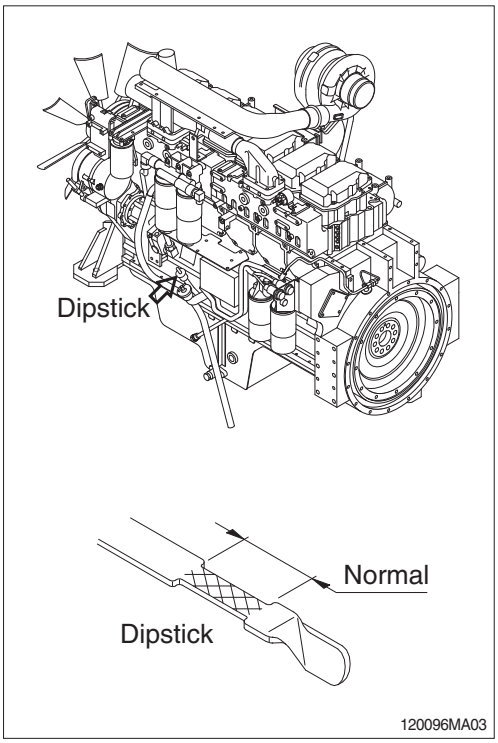
(2) Check the oil level by inserting the dipstick completely into the hole and pulling out again.

(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.**



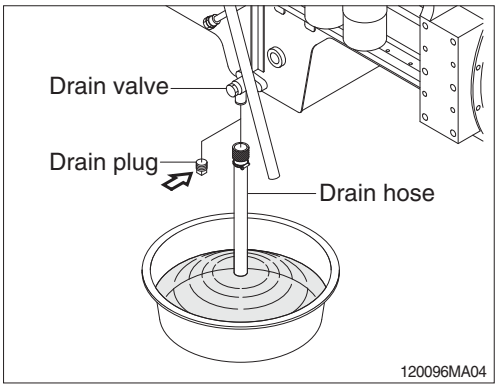
2) REPLACEMENT OF ENGINE OIL AND OIL FILTER

(1) Warm up the engine.

(2) Remove the oil drain plug and fit the drain hose.

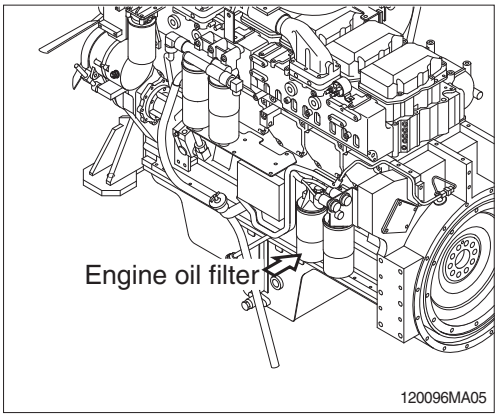
(3) Open the drain valve and drain oil.

※ **A drain pan with a capacity of 80 liters (21.1 U.S. gallons) will be adequate.**



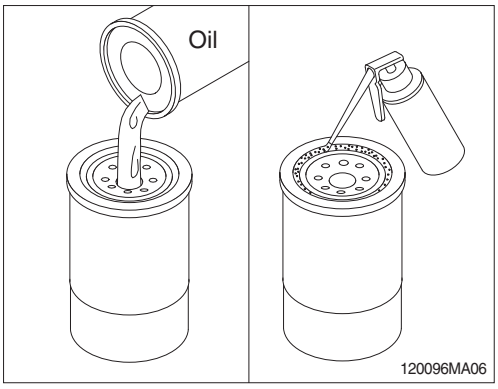
(4) Clean around the filter head, remove the filter by oil filter wrench and clean the gasket surface.

※ **The O-ring can stick on the filter head.**
Make sure it is removed before installing the new filter.



(4) Apply a light film of lubricating oil to the gasket sealing surface before installing the filters.

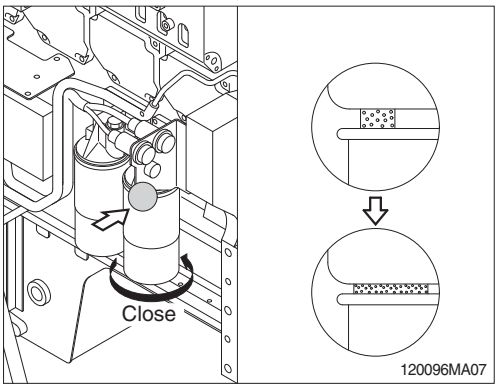
※ **Fill the filters with clean lubricating oil.**



(5) Install the filter to the filter head.

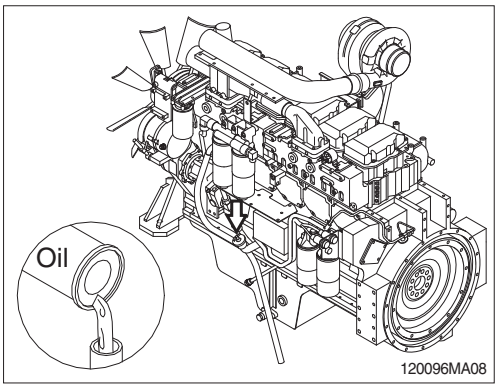
※ **Mechanical over-tightening may distort the threads or damage the filter element seal.**

· Install the filter as specified by the filter manufacturer.

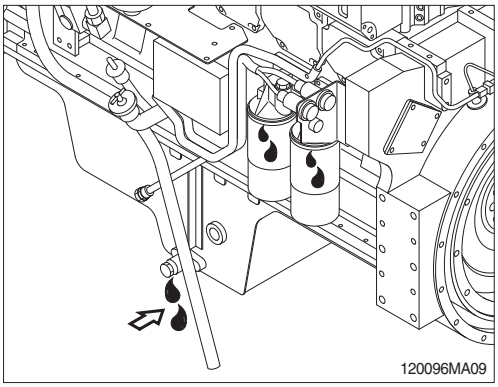


(6) Fill the engine with clean oil to the proper level.

· Quantity : 70 ℓ (18.5 U.S. gallons)



(7) 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 15minutes for oil to drain down before checking.

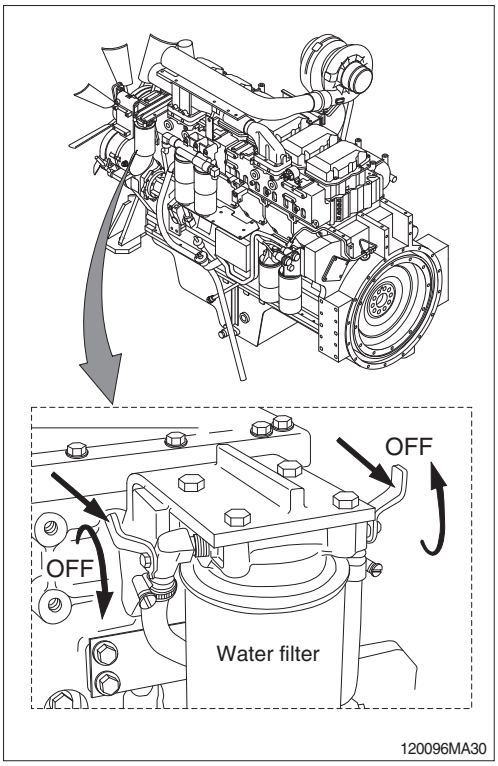


3) REPLACEMENT OF WATER FILTER (CORROSION RESISTOR)

(1) Turn the valve on the filter head to the OFF position.

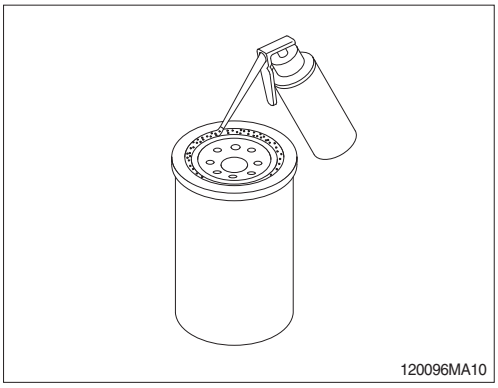
⚠ Wait until the temperature is below 50˚C (122˚F) before removing the radiator cap. Remove the coolant system radiator cap and close the shutoff valve before removing the water filter. Failure to do so can result in personal injury from heated coolant spray.

(2) Remove and discard the water filter.
Clean the gasket surface.



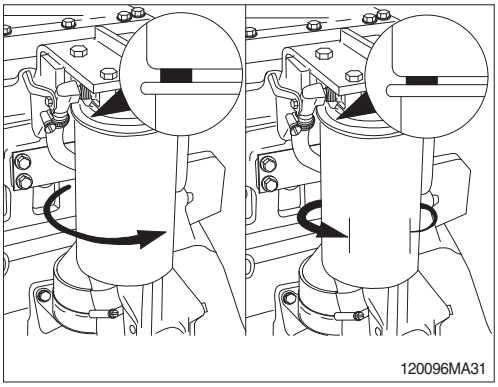
(3) Apply a thin film of lubricating oil to the gasket sealing surface before installing the new water filter.

⚠ Do not allow oil to get into the filter. It will break down the supplement coolant additive.

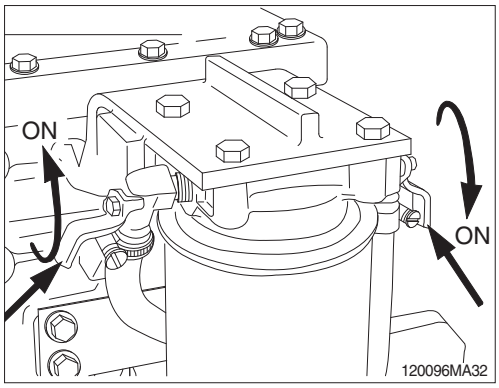


(4) Install the water filter on the filter head. Tighten the filter until the gasket contacts the filter head surface.
Tighten the water filter an additional 1/2 to 3/4 of a turn or as specified by the filter manufacturer.

⚠ Mechanical overtightening can distort the threads or damage the filter head.



(5) Trun the valve to the ON position.



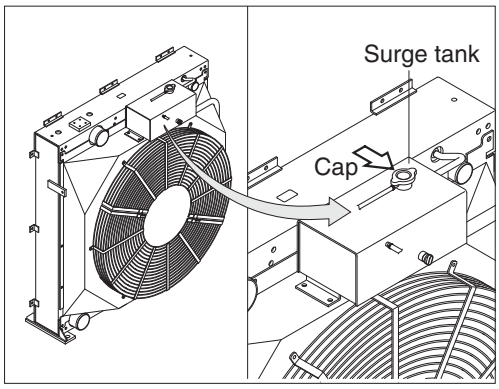
4) CHECK COOLANT

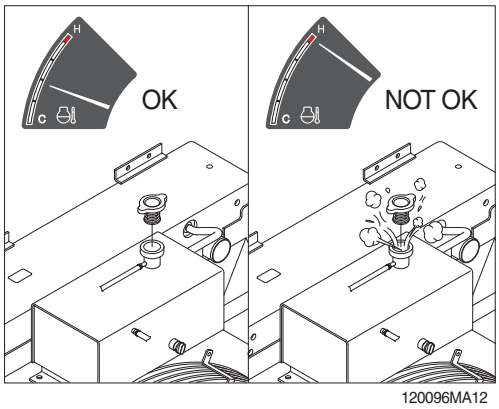
(1) Add the mixture of antifreeze and water after removing the cap of the surge tank if coolant is not sufficient.

