

SEM 658/659

Periodical Maintenance Manual

SHANDONG SEM MACHINERY CO., LTD (SEM)

Important Safety Information

Most accidents that involve product operation, maintenance and repair are caused by failure to observe basic safety rules or precaution. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards. This person should also have necessary training ,skills and tools to perform these functions properly.

Proper repair is important to the safe operation and the reliable operation of this machine. This document outlines basic recommended procedures. Some of the procedures require special tools ,devices, or work method.

Before you perform any repairs or any maintenance, read and understand all safety information. Safety information can be found in this document, warning labels that are located on the machine and engine. If these hazard warning are not heeded, bodily injury or death could occur to you or other persons.

Safety Identifier



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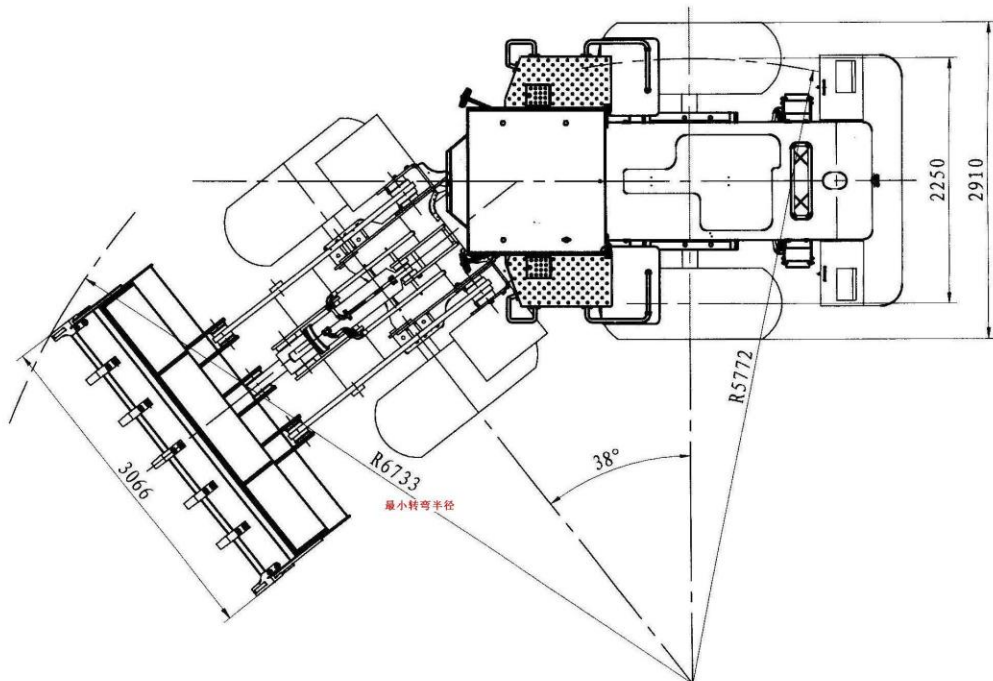
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Chapter 1 Essential Technical Data

This chapter lists essential technical data of SEM658/659 Wheel Loader including Engine, Transmission, Hydraulic system and other basic performance data which help users to know this machine well.



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2-1, SEM658/659 Wheel Loader Main Technical Data:

SEM[®] SPECIFICATIONS

ENGINE

C6121	(658&659 standard only)	WD615G.220	(650 standard only)
In line, water cooled, 4 stroke, direct injection		In line, water cooled, 4 stroke, direct injection	
Rated speed	2200RPM	Rated speed	2200RPM
Rated power	162kW	Rated power	162kW
Cylinder bore x stroke	6 × 126mm x 130mm	Cylinder bore x stroke	6 × 121mm x 152mm
Max. torque	843Nm	Max. torque	860Nm
Displacement	10.5L	Displacement	9.73L

TRANSMISSION

Torque converter ZFD340 (658&659)		Torque converter (650)		3-element, single stage countershaft
Transmission ZF 4WG200 (658&659)		Transmission SEM TR-200 (650)		
Gear shift	I	II	III	IV
Forward (658)	6.1	11	23.2	37.3 (km/h)
Reverse (658)	6.1	11	23.2	
Forward (659)	6.5	11.7	24	38.2 (km/h)
Reverse (659)	6.5	11.7	24	
Forward (650)	8.9	16.5	25.5	44.5 (km/h)
Reverse (650)	8.9	16.5	25.5	44.5 (km/h)

AXLES

Four wheel drive, front axle fixed, rear axle oscillating, oscillating angle of rear axle: $\pm 11^\circ$
 Made by ZF, full sealed (For 658 only)

HYDRAULIC SYSTEM

Working pressure	16Mpa
Boom lifting time	5.87s
Bucket dumping time	1.11s
Boom lowering time	4.4s
Pilot controlling	standard

BUCKET CAPACITY 3.0-4.5 m³

PERFORMANCE SPECIFICATIONS

Breakout force	186KN
Max. rim-pull	164KN (658)
	155KN (659)
	152KN (650)

BRAKE SYSTEM

Service brake	Wet type disc brake (for 658 only) Air assisted oil disc type four wheel brake
Parking brake	Hoof type

STEERING SYSTEM

Articulated, load-sensing, steering priority

TANK CAPACITY

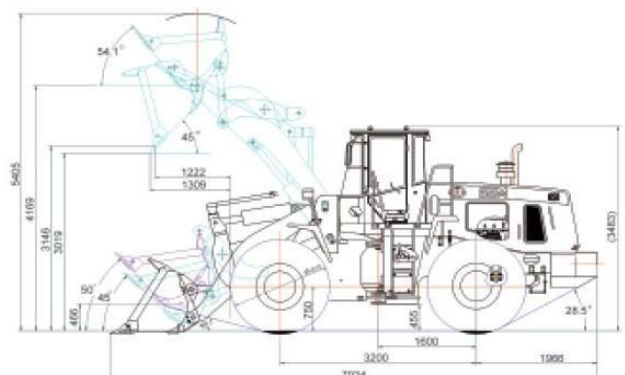
Fuel tank	297L
Hydraulic tank	297L

TIRE

Size	23.5-25
------	---------

OPERATING WEIGHT	15900 kg (658)
	16700 kg (659)
	17050 kg (650)

OVERALL DIMENSION



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2-2, SEM658/659 Wheel Loader Technical Specifications:

Power Train			Steering System		
1	Torque Converter Model	YJ320B1	1	Model of system	Load-sensing, steering priority
2	Type	3-element. Single stage	2	Model of steering gear	BZZ6-1000
3	Cooling type	Pressure oil circulating	3	Model of steering pump	Gear pump P7200-permco
4	Transmission Type	Power shift	4	System pressure	14MPa
5	Gear shift position	4 Forward 3 Reverse	5	Dimension of steering cylinder	Φ100*55*324 (mm)
6	Type of main reducer	single stage	Brake System		
7	Type of Final reducer	single stage planetary	1	Type of travel brake	Full seal wet brake-658 Dry brake disc-659
8	Size of tyre	23.5-25	2	Emergency / parking brake	Automatic cutting air brake, boosting inner expand hoof
9	Pressure of tyre (F/R)	400/350Kpa	Oil refill Capacity		
Working Device Hydraulic System			1	Fuel tank	300 (L)
1	Model of oil pump	Gear pump P4800-permco	2	Oil for converter&gear box	30(L)
2	Displacement of the pump	100 (ml/r)	3	Hydraulic oil tank	300(L)
3	System pressure	16.5(Mpa)	4	Oil For front driving axle	34(L)
4	Model of system	Pilot control.	5	Oil for rear driving axle	28(L)
5	(D*L) Dimension of lifting cylinder	Φ180*100*721 (mm)			
6	(D*L) Dimension of tilting cylinder	Φ200*110*563 (mm)			

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Bore (mm)	121	Rated power/speed	162KW/2200RPM
Stroke (mm)	130	Min. Oil pressure at idle speed	50kpa
Displacement (Liter)	10.45	Min. Oil pressure at rated speed	165kpa
Cylinder agreement	In-line	Max. oil release pressure	600kpa
Firing order (Injection Sequence)	1-5-3-6-2-4	Injector pressure	15170±1030kpa
Direction of Rotation (View from fan end)	clockwise	Rated power	162kw
Inlet / exhaust valve lash	0.38mm 0.64mm	Oil pan capacity	20 L
Oil consumption	0.19-1.77 g/km.h	Engine oil requirement API	CD above
Min. fuel consumption @ full load Max. torque	≤215g/kw.h 425N.m@ 1400-1600R/PM	Engine oil requirement SAE	Recommended: CD 15W-40 (-10°C to +40°C)
Starter	24V/7.5KW	Coolant capacity (Engine body only)	20 L
Generator	28V/45A	Thermostat operating range	79-91°C

Chapter 2 Mandatory Periodical Maintenance Program

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2.0, DM--Every 10Hrs Maintenance

2.1 First Maintenance on Engine, Hydraulic, Transmission

2.2,PM1-- Every 250Hrs Maintenance

2.3,PM2--Every 500Hrs or 3 Months Maintenance

2.4,PM3--Every 1000Hrs or 6 Months Maintenance

2.5,PM4--Every 2000Hrs or 1 Year Maintenance

2.6,Every 4000Hrs or 2 Year Maintenance

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Recommended maintenance schedule

The purpose of mandatory Periodical Maintenance and service is to carry out timely and comprehensive maintenance to the machine, which helps create great value to customer.

To gain the customer satisfaction to the largest extent, SEM recommends the following mandatory Periodical Maintenance program on SEM658/659 wheel loader.

This Periodical Maintenance program includes DM--“10” hours/every day maintenance, PM1-“250” hours maintenance, PM2-“500” hours / 3 months maintenance, PM3-“1000” hours / 6 months maintenance, PM4-“2000” hours / one year maintenance.

The Periodical Maintenance Program should be fulfilled every 250 hours as standard interval, for any applications like heavy-duty, high temperature or heavy dust environment, the interval hours should be shorten according to application.

