SERVICING

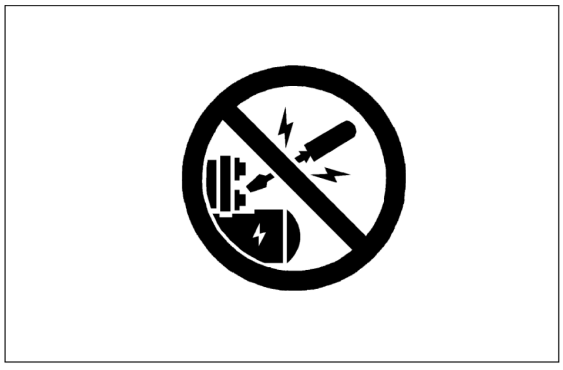
CONTENTS

1. GENERAL S-1
   [1] ENGINE IDENTIFICATION S-1
      (1) Model Name and Engine Serial Number S-1
      (2) Cylinder Number S-2
   [2] GENERAL PRECAUTION S-3
   [3] TIGHTENING TORQUES S-4
      (1) Tightening Torques for Special Use Screws, Bolts and Nuts S-4
      (2) Tightening Torques for General Use Screws, Bolts and Nuts S-4
   [4] TROUBLESHOOTING S-5
   [5] SERVICING SPECIFICATIONS S-8
   [6] MAINTENANCE CHECK LIST S-16
   [7] CHECK AND MAINTENANCE S-18
      (1) Daily Check Points S-18
      (2) Check Points of Initial 50 Hours S-20
      (3) Check Points of Every 50 Hours S-21
      (4) Check Points of Every 100 Hours S-22
      (5) Check Point of Every 150 Hours S-24
      (6) Check Points of Every 200 Hours S-26
      (7) Check Points of Every 400 hours S-28
      (8) Check Points of Every 500 Hours S-29
      (9) Check Points of Every 1 or 2 Months S-32
      (10)Check Point of Every Year S-33
      (11)Check Point of Every 800 Hours S-34
      (12)Check Points of Every 1500 Hours S-35
      (13)Check Points of Every 3000 Hours S-37
      (14)Check Points of Every 2 Years S-38
   [8] SPECIAL TOOLS S-42
2. ENGINE BODY S-50
   [1] CHECKING AND ADJUSTING S-50
   [2] DISASSEMBLING AND ASSEMBLING S-52
      (1) Draining Oil and Coolant S-52
      (2) External Components S-52
      (3) Cylinder Head and Valves S-53
      (4) Timing Gears, Camshaft and Fuel Camshaft S-57
      (5) Piston and Connecting Rod S-63
      (6) Crankshaft S-66
   [3] SERVICING S-69
      (1) Cylinder Head and Valves S-69
      (2) Timing Gears, Camshaft and Fuel Camshaft S-75
      (3) Piston and Connecting Rod S-79
      (4) Crankshaft S-82
      (5) Cylinder S-88
3. LUBRICATING SYSTEM S-90
   [1] CHECKING S-90
   [2] SERVICING S-91
4. COOLING SYSTEM S-92
   [1] CHECKING AND ADJUSTING S-92

KiSC issued 04, 2006 A

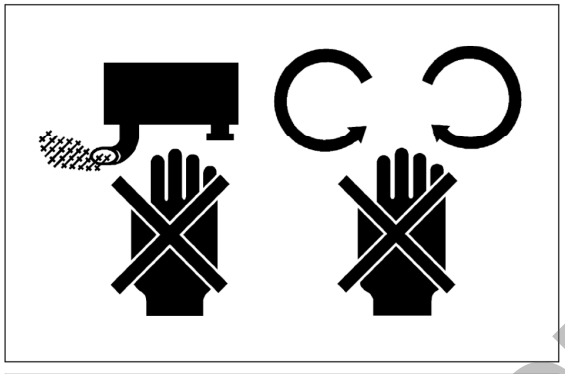
PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com