(2) Be sure to use the surge tank empty, add the coolant by opening the cap of surge tank.

(3) 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.





4-1) 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℃ when tested
- Room temperature is best.

② For accurate results, test must be completed within 75 seconds.
- Follow recommended test times. Use a stopwatch.

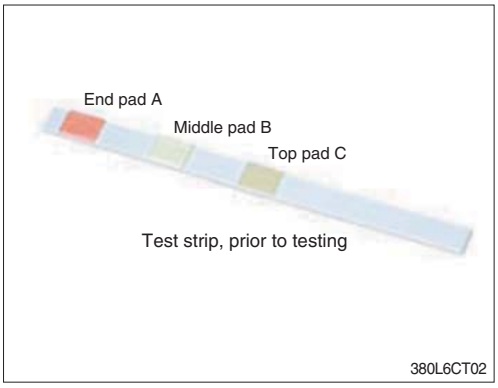
③ Record and track results.

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

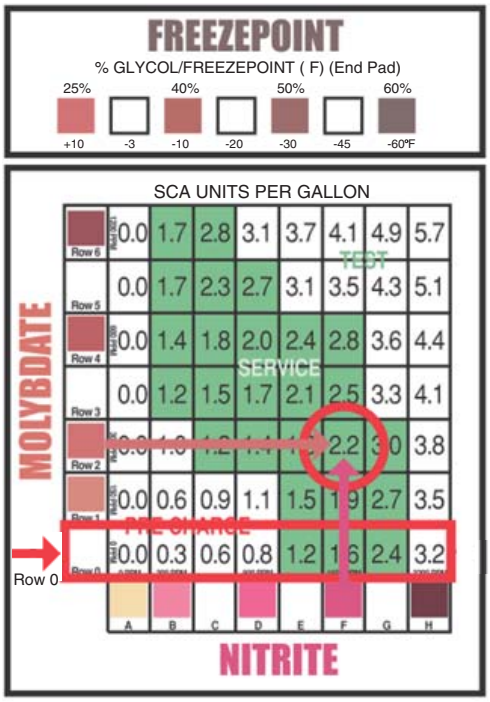
③ 45 seconds after dipping strip, compare results to color chart and record in the following order:

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

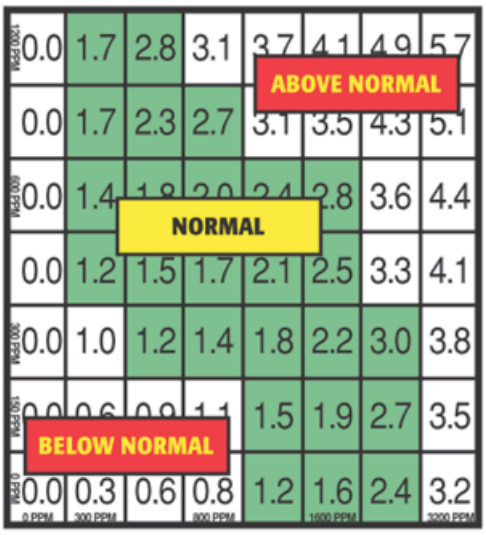
NORMAL - Continue to replace the coolant filter at your normal interval.

③ Below normal

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

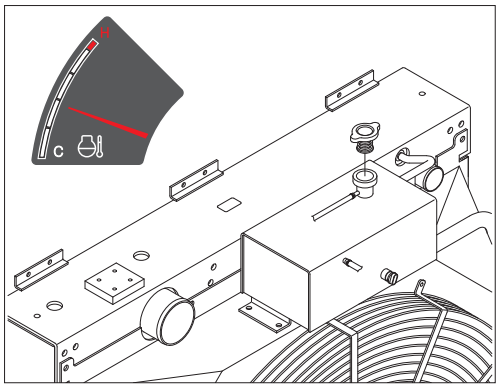
- Replace the coolant filter and add 40 cc of additive per each 1 liter of coolant.

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



380L6CT04

5) FLUSHING AND REFILLING OF RADIATOR

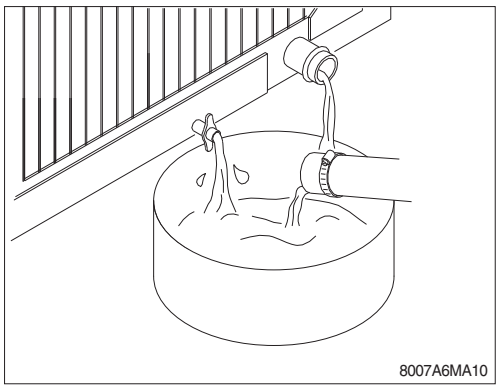


120096MA13

(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.


8007A6MA10

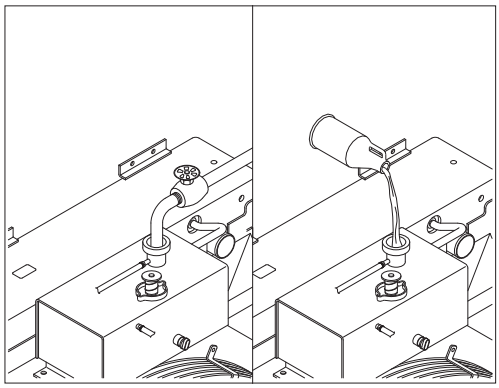
⚠ Wait until the temperature is below 50 °C (120 °F) before removing the coolant system pressure cap.
Failure to do so can cause personal injury from heated coolant spray.
Drain the cooling system by opening the drain valve on the radiator and removing the plug in the bottom of the water inlet. A drain pan with a capacity of 100 liters (26.4 U.S.gallons) will be adequate in most applications.

(2) Flushing of cooling system

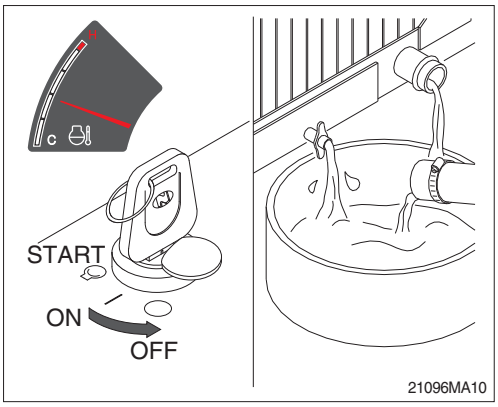
① Fill the system with a mixture of sodium carbonate and water (or a commercially available equivalent).

※ 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.


120096MA14

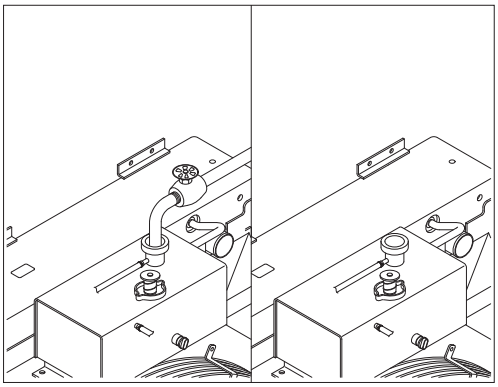
② Operate the engine for 5 minutes with the coolant temperature above 85 °C (185 °F).
Shut the engine off, and drain the cooling system.



③ Fill the cooling system with clean water.

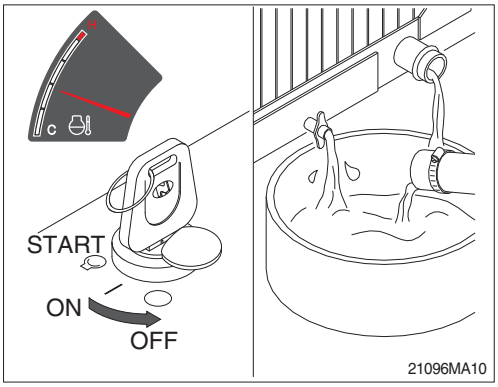
※ **Be sure to vent the engine and aftercooler for complete filling.**

※ **Do not install the surge tank cap and the new coolant filter.**



④ Operate the engine for 5 minutes with the coolant temperature above 85°C (185°F).
Shut the engine off, and drain the cooling system.

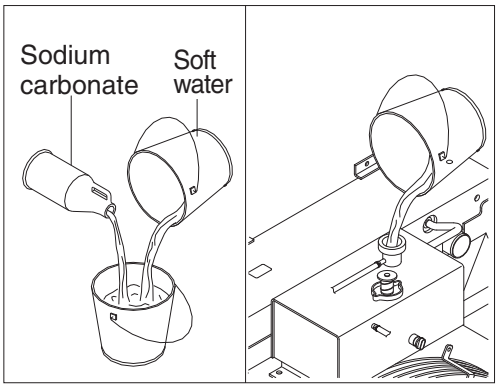
※ **If the water being drained is still dirty, the system must be flushed again until the water is clean.**



(3) Cooling system filling

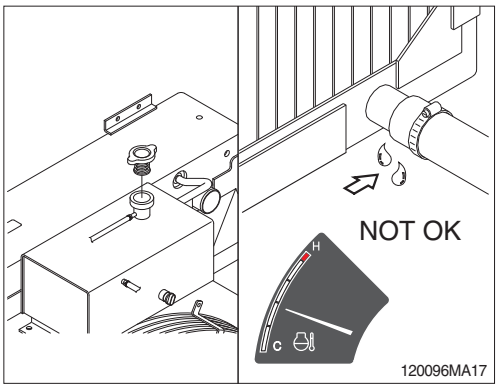
① Use a mixture of 50 percent soft water and 50 percent ethylene glycol antifreeze to fill the cooling system. Refer to the page 6-10.
Coolant capacity (engine only) : 46 ℓ (12 U.S. gallons)

※ **Do not use hard water such as river water or well water.**



120096MA16

② Install the pressure cap. Operate the engine until it reaches a temperature 70˚C (160˚F), and check for coolant leaks.
Check the coolant level again to make sure the system is full of coolant.



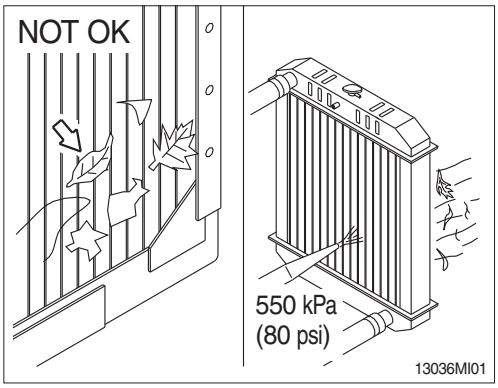
120096MA17

6) 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.
Blow the air in the opposite direction of the fan air flow.

