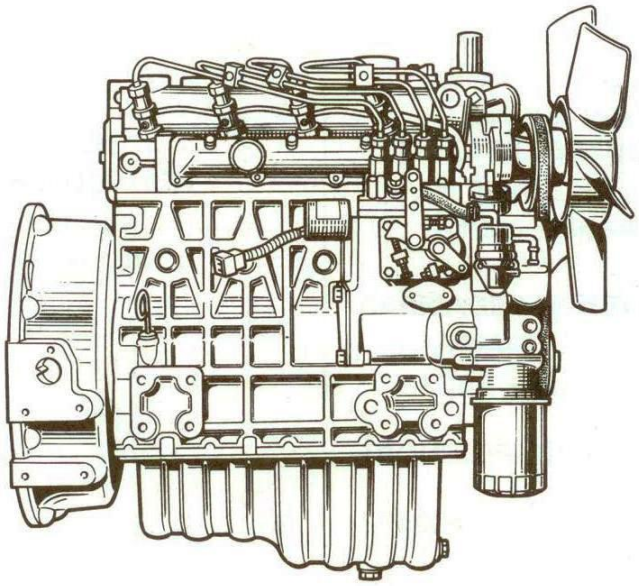
OPERATOR'S MANUAL

ENGLISH

KUBOTA
DIESEL ENGINE

MODELS D905-EBG ·D1105-EBG·V1505-EBG
D1005-EBG·V1305-EBG



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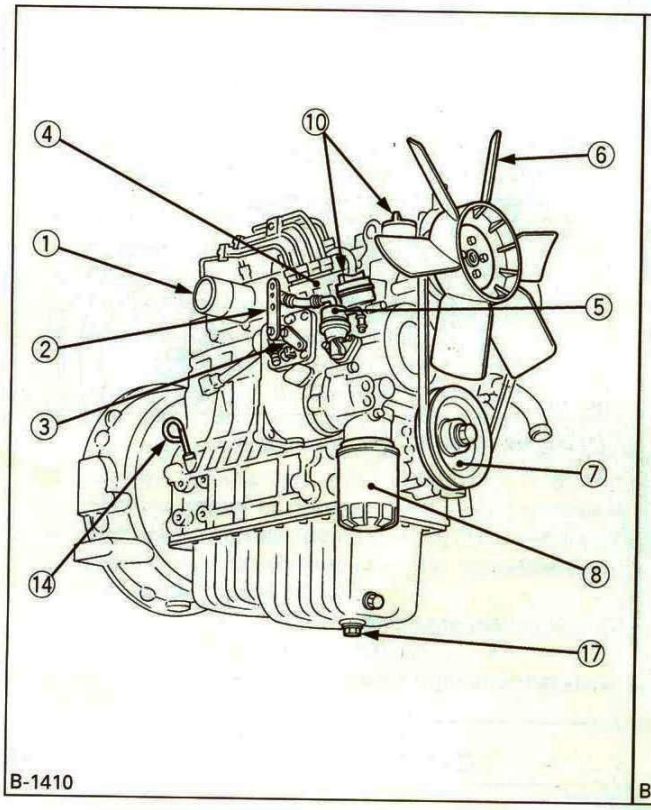
READ AND SAVE THIS MANUAL

Kubota

NAMES OF PARTS



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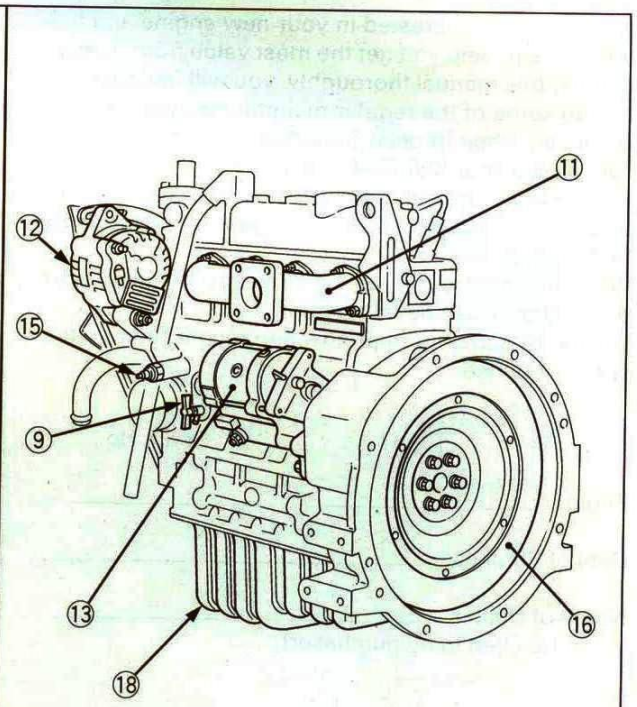


B-1409

(1) Intake manifold
(2) Speed control lever
(3) Engine stop lever
(4) Injection pump
(5) Fuel feed pump
(6) Cooling fan
(7) Fan drive pulley
(8) Oil filter cartridge
(9) Water drain cock
(10) Oil filler plug
(11) Exhaust manifold
(12) Alternator
(13) Starter
(14) Oil level gauge
(15) Oil pressure switch
(16) Flywheel
(17) Oil drain plug
(18) Oil pan

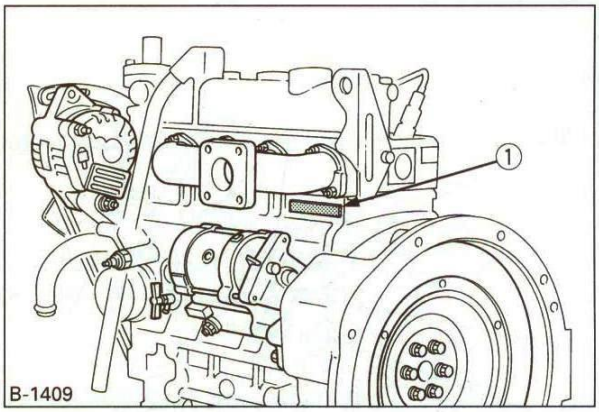
SERVICING OF THE ENGINE

Your dealer is interested in your new engine and has the desire to help you get the most value from it. After reading this manual thoroughly, you will find that you can do some of the regular maintenance yourself.
However, when in need of parts or major service, be sure to see your KUBOTA dealer.
For service, contact the KUBOTA Dealership from which you purchased your engine or your local KUBOTA dealer.
When in need of parts, be prepared to give your dealer the engine serial number.
Locate the serial number now and record them in the space provided.

	Type	Serial No.
Engine	_____	_____

Date of Purchase _____

Name of Dealer _____
(To be filled in by purchaser)



(1) Engine serial number

PRE-OPERATION CHECK

BREAK-IN

During the engine break-in period, observe the following by all means:

1. Change engine oil and oil filter cartridge after the first 50 hours of operation (See "ENGINE OIL" in PERIODIC SERVICE Section).
2. When ambient temperature is low, operate the machine after the engine has been completely warmed up.

DAILY CHECK

To prevent trouble from occurring, it is important to know the conditions of the engine well. Check it before starting.

CAUTION

To avoid personal injury:

- **Be sure to install shields and safeguards attached to the engine when operating.**
- **Stop the engine at a flat and wide space when checking.**
- **Keep dust or fuel away from the battery, wiring, muffler and engine to prevent a fire. Check and clear them before operating everyday. Pay attention to the heat of the exhaust pipe or exhaust gas so that it cannot ignite trash.**

Item		Ref. page
1. Parts which had trouble in previous operation.		–
2. By walking around the machine	(1) Oil or water leaks	12 to 17
	(2) Engine oil level and contamination	12, 13
	(3) Amount of fuel	10
	(4) Amount of coolant	14 to 17
	(5) Dust in air cleaner dust cup	18
	(6) Damaged parts and loosened bolts and nuts	–
3. By inserting the key into the starter switch	(1) Proper functions of meters and pilot lamps; no stains on these parts	–
	(2) Proper functions of glow lamp timer	–
4. By starting the engine	(1) Color of exhaust fumes	7
	(2) Unusual engine noise	7

OPERATING THE ENGINE

STARTING THE ENGINE (NORMAL)

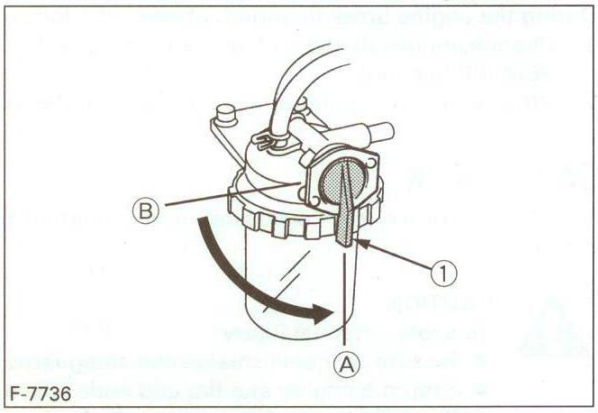
CAUTION
To avoid personal injury:

- **Do not allow children to approach the machine while the engine is running.**
- **Be sure to install the machine on which the engine is installed, on a flat place.**
- **Do not run the engine on gradients.**
- **Do not run the engine in an enclosed area. Exhaust gas can cause air pollution and exhaust gas poisoning.**
- **Keep your hands away from rotating parts (such as fan, pulley, belt, flywheel etc.) during operation.**
- **Do not operate the machine while under the influence of alcohol or drugs.**
- **Do not wear loose, torn or bulky clothing around the machine. It may catch on moving parts or controls, leading to the risk of accident. Use additional safety items, e.g. hard hat, safety boots or shoes, eye and hearing protection, gloves, etc., as appropriate or required.**
- **Do not wear radio or music headphones while operating engine.**
- **Check to see if it is safe around the engine before starting.**
- **Reinstall safeguards and shields securely and clear all maintenance tools when starting the engine after maintenance.**

IMPORTANT:

- Do not use ether or any starting fluid for starting the engine, or a severe damage will occur.
- When starting the engine after a long storage (of more than 3 months), first set the stop lever to the "STOP" position and then activate the starter for about 10 seconds to allow oil to reach every engine part.