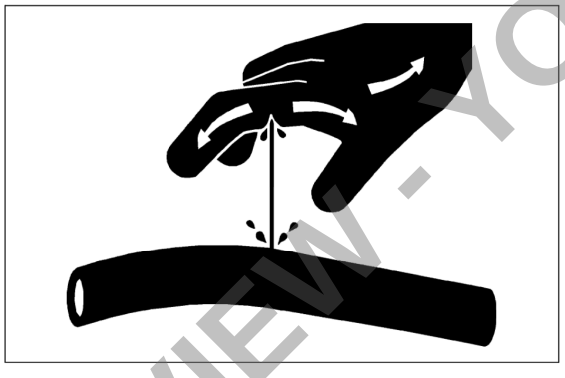
SAFETY STARTING

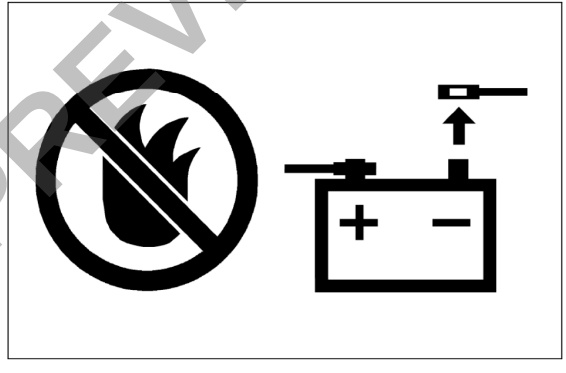
- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Unauthorized modifications to the engine may impair the function and / or safety and affect engine life.



SAFETY WORKING

- Do not work on the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- Wear close fitting clothing and safety equipment appropriate to the job.
- Use tools appropriate to the work. Makeshift tools, parts, and procedures are not recommended.
- When servicing is performed together by two or more persons, take care to perform all work safely.
- Do not touch the rotating or hot parts while the engine is running.
- Never remove the radiator cap while the engine is running, or immediately after stopping. Otherwise, hot water will spout out from radiator. Only remove radiator cap when cool enough to touch with bare hands. Slowly loosen the cap to first stop to relieve pressure before removing completely.
- Escaping fluid (fuel or hydraulic oil) under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic or fuel lines. Tighten all connections before applying pressure.
- Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.





AVOID FIRES

- Fuel is extremely flammable and explosive under certain conditions. Do not smoke or allow flames or sparks in your working area.
- To avoid sparks from an accidental short circuit, always disconnect the battery negative cable first and connect it last.
- Battery gas can explode. Keep sparks and open flame away from the top of battery, especially when charging the battery.
- Make sure that no fuel has been spilled on the engine.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