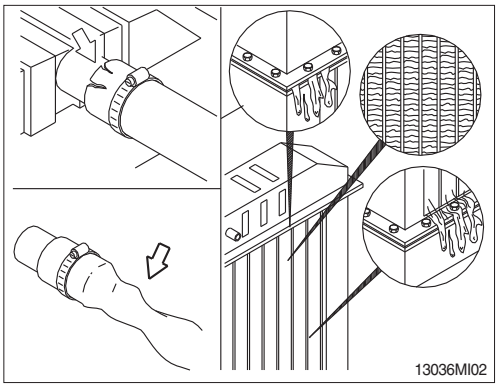


13036MI01

(3) Visually inspect the radiator for bent or broken fins.

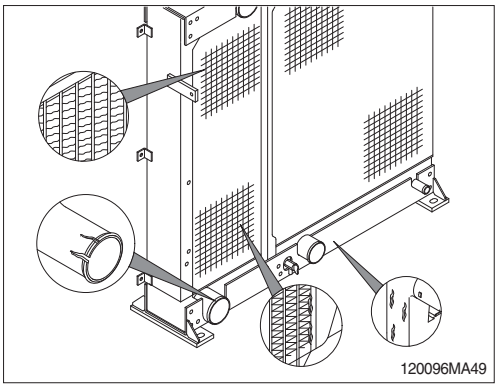
※ **If the radiator must be replaced due to bent or broken fins which can cause the engine to overheat, refer to the manufacturer's replacement procedures.**

(4) Visually inspect the radiator for core leaks.


13036MI02

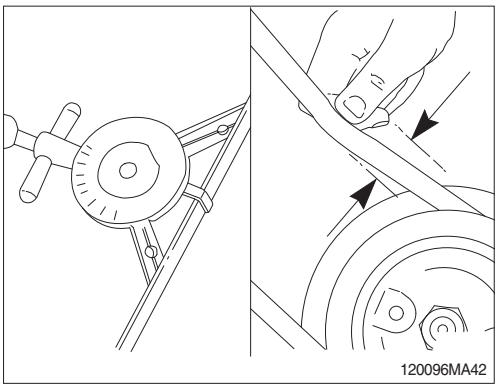
7) CHECK CHARGE AIR COOLER

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 Hyundai distributor.

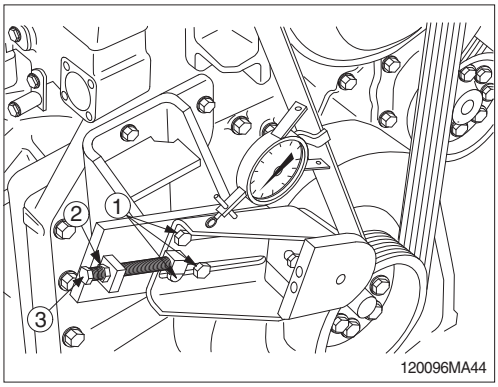


8) FAN BELT TENSION

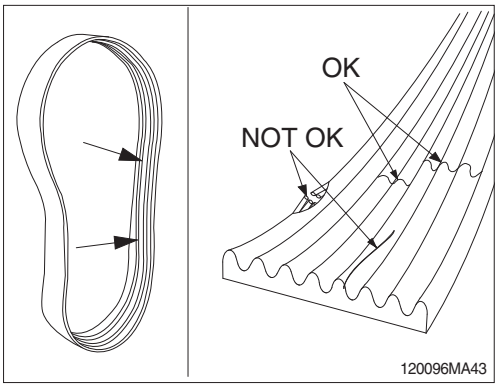
(1) Use the belt tension gage to measure the belt tension.
- Fan belt tension : 11.3 kg (25 lb)



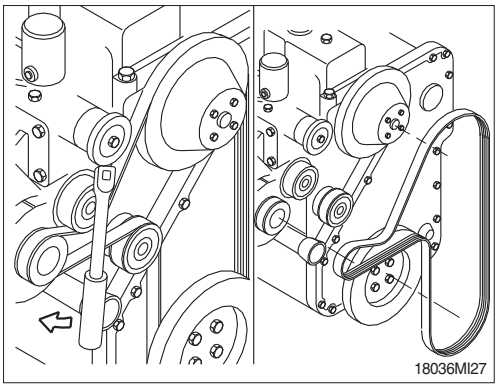
(2) Loosen the tensioner clamping bolts (1).
Loosen the adjusting screw locknut (2).
Turn the adjusting screw (3) clockwise to increase belt tension and counterclockwise to decrease belt tension.



(3) Inspect the drive for damage.



(4) Inspect the drive belt and fan hub.



9) 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.

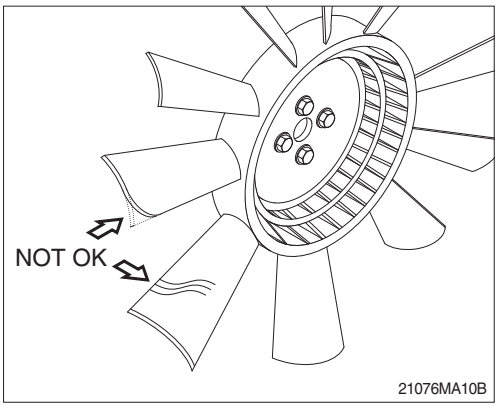
※ Rotate the crankshaft by using the engine barring gear.

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

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

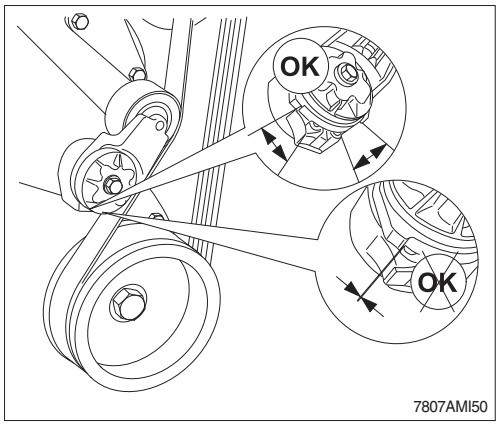
Check the fan to make sure it is securely mounted. Tighten the capscrews if necessary.

Replace any fan that is damaged.

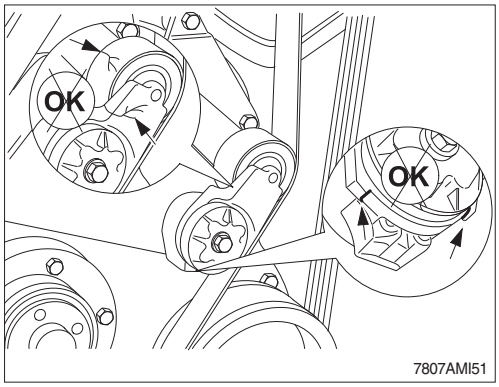


10) BELT TENSIONER, AUTOMATIC ADJUSTMENT

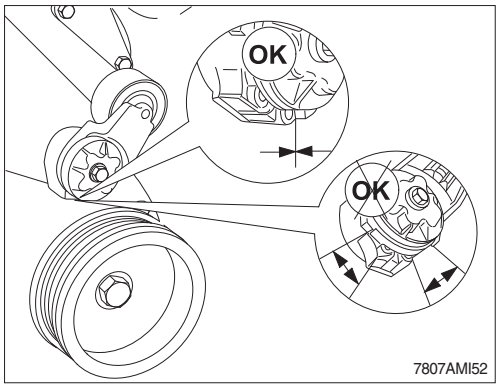
(1) Every 1000hours, or 1 year, whichever occurs first, inspect the automatic belt tensioner.
With the engine turned off, check that neither the top nor bottom tensioner arm stop is touching the cast boss on the tensioner body. If either of the stops is touching a boss, the alternator belt must be replaced. Check to make sure the correct belt part number is being used it either condition exists.



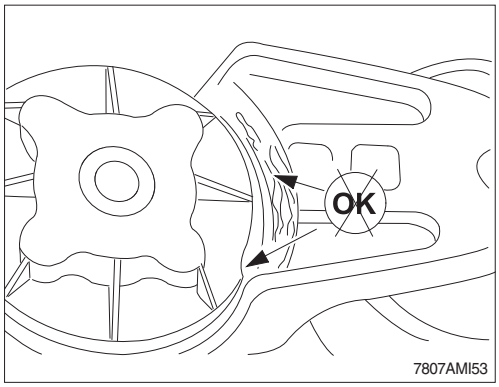
(2) Check the tensioner pulley and body for cracks. If any cracks are noticed, the tensioner must be replaced. Refer to a Cummins Authorized Repair facility. Check the tensioner for dirt buildup. If this condition exists, the tensioner must be removed and steam-cleaned.



(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.



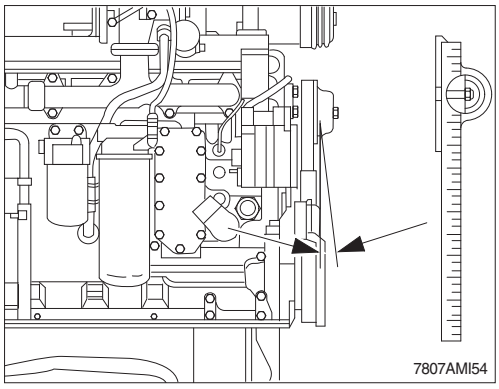
(4) Inspect the tensioner for evidence of the pivoting tensioner arm contacting the stationary circular base. If there is evidence of thess two areas touching, the pivot tube bushing has failed and the tensioner must be replaced.



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

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

(6) Install the belt.



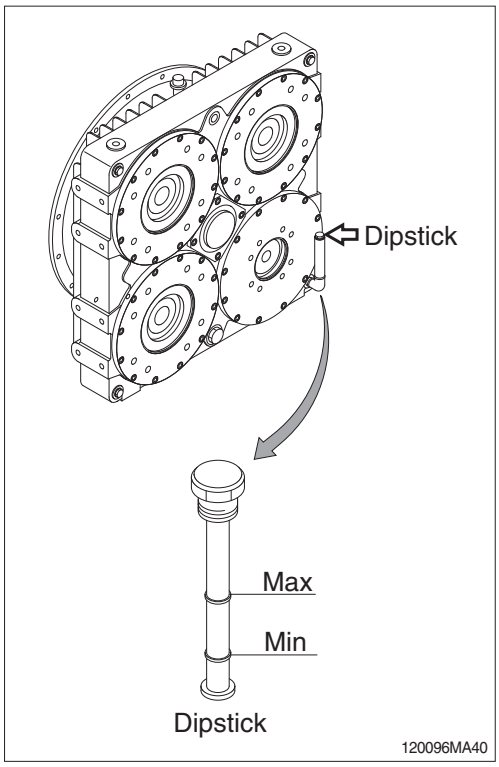
11) CHECK GEAR BOX OIL LEVEL

Check the oil level with the machine on a flat ground.

(1) Pull out the dipstick and wipe with a clean.

(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 than check again.



12) CHANGE GEAR BOX OIL

(1) Warm up the gear box.