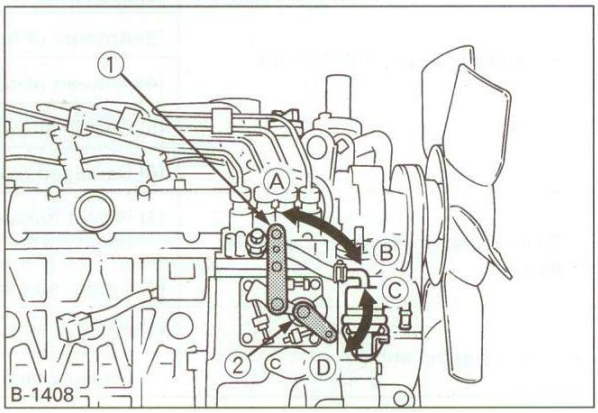
1. Set the fuel lever to the "ON" position.



(1) Fuel lever
(A) "ON"
(B) "OFF"

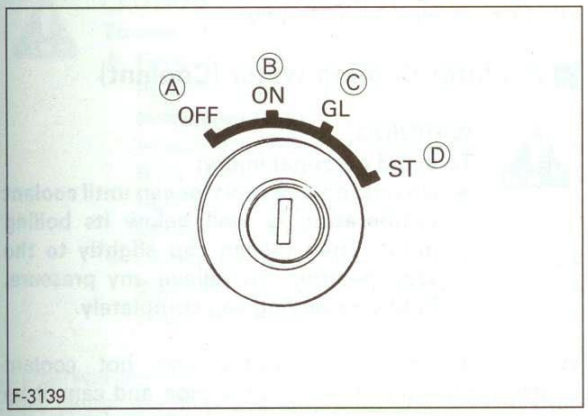
2. Place the engine stop lever to the "START" position.

3. Place the speed control lever at more than half "OPERATION".



(1) Speed control lever
(2) Engine stop lever
(A) "IDLING"
(B) "OPERATION"
(C) "START"
(D) "STOP"

4. Insert the key into the key switch and turn it to the "OPERATION" position.



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(A) "SWITCHED OFF"
(B) "OPERATION"
(C) "PREHEATING"
(D) "START"

5. Check to see that the oil pressure lamp and charge lamp are on.

6. Turn the key to the "START" position and the engine should start. Release the key immediately when the engine starts.

7. Check to see that the oil pressure lamp and charge lamp are off. If the lamps are still on, immediately stop the engine, and determine the cause.
(See "CHECKS DURING OPERATION" in OPERATING THE ENGINE Section)

NOTE:
- If the oil pressure lamp should be still on, immediately stop the engine and check;
  –if there is enough engine oil.
  –if the engine oil has dirt in it.
  –if the wiring is faulty.

8. Warm up the engine at medium speed without load.

IMPORTANT:
- If the glow lamp should redden too quickly or too slowly, immediately ask your KUBOTA dealer to check and repair it.
- If the engine does not catch or start at 10 seconds after the starter switch is set at "START", wait for another 30 seconds and then begin the engine starting sequence again. Do not allow the starter motor to run continuously for more than 20 seconds.

COLD WEATHER STARTING

If the ambient temperature is below* -5°C(23°F) and the engine is very cold, start it in the following manner:
Take steps (1) through (4) left.

5. Turn the key to the "PREHEATING" position and keep it there for a certain period mentioned below.

IMPORTANT:
- Shown below are the standard preheating times for various temperatures. This operation, however, is not required, when the engine is warmed up.

Ambient temperature	Preheating time	
	Ordinary heat type	With glow lamp timer
Above 10°C (50°F)	NO NEED	See NOTE:
10°C (50°F) to –5°C (23°F)	Approx. 5 seconds	
*Below -5°C (23°F)	Approx. 10 seconds	
Limit of continuous use	20 seconds	

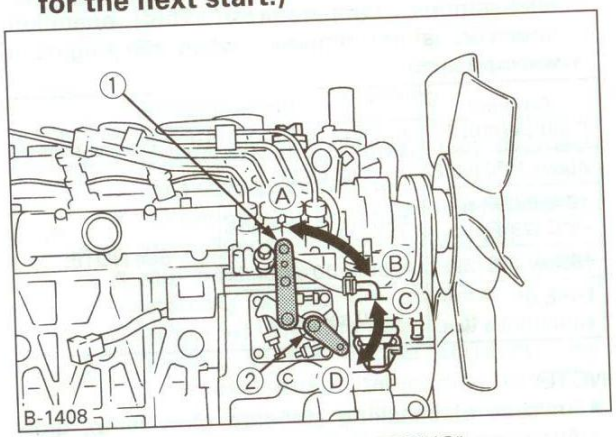
NOTE:
- In case of installing standard glow lamp, glow lamp goes off after about 6 seconds, when the starter switch key is turned to preheating position. However if necessary, keep the starter switch key at preheating position for longer time, according to the left recommendation.

6. Turn the key to the "START" position and the engine should start.
(If the engine fails to start after 10 seconds, turn off the key for 5 to 30 seconds. Then repeat steps (5) and (6).)

IMPORTANT:
- Do not allow the starter motor to run continuously for more than 20 seconds.
- Be sure to warm up the engine, not only in winter, but also in warmer seasons. An insufficiently warmed-up engine can shorten its service life.
- When there is fear of temperature dropping below –15°C (5°F), detach the battery from the machine, and keep it indoors in a safe area, to be reinstalled just before the next operation.

STOPPING THE ENGINE

1. **Return the speed control lever to low idle, and run the engine under idling conditions.**
2. **Set the engine stop lever to the "STOP" position.**
3. **With the key switch placed to the "SWITCHED OFF" position, remove the key. (Be sure to return the engine stop lever to the "START" position to be ready for the next start.)**



(1) Speed control lever
(2) Engine stop lever
(A) "IDLING"
(B) "OPERATION"
(C) "START"
(D) "STOP"

IMPORTANT:

- If equipped with a turbo-charger, allow the engine to idle for 5 minutes before shutting it off after a full load operation.
  Failure to do so may lead to turbo-charger trouble.

CHECKS DURING OPERATION

While running, make the following checks to see that all parts are working correctly.

■ Radiator Cooling water (Coolant)

WARNING
To avoid personal injury:

- **Do not remove radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop position, to relieve any pressure, before removing cap completely.**

When the engine overheats and hot coolant overflows through the overflow pipe and cannot be stopped, stop the engine immediately and make the following checks to determine the cause of trouble:

Check item

1. Check to see if there is any coolant leak;
2. Check to see if there is any obstacle around the cooling air inlet or outlet;
3. Check to see if there is any dirt or dust between radiator fins and tube;
4. Check to see if the fan belt is too loose;
5. Check to see if radiator water pipe is clogged; and
6. Check to see if anti-freeze is mixed into coolant in warm seasons.

■ Oil pressure lamp

The lamp lights up to warn the operator that the engine oil pressure has dropped below the prescribed level. If this should happen during operation or should not go off even after the engine is accelerated more than 1000rpm, immediately stop the engine and check the following:

1. Engine oil level (See "ENGINE OIL" in MAINTENANCE Section).
2. Lubricant system (See "ENGINE OIL" in MAINTENANCE Section).

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CAUTION
To avoid personal injury:
- **Fluid escaping from pinholes may be invisible. Do not use hands to search for suspected leaks; Use a piece of cardbord or wood, instead. If injured by escaping fluid, see a medical doctor at once. This fluid can produce gangrene or a severe allergic reaction.**
- **Check any leaks from fuel pipes or fuel injection pipes. Use eye protection when checking for leaks.**

e careful not to empty the fuel tank. Otherwise air ay enter the fuel system, requiring fuel system leeding. (See "FUEL" in MAINTENANCE Section).

■ Color of exhaust

While the engine is run within the rated output range:
- The color of exhaust remains colorless.
- If the output slightly exceeds the rated level, exhaust may become a little colored with the output level kept constant.
- If the engine is run continuously with dark exhaust emission, it may lead to trouble with the engine.

■ Immediately stop the engine if;

- The engine suddenly slow down or accelerates.
- Unusual noises suddenly appear.
- Exhaust fumes suddenly become very dark.
- The oil pressure lamp or the water temperature alarm lamp lights up.

REVERSED ENGINE REVOLUTION AND REMEDIES

CAUTION
To avoid personal injury:
- **Reversed engine operation can make the machine reverse and run it backwards. It may lead to serious trouble.**
- **Reversed engine operation may make exhaust gas gush out into the intake side and ignite the air cleaner; It could catch fire.**

Reversed engine revolution must be stopped immediately since engine oil circulation is cut quickly, leading to serious trouble.

■ How to tell when the engine starts running backwards

1. Lubricating oil pressure drops sharply. Oil pressure warning light, if used, will light.
2. Since the intake and exhaust sides are reversed, the sound of the engine changes, and exhaust gas will come out of the air cleaner.
3. A louder knocking sound will be heard when the engine starts running backwards.