250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000
PM1	PM2	PM1	PM3	PM1	PM2	PM1	PM4	PM1	PM2	PM1	PM3	PM1	PM2	PM1	PM4

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Periodical Maintenance Check List

Maintenance Descriptions	DM	PM1	PM2	PM3	PM4
Check Oil Level in Engine Block	✓	✓	✓	✓	✓
Check Coolant Level	✓	✓	✓	✓	✓
Check Hydraulic Oil Level	✓	✓	✓	✓	✓
Check Fuel Level, Release Water and Impurity from Primary Filter	✓	✓	✓	✓	✓
Check Air Filter Service Indicator	✓	✓	✓	✓	✓
Inspect the Lights and Monitor Panel	✓	✓	✓	✓	✓
Check the Air Pressure of Tires and if it is Damaged	✓	✓	✓	✓	✓
Inspect Back-up Alarm Performance	✓	✓	✓	✓	✓
Check Oil Level in Gearbox	✓	✓	✓	✓	✓
Lubricate all Grease Points According to Indication of the Lubrication Map	✓	✓	✓	✓	✓
Check Brake Fluid Level in Boosters	✓	✓	✓	✓	✓
Check Transmission Control System, Adjust it, if Necessary	✓	✓	✓	✓	✓
Inspect Steering Wheel Joint Nut	✓	✓	✓	✓	✓
Look Around the Machine to check any Abnormal or Leakage	✓	✓	✓	✓	✓
Visual Inspect the Fan and Driving Belt	✓	✓	✓	✓	✓
Lubricate all Driving Shafts According to Indication of the Lubrication Map	✓	✓	✓	✓	✓
Screw All Bolts of Driving Shafts	✓	✓	✓	✓	✓
Inspect the Parking Brake by Adjusting Clearance Between Shoe & Hood	F Check	✓	✓	✓	✓
Inspect all Rim Bolts and Nuts	F Check	✓	✓	✓	✓
Replace Engine Oil and Filters (First 50H)	F Change				
Replace Transmission System Oil & Filters (First 250H)		F Change			
Replace Hydraulic Return Oil Filter		F Change			
Replace Hydraulic PPC Valve Filter		F Change	Clean		
Lubricate Batteries Terminals to Prevent Rust		✓	✓	✓	✓
Clean Engine Cylinder Heads		✓	✓	✓	✓
Clean Cooling Package		✓	✓	✓	✓
Clean Filling Filter of Fuel Tank		✓	✓	✓	✓
Clean Filling Filter of Hydraulic Tank		✓	✓	✓	✓
Check Bolts of Engine and Gearbox Brackets		✓	✓	✓	✓
Check Under-Frame and Working Device Welding		✓	✓	✓	✓
Check Oil Level in Front & Rear Axles		✓	✓	✓	✓
Check Engine Air Intake System		✓	✓	✓	✓
Check Fans of Engine and AC system		✓	✓	✓	✓
Inspect Capability of Service Brake and Parking Brake		✓	✓	✓	✓
Replace Engine Oil and Filters		✓	✓	✓	✓
Replace Primary Fuel Filter		✓	✓	✓	✓
Check Frame Pivot Pins			✓	✓	✓
Check Oil Level in Brake Boosters			✓	✓	✓
Check Connecting Bolts between Axles & Frame			✓	✓	✓
Clean Filter Screen in Brake Boosters			✓	✓	✓
Replace Filter in Breather of Hydraulic Tank			✓	✓	✓
Replace Fuel Filters			✓	✓	✓
Change Air Filter			✓	✓	✓
Adjust Valve Lash of Engine				✓	✓
Check Bearings of Jockey Wheel and Fan				✓	✓
Screw All Bolts of Batteries and Clean Batteries				✓	✓
Clean Fuel Tank				✓	✓
Clean Breathers of Gearbox & Torque Converter				✓	✓
Replace Transmission System Oil				✓	✓
Replace Transmission Oil Filters				✓	✓
Replace Hydraulic Return Oil Filter				✓	✓
Replace Axles Gear Oil				✓	✓
Replace PPC Valve Filter				✓	✓
Inspect Engine Damper					✓
Change Brake Pads or Hoses, if Necessary					✓
Check Booster Seals, Replace Brake Fluid,					✓
Inspect Flexibility of Steering, Replace Hoses, if Necessary					✓
Inspect Starter, Alternator and Turbocharger					✓
Check the Valves and Cylinder Seals by Measuring the Cylinder Subsidence					✓
Replace Hydraulic Tank Breather (Filling Filter)					✓
Replace Fuel Tank Breather (Filling Filter)					✓
Replace & Clean Cooling System. (Every 2 Years Regardless Working Hours)					✓
Replace Hydraulic Oil & Filter, Clean the Tank					✓

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Note:

THIS PERIODICAL MAINTENANCE CHECKLIST ("CHECKLIST") IS MEANT TO BE A QUICK REFERENCE ONLY. IT DOES NOT REPLACE THE OPERATION AND MAINTENANCE MANUAL ("OMM") APPLICABLE TO YOUR MACHINE. THE DATA ON THIS CHECKLIST MAY BE CHANGED OR UPDATED WITHOUT NOTICE.

The data on this Checklist correspond to the extended fluid changes for the engine oil, and/or the hydraulic oil, and/or the Extended Life Coolant recommended in the OMM applicable to your machine when

- (i) the guidelines provided in the OMM are followed and
- (ii) certain applications and operating conditions outlined in the OMM are met.

The data herein relate to the OMM recommendations in effect on the date of this Checklist that may be applicable to your machine. However, your machine may require different oil and/or coolant change intervals from those shown on this Checklist. Consult the OMM applicable to your machine.

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2.0 DM—Every “10” Hours Maintenance

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DM-2	Check Coolant Level	19
DM-3	Check Hydraulic Oil Level	20
DM-4	Check Fuel Level, Release Water and Impurity from Primary Filter	21
DM-5	Check Air Filter Service Indicator	22
DM-6	Inspect the Lights and Monitor Panel	23
DM-7	Check the Air Pressure of Tires and if It Is Damaged	24
DM-8	Inspect Back-up Alarm Performance	25
DM-9	Check Oil Level in Gearbox	26
DM-10	Lubricate all Grease Points According to Indication of the Lubrication M	27
DM-11	Check Brake Fluid Level in Boosters	28
DM-12	Check Transmission Control System, Adjust It, if Necessary	29
DM-13	Inspect Steering Wheel Joint Nut	30
DM-14	Look Around the Machine to Check any Abnormal or Leakage	31
DM-15	Visual Inspect the Fan and Driving Belt	32
DM-16	Lubricate all Driving Shafts According to Indication of the Lubrication Ma	33
DM-17	Screw All Bolts of Driving Shafts	24

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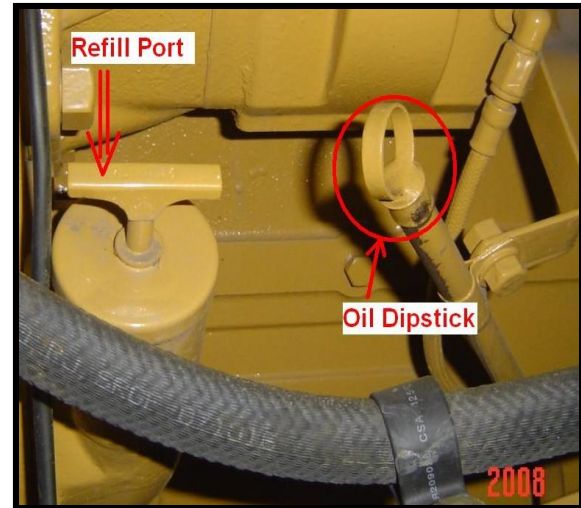
DM-1 Check Oil Level C6121

1: Operate the vehicle to a flat ground and shut it down , then activate the Hand parking brake. wait for ten minutes.

2: Open the engine hood, the oil Dipstick and Filling cap are located on the right side of the engine.

3.Pull out the oil dipstick, polish it with clean cloth, reinsert it and pull out to check it, the oil level should between “Refill”and “Full”

4: If the oil level is less “Refill”, please refill some oil; If the oil level is over “Full” please loosen the drain plug, drain some oil out



Filling cap and Dipstick

Note:

Add oil if necessary with same level Diesel Engine Oil

Engine Oil (27 L)

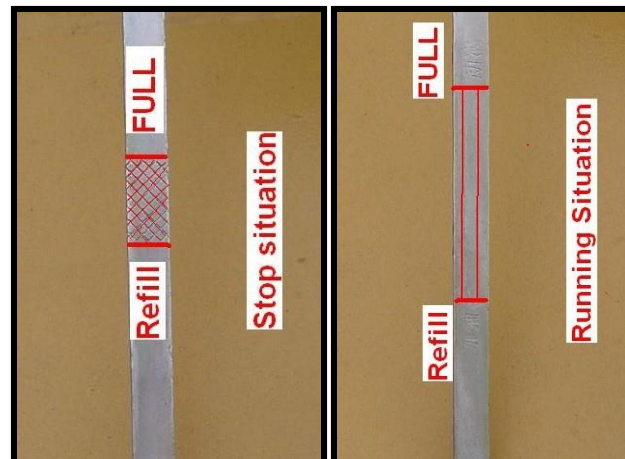
For C6121 engine (CAT3306B licensed)

API recommended: CD or higher level

(Equivalent to MIL-L-2104C/D, MIL-L-45199)

SAE recommended: 15W-40

(under ambient temperature -20°C--+50°C)



Engine oil dipstick

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DM-2 Check Coolant Level

The water radiator is located the rear part of the machine. Check the level of the coolant Whether located between the high water mark and the low water level at the vice- water tank.

Check the seal of the water radiator filler, if damages should replace it.

Fasten the cover of water radiator filler.

Note:

If every day needs to fill the coolant, should check the situation of the engine cooling system. If there is a leakage, eliminate it, and fill antifreeze fluid to corresponding position.

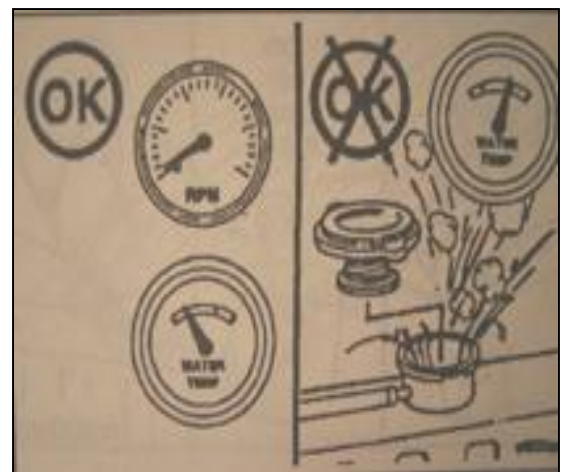
Note:

1, At operating temperature, the engine coolant is hot and under pressure. Steam can cause personal injury!

2, Check the coolant level only after engine has been stopped and the filler cap is cool enough to remove with your bare hands! (normally under 50°C)

3, Remove the radiator filler cap slowly to release pressure!

4, Coolant additives (antirust) contains alkali, to prevent personal injury, avoid contact with the skin and eyes!

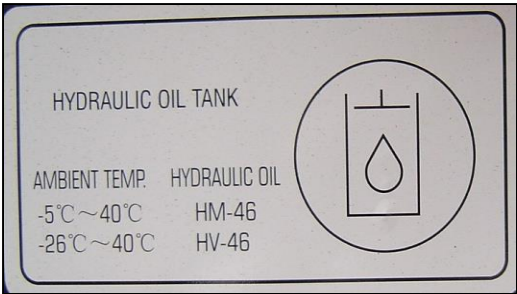


DM-3 Check Hydraulic Oil Level

The hydraulic tank locates on the left side of cab. There is a indicator to show the level

When checking the hydraulic oil level, park the machine at the flat field, lower the bucket on the ground, and keep the front frame and rear frame straightly. At this time, the hydraulic oil level should reach 2/3 of level gauge.

Inspect any leakage, color changing or water entrance of hydraulic tank.



Note: Refill hydraulic oil if needed, following is oil requirement:

Ambient Temp.	Hydraulic oil type	Mobil Lubricant
-26 ⁰ C---40 ⁰ C	ISOVG46, L-HV46	Mobil DTE15M
-5 ⁰ C---50 ⁰ C	ISOVG46, L-HM46	Mobil DTE25

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DM-4 Check Fuel Level

The fuel tank locates in the left side of cab. There are 2 level gauges to indicate the fuel level of H & L level.