SPECIFICATIONS

Model		D1503-M	D1703-M	D1803-M
Number of Cylinders		3		
Type		Vertical, Water-cooled, 4 cycle diesel engine		
Bore × Stroke		83 × 92.4 mm (3.27 × 3.64 in.)	87 × 92.4 mm (3.43 × 3.64 in.)	87 × 102.4 mm (3.43 × 4.03 in.)
Total Displacement		1499 cm^3 (91.47 cu.in.)	1647 cm^3 (100.51 cu.in.)	1826 cm^3 (111.43 cu.in.)
ISO Net Cont.		20.4 kW / 2800 min^{-1} (rpm) (27.4 HP / 2800 min^{-1} (rpm))	22.4 kW / 2800 min^{-1} (rpm) (30.0 HP / 2800 min^{-1} (rpm))	23.3 kW / 2600 min^{-1} (rpm) (31.2 HP / 2600 min^{-1} (rpm))
ISO/SAE Net Intermittent		23.5 kW / 2800 min^{-1} (rpm) (31.5 HP / 2800 min^{-1} (rpm))	25.7 kW / 2800 min^{-1} (rpm) (34.5 HP / 2800 min^{-1} (rpm))	26.9 kW / 2600 min^{-1} (rpm) (36.1 HP / 2600 min^{-1} (rpm))
SAE Gross Intermittent		24.9 kW / 2800 min^{-1} (rpm) (33.4 HP / 2800 min^{-1} (rpm))	27.4 kW / 2800 min^{-1} (rpm) (36.7 HP / 2800 min^{-1} (rpm))	28.4 kW / 2600 min^{-1} (rpm) (38.1 HP / 2600 min^{-1} (rpm))
Maximum Bare Speed		3000 min^{-1} (rpm)		2800 min^{-1} (rpm)
Minimum Bore Idling Speed		750 to 850 min^{-1} (rpm)		
Combustion Chamber		Spherical Type (E-TVCS)		
Fuel Injection Pump		Bosch Type Mini Pump		
Governor		All speed mechanical governor		
Direction of Rotation		Counter-Clockwise (viewed from flywheel side)		
Injection Nozzle		Bosch Throttle Type Mini Nozzle (OPD)		
Injection Timing		0.314 rad (18 °) before T.D.C.		
Firing Order		1-2-3		
Injection Pressure		13.73 MPa (140 kgf/cm^2, 1991 psi)		
Compression Ratio		23 : 1	22.6 : 1	23.8 : 1
Lubricating System		Forced Lubrication by Trochoid Pump		
Oil Pressure Indicating		Electrical type switch		
Lubricating Filter		Full flow paper filter (cartridge type)		
Cooling System		Pressurized radiator, forced circulation with water pump		
Starting System		Electric Starting with Starter		
Starting Motor		12 V, 1.4 kW		12 V, 2.0 kW
Starting Support Device		By Glow Plug in Combustion Chamber		
Battery		12 V, 60 AH, equivalent		12 V, 88 AH, equivalent
Charging Alternator		12 V, 480 W		
Fuel		Diesel Fuel No.2-D (ASTM D975)		
Lubricating Oil		Class CF lubricating oil as per API classification is recommended. If this class of lubricating oil is not available, preferably use Class CD or CE lubricating oil. For details on recommended lubricating oils, see page S-17, 20.		
Lubricating Oil Capacity	Oil Pan Depth 90 mm (3.54 in.)	5.6 L (1.48 U.S.gals)		
	Oil Pan Depth 124 mm (4.88 in.)	7.0 L (1.85 U.S.gals)		
Weight (Dry)		148 kg (326 lbs)		151 kg (333 lbs)

* The specification described above is of the standard engine of each model.
* Conversion Formula : HP = 0.746 kW, PS = 0.7355 kW

W10275180

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

[4] TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	No fuel	Replenish fuel	–
	Air in the fuel system	Vent air	S-19
	Water in the fuel system	Change fuel and repair or replace fuel system	S-19, 20, 24
	Fuel hose clogged	Clean or replace	S-19
	Fuel filter clogged	Replace	S-20, 24
	Excessively high viscosity of fuel or engine oil at low temperature	Use specified fuel or engine oil	–
	Fuel with low cetane number	Use specified fuel	–
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	S-42
	Incorrect injection timing	Adjust	S-82
	Fuel camshaft worn	Replace	S-51
	Injection nozzle clogged	Clean or replace	S-83
	Injection pump malfunctioning	Repair or replace	S-46
	Seizure of crankshaft, camshaft, piston, cylinder or bearing	Repair or replace	–
	Compression leak from cylinder	Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder	–
	Improper valve timing	Correct or replace timing gear	S-50
	Piston ring and cylinder worn	Replace	S-40, 53, 68, 75
	Excessive valve clearance	Adjust	S-30
	Stop solenoid mulfunctining	Replace	
(Starter Does Not Run)	Battery discharged	Charge	S-28
	Starter malfunctioning	Replace	S-84, 88, 91
	Key switch malfunctioning	Repair or replace	–
	Wiring disconnected	Connect	S-95
Engine Revolution Is Not Smooth	Fuel filter clogged or dirty	Replace	S-20, 24
	Air cleaner clogged	Clean or replace	S-20
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	S-42
	Injection pump malfunctioning	Repair or replace	S-46
	Incorrect nozzle injection pressure	Adjust	S-83
	Injection nozzle stuck or clogged	Repair or replace	S-83
	Governor malfunctioning	Repair	S-47, 48, 51

W1014322

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

[6] MAINTENANCE CHECK LIST

To maintain long-lasting and safe engine performance, make it a rule to carry out regular inspections by following the table below.

