< PRECAUTION > PRECAUTION PRECAUTIONS

Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the "SRS AIR BAG" and "SEAT BELT" of this Service Manual.

WARNING:

Always observe the following items for preventing accidental activation.

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see "SRS AIR BAG".
- Never use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

Always observe the following items for preventing accidental activation.

- When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.
- When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the battery, and wait at least 3 minutes before performing any service.

Precaution Necessary for Steering Wheel Rotation After Battery Disconnect

INFOID:000000011999089

CAUTION:

Comply with the following cautions to prevent any error and malfunction.

- Before removing and installing any control units, first turn the ignition power source and accessory power source to the OFF, then disconnect both battery cables.
- After finishing work, confirm that all control unit connectors are connected properly, then re-connect both battery cables.
- Always use CONSULT to perform self-diagnosis as a part of each function inspection after finishing work. If a DTC is detected, perform trouble diagnosis according to self-diagnosis results.

For vehicle with steering lock unit, if the battery is disconnected or discharged, the steering wheel will lock and cannot be turned.

If turning the steering wheel is required with the battery disconnected or discharged, follow the operation procedure below before starting the repair operation.

OPERATION PROCEDURE

1. Connect both battery cables. **NOTE:**

Supply power using jumper cables if battery is discharged.

- 2. Open driver door.
- Turn the ignition switch to the ON position. (At this time, the steering lock will be released.)
- 4. Turn the ignition switch to OFF position with driver door open.
- 5. Wait for 3 minutes or longer with driver door open.
 - NOTE:
 - Do not close driver door because the steering wheel locks when driver door is closed.

EM-136

[YS23DDT/YS23DDTT]

INFOID:000000011999090

PIIB3706J

- The auto acc function is adapted to this vehicle. For this reason, even when the ignition switch is turned to OFF position, the accessory power source does not turned OFF and continues to be supplied for a certain amount of time.
- Disconnect both battery cables. The steering lock will remain released with both battery cables disconnected and the steering wheel can be turned.
- 7. Perform the necessary repair operation.

< PRECAUTION >

- 8. When the repair work is completed, re-connect both battery cables. With the brake pedal released, turn the ignition switch from OFF position to ON position, then to LOCK position. (The steering wheel will lock when the ignition switch is turned to LOCK position.)
- 9. Perform self-diagnosis check of all control units using CONSULT.

Precaution for Procedure without Cowl Top Cover

When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc to prevent damage to windshield.



- Before starting work, check no fire or spark producing items are in the work area.
- Release fuel pressure before disconnecting and disassembly.
- After disconnecting pipes, plug openings to stop fuel leakage.

DRAINING ENGINE COOLANT

Drain engine coolant and engine oil when the engine is cooled.

INSPECTION, REPAIR AND REPLACEMENT

Before repairing or replacing, thoroughly inspect parts. Inspect new replacement parts in the same way, and replace if necessary.

REMOVAL AND DISASSEMBLY

- When instructed to use SST, use specified tools. Always be careful to work safely, avoid forceful or uninstructed operations.
- Exercise maximum care to avoid damage to mating or sliding surfaces.
- Dowel pins are used for several parts alignment. When replacing and reassembling parts with dowel pins, check that dowel pins are installed in the original position.
- Must cover openings of engine system with a tape or equivalent, to seal out foreign materials.
- Mark and arrange disassembly parts in an organized way for easy troubleshooting and reassembly.
 - When loosening nuts and bolts, as a basic rule, start with the one furthest outside, then the one diagonally opposite, and so on. If the order of loosening is specified, do exactly as specified. Power tools may be used in the step.

ASSEMBLY AND INSTALLATION

- Use torque wrench to tighten bolts or nuts to specification.
- When tightening nuts and bolts, as a basic rule, equally tighten in several different steps starting with the ones in center, then ones on inside and outside diagonally in this order. If the order of tightening is specified, do exactly as specified.
- Replace with new gasket, packing, oil seal or O-ring.

INFOID:00000001199909

 $\langle \mathcal{A} \rangle$

- Κ

2



EM-137

EM

F

Н

А

Thoroughly wash, clean, and air-blow each part. Carefully check engine oil or engine coolant passages for any restriction and blockage.

- Avoid damaging sliding or mating surfaces. Completely remove foreign materials such as cloth lint or dust. Before assembly, oil sliding surfaces well.
- After disassembling, or exposing any internal engine parts, change engine oil and replace oil filter with a new one.
- Release air within route when refilling after draining engine coolant.
- After repairing, start the engine and increase engine speed to check engine coolant, fuel, engine oil, and exhaust gases for leakage.

Parts Requiring Angle Tightening

- Use the angle wrench [SST: KV10112100] for the final tightening of the following engine parts:
- Camshaft sprocket (INT) bolt
- Cylinder head bolts

< PRECAUTION >

- Main bearing cap bolts
- Connecting rod cap bolts
- Crankshaft pulley bolt (No the angle wrench is required as bolt flange is provided with notches for angle tightening)
- Do not use a torque value for final tightening.
- The torque value for these parts are for a preliminary step.
- Ensure thread and seat surfaces are clean and coated with engine oil.

Liquid Gasket

REMOVAL OF LIQUID GASKET SEALING

 After removing mounting nuts and bolts, separate the mating surface using the seal cutter [SST: KV10111100] (A) and remove old liquid gasket sealing.

CAUTION:

Never damage the mating surfaces.