Open the engine hood and lock with safety link, or check the fuel level by opening the right service window

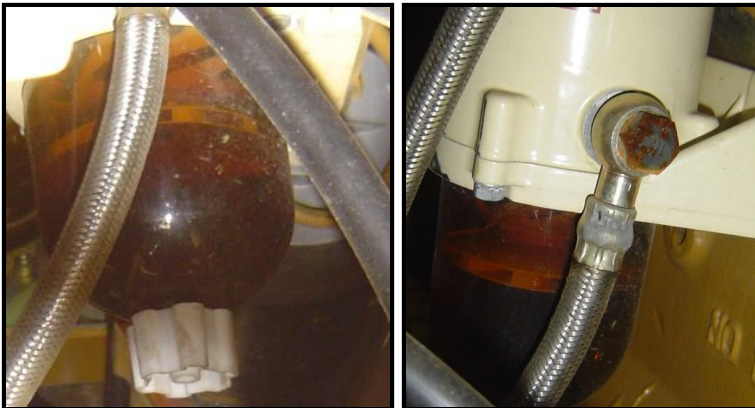
Release water and sediment from pre-fuel filter

Should drain the sediment and water. Method as follows:

If condition permitted, fuel should be precipitated for 24 hours before fill in the fuel tank.

Before filling fuel. open the drain plug. Drain the sediment and water from the fuel tank every week.

Loosen the drain plug under the pre-filter and fuel strainer. Drain out the sediment and water from the fuel tank after completing the day's work

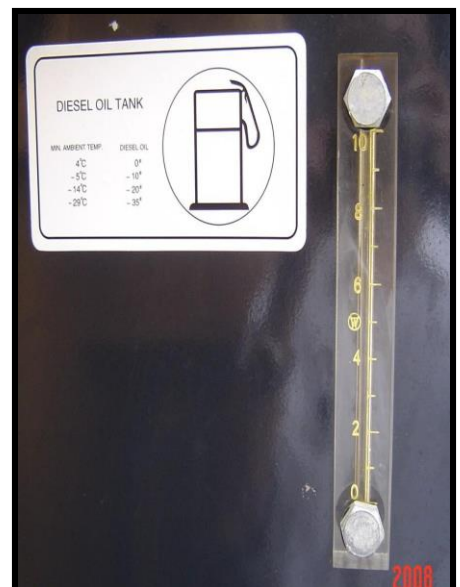
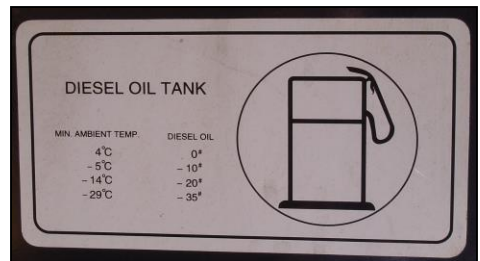


Note:

Always fill the fuel tank after completing the day's working order to discharge the wet air.

start the engine 5 to 10 minutes after filling fuel, in order to precipitate the sediment and water to the base of the fuel tank.

Don't fill fuel until it is less, this can make the engine stop, and the fuel contains lots of water and sediment, can impact engine proper work.



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DM-5 Check Air Filter Service Indicator

Check air cleaner service indicator, when the piston locks in **red** position view from sight window, or green arrow is at **6.2-7.5 Kpa** area, service the air cleaner

Note:

2, Service the filter elements: use not more than 205kpa (**2.1kg/cm²**) pressure air clean the main element, direct pressure air along the length of the pleats inside of filter element.

1, The external element can only be serviced 5 times, after that it must be changed!

2, Don't clean the filter element by bumping or tapping!

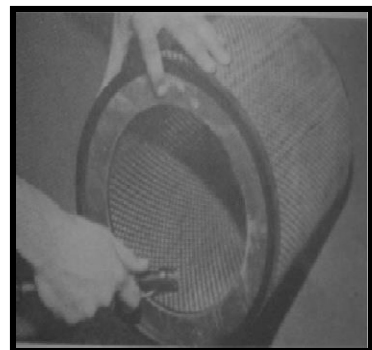
3, Don't clean the internal one, this element can only be changed with new one when it is dirty.

4, SEM suggest change internal element every 500 hours or along with the external one

5, Service the air cleaner only when engine stops!



Filter element



Blow the Filter media

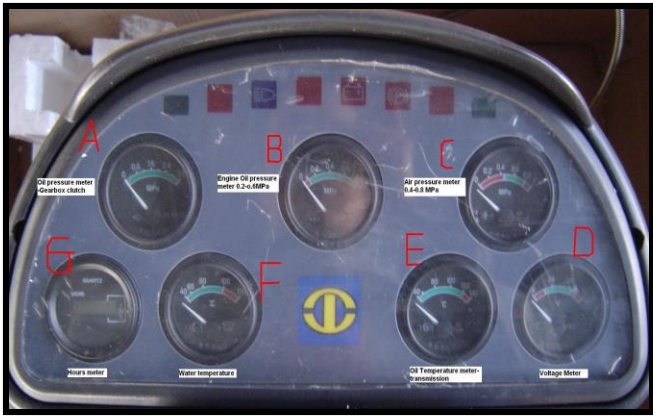
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DM-6 Inspect the Lights and Monitor Panel

- 1, Start engine, all the gauges reading should be in normal range
- 2, Check steering lamp, horn, brake lamp, backup lamp, rear lamp, front lamp
- 3, Check all fuse
When one fuse is burned off, the red indicator of this fuse will be ON when main power switch turned on.
- 4, Check all lamps
The reference information of lamp bulbs are:

SEM658/659				
	Votage	24V		
Item	Sort	Power(W)	Qty	G. Power
1	Front Lamp	50/55	2	100/110
2	Service Lamp	10	4	40
3	Steering Lamp	21	2	42
4	Backup Lamp	21	2	42
5	Brake Lamp	21	2	42
6	Anti-fog Lamp	50	2	100
7	Rear Lamp	70	2	140
8	Ceiling Lamp	20	1	20



Control panel



Fuse Chips-Left & Right



DM-7 Check the Air Pressure of Tires

Check and adjust the tire inflation pressure after the tire cools down

Use tire pressure gauge check all tires air pressure

The front tires pressure should be **0.4MPa**

The rear tires pressure should be **0.35 MPa**

Note: The tire of SEM658/659 loader is 23.5-25-18/16 PR



Don't charge the tire over pressure, this will cause the canvas and rubber of tire fractured.

Don't charge the tire under pressure, this will cause the tire body over curving and fast worn

DM-8 Inspect Back-up Alarm Performance

The back up alarm is mounted on top of counterweight, which can warn people whom stay in loader working area while loader is reversing.



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DM-9 Check Oil Level in Gearbox

- 1: Parking the loader on the Flat ground, engine is running idle.
- 2, the parking brake is activated.
- 3, The Range selector is in Neutral position.

4. Check the hot oil level

Loosen oil dipstick by anticlockwise rotation, remove and clean it, Insert oil dipstick into the oil level pipe until contact is obtained and take it out.

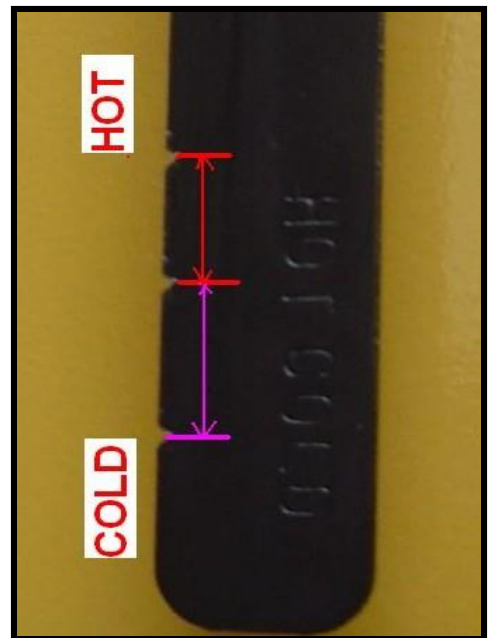
Oil level at 40°C on the lower mark "COLD"
Oil level at 80°C on the upper mark "HOT"

Viscosity	Ambient Tempt.
ATF	-30°C to +30°C
SAE 10W	-20°C to +30°C
SAE 10W-30, 10W-40	-20°C to +40°C
SAE 15W-40	-20°C to +50°C
SAE 20W-20	-10°C to +40°C

Notice

The transmission will be damaged whether transmission oil is a bit higher or lower. Please keep transmission oil level in right position.

Must pay attention to the cleanliness while checking transmission oil level and refilling the transmission oil. Avoid the dirt into the transmission in case of the damage.



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SEM 658/659 Periodical Maintenance Manual

DM-10 Lubricate all Grease Points According to Indication of the Lubrication Chart

The recommended grease type:

1, In summer
3# Lithium based grease or
Mobil grease XHP2222

2, In winter
2# Lithium based grease or
Mobil grease XHP2222

3, Pay more attention to the

Maintenance Chart for 658 Wheel Loader

Item No.	Location	Oil	Remarks	Lab. points
19	Fuel tank	F	Check every	1
25	Brake oil		Check every	2
24	Cooling package		Check every	1
23	Engine oil	ED	Check every	1
22	Hydraulic tank		Check every	1
10	Auto cradle pin	G	Grease	2
9	Driving shaft bracket			1
8	Bucket linkage pin			2
7	Bucket pin			2
6	Lift arm pin			2
5	Bucket arm pin	G	Grease	1
4	Lift cylinder pin			4
3	Steering cylinder pin			4
2	Tilt cylinder pin			2
1	Hinge shaft of frame	G	Grease	2
11	Driving shaft			9
21	Engine oil	ED	Recheck	1
20	Engine oil filter		Recheck	1
19	Engine oil filter		Recheck	1
18	Engine oil filter		Recheck	1
17	Engine oil filter		Recheck	1
16	Engine oil filter		Recheck	1
15	Engine oil filter		Recheck	1
14	Engine oil filter		Recheck	1
13	Engine oil filter		Recheck	1
12	Engine oil filter		Recheck	1
11	Engine oil filter		Recheck	1
10	Engine oil filter		Recheck	1
9	Engine oil filter		Recheck	1
8	Engine oil filter		Recheck	1
7	Engine oil filter		Recheck	1
6	Engine oil filter		Recheck	1
5	Engine oil filter		Recheck	1
4	Engine oil filter		Recheck	1
3	Engine oil filter		Recheck	1
2	Engine oil filter		Recheck	1
1	Engine oil filter		Recheck	1

1. Oil supply interval should be calculated according to the actual operating time of the machine.
2. Abbreviation ED for Engine oil; G: Lithium-Base Grease.
No. 2: F: Diesel oil; A: Lubricant for axle.
Refers to Operation and Maintenance Manual for permitted brands of ED, F and A lubricants.
3. Numbers in left column of the table is the sequence number of oil supply points as shown in drawings above.
4. Refers to Operation and Maintenance Manual and Shop for other notices.