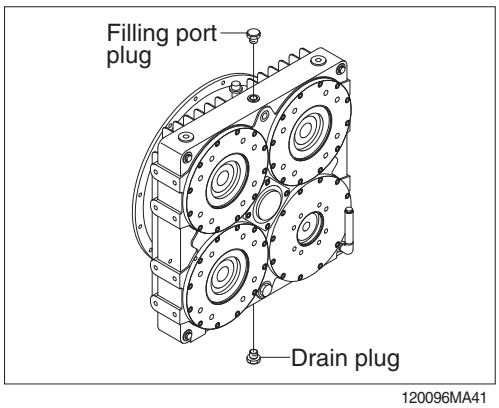
(2) Prepare a proper container.

(3) Loosen the drain plug.

(4) Clean around the drain plug and tighten the drain plug.

Fill proper amount of recommeded oil.

· Amount of oil : 6.0 ℓ (1.6 U.S. gallons)



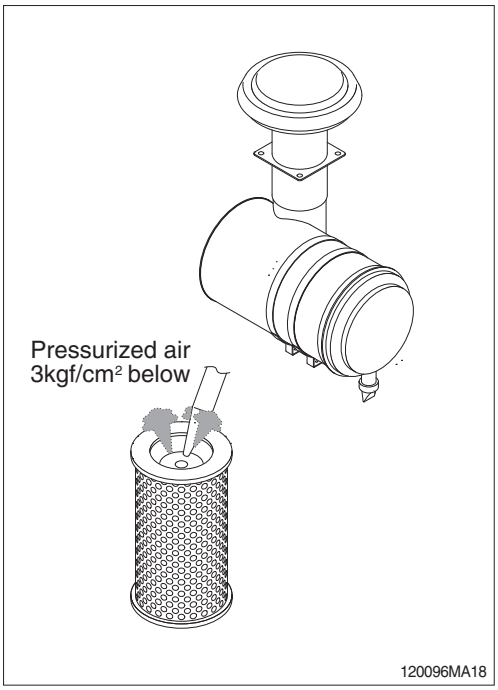
13) CLEANING OF AIR CLEANER

(1) Primary element

① Open the cover 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.

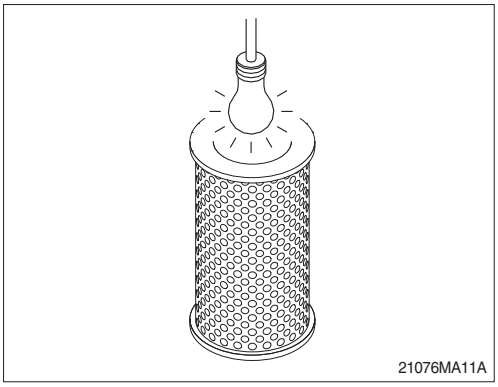
④ Inspect for cracks or damage of element by putting a light bulb inside of the element.
⑤ Insert element and tighten wing nut.

※ **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.**

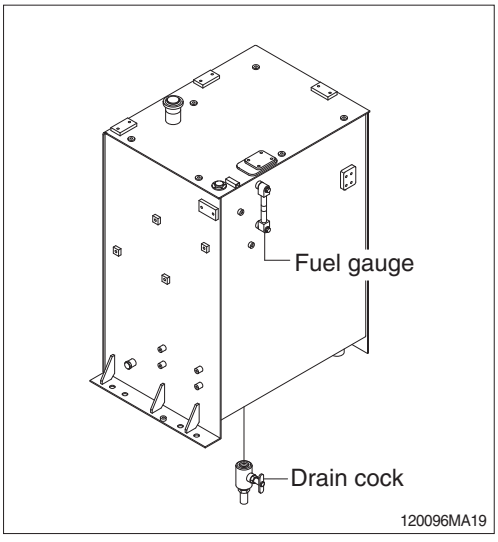


14) FUEL TANK

(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.



15) REPLACEMENT OF FUEL FILTER
(Machine serial No. : -#0053)

(1) Clean around the filter head, remove the filter and clean the gasket surface.

(2) Replace the O-ring.

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

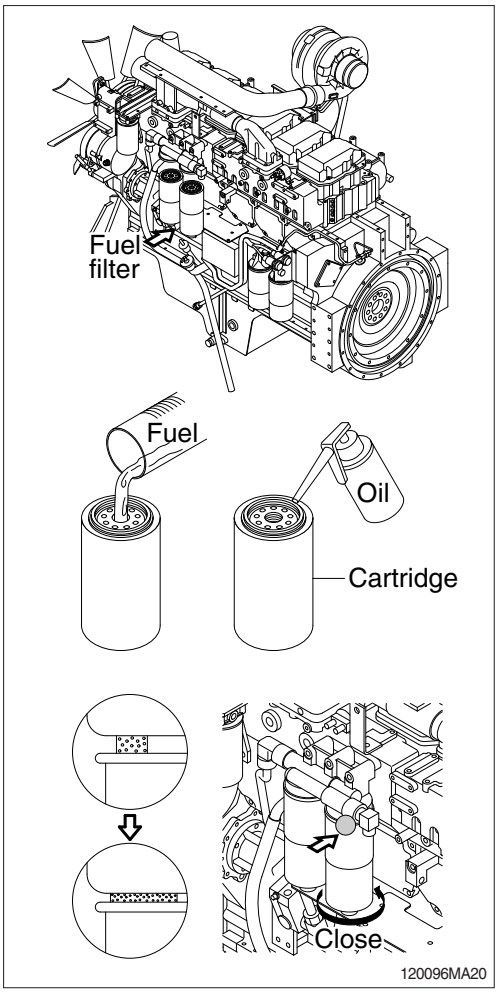
(3) Apply engine oil on the gasket of new filter when mounting, and tighten 3/4 to 1 turn more after the gasket touches the filter head.

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

(4) Relieve the air after mounting.

※ **Do not pre-fill an on-engine fuel filter with fuel. The system must be primed after the fuel filter is installed. Pre filling the fuel filter can result in debris entering the fuel system and damaging fuel system components.**

※ **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 FILTER (Machine serial No. : #0054-)

※ **Check all electrical connections for corrosion and all fuel fittings for leaks every 12 months.**

※ **Extreme winter or salt corrosion environments may require lubrication of the top collar threads with anti-seize lubricant every 180 days.**

⚠ **When diesel fuel is circulated through an operating engine, it can become very hot. To prevent personal injury.**

⚠ **Scalding hazard! Do not allow heated liquid fuel to come in contact with eyes or unprotected skin. Always allow the engine and fuel to cool to ambient temperature before replacing the fuel filter or performing service operations which could result in the spillage of fuel from the fuel system. If this is not possible, protective clothing (face shield, insulated hat, gloves, apron) must be worn.**

⚠ **Heated diesel fuel can form combustible vapor mixtures in the area around the fuel source. To eliminate the potential for fire, keep open flames, sparks or other potential ignition sources away from the work area, and do not smoke during filter replacement or service operations which could result in the escape of diesel fuel or fuel vapors.**

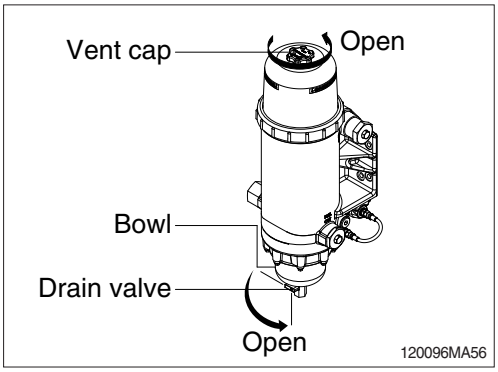
⚠ **Always perform engine or vessel fuel system maintenance in a well ventilated area that is kept free of bystanders.**

⚠ **To ensure priming pump hoses are not kinked by mishandling, do not lift or handle the fuel processor by the hoses. Do not allow the weight of the processor to rest on the hoses.**
To avoid fuel line water traps that can freeze in cold conditions and restrict, or block, the flow of fuel to the engine, be certain that there are no low spots in the hoses when routing them in the engine compartment.

※ **To avoid damaging the aluminum fuel housing, do not overtighten fuel lines or line fittings. Do not exceed 9.0 kgf·m (65 lbf·ft).**

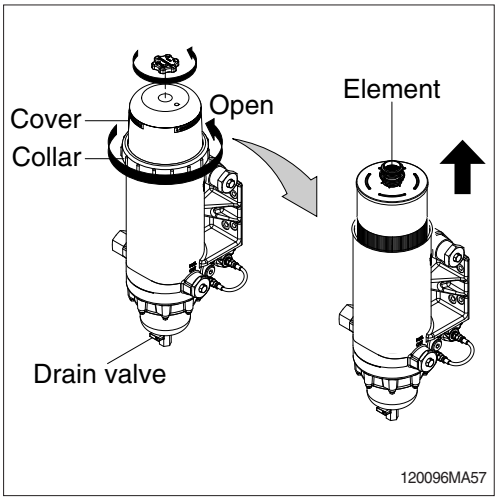
(1) Drain water

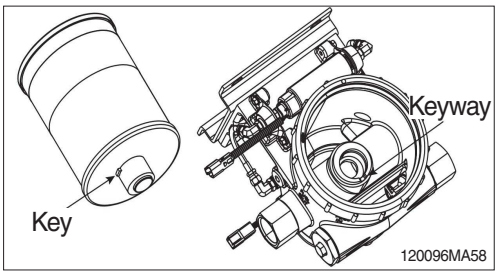
① Turn off the engine and open the vent cap.
② Place a suitable container under the drain valve at the base of the fuel filter and open the drain valve.
③ Water and contaminants will flow into the container. When fuel begins to flow out of the drain, close the drain valve.
④ Tighten the vent cap by hand until it "clicks."
⑤ Start the engine. Raise the RPM for one minute to purge the air from the system.



(2) Replace element

① Turn off the engine. Remove the vent cap and dispose of the O-ring. Clean the threads of the vent cap and on the top of the cover. Set the vent cap aside.
② Open the drain valve and drain the fuel completely from the unit, then close the drain valve.
※ **The unit must be completely drained to prevent contamination of the clean side of the filtration system.**
③ Using the collar wrench loosen the collar. Remove the clear cover and collar from the fuel filter. Discard the cover O-ring and install a new O-ring (supplied with the filter) on the cover. Clean the threads on the collar and body of the fuel filter.
④ Install the new O-ring on the vent cap (supplied with the filter).
⑤ Remove the filter element from the fuel filter by pulling upward.
⑥ Install the new filter element. The right figure shows a key of the filter which fits into a keyway on the center boss. Position the filter element so the filter element key is lined up with the keyway on the center boss of the housing and press the filter element into the housing. Ensure the filter element is fully seated by firmly pushing on the end plate.





⑦ After checking to make sure the new O-ring seal is seated correctly on the base of the cover, install the cover and collar.
Simultaneously apply modest pressure to the top of the cover and turn the collar until it no longer spins freely. Using the collar wrench, tighten the collar the distance of two additional ribs.