- Tap the seal cutter [SST: KV10111100] to insert it B, and then slide it ^C by tapping on the side as shown in the figure.
- In areas where the seal cutter [SST: KV10111100] is difficult to use, lightly tap the parts using a plastic hammer to remove it. **CAUTION:**

If for some unavoidable reason tool such as a screwdriver is used, be careful not to damage the mating surfaces.

LIQUID GASKET APPLICATION PROCEDURE

- 1. Using a scraper (A), remove old liquid gasket adhering to the liquid gasket application surface and the mating surface.
 - Remove liquid gasket completely from the groove of the liquid gasket application surface, mounting bolts, and bolt holes.
- Wipe the liquid gasket application surface and the mating sur-2. face with white gasoline (lighting and heating use) to remove adhering moisture, grease and foreign materials.





INFOID:000000011999092

INFOID-000000011999093

[YS23DDT/YS23DDTT

3. Attach liquid gasket tube to the tube presser (commercial service tool).

- Apply liquid gasket without 4. ing to the specified dimensi
 - If there is a groove for life gasket to the groove.
 - As for bolt holes (B), nor holes. Occasionally, it sh Check to read the text of
 - : Groove (A)

< PRECAUTION >

- Within five minutes of liqu ing component.
- · If liquid gasket protrudes,
- Do not retighten mounting
- After 30 minutes or more engine oil and engine coo CAUTION:

If there are specific instru

Precaution for Diesel Equ

	~
 4. Apply liquid gasket without gaps to the specified location according to the specified dimensions. If there is a groove for liquid gasket application, apply liquid gasket to the groove. 	S EM
EMA0622D	C C
 As for bolt holes B, normally apply liquid gasket inside the holes. Occasionally, it should be applied outside the holes. Check to read the text of this manual. 	E
A : Groove	F
• Within five minutes of liquid gasket application install the mat-	
 If liquid gasket protrudes, wipe it off immediately. Do not retighten mounting bolts or nuts after the installation. 	G
 After 30 minutes of more have passed from the installation, fill engine oil and engine coolant. CAUTION: 	Н
If there are specific instructions in this manual, observe them.	1
Precaution for Diesei Equipment	99094
CLEANLINESS CLEANLINESS INSTRUCTIONS WHICH MUST BE FOLLOWED WHEN WORKING ON THE HIGH PRE SURE DIRECT INJECTION SYSTEM Risks relating to contamination	S- ^J
 The system is very sensitive to contamination. The risks caused by the introduction of contamination are: Damage or destruction of the high pressure injection system and the engine Seizing or leaking of a component 	K
All After-Sales operations must be performed under very clean conditions. This means that no impurities (p ticles a few microns in size) get into the system during dismantling or into the circuits via the fuel unions. The cleanliness principle must be applied from the fuel filter to the fuel injectors.	ar- ∟
WHAT ARE THE SOURCES OF CONTAMINATION?	M
Contamination is caused by: • Metal or plastic chips • Paint • Fibers: - Boxes	Ν

- Ρ

Foreign bodies such as hair

- Ambient air
- Etc.

 Fibers: - Boxes - Brushes - Paper Clothing - Cloths

WARNING:

It is not possible to clean the engine using a high pressure fuel pump because of the risk of damaging connections. In addition, moisture may collect in the connectors and create electrical connection malfunctions

INSTRUCTIONS TO BE FOLLOWED BEFORE ANY WORK IS CARRIED OUT ON THE INJECTION SYS-TEM

- Check that you have the plugs for the unions to be opened (bag of plugs sold at the Parts Stores Nissan part No. 16609 00Q0A, Renault part No. 77 01 209 062). Plugs are to be used once only. After use, they must be thrown away (once used they are soiled and cleaning is not sufficient to make them reusable). Unused plugs must be thrown away.
- Check that you have hermetically resealable plastic bags for storing removed parts. Stored parts will therefore be less subject to the risk of impurities. The bags must be used only once, and after use they must be thrown away.
- Lint-free towelettes to be used for fuel pump related service purpose. The use of a normal cloth or paper for cleaning purposes is forbidden. These are not lint-free and may contaminate the fuel circuit of the system. Each lint-free cloth should only be used once.

INSTRUCTIONS TO BE FOLLOWED BEFORE OPENING THE FUEL CIRCUIT

- For each operation, use new thinner (used thinner contains impurities). Pour it into a clean receptacle.
- For each operation, use a clean brush which is in good condition (the brush must not shed its bristles).
- Use a brush and thinners to clean the connections to be opened.
- Blow compressed air over the cleaned parts (tools, cleaned the same way as the parts, connections and injection system zone). Check that no bristles remain adhered.
- Wash your hands before and during the operation if necessary.
- When wearing leather protective gloves, cover these with latex gloves.

INSTRUCTIONS TO BE FOLLOWED DURING THE OPERATION

- As soon as the circuit is open, all openings must be plugged to prevent impurities from entering the system. The plugs to be used are available from the Parts Stores - Nissan part No. 16609 00Q0A, Renault part No. 77 01 209 062. They must not, under any circumstances, be reused.
- Close the hermetically sealed bag, even if it has to be reopened shortly afterwards. Ambient air carries contamination.
- All components of the injection system that are removed must be stored in a hermetically sealed plastic bag once the plugs have been inserted.
- The use of a brush, thinner, bellows, sponge or normal cloth is strictly forbidden once the circuit has been opened. These items are likely to allow impurities to enter the system.
- A new component replacing an old one must not be removed from its packaging until it is to be fitted to the vehicle.

