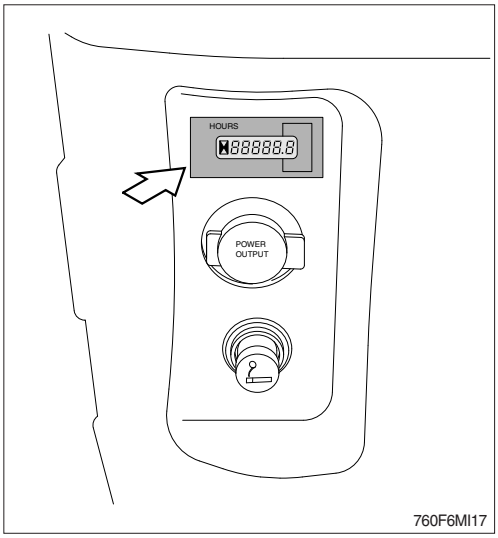
1. INSTRUCTIONS

1) INTERVAL OF MAINTENANCE



(1) You may inspect and service the machine by the period as described at page 6-10 based on service meter of monitor.

(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 250 hours, carry out all the maintenance「each 250 hours, each 100 hours and daily service」 at the same time.

2) PRECAUTION

(1) Start to maintenance after you have the full knowledge of machine.

(2) The monitor installed on this machine does not entirely guarantee the condition of the machine.
Daily inspection should be performed according to clause 4, maintenance check list.

(3) Engine and hydraulic components have been preset in the factory.
Do not allow unauthorized personnel to reset them.

(4) Drain the used oil and coolant in a container and handle according to the method of handling for industrial waste to meet with regulations of each province or country.

⚠ Hot oil and hot components can cause personal injury. Do not allow hot oil or hot components to contact skin.

△ Accumulated grease and oil on the machine is a fire hazard. Remove this debris with steam cleaning or high pressure water, at least every 1000 hours.

△ Inspect the engine compartment for any trash build up. Remove any trash build up from the engine compartment.

(5) Ask to your local dealer or HD Hyundai Construction Equipment for the maintenance advice if unknown.

3) PROPER MAINTENANCE

(1) Replace and repair of parts
It is required to replace the wearable and consumable parts such as bucket tooth, cutting edge, 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 by opening of breather when repairing the hydraulic system.

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

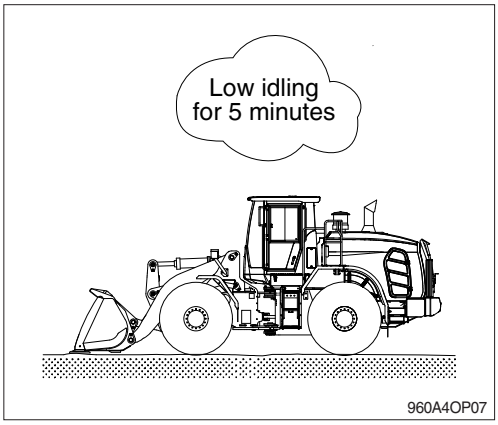
(9) For more detail information of maintenance, please contact local HD Hyundai Construction Equipment dealer.

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

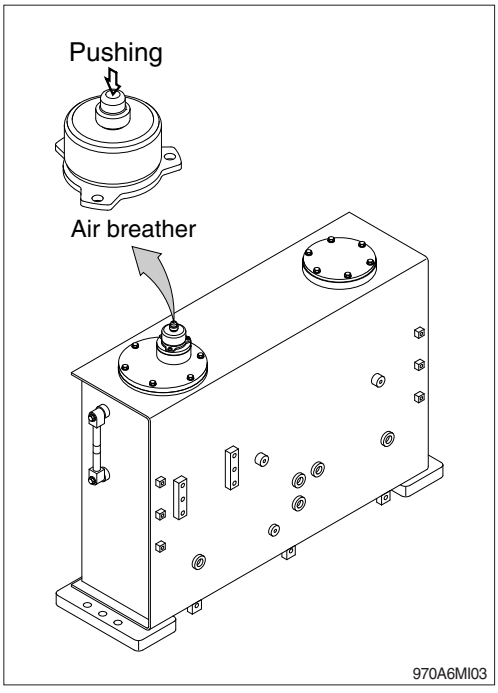
4) RELIEVING THE PRESSURE IN THE HYDRAULIC SYSTEM

※ Spouting of oil can cause the accident when loosening the cap or hose right after the operating of the 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) Repairs or maintenance of the machine shall be performed only after the power is off, and the machine blocked against hazardous motion.
The attachment shall be lowered.



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

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

Periodical replacement of safety parts	Interval
Fuel hose (engine-tank)	Every 2 years
Hose of steering system	
Packing, seal and O-ring of steering cylinder	
Hose of brake system	
Piston seal and packing of boom, bucket cylinder	

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

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

2. TIGHTENING TORQUE

Use following table for unspecified torque.

1) BOLT AND NUT

(1) Coarse thread

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

(2) Fine thread

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

2) PIPE AND HOSE (FLARE type)

Thread size	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	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, nut (rubber, 2EA)	M24×3.0	76.5 ± 7.7	553 ± 55.7
2		Engine mounting bolt (bracket, 8EA)	M12×1.75	11.7	84.6
3		Engine mounting bolt (T/C housing, 11EA)	M10×1.5	6.63 ± 1.0	48 ± 7.2
4		Engine mounting socket bolt (flywheel, 8EA)	M10×1.5	6.9	49.9
5		Fan motor mounting bolt	M12×1.75	12.8 ± 3.0	92.6 ± 21.7
6		Radiator mounting bolt	M16×2.0	29.7 ± 5.9	215 ± 42.7
7		Fuel tank mounting bolt, nut	M16×2.0	29.7 ± 4.5	215 ± 32.5
8	Hydraulic system	Main pump housing mounting bolt	M14×2.0	19.6 ± 2.9	142 ± 21.0
9		Fan & Brake pump housing mounting bolt	M12×1.75	12.8 ± 3.0	92.6 ± 21.7
10		Main control valve mounting bolt	M12×1.75	12.8 ± 3.0	92.6 ± 21.7
11		Steering unit mounting bolt	M10×1.5	6.9 ± 1.4	50 ± 10.1
12		Steering valve mounting bolt	M10×1.5	6.9 ± 1.4	50 ± 10.1
13		Brake valve mounting bolt	M8×1.25	2.5 ± 0.5	18.1 ± 3.6
14		Cut-off valve mounting bolt	M8×1.25	2.5 ± 0.5	18.1 ± 3.6
15		EH control block mounting bolt	M8×1.25	2.5 ± 0.5	18.1 ± 3.6
16		Safety valve mounting bolt	M10×1.5	6.9 ± 1.4	50 ± 10.1
17		Hydraulic oil tank mounting bolt	M16×2.0	29.7 ± 4.5	215 ± 32.5
18	Power train system	Transmission mounting bolt, nut (rubber, 4EA)	M24×3.0	76.5 ± 7.7	553 ± 55.7
19		Transmission mounting bolt (bracket, 8EA)	M20×2.5	56.1 ± 8.4	406 ± 60.8
20		Front axle mounting bolt, nut	M33×2.0	225 ± 20	1627 ± 145
21		Rear axle support mounting bolt, nut	M36×3.0	280 ± 30	2025 ± 217
22		Tire mounting nut	M22×1.5	79 ± 2.5	571 ± 18.1
23		Drive shaft joint mounting bolt	1/2-20UNF	15 ± 2.0	108 ± 14.5
24	Others	Counterweight mounting bolt	M30×3.5	199 ± 30	1439 ± 216
		Counterweight mounting bolt	M24×3.0	100 ± 15	723 ± 108
25		Operator's seat mounting bolt	M8×1.25	3.4 ± 0.8	24.6 ± 5.0
26		ROPS Cab mounting bolt (4EA)	M30×3.5	199 ± 29.9	1440 ± 216
		ROPS Cab mounting nut (4EA)	M16×2.0	20.5 ± 4.7	148± 34

3. SPECIFICATION OF FUEL, COOLANT AND LUBRICANTS

1) NEW MACHINE

New machine used and filled with following lubricants.

Description	Specification
Engine oil (API CK-4)	SAE 15W-40, ★2SAE 5W-40
DEF/AdBlue®	ISO 22241 (32.5% high-purity urea and 67.5 deionized water)
Hydraulic oil	HD Hyundai Construction Equipment genuine long life (ISO VG 46, VG 68 only) Conventional (ISO VG15★2) HD Hyundai Construction Equipment Bio Hydraulic Oil (HBHO, ISO VG 46)
Transmission oil	SAE 15W-40 (Oils of the API CI-4+, CJ-4, CK-4, SM, or ACEA specification, Category E9 are not permitted to use for the transmission)
Axle oil	★Refer to below list
Grease	Lithium base grease NLGI No. 2
Fuel	ASTM D975-No. 2, ★1Ultra low sulfur diesel
Coolant	ASTM D6210 Mixture of 50% ethylene glycol base antifreeze and 50% water Mixture of 60% ethylene glycol base antifreeze and 40% water★2

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
DEF : Diesel Exhaust Fluid
DEF compatible with AdBlue®

★ Recommended oil list
- Gear oil with limited-slip additive
- Viscosity grades: SAE 75W-90/75W-110/ 75W-140 /80W-90/85W-90
- Universal axle and transmission oil
- Premium universal axle and transmission oil

★1 Ultra low sulfur diesel
- sulfur content ≤ 15 ppm

★2 Cold region
Russia, CIS, Mongolia

2) RECOMMENDED OILS

HD Hyundai Construction Equipment genuine lubricating oils have been developed to offer the best performance and service life for your equipment. These oils have been tested according to the specifications of HD Hyundai Construction Equipment and, therefore, will meet the highest safety and quality requirements.
We recommend that you use only HD Hyundai Construction Equipment genuine lubricating oils and grease officially approved by HD Hyundai Construction Equipment.

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

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

※ Do not use any engine oil other than that specified above, as it may clog the diesel particulate filter(DPF).

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

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	23 (6.1)	SAE 15W-40 ★2 SAE 5W-40 SAE 0W-40
DEF/ AdBlue® tank	Mixture of urea and deionized water	44.5 (11.8)	ISO 22241, High-purity urea + deionized water (32.5 : 67.5)
Transmission	Engine oil	53 (14)	SAE 10W-30 SAE 15W-40
Axle ★4	UTTO	FR : 42 (11.1) RR : 42 (11.1)	★Refer to below list
Hydraulic tank	Hydraulic oil	Tank: 152 (40.2) System: 276 (72.9)	★2 ISO VG 15 ISO VG 46, HBHO VG 46★5 ISO VG 68
Fuel tank	Diesel fuel★1	365 (96.4)	★2 ASTM D975 NO.1 ASTM D975 NO.2
Fitting (grease nipple)	Grease	As required	★2 NLGI NO.1 NLGI NO.2
Radiator (reservoir tank)	Mixture of antifreeze and soft water★3	47 (12.4)	Ethylene glycol base permanent type (50 : 50) ★2 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
UTTO : Universal Tractor Transmission Oil
DEF : Diesel Exhaust Fluid
DEF compatible with AdBlue®

★1 Ultra low sulfur diesel
- sulfur content ≤ 15 ppm

★ Recommended oil list
- Gear oil with limited-slip additive
- Viscosity grades: SAE 75W-90/75W-110/ 75W-140 /80W-90/85W-90
- Universal axle and transmission oil
- Premium universal axle and transmission oil

★2 Cold region : Russia, CIS, Mongolia
★3 Soft water : City water or distilled water
★4 If the machine is equipped with axle oil cooler, refer to page 6-44.
★5 HD Hyundai Construction Equipment Bio Hydraulic Oil

4. MAINTENANCE CHECK LIST

Scheduled maintenance is the normal maintenance necessary to provide proper and efficient machine operation. To protect your investment and prolong the service life of your machine, follow the scheduled maintenance list below.

1) EVERY 10 HOURS SERVICE

Check items	Service	Page
Hydraulic oil level	Check, Add	6-38
Engine oil level	Check, Add	6-15
Radiator coolant level	Check, Add	6-17
Belt tension & damage	Check	6-25, 26
Fuel pre-filter element (water)	Drain	6-28
DEF/AdBlue® tank	Check, Add	6-30
Charge air piping	Check	6-24
Cooling fan	Check	6-25
After treatment exhaust piping	Check	-
Air intake piping	Check	-
Air cleaner and dust ejection valve	Check	-

2) EVERY 50 HOURS SERVICE

Check items	Service	Page
Attachment pins	Lubricate	6-51
Tire (air)	Check, Add	6-41
Drive shaft (flange bearing, front, center, rear)	Lubricate	6-48
Steering cylinder pins	Lubricate	6-48
Rear axle pivot	Lubricate	6-48
Fuel tank (water, sediment)	Drain	6-28

3) INITIAL 250 HOURS SERVICE

Check items	Service	Page
Engine oil and filter	Change	6-15, 16, 17
Fuel filter element	Replace	6-29
Fuel pre-filter element	Replace	6-28
Transmission oil and filter	Change	6-44, 46
Front and rear axle oil	Change	6-47
Hydraulic oil return filter	Replace	6-39
Pilot line filter element	Replace	6-40
Pressure filter element	Replace	6-40

4) EVERY 250 HOURS SERVICE

Check items	Service	Page
Wheel nuts	Check, Tight	6-41, 42
Battery (voltage) / Battery cable and connections	Check	6-53, 54
Air conditioner and heater filter (inner and outer)	Check, Clean	6-56

5) EVERY 500 HOURS SERVICE

Check items	Service	Page
Radiator, oil cooler, change air cooler, condenser	Check, Clean	6-21
Air cleaner element (primary)★	Clean	6-27
Coolant filter	Replace	6-23
Air compressor air filter (option)	Check, Clean	6-52-1
Parking brake clearance	Check, Adjust	6-45-1

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

6) EVERY 1000 HOURS SERVICE

Check items	Service	Page
Engine oil ★	Change	6-15, 16, 17
Engine oil filter ★	Replace	6-15, 16, 17
Fuel filter element	Replace	6-29
Fuel pre-filter element	Replace	6-29
Drive belt, cooling fan, belt tensioner	Check	6-22, 23
Hydraulic oil return filter	Replace	6-39
Pilot line filter element	Replace	6-40
Hydraulic tank air breather element	Replace	6-40
Pressure filter element	Replace	6-40
Center pivot pin	Lubricate	6-48
Transmission oil	Change	6-44, 45
Transmission oil filter	Replace	6-45
Aircon and heater outer filter	Replace	6-56

★ Change oil and filter every 500 hours when using API CJ-4.

7) EVERY 1500 HOURS SERVICE

Check items	Service	Page
Front axle oil	Change	6-47
Rear axle oil	Change	6-47
Axle oil filter (option)	Replace	6-47

8) EVERY 2000 HOURS SERVICE

Check items	Service	Page
Coolant, cooling system and antifreeze★1	Change, Flush	6-17, 18, 19, 20
Engine cleaning	Clean	6-33
Vibration damper (rubber, viscous)	Check	6-34
Air cleaner element (safety and primary)	Replace	6-27
Hydraulic oil★1	Change	6-39
HBHO★2	Change	6-39
Hydraulic oil suction strainer	Check, Clean	6-39
Airconditioner and heater inner filter	Replace	6-56
DEF/AdBlue® tank filter	Replace	6-31
Hoses, fittings, clamps (fuel, coolant, hydraulic)	Check, Retighten, Replace	-
Air compressor air filter (option)	Replace	6-25-1

★1 Conventional

★2 If do not want to change HBHO (HD Hyundai Construction Equipment Bio Hydraulic Oil, ISO VG 46) every 2000 hours, contact HD Hyundai Construction Equipment dealer and ask about SAMPLING.

9) EVERY 4500 HOURS SERVICE

Check items	Service	Page
DEF/AdBlue® supply module filter ★	Replace	6-32

★ When working in dusty environments, inspection per 1500 hours is highly recommended.