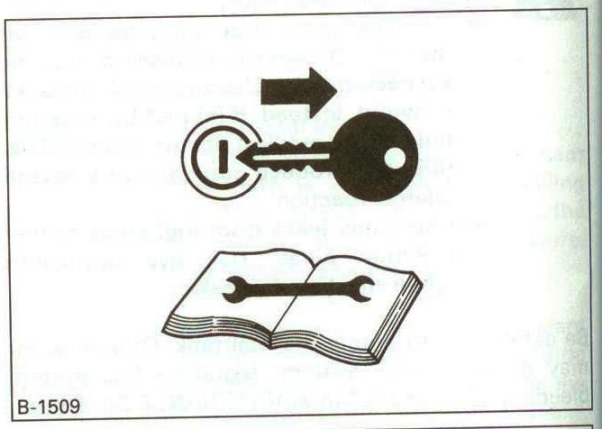
■ Remedies

1. Immediately set the engine stop lever to the "STOP" position to stop the engine.
2. After stopping the engine, check the air cleaner, intake rubber tube and other parts and replace parts as needed.

MAINTENANCE

CAUTION
To avoid personal injury:

- **Be sure to conduct daily checks, periodic maintenance, refueling or cleaning on a level surface with the engine shut off and remove the key.**
- **Before allowing other people to use your engine, explain how to operate, and have them read this manual before operation.**
- **When cleaning any parts, do not use gasoline but use regular cleanser.**
- **Always use proper tools, that are in good condition. Make sure you understand how to use them, before performing any service work.**
- **When installing, be sure to tighten all bolts lest they should be loose. Tighten the bolts by the specified torque.**
- **Do not put any tools on the battery, or battery terminals may short out. Severe burns or fire could result. Detach the battery from the engine before maintenance.**
- **Do not touch muffler or exhaust pipes while they are hot; Severe burns could result.**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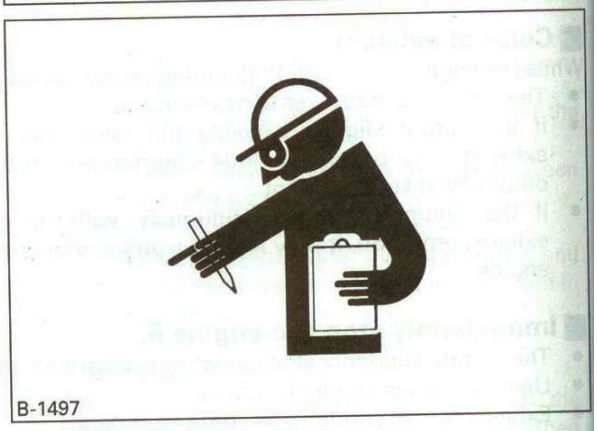
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SERVICE INTERVALS

Observe the following for service and maintenance.
The lubricating oil change intervals listed in the table below are for Classes CF, CE and CD lubricating oils of API classification with a low-sulfur fuel in use. If the CF-4 or CG-4 lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals than recommended in the table below depending on the operating condition.

Interval	Item	Ref. Page		
Every 50 hours	Check of fuel pipes and clamp bands	11		@
See NOTE:	Change of engine oil	12, 13	◎	
Every 100 hours	Cleaning of air cleaner element	18, 19	*1	@
	Check of battery electrolyte level	19		
	Check of fan belt tightness	20		
Every 200 hours	Check of radiator hoses and clamp bands	16		
	Check of intake air line	–		@

Interval	Item	Ref. Page		
Every 400 hours	Replacement of oil filter cartridge	15	◎	
	Replacement of fuel filter cartridge	12		@
Every 500 hours	Removal of sediment in fuel tank	–		
	Cleaning of water jacket (radiator interior)	15 to 18		
	Replacement of fan belt	22		
Every year	Replacement of air cleaner element	19, 20	*2	@
	Check of damage in electric wiring and loose connections	–		
Every 800 hours	Check of valve clearance	24		
Every 1500 hours	Check of fuel injection nozzle injection pressure	–	*3	@
Every 3000 hours	Check of turbo charger	–	*3	@
	Check of injection pump	–	*3	@
	Check of fuel injection timer	–	*3	@
Every two years	Change of radiator coolant (L.L.C.)	17		
	Replacement of battery	20, 21		
	Replacement of radiator hoses and clamp bands	17		
	Replacement of fuel pipes and clamp bands	12	*3	@
	Replacement of intake air line	–	*4	@

IMPORTANT:

- The jobs indicated by ◎ must be done after the first 50 hours of operation.

*1 Air cleaner should be cleaned more often in dusty conditions than in normal conditions.
*2 After 6 times of cleaning.
*3 Consult your local KUBOTA Dealer for this service.
*4 Replace only if necessary.

- When the battery is used for less than 100 hours in a year, check its electrolyte yearly. (for refillable battery's only)
- The items listed above (@ marked) are registered as emission related critical parts by KUBOTA in the U.S. EPA nonroad emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction.
  Please see the Warranty Statement in detail.

NOTE:

Lubricating oil

With the emission control now in effect, the CF-4 and CG-4 lubricating oils have been developed for use of a low-sulfur fuel on on-road vehicle engines. When an off-road vehicle engine runs on a high-sulfur fuel, it is advisable to employ the CF, CD or CE lubricating oil with a high total base number. If the CF-4 or CG-4 lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals.

- **Lubricating oil recommended when a low-sulfur or high-sulfur fuel is employed.**

○ : Recommendable × : Not recommendable

Fuel / Lubricating oil class	Low sulfur	High sulfur	Remarks
CF	○	○	TBN ≧ 10
CF-4	○	×	
CG-4	○	×	

PERIODIC SERVICE

FUEL

Fuel is flammable and can be dangerous. You should handle fuel with care.

CAUTION
To avoid personal injury:

- **Do not mix gasoline or alcohol with diesel fuel. This mixture can cause an explosion.**
- **Be careful not to spill fuel during refueling. If fuel should spill, wipe it off at once, or it may cause a fire.**
- **Do not fail to stop the engine before refueling. Keep the engine away from the fire.**
- **Be sure to stop the engine while refueling or bleeding and when cleaning or changing fuel filter or fuel pipes. Do not smoke when working around the battery or when refueling.**
- **Check the above fuel systems at a well ventilated and wide place.**
- **When fuel and lubricant are spilled, refuel after letting the engine cool off.**
- **Always keep spilled fuel and lubricant away from engine.**

■ Fuel level check and refueling

1. Check to see that the fuel level is above the lower limit of the fuel level gauge.
2. If the fuel is too low, add fuel to the upper limit. Do not overfill.

No.2-D is a distillate fuel oil of lower volatility for engines in industrial and heavy mobile service.
(SAE J313 JUN87)
Grade of Diesel Fuel Oil According to ASTM D975

Flash Point, °C (°F)	Water and Sediment, volume %	Carbon Residue on, 10 percent Residuum, %	Ash, weight %
Min	Max	Max	Max
52 (125)	0.05	0.35	0.01

Distillation Temperatures, °C (°F) 90% Point		Viscosity Kinematic cSt or mm ^{2}/s at 40°C		Viscosity Sayboit, SUS at 100°F		Sulfur, weight %	Copper strip Corrosion	Cetane Number
Min	Max	Min	Max	Min	Max	Max	Max	Min
282 (540)	338 (640)	1.9	4.1	32.6	40.1	0.50	No.3	40

The cetane number is required not to be less than 45.

IMPORTANT:

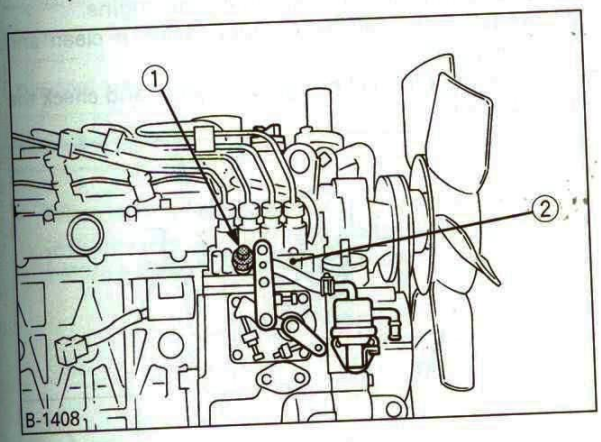
- Be sure to use a strainer when filling the fuel tank, or dirt or sand in the fuel may cause trouble in the fuel injection pump.
- For fuel, always use diesel fuel. You are required not to use alternative fuel, because its quality is unknown or it may be inferior in quality. Kerosene, which is very low in cetane rating, adversely affects the engine. Diesel fuel differs in grades depending on the temperature.
- Be careful not to let the fuel tank become empty, or air can enter the fuel system, necessitating bleeding before next engine start.

Air bleeding the fuel system

CAUTION
To avoid personal injury;
- **Do not bleed a hot engine as this could cause fuel to spill onto a hot exhaust manifold creating a danger of fire.**

Air bleeding of the fuel system is required if;
- after the fuel filter and pipes have been detached and refitted;
- after the fuel tank has become empty; or
- before the engine is to be used after a long storage.

[PROCEDURE] (gravity feed fuel tanks)
1. Fill the fuel tank to the fullest extent. Open the fuel filter lever.
2. Loosen air vent plug of the fuel filter a few turns.
3. Screw back the plug when bubbles do not come up any more.
4. Open the air vent plug on top of the fuel injection pump.
5. Retighten the plug when bubbles do not come up any more.