Instructions for Fitting the Plugs

Nissan part No. 16609 00Q0C

[YS23DDT/YS23DDTT]

А

F

J

L

Ρ





SPECIAL FEATURES

- **CAUTION:**
- The engine must not operate with:
- Use diesel fuel required by the regulations for cetane number. Refer to GI-27, "Fuel".
- Petrol, even in tiny quantities
- Before carrying out any work, check that the fuel rail is not under pressure and that the fuel temperature is not too high. [The system can inject the diesel into the engine at a pressure up to 160,000 kPa (1,600 bar, 1,632 kg/cm², 23,200 psi)].

< PRECAUTION >

- Respect the cleaning and safety advice specified in this document for any work on the high pressure injection system.
- Remove of the interior of the fuel pump and fuel injectors is prohibited.
- For safety reasons, it is strictly forbidden to slacken an injection tube union when the engine is running.
- It is not possible to remove the fuel pressure sensor from the fuel rail because this may cause circuit contamination malfunctions. If the fuel pressure sensor fails, the fuel pressure sensor, the fuel rail and the fuel injection tubes must be replaced.
- It is strictly forbidden to remove the fuel pump pulley.
- Applying 12 volts directly to any component in the system is prohibited.
- Ultrasonic carbon removal and cleaning are prohibited.
- Never start the engine without the battery being connected correctly.

CHECKING SEALING AFTER REPAIR

CAUTION:

After any operation, check that there is no diesel leakage.

- Start the engine and check for fuel leak for one minute after starting.
- Apply tracing fluid around the high pressure connections of the pipe that has been replaced.
- Once the engine coolant temperature is above 50°C (122°F) and provided there are no malfunctions
 present, carry out a road test, taking the engine speed up to 4,000 rpm at least once to check that there is no
 leakage.
- Perform a visual inspection after the road test to check that there is no high pressure leakage.
- Clean off the tracing fluid.

Precautions for Removing Battery Terminal

INFOID:000000011999095

- With the adoption of Auto ACC function, ACC power is automatically supplied by operating the intelligent key or remote keyless entry or by opening/closing the driver side door. In addition, ACC power is supplied even after the ignition switch is turned to the OFF position, i.e. ACC power is supplied for a certain fixed time.
- When disconnecting the 12V battery terminal, turn off the ACC power before disconnecting the 12V battery terminal, observing "How to disconnect 12V battery terminal" described below.
 NOTE:

Some ECUs operate for a certain fixed time even after ignition switch is turned OFF and ignition power supply is stopped. If the battery terminal is disconnected before ECU stops, accidental DTC detection or ECU data damage may occur.

• For vehicles with the 2-batteries, be sure to connect the main battery and the sub battery before turning ON the ignition switch. **NOTE:**

If the ignition switch is turned ON with any one of the terminals of main battery and sub battery disconnected, then DTC may be detected.

After installing the 12V battery, always check "Self Diagnosis Result" of all ECUs and erase DTC.
 NOTE:

The removal of 12V battery may cause a DTC detection error.

HOW TO DISCONNECT 12V BATTERY TERMINAL

Disconnect 12V battery terminal according to instruction described below.

- 1. Open the hood.
- 2. Turn ignition switch to the ON position.
- 3. Turn ignition switch to the OFF position with the driver side door opened.
- 4. Get out of the vehicle and close the driver side door.
- 5. Wait at least 3 minutes. For vehicle with the engine listed below, remove the battery terminal after a lapse of the specified time.

D4D engine	: 20 minutes	YS23DDT	: 4 minutes
HRA2DDT	: 12 minutes	YS23DDTT	: 4 minutes
K9K engine	: 4 minutes	ZD30DDTi	: 60 seconds
M9R engine	: 4 minutes	ZD30DDTT	: 60 seconds
R9M engine	: 4 minutes		
V9X engine	: 4 minutes		
YD25DDTi	: 2 minutes		



EM-142

< PRECAUTION >

CA	U	ГЮ	N :	
	-		-	-

While waiting, never operate the vehicle such as locking, opening, and closing doors. Violation of A this caution results in the activation of ACC power supply according to the Auto ACC function.

6. Remove 12V battery terminal. CAUTION:

After installing 12V battery, always check self-diagnosis results of all ECUs and erase DTC.

Μ

Ν

Ο

Ρ

ΕM

С

< PREPARATION > PREPARATION

PREPARATION

Special Service Tools

INFOID:000000011999096

NISSAN tool number (RENAULT tool No.) Tool name		Description
KV10111100 (—) Seal cutter	NT046	Removing oil pan and front cover. etc
KV10112100 (—) Angle wrench	NT014	Tightening bolts for bearing cap, cylinder head, etc. in angle
— (Mot. 1766) TDC set pin	JPBIA0629ZZ	To lock engine at TDC
— (Mot. 1769) Camshaft timing tool	JPBIA0628ZZ	To lock camshaft when changing timing chain
— (Mot. 1770) Crankshaft pulley locking tool	JPBIA0630ZZ	To lock crankshaft pulley
KV111063S0 Adapter set ① KV11106310 Adapter ② KV11106320 Gasket ③ KV11106330 Gasket	JPBIA6259ZZ	Connecting compression gauge and com- pression gauge adapter (a) : \phi 16.2 mm (0.64 in) (b) : \phi 13.1 mm (0.52 in)