10) EVERY 5000 HOURS SERVICE

Check items	Service	Page
Overhead set (shop inspection)	Adjust	6-35, 36, 37
Hydraulic oil★3	Change	6-39

★3 HD Hyundai Construction Equipment genuine long life

11) EVERY 6000 HOURS SERVICE

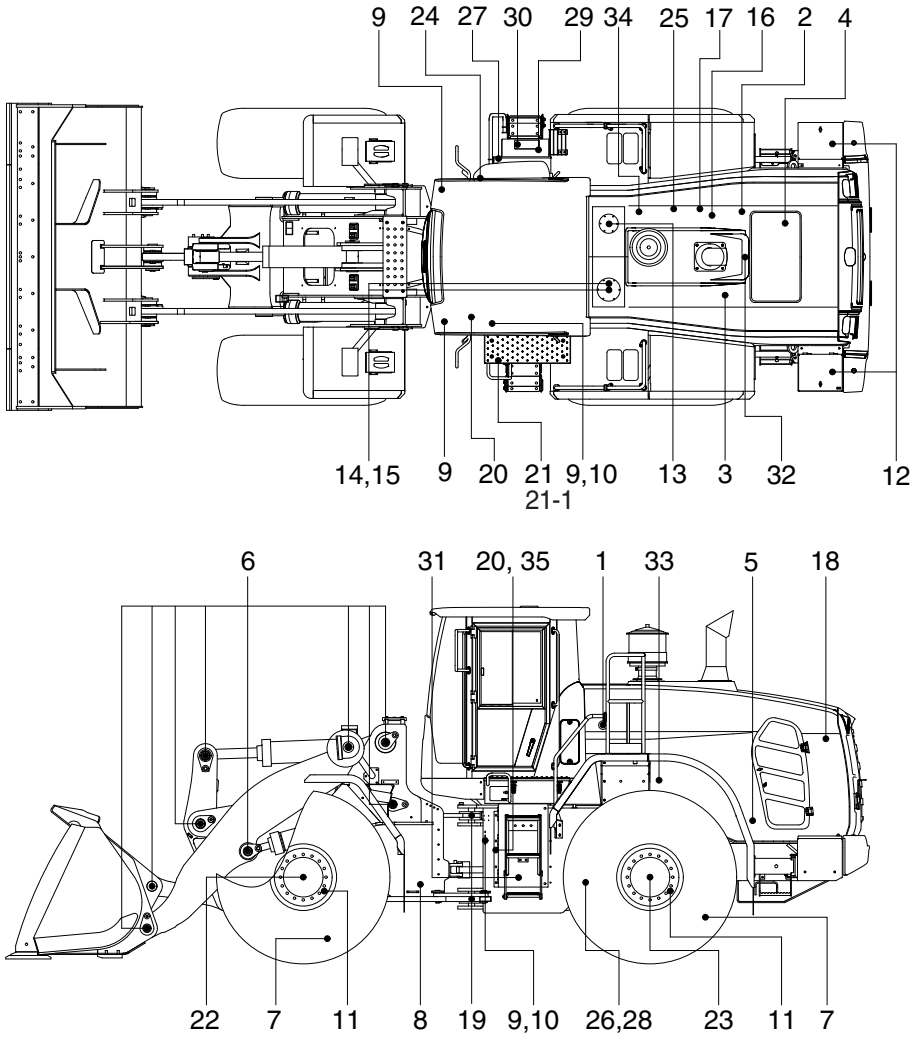
Check items	Service	Page
Coolant, cooling system and antifreeze★3	Change, Flush	6-17, 18, 19, 20

★3 HD Hyundai Construction Equipment genuine long life

12) WHEN REQUIRED

Check items	Service	Page
Air cleaner element		
· Safety	Replace	6-27
· Primary	Clean, Replace	6-27
Air conditioner and heater		
· Outer filter	Replace	6-56
· Inner filter	Clean, Replace	6-56
DPF (diesel particulate filter)	Clean	6-33
Air compressor air filter (option)	Clean or Replace	6-52-1

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.
4. For other details, refer to the service manual.

- EO : Engine oil - GO : Gear oil
- C : Coolant - DEF : DEF/AdBlue®
- HO : Hydraulic oil - PGL : Grease
- UTTO : Refer to page 6-9.

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	152 (40.2)	1
	2	Engine oil level	Check, Add	EO	23 (6.1)	1
	4	Radiator coolant level	Check, Add	C	47 (12.4)	1
	5	Fan belt tension & damage	Check, Adjust	-	-	1
	17	Fuel pre-filter (water)	Drain	-	-	1
	29	DEF/AdBlue® tank	Check, Add	DEF	44.5 (11.8)	1
50 Hours or weekly	6	Attachment pins	Lubricate	PGL	-	13
	7	Tire (air)	Check, Add	-	-	4
	8	Drive shaft (flange bearing)	Lubricate	PGL	-	1
	9	Steering cylinder pin	Lubricate	PGL	-	4
	10	Rear axle pivot	Lubricate	PGL	-	2
	26	Drive shaft sleeve yoke	Lubricate	PGL	-	2
	28	Drive shaft journal bearing assy	Lubricate	PGL	-	5

Service interval	No.	Description	Service action	Oil symbol	Capacity ℓ (U.S.gal)	Service points No.
250 Hours	11	Wheel nuts	Check, Tight	-	-	80
	12	Battery voltage, cable and connection	Check, Add	-	-	2
	24	Aircon and heater inner and outer filter	Check, Clean	-	-	2
Initial 250 Hours	2	Engine oil	Change	EO	23 (6.1)	1
	3	Engine oil filter	Replace	-	-	1
	13	Hydraulic oil return filter	Replace	-	-	1
	16	Fuel filter element	Replace	-	-	1
	17	Fuel pre-filter element	Replace	-	-	1
	20	Transmission oil	Change	EO	53 (14)	1
	21	Transmission oil filter	Replace	-	-	1
	22	Axle oil (front)	Change	UTTO	See 6-9	3
	23	Axle oil (rear)	Change	UTTO	See 6-9	3
	31	Pilot line filter element	Replace	-	-	1
	34	Pressure filter	Replace	-	-	1
500 Hours	18	Radiator, oil cooler, CAC, condenser	Clean	-	-	5
	21-1	Parking brake clearance	Check, Adjust	-	-	1
	25	Air cleaner element (primary)	Clean	-	-	2
	33	Coolant filter	Replace	-	-	1
	35	Air compressor air filter (option)	Check, Clean	-	-	1
1000 Hours	2	Engine oil	Change	EO	23 (6.1)	1
	3	Engine oil filter	Replace	-	-	1
	13	Hydraulic oil return filter	Replace	-	-	1
	14	Hydraulic tank air breather element	Replace	-	-	1
	16	Fuel filter element	Replace	-	-	1
	17	Fuel pre-filter element	Replace	-	-	1
	19	Center pivot pin	Lubricate	PGL	-	2
	20	Transmission oil	Change	EO	53 (14)	1
	21	Transmission oil filter	Replace	-	-	2
	24	Airconditioner and heater outer filter	Replace	-	-	1
	31	Pilot line filter element	Replace	-	-	1
	34	Pressure filter	Replace	-	-	1
1500 Hours	22	Axle oil (front)	Change	UTTO	See 6-9	3
	23	Axle oil (rear)	Change	UTTO	See 6-9	3
	-	Axle oil filter (opt)	Replace	-	See 6-47	2
2000 Hours	1	Hydraulic oil★1	Change	HO	152 (40.2)	1
	1	Hydraulic oil (HBHO★2)	Change	-	152 (40.2)	1
	4	Radiator coolant★1	Change	C	47 (12.4)	1
	15	Hydraulic oil suction strainer	Check, Clean	-	-	1
	24	Air conditioner and heater inner filter	Replace	-	-	1
	25	Air cleaner element (safety, primary)	Replace	-	-	4
	-	Engine cleaning, Vibration damper	Clean, Check	-	-	2
	-	Hoses, fittings, clamps (fuel, coolant, hydraulic)	Check, Retighten, Replace	-	-	-
	30	DEF/AdBlue® tank filter	Replace	-	-	1
	35	Air compressor air filter (option)	Replace	-	-	1
4500 Hours	27	DEF/AdBlue® supply module filter	Replace	-	-	1
5000 Hours	1	Hydraulic oil★3	Change	HO	152 (40.2)	1
	-	Overhead set (shop inspection)	Adjust	-	-	1
6000 Hours	4	Radiator coolant★3	Change	C	47 (12.4)	1
When required	24	Air conditioner and heater outer filter	Replace	-	-	1
		Air conditioner and heater inner filter	Clean, Replace	-	-	1
	25	Air cleaner element (safety)	Replace	-	-	2
		Air cleaner element (primary)	Clean, Replace	-	-	2
	35	Air compressor air filter (option)	Clean, Replace	-	-	1

★1 Conventional ★2 HD Hyundai Construction Equipment Bio Hydraulic Oil

★3 HD Hyundai Construction Equipment genuine long life

1) CHECK ENGINE OIL LEVEL

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

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

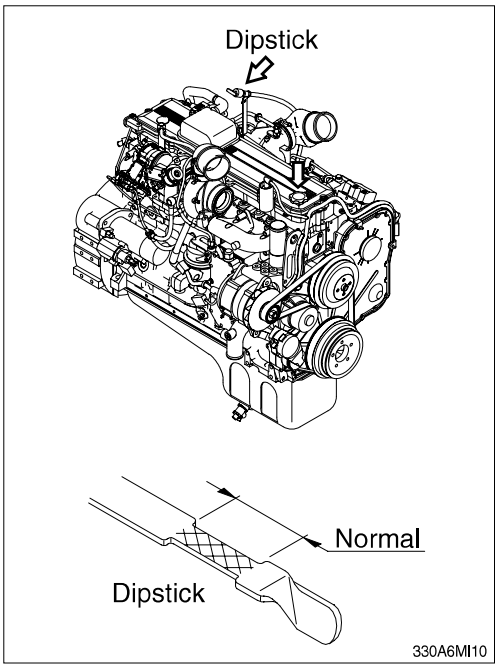
(2) Check the oil level by inserting the dipstick completely into the hole and pulling out again.

(3) If oil level is LOW, add oil and then check again.

※ If the oil is contaminated or diluted, change the oil regardless of the regular change interval.

※ Check oil level after engine has been stopped for 15 minutes.

⚠ Do not operate unless the oil level is in the normal range.



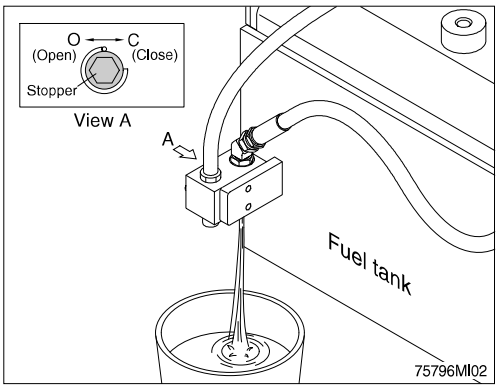
2) REPLACEMENT OF ENGINE OIL AND OIL FILTER

(1) Operate the engine until the coolant temperature reaches 60˚C (140˚F). Shut off the engine.

(2) Turn the stopper to the open position and allow the oil to drain.

· Wrench size : 10 mm

※ A drain pan with a capacity of 30 liters (6.6 U.S.gallons) will be adequate.

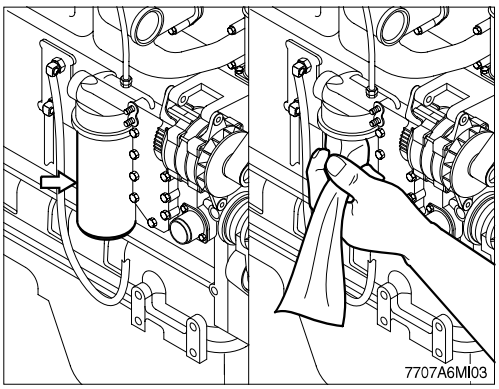


(3) Clean the area around the oil filter head.

(4) Use oil filter wrench to remove the oil filter.

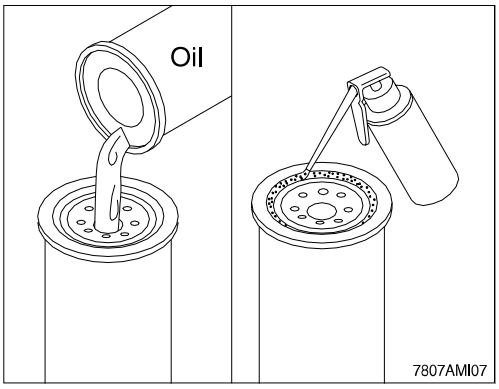
(5) Clean the gasket surface of oil filter head.

※ The O-ring can stick on the filter head; make sure it is removed.



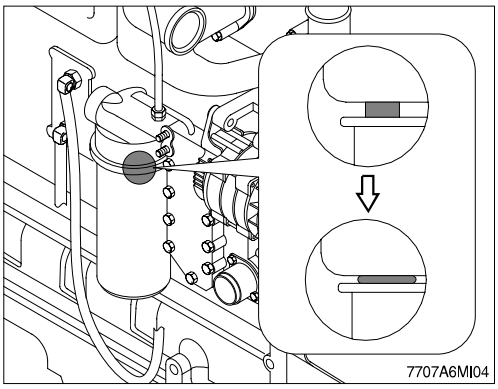
(6) Apply a light film of lubricating oil to the gasket sealing surface before installing the filter.

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

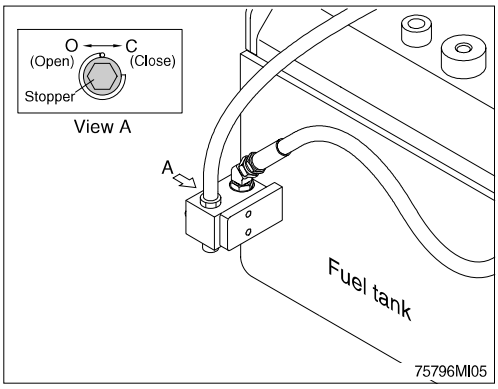


(7) Install the filler to the filter head.
Tighten the filter until the gasket contacts the filter head surface.
Tighten 3/4 to 1 turn after gasket makes contact with the filter head.

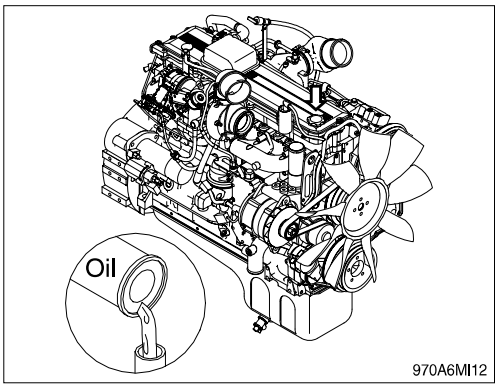
※ **Mechanical over-tightening may distort the threads or damage the filter element seal.**



(8) Turn the stopper to the close position.

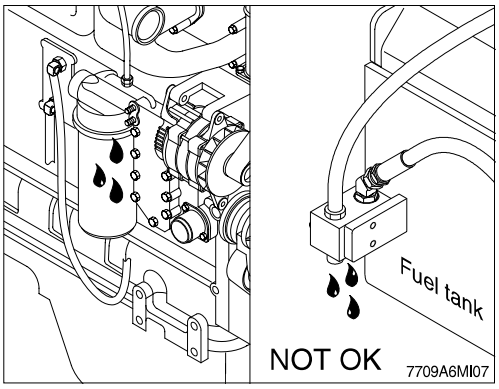


(9) Fill the engine with clean oil to the proper level.
· Quantity : 23 ℓ (6.1 U.S.gallons)



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

※ **Do not overfill the engine with oil.**

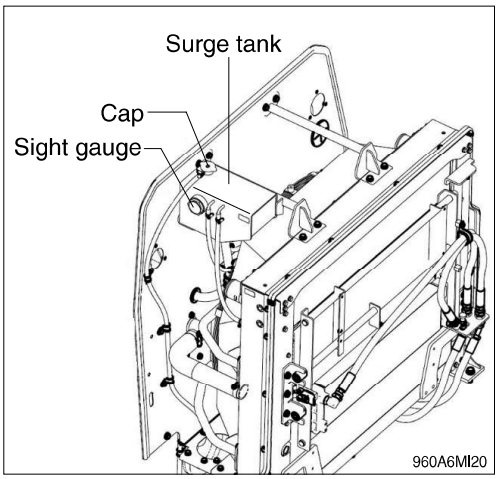


3) CHECK COOLANT LEVEL

(1) Check the engine fault code on the monitor.

(2) If you following fault codes exist, check the coolant level.
- SPN : 111, FMI : 18
  - Coolant level is low.
- SPN : 111, FMI : 1
  - Coolant level is the most severely low.

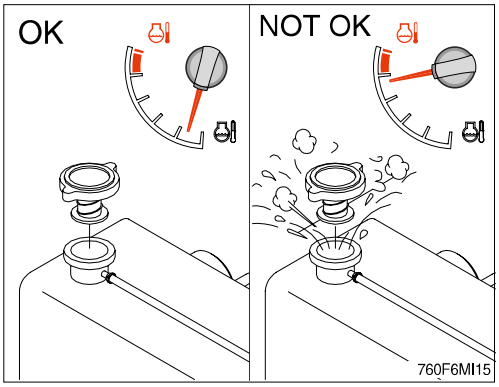
(3) Add the mixture of antifreeze and water after removing the cap of the surge tank if coolant is not sufficient.



(4) Replace gasket of surge tank cap when it is damaged.

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

※ **Do not add cold coolant to a hot engine ; engine castings can be damaged. Allow the engine to cool to below 50˚C (120˚F) before adding coolant.**



3-1) 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.

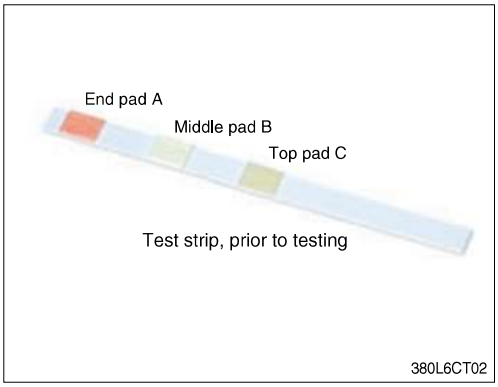
③ Record and track results.