Item		Service Interval Every 50 hrs	100 hrs	150 hrs	200 hrs	400 hrs	500 hrs	1 or 2 months	1 year	800 hrs	1500 hrs	3000 hrs	2 years	Reference page
* Checking fuel hoses and clamp bands														S-19
Changing Engine oil (depending on the oil pan)	(1) Oil pan depth (90 mm 3.54 in.)													S-21, 22
	(2) Oil pan depth (124 mm 4.88 in.)													S-22
* Cleaning air cleaner element (Replace the element after 6-times cleanings)														S-20
* Cleaning fuel filter (Element type)														S-20
Checking battery electrolyte level														S-20
Checking fan belt tension and damage														S-21
Replacing oil filter cartridge	(1) Oil pan depth (90 mm 3.54 in.)													S-23, 24
	(2) Oil pan depth (124 mm 4.88 in.)													S-24
Checking radiator hoses and clamp bands														S-23
* Checking intake air line														S-23
Replacing fuel filter cartridge														S-24
Cleaning water jacket and radiator interior														S-25
Replacing fan belt														S-27
Recharging battery														S-28
* Replacing air cleaner element														S-20
Checking valve clearance														S-30
* Checking injection nozzle pressure														S-31
* Checking injection pump														–
* Replacing intake air line														S-23
Replacing battery														–
Replacing radiator hoses and clamp bands														S-23
* Replacing fuel hoses and clamp bands														S-19
Changing radiator coolant (L.L.C.)														S-25

Change engine oil and replace oil filter cartridge after the first 50 hours of operation.

* 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.

W1029462

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

[3] TIGHTENING TORQUES

Screws, bolts and nuts must be tightened to the specified torque using a torque wrench, several screws, bolts and nuts such as those used on the cylinder head must be tightened in proper sequence and the proper torque.

(1) Tightening Torques for Special Use Screws, Bolts and Nuts

NOTE

- **For "*" marked screws, bolts and nuts on the table, apply engine oil to their threads and seats before tightening.**
- **The letter "M" in Size x Pitch means that the screw, bolt or nut dimension stands for metric. The size is the nominal outside diameter in mm of the threads. The pitch is the nominal distance in mm between two threads.**

Item	Size x Pitch	N·m	kgf·m	ft-lbs
Cylinder head cover screw	M6 × 1.0	6.9 to 11.3	0.7 to 1.15	5.1 to 8.32
* Cylinder head screw	M11 × 1.25	93.2 to 98.1	9.5 to 10.0	68.7 to 72.3
* Main bearing case screw 1	M9 × 1.25	46.1 to 51.0	4.7 to 5.2	34.0 to 37.6
* Main bearing case screw 2	M10 × 1.25	68.6 to 73.5	7.0 to 7.5	50.6 to 54.2
* Flywheel screw	M12 × 1.25	98.1 to 107.9	10.0 to 11.0	72.3 to 79.6
* Connecting rod screw	M8 × 1.0	44.1 to 49.0	4.5 to 5.0	32.5 to 36.2
* Rocker arm bracket screw	M8 × 1.25	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
* Idle gear shaft screw	M8 × 1.25	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Fan drive pulley mounting nut	M30 × 1.5	137.3 to 156.9	14.0 to 16.0	101.3 to 115.7
* Bearing case cover screw	M8 × 1.25	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Glow plug	M10 × 1.25	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Nozzle holder assembly	M20 × 1.5	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Oil Switch taper screw	PT 1/8	14.7 to 19.6	1.5 to 2.0	10.8 to 14.5
Injection pipe retaining nut	M12 × 1.5	24.5 to 34.3	2.5 to 3.5	18.1 to 25.3
Overflow pipe assembly retaining nut	–	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Camshaft set screw	M8 × 1.25	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Hi-idling body	M14 × 1.0	44.1 to 49.0	4.5 to 5.0	32.6 to 36.3
Balancer shaft set bolt	M8 × 1.25	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3