PREPARATION

[YS23DDT/YS23DDTT]



< PREPARATION >

PREPARATION

[YS23DDT/YS23DDTT]

NISSAN tool number (RENAULT tool No.) Tool name	Description
— (Mot. 1966) Injector extractor	Removing fuel injector (Use with Mot. 2093)
 (Mot. 2093) Injector extractor	Removing fuel injector (Use with Mot. 1966)
 (Mot. 2047) High pressure pump pinion locking tool	To lock high pressure pump pinion

Commercial Service Tools

< PREPARATION >

INFOID:000000011999097

Valve seal remover Tool for removing valve oil seals NOTE: NISSAN tool number : KV113B0090 RENAULT tool No. : Mot. 1335 Tool for installing valve oil seals Valve seal drift Tool for installing valve oil seals MOTE: NISSAN tool number : KV113B0180 RENAULT tool No. : Mot. 1511-01 RENAULT tool No. : Mot. 1511-01 Valve seal stand Cylinder head and cylinder head housing support NOTE: NISSAN tool number : KV113B0200 RENAULT tool No. : Mot. 1573 RENAULT tool No. : Mot. 1573 Tube presser Pressing the tube of liquid gasket	Tool name		Description
Valve seal drift Tool for installing valve oil seals MOTE: NISSAN tool number : KV113B0180 RENAULT tool No. : Mot. 1511-01 RENAULT tool No. : Mot. 1511-01 MBIBOSTRE Cylinder head and cylinder head housing support MOTE: NISSAN tool number : KV113B0200 RENAULT tool No. : Mot. 1573 NOTE: Tube presser Pressing the tube of liquid gasket	Valve seal remover	МВІВОЗ70Е	Tool for removing valve oil seals NOTE: NISSAN tool number : KV113B0090 RENAULT tool No. : Mot. 1335
MBIB0378E Cylinder head stand Image: Cylinder head stand Image: Cylinder head stand Image: Cylinder head stand cylinder head housing support NOTE: NISSAN tool number : KV113B0200 RENAULT tool No. : Mot. 1573 Tube presser Image: Cylinder head and cylinder head housing support NOTE: NISSAN tool number : KV113B0200 RENAULT tool No. : Mot. 1573 Pressing the tube of liquid gasket	Valve seal drift		Tool for installing valve oil seals NOTE: NISSAN tool number : KV113B0180 RENAULT tool No. : Mot. 1511-01
Cylinder head stand Cylinder head and cylinder head housing support NOTE: NISSAN tool number : KV113B0200 RENAULT tool No. : Mot. 1573 RENAULT tool No. : Mot. 1573 Tube presser Pressing the tube of liquid gasket		MBIB0378E	
Tube presser Pressing the tube of liquid gasket	Cylinder head stand	MBIB0380E	Cylinder head and cylinder head housing sup- port NOTE: NISSAN tool number : KV113B0200 RENAULT tool No. : Mot. 1573
	Tube presser		Pressing the tube of liquid gasket

PREPARATION

< PREPARATION >

[YS23DDT/YS23DDTT]

Tool name	Description	_
Manual lift table caddy	Removing and installing engine	A
		EM
		С
ZZA1210D		_
Piston ring expander	Removing and installing piston ring	
		D
		E
NT030		
		F
		0
		G

I

Н

J

Κ

L

M

Ν

0

Ρ

BASIC INSPECTION COMPRESSION PRESSURE

Inspection

INFOID:0000000012157949

- 1. PREPARATION OPERATION FOR CHECK
 - Remove the grow plugs. Refer to EM-185, "Removal and Installation".
 - Disconnect all the connectors of the fuel injector.
 - Set the compression gauge adapter [SST: (Mot. 1772)] in place of one of the removed grow plugs.
 - Moderately tighten the compression gauge adapter [SST: (Mot. 1772)] using an open-jawed spanner.
 - Screw the conversion compression gauge adapter [SST: (Mot. 1772)] of the diesel compression gauge onto the hose.
 - NOTE:

If compression gauge for diesel engine cannot connect to the compression gauge adapter, use the adapter [SST: KV111063S0 (-)].

Compression gauge adapter

• : 20 N·m (2.0 kg-m, 15 ft-lb)

• Put the vehicle under the starting conditions with the gear lever in neutral.

2. TEST OPERATION

• Turn the engine ignition key to trigger the engine starting phase. **NOTE:**

The engine will be driven for 20 s without starting.

• Check the compression of cylinder no. 1.

Compression pressure Refer to EM-261, "General Specification"

NOTE:

Put the vehicle back in forced + after ignition feed as soon as the starter has stopped (in order to maintain engine start inhibition and to measure the compression of the other cylinders).

NOTE:

It is necessary to wait for at least 10 seconds before starting the engine each time (the starter will not run due to its thermal protection).

• Measure the compression of the other cylinders.

3. FINAL OPERATION

- Proceed in the reverse order to removal.
- Install the glow plugs. Refer to EM-185, "Removal and Installation".

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING [YS23DDT/YS23DDTT] < SYMPTOM DIAGNOSIS >

SYMPTOM DIAGNOSIS

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NVH Troubleshooting - Engine Noise



А

INFOID:000000011999098

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING [YS23DDT/YS23DDTT]

< SYMPTOM DIAGNOSIS >

Use the Chart Below to Help You Find the Cause of the Symptom

INFOID:000000011999099

- 1. Locate the area where noise occurs.
- 2. Confirm the type of noise.
- 3. Specify the operating condition of engine.
- 4. Check specified noise source.