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:

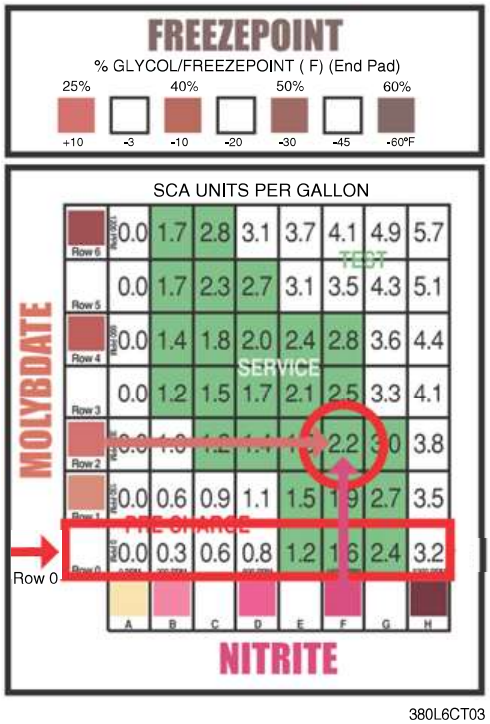
for DCA4:

a FREEZEPOINT
b MOLYBDATE
c NITRITE

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

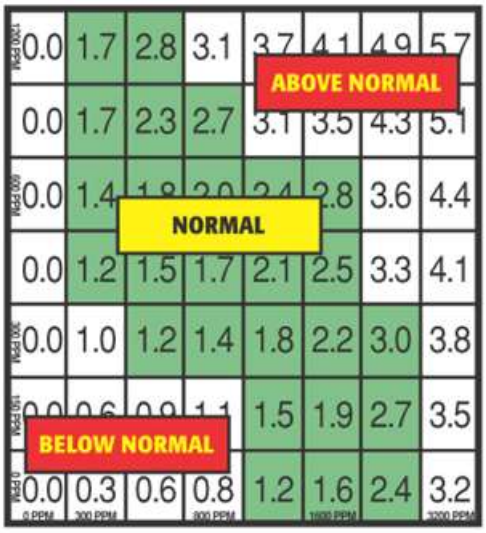
NORMAL - Continue to replace the coolant filter at your normal interval.

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.

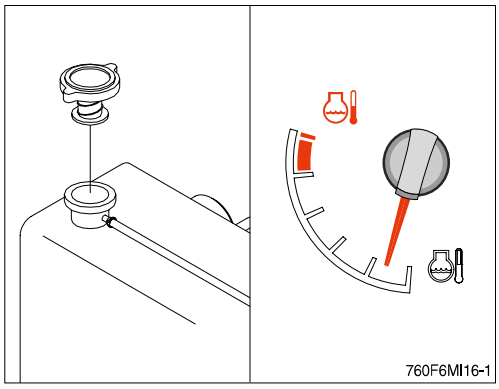
※ If you need part number of Test kit or DCA4, please see Parts Manual.



380L6CT04

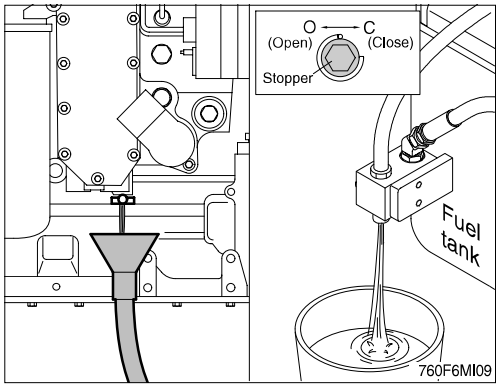
4) FLUSHING AND REFILLING OF RADIATOR

(1) Change coolant



⚠ Avoid prolonged and repeated skin contact with used antifreeze. Such prolonged repeated contact can cause skin disorders or other bodily injury.
Avoid excessive contact-wash thoroughly after contact.
Keep out of reach of children.

⚠ Protect the environment: Handling and disposal of used antifreeze can be subject to federal, state, and local law regulation.
Use authorized waste disposal facilities, including civic amenity sites and garages providing authorized facilities for the receipt of used antifreeze.
If in doubt, contact your local authorities for guidance as to proper handing of used antifreeze.



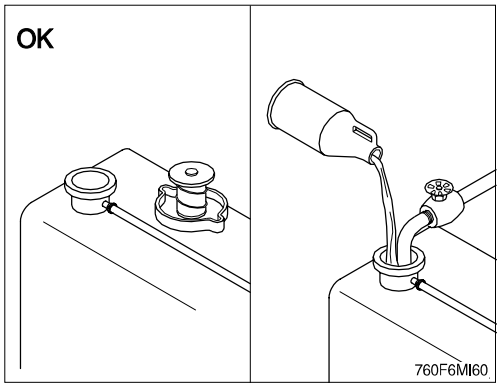
⚠ Wait until the temperature is below 50˚C (120˚F) before removing the coolant system cap. Failure to do so can cause personal injury from heated coolant spray.
Drain the cooling system by turning the stopper to the open position.
A drain pan with a capacity of 50 liters (13.2 U. S.gallons) will be adequate in most applications.

(2) Flushing of cooling system

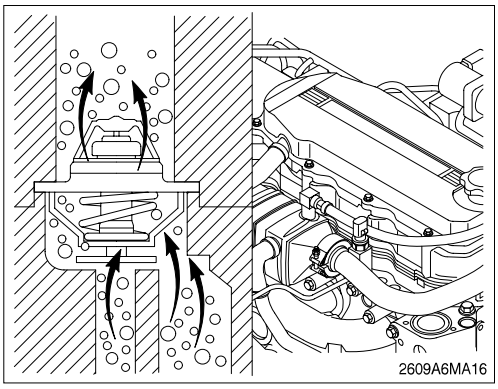
① Fill the system with a mixture of sodium carbonate and water (or a commercially available equivalent).

※ Use 0.5 kg (1.0 pound) of sodium carbonate for every 23 liters (6.0 U.S. gallons) of water.

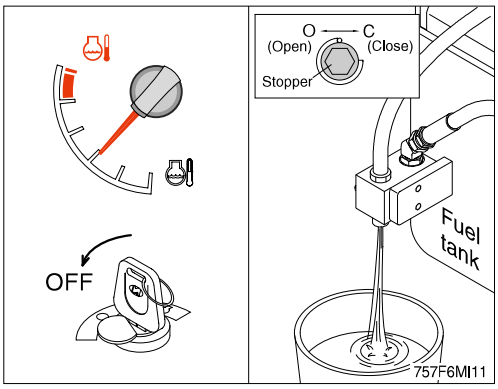
※ Do not install the cap. The engine is to be operated without the cap for this process.



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



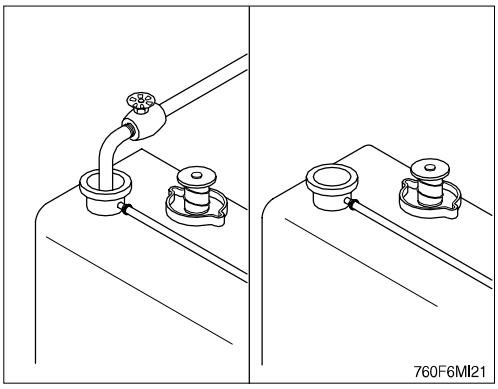
② Operate the engine for 5 minutes with the coolant temperature above 80˚C (176˚F).
Shut the engine off, and drain the cooling system.



③ Fill the cooling system with clean water.

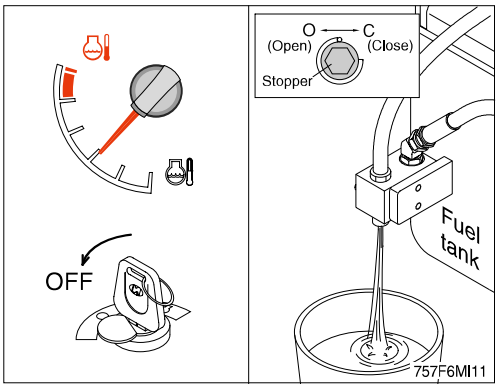
※ **Be sure to vent the engine and aftercooler for complete filling.**

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



④ Operate the engine for 5 minutes with the coolant temperature above 80˚C (176˚F).
Shut the engine off, and drain the cooling system.

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

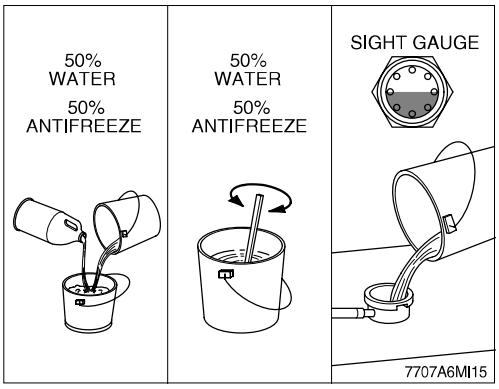


(3) Cooling system filling

① Use a mixture of 50 percent soft water and 50 percent ethylene glycol antifreeze to fill the cooling system. Refer to the page 6-9.

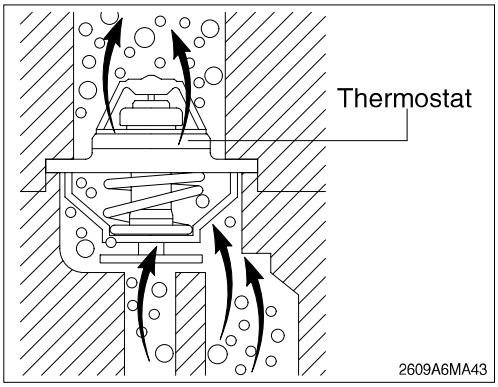
※ **Never use water alone for coolant.**
This can result in damage from corrosion.

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

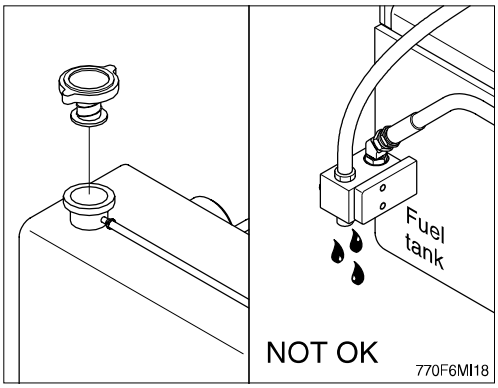


② The system has a maximum fill rate of 19 liters (5.0 U.S. gallons) per minute.
Do not exceed this fill rate.

※ **The system must be filled slowly to prevent air locks.**
During filling, air must be vented from the engine coolant passage.



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



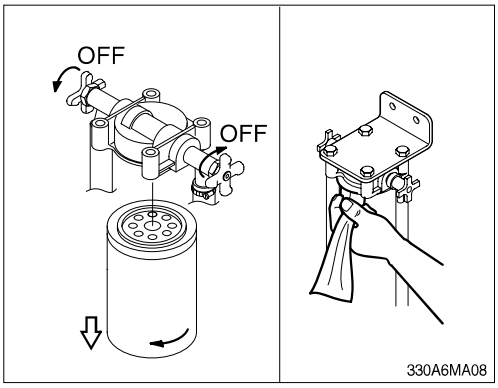
5) COOLANT FILTER

⚠ **Do not remove the rad radiator cap from a hot engine. Wait until the coolant temperature is below 50°C (120°C) before removing the radi-ator 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.**



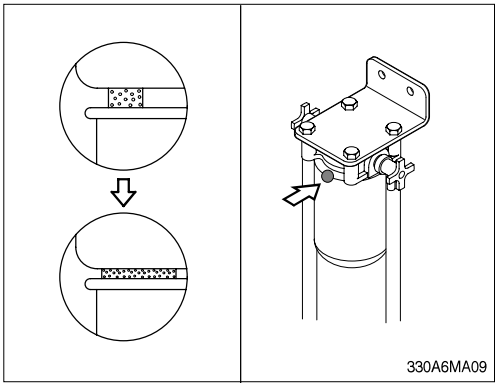
(4) Apply a thin film of clean engine oil to the gasket sealing surface before installing the new filter.

※ **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.

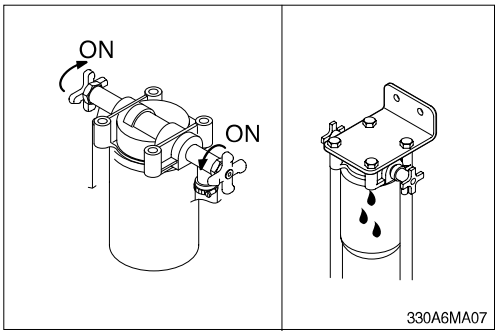
※ **Mechanical over tightening can distort the filter threads or damage the filter head.**



(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.**

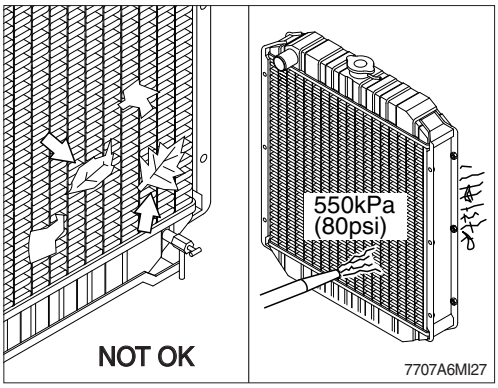


6) CLEAN RADIATOR AND OIL COOLER

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.

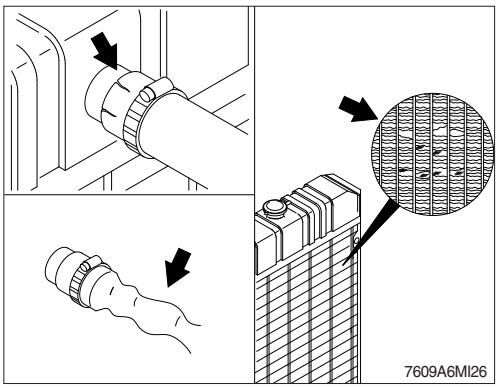
(2) Use 550 kPa (80 psi) air pressure to blow the dirt and debris from the fins.
Blow the air in the opposite direction of the fan air flow.



(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.**

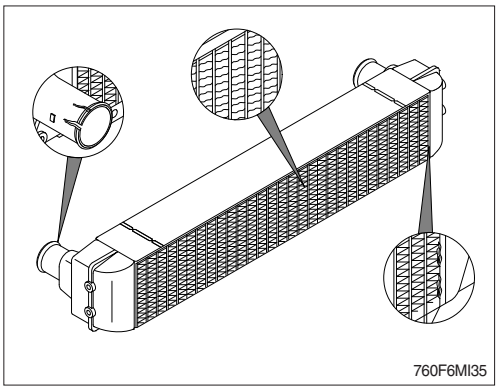
(4) Visually inspect the radiator for core and gasket leaks.



7) CHECK CHARGE AIR COOLER AND PIPING

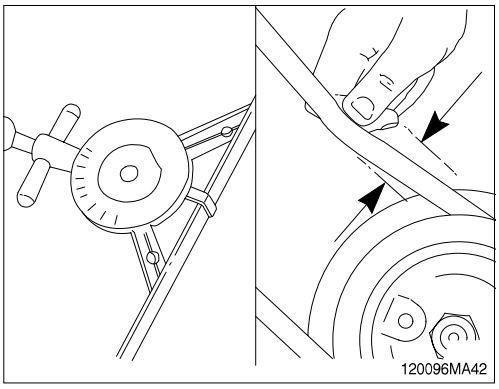
(1) Inspect the charge air cooler for dirt and debris blocking the fins. Check for cracks, holes, or other damage. If damage is found, please contact HD Hyundai Construction Equipment distributor.

(2) Inspect the charge air piping and hoses for leaks, holes, cracks, or loose connections.
Tighten the hose clamps if necessary.

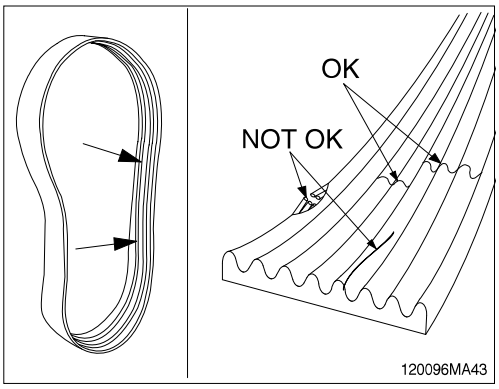


8) FAN BELT

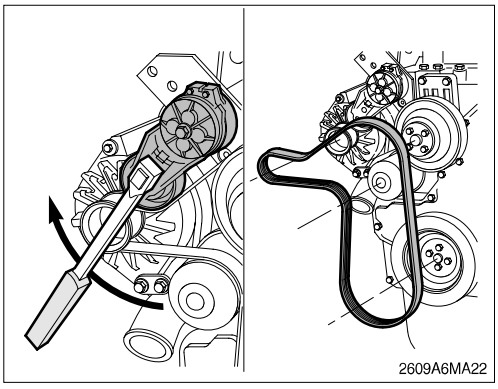
(1) Use the belt tension gage to measure the belt tension.
· Fan belt tension : 11.3 ㎏ (25 �lb)



(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.

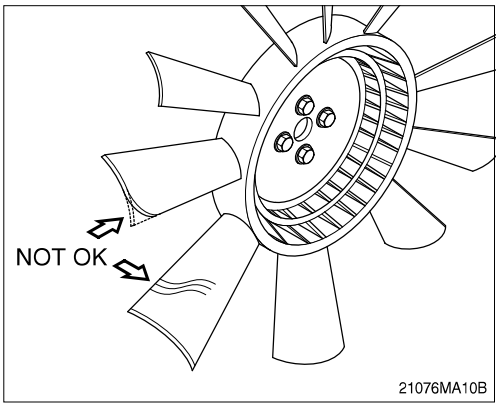


9) INSPECTION OF COOLING FAN

⚠ 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.

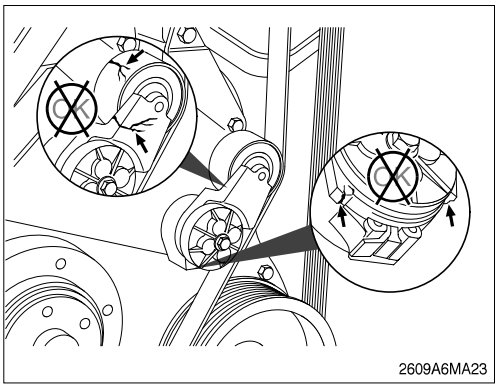
※ Rotate the crankshaft by using the engine barring gear.