Fan bearing lubricating point

3.1: Water Pump Bearing/Fan Bearing on Engine



3.2: Rear Oscillating Frame Pins

Steering wheel bearing lubricating point

3.3: All points of working device



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DM-11 Check Brake Fluid Level in Boosters

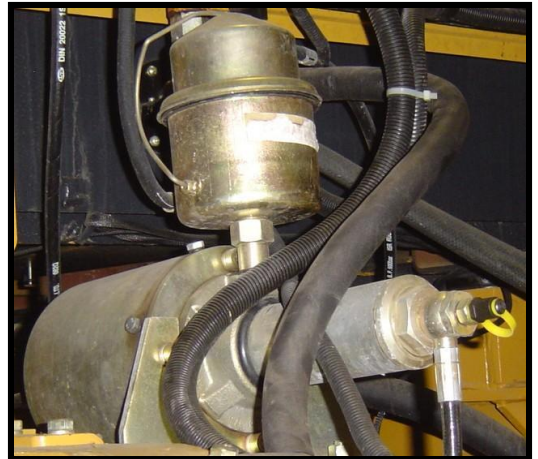
- 1, Brake air pressure should be 3.5-7bar, and should be no leakage in brake system
- 2, The brake fluid level in booster should have 20mm distance to the cover or according to the mark in booster oil cup.



Top: front Booster
Below: Rear Booster

Note:

- 1, DOT3 or DOT4 brake fluid is required for SEM659
- 2, Never use mineral oil to clean brake system
- 3, Never use different brand brake fluid together.
4. Drain water and sediment every day, specially in moist area
6. For SEM658 the Brake Fluid model is SAE 10W.



Check brake friction spacer



Water release plug

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DM-13 Inspect Steering Wheel Joint Nut

Before start the engine, turn the steering wheel by hands, it should be very hard to turn the steering wheel to each side.

fell if there is any clearance between wheel and column while you are turning the wheel from one side to other side.

Check the steering wheel lock nut by open the Horn Cover Button if there is any loose



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DM-14 Look Around the Machine to Check any Abnormal or Leakage

- 1: Before start the engine, check up and fulfill all daily maintenance according to previous methods;
- 2: Start the engine, check all the reading on the gauges, check electric wiring performance;
- 3: Start to operate the working device about 3 circles, to warm up hydraulic system and check if there is any abnormal
- 4: Start to shift machine with different gears, check clutch shifting performance
- 5: Remain engine running, shift the gear to Neutral position and pull out the parking brake button;
- 6: Get off the machine and walk around, listen any noise and observe any oil leakage and abnormal.
- 7: Start to work according to cold machine operation regulation before engine and hydraulic oil been warm up.

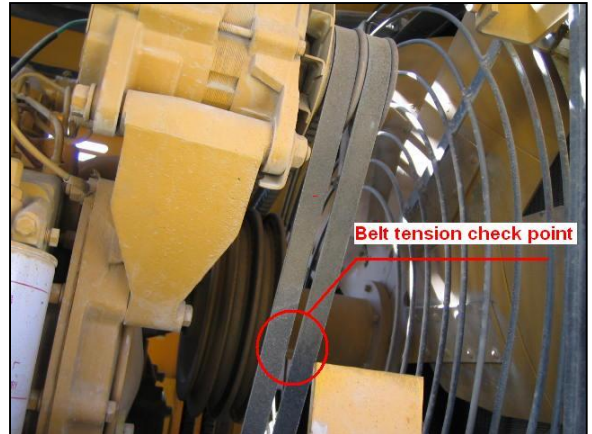
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DM-15 Visual Inspect the Fan and Driving Belt

CHECKING:

- 1), check all drive belts for excessive wear, abrasion and break
- 2), measure the belt tension



C6121

For C6121 engine

Apply a force of **110N** vertically to the belt between the driving and driven pulleys, the normal deflection of belt should be **14-20mm**.

ADJUSTING:

- (1), loosen the retaining bolt of the slotted bracket.
- (2), move the alternator in or out to get correct adjustment
- (3), tighten the retaining bolt after adjustment



Adjust rod

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DM-16 Lubricate all Driving Shafts According to Indication of the Lubrication Chart

Pay more attention to:

1: Front Driving Shaft Bracket Bearing



2: All rest driving shafts grease points



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DM-17 Tighten All Bolts of Driving Shafts

Name: Driving shaft bracket
Location: Front driving shaft and
Middle driving shaft
Lubrication point: 1 points



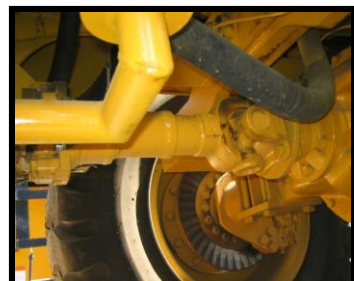
Name: Middle driving shaft
Location: Driving shaft bracket
and Gear box
Lubrication point: 3 points



Name: Front driving shaft
Location: Front axle and Driving
shaft bracket
Lubrication point: 3 points



Name: Rear driving shaft
Location: Gear box and Rear axle
Lubrication point: 3 points



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2.1 First Maintenance on Engine, Hydraulic, Transmission

First Oil Change Description	50H	250H	Page/Remarks
Inspect the Parking Brake by Adjusting Clearance Between Shoe& Hood	First Check		Refer to description of PM 1-1
Inspect all Rim Bolts and Nuts	First Check		Refer to description of PM 1-2
Replace Engine Oil and Filters (First 50H)	First Change		Refer to description of PM 1-14
Replace Transmission System Oil&Filters (First 250H)		First Change	Refer to description of PM 3-6 & PM 3-7
Replace Hydraulic Return Oil Filter (First 250H)		First Change	Refer to description of PM 4-10
Replace Hydraulic PPC Valve Filter (First 250H)		First Change	Refer to description of PM 3-10

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2.2 PM1—Every “250” Hours Maintenance

Item	Maintenance Descriptions	Page
DM		
PM1-1	Inspect the Parking Brake by Adjusting Clearance Between Shoe& Hood	37
PM1-2	Inspect all Rim Bolts and Nuts	38
PM1-3	Lubricate Batteries Terminals to Prevent Rust	39
PM1-4	Clean Engine Cylinder Heads	40
PM1-5	Clean Cooling Package	41
PM1-6	Clean Filling Filter of Fuel Tank	42
PM1-7	Clean Filling Filter of Hydraulic Tank	43
PM1-8	Check Bolts of Engine and Gearbox Brackets	44
PM1-9	Check Under-Frame and Working Device Welding	45
PM1-10	Check Oil Level in Front & Rear Axles	46
PM1-11	Check Engine Air Intake System	47
PM1-12	Check Fans of Engine and AC system	48
PM1-13	Inspect Capability of Service Brake and Parking Brake	49
PM1-14	Replace Engine Oil and Filters	51
PM1-15	Replace Primary Fuel Filter	53

SEM SERVICE

SEM 658/659 Periodical Maintenance Manual

PM1-1 Inspect the Parking Brake by adjusting Clearance Between Shoe& Hood

Inspect parking brake

Adjust the tire pressure to the regulated value. The bucket is leveled 300mm or so away from ground. And confirm the machine with a good service brake.

Start the engine and make the machine facing to the slope of 18% (angle is 10° 12') and the road should be flat and dry.

Step on the service brake pedal and stop the machine. Let the transmission control lever in neutral position and then stall the engine.

Pull out the parking brake button, loose the service brake pedal slowly and check the machine moves or not.

Adjust parking brake

- 1, Check the air pressure in normal range:0.7-0.8Mpa
- 2, Adjusting the lock-nut on stub of chamber to obtain perfect performance.
- 3, Make sure there is no oil on brake hoofs



Parking brake button

Note:

- 1, Emergency brake is realized by spring force in air chamber, force of spring in brake air chamber is so large that special tools be used for assembling and disassembling.
- 2, Don't try to disassembling this brake air chamber without special tools and trained technician.
- 3, When there is no air pressure or air pressure is not sufficient in air tank, disconnected push rod of air chamber from linkage rod of brake first to release brake before towing.



Parking brake chamber

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PM1-2 Inspect all Rim Bolts and Nuts

Check Lock Nuts of Rim Bolt and Rim Nuts

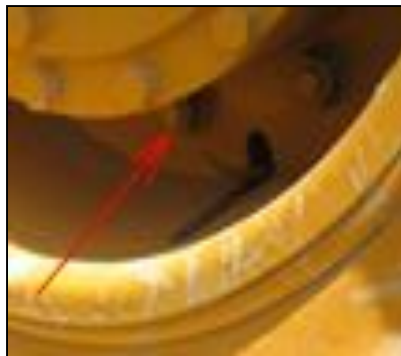


Lock nuts

Check torque of bolts and nuts

For 659 the Torque **725~862NM**

For 658 the Torque :600 N.M



Rim nuts

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PM1-3 Lubricate Batteries Terminals to Prevent Rust

Clean the battery

Clean the surface of battery, keep all terminals clean and coat them with grease.

Check the Battery

If the window indicates **GREEN** color, the battery condition is healthy.

If the window indicates **BLACK** color, the battery condition is weak, need recharging.

If the window indicates **WHITE** color, the battery is no value, need change new battery.

Charge the battery

Battery Charging Operation

Confirm the battery post clean and charging circuit to have a good connection.

The anode of charger connects with the anode of battery. The cathode of charger connects with battery cathode.

It is suggested to use constant voltage 16.0V (no more than 16.2V,)

As for the battery, whose voltage is lower than 11.0V, the battery can't be charged in the initial charging period. At this time, the current can be reduced or charger with bigger power can be changed.

The battery temperature exceeds 45° C during charging. Stop charging until the battery temperature reduces to the room temperature. Reduce the charging current to a half and continue to charge.



Maintenance free battery



Battery condition check window



Notice

- 1, Don't smoke when observing the battery electrolyte level, Battery give off flammable fumes, which can explode.
- 2, Battery electrolyte contains acid, and can cause personal injury if it contacts skin and eyes;
- 3, Check the battery condition indicator every month.

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SEM 658/659 Periodical Maintenance Manual

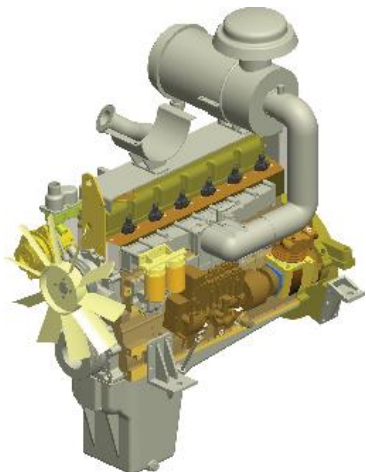
PM1-4 Clean Engine Cylinder Heads

- 1: Carry out this procedure if there is any dust or leaves deposited on the head of engine.
- 2: Shut down the engine, park the machine on flat ground and pull out the parking brake button, turn of the key start switch.
- 3: Tilt backward the engine hood and locked with safety rod;
- 4: Clean the dust with compressed air and leaves from the cylinder head,



Notice

- 1: Clean the engine head only after engine cool down!
- 2: Clean engine head only after engine was shut down!
- 2: Don't use water to wash engine head and radiator while engine is very hot!