(1) Air vent plug
(2) Injection pump

Checking the fuel pipes

CAUTION
To avoid personal injury:
- **Check or replace the fuel pipes after stopping the engine. Broken fuel pipes can cause fires.**

Check the fuel pipes every 50 hours of operation.
When if;
1. If the clamp band is loose, apply oil to the screw of the band, and tighten the band securely.
2. If the fuel pipes, made of rubber, become worn out, replace them and the clamp bands every two years.
3. If the fuel pipes and clamp bands are found worn or damaged before two years'time, replace or repair them at once.
4. After replacement of the pipes and bands, air-bleed the fuel system.

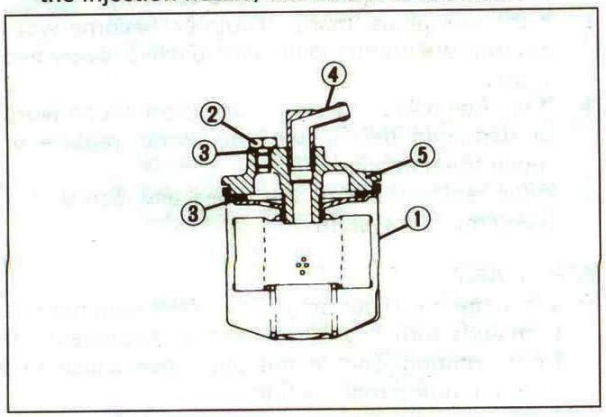
IMPORTANT:
- When the fuel pipes are not installed, plug them at both ends with clean cloth or paper to prevent dirt from entering. Dirt in the pipes can cause fuel injection pump malfunction.

■ Fuel filter cartridge replacement

1. Replace the fuel filter cartridge with a new one every 400 operating hours.
2. Apply fuel oil thinly over the gasket and tighten the cartridge into position by hand-tightening only.
3. Finally, vent the air.

IMPORTANT:

- Replace the fuel filter cartridge periodically to prevent wear of the fuel injection pump plunger or the injection nozzle, due to dirt in the fuel.



(1) Fuel filter cartridge
(2) Air vent plug
(3) O ring
(4) Pipe joint
(5) Cover

ENGINE OIL

CAUTION
To avoid personal injury:

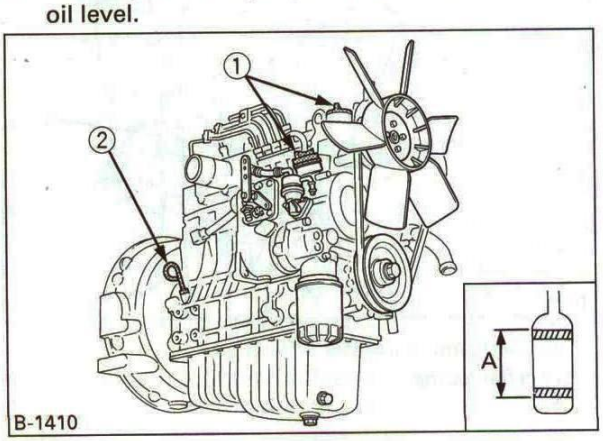
- **Be sure to stop the engine before checking and changing the engine oil and the oil filter cartidge.**
- **Do not touch muffler or exhaust pipes while they are hot; Severe burns could result. Always stop the engine and allow it to cool before conducting inspections, maintenance, or for a cleaning procedure.**
- **Contact with engine oil can damage your skin.**
  Put on gloves when using engine oil. If you come in contact with engine oil, wash it off immediately.

NOTE:

- Be sure to inspect the engine, locating it on a level place. If placed on gradients accurately, oil quantity may not be measured.

■ Checking oil level and adding engine oil

1. Check the engine oil level before starting or more than 5 minutes after stopping the engine.
2. Remove the oil level gauge, wipe it clean and reinstall it.
3. Take the oil level gauge out again, and check the oil level.



(1) Oil filler plug
(2) Oil level gauge
[Lower end of oil level gauge]
(A) Engine oil level within this range is proper.

4. If the oil level is too low, remove the oil filler plug, and add new oil to the prescribed level.
5. After adding oil, wait more than 5 minutes and check the oil level again. It takes some time for the oil to drain down to the oil pan.
6. If the engine is operated with the oil level nearing the lower limit, however, oil may deteriorate quickly; keeping the oil level near the upper limit is thus recommended.

Engine oil quantity

Model	Quantity
D905-EBG, D1005-EBG, D1105-EBG	5.1 L (1.35 U.S.gals.)
V1305-EBG, V1505-EBG	6.0 L (1.59 U.S.gals.)

Oil quantities shown are for standard oil pans.

IMPORTANT:

- Engine oil should be MIL-L-2104C or have properties of API classification CD grades or higher.
  Change the type of engine oil according to the ambient temperature.

above 25°C (77°F)	SAE30	or	SAE10W-30 SAE10W-40
0 to 25°C (32 to 77°F)	SAE20	or	SAE10W-30 SAE10W-40
below 0°C (32°F)	SAE10W	or	SAE10W-30 SAE10W-40

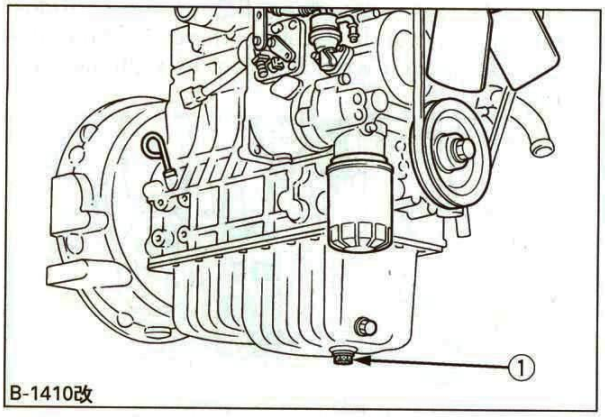
- When using oil of different brands from the previous one, be sure to drain all the previous oil before adding the new engine oil.

■ Changing engine oil

CAUTION
To avoid personal injury:

- **Be sure to stop the engine before draining engine oil.**
- **When draining engine oil, place some container underneath the engine and dispose it according to local regulations.**
- **Do not drain oil after running the engine. Allow engine to cool down sufficiently.**

1. Change oil after the initial 50 hours of operation and every 200 hours thereafter.
2. Remove the drain plug at the bottom of the engine, and drain all the old oil. Drain oil will drain easier when the oil is warm.



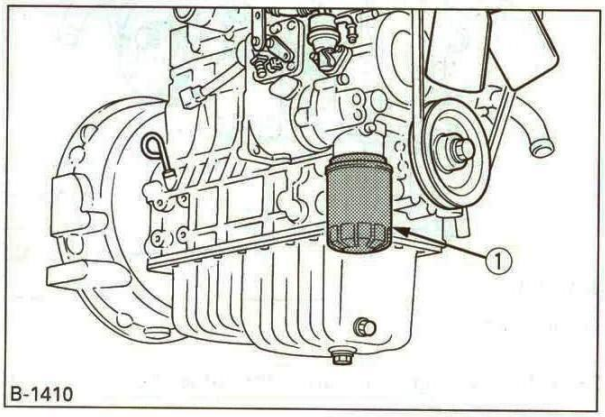
(1) Oil drain plug

3. Add new engine oil up to the upper limit of the oil level gauge.

■ Replacing the oil filter cartridge

CAUTION
To avoid personal injury:
- **Be sure to stop the engine before changing the oil filter cartridge.**
- **Allow engine to cool down sufficiently. Oil can be hot and cause burns.**

1. Replace the oil filter cartridge after the initial 50 hours of operation and every 400 hours thereafter.
2. Remove the old oil filter cartridge with a filter wrench.
3. Apply a film of oil to the gasket for the new cartridge.
4. Screw in the cartridge by hand. When the gasket contacts the seal surface, tighten the cartridge enough by hand. Because, if you tighten the cartridge with a wrench, it will be tightened too much.



(1) Oil filter cartridge
Remove with a filter wrench
(Tighten with your hand)

5. After the new cartridge has been replaced, the engine oil level normally decreases a little. Thus, run the engine for a while and check for oil leaks through the seal before checking the engine oil level. Add oil if necessary.

NOTE:
- Wipe off any oil sticking to the machine completely.

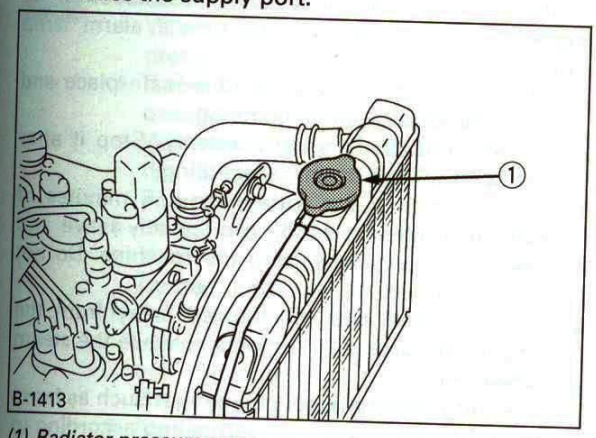
RADIATOR

Coolant will last for one day's work if filled all the way up before operation. Make it a rule to check the coolant level before every operation.