※ 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.

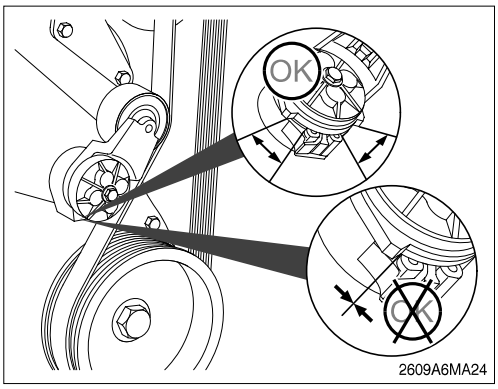


10) FAN BELT TENSIONER

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

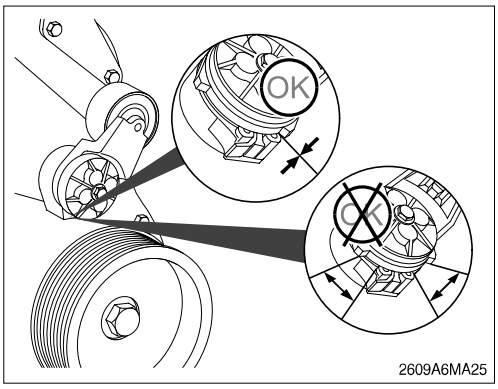


(2) With the belt installed, verify that neither tensioner arm stop is in contact with the spring case stop.
After replacing the belt, if the tensioner arm stops are still in contact with the spring case stop, replace the tensioner.

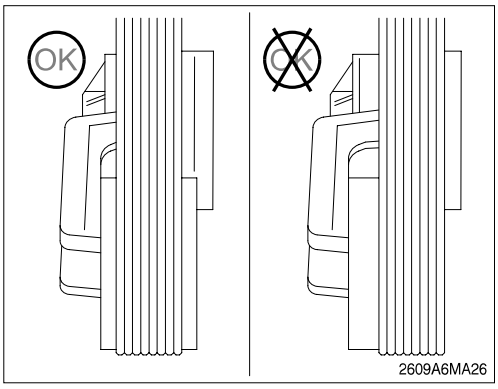


(3) With the belt removed, verify that the tensioner arm stop is in contact with the spring case stop.
If these two are not touching, the tensioner must be replaced.

※ **After replacing the belt, if the tensioner arm stop is still in contact with the spring case stop, the tensioner MUST be replace.**



(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.



11) CLEANING OF AIR CLEANER

(1) Primary element

① Open the cover and remove the element.

② Wipe all contaminant and debris from inside the housing body.

③ Do not clean the filter element by striking or hitting the filter against any object to shake the debris from the filter element.

④ Clean the filter element with compressed air.

a. Remove dust from filter element by directing the compressed air into the opening of the air filter element.

b. Use 3 kg/cm^2 (40 psi) maximum air pressure and hold the compressed air nozzle at least 2.5 cm (1") away from the pleats while cleaning. Make sure to keep the clean side of air filter free of debris.

⑤ Visually inspect for damage to the filter elements and components. Use a light source to help identify any defects in the media. If any defects are observed discard the filter element and replace with a new primary filter element.

a. Before any type of cleaning, a visual inspection of the filter is needed. If there is any damage to the filter body, gaskets or endplates, do not clean or reuse; the filter should be discarded. Always clean filters in a clean environment, observe strict inspection procedures and repackage filters immediately after the cleaning process with appropriate materials.

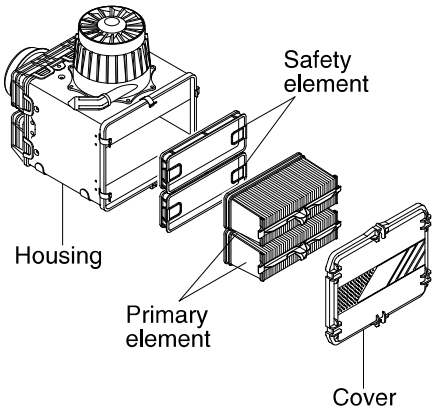
b. Use observe proper safety precautions and dispose of waste materials in an environmentally compliant manner.

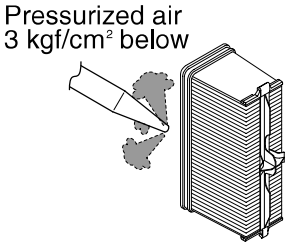
⑥ Re-install filter element into the air housing.

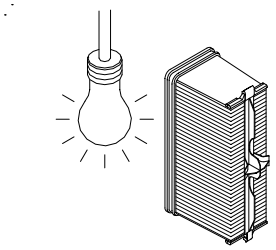
⑦ Replace the primary element at the fourth cleaning.

(2) Safety element

The safety filter element should never be cleaned since the safety filter is the last barrier to contaminant before it reaches engine/equipment. The useful life of the safety filter is equivalent to that of the primary air filter only if the primary filter element is being regularly cleaned. If the primary filter element is not cleaned, the safety filter should be changed at every third primary air filter change or after one year of continuous service, whichever occurs first.







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12) FUEL TANK

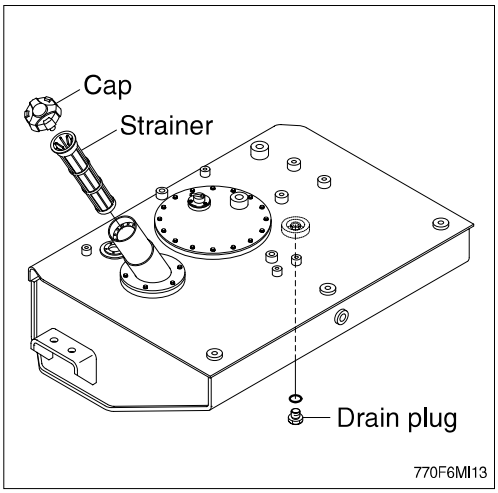
(1) Fill fuel fully when system the operation to minimize water condensation, and check it with fuel gauge before starting the machine.

(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.



13) FUEL PRE-FILTER

※ Inspect or drain the collected water daily and replace the element every 1000hours.

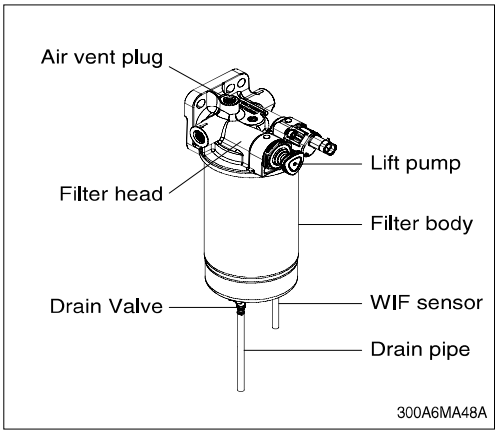
(1) Drain water

① Open the drain valve to evacuate water for 10 seconds.

② Close drain valve.

※ Do not use tools.

※ Don't tighten up a drain valve so strong.



(2) Replace element

① Loosen the air vent plug and drain the unit of fuel. Follow "Drain water" instructions above.

② Remove the drain pipe and WIF sensor from filter body.

③ Remove the filter body from filter head.

④ Pre-fill a new filter body with fuel and lubricate a gasket on the new filter body.

⑤ Install the filter on the filter head. Tighten the filter until the gasket contacts the filter head surface. Tighten the prefilter an additional 3/4 turn after contact.

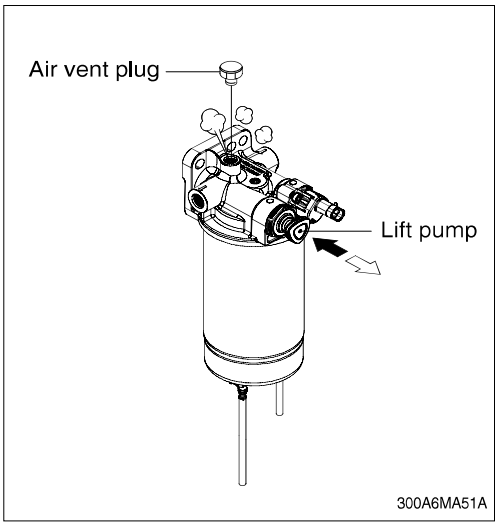
⑥ Connect the drain pipe and WIF sensor to filter body.

(3) Air bleeding

① Do hand-priming the lift pump repeatedly until air bubbles comes out from air vent hole completely.

② Tighten the air vent plug to its origin position.

⚠ 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. Personal injury and property damage can result. Wait at least 10 minutes after shutting down the engine before loosening any fittings in the high-pressure fuel system to allow pressure to do decrease to a lower level.



14) REPLACEMENT OF FUEL FILTER

(1) Use 1" wrench, loosen and remove the filter and clean the gasket surface.

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

(2) Lubricate the fuel filter O-ring with clean lubricating oil.

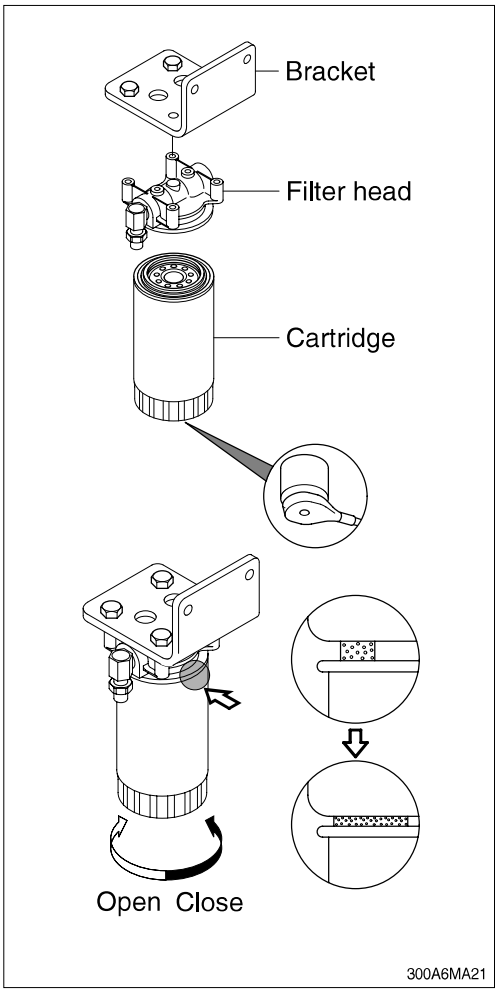
(3) Install the filter on the filter head. Tighten the filter until the gasket contacts the filter head surface. Tighten the fuel filter an additional 3/4 turn after contact.

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

(4) Relieve the air after mounting.

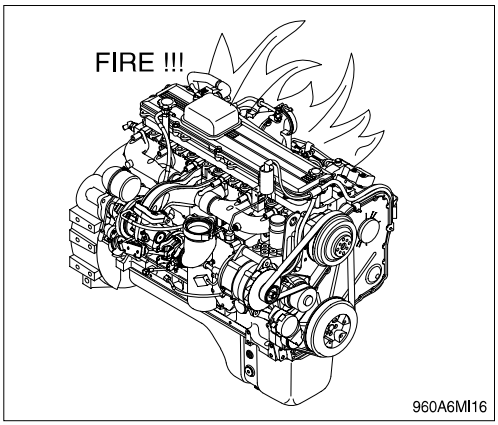
※ **Do not pre-fill an on-engine fuel filter with fuel. The system must be primed after the fuel filter is installed. Pre filling the fuel filter can result in debris entering the fuel system and damaging fuel system components.**

※ **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.**



15) LEAKAGE OF FUEL

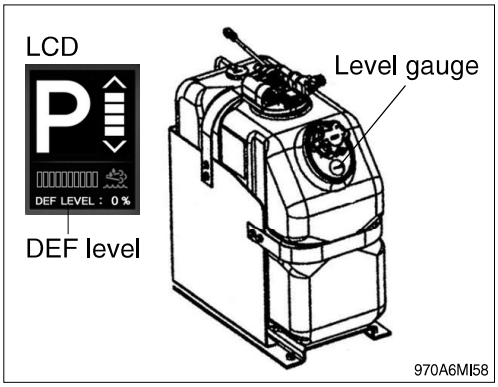
⚠ Be careful and clean the fuel hose, injection pump, fuel filter and other connections as the leakage from these part can cause fire.



16) DEF/AdBlue® TANK

(1) The DEF/AdBlue® tank level must be checked daily with DEF/AdBlue® level on LCD. Refer to the page 3-12.

※ The DEF/AdBlue® tank is located on the right side of the machine.
Make sure that the filler filter in cap is clean. If it is dirty, clean the filler filter with clean water and refit it.

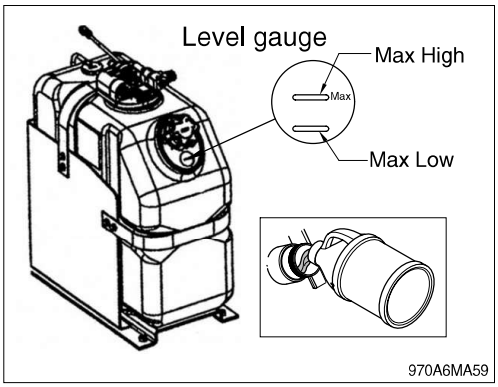


(2) If the DEF/AdBlue® level is found to below, DEF/AdBlue® must be added.

(3) When fill the tank with DEF/AdBlue®, check the level gauge and don't fill up "Max High" level line to prevent overflow.

⚠ It is unlawful to tamper with or remove any component of the aftertreatment system. It is also unlawful to use a catalyst solution that does not meet the specifications provided or the operate the machine with no catalytic solution.

※ Be careful to entering dust, sand or other contamination substance when you refill the DEF/AdBlue® into the tank. Otherwise, fatal problem such as engine idle locking, derating or engine stopping can be happen.

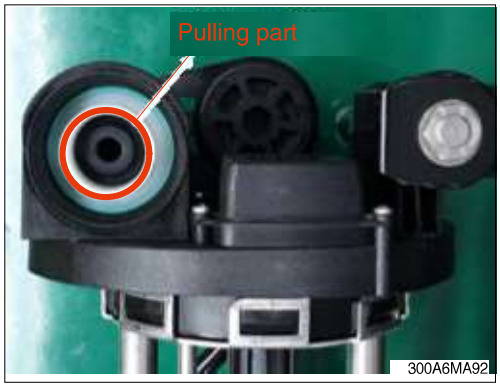


17) DEF/AdBlue® TANK FILTER

(1) The filter is located top side of the DEF/AdBlue® tank cover.

(2) Insert a hex wrench into the filter cover, rotate it anti-clockwise and remove the filter cover.

(3) Pull out the filter by using a long nose pliers.



(4) Replace the filter and fit with a new filter.

(5) Place the filter cover and rotate the cover clockwise by using hex wrench.

※ **Replace the filter every 2000 hours.**

※ **If the filter is reused, take care not to damage the thread part of the filter with a long nose pliers. Use protection material such as a cloth etc to the grip part of the filter by the long nose pliers.**

※ **Pay attention not to fasten unstable condition by a misaligned screwing.**

18) DEF/AdBlue® SUPPLY MODULE FILTER

(1) Inspect the area around the DEF/AdBlue® supply module filter case for signs of leakage.

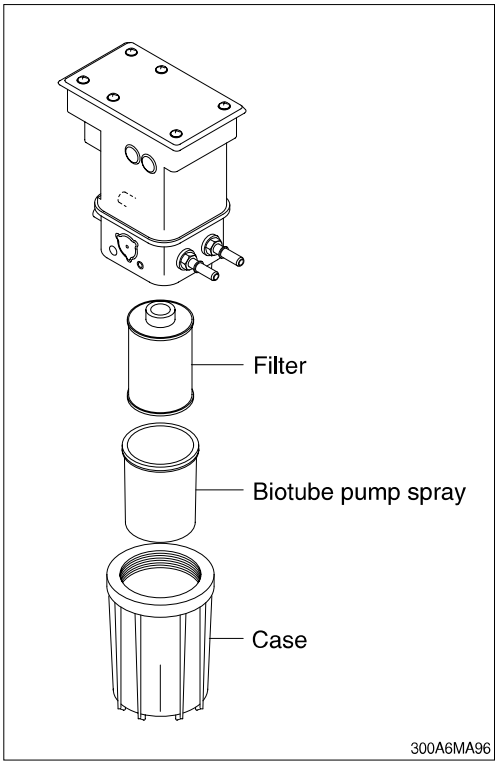
※ **Turn OFF the master switch located in tool box on the left side of rear frame.**

(2) Remove the filter case with the biotube pump spray and filter.

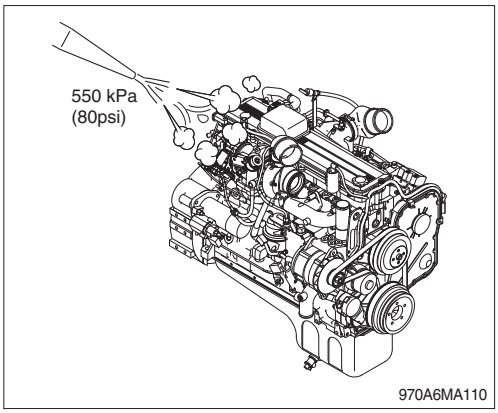
(3) Remove the filter and biotube pump spray from the case.

※ **Clean the case inside and biotube pump spray.**

(4) Insert a new filter and biotube pump spray into the case and tighten the case.



19) 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.

(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 cleaner spray nozzle.