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PM1-5 Clean Cooling Package

Clean radiator fins and external contamination

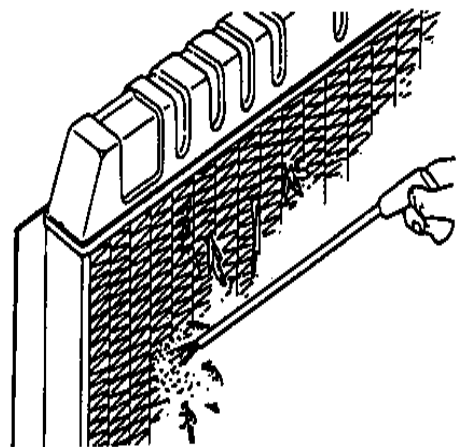
- 1: Carry out this procedure if there is any mud or dirt stuck to the radiator.
- 2: Tilt backward the engine hood and locked with safety rod;
- 3: Remove bolts of fan guard grill, take off the fan grill
- 4: Clean the mud dust with compressed air and leaves from the radiator fins. Steam or water may be used instead of compressed air.
- 5: The rubber hose, tube clamps and radiator seals should be checked at the same time. If the hose is found to have cracks or to be hardened by ageing, it should be replaced with a new one. Further, loosen clamps should also be tightened



Open the engine hood



Rear engine hood grill



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PM1-6 Clean Filling Filter of Fuel Tank

- 1: Stop engine, park machine in flat ground;
- 2: Remove the breather of fuel tank, remove bolts of filling filter screen from fuel tank
- 3: Clean the contamination with compressed air and clean fuel.
- 4: Replace new seal, install clean filling filter.
- 5: Screw all bolts

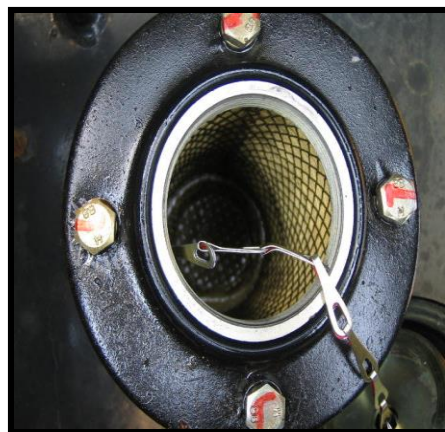
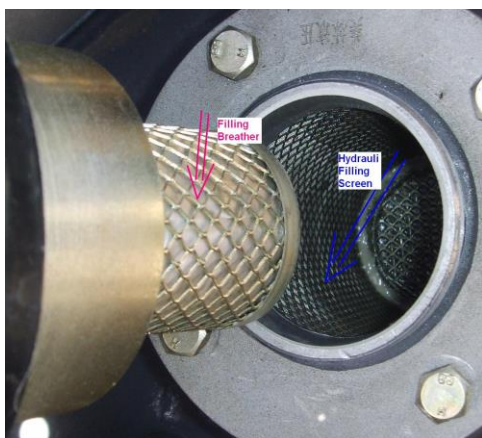
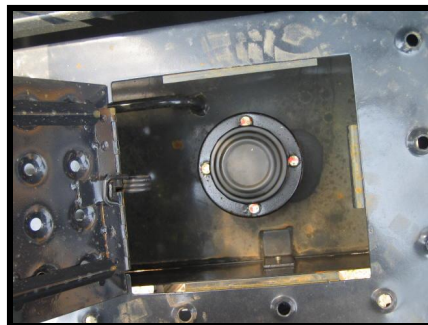


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PM1-7 Clean Filling Filter of Hydraulic Tank

- 1: Stop engine, park machine in flat ground;
- 2: Open the access board on right hand of side floor;
- 3: Remove the breather of hydraulic oil tank, remove bolts of filling filter screen from tank;
- 4: Clean the contamination with compressed air and clean hydraulic oil.
- 5: Replace new seal, install clean filling filter.
- 6: Screw all bolts



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SEM 658/659 Periodical Maintenance Manual

PM1-8 Check Bolts of Engine and Gearbox Brackets

Check Bolts of Engine and
Gearbox Brackets



Gearbox bracket



Engine bracket



Radiator mounting

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PM1-9 Check Under-Frame and Working Device Welding

Walk around the machine, check all working device welding line by observation

If need welding operation, following:

- 1: Before welding, do read and understand the relevant safe regulations of welding.
- 2: Before welding, shutdown the engine starting switch and disconnect the power cathode switch.
- 3: Before welding, do disassemble the coupling of panel to prevent damaging the panel. Disconnect between the cab harness (underneath the cab right side and close to the frame joint) and machine harness.
- 4: Forbid to use the continuous voltage above 200v.
- 5: The distance between welding area and ground cable is in 1m.
- 6: Avoid the seal ring and bearing between welding area and ground cable.
- 7: Please not weld or cut the hoses and container with fuel, engine oil and hydraulic oil.
- 8: Please not weld or cut the sealed or poor vent container.



Front frame



Front frame



Pivot pins

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SEM 658/659 Periodical Maintenance Manual

PM1-10 Check Oil Level in Front & Rear Axles

Check the axle oil level

- 1: Drive the machine on the flat field.
- 2: Shift transmission to neutral position, activated the parking brake.
- 3: Clean the area near to the drain plug on both final drives of axle.
- 4: Remove the drain plug to observe. The oil level in the axle should be flow out from the drain port. If the oil level is under the drain port, the clean gear oil should be added.
- 5: Observe for 5 minutes after filling the oil.
- 6: Screw on the drain plugs.



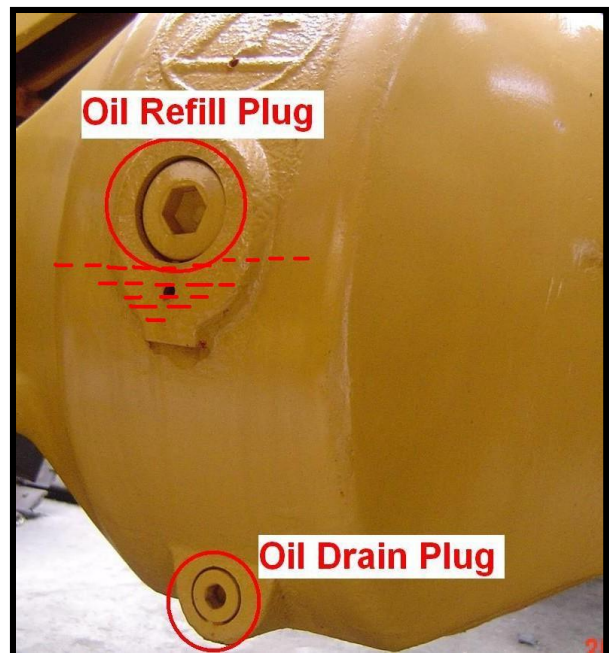
Final Reducer

Note:

Oil capacity of each axle

Front 34L

Rear 28L



Main Reducer

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PM1-11 Check Engine Air Intake System

Inspect the intake piping for cracked hoses, loose clamps, or punctures which can allow dirt and debris to enter the engine.

Tighten or replace parts as necessary to make sure the air intake system does not leak.



C6121 Engine

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PM1-12 Check Fans of Engine and AC system

A visual inspection of cooling fan is required daily, Check for crack, loose rivets, and bent or loose blades. Check the fan to make sure it is securely mounted. Tighten the cap screws if necessary. Replace any fan that is damaged.



Warning

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

Note:

Rotate the crankshaft by using the engine barring gear.



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PM1-13 Inspect Capability of Service Brake and Parking Brake

Ensure the machine parking brake system normally before checking the service brake performance in order to actuate the parking brake to stop the machine emergently in an emergency condition.

Inspect Capability of Parking brake

The parking brake should be often checked to guarantee safety and brake performance of emergent brake.

- 1: Adjust the tire pressure to the regulated value. The bucket is leveled 300mm or so away from ground. And confirm the machine with a good service brake.
- 2: Start the engine and make the machine facing to the slope of 18% (angle is 10° 12') and the road should be flat and dry.
- 3: Step on the service brake pedal and stop the machine. Let the transmission control knob at the neutral position and then stall the engine.
- 4: Pull the parking brake button, loose the service brake pedal slowly and check the machine moves or not.

Inspect the service brake

- 1: The machine travels at 20km/h at the flat, straight and dry concrete road.
- 2: Step on the service brake pedal to brake fully. After the machine stops, push the transmission control knob to the neutral position.
- 3: Pull the button of parking brake and then loose the service brake pedal.
- 4: Check the machine brake distance, which should not be more than 9m.
- 5: The machine travels at 32km/h. should break the machine quickly and the machine will not run off tracking.

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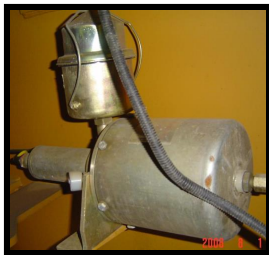
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PM1-13 Inspect Capability of Service Brake and Parking Brake

Inspect the brake system components

1, Check the Multi-function relief valve, Central brake valve, Air controlled cut-off valve, Parking brake chamber and Booster

2, Change frictions before the depth of vertical groove on surface worn out.—SEM659



Front Booster



Rear Booster



Parking brake chamber



Air controlled cut-off valve



Central brake valve



Multi-function relief valve

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PM1-14 Replace Engine Oil and Filters

1, When the engine is stopped and the oil is still hot, (about 60°C), remove the crankcase oil drain plug and allow the oil to drain;

2, Clean up the dirt on the surface of oil filter, remove and discard the filter, then wipe the sealing surface of the filter mounting base, make sure all of the old gasket is removed.

3, Fill CD 15W-40 or upper grade engine oil into the oil filter and oil the rubber before install it by hand until the gasket contacts the base. Tighten the filter $\frac{3}{4}$ of a turn more by hand.

4, Clean the oil drain plug and then install it.

5, Fill the crankcase with clean CD 15W-40 oil or upper grade

6, The oil pan capacity without filter is 27

Add oil if necessary with same level Diesel Engine Oil

Engine Oil (27 L)

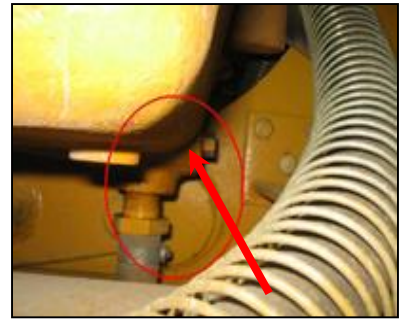
For C6121 engine (CAT3306B licensed)

API recommended: CD or higher level
(Equivalent to MIL-L-2104C/D, MIL-L-45199)

SAE recommended: 15W-40
(under ambient temperature -20°C--+50°C)

Notice

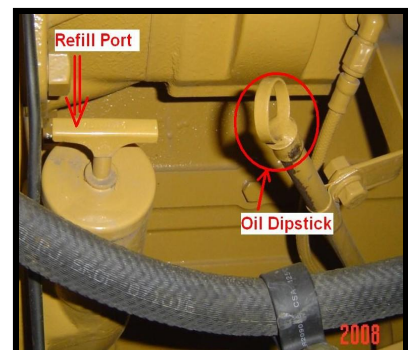
When the engine start in latter 15 seconds, the engine oil pressure gauge should have the reading. If does not have the reading, please immediately stop the engine, in order to avoid damaging engine, and check engine oil level whether in correct position.