WARNING
To avoid personal injury:
- **Do not stop the engine suddenly, stop it after about 5 minutes of unloaded idling.**
- **Work only after letting the engine and radiator cool off completely (more than 30 minutes after it has been stopped).**
- **Do not remove the radiator cap while coolant is hot. When cool to the touch, rotate cap to the first stop to allow excess pressure to escape. Then remove cap completely.**
  If overheats should occur, steam may gush out from the radiator or reserve tank; Severe burns could result.

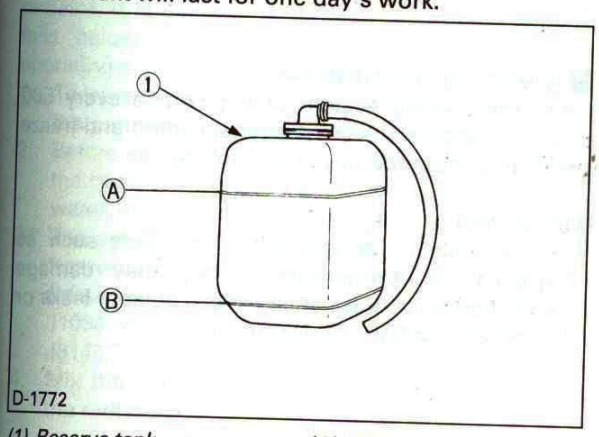
■ Checking coolant level, adding coolant

1. Remove the radiator cap after the engine has completely cooled, and check to see that coolant reaches the supply port.



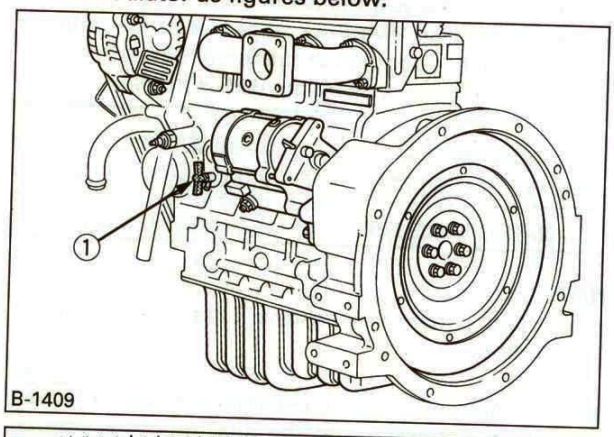
(1) Radiator pressure cap

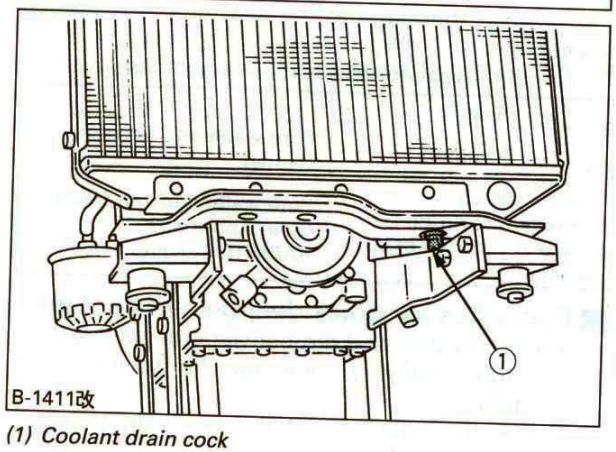
2. If the radiator is provided with a reserve tank, check the coolant level of the reserve tank. When it is between the "FULL" and "LOW" marks, the coolant will last for one day's work.



(1) Reserve tank *(A) "FULL"* *(B) "LOW"*

3. When the coolant level drops due to evaporation, add water only up to the full level.
4. Check to see that two drain cocks; one is at the crankcase side and the other is at the lower part of the radiator as figures below.





(1) Coolant drain cock

IMPORTANT:

- If the radiator cap has to be removed, follow the caution and securely retighten the cap.
- If coolant should be leak, consult your local KUBOTA dealer.
- Make sure that muddy or sea water does not enter the radiator.
- Use clean, fresh water and 50% anti-freeze to fill the recovery tank.
- Do not refill reserve tank with coolant over the "FULL" level mark.
- Be sure to close the radiator cap securely. If the cap is loose or improperly closed, coolant may leak out and decrease quickly.
- When coolant is added, coolant level drops the first time the engine is started. Stop the engine, and add more coolant.

■ Changing coolant

1. To drain coolant, always open both drain cocks and simultaneously open the radiator cap as well. With the radiator cap kept closed, a complete drain of water is impossible.
2. Remove the overflow pipe of the radiator pressure cap to drain the reserve tank.
3. Prescribed coolant volume (U.S.gallons)

Models	Quantity
D905-EBG, D1005-EBG, D1105-EBG	3.1 L (0.82 U.S.gals.)
V1305-EBG, V1505-EBG	4.0 L (1.06 U.S.gals.)

NOTE:
- Coolant quantities shown are for standard radiators.

4. An improperly tightened radiator cap or a gap between the cap and the seat quickens loss of coolant.
5. Coolant (Radiator cleaner and anti-freeze)

Season	Coolant
Summer	Pure water and radiator cleaner
Winter (When temperature drops below 0°C (32°F)) or all season	Pure water and anti-freeze (See "Anti-freeze" in RADIATOR section)

■ Remedies for quick decrease of coolant

1. Check any dust and dirt between the radiator fins and tube. If any, remove them from the fins and the tube.
2. Check the tightness of the fan belt. If loose, tighten it securely.
3. Check the internal blockage in the radiator hose. If scale forms in the hose, clean with the scale inhibitor or its equivalent.

■ Checking radiator hoses and clamp

CAUTION
To avoid personal injury:
- **Be sure to check radiator hoses and hose clamps periodically. If radiator hose is damaged or coolant leaks, overheats or severe burns could occur.**

Check to see if radiator hoses are properly fixed every 200 hours of operation or 6 months, whichever comes first.

1. If hose clamps are loose or water leaks, tighten hose clamps securely.
2. Replace hoses and tighten hose clamps securely, if radiator hoses are swollen, hardened or cracked.

Replace hoses and hose clamps every 2 years, or earlier, if checked and found that hoses are swollen, hardened or cracked.

■ Precaution at overheating

Take the following actions in the event the coolant temperature is nearly or more than the boiling point, what is called "Overheating". Take these actions if the engine's alarm buzzer sounds or the alarm lamp lights up.

1. Stop the engine operation in a safe place and keep the engine unloaded idling.
2. Do not stop the engine suddenly. Stop it after about 5 minutes of unloaded idling.
3. If the engine stalls within about 5 minutes of running under no load, immediately leave and keep yourself away from the machine. Do not open the hood and any other part.
4. Keep yourself and others well away from the engine for further 10 minutes or while the steam blown out.
5. Checking that there gets no danger such as burn, get rid of the causes of overheating according to the manual, see "TROUBLESHOOTING" Section. And then, start again the engine.

■ Cleaning radiator core (outside)

If dust is between the fin and tube, wash it away with running water.

■ Cleaning the radiator

Clean the cooling system of the engine every 500 hours. In addition, clean it before adding anti-freeze and before stopping use of anti-freeze.

IMPORTANT:
- Do not clean radiator with firm tools such as spatulas or screwdrivers. They may damage specified fin or tube. It can cause coolant leaks or decrease coolings performance.

■ Anti-freeze

CAUTION
To avoid personal injury:

- **When using anti-freeze, put on some protection such as rubber gloves.**
- **If should drink anti-freeze, throw up at once and take medical attention.**
- **When anti-freeze comes in contact with the skin or clothing, wash it off immediately.**
- **Do not mix different types of anti-freeze.**
- **Keep fire and children away from anti-freeze.**
- **Be mindful of the environment and ecology. Before draining any fluids, find out the correct way of disposing by checking with local codes.**
- **Also, observe the relevant environmental protection regulations when disposing of oil, fuel, coolant, brake fluid, filters and batteries.**

If it freezes, coolant can damage the cylinders and radiator. It is necessary, if the ambient temperature falls below 0°C (32°F), to remove coolant after operating or to add anti-freeze to it.

1. There are two types of anti-freeze available; use the permanent type (PT) for this engine.
2. Before adding anti-freeze for the first time, clean the radiator and engine interior by pouring fresh water, and draining it a few times.
3. The procedure for the mixing of water and anti-freeze differs according to the make of the anti-freeze and the ambient temperature. Refer to SAE J1034 standard, more specifically also to SAE J814c.
4. Mix the anti-freeze with water, and then fill into the radiator.

IMPORTANT:

- When the anti-freeze is mixed with water, the anti-freeze mixing ratio must be less than 50%.

Vol % Anti-freeze	Freezing Point		Boiling Point ※	
	°C	°F	°C	°F
40	−24	−12	106	222
50	−37	−34	108	226

※ At 1.013×10^5Pa (760mmHg) pressure (atmospheric). A higher boiling point is obtained by using a radiator pressure cap which permits the development of pressure within the cooling system.

NOTE:

- The above data represents industry standards that necessitate a minimum glycol content in the concentrated anti-freeze.
- When the coolant level drops due to evaporation, add water only to keep the anti-freeze mixing ratio less than 50%. In case of leakage, add anti-freeze and water in the specified mixing ratio before filling into the radiator.
- Anti-freeze absorbs moisture. Keep unused anti-freeze in a tightly sealed container.
- Do not use radiator cleaning agents when anti-freeze has been added to the coolant. (Anti-freeze contains an anti-corrosive agent, which will react with the radiator cleaning agent forming sludge which will affect the engine parts.)