⑧ Prime the fuel system according to the steps in the "Priming the fuel system" instructions below. (The vent cap will be returned to the fuel filter during the priming process).

(3) Priming the fuel system

① Check to make sure the drain valve at the base of the fuel filter is closed. Close the fuel shutoff valve (if equipped).

② Remove the vent cap from the top of the clear cover. Fill the fuel filter full of clean fuel. Tighten the vent cap (tighten by hand only) until it "clicks."

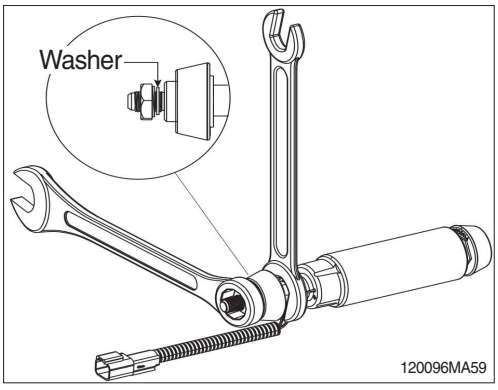
③ Open the fuel shutoff valve (if equipped). Start the engine. When the lubrication system reaches its normal operating pressure, increase engine speed to high idle for one to two minutes. Loosen the vent cap until the fuel level drops to just above the collar. Tighten the vent cap (tighten by hand only) until it "clicks."

※ **The clear filter cover will not fill completely during engine operation. It will gradually fill over time and the fuel level will rise as the filter becomes clogged.**

(4) Servicing the primer pump

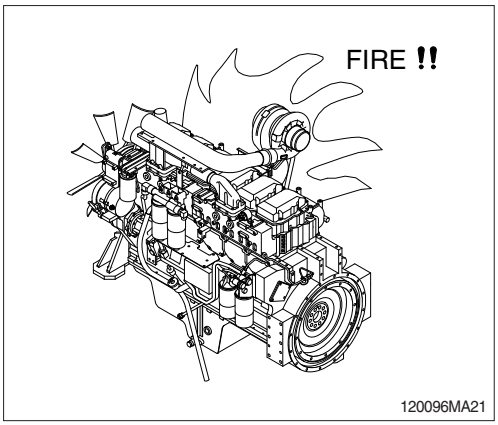
① Remove the fitting on the end of the pump using two wrenches to hold the end stationary as the fitting is loosened.

② The washer on the fittings must be in place when reassembled.



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.



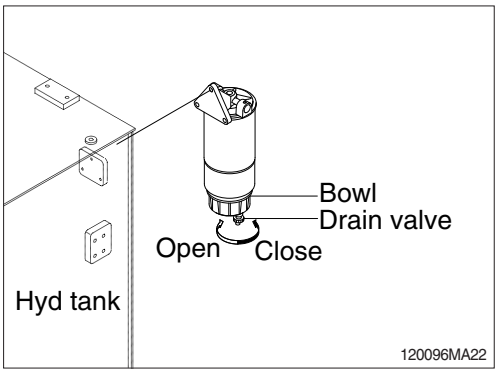
17) PREFILTER (Machine serial No. : -#0053)

※ Inspect or drain the collection bowl of water daily and replace the element every 250hours.

(1) Drain water

① Open bowl drain valve to evacuate water.

② Close drain valve.



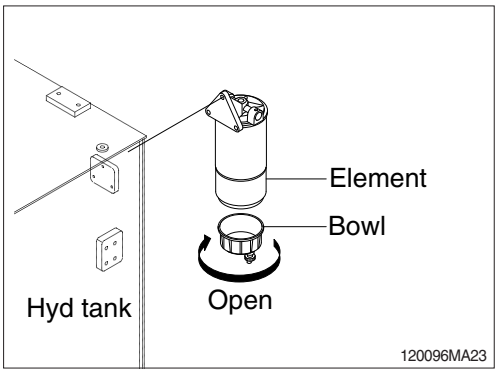
(2) Replace element

① Drain the unit of fuel. Follow "Drain water" instructions above.

② Remove element bowl from filter head.

※ The bowl is reusable, do not damage or discard.

③ Separate element from bowl. Clean bowl and seal gland.

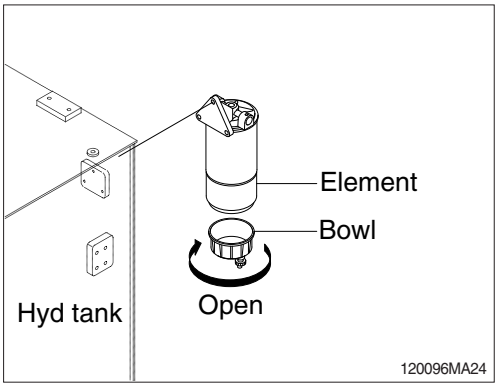


④ Lubricate new bowl seal with clean fuel or motor oil and place in bowl gland.

⑤ Attach bowl to new element firmly by hand.

⑥ Lubricate new element seal and place in element top gland.

⑦ Attach the element bowl to the head.

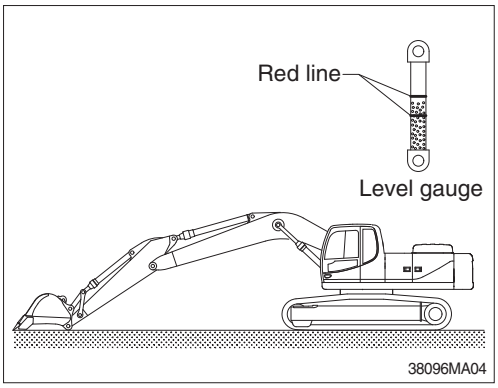


18) HYDRAULIC OIL CHECK

(1) Stop the engine after retract the arm and bucket cylinders, then lower the boom and set the bucket on the ground at a flat location as in the illustration.

(2) Check the oil level at the level gauge of hydraulic oil tank.

(3) The oil level is normal if between the red lines.



19) FILLING HYDRAULIC OIL

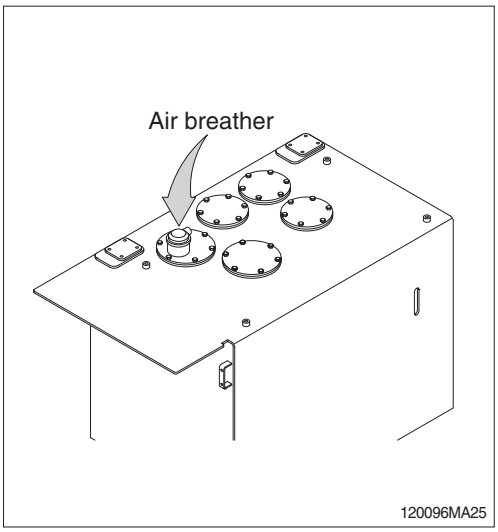
(1) Stop the engine to the position of level check.

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

(3) Remove the breather on the top of oil tank and fill the oil to the specified level.
- Tightening torque : 1.44±0.3 kgf · m
  (10.4±2.1 lbf · 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.



20) 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±1.4 kgf · m
  (50±10 lbf · ft)

(4) Prepare a suitable container.

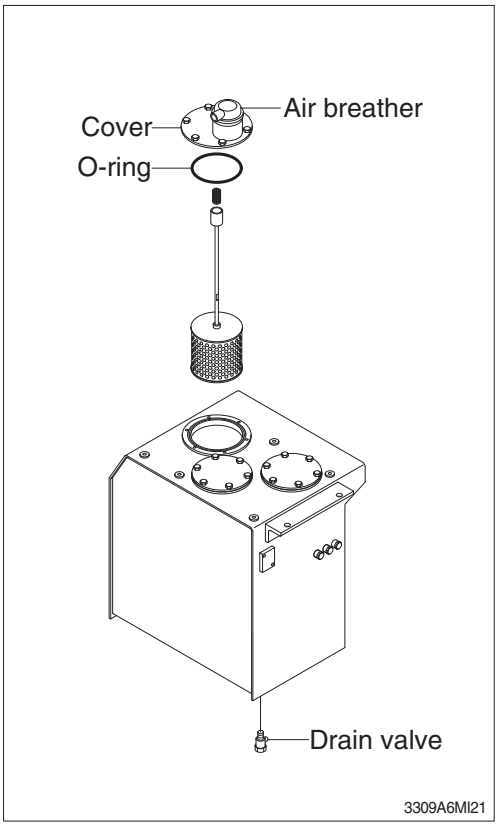
(5) To drain the oil loosen the drain plug at the bottom of the oil tank.

(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.



21) CLEAN SUCTION STRAINER

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

(1) Remove the cover on the top of the oil tank.
- Tightening torque : 6.9±1.4 kgf · m (50±10 lbf · ft)

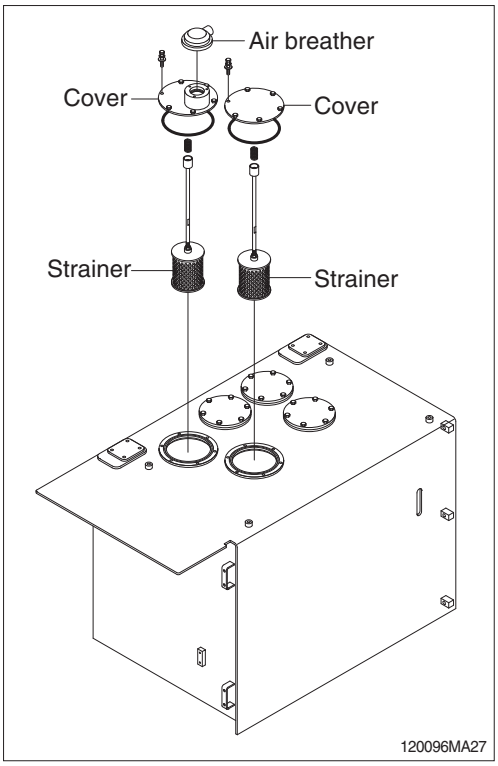
(2) Pull out the strainer in the tank.

(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.**



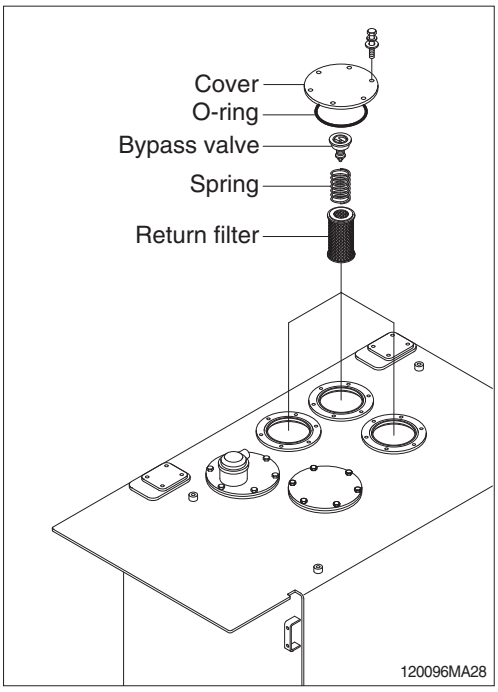
22) REPLACEMENT OF RETURN FILTER

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

(1) Remove the cover.
- Tightening torque : 6.9±1.4 kgf · m (50±10 lbf · ft)

(2) Remove the spring, by-pass valve, and return filter in the tank.