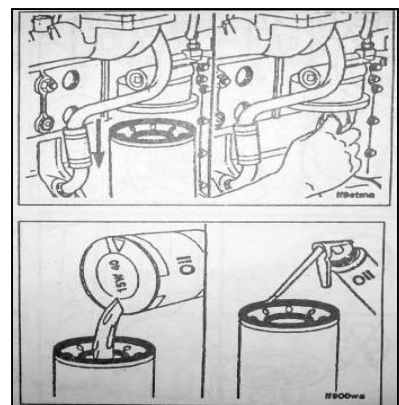
Oil drain port



Oil filter



Control oil level by oil dipstick



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PM1-15 Replace Primary Fuel Filter

- 1: Clean the area around the filter then Remove the it
- 3: Clean the Rubber surface of the filter head.
- 4: Fill the new filter with clean fuel and lubricate the o-ring seal with clean one
- 5: Install the filter as specified by the filter manufacturer
- 6: Bleeding the air in fuel system after renew fuel filter by: Open the vent screw and operate the plunger on the lift pump until the fuel flowing from the fitting is free of air.



Fuel filter



Primary fuel filter-Water & Fuel Separator

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2.3 PM2—Every “500” hours Maintenance

Item	Maintenance Descriptions	Page
PM1		
PM2-1	Check Frame Pivot Pins	55
PM2-2	Check Oil Level in Brake Boosters	56
PM2-3	Check Connecting Bolts between Axles & Frame	57
PM2-4	Clean Air Filter in Brake Boosters	58
PM2-5	Replace Filter in Breather of Hydraulic Tank	59
PM2-6	Replace Fuel Filters	60
PM2-7	Chang Air Filter	61

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PM2-1 Check Frame Pivot Pins

The clearance between front frame and rear frame is controlled by upper pivot pin, so check upper pin carefully;

1: Check the lubrication situation of pivot pins

2: Check the lock nut of upper pivot pin, tighten the lock nut, if necessary



Upper Pivot Pin



Lower Pivot Pin



Upper Pivot Pin Bearing



Lower Pivot Pin



Lower Pivot Pin Bearing

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PM2-2 Check Brake Fluid Level

1: Open the cover of the Brake Fluid container to ensure the level.

Note

- 1, DOT3 or DOT4 brake fluid is required for SEM659.
- 2, Never use mineral oil to clean brake system
- 3, Never use different brand brake fluid together.
- 4, **SAE 10W is for SEM658 always.**



SEM659 Brake Booster



SEM658 Front Booster



SEM658 Rear Booster

SEM SERVICE

SEM 658/659 Periodical Maintenance Manual

PM2-3 Check Connecting Bolts between Axles & Frame

1: Lower the lift arm to flat ground;

2: Shut off the engine, and switch the Parking brake.

3: Check the connecting bolts between axles and frame, required torque is **1,000NM**

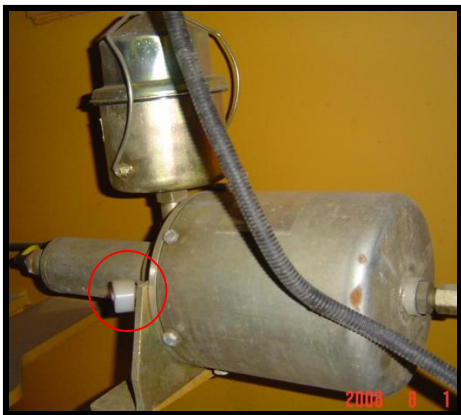


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SEM 658/659 Periodical Maintenance Manual

PM2-4 Clean Air Filter in Brake Boosters

- 1: Shut off the engine and activated the parking brake.
- 2, Obstructed the tire with block.
- 3, Remove the Breather from Booster and Blow it with Pressurized Air.



SEM658 Booster Breather



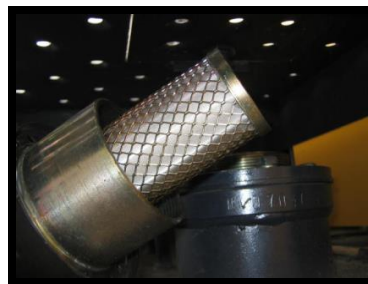
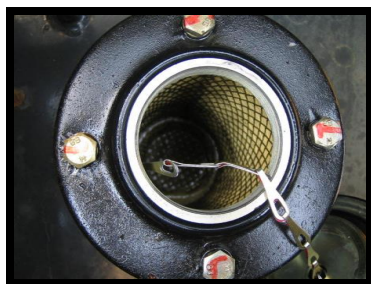
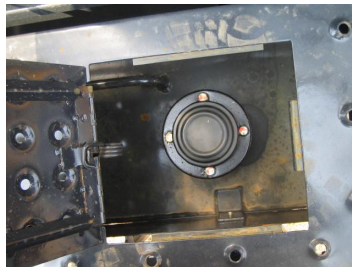
SEM659 Booster Breather

SEM SERVICE

SEM 658/659 Periodical Maintenance Manual

PM2-5 Replace the Breather Filter of Hydraulic Tank

- 1: Stop engine, park machine in flat ground;
- 2: Open the access cover on the right floor;
- 3: Remove the breather of hydraulic oil tank;
- 4: Remove the breather filter which mounted with Cap.
- 5: replace new one.



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PM2-6 Replace Fuel Filters

1: Firstly, must clean the peripheral region and the installment place.

2: Remove the filter with wrench

3: Clean up the seal surface of the installment place with the non- textile fiber cloth.

4: Fasten filter in the fixing seat by hand, and fasten 1/2 ~3/4 circle more after it just contact the fixing seat, Prohibit to use the mechanical method to fasten, in order to avoid damaging the filter.



Note:

The fuel pump is a precision instrument, and if fuel containing water or dirt, it cannot work properly, and will be damaged quickly

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PM2-7 Chang Air Filter

· After cleaning up the main filter element, using lamp inspection, if find the eyelet or the particle on it, as well as the gasket or the seal is damaged, should replace a new main filter element.

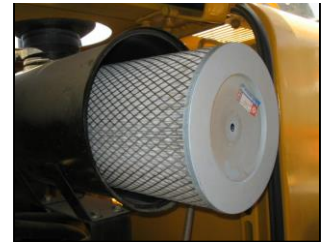
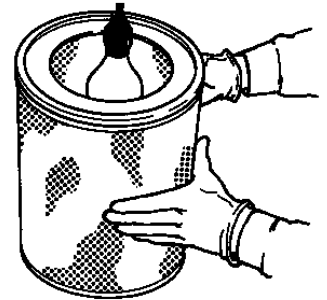
· Install the clean main filter element in the air filter shell; keep the host filter element nose seal uniform contact. Tight the nut of the host filter element peak by hand cannot use the tool, in order to avoid damages the main filter element.

· Clean and install air filter cover, keep air filter gasket and air filter shell uniform contact.

· Press the top of the service indicator, to reset.

If the engine has been started or much dark smoke is exhausted after cleaning primary element, replace with a new safe element.

The primary element must be changed after serviced 6 times or at least replaced new one in 6 months.



External element



Service Indicator
Press the Top to reset



Internal element

Notice

- 1: The internal element replaced with a new one always. not allowed once more.
- 2: When replaces the external element, the internal one should be replaced
- 3: Don't clean the filter element by bumping or tapping!
- 4: Change the air filter only when engine stops!
- 5: Use not more than 205kpa (2.1kg/cm²) pressure air clean the main element, direct pressure air along the length of the pleats inside of filter element.

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2.4 PM3—Every “1000” hours Maintenance

Item	Maintenance Descriptions	Page
PM2		
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PM3-3	Screw All Bolts of Batteries and Clean Batteries	66
PM3-4	Clean Fuel Tank	67
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PM3-6	Replace Transmission System Oil	69
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PM3-9	Replace Alxes Gear Oil	72
PM3-10	Replace PPC Valve Filter	73

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PM3-1 Adjust Valve Lash of Engine-6BT5.9

1: Remove the valve covers

2: Locate Top Dead Center(TDC) for cylinder No. 1 by barring engine slowly while pressing on the engine timing pin. When the pin engages the hole in the camshaft gear, Cylinder No1 is at TDC on the compression stroke.

3: Check /adjust the valves of No. 1 ,2,3,6,7,10 (from direction of fan end); Tighten the lock nut and measure the valve lash again.

4: Mark the pulley/vibration damper and rotate the crankshaft 360 degree

5: Check /adjust the rest valves of No. 4,5,8,9,11,12; Tighten the lock nut and measure the valve lash again.

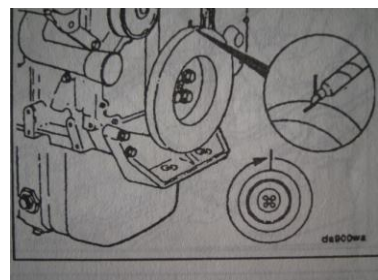
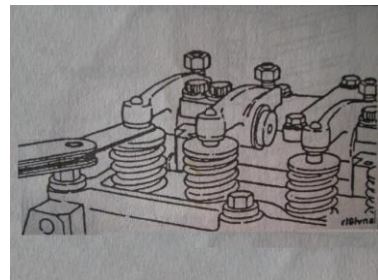
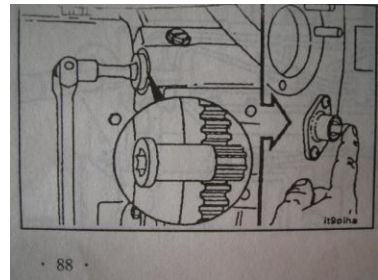
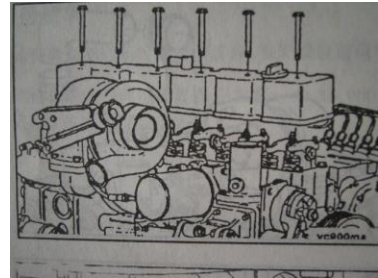
6: Install valve covers and tighten cap screws by torque 24Nm

Caution:

To prevent damage to engine or pin, be sure to disengage the pin after locating TDC

The correct valve lash are INLET: 0.38mm EXHAUST: 0.64mm
--

Adjust the valves when engine is stopped and cooled!



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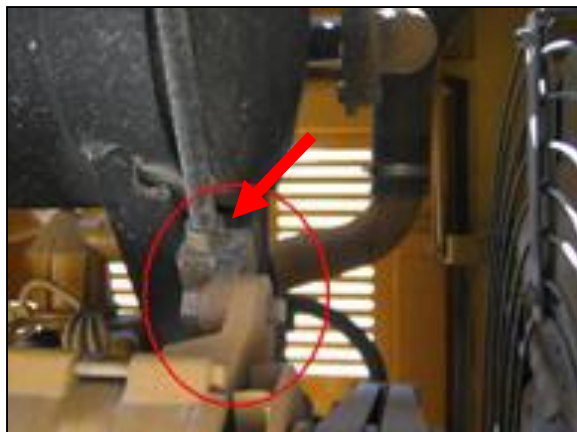
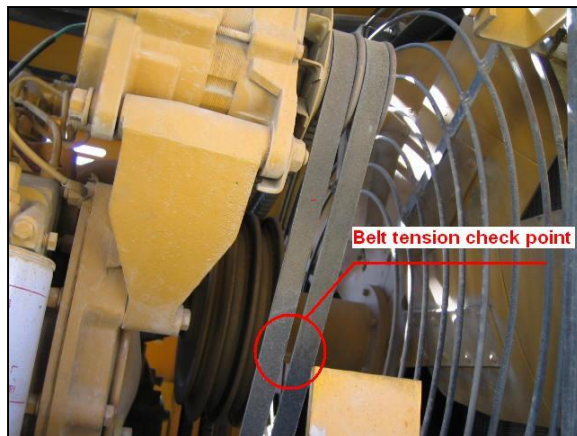
PM3-2 Check Belt and Fan

For C6121 engine

Apply a force of **110N** vertically to the belt between the driving and driven pulleys, the normal deflection of belt should be **14-20mm**.