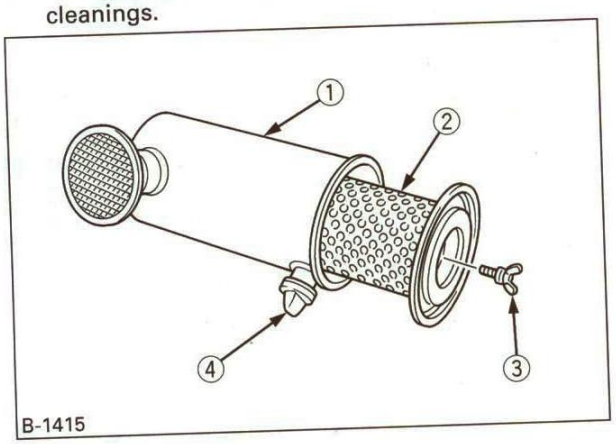
■ Radiator cement

As the radiator is solidly constructed, there is little possibility of water leakage. Should this happen, however, radiator cement can easily fix it. If leakage is serious, contact your local KUBOTA dealer.

AIR CLEANER

Since the air cleaner employed on this engine is a dry type, never apply oil to it.

1. Open the evacuator valve once a week under ordinary conditions — or daily when used in a dusty place. This will get rid of large particles of dust and dirt.
2. Wipe the inside air cleaner clean with cloth if it is dirty or wet.
3. Avoid touching the element except when cleaning.
4. When dry dust adheres to the element, blow compressed air from the inside turning the element. Pressure of compressed air must be under 205kPa (2.1kgf/cm², 30psi).
5. When carbon or oil adheres to the element, soak the element in detergent for 15 minutes, then wash it several times in water, rinse with clean water and dry it naturally.
6. After the element is fully dried, inspect the inside of the element with a light, and check if it is damaged or not. (referring to the instructions on the label attached to the element.)
7. Replace the element every year or every 6 cleanings.



B-1415

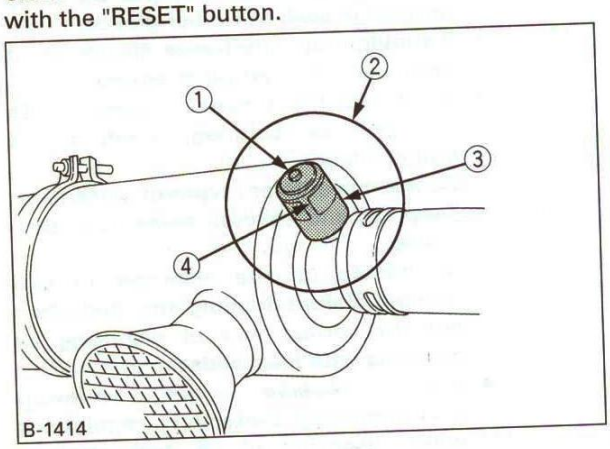
(1) Air cleaner body
(2) Element
(3) Wing bolt
(4) Evacuator valve

IMPORTANT:

- Make sure the wing bolt for the element is tight enough. If it is loose, dust and dirt may be sucked in, wearing down the cylinder liner and piston ring earlier, and thereby resulting in poor power output.
- Do not overservice the air cleaner element. Overservicing may cause dirt to enter the engine causing premature wear. Use the dust indicator as a guide on when to service.

■ Dust indicator (optional)

If the red signal on the dust indicator attached to the air cleaner is visible, the air cleaner has reached the service level.
Clean the element immediately, and reset the signal with the "RESET" button.



B-1414

(1) "RESET" button
(2) Dust indicator
(3) Service level
(4) Signal

BATTERY

CAUTION
To avoid personal injury:
- **Be careful not to let the battery electrolyte contact your body or clothing.**
- **Wear eye protection and rubber gloves, since the diluted sulfuric acid solution burns skin and eats holes in clothing. Should this occur, immediately wash it off with running water and get medical attention.**

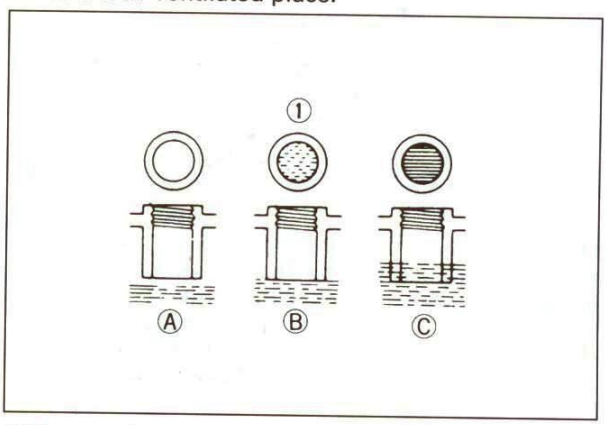
Mishandling of the battery shortens the service life and adds to maintenance costs. Obtain the maximum performance and the longest life of the battery by handling properly and with care.
Engine starting will be more difficult, if the battery charge is low. Be careful to recharge it at an early occasion before it is too late.

■ Battery charging

DANGER
The battery comes in two types: Refillable, Non-refillable.
- **For using the refillable type battery, follow the instructions below.**
  Do not use or charge the battery if its fluid level stands below the LOWER (lower limit level) mark.
  Otherwise, the battery component parts may deteriorate earlier than expected, which may shorten the battery's service life or cause an explosion.
  Immediately, add distilled water until the battery's fluid level is between the UPPER and LOWER levels.

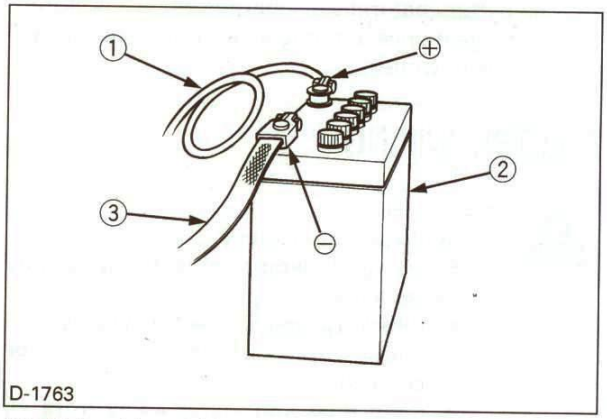
CAUTION
To avoid personal injury:
- **When the battery is being activated, hydrogen and oxygen gases in the battery are extremely explosive. Keep open sparks and flames away from the battery at all times, especially when charging the battery.**
- **When charging the battery, remove the battery vent plugs.**
- **When disconnecting the cable from the battery, start with the negative terminal, and when connecting them, start with the positive terminal first.**
- **DO NOT check the battery charge by placing a metal object across the terminals. Use a voltmeter or hydrometer.**

1. Make sure each electrolyte level is to the bottom of vent wells, if necessary, add only distilled water in a well-ventilated place.

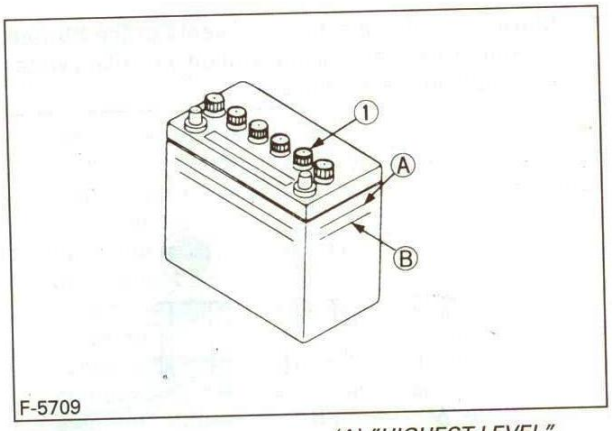


(1) Battery electrolyte level
(A) "TOO LOW"
(B) "PROPER"
(C) "TOO HIGH"

2. To slow charge the battery, connect the charger positive terminal to the battery positive terminal, and the negative to the negative, then recharge in the standard fashion.
3. Quick recharging charges the battery at a high rate in a short time. This is only for emergencies.
4. Recharge the battery as early as possible, or battery life will be extremely shortened.
5. When exchanging an old battery for a new one, use a battery of equal specifications shown in page 24, 25.



(1) Thick cable red (+)
(2) Battery case
(3) Earth cable black (–)



(1) Plug
(A) "HIGHEST LEVEL"
(B) "LOWEST LEVEL"

IMPORTANT:
- Connect the charger positive terminal to the battery positive terminal, and negative to the negative.
- When disconnecting the cable from the battery, start with the negative terminal first.
  When connecting the cable to the battery, start with the positive terminal first.
  If reversed, the contact of tools on the battery may cause a short.

■ Direction for long term storage

1. When storing the engine for long periods of time, remove the battery, adjust the electrolyte to the proper level, and store in a dry and dark place.
2. The battery naturally discharges while it is stored. Recharge it once a month in summer, and every 2 months in winter.

ELECTRIC WIRING

CAUTION
To avoid personal injury:
Shorting of electric cable or wiring may cause a fire.
- **Check to see if electric cables and wiring are swollen, hardened or cracked.**
- **Keep dust and water away from all power connections.**
  Loose wiring terminal parts, make bad connections. Be sure to repair them before starting the engine.

Damaged wiring reduces the capacity of electrical parts. Change or repair damaged wiring immediately.