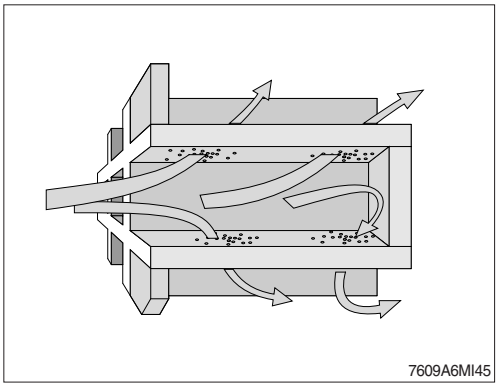
(3) Components to protect include, but are not limited to the following:

- 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.

20) DPF (diesel particulate filter) CLEANING



(1) The diesel particulate filter can not be cleaned for maintenance purpose using conventional tools.

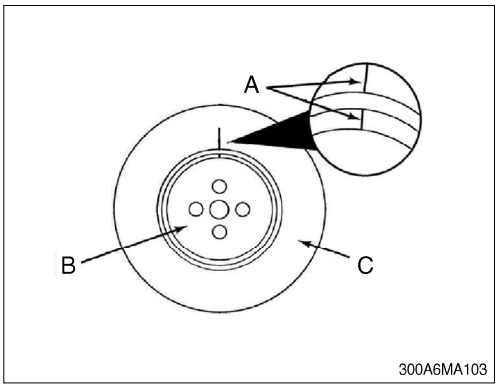
(2) The diesel particulate filter needs to be cleaned and checked using an approved cleaning machine at a authorized service center.

※ Please contact your HD Hyundai Construction Equipment service center or local dealer.

21) VIBRATION DAMPER

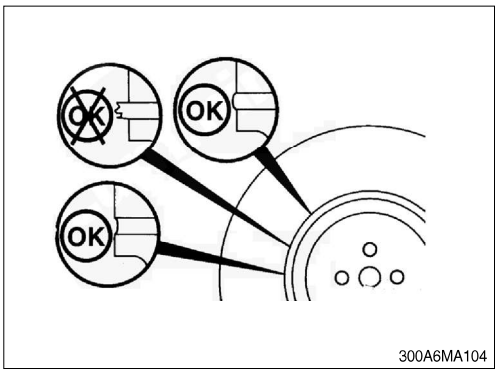
(1) Rubber

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 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.

③ Look for forward movement of the damper ring on the hub. Replace the vibration damper if any movement is detected.

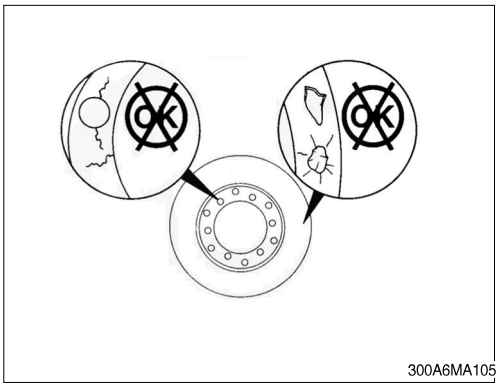


(2) Viscous

※ 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 Cummins authorized repair location to replace the vibration damper.movement is detected.



22) OVERHEAD SET ADJUSTMENT

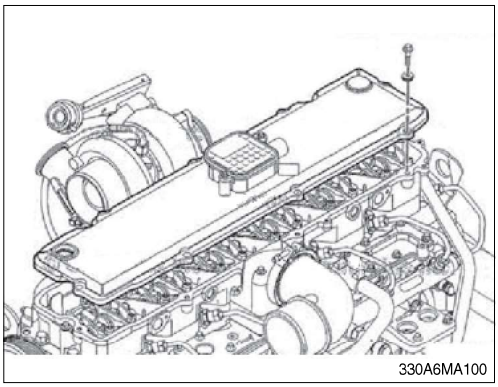
※ **This procedures are perform the repair shop.**

※ **Service tools**

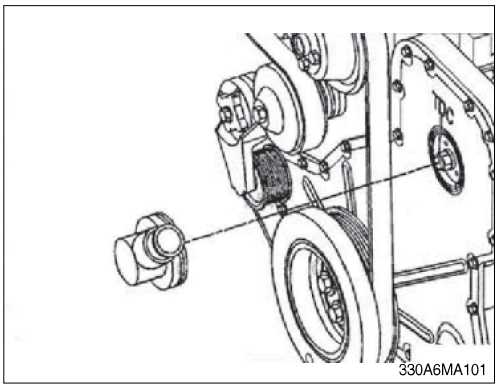
- Cummins barring tool, p/no. 3824591
- Feeler gauge

(1) Remove the capscrews.

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


330A6MA100

(3) Remove the plastic fuel pump drive cover located on the front of the engine.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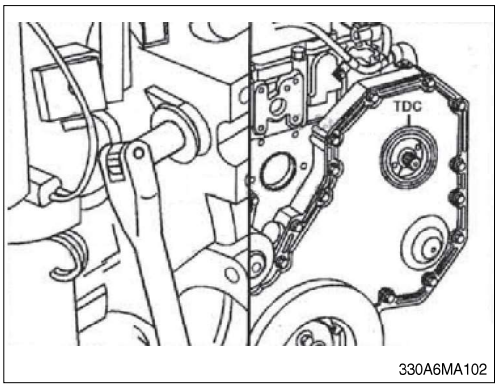
※ **Engine coolant temperature should be less than 60 ℃ (140 °F).**

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



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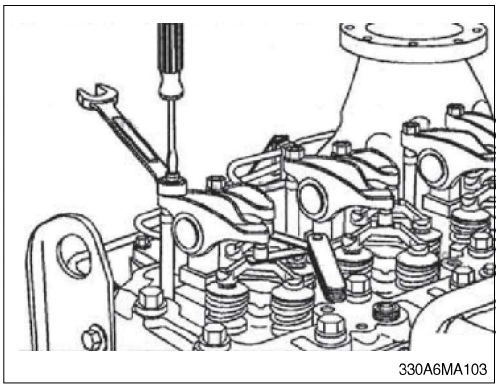
(5) With the engine in this position, lash can be checked on the following rocker arms : 1I, 1E, 2I, 3E, 4I and 5E.

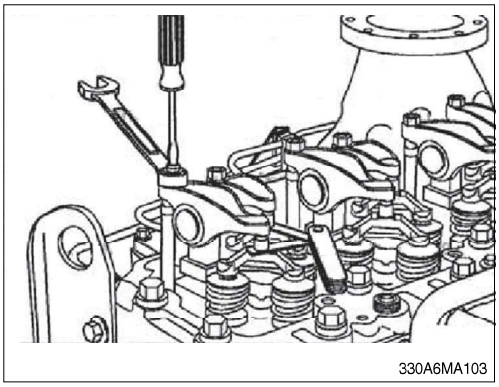


Lash check limits

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 trouble-shooting procedure, and resetting is not requires suring checks as long as the lash measure-ments 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.



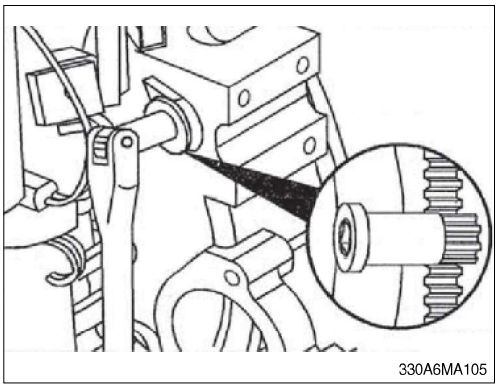
Lash reset specifications

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.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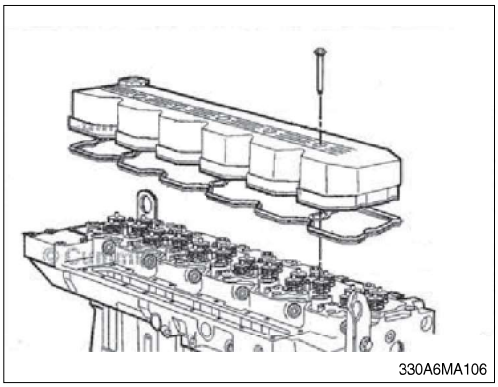
(9) Place the gasket on the cylinder head. Be sure the gasket is properly aligned around the cylinder head capscrews.

(10) Install the rocker lever and capscrews.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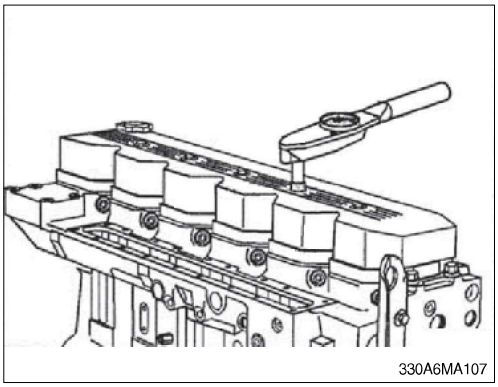
(11) Tighten the capscrews.
Tightening torque: 1.2 kgf·m (8.9 lbf·ft)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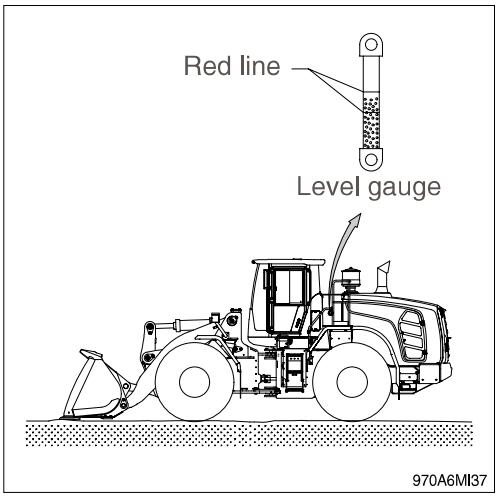
23) HYDRAULIC OIL CHECK

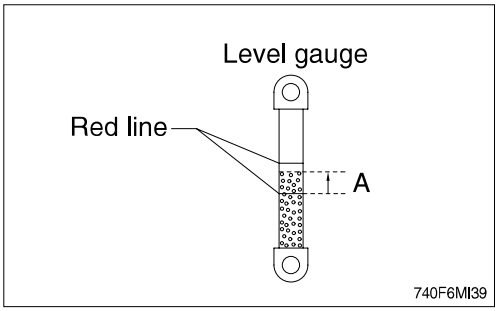
(1) Position the machine as shown in the illustration on the right. Then stop engine.

(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	
℃	°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 3-2 for checking the temperature of the hydraulic oil.

※ Add the hydraulic oil, if necessary.

24) FILLING HYDRAULIC OIL

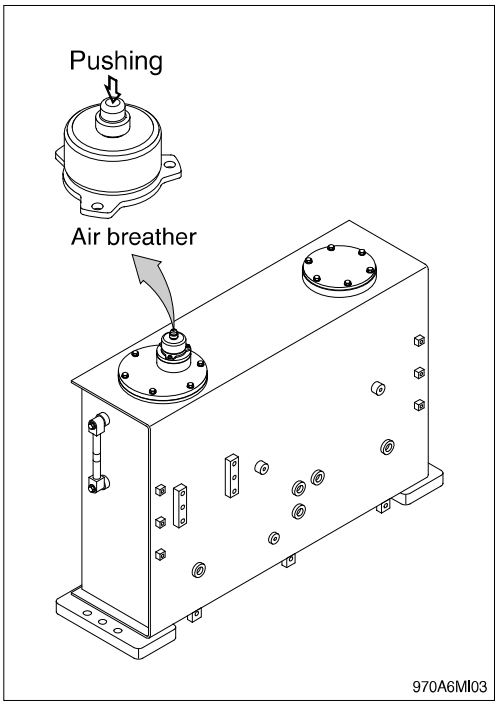
(1) Stop the engine to the position of level check.

(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.

(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.



25) CHANGE THE HYDRAULIC OIL

(1) Lower the bucket on the ground extend the bucket cylinder to the maximum.

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

(3) Prepare a suitable container.

(4) To drain the oil loosen the drain plug on the rear frame LH side.

(5) Tighten the drain plug.

(6) Fill proper amount of recommended oil.

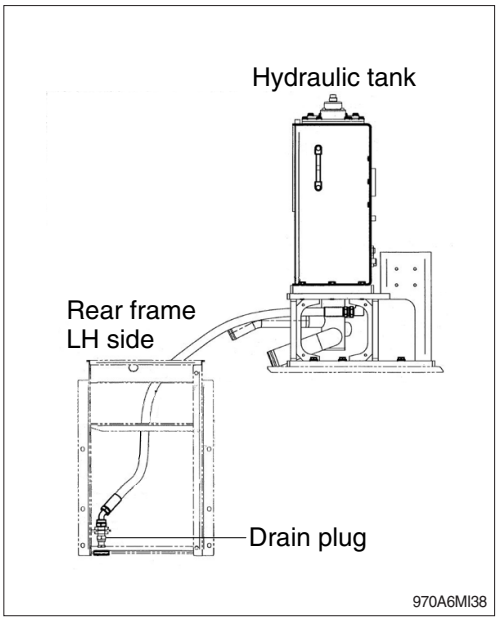
(7) Put the breather in the right position.

(8) Start engine and run continually. Release the air by full stroke of control lever.

※ The oil must be free of bubbles. If bubbles are present in the oil, air is entering the hydraulic system. Inspect the suction hoses and hose clamps.

※ Incase of injecting HBHO (HD Hyundai Construction Equipment Bio Hydraulic Oil) to machines that have formerly used different hydraulic oil, the proportion of residual oil must not exceed 2 %.

※ Do not mix any other Bio oil, use only HBHO as bio oil.
If changing to Bio oil, contact HD Hyundai Construction Equipment dealer.



26) CLEANING AND REPLACING RETURN FILTER

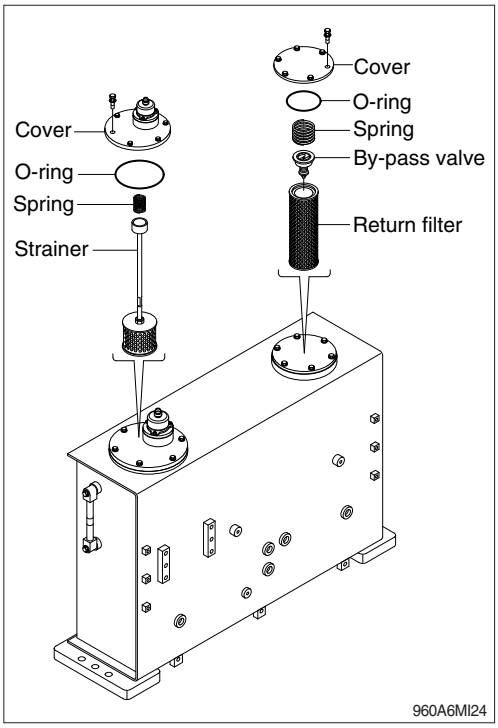
Clean and replace the return filter in the following manner.

(1) Remove the cover.

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

(3) Replace element with new one and assemble spring and by-pass valve after cleaning.

(4) Install the cover on the tank.
· Tightening torque : 6.9±1.4 kgf · m
(50±10 lbf · ft)



27) REPLACEMENT OF ELEMENT IN HYDRAULIC TANK BREATHER

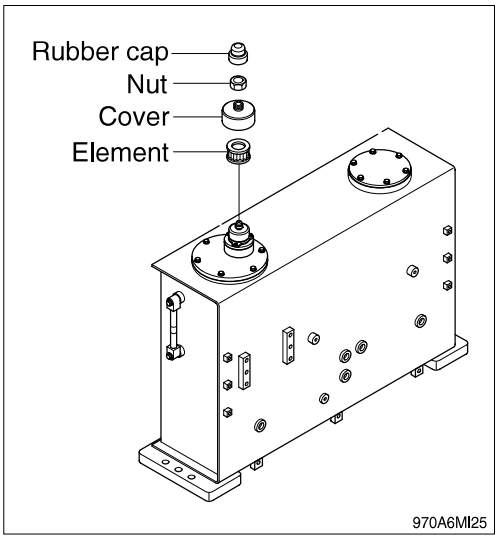
(1) Loosen the cap and relieve the pressure in the tank by pushing the top of the air breather.

(2) Loosen the lock nut and remove the cover.

(3) Pull out the filter element.

(4) Replace the filter element new one.

(5) Reassemble by reverse order of disassembly.
· Tightening torque : 1.05 ±0.21 kgf · m
(7.6±1.5 lbf · ft)

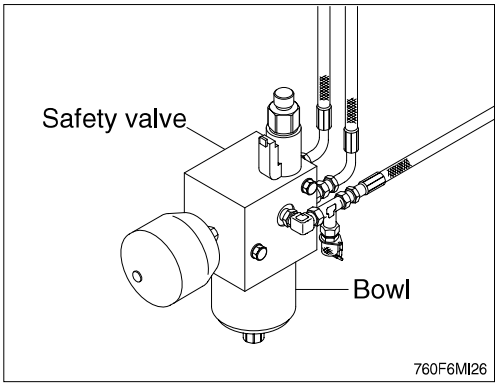


28) REPLACE OF PILOT LINE FILTER

(1) Loosen the bowl positioned on the safety valve.

(2) Pull out the filter element and clean the bowl.