If necessary, repair or replace these parts.

			Operating condition of engine							
Location of noise	Type of noise	Before warm- up	After warm- up	When start- ing	When idling	When racing	While driving	Source of noise	Check item	Refer- ence page
Top of en- gine	Ticking or clicking	А	С		В	В		Hydraulic tappet noise	Out of oil	<u>EM-228</u>
Cylinder head	Rattle	С	А		A	В	С	Camshaft bearing noise	Camshaft journal oil clearance	<u>EM-226</u>
Crank-	Slap or knock	_	A		В	В		Piston pin noise	Piston to piston pin oil clearance Connecting rod bushing oil clearance	<u>EM-248</u>
shaft pul- ley Cylinder	Slap or rap	А		_	В	В	A	Piston slap noise	Piston ring side clear- ance Piston ring end gap	<u>EM-248</u>
(Side of engine) Oil pan	Knock	A	В	С	В	В	В	Connect- ing rod bearing noise	Connecting rod bushing oil clearance Connecting rod bearing oil clearance	<u>EM-248</u>
	Knock	A	В	_	A	В	С	Main bear- ing noise	Main bearing oil clear- ance	<u>EM-248</u>
Front of engine Front cov- er	Tapping or ticking	A	A	_	В	В	В	Timing chain and chain ten- sioner noise	Timing chain cracks and wear Timing chain tensioner operation	<u>EM-200</u>
	Squeak- ing or fizz- ing	A	В	_	В	_	С	Drive belt (Sticking or slip- ping)	Drive belt deflection	<u>EM-158</u>
Front of engine	Creaking	А	В	А	В	А	В	Drive belt (Slipping)	Idler pulley bearing op- eration	
	Squall Creak	Α	В		В	А	В	Water pump noise	Water pump operation	<u>CO-55</u>

A: Closely related B: Related C: Sometimes related -: Not related

< PERIODIC MAINTENANCE > PERIODIC MAINTENANCE **DRIVE BELT**

Exploded View



CAUTION:

- Replace the drive belt and compressor belt that has been removed with a new one.
- Drive belt auto-tensioner and idler pulley must be replaced with new ones when the drive belt is replaced.
- Never run the engine without the drive belt to avoid damaging the crankshaft pulley.

REMOVAL

- Remove front under cover. Refer to EXT-24, "Removal and Installation". 1.
- 2. Remove radiator hose (lower) bolt (A) from charge air cooler cover(1).

: Vehicle front

Remove charge air cooler cover. Refer to EM-162, "Removal 3. and Installation".



А

Κ

L

Ρ

DRIVE BELT

< PERIODIC MAINTENANCE >

4. Remove compressor belt by cutting it with an appropriate tool (A).

Revision: 2015 March

6. Insert a stopper pin (A) in diameter such as short-length screwdriver into the hole of the retaining boss to fix drive belt auto-tensioner pulley.

dle in the direction of arrow (loosening direction arrow)

· Keep drive belt auto-tensioner pulley arm locked after drive belt is removed.



7. Remove drive belt.

INSTALLATION

- 1. Install drive belt. **CAUTION:**
 - · Check that drive belt is completely set to pulleys.
 - Check for engine oil, working fluid and engine coolant are not adhered to drive belt and each pulley groove.
- 2. Release drive belt auto-tensioner, and apply tension to drive belt.
- Turn crankshaft pulley clockwise several times to equalize tension between each pulley. 3.
- 4. Check that the indicator (notch on fixed side) of drive belt auto-tensioner is within the range when new drive belt is installed. Refer to EM-153, "Inspection".

EM-152

5. Set compressor belt (1) on compressor pulley (2).

[YS23DDT/YS23DDTT]





DRIVE BELT

< PERIODIC MAINTENANCE >

6. Install stretch belt service tool (A) to compressor belt as shown in the figure.



NOTE:

Stretch belt service tool is enclosed when compressor belt is ordered.

CAUTION:

- Install stretch belt service tool (A) as shown in the figure.
 - B : Correct
 - © : Incorrect
- Check that belt is properly placed in the groove of pulley.



[YS23DDT/YS23DDTT]

А

ΕM

D

Ε

F

Н

J

Κ

 Since the lower part of belt
 B becomes warped, rotate crankshaft pulley by holding the belt by hand.
 CAUTION:

Be careful not to get fingers caught in the pulley.

A : Stretch belt service tool



8. If stretch belt service tool comes off check if the belt is properly placed in the groove of eachpulley.



DRIVE BELT

Drive belt auto-tensioner

Water pump pulley

Drive belt

Indicator

(2)

(5)

(8)

B

< PERIODIC MAINTENANCE >

[YS23DDT/YS23DDTT]

Power steering oil pump pulley

Range when new drive belt is in-

Crankshaft pulley

Compressor belt

stalled

3

6)

(9)

 \bigcirc

- (1) Alternator
- (4) Compressor
- ⑦ Idler pulley
- (A) View
- D Possible use range
- WARNING:

Be sure to perform this step when the engine is stopped.

• Check that the indicator (B) (notch on fixed side) of drive belt auto-tensioner is within the possible use range (D).