W1013236

(2) Tightening Torques for General Use Screws, Bolts and Nuts

Grade / Nominal Diameter / Unit	Standard Screw and Bolt ④			Special Screw and Bolt ⑦		
	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
M6	7.9 to 9.3	0.80 to 0.95	5.8 to 6.9	9.8 to 11.3	1.00 to 1.15	7.23 to 8.32
M8	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
M10	39.2 to 45.1	4.0 to 4.6	28.9 to 33.3	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
M12	62.8 to 72.6	6.4 to 7.4	46.3 to 53.5	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5

W10371750

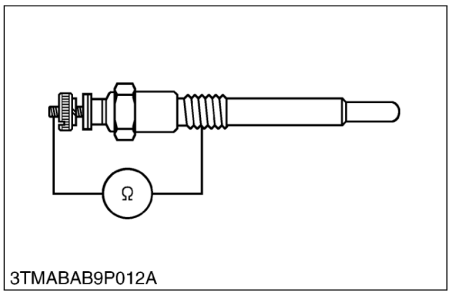
Screw and bolt material grades are shown by numbers punched on the screw and bolt heads. Prior to tightening, be sure to check out the numbers as shown below.

Punched number	Screw and bolt material grade
None or 4	Standard screw and bolt SS400, S20C
7	Special screw and bolt S43C, S48C (Refined)

W1012705

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com



3TMABAB9P012A

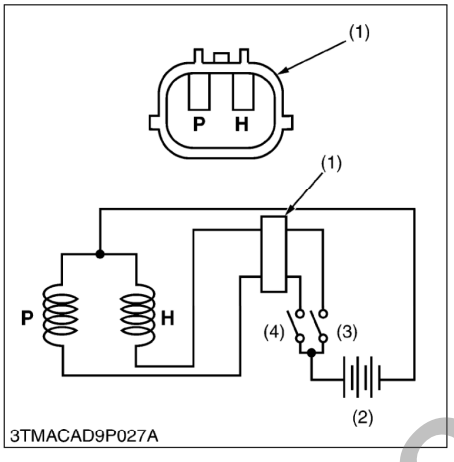
Glow Plug Continuity

1. Remove the glow plug.
2. Measure the resistance with a circuit tester between the glow plug terminal and the glow plug housing.
3. If the factory specification is not indicated, glow plug is faulty.

Resistance	Factory spec.	Approx. 0.9 Ω

0000010726E

(4) Engine Stop Solenoid



3TMACAD9P027A

Engine Stop Solenoid

1. Remove the engine stop solenoid from the engine.
2. Connect the jumper leads from the pulling coil **P** terminal to the switch (3), and from switch (3) to the battery positive terminal.
3. Connect the jumper leads from the holding coil **H** terminal to the switch (4), and from switch (4) to the battery positive terminal.
4. Connect the jumper leads from the engine stop solenoid body to the battery negative terminal.
5. When switch (4) is turn on, the plunger pull into the solenoid body and then turn off the switch (4), the plunger comes out.
6. Turn on the switch (3) then turn on the switch (4), the plunger pull into the solenoid body and it keep in holding position after turn off the switch (4).
7. If the plunger is not attracted, the engine stop solenoid is faulty.

IMPORTANT

- **Never apply the current for pulling coil more than two seconds when inspecting.**

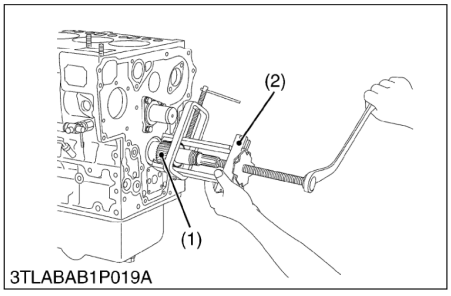
(1) Connector
(2) Battery
(3) Switch for Holding Coil
(4) Switch for Pulling Coil