(3) Replace the element with new one.



23) REPLACEMENT OF ELEMENT IN HYDRAULIC TANK BREATHER

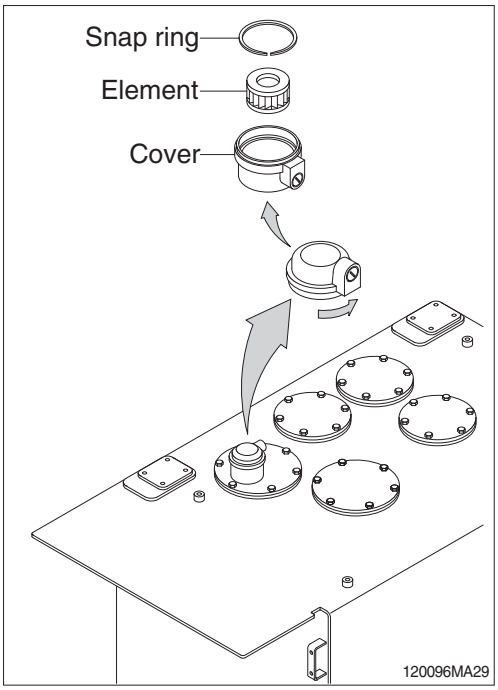
(1) Relieve the pressure in the tank by pushing the top of the air breather.

(2) Remove the cover.

(3) Remove the snap ring and pull out the filter element.

(4) Replace the filter element new one.

(5) Reassemble by reverse order of disassembly.
- Tightening torque : 0.2~0.3 kgf · m
  (1.4~2.1 lbf · ft)

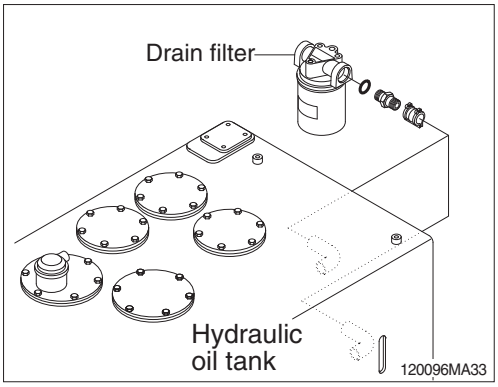


24) REPLACE OF DRAIN FILTER CARTRIDGE

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.**



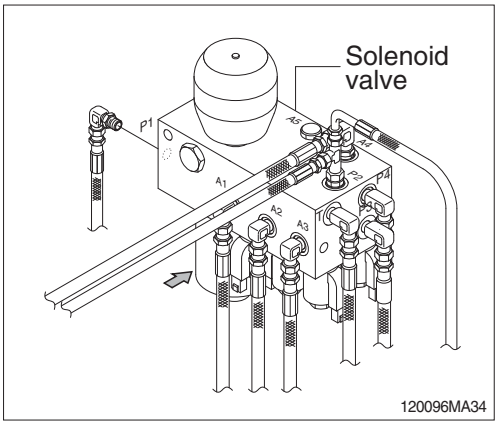
25) REPLACE OF PILOT LINE FILTER

(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.**

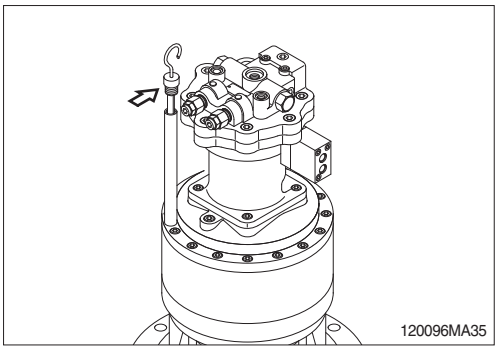


26) CHECK THE SWING REDUCTION GEAR OIL

(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.



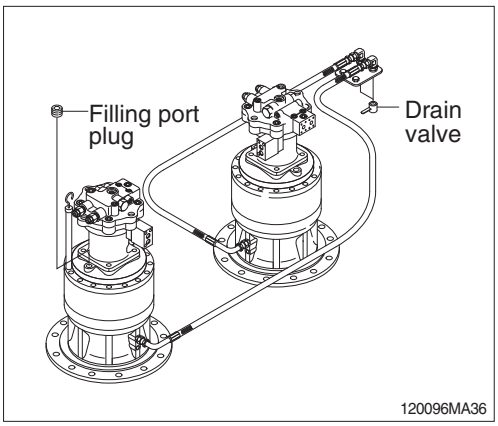
27) CHANGE SWING REDUCTION GEAR OIL

(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) Loosen the drain valve.

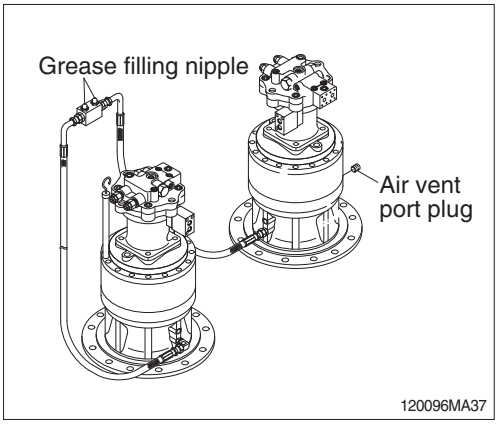
(4) Clean around the valve and close the drain valve.
Fill proper amount of recommended oil.
· Amount of oil (each) : 8.0 ℓ (2.1 U.S.gal)



28) LUBRICATE BEARING OF OUTPUT SHAFT IN REDUCTION GEAR

(1) Remove air vent plug.

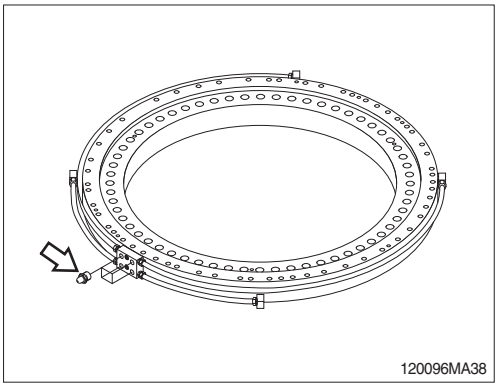
(2) Lubricate NLGI No.2 with grease gun until comes out new grease from air vent port.
· Amount of oil : 1.6 kg (0.42 lb)



29) LUBRICATE SWING BEARING

(1) Grease at 4 fitting.

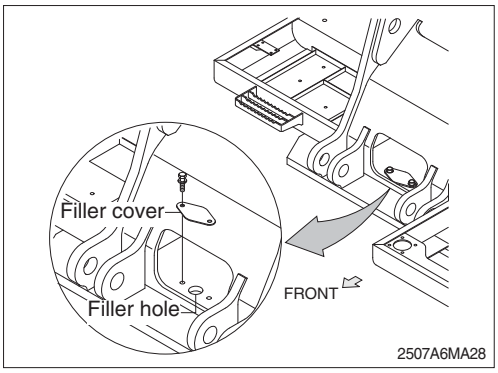
※ **Lubricate every 50 hours.**



30) SWING GEAR AND PINION

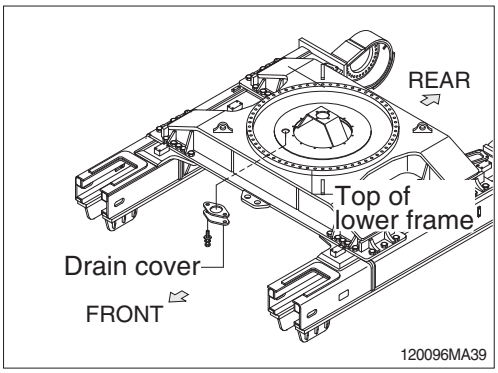
(1) Drain old grease

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 : 50 kg (110 lb)

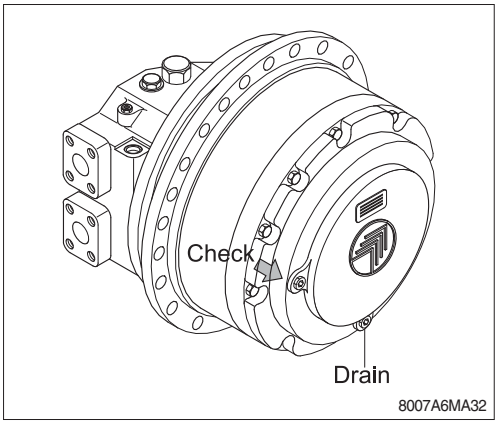


31) CHECK THE TRAVEL REDUCTION GEAR OIL

(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 : 20 ℓ (5.3 U.S.gal)



32) 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.

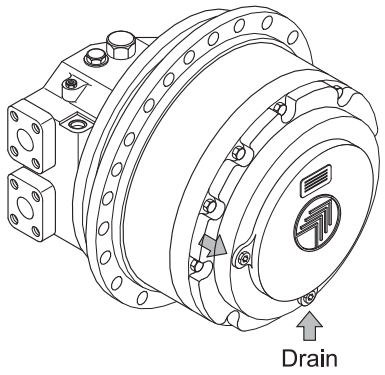
(3) Loosen the level plug and then the drain plug.

(4) Drain the oil to adequate container.

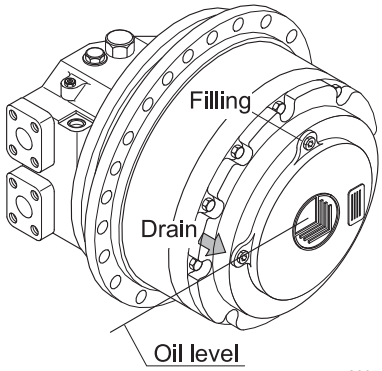
(5) Tighten the drain plug and fill specified amount of oil at filling port.

(6) Tighten the level plug and travel slowly to check if there is any leakage of oil.

· Draining position



· Filling position



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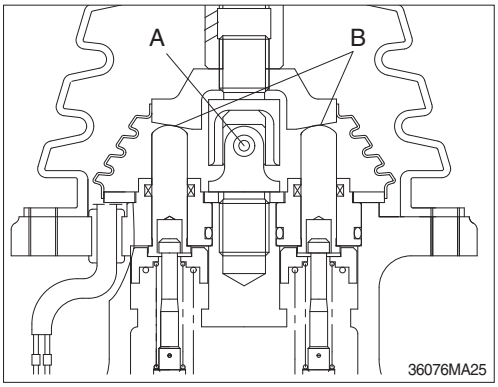
33) LUBRICATE RCV LEVER

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

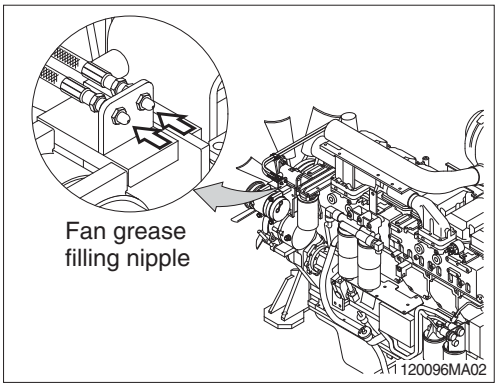


36076MA25

34) LUBRICATE ENGINE FAN SYSTEM

(1) Grease at 2 fitting.