FAN BELT

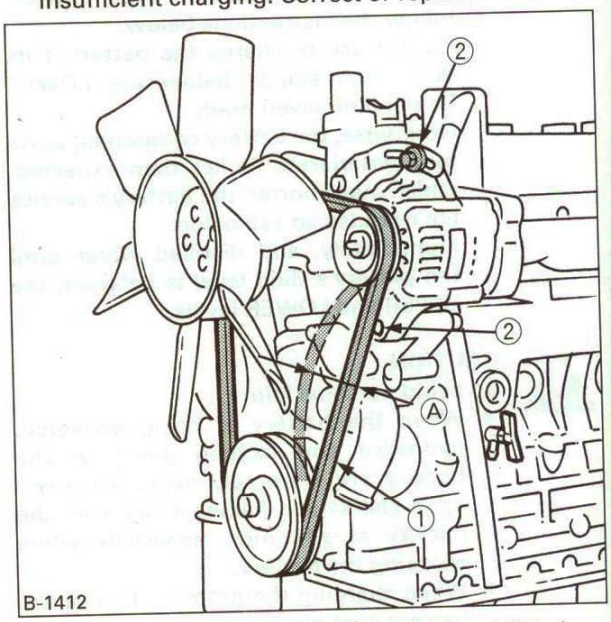
■ Adjusting Fan Belt Tension

CAUTION
To avoid personal injury:
- **Be sure to stop the engine and remove the key before checking the belt tension.**
- **Be sure to reinstall the detached safety shield after maintenance or checking.**

Proper fan belt tension	A deflection of between 7 to 9 mm (0.28 to 0.35 in.) when the belt is pressed in the middle of the span.

1. Stop the engine and remove the key.
2. Apply moderate thumb pressure to belt between pulleys.
3. If tension is incorrect, loosen the alternator mounting bolts and, using a lever placed between the alternator and the engine block, pull the alternator out until the deflection of the belt falls within acceptable limits.
4. Replace fan belt if it is damaged.

IMPORTANT:
- If belt is loosen or damaged and the fan is damaged, it could result in overheats or insufficient charging. Correct or replace belt.



(1) Fan belt
(2) Bolt and nut
(A) 7 to 9 mm (0.28 to 0.35 in.) (under load of 10 kgf (22.1 lbs))

CARRIAGE AND STORAGE

CARRIAGE

CAUTION
To avoid personal injury:
- **Fix the engine securely not to fall during operation.**
- **Do not stand near or under the engine while carrying it.**
- **The engine is heavy. In handling it, be very alert not to get your hands and body caught in.**

1. Use carrier such as crane when carrying the engine, or hurt your waist and yourself. Support the engine securely with rope not to fall while carrying it.
2. When lifting the engine, put the hook securely to metal fittings attached to the engine. Use strong hook and fittings enough to hang the engine.

STORAGE

CAUTION
To avoid personal injury:
- **Do not clean the machine with engine running.**
- **To avoid the danger of exhaust fume poisoning, do not operate the engine in a closed building without proper ventilation.**
- **When storing the engine just after running, let the engine cool off.**

Before storing the engine for more than a few months, remove any dirt on the machine, and:

1. Drain the coolant in the radiator. Open the cock at the bottom of the radiator, and remove the pressure cap to drain water completely. Leave the cock open. Hang a note written "No water" on the pressure cap. Since water may freeze when the temperature drops below 0°C (32°F), it is very important that no water is left in the machine.
2. Remove dirty engine oil, fill with new oil and run the engine for about 5 minutes to let the oil penetrate to all the parts.
3. Check all the bolts and nuts, and tighten if necessary.
4. Remove the battery from the engine, adjust the electrolyte level, and recharge it. Store the battery in a dry and dark place.
5. When the engine is not used for a long period of time, run it for about 5 minutes under no load every 2-3 months to keep it free from rust. If the engine is stored without any running, moisture in the air may condense into dew over the sliding parts of the engine, resulting in rust there.
6. If you forget to run the engine for longer than 5-6 months, apply enough engine oil to the valve guide and valve stem seal and make sure the valve works smoothly before starting the engine.
7. Store the engine in a flat place and remove the key from engine.
8. Do not store the engine in a place where has flammable materials such as dry grass or straw.
9. When covering the engine for storage, let engine and muffler cool off completely.
10. Operate the engine after checking and repairing damaged wirings or pipes, and clearing flammable materials carried by mouse.

TROUBLESHOOTING

If the engine does not function properly, use the following chart to identify and correct the cause.

■ When it is difficult to start the engine.

Cause	Countermeasures
Fuel is thick and doesn't flow.	✻ Check the fuel tank and fuel filter. Remove water, dirt and other impurlities. ✻ As all fuel will be filtered by the filter, if there should be water or other foreign matters on the filter, clean the filter with kerosene.
Air or water mixed in fuel sistem	✻ If air is in the fuel filter or injection lines, the fuel pump will not work properly. To attain proper fuel injection pressure, check carefully for loosened fuel line coupling, loose cap nut, etc. ✻ Loosen joint bolt stop fuel filter and air vent screws of fuel injection pump to eliminate all the air in the fuel system.
Thick carbon deposits on orifice of injection nozzle.	✻ This is caused when water or dirt is mixed in the fuel. Clean the nozzle injection piece, being careful not to damege the orifice. ✻ Check to see if nozzle is working properly or not. If not, install a new nozzle.
Valve clearance is wrong.	✻ Adjust valve clearance to 0.145 to 0.185 mm (0.0057 to 0.0072 in.) when the engine is cold.
Leaking valves	✻ Grind valves.
Fuel injection timing is wrong.	✻ Adjust injection timing ✻ The injection timing 16.5° before top dead center.
Engine oil becomes thick in cold weather and engine cranks slow.	✻ Change grade of oil according to the weather (temperature.)
Low compression	✻ Bad valve or excessive wear of rings, pistons and liners cause insufficient compression. Replace with new parts.
Battery is discharged and the engine will not crank.	✻ Charge battery. ✻ In winter, always remove battery from machine, charge fully and keep indoors. Install in machine at time of use.

■ When output is insufficient

Cause	Countermeasures
Carbon stuck around orifice of nozzle piece	✻ Clean orifice and needle valve, being very careful not to damage the nozzle orifice. ✻ Check nozzle to see if good. If not, replace with new parts.
Compression is insufficient. Leaking valves	✻ Bad valve and excessive wear of rings, pistons and liners cause insufficient compression. Replace with new parts. ✻ Grind valves.
Fuel is insufficient.	✻ Check fuel system.
Overheating of moving parts	✻ Check lubricating oil system. ✻ Check to see if lubricating oil filter is working properly. ✻ Filter element deposited with impurities would cause poor lubrication. Change element. ✻ Check the clearance of bearing are within factory specs. ✻ Check injection timing.
Valve clearance is wrong.	✻ Adjust to proper valve clearance of 0.145 to 0.185 mm (0.0057 to 0.0072 in.) with engine cold.
Air cleaner is dirty	✻ Clean the element every 100 hours of operation.
Fuel injection pressure is wrong.	✻ Adjust to proper pressure. 13.7 Mpa (140kgf/cm², 1991psi)
Injection pump wear	✻ Do not use poor quality fuel as it will cause wear of the pump. Only use No.2-D diesel fuel. ✻ Check the fuel injection pump element and delivery valve assembly and replace as necessary.

NOTE:

- If the cause of trouble cannot be found, contact your KUBOTA Dealer.

■ When engine suddenly stops

Cause	Countermeasures
Lack of fuel	✻ Check the fuel tank and refill the fuel, if necessary. ✻ Also check the fuel system for air or leaks.
Bad nozzle	✻ If necessary, replace with a new nozzle.
Moving parts are overheated due to shortage of lubrication oil or improper lubrication.	✻ Check amount of engine oil with oil level gauge. ✻ Check lubricating oil system. ✻ At every 2 times of oil change, oil filter cartridge should be replaced. ✻ Check to see if the engine bearing clearances is within factory specs.

■ When color of exhaust is especially bad

Cause	Countermeasures
Fuel governing device bad	✻ Contact dealer for repairs.
Fuel is of extremely poor quality.	✻ Select good quality fuel Use No. 2-D diesel fuel only.
Nozzle is bad.	✻ If necessary, replace with new nozzle.
Combustion is incomplete.	✻ Cause is poor atomization, improper injection timing, etc. Because of trouble in injection system or in poor valve adjustment, or compression leakage, poor compression, etc. Check for the cause.

■ When engine must be stopped immediately

Cause	Countermeasures
Engine revolution suddenly decreases or increases.	✻ Check the adjustments, injection timing and the fuel system.
Unusual sound is heard suddenly.	✻ Check all moving parts carefully.
Color of exhaust suddenly turns dark.	✻ Check the fuel injection system, especially the fuel injection nozzle.
Bearing parts are overheated.	✻ Check the lubricating system.
Oil lamp lights up during operation.	✻ Check lubricating system. ✻ Check , if the engine bearing clearances are within factory specs. ✻ Check the function of the relieve valve in the lubricating system. ✻ Check pressure switch. ✻ Check filter base gasket.

■ When engine overheats

Cause	Countermeasures
Engine oil insufficient	✻ Check oil level. Replenish oil as required.
Fan belt broken or elongated	✻ Change belt or adjust belt tension.
Coolant insufficient	✻ Replenish coolant.
Excessive concentration of antifreeze	✻ Add water only or change to coolant with the specified mixing ratio.
Radiator net or radiator fin clogged with dust	✻ Clean net or fin carefully.
Inside of radiator or coolant flow route corroded	✻ Clean or replace radiator and parts.
Fan or radiator or radiator cap defective	✻ Replace defective part.
Thermostat defective	✻ Check thermostat and replace if necessary.
Temperature gauge or sensor defective	✻ Check temperature with thermometer and replace if necessary.
Overload running	✻ Reduce load.
Head gasket defective or water leakage	✻ Replace parts.
Incorrect injection timing	✻ Adjust to proper timing.
Unsuitable fuel used	✻ Use the specified fuel.