P : Terminal for Pulling Coil
H : Terminal for Holding Coil

W1020600

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com



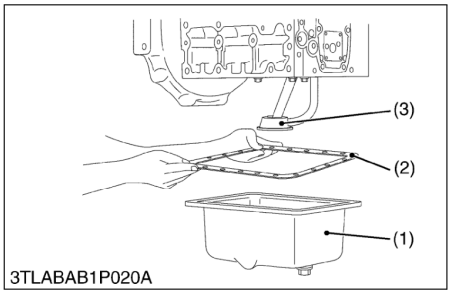
Crank Gear

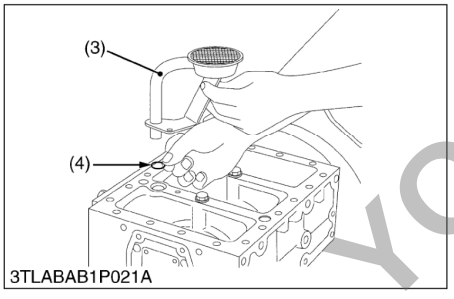
1. Draw out the crank gear (1) with a puller (2).
2. Remove the feather key.

(1) Crank Gear (2) Gear Puller

W1025476

(5) Piston and Connecting Rod





Oil Pan and Oil Strainer

1. Remove the oil pan mounting screws.
2. Remove the oil pan (1) by lightly tapping the rim of the pan with a wooden hammer.
3. Remove the oil pan gasket (2).
4. Remove the oil strainer (3) and O-ring (4).

(When reassembling)

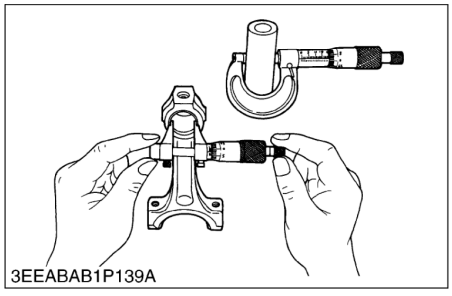
- After cleaning the oil strainer (3), check to see that the filter mesh in clean, and install it.
- Visually check the O-ring (4), apply engine oil, and install it.
- Securely fit the O-ring (4) to the oil strainer (3).
- Apply a liquid gasket (Three Bond 1215 or equivalent) to the oil pan side of the oil pan gasket (2).
- To avoid uneven tightening, tighten oil pan mounting screws in diagonal order from the center.

(1) Oil Pan (3) Oil Strainer
(2) Oil Pan Gasket (4) O-ring

W1025687

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com


3EEABAB1P139A

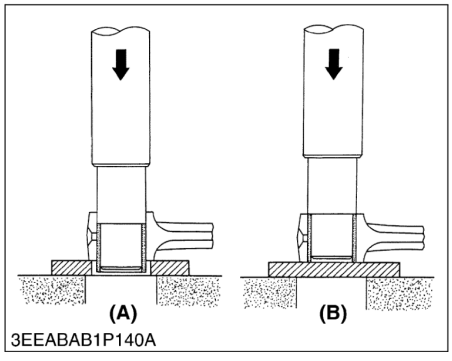
Oil Clearance between Piston Pin and Small End Bushing

1. Measure the piston pin O.D. where it contacts the bushing with an outside micrometer.
2. Measure the small end bushing I.D. with an inside micrometer, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit, replace the bushing. If it still exceeds the allowable limit, replace the piston pin.

Oil clearance between piston pin and small end bushing	Factory spec.	0.014 to 0.038 mm 0.00055 to 0.00150 in.
	Allowable limit	0.15 mm 0.0059 in.

Piston pin O.D.	Factory spec.	25.002 to 25.011 mm 0.98433 to 0.98469 in.
Small end bushing I.D.	Factory spec.	25.025 to 25.040 mm 0.98524 to 0.98583 in.

W1031982



3EEABAB1P140A

Replacing Connecting Rod Small End Bushing

(When removing)

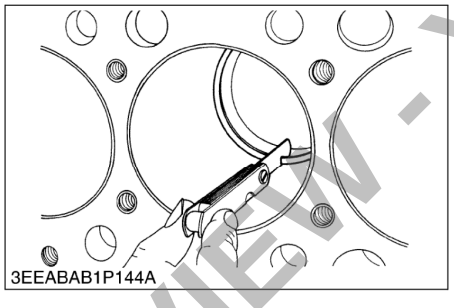
1. Press out the used small end bushing using a small end bushing replacing tool. (See page **"SPECIAL TOOLS"**.)