NOTE:

- Check the drive belt auto-tensioner indication when the engine is cold.
- When new drive belt is installed, the indicator (notch on fixed side) should be within the range © in the figure.
- Visually check entire drive belt for wear, damage or cracks.
- If the indicator (notch on fixed side) is out of the possible use range or belt is damaged, replace drive belt. CAUTION:

Drive belt auto-tensioner and idler pulley must be replaced with new ones when the drive belt is replaced.

Adjustment

INFOID:000000011999103

Refer to EM-261, "Drive Belts".

< PERIODIC MAINTENANCE >

AIR CLEANER FILTER

Exploded View

INFOID:000000011999104



А

AIR CLEANER FILTER

< PERIODIC MAINTENANCE >

- 1. Unhook clips (A) and pull up the air cleaner body cover upward (1).

[YS23DDT/YS23DDTT]

2. Remove air cleaner filter (1) from the air cleaner body assembly.



INFOID:000000011999106

INSTALLATION

Install in the reverse order of removal.

Inspection (Dry Paper Type)

INSPECTION AFTER REMOVAL

Examine with eyes that there is no stain, clogging, or damage on air cleaner element.

- Remove dusts (such as dead leafs) on air cleaner element surface and inside cleaner case.
- To clean air cleaner element, blow it from intake manifold side towards air intake side to remove trash or dust.
- If clogging or damage is observed, replace the air cleaner element.

MAINTENANCE INTERVAL Refer to <u>MA-9</u>, "Periodic Maintenance".

< REMOVAL AND INSTALLATION > **REMOVAL AND INSTALLATION**

ENGINE COVER

Exploded View

INFOID:000000011999108



Ρ

А

DRIVE BELT AUTO TENSIONER AND IDLER PULLEY

< REMOVAL AND INSTALLATION >

DRIVE BELT AUTO TENSIONER AND IDLER PULLEY

Exploded View

INFOID:0000000011999110

[YS23DDT/YS23DDTT]



Removal and Installation

INFOID:0000000011999111

CAUTION:

- Replace the drive belt that has been removed with a new one.
- Drive belt auto-tensioner and idler pulley must be replaced with new ones when the drive belt is replaced.
- Never run the engine without the drive belt to avoid damaging the crankshaft pulley.

REMOVAL

- 1. Remove the radiator shorud (upper and lower). Refer to CO-48, "Removal and Installation".
- 2. Loosen drive belt. Refer to EM-151, "Removal and Installation".
- 3. Remove drive belt auto-tensioner and idler pulley. **NOTE:**

Keep auto-tensioner pulley arm locked to install or remove auto-tensioner.

CAUTION:

The disassemble prohibition part. Never disassemble the drive belt auto-tensioner, because the worker shall injure by the spring jumped out.

INSTALLATION

Note the following, and install in the reverse order of removal.

If there is damage greater than peeled paint, replace drive belt auto-tensioner.

< REMOVAL AND INSTALLATION >

AIR CLEANER AND AIR DUCT

Exploded View

INFOID:000000012149565



- 6. Remove air duct 2.
- 7. Remove mass air flow sensor from air cleaner case, if necessary.

CAUTION:

EM-159

D23

А

< REMOVAL AND INSTALLATION >

- Never shock mass air flow sensor.
- Never disassemble mass air flow sensor.
- Never touch mass air flow sensor element.

INSTALLATION

Note the following, and install in the reverse order of removal.

• Align marks. Attach each joint. Screw clamps firmly.

Inspection

INFOID:000000011999114

INSPECTION AFTER REMOVAL

Inspect air duct for crack or tear.

• If anything found, replace air duct.

< REMOVAL AND INSTALLATION >

CHARGE AIR COOLER

Exploded View

[YS23DDT/YS23DDTT]

INFOID:000000011999115

А



: N·m (kg-m, in-lb)

< REMOVAL AND INSTALLATION >



- : N·m (kg-m, ft-lb)
- : N·m (kg-m, in-lb)

Removal and Installation

REMOVAL

Air inlet hose 1 and air inlet tube (silencer)

- 1. Remove front under cover. Refer to EXT-24, "Exploded View".
- Revision: 2015 March

EM-162

D23

INFOID:000000011999116

< REMOVAL AND INSTALLATION >

- 2. Remove radiator hose (lower) mounting bolt (A) from charge air cooler cover (1).



- 3. Remove charge air cooler cover.
- 4. Remove engine cover. Refer to EM-157, "Removal and Installation".
- 5. Remove air cleaner assembly Refer to EM-159, "Removal and Installation".
- 6. Remove reservoir tank and move to aside. Refer to CO-47, "Exploded View".
- 7. Remove air inlet hose 1 with the following procedure:
- a. Insert suitable tool between air inlet hose 1 and retainer ①.
 - (A) : View
 - B : Insert position
 - © : Movement direction of the retainer
 - D : Projection
- b. Unlock the retainer and pull out air inlet hose 1.
- 8. Remove air inlet tube (silencer).