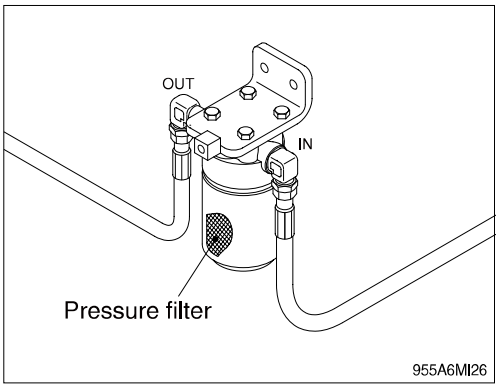
(3) Install the new element and tighten the bowl using spanner.
· Spanner size : 27 mm



28-1) REPLACE OF PRESSURE FILTER

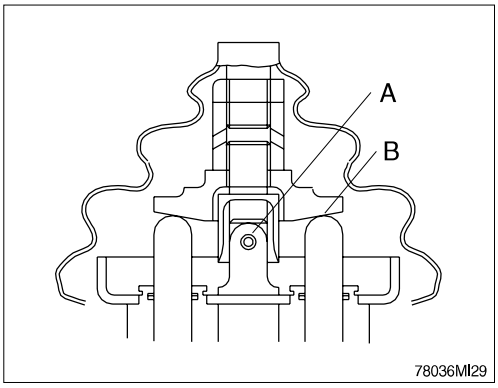
(1) Loosen the pressure filter.

(2) Install the new filter and tighten.



29) LUBRICATE RCV LEVER

Remove bellows and grease the joint (A) and the sliding parts (B).



30) TIRE PRESSURE

(1) Inappropriate tire pressure is a primary cause for tire damage. Insufficient tire pressure will damage internal carcass of tire. Repeated excessive bending will damage or break the carcass. Excessive pressure will also cause premature damage of tire.

(2) Recommended tire pressure (When tire is cooled) / Refer to the page 5-1.

Size	Pressure
26.5 R25, ★★, L3	4.6 bar (65 psi)

(3) Continuous operation will produce heat and increase pressure on tire. But such phenomenon was already taken into account when designing a tire. Do not try to remove normally increased air because tires may be crushed or overinflated.

(4) The three major causes for excessive heat and pressure of tire are insufficient pressure, excessive load and overspeed. Avoid excessive load and overspeed in order to keep tires in good shape.

⚠ Do not inflate tires using flammable gases or alcohol injector.
This cause explosion or personal injury.

⚠ Inflate tires at the pressure level recommended by the manufacturer, and check periodically pressure and wear of tires.

⚠ When replacing the inflated tire, do not stand near the tire.

※ Check the tire when the tire is at normal temperature and the machine is not loaded.

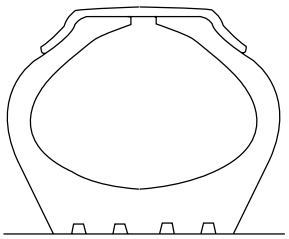
⚠ Do not use recycled wheel parts.

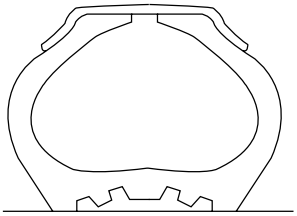
⚠ When removing lockering or inflating tire, use safety cable or chain to ensure safety.

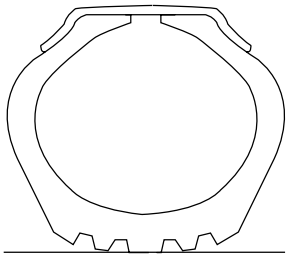
※ Be sure to bleed air before removing lockering. Never inflate tires unless the lockering is assembled in its place.

① Avoid the followings when traveling.
② Rubbing tires against road bank or rack at cargo-unloading spot.
③ Tires slippage during working.
④ Abrupt starting of machine.

When oil, grease or gasoline smeared on tire, clean those. Otherwise it may cause of permanent deformation.


Normal


Too low pressure


Excess pressure

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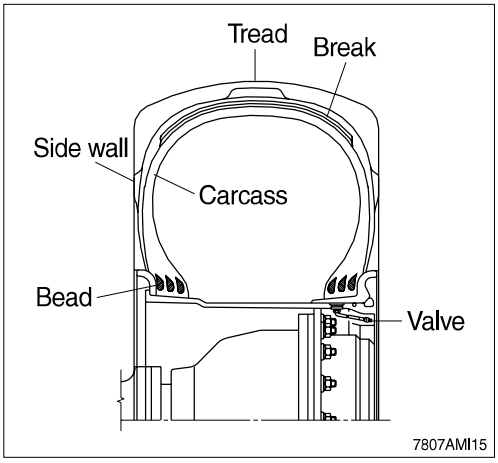
31) REPLACEMENT OF TIRE

⚠ Disassembly, reassembly, replacement and repair of tire requires special skills and equipment. Contact a tire repair shop.

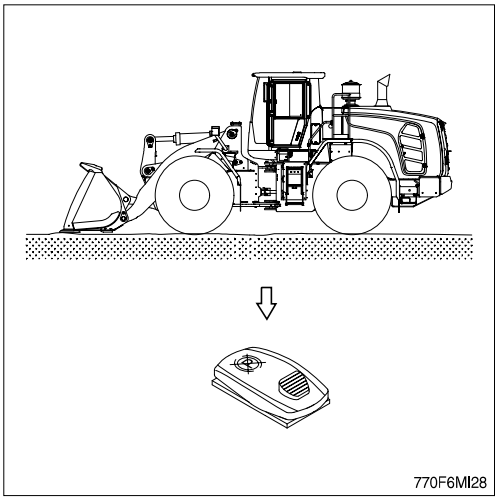
(1) Tires to be replaced

① Tires with broken or bent bead wires
② Tires exposed more than 1/4 of carcass fly.
③ Tires whose carcass is damaged more than 1/3 of the tire width.
④ Tires which show fly separation.
⑤ Tires which has a radial crack near the carcass.
⑥ Tires which are judged to be unsuitable for use because of deformation or damage.

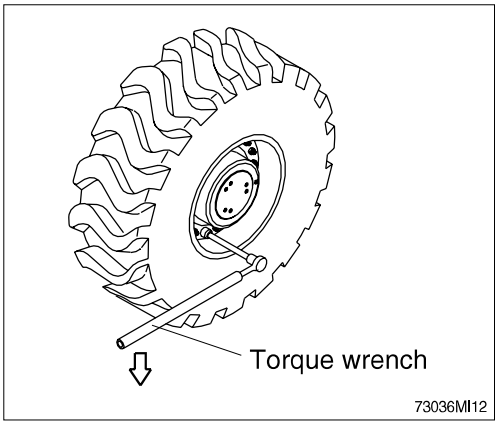


(2) Separation of tire

① After moving the machine to flat ground, lower the bucket to the ground and turn the parking brake switch ON.

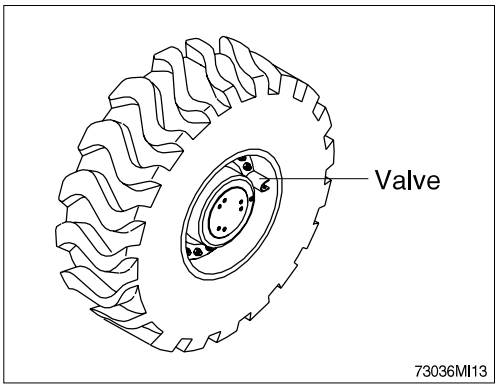


② Loosen slightly all wheel mounting.
· Tools : Socket 32 mm
Torque wrench
Extension bar
③ Lift the machine with a jack.
④ Loosen all wheel mounting nuts and replace the tire.



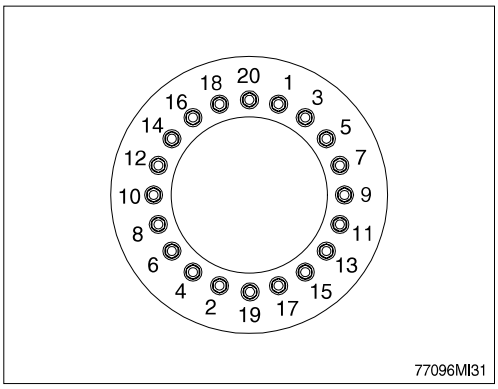
(3) Direction of tire to be installed

① Be careful that the valve should be facing the outside.



(4) Mounting of tire

① Lightly tighten nuts as shown in the illustration.
② Lower the jack after tire is replaced.
③ Tighten nuts according to the specified tighten torque.
· Tightening torque : 79±2.5 kgf · m
(571±18 lbf · ft)

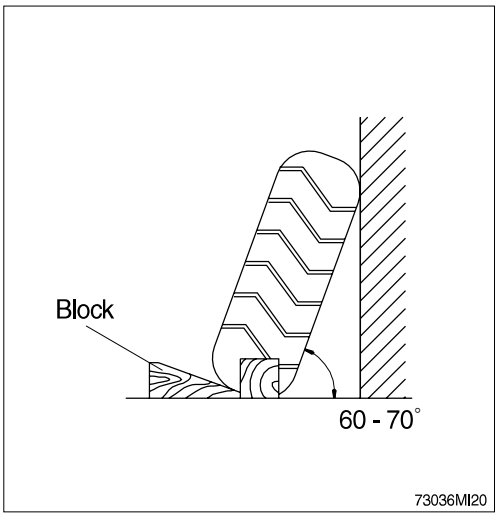


32) STORING TIRES AFTER REMOVAL

As a basic rule, store the tires in a warehouse which unauthorized persons cannot enter. If the tire are stored outside, always erect a fence around the tires and put up "No Entry" and other warning signs that even young children can understand.

Stand the tire on level ground, and block it securely so that it cannot roll or fall over.

If the tire should fall over, get out of the way quickly. The tires for construction equipment are extremely heavy, so trying to hold the tire may lead to serious injury.



33) CHECK TRANSMISSION OIL LEVEL

(1) The oil level check must be carried out as follows; oil level check (weekly).

(2) Before the oil level check, Transmission must have been running to warm up enough.

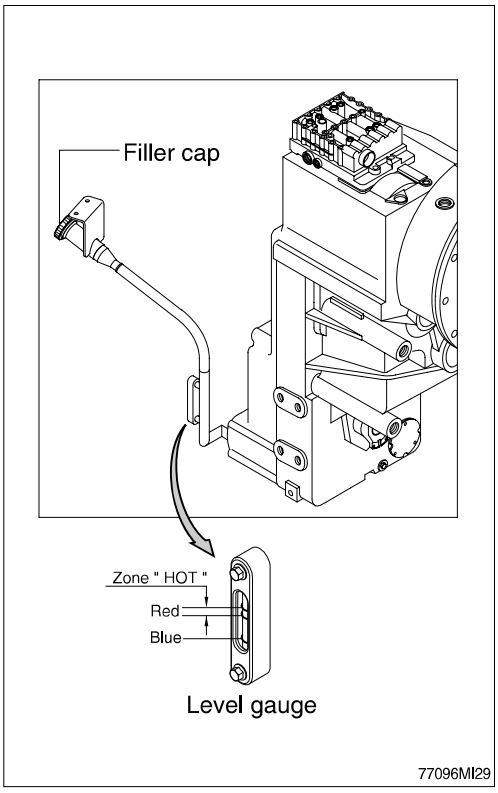
(3) When the oil level is checked, machine must be on flat ground and engine must be at idling speed, transmission must be in neutral position.

(4) Check the oil level on level (sight) gauge.

(5) Oil level

- Operating temperature (about 80~90˚C)
  :The Oil level must be lying in zone HOT (between two red lines).
- Cold phase (about 40˚C)
  :The Oil level must be lying near cold mark (blue line).

⚠ **When checking, press the parking brake switch and fix the front and rear frames with the safety lock bar.**



34) REPLACEMENT OF TRANSMISSION OIL AND FILTER ELEMENT

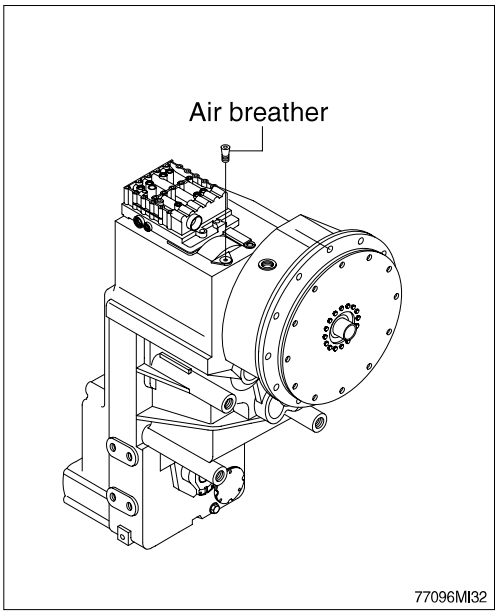
(1) Operate the machine for a few minutes in order to warm the transmission oil.

(2) Move the machine to flat ground. Lower the bucket to the ground and slightly apply downward force.

(3) Press the parking brake switch and stop the engine.

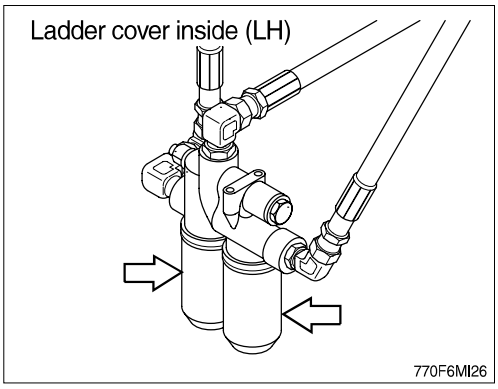
(4) Open transmission air breather to relieve internal air pressure.

(5) Remove the transmission drain plug. Allow the transmission oil to drain into a suitable container.



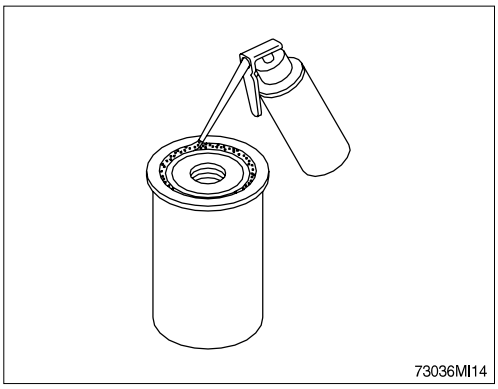
(6) Remove the transmission oil filter cartridge. Dispose of the used transmission oil filter cartridge properly.

(7) Clean the filter cartridge mounting base. Remove any part of the filter cartridge gasket that remains on the filter cartridge mounting base.



(8) Apply a light coat of oil to the gasket of a new transmission oil filter cartridge.

(9) Install the new transmission oil filter cartridge. Screw the filter in until contacts with the sealing surface is obtained and tighten it now by hand about 1/3 to 1/2 turn.



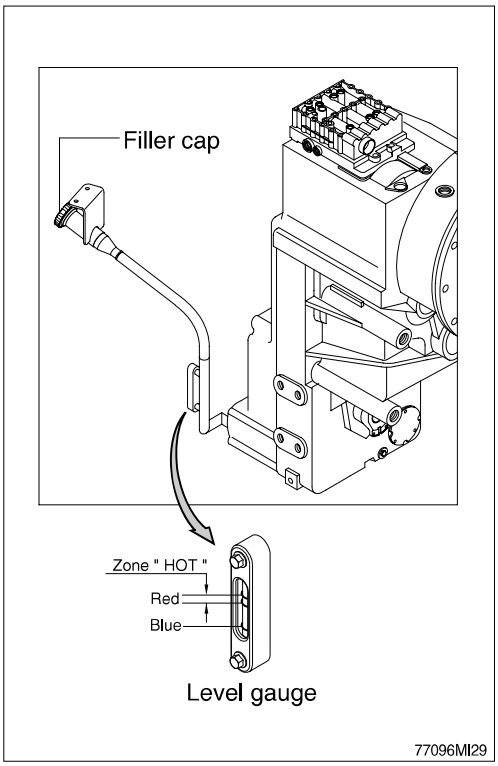
(10) Fill the oil through filler cap and check if the oil is at the appropriate level.

(11) The proper oil amount is 53 liters. (14 U.S. gallons)

⚠ As the machine is hot after operation wait until the temperature has dropped.

⚠ It is imperative to pay attention to absolute cleanliness of oil and filter.
Binding is in any case the marking on the oil level gauge.

※ Prohibition to inject water to filler cap directly when you wash the machine.

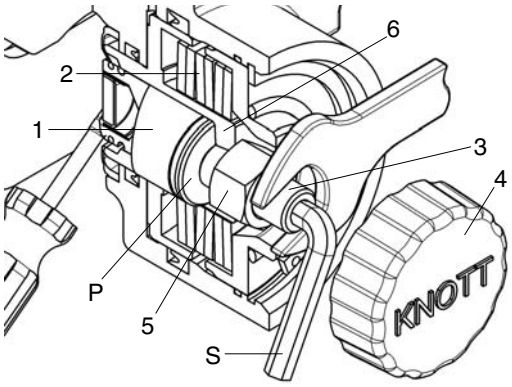


34-1) PARKING BRAKE CLEARANCE

(1) Safety instruction

① Park the machine on level ground, lower equipment to the ground.
② Insert wheel chocks.
③ Insert steering lock.
④ Leave the engine running.
※ **Isolate the machine from driving.**
⑤ Release the parking brake.
⑥ Check clearance and adjust accordingly.

(2) Check and adjusting instruction



1 Thrust bolt
2 Bank of cup springs
3 Adjusting screw
4 Screw cap
5 Lock nut
6 Piston
P Even surface
S Socket wrench

① Place the machine on flat ground and secure against rolling away.

② Start the engine and run at low idle. Release the parking brake by releasing the parking brake switch in the cabin.

③ Release the screw cap (4) and unscrew.