(When installing)

1. Clean a new small end bushing and bore, and apply engine oil to them.
2. Using a small end bushing replacing tool, press in a new bushing taking due care to see that the connecting rod oil hole matches the bushing hole.

(A) When removing **(B) When installing**

W1032140


3EEABAB1P144A

Piston Ring Gap

1. Insert the piston ring into the lower part of the liner (the least worn out part) with the piston.
2. Measure the ring gap with a feeler gauge.
3. If the gap exceeds the allowable limit, replace the ring.

Top ring	Factory spec.	D1503-M	0.20 to 0.35 mm 0.0079 to 0.0138 in.
		D1703-M D1803-M V2203-M V2403-M	0.20 to 0.40 mm 0.0079 to 0.0157 in.
	Allowable limit		1.25 mm 0.0492 in.

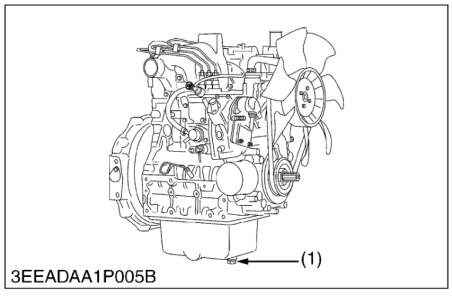
Second ring	Factory spec.	0.30 to 0.45 mm 0.0118 to 0.0177 in.
	Allowable limit	1.25 mm 0.0492 in.

Oil ring	Factory spec.	0.25 to 0.45 mm 0.0098 to 0.0177 in.
	Allowable limit	1.25 mm 0.0492 in.

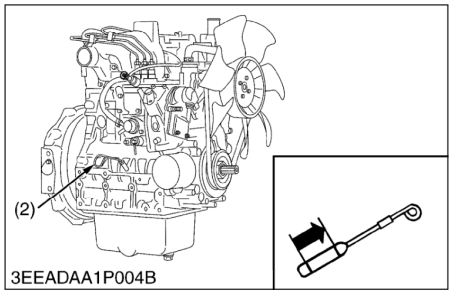
W1032246

PREVIEW - YOUFIXTHIS.COM
Download full manual at youfixthis.com

(6) Check Points of Every 200 Hours



3EEADAA1P005B



3EEADAA1P004B

Changing Engine Oil (for 124 mm (4.88 in.) Depth Oil Pan)

CAUTION

- **Be sure to stop engine before changing engine oil.**

1. Start and warm up the engine for approx. 5 minutes.
2. Place an oil pan underneath the engine.
3. To drain the used oil, remove the drain plug (1) at the bottom of the engine and drain the oil completely.
4. Screw the drain plug (1).
5. Fill new oil up to upper line on the dipstick (2).

IMPORTANT

- **When using an oil of different maker or viscosity from the previous one, remove all of the old oil.**
- **Never mix two different types of oil.**
- **Engine oil should have properties of API classification CD/CE/CF/CF-4/CG-4.**
- **Use the proper SAE Engine Oil according to ambient temperature.**

Above 25 °C (77 °F)	SAE 30 or SAE 10W-30 SAE 10W-40
0 °C to 25 °C (32 °F to 77 °F)	SAE 20 or SAE 10W-30 SAE 10W-40
Below 0 °C (32 °F)	SAE 10W or SAE 10W-30 SAE 10W-40

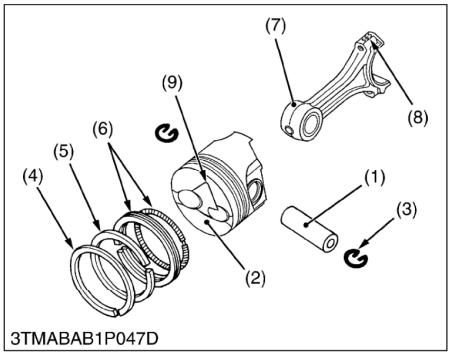
Models	Oil pan depth	
	124 mm (4.88 in.)	*90 mm (3.54 in.)
D1503-M D1703-M D1803-M	7.0 L 1.85 U.S.gals	5.6 L 1.48 U.S.gals
V2203-M V2403-M	9.5 L 2.51 U.S.gals	7.6 L 2.01 U.S.gals

*90 mm (3.54 in.) oil pan depth is optional.