Air inlet hose 2 and air inlet tube

- 1. Remove front under cover. Refer to <u>EXT-24, "Exploded View"</u>.
- 2. Remove radiator hose (lower) mounting bolt (A) from charge air cooler cover (1).
 - : Vehicle front





- 3. Remove charge air cooler cover.
- 4. Remove engine cover. Refer to EM-157, "Removal and Installation".
- 5. Remove air inlet hose 2 with the following procedure:

Ρ

[YS23DDT/YS23DDTT]

А

ΕM

D

Ε

< REMOVAL AND INSTALLATION >

- Insert suitable tool between air inlet hose 2 and retainer (1). a.
 - (A): View
 - **B** : Insert position
 - \bigcirc : Movement direction of the retainer
 - \bigcirc : Projection
- b. Unlock the retainer and pull out air inlet hose 2.
- Remove air inlet hose 2.
- 7. Separate air inlet tube from mounting part.
- 8. Disconnect intake air temperature sensor 2 harness connector.
- 9. Remove air inlet tube.
- 10. Remove intake air temperature sensor 2, if necessary.

Charge air cooler

CAUTION:

When removing charge air cooler, close opening on turbocharger and on intake manifold with shop cloth or other suitable material.

- Remove front under cover. Refer to EXT-24, "Exploded View". 1.
- 2. Remove radiator hose (lower) mounting bolt (A) from charge air cooler cover (1).
 - : Vehicle front



- Remove charge air cooler cover.
- 4. Remove air inlet hose 1, air inlet hose 2, air inlet tube and air inlet tube (silencer).
- 5. Remove charge air cooler seal (RH) and (LH).
- 6. Remove vacuum hose in charge air cooler side.
- 7. Remove the mounting bolt of bracket (RH lower) and bracket (LH lower), remove charge air cooler.

INSTALLATION

Note the following, and install in the reverse order of removal.

- When installing hoses, insert hose all the way to the end.
- When installing clamps, check that the screw (B) and band (A) of clamp have no damage and permanent strain. Replace with a new one if the clamp has damage of permanent strain.
- · When installing air inlet hose, align identification marks (color and direction).
- Align marks. Attach each joint. Screw clamps firmly.
- Do not retighten clamp.

CAUTION:

If it is necessary to retighten a clamp, loosen it and visually check that there is no damage. After this, tighten the clamp to the specified torque.

Inspection

INSPECTION AFTER REMOVAL

1. Check that the charge air cooler is not full of oil. In that case, clean it with cleaning agent and then let it dry.



INFOID:000000011999117

EM-164

[YS23DDT/YS23DDTT]



< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

- 2. Check air passages of charge air cooler core and fins for clogging, leaks or deformation. Clean or replace charge air cooler if necessary.
 - Do not deform core fins.

А

ΕM

С

D

Е

F

G

Н

J

Κ

L

Μ

Ν

Ο

Ρ

< REMOVAL AND INSTALLATION >

INTAKE MANIFOLD

Exploded View

INFOID:0000000011999118

[YS23DDT/YS23DDTT]



Always replace after every disassembly.

Removal and Installation

REMOVAL

- 1. Remove alternator. Refer to CHG-39, "YS23DDT, YS23DDTT : Removal and Installation".
- Remove alternator bracket. Refer to <u>CHG-39</u>, "<u>YS23DDT</u>, <u>YS23DDTT</u> : <u>Exploded View</u>".
- 3. Remove air inlet hose 2 and air inlet tube. Refer to EM-162, "Removal and Installation".
- 4. Disconnect turbocharger boost sensor harness connector.
- 5. Disconnect thermo management valve control valve harness connector.
- 6. Remove thermo management valve control valve.
- 7. Disconnect electric throttle control actuator harness connector.
- 8. Remove electric throttle control actuator and O-ring.

Revision: 2015 March

EM-166

D23

INFOID:000000011999119

INTAKE MANIFOLD

< REMOVAL AND INSTALLATION >

- 9. Remove intake manifold with the following procedure:
- a. Remove EGR valve manifold duct.
- b. Loosen mounting bolts in the order from 9 to 1 as shown in the figure.



[YS23DDT/YS23DDTT]

Remove intake manifold and gasket.

Cover engine openings to avoid entry of foreign materials.

INSTALLATION

Note the following, and install in the reverse order of removal.

CAUTION:

c.

- Clean each joint surface before installation.
- Do not reuse O-ring and gaskets.

Intake Manifold

- 1. Install intake manifold.
- Tighten mounting nuts in the order from 1 to 9 as shown in the figure.
- Perform "THROTTLE VALVE POSITION LEARNING". Refer to <u>EC-928. "Description"</u>.



Inspection

INSPECTION AFTER REMOVAL

Surface Distortion

• Check the surface distortion of the intake manifold mating surface with a straightedge and a feeler gauge.

Standard : Refer to EM-261, "Intake Manifold".

• If it exceeds the standard, replace intake manifold.

ΕM

D

Ε

F

Н

Κ

L

Μ

Ν

Ρ

< REMOVAL AND INSTALLATION >

EGR SYSTEM

Exploded View

INFOID:000000011999121



: N·m (kg-m, ft-lb)

●, ▲, ■: Indicates that the parts is connected at points with same symbols in actual vehicle.

EGR SYSTEM

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]



EM-169

EGR SYSTEM

[YS23DDT/YS23DDTT]

< REMOVAL AND INSTALLATION >

- Handle carefully to avoid any shock to EGR volume control valve.
- Never disassemble EGR volume control valve.
- Cover engine openings to avoid entry of foreign materials.
- 11. Disconnect EGR temperature sensor harness connector.
- 12. Remove EGR valve inlet pipe.