④ Release the lock nut (5, size 30) and turn the adjusting screw (3) with socket wrench size 10 manually clockwise until the two brake pads make contact with the brake disk.

⑤ Turn the adjusting screw (3) anti-clockwise and set the clearance specified in the table below.

Clearance		Turns
Min.	1.0 mm	2/5
Nominal clearance	2.0 mm	4/5
Max.	3.0 mm	1 1/5

⑥ Hold the adjusting screw (3) in position with the hexagonal socket wrench and lock with the lock nut (5).
· Tightening torque for the lock nut (5) : 6.1 kgf · m (44.3 lbf · ft)

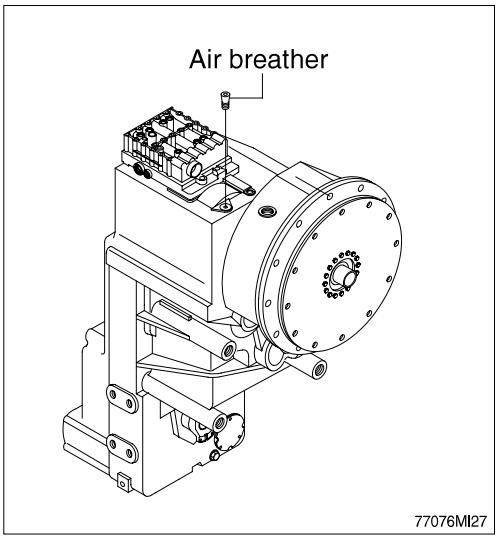
⑦ Mount the screw cap (4) and tighten as far as possible manually.

※ **Check if the parking brake is working properly with operating the parking brake switch on and off.**

35) CLEANING TRANSMISSION AIR BREATHER

(1) Remove dust or debris around the air breather.

(2) Remove the air breather and wash it with cleaning oil.



36) CHECK AND SUPPLYING AXLE OIL

(1) Move the machine to flat ground.

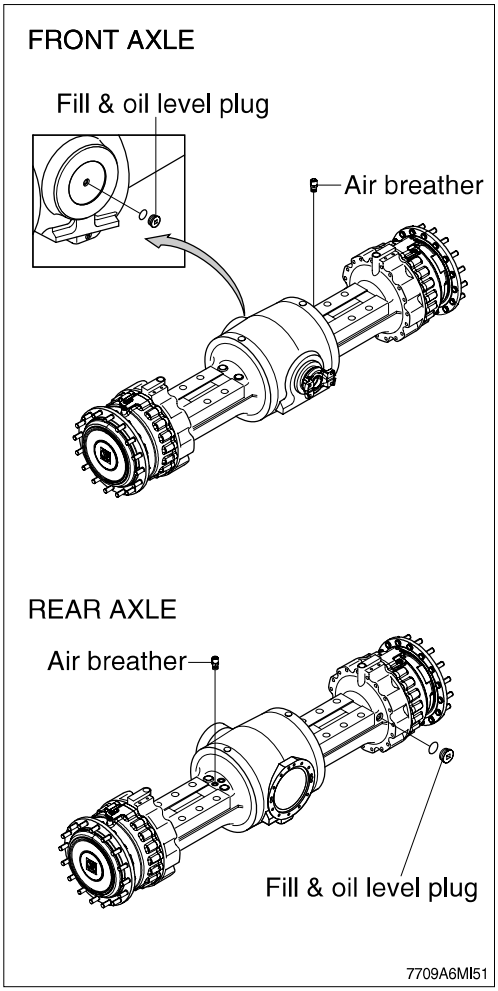
(2) Open the axle air breather to relieve internal air pressure.

(3) Remove the plug and check the oil amount.
If the oil level is at the hole of the plug, it is normal.

※ **Provide fill & level plug with O-ring and install it.**

⚠ **When checking the oil level, press the parking brake switch and fix front and rear frames using the safety lock bar.**

⚠ **As the machine is hot after operation, wait until the temperature has dropped. Set the plug of planetary gear in parallel to the ground.**



37) CHANGE THE AXLE OIL

(1) Place a case under drain plug to catch oil.

(2) Remove the air breather to relieve internal pressure.

(3) The basic condition for a correct oil change of the axle is horizontal plane of installation in every direction. Place machine in a horizontal position

(4) All plugs must be cleaned carefully before opening.

(5) Loosen drain plugs and drain oil.

(6) Provide drain plugs with new O-ring and install them.

(7) Fill up oil to the overflow on fill & level plug.
- Oil amount
  - Front axle : 42 ℓ (11.1 U.S. gal)
  - Rear axle : 42 ℓ (11.1 U.S. gal)

- If equipped with axle oil cooler (option)

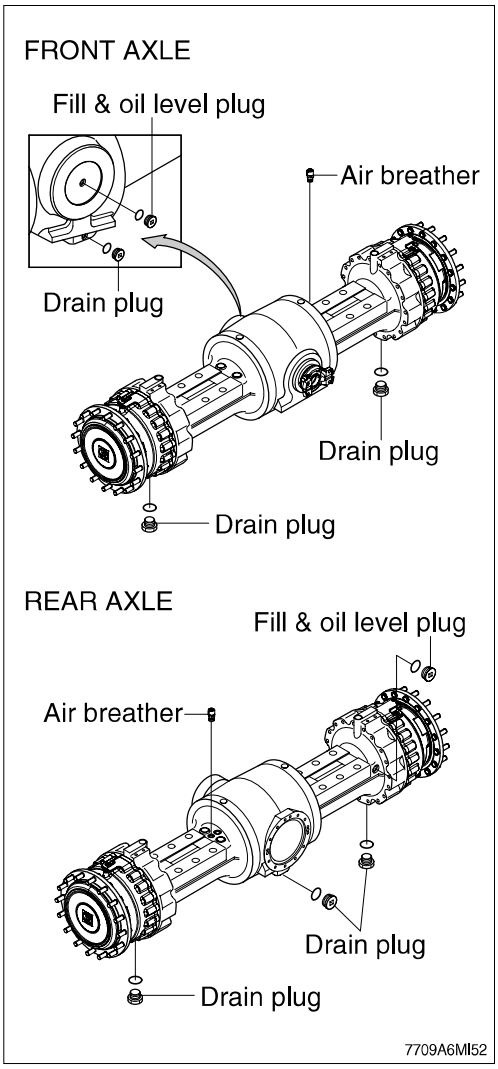
(8) Replace two axle oil filters (front and rear).

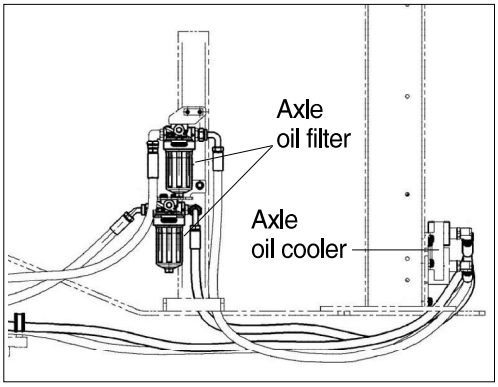
(9) After starting the engine on flat ground, operate boom up and down for five minutes.

(10) Fill up oil to the overflow on fill & level plug at low idle and install plugs.
- Oil amount
  - Front : 47.5 ℓ (axle only 42 ℓ)
  - Rear : 45.5 ℓ (axle only 42 ℓ)

⚠ As the machine is hot after operation, wait until the temperature has dropped.

※ If a work requires frequent use of brake, replace it earlier than normal change interval.

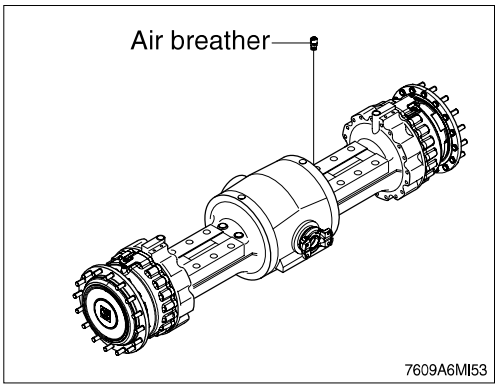




38) CLEANING AXLE BREATHER

(1) Remove dust or debris around the breather.

(2) Remove the breather and wash it with cleaning oil.



39) LUBRICATION

(1) Supply grease through the grease nipple, using grease gun.

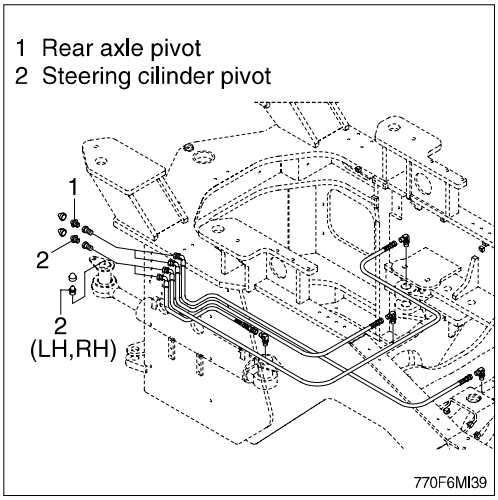
(2) After lubricating, clean off spilled grease.

⚠ **Press the parking brake switch and fix front and rear frames using the safety lock bar.**

⚠ **Set the work equipment in a stable position and push the pilot cut off switch to the OFF position.**

(3) Rear axle pivot : 2EA

(4) Steering cylinder pin : 4EA



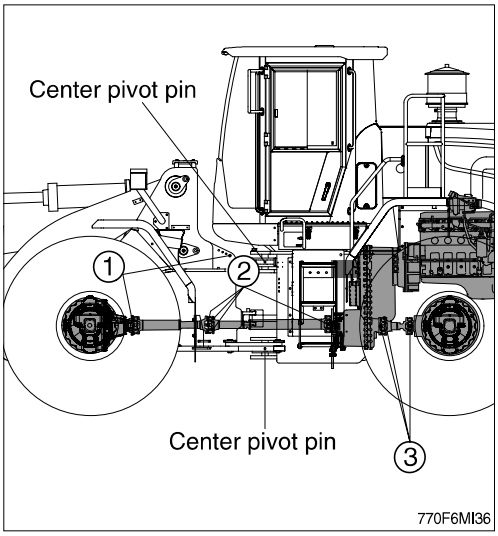
(5) Center pivot pin : 2EA

(6) Drive shaft

① Front (flange bearing, journal bearing) : 2EA

② Center (sleeve yoke, journal bearing) : 4EA

③ Rear (sleeve yoke, journal bearing) : 3EA



40) REPLACEMENT OF BOLT ON CUTTING EDGE

(1) Replacement time

Replace the cutting edge before it has worn out to the end of bucket.

(2) Replacement method

⚠ Make sure the work equipment does not move when replacing the cutting edge. Set the work equipment in a stable position, put the pilot cut off switch in the OFF position.

① Lift the bucket to a proper height and insert blocks so that the bucket does not fall down.

② Loosen bolts and nuts, and remove the cutting edge.

③ Clean the contacted surface.

④ Turn the cutting edge and install on the bucket.

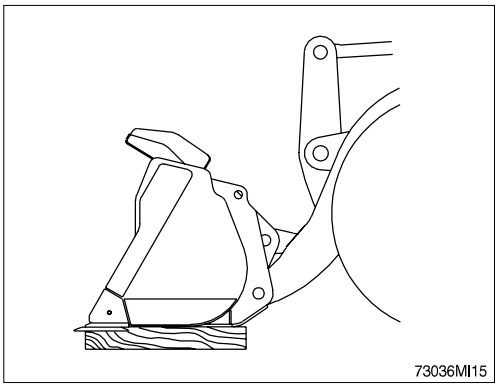
※ If both sides have worn out, replace it with new ones.

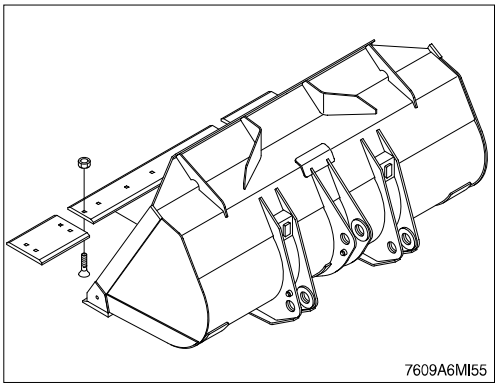
※ If the contacted face of cutting edge has worn out, repair the contacted face of it.

⑤ Tighten evenly bolts and nuts to remove the clearance between bucket and cutting edge.

· Tightening torque : 83.2±12.5 kgf · m
(60.2±90.4 lbf · ft)

⑥ After a few hours of operation, retighten bolts.





41) REPLACEMENT OF BUCKET TOOTH

(1) Replacement time

Replace the bucket tooth before it has worn out to the end of the bucket.

(2) Replacement method

⚠ Make sure the work equipment does not move when replacing the bucket tooth. Set the work equipment in a stable position, put the pilot cut off switch in the OFF position and stop the engine.

① Lift the bucket to a proper height and insert blocks so that the bucket does not fall down.

② Loosen bolts and nuts, and remove bucket tooth.

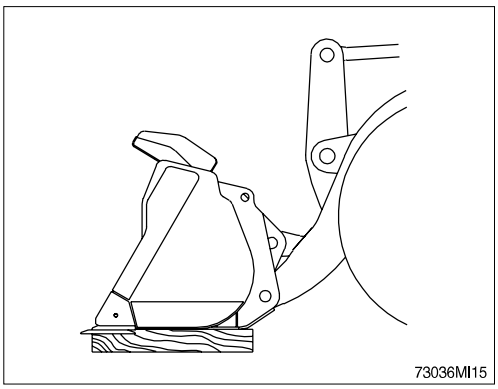
③ Clean the contacted surface.

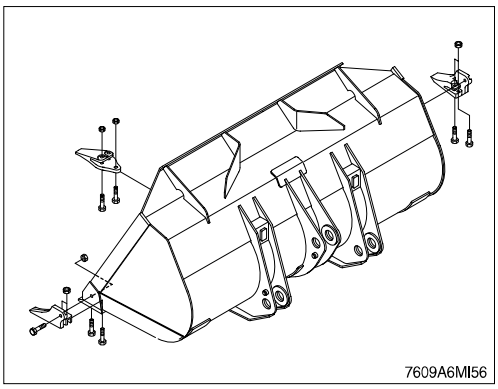
※ If the contacted face of bucket tooth has worn out, repair the contacted face of it.

④ Install new bucket tooth on the bucket, and tighten bolts and nuts.

· Tightening torque : 83.2±12.5 kgf · m
(602±90.4 lbf · ft)

⑤ After a few hours of operation, retighten bolts.



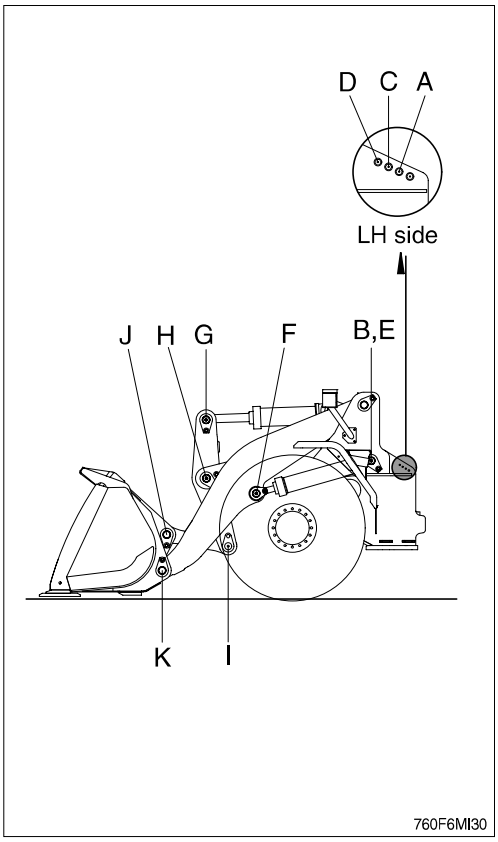


42) MAINTENANCE OF WORK EQUIPMENT

(1) Lubricate to each pin of working device.
Lubricate the grease to grease nipple in accordance with lubrication intervals.

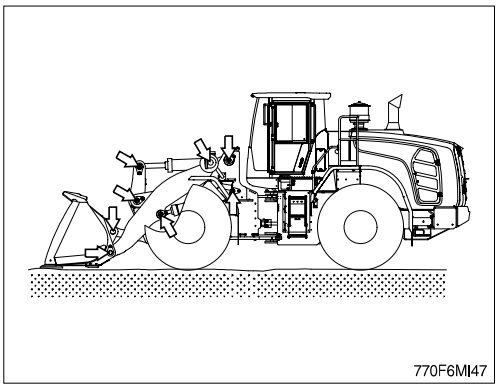
No.	Description	Qty
A	Bucket cylinder (front frame side) pin	1
B	Boom cylinder (front frame side) right pin	1
C	Boom-front frame right connection pin	1
D	Boom-front frame left connection pin	1
E	Boom cylinder (front frame side) left pin	1
F	Boom cylinder-boom connection pin	2
G	Bucket cylinder-bell crank connection pin	1
H	Boom-bell crank connection pin	1
I	Bell crank-bucket link connection pin	1
J	Bucket-Bucket link connection pin	2
K	Bucket-boom connection pin	2

※ Shorten lubricating interval when working in the water or dusty place.



(2) Check for wear and tear of work equipment pins and bushings.

(3) Check for damage of boom and bell crank.