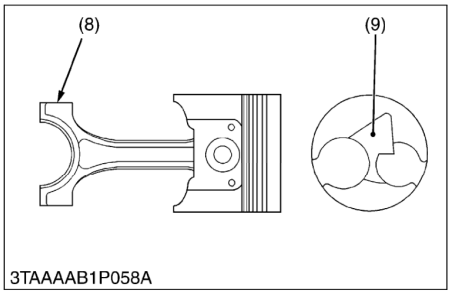
(1) Drain Plug (2) Dipstick

W1022765

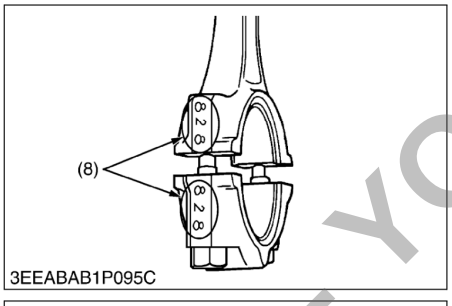
PREVIEW - YOUFIXTHIS.COM
Download full manual at youfixthis.com



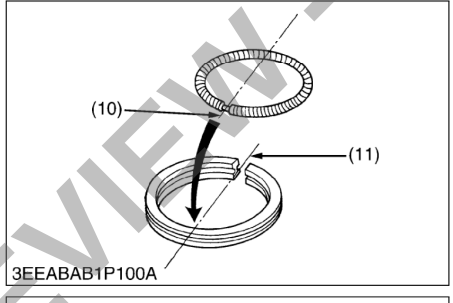
3TMABAB1P047D



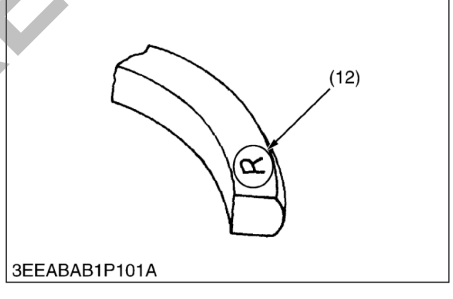
3TAAAAB1P058A



3EEABAB1P095C



3EEABAB1P100A



3EEABAB1P101A

Piston Ring and Connecting Rod

1. Remove the piston rings (4), (5), (6) using a piston ring tool.
2. Remove the piston pin (1), and separate the connecting rod (7) from the piston (2).

(When reassembling)

- When installing the rings, assemble the rings so that the manufacturer's mark (12) near the gap faces the top of the piston (2).
- When installing the oil ring (6) onto the piston (2), place the expander joint (10) on the opposite side of the oil ring gap (11).
- Apply engine oil to the piston pin.
- When installing the connecting rod (7) to the piston (2), immerse the piston (2) in 80 °C (176 °F) oil for 10 to 15 minutes and insert the piston pin (1) to the piston (2).
- When installing the connecting rod (7) to the piston (2), align the mark (8) on the connecting rod (7) to the fan-shaped concave (9).

NOTE

- **Mark the same number on the connecting rod (7) and the piston (2) so as not to change the combination.**

(1) Piston Pin
(2) Piston
(3) Piston Pin Snap Ring
(4) Top Ring
(5) Second Ring
(6) Oil Ring
(7) Connecting Rod
(8) Mark
(9) Fan-Shaped Concave
(10) Expander Joint
(11) Oil Ring Gap
(12) Manufacturer's Mark

W1026376

PREVIEW - YOUFIXTHIS.COM
Download full manual at youfixthis.com

PREVIEW ONLY

You're viewing 11 of 125 pages

The full manual includes:

- All 125 pages, complete
- Searchable PDF (find any keyword)
- No watermarks
- Instant download
- Print-ready quality

GET FULL MANUAL NOW

Kubota 03-M Series Shop Manual

Scan or click anywhere
youfixthis.com

Click anywhere on this page to get the full manual