· Capacity : 0.2 ℓ (0.05 U.S.gal)



120096MA02

35) ADJUSTMENT OF TRACK TENSION

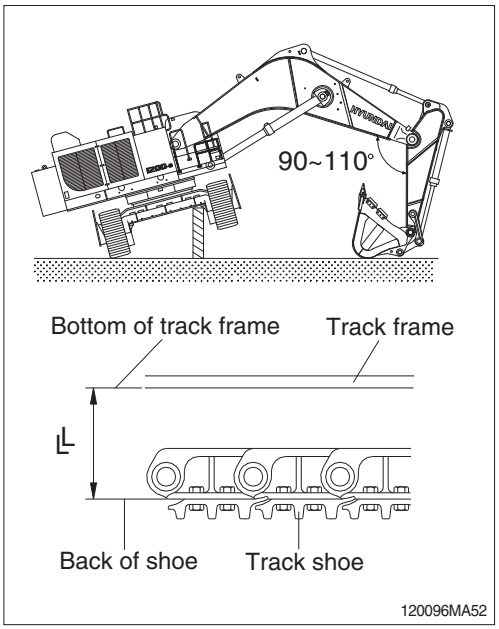
※ It is important to adjust the tension of track properly to extend the lifetime of track and traveling device.

※ 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.

⚠ When loosening the grease nipple, do not loosen more than one turn as there is a danger of a spring coming out of the nipple because of the high pressure inside.

※ 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.

Working condition	Length (L)	
General	470~510 mm	18.5~20.0"

36) 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 lever to the LOCK position and stop the engine.

(3) Remove the stopper bolts (1) and stopper (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.**

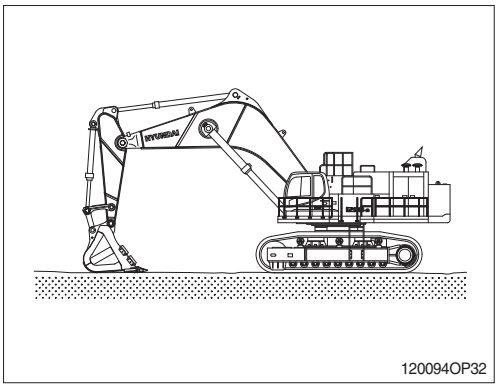
※ **If the bucket is lowered strongly to the ground, the resistance will be increased and it will be difficult to remove the pins.**

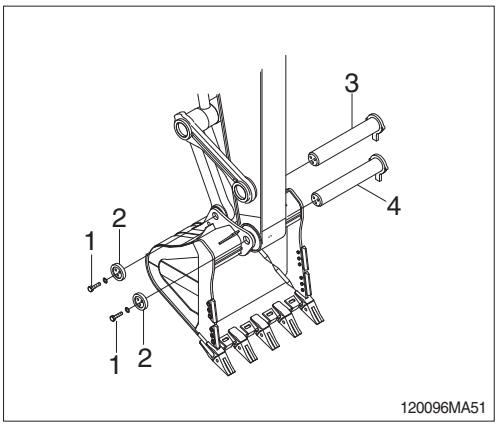
※ **After remove the pins, make sure that they do not become contaminated with sand or mud and that the seals of bushing on both sides do not become damaged.**

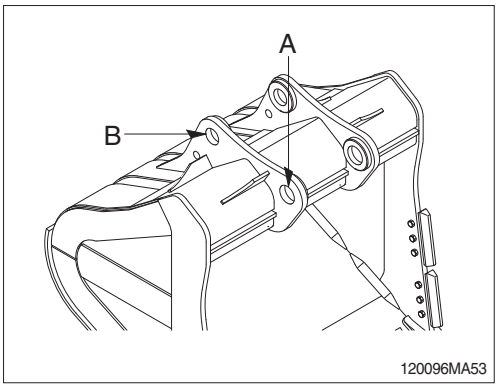
(4) Align the arm with holes (A) and the link with holes (B), then coat with grease and install pins(3, 4)

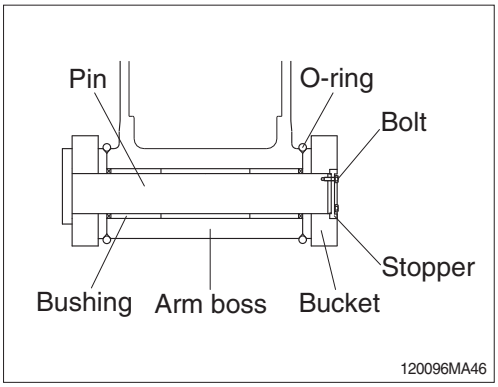
※ **When installing the bucket, the O-rings are easily damaged, so fit the O-rings on the boss of the bucket as shown in the picture. After knocking the pin, move the O-ring down to the regular groove.**

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







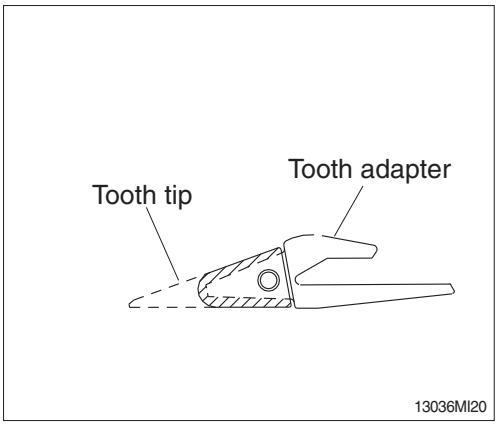


37) REPLACEMENT OF BUCKET TOOTH

(1) Timing of replacement

① Check wearing condition as shown in the illustration and replace tooth tip 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 locking washer.

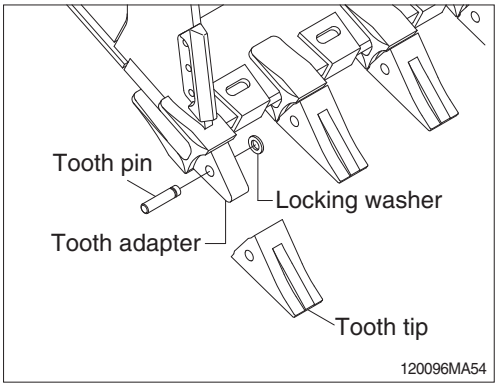
② Remove dust and mud from surface of tooth adapter by using knife.

③ Place locking washer in its proper place, and fit tooth tip to adapter.

④ Insert pin until locking washer is positioned at tooth pin groove.

⚠ Personal injury can result from bucket falling.

⚠ Block the bucket before changing tooth tips or side cutters.



38) ADJUSTMENT OF BUCKET CLEARANCE

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

(2) Swing to the left and keep the arm boss to be contact to the bucket left.

(3) Lock the safety lever 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

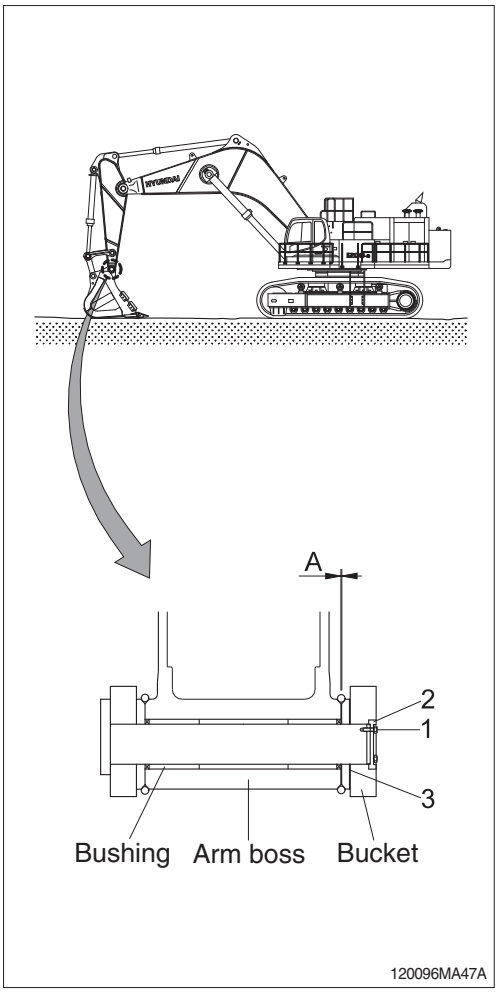
① Loosen bolt (1), and remove stopper (2), and shim (3).

② Remove the shim equivalent value with measuring value.

③ Assemble the parts in the reverse order of removal.

- Tightening torque : 100 ± 15 kgf · m (723 ± 108 lbf · ft)
- Normal clearance : 0.5 ~ 1.0 mm (0.02 ~ 0.04 in)

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

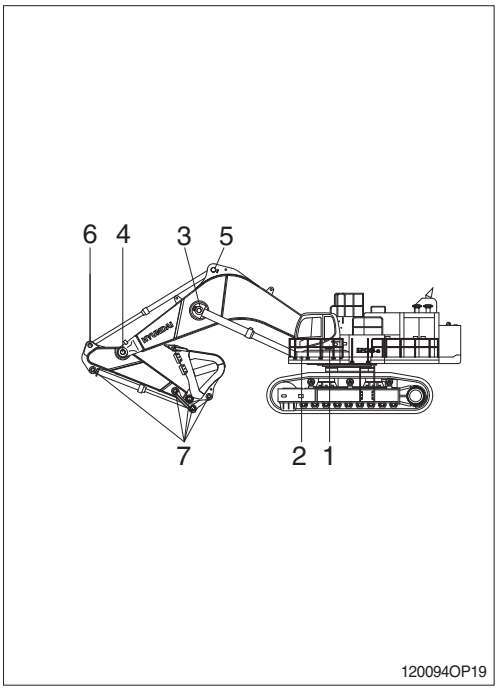


39) LUBRICATE PIN AND BUSHING

(1) Lubricating point

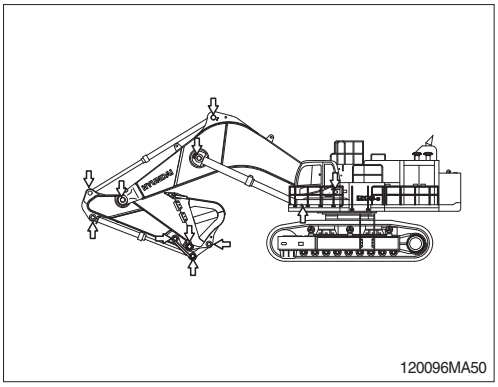
No.	Description	Qty
1	Boom and upper frame connection pin	2
2	Boom cylinder head pin	2
3	Boom cylinder rod pin	2
4	Boom and arm connection pin	2
5	Arm cylinder head pin	1
6	Arm cylinder rod pin	1
7	Bucket cylinder pin(head, rod)	2
	Bucket link(control rod)	3
	Arm and bucket connection pin	1
	Arm and control link connection pin	1

※ **Refer to the page 8-1 for central grease lubrication system.**



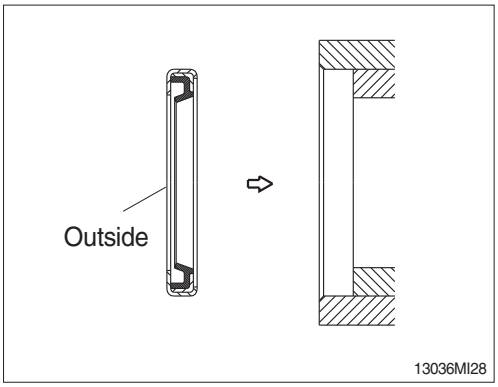
(2) Dust seals are mounted on the rotating part of working device to extend the lubricating interval.