ADJUSTING:

- (1), loosen the retaining bolt of the slotted bracket.
- (2), move the alternator in or out to get correct adjustment
- (3), tighten the retaining bolt after adjustment



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PM3-3 Screw All Bolts of Batteries and Clean Batteries

- 1: Check the appearance of battery
- 2: Clean the post and remove the external oxidized cover
- 3: Screw all bolts of batteries
- 4: Clean all terminals, apply with Grease or Vaseline



Note

Never recharge the broken battery
Replace it with new then to find out the reasons.

The battery with the damaged terminal pole can't refuel the power.
Replace this battery after finding out the reasons.



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PM3-4 Clean Fuel Tank

The fuel tank is located on the left side of the machine.

The fuel refilling screen is under the floor. Once open the access cove, you will see.

fuel tank may be cleaned according to following

Remove the flange at the bottom of the fuel tank, clean the internal surface of fuel tank, loosen the drain plug of the fuel tank, draw put the fuel.

Repeatedly flushes, until discharged fuel is clean.



Fuel refilling screen .



Bottom of the Fuel Tank

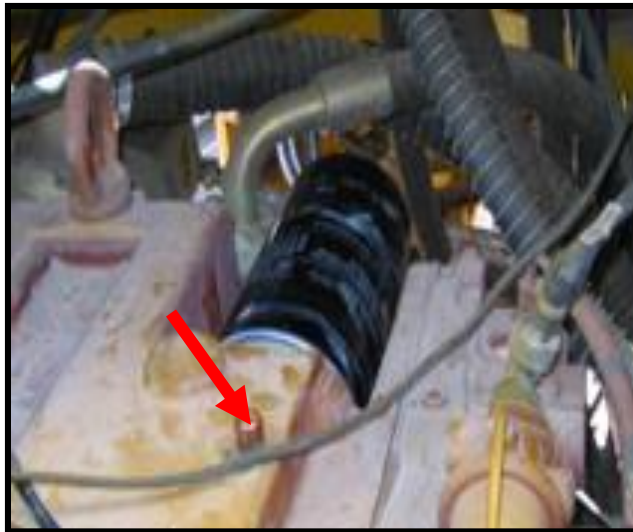
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PM3-5 Clean Breathers of Gearbox & Torque Converter

Transmission breather

Location: On top cover of gear box. Clean the dirt around the breather before remove it.



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PM3-6 Replace Transmission System Oil

- 1: Park the machine on the flat field. The transmission control lever is in neutral position.
- 2: Shut off the engine and remove the plug at the bottom of transmission to drain oil out to in a container(30L).
- 3: loosen the hoses from oil cooler, to drain oil out
- 4: Then fix the Plug and tighten the hose to refill the Transmission Oil.
- 5, Start the engine with the range selector in Neutral position, to check the Dipstick.

Transmission Oil (28L)

1. **Start the engine, idle speed**
 2. **Range selector in Neutral position N,**
- Oil level at 80°C on the upper marking "HOT"**
Oil level at 40°C on the lower marking "COLD".



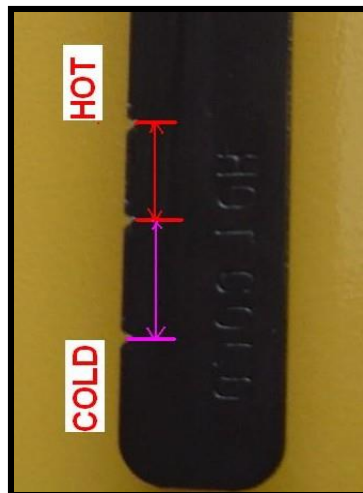
Transmission oil drain plug



Oil cooler tube



Transmission oil filling pipe



Transmission oil dipstick



Transmission Filter

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PM3-8 Replace Hydraulic Return Oil Filter

- 1: Raise the lift arm and make the bucket at the tilting down position at the same time. Use the support against the lift arm to prevent the work tool falling down;
- 2: keeping the control levers in neutral position. Actuate the parking brake and Shut off the engine.
- 3: Drain out the Hydraulic from the plug on the bottom of the Tank. Then remove the cover
- 4: Take off the spring and then remove filter element.
- 5: Change new filter, always use new gasket, and fix the cover .
- 6, refill Hydraulic oil and check the level.

Refill new hydraulic oil with

ISOVG46, L-HM46 (-5°C---40°C) or
ISOVG46, L-HV46 (-26°C---40°C).



Raise lifting arm to highest position



Oil level gauge

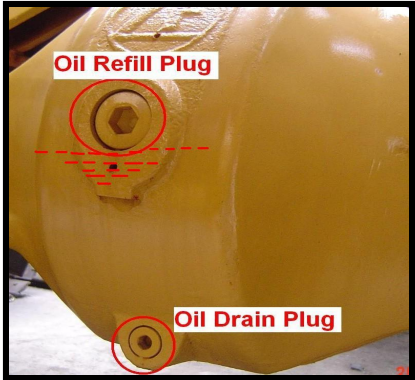
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PM3-9 Replace Axles Gear Oil

Drain out gear oil

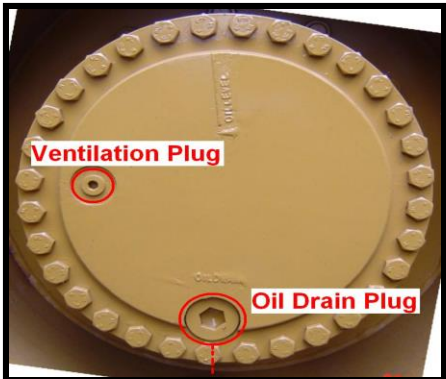
- 1: Park the machine on the flat field and move the machine slowly with slight throttle to make the final drive end cover drain plug of front axle at the lowest position.
- 2: Screw off the drain plugs on both end covers of axles and drain plugs in the middle of axle housing.



Fill with new gear oil

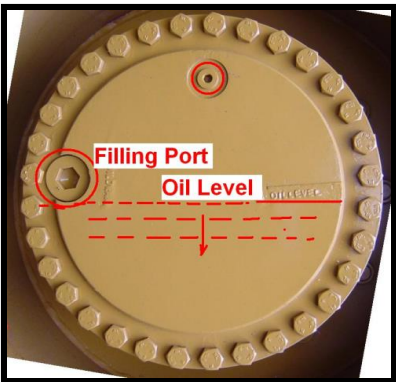
- 1: Start the engine to move the machine slowly to make the drain plugs on final drive end cover of front axle at the horizontal position. Then shut off the engine.
- 2: Screw on the drain plugs in the middle housing.
- 3: Fill the clean gear oil from the drain port on both final drive end covers and middle housing of front axle until the oil level reaches the drain port on both end covers of axles. Screw on the two drain plugs of front axle.
- 4: The oil capacity of each axle is 34 L for front one while 28L for rear ones.

Main reducer



Final reducer

Ambient temp.	SAE	API
-20°C~40°C	SAE85W-90	APIGL-5



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PM3-10 Replace PPC Valve Filter

- 1: Open the engine hood, locked with safety rod;
- 2: Clean the neighboring area of pilot filter.
- 3: Disassemble the pilot filter housing with wrench and remove the element.
- 4: Clean the contacting surface of seal ring on mounting block with the clean cloth (if the seal ring is damaged, please replace it.)
- 5: Mount new element.
- 6: Assemble the pilot filter.



Pilot oil filter assembly



Pilot oil filter element

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2.5 PM4—Every “2000” hours Maintenance

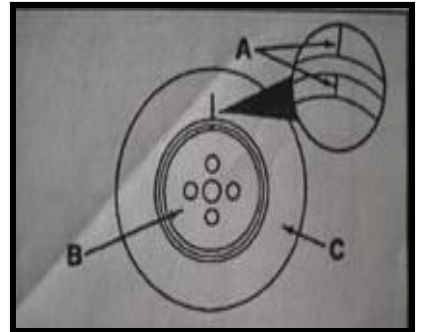
Item	Maintenance Descriptions	Page
PM3		
PM4-1	Inspect Engine Damper	75
PM4-2	Change Brake Pads or Hoses, if Necessary	76
PM4-3	Check Booster Seals, Replace Brake Fluid	77
PM4-4	Inspect Flexibility of Steering, Replace Hoses, if Necessary	79
PM4-5	Inspect Starter, Alternator and Turbocharger	80
PM4-6	Check the Valves and Cylinder Seals by Measuring the Cylinder Subsidence	81
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PM4-9	Replace Coolant, Clean Cooling System. (Every Two Years Regardless Working Hours)	84
PM4-10	Replace Hydraulic Oil & Filter, Clean the Tank	87

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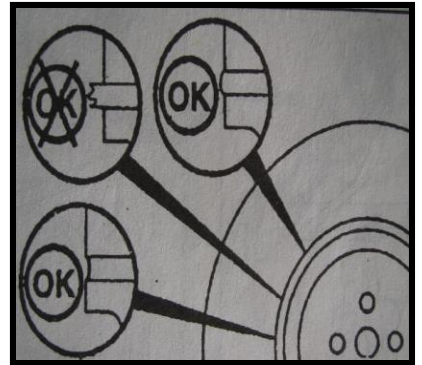
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PM4-1 Inspect Engine Damper

Check the Reference Mark on absorber-house (B) and Mark Line on absorber-ring (A), if the Mark Line and the Reference Mark are stagger more than 1.59mm, change new absorber.



Check the rubber between absorber-ring and absorber-house, if it is aging, cracking, or the rubber end is under the surface of metal parts more than 3.18mm, then change new absorber.



Check out carefully whether the absorber-ring has any movement out of the absorber-house. If so, change the absorber



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PM4-2 Chang Brake Band or Hoses, if Necessary SEM659

1: Service brake friction disc replacement procedure

There are 3 longitudinal grooves on the friction disc of brake caliper are the symbol of grinding volume. Replace the new disc when the grooves are wore down.



Note:

Every friction plate has two fixed-pins to position. The brake function will be invalidation if the friction plates lose because of the fixed-pin loose.



2, Change piston seals if needed

If oil leak from some pliers, all seals should be changed

If piston of brake pliers can not reset, this can cause brake disc overheating, noise on broken-down wheel and frictions worn-out quickly. Change all piston seals of this wheel



3, Change brake air tubes if needed

All brake system air tube should be change every 4000 hours or 2 years

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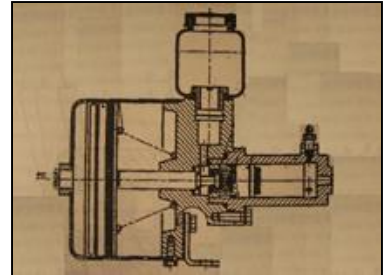
PM4-3 Check Booster Seals, Replace Brake Fluid

Check Booster Seals SEM659

1: Before check booster, make sure the brake air pressure is normal (3.5-7.6Bar), and the brake air tubes and control valve are normal;

2: Press the brake pedal down and check the brake fluid in the air booster, if the fluid level falls down with the brake pedal pressing and comes up with the brake pedal releasing, the air boosting pump is normal.