SPECIFICATIONS

Model	D905-EBG1	D905-EBG2	D1005-EBG1	D1005-EBG2	D1105-EBG1	D1105-EBG2
Type	Vertical, water-cooled, 4-cycle diesel engine					
Number of cylinders	3					
Bore and stroke mm (in.)	72×73.6 (2.83×2.90)		76×73.6 (2.99×2.90)		78×78.4 (3.07×3.09)	
Total displacement L (cu.in.)	0.898 (54.80)		1.001 (61.08)		1.123 (68.53)	
Combustion chamber	Spherical Type (E-TVCS)					
SAE NET Continuous H.P. (SAEJ1349) kW / min^{-1}(rpm) (HP / min^{-1}(rpm))	7.8 / 1800 (10.5 / 1800)	6.5 / 1500 (8.8 / 1500)	8.6 / 1800 (11.6 / 1800)	7.2 / 1500 (9.7 / 1500)	10.1 / 1800 (13.6 / 1800)	8.4 / 1500 (11.3 / 1500)
SAE Standby H.P. (SAEJ1349) kW / min^{-1}(rpm) (HP / min^{-1}(rpm))	8.8 / 1800 (11.9 / 1800)	7.3 / 1500 (9.9 / 1500)	9.7 / 1800 (13.1 / 1800)	8.2 / 1500 (11.0 / 1500)	11.4 / 1800 (15.4 / 1800)	9.5 / 1500 (12.8 / 1500)
Maximum bare speed min^{-1}(rpm)	1890	1575	1890	1575	1890	1575
Minimum bare idling speed min^{-1}(rpm)	800~900					
Order of firing	1–2–3					
Direction of rotation	Counter-clockwise (viewed from flywheel side)					
Injection pump	Bosch MD Type Mini Pump					
Injection pressure	140 kgf / cm^2 (13.73 MPa, 1991 psi)					
Injection timing (Before T.D.C)	16.5°					
Compression ratio	22 : 1					
Fuel	Diesel Fuel No.2-D (ASTM D975)					
Lubricant (API classification)	above CD grade					
Dimensions (length × width × height) mm (in.)	549.3×398×608.7 (21.63×15.67×23.96)					
Dry weight kg (lbs.)	110 (242.5)					
Starting system	Cell starter (with glow plug)					
Starting motor	12 V, 1.0 kW					
Charging generator	12 V, 360 W					
Recommended battery capacity	12 V, 65 AH, equivalent					

NOTE:

- Model EBG1 is 1800rpm for 60Hz, EBG2 is 1500rpm for 50Hz.
- Flywheel type is SAE clutch No. 6-1/2 or its equivalent.
- Flywheel housing type is SAE No. 5 or its equivalent.
- Governor drop is within 5%
- Continuous will operate at the stated rating continuously and have a 10% overload capability for one hour in 12 hours.
- Standby will operate at the stated full rating for one hour in 12 hours. No overload capacity is specified for this rating.
- **Specifications are subject to change without notice.**

V1305-EBG1	V1305-EBG2	V1505-EBG1	V1505-EBG2
Vertical, water-cooled, 4-cycle diesel engine			
4			
76×73.6 (2.99×2.90)		78×78.4 (3.07×3.09)	
1.335 (81.47)		1.498 (91.41)	
Spherical Type (E-TVCS)			
11.5 / 1800 (15.5 / 1800)	9.6 / 1500 (12.9 / 1500)	13.3 / 1800 (17.9 / 1800)	11.1 / 1500 (14.9 / 1500)
13.0 / 1800 (17.5 / 1800)	10.8 / 1500 (14.6 / 1500)	15.0 / 1800 (20.2 / 1800)	12.5 / 1500 (16.8 / 1500)
1890	1575	1890	1575
800~900			
1–3–4–2			
Counter-clockwise (viewed from flywheel side)			
Bosch MD Type Mini Pump			
140 kgf / cm^2 (13.73 MPa, 1991 psi)			
16.5°			
22 : 1			
Diesel Fuel No.2-D (ASTM D975)			
above CD grade			
634.3×398×613.7 (24.97×15.67×24.16)			
127 (280.0)			
Cell starter (with glow plug)			
12 V, 1.2 kW			
12 V, 360 W			
12 V, 70 AH, equivalent			

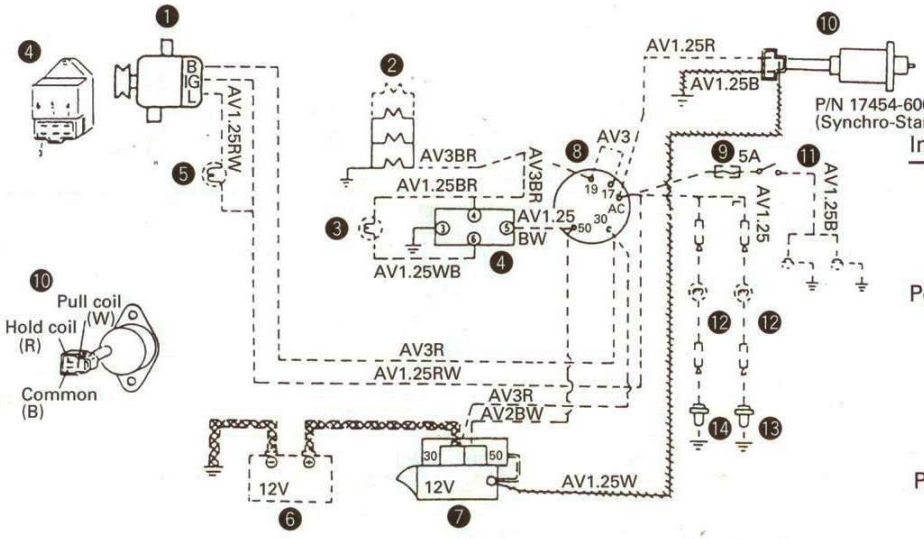
NOTE:

- Model EBG1 is 1800rpm for 60Hz, EBG2 is 1500rpm for 50Hz.
- Flywheel type is SAE clutch No. 6-1/2 or its equivalent.
- Flywheel housing type is SAE No. 5 or its equivalent.
- Governor drop is within 5%
- Continuous will operate at the stated rating continuously and have a 10% overload capability for one hour in 12 hours.
- Standby will operate at the stated full rating for one hour in 12 hours. No overload capacity is specified for this rating.
- **Specifications are subject to change without notice.**

WIRING DIAGRAMS

■ D905-EBG, D1005-EBG, D1105-EBG, V1205-EBG, V1305-EBG, V1505-EBG, V1505-T-EBG,

(STANDARD MODEL)



Inner connection of key switch ❽

- New recommended P/N 15248-63592

terminal No.

Position	19	30		50	AC
0					
1					
2					
3					

- Old P/N 66711-55132

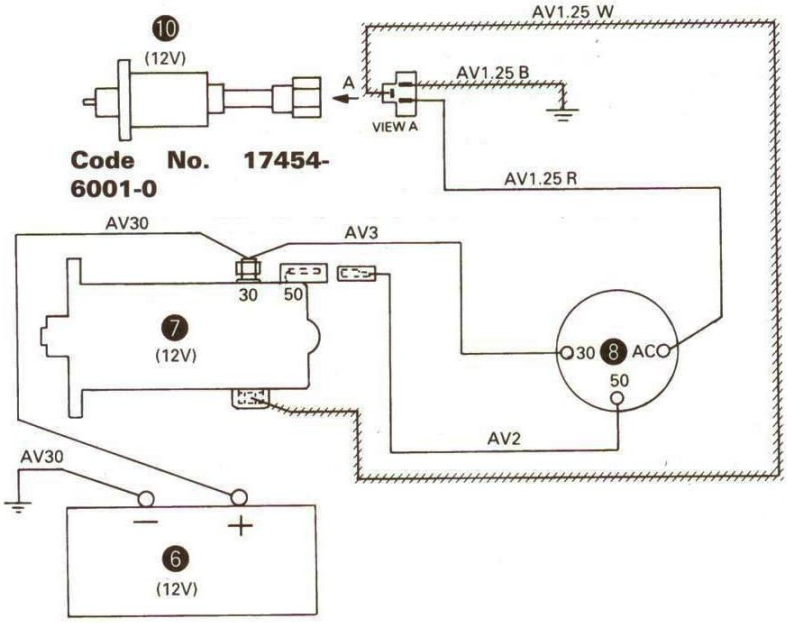
terminal No.

Position	19	30	17	50	AC
3					
0					
1					
2					

NOTE: Solenoid. Energize to run.

NOTE: " ⟿ " Total length is 1 m or less.

■ Option Solenoid Energize to run



Code No. 17454-6001-0

NOTE: " ⟿ " Total length is 1 m or less.

❶ *Alternator*
❷ *Glow plug*
❸ *Lamp*
❹ *Lampe timer (Option)*
❺ *Charge lamp (3.4W or less)*
❻ *Battery*
❼ *Starter*
❽ *Key switch**
❾ *Fuse*
❿ *Solenoid (Option)*
⓫ *Switch*
⓬ *Oil lamp (3.4W or less)*
⓭ *Oil switch*
⓮ *Water temp. Switch*
⓯ *Relay*

	CORD COLOR
B	Black
L	Blue
R	Red
W	White