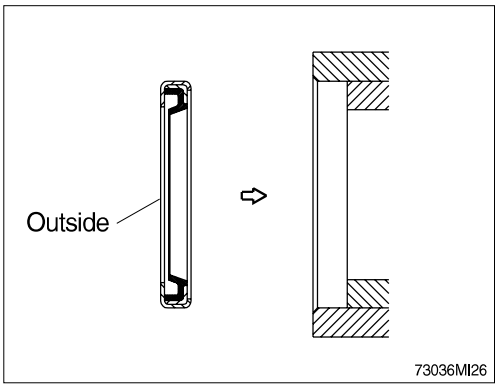


(4) Dust seal are mounted on the rotating part of working device to extend the lubricating interval.

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

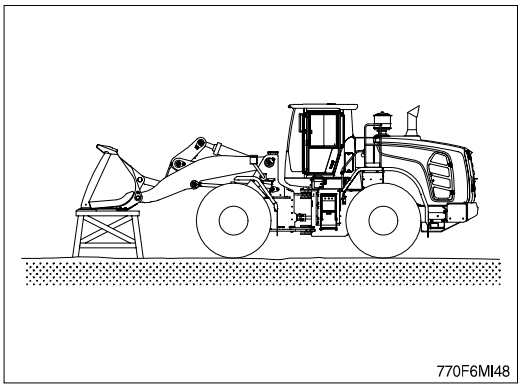
※ If it is assembled in wrong direction, it will cause fast wear of pin and bushing, and create noise and vibration during operation.

※ Make sure the seals are not damaged or deformed.



43) WORK EQUIPMENT SUPPORT

When carrying out inspection and maintenance with the equipment raised, fit a stand under the lift arm securely to prevent the work equipment from coming down. In addition, set the work equipment control levers to the Hold position and put the pilot cut off switch to the OFF position.



44) BOOM SAFETY LOCK BAR (option)

(1) Supporting

⚠ If it is necessary to carry out any maintenance operation or to stop the machine with raised boom, always use the boom safety lock bar and put the pilot cut off switch to the OFF position.

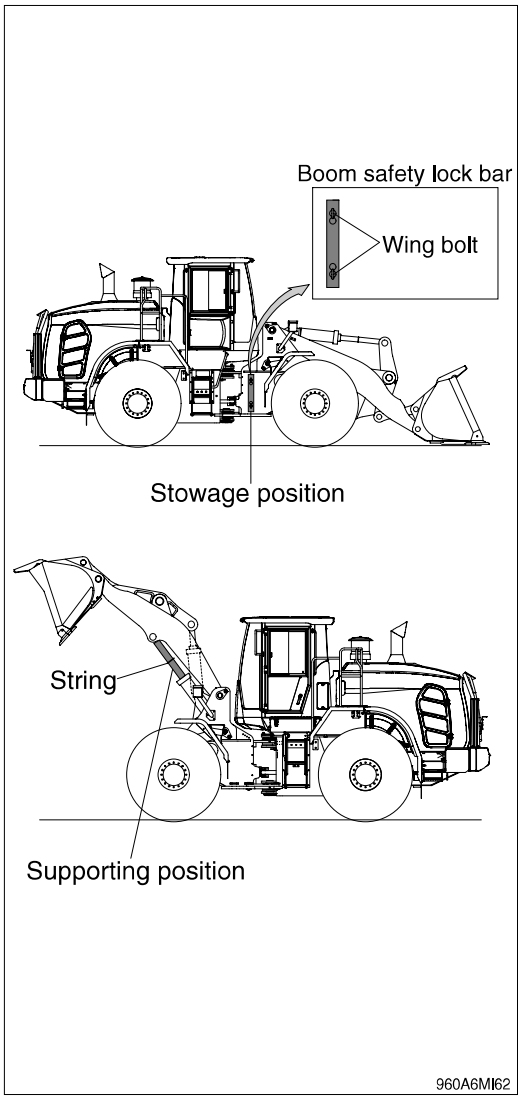
※ The attachment should be empty.

① Raise the boom fully.
② Stop the engine and remove the starter key.
③ Loosen the two wing bolts and remove safety lock bar from its stowage position.
④ Place the safety lock bar onto the boom cylinder and secure the safety lock bar by tyng the string shown as figure.
⑤ Slowly lower the boom to fix the safety lock bar.

※ When lowering the boom, operate the control lever very slowly.

(2) Lowering

① Raise the boom to take the weight off the safety lock bar.
② Stop the engine and remove the starter key.
③ Loosen the string and remove the safety lock bar carefully.
④ Reinstall the safety lock bar onto its stowage position using the wing bolts.



45) REPLACEMENT OF THE AIR COMPRESSOR'S AIR FILTER (option)

(1) Loosen the air filter cap counterclockwise.

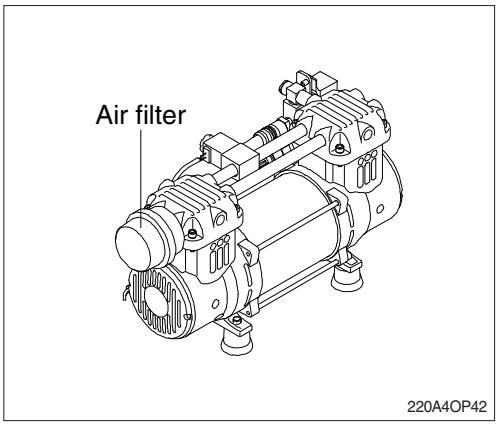
(2) Use pressurized air from the inside to the outside when cleaning the air filter.

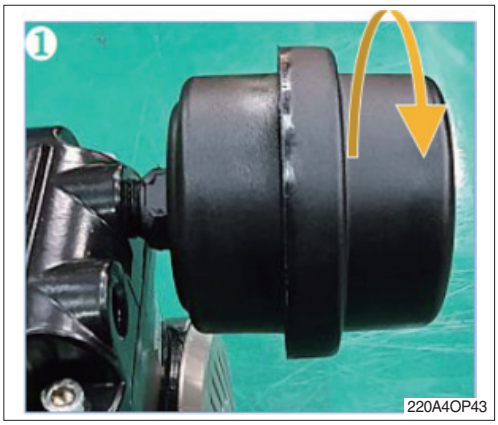
(3) Reassemble by reverse order of disassembly.

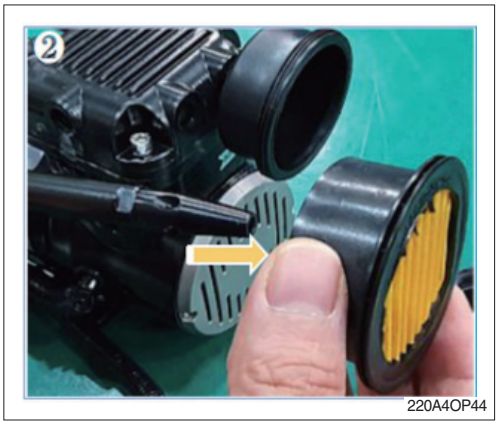
※ **Please install the air inlet in the lower direction.**

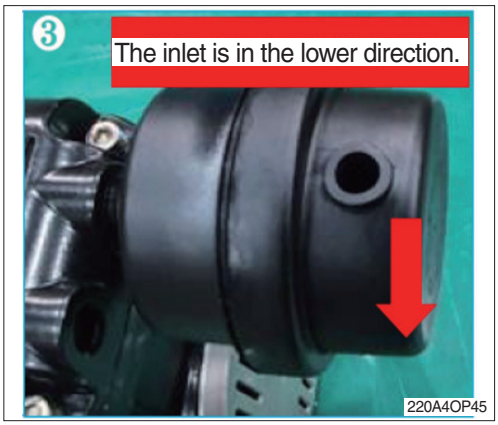
(4) If the air filter is damaged or badly contaminated, use a new filter.

△ **If you are using the air compressor on the equipment when cleaning the air filter, the use for a long time can cause internal damage to a piston ring or a liner. Because dust or a contaminant may be inhaled through the air inlet. Please use for a short time at a clean place.**



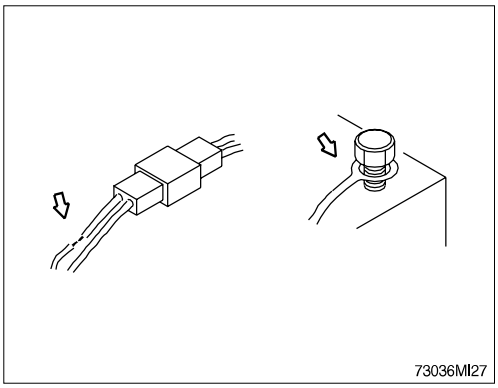






1) WIRING, GAUGES

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.

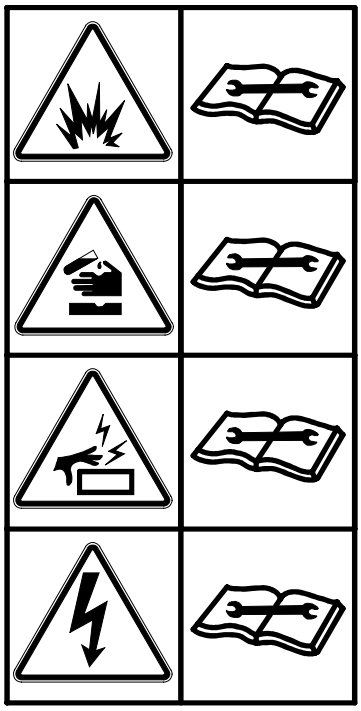
⚠ Do not stain clothes or skin with electrolyte as it is acid.
Be careful not to get the electrolyte in eyes.
Wash with clean water and go to the doctor if it enters the eyes.

⚠ Avoid short-circuiting the battery terminals through accidental contact with metallic objects, such as tools, across the terminals.

⚠ Do not store tools, bucket tooth and other flammable things in battery box. They could cause a fire.

⚠ Tighten the battery terminals securely.
Loosened terminals can generate sparks and lead to explosion.

⚠ Make sure that the battery terminal's caps always are installed.



(2) Recycle

Never discard a battery.

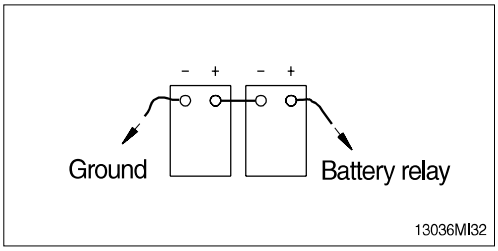
Always return used batteries to one of the following locations.

- · 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.

※ **Pay attention to the correct polarity.**



3) STARTING THE ENGINE WITH A BOOSTER CABLE

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

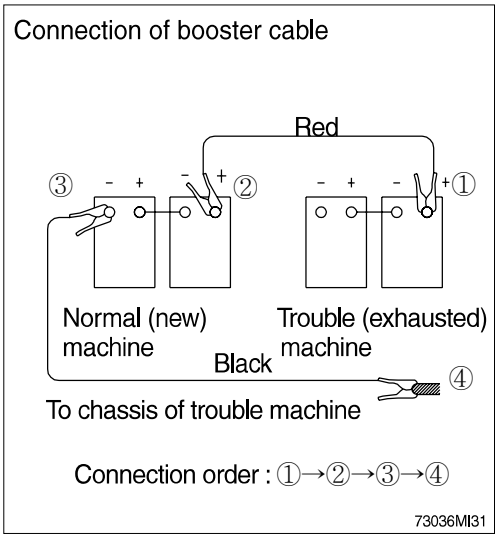
(1) Connection of booster cable

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

① Connect the red terminal of booster cable to the battery(+) terminal between exhausted and new battery.

② Connect the black terminal of the booster cable to the battery (-) terminal between exhausted and new battery.

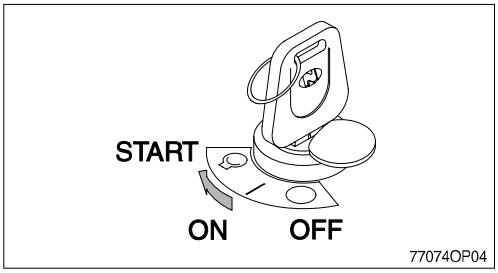
※ **Keep firmly all connection, the spark will be caused when connecting finally.**



(2) Starting the engine

① Start engine with starting key.

② 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.

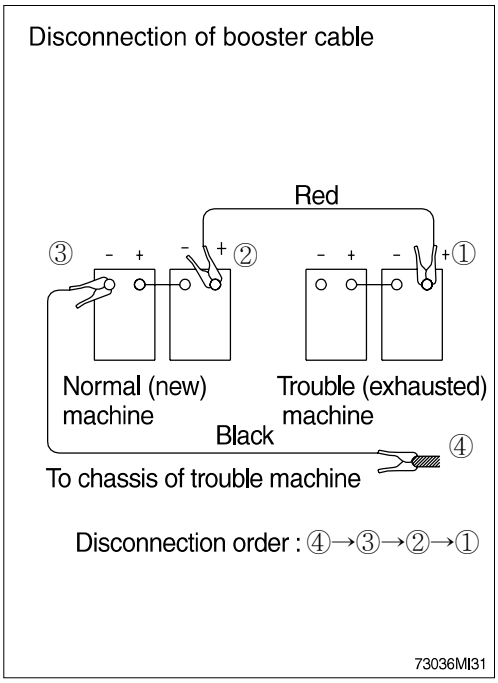
③ Run engine with high idle until charging the exhausted battery by alternator, fully.

⚠ **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 to charge 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.

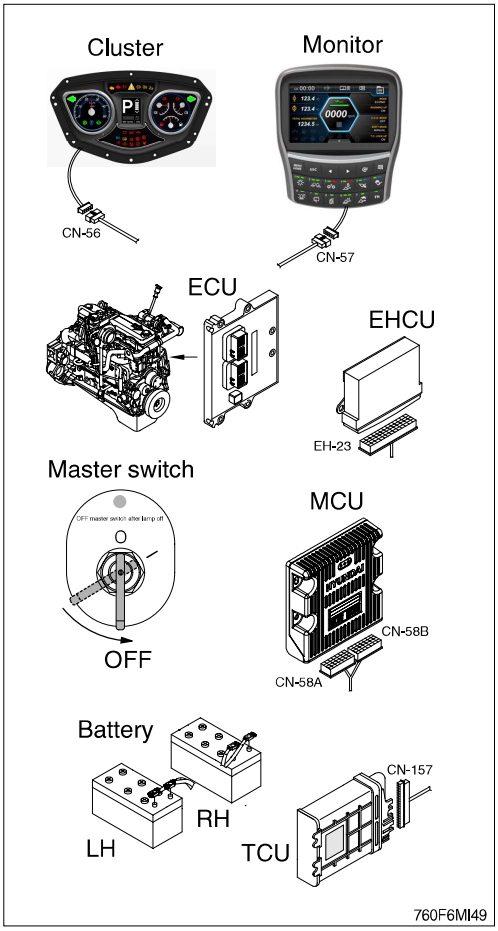
(2) Disconnect ground cable from battery by master switch.

(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, TCU, ECU, EHCU, cluster, monitor etc).

(4) Connect the earth (ground) lead of the welding equipment as close to the welding points 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 INNER AND OUTER FILTER

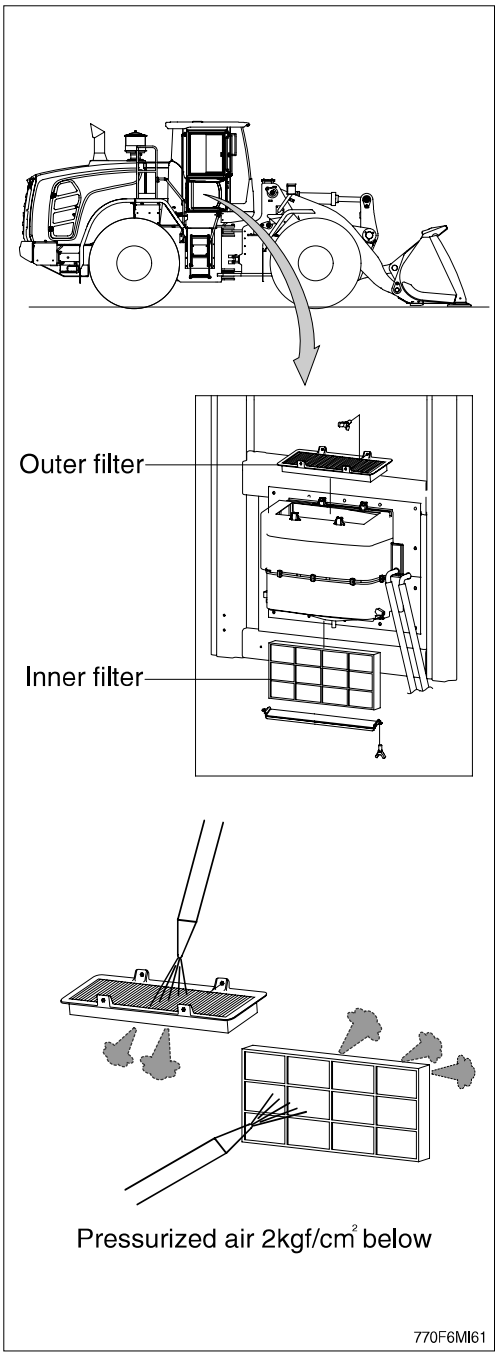
※ Always stop the engine before servicing.

(1) Open the air conditioner cover, loosen the wing bolt and remove the inner and outer filter.

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

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

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



2) 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.

3) CHECK DURING SEASON

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

4) 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.

5) REFRIGERANT

(1) Equipment contains fluorinated greenhouse gas.

Model	Type	Total mass	GWP : 1430
HL970A	HFC-134a	0.75 kg (1.65 lb)	CO_2 eq. : 1.0725 t

※ 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 flourinated 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 preform 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.