3: If fluid level doesn't fall down while press the brake pedal, the booster seals should be changed.



Replace Brake Fluid

Refer to following the adjustment of brake system

Note:

- 1, DOT3 or DOT4 brake fluid is required
- 2, Never use mineral oil to clean brake system
- 3, Never use different brand brake fluid together.
- 4, **ZF Axle uses SAE 10 W.**

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PM4-3 Check Booster Seals, Replace Brake Fluid

Adjust Brake System

1, After refill new fluid to booster, loose the air-release-plug from brake booster, until new fluid flow out from plug then close this plug.



2, Press brake pedal and hold the pedal,



3, loose all air-release-plug of the brake pliers to eliminate air, then close the plug



4, Release the brake pedal.



5, Repeat step 2 to step 4 until no air come out, then do same process on other pliers.

6, Repeat step 1 to 4 to eliminate air on another axle.

7: Inspect service brake performance after replace brake fluid

Note: keep watching the fluid level in booster
while eliminating air from brake system

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PM4-4 Inspect Flexibility of Steering, Replace Hoses, if Necessary

1: Check the co-axis flow amp ,priority valve & 2 steering cylinders to be sure there is no any leaks

2: check hydraulic pump suction hose and all steering hoses, no cracks and bending

3: Turn the steering wheel until the tires are at its maximum steering position, and then continue to turn the steering wheel, forcing the safety valve open, check the system pressure to be 10Mpa by the checking point.

4: Operation of the steering wheel at their maximum limited steering position to check if there any tactile operator feedback that the tires are at its maximum steering limit. This way can check the Bidirectional Cushion Valve. Replace the steering control valve unit, if necessary

5: Replace all steering hoses every 2 years/4000 hours working.



Steering pressure testing point



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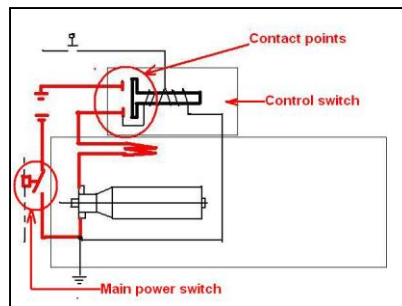
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PM4-5 Inspect Starter, Alternator

If this item need to do, please contact with SEM authorized service agent in your territory or local skilled electrician

Starter

- 1: Clean the contact points of control switch in starter;
- 2: Check the carbon brushes



Alternator

- 1: Check the pulley and fan bearing
- 2: Check the carbon brushes (if installed)



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PM4-6 Check the Valves and Cylinder Seals by Measuring the Cylinder Subsidence

- 1, Start engine and raise lifting arm to one position, then release operation lever to natural position
- 2, Visually inspect If lifting arm fall down automatically.
- 3, Extinguish engine, if lifting arm fall down, check cylinders seal
- 4, If lifting arm doesn't fall down when engine is off, then



Open port

Note: How to estimate lifting cylinder inner leakage

- 1, Start engine, raise lifting arm to limit position, continue to put lift lever to Raise position
 - 2, Open tube from front chamber of one lifting cylinder
 - 3, Continue to dump lifting arm at middle engine speed, if pressure oil flows out from oil port of cylinder, change seal kit of this cylinder.
- If pressure oil flows out from another tube, means another cylinder leak from inner seal, change that cylinder seal



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PM4-7 Replace Hydraulic Tank Breather (Filling Filter)

- 1: Stop engine, park machine in flat ground;
- 2: Open the access board on right hand of side floor;
- 3: Remove the breather of hydraulic oil tank;
- 4: Remove the breather filter from the cap.
- 5: Install breather.



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PM4-8 Replace Fuel Tank Breather (Filling Filter)

- 1: Open the hood,
- 2: Clean the fuel tank
- 3: Change the filling filter and breather assembly



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PM4-9 Replace Coolant, Clean Cooling System. (Every Two Years Regardless Working Hours)

Clean cooling system

Replace the coolant; clean the cooling system slightly in every 2,000 or for two years (take first to arrive as).

- 1: Till the coolant temperature drop to lower than 50 ° C, slowly open water radiator fillers relief pressure.
- 2: Turn on the power master switch; put the key into starting switch, and turn clockwise to 1 gear position to turn on the machine power; Put change-over switch of the air-conditioning system to the warm grade; or switch-on the change-over manual-switch of heating route (for heating manually control model)
- 3: Open the drain valve under the radiator and the drain valve of engine lubricating oil cooler; , discharge the coolant to a container.
- 4: After drain out the coolant, close the drain valve under the radiator and drain valve of engine lubricating cooler.
- 5: Check all water pipes and the clamps of the cooling system whether damages, replace them if necessary. Check whether the radiator is leakage, damage or dirty, Clean and repair if necessary
- 6: Fill the cleaning liquid to the engine cooling system, which is mixed by the water and the sodium carbonate(Na_2CO_3), the proportion of mixture is in every 23L water add 0. 5L sodium carbonate. The fluid level should arrive at the engine normal fluid level, and keeps stably in ten minutes.
- 7: Keep the radiator filler cap open, start engine, when coolant t temperature is up to more than 80 ° C, run the engine 5 minutes once more.
- 8: Stop engine, discharge-cleaning liquid.
- 9: Fill the clean water to the engine cooling system to the normal level, and keep ten minutes, keep the radiator filler cap open, start engine, when coolant temperature is up to more than 80 ° C, again run the engine 5 minutes.
- 10: Stop engine, drain out the water. If the water was discharged still dirty, must clean the system until discharges to be clean once more.

Warning

The coolant is poisonous, do not drink, please handle it according to the local relevant laws and regulations.

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PM4-9 Replace Coolant, Clean Cooling System. (Every Two Years Regardless Working Hours)

Discharge the coolant

1: Till the coolant temperature drop to lower than 50 ° C, slowly open water radiator fillers relief pressure. Open the cover of the radiator filler

2: Turn on the power switch, put switch of the air-conditioning system to the warm grade; or switch-on the change-over manual-switch of heating route (for heating manually control model)

3: Release the coolant from engine block and radiator.

4: Close all coolant release plugs

Fill the coolant

1: Turn on the power switch, put switch of the air-conditioning system to the warm grade; or switch-on the change-over manual-switch of heating route (for heating manually control model)

2: Open the cover of the radiator filler, fill the coolant slowly, until the level arrives at the high water mark of the vice- water tank, and keep the position in ten minutes.

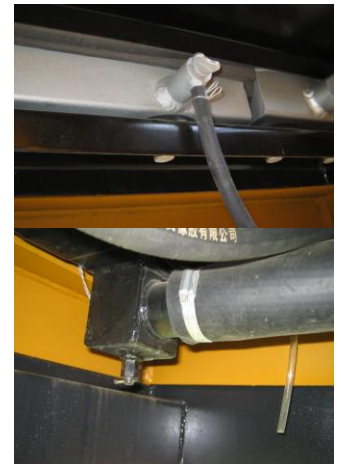
3: Keep the water radiator filler cap open, start engine, start 5 minutes in low idle speed, start 5 minutes in high idle speed more, and enables the coolant temperature to above 85 ° C.

4: Check the level of the coolant once more. if necessary, continue to fill coolant until the level arrive at the high water mark of the shunt tank.

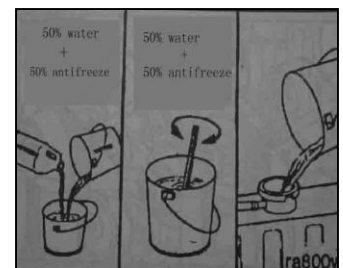
5: Put back the cover of water radiator filler



change-over manual-switch



Radiator Coolant release switch



Notice

System total volume is **30 liters**.

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PM4-9 Replace Coolant, Clean Cooling System. (Every Two Years Regardless Working Hours)

- 1, Make sure not to use the water as coolant.
- 2, Antifreeze about 68% density offers max. freezing point protection.
- 3, Density of freeze can never over 68% standard.
- 4, Too high density of antifreeze will lead to gel, tube block and engine overheating.
- 5, Too low density of antifreeze will cause corrosive damage of cooling system.
- 6, Never add coolant water to an overheating engine, engine damage can result. Always let engine to cool first.
- 7, Choose the anti-freeze by 10° C lower than the local lowest temperature,

Density of antifreeze (Ethylene glycol)	Minimum temperature
30% antifreeze, 70% water	-15°C
40% antifreeze, 60% water	-23°C
50% antifreeze, 50% water	-37°C
60% antifreeze, 40% water	-54°C
68% antifreeze, 32% water	-71°C

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PM4-10 Replace Hydraulic Oil & Filter, Clean the Tank

Drain hydraulic oil from tank

Replace the hydraulic oil once every 2000 hrs or every year. The method is as follows:

1: Clean the dirt in the bucket. Park the machine at the flat ground and put transmission to neutral position.

2: Pull out the parking brake button and mount the lock pin of frame. Start the engine and run it for 10 minutes at the idle speed. Raise the lift arm, lower the lift arm, dump and rack back bucket etc. reiterate.

3: Finally, raise the lift arm to the highest position and backward the bucket to the largest position.

4: Stop the engine.

5: Push forward the bucket control lever, dump the bucket under the gravity effect and drain the fluid of tilt cylinder;

6: When the bucket is tilted at the required position, push forward the lift arm control lever, lower the lift arm under gravity effect and drain the oil of lift arm cylinders.

7: Clean the drain port under the hydraulic tank. Screw off the drain plug to drain the hydraulic oil and fill it in the container. At the same time, screw off the filling cap and quicken the drain course.

8: Disassemble the inlet hose of hydraulic cooler and drain out hydraulic oil in the cooler.

9: Disassemble the hydraulic return filter from the hydraulic tank and replace the new filter element.



Oil requirement

Ambient Temp.	Hydraulic oil type	Mobil Lubricant
-26°C--40°C	ISOVG46, L-HV46	Mobil DTE15M
-5°C---50°C	ISOVG46, L-HM46	Mobil DTE25

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PM4-10 Replace Hydraulic Oil & Filter, Clean the Tank

Clean the hydraulic tank

- 1: Disassemble the cleaning flange disc of tank under the filling port. Use the diesel to wash bottom hydraulic oil and its four sides. Finally clean it with clean cloth.
- 2: Mount the drain plug of hydraulic tank, oil return filter and cover, filling filtration screen, tank cleaning flange port and cooling inlet hose.
- 3: Filling the clean hydraulic oil from the filling port of hydraulic tank to make the oil level reach the upper scale of hydraulic level gauge. Screw on the filling cover.



Tank access cover

Oil level check

- 1: Disassemble the lock pin of frame and start the engine.
- 2: Operate the control lever. Raise and lower the lift arm, dump and rack back the bucket and steer left and right to biggest angle 2 or 3 times to make the hydraulic oil to fill the cylinder and hose.
- 3: During this operation, make sure don't let cylinder piston comes to its top position!
- 4: Then run the engine for 5 minutes at the idle speed to discharge the air.
- 5: Stall the engine and open the filling cover of hydraulic tank. Add the clean hydraulic oil to 2/3 scale of hydraulic tank level gauge.



Oil level gauge

Notice

- 1: Hydraulic oil should be changed every 2000 hours.
- 2: Oil return filter should be replaced every 1000 hours
- 3: Every time when change hydraulic oil, change with new oil return filter

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Note Pad

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