※ **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.**

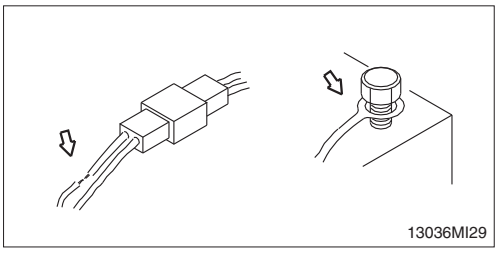
※ **Assemble the seal same direction with picture and use with plastic hammer when replace.**



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.

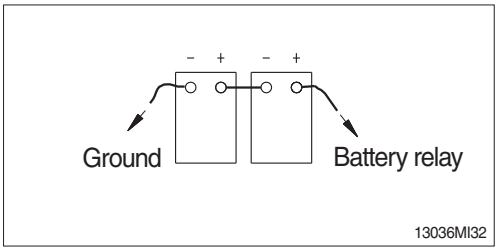
(2) Recycle

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

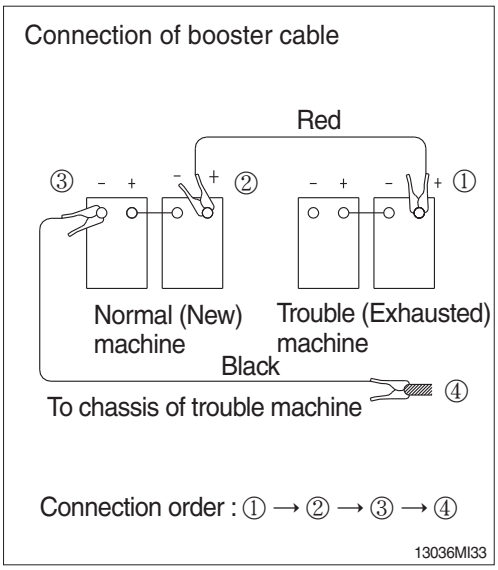
※ **Use the same capacity of battery for starting.**

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.**

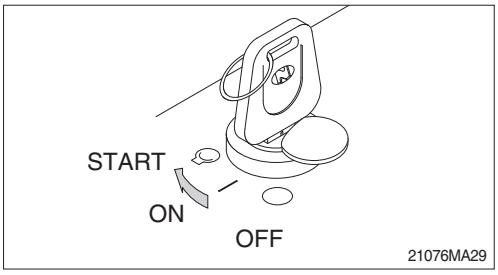


(2) Starting the engine

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.

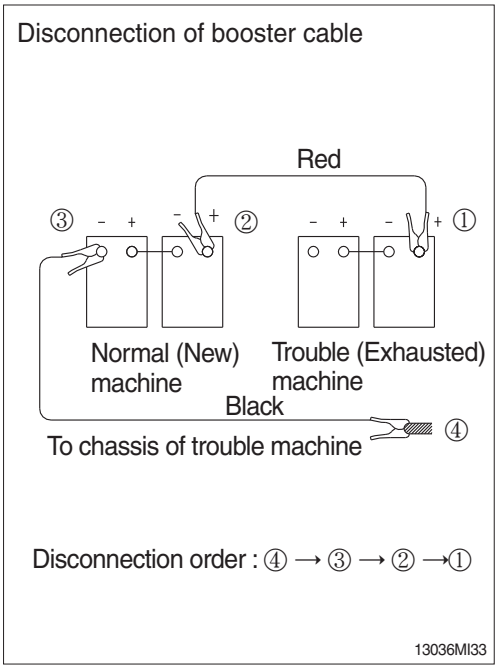
③ Run engine with high idle until charging the exhausted battery by alternator, fully.

⚠ **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.

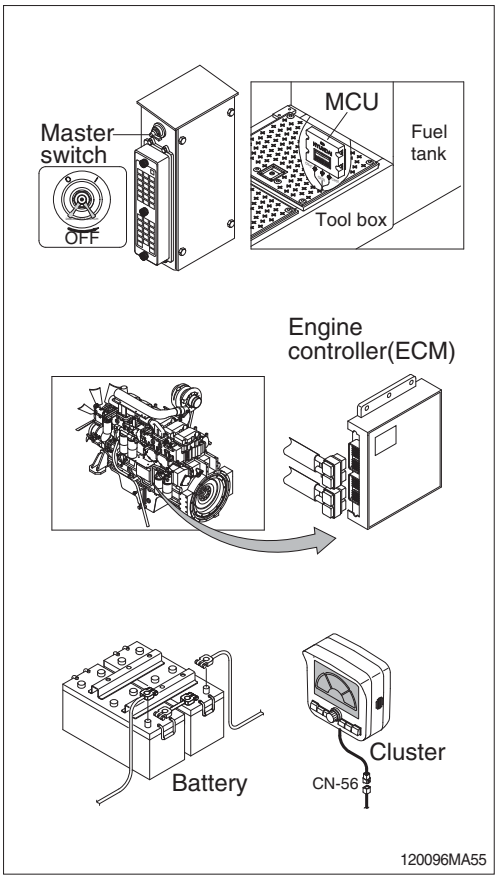
③ Before carrying out any electric welding on the machine, the battery cables should be disconnected and the connectors pulled out of the electronic control units(MCU, ECM, cluster etc).

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.

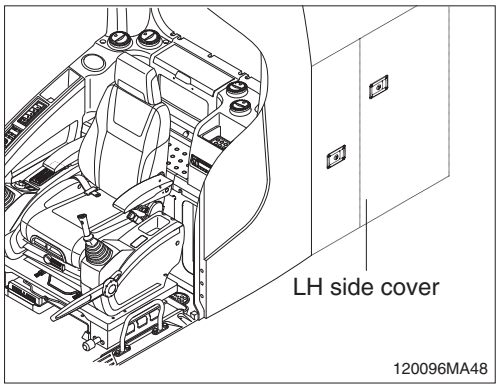


8. AIR CONDITIONER AND HEATER

1) CLEAN AND REPLACE OF FRESH AIR FILTER

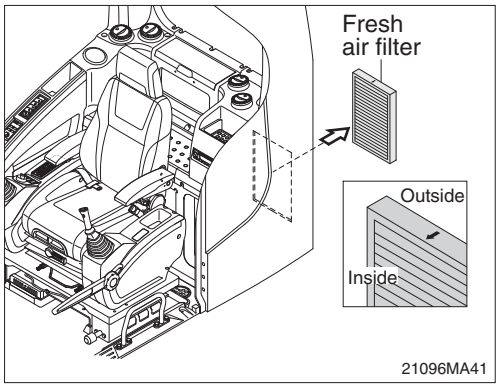
※ **Always stop the engine before servicing.**

(1) Open the LH side cover.



(2) Remove the fresh air filter.

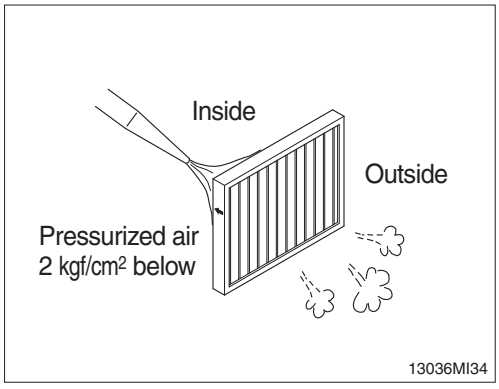
※ **When installing a filter, be careful not to change the filter direction.**



(3) Clean the filter using a pressurized air (below 2 kgf/cm^2, 28 psi).

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

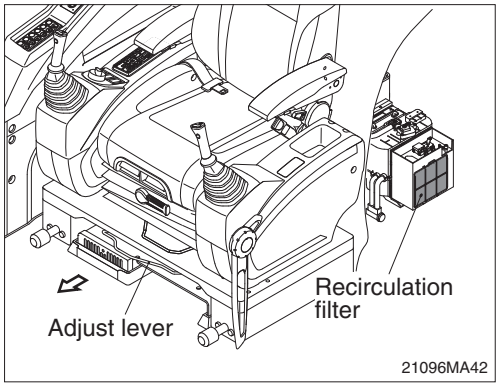
(4) **Inspect the filter after cleaning. If it is damaged or badly contaminated, use a new filter.**



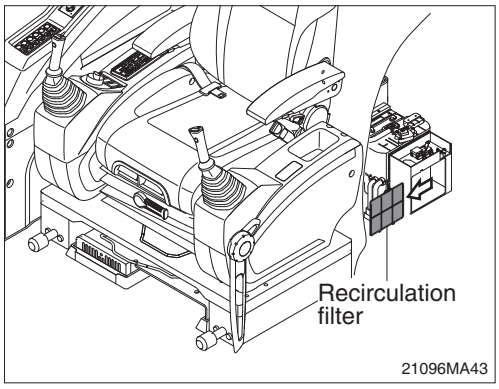
2) CLEAN AND REPLACE OF RECIRCULATION FILTER

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

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



(2) Remove recirculation filter.

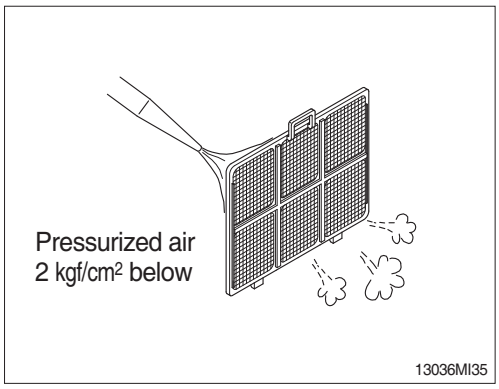


(3) Clean the recirculation filter using a pressurized air (below 2 kgf/cm², 28 psi) or washing with water.

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

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

(4) 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.

6) Refrigerant (R134-a) amount : 1000 ± 50 g

7) COMPRESSOR LUBRICANT OIL (SYNTHETIC OIL) : 265mL