EGR cooler

- 1. Drain engine coolant. Refer to CO-40, "Draining".
- 2. Remove turbocharger (YS23DDTT). Refer to EM-179, "Removal and Installation".
- 3. Remove exhaust manifold and turbocharger. Refer to EM-174, "Removal and Installation".
- 4. Remove EGR cooler bypass valve control solenoid valve.
- 5. Remove water pipe from EGR cooler.
- 6. Remove EGR cooler

CAUTION:

- Never disassemble EGR cooler.
- Cover engine openings to avoid entry of foreign materials.

INSTALLATION

Note the following, and install in the reverse order of removal.

CAUTION:

Clean each joint surface before installation.

EGR volume control valve

Perfrom the "EGR VOLUME CONTROL VALVE POSITION LEARNING" . Refer to EC-929, "Description".

< REMOVAL AND INSTALLATION >

DPF (DIESEL PARTICULATE FILTER)

Exploded View

INFOID:000000011999123

А

SEC. 208	9.0 (0.92, 80)		0.6	32.0 (3.3, 24)	
			(0.59, 51		 10.0 (1.0, 89) 2 5.8 (0.59, 51)
		4		34.5 (3.5, 25)	34.5 (3.5, 25)
	80)	/			➡ B 14.5 (1.5, 11)
	ĊŢ	17.0 (1.7, 13) (6)	9 17.0 (1.7, 13)	JSBIA6464GB
Exhaust gas ten	nperature sensor 2	2	Bracket	3	DPF (diesel particulate filter) differ- ential pressure tube
DPF (diesel par ential pressure t	ticulate filter) differ- ube	5	Clamp	6	DPF (diesel particulate filter)
Bracket		8	Mounting rubber	9	Bracket
Mounting rubbe	r bracket	(11)	Bracket	(12)	DPF (diesel particulate filter) differ- ential pressure sensor
Clamp		14	DPF (diesel particulate filter) pressure hose	differential	
To turbocharger		B	To main muffler		
: N∙m (kg-m, in-l	b)				
: N∙m (kg-m, ft-ll	o)				
: Indicates that	he parts is connecte	ed at p	oints with same symbols in act	ual vehicle.	
oval and i	nstallation				INFOID:00000001199912
FION:					
form the oper er engine sto careful not t	eration with the ps. o cut your hanc	exha d on t	aust system fully cooled	d down beca	ause the system is still hot just
OVAL	-		-		
Remove front	tire (RH). Refer	to <u>W</u>	T-7, "Exploded View".		
amovo fonde	ar protector (RH)	Rof	er to EXT-23 "Exploded	View"	

- 3. Remove main muffler. Refer to <u>EX-10, "Exploded View"</u>.
- 4. Remove DPF (diesel particulate filter) differential pressure tube.

EM-171
DPF (DIESEL PARTICULATE FILTER)

< REMOVAL AND INSTALLATION >

- 5. Disconnect exhaust gas temperature sensor 2 harness connector.
- 6. Remove mounting bracket from transmission cross member.
- 7. Remove front cross member. Refer to EM-212, "Exploded View".
- 8. Remove clamp between DPF (diesel particulate filter) and turbocharger air outlet pipe.
- 9. Remove bracket nuts of DPF (diesel particulate filter) side.
- 10. Remove DPF (diesel particulate filter)
- 11. Remove exhaust gas temperature sensor 2. CAUTION:

Be careful not to impact or damage exhaust gas temperature sensor 2.

INSTALLATION

- Note the following, and install in the reverse order of removal. **CAUTION:**
- Be careful not to impact or damage particle filter sensor.
- When installing never use such tools as an air impact wrench.
- Perform "Diesel particulate filter data clear". Refer to <u>EC-934, "Description"</u>. When replacing diesel particulate filter. Refer to <u>EC-921, "Description"</u>

< REMOVAL AND INSTALLATION >

EXHAUST MANIFOLD AND TURBOCHARGER ASSEMBLY

Exploded View

INFOID:000000011999125

А

[YS23DDT/YS23DDTT]



< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]



REMOVAL

YS23DDT

- 1. Remove front tire (RH). Refer to WT-7, "Exploded View".
- Remove fender protector (RH). Refer to <u>EXT-23, "Exploded View"</u>.
- 3. Remover main muffler. Refer to EX-10, "Removal and Installation".
- 4. Remove DPF (diesel particulate filter). Refer to EM-171, "Removal and installation"
- 5. Remove air cleaner assembly. Refer to EM-159, "Exploded View".
- Remove air duct 1 and air duct 2. Refer to <u>EM-159</u>, "Exploded View".

EM-174

13. Remove EGR heat shield. Refer to EM-168, "Exploded View". 14. Disconnect exhaust gas temperature sensor 1 harness connector.

12. Remove engine oil level gauge guide. Refer to EM-182, "Exploded View".

Remove air inlet tube (silencer) and air inlet hose 1. Refer to EM-162, "Removal and Installation".

15. Remove turbocharger air inlet pipe.

< REMOVAL AND INSTALLATION >

9. Remove A/F sensor. 10. Remove heat shield.

Disconnect A/F sensor harness connector.

7.

8.

- 16. Remove exhaust gas pressure sensor.
- 17. Remove oil return pipe and oil feed pipe. CAUTION:

• Be careful not to deform oil feed and return tube.

Remove water pipe cover. Refer to EM-168, "Exploded View".

- 18. Remove exhaust manifold and turbocharger bracket.
- 19. Loosen exhaust manifold and turbocharger nuts in the order from 8 to 1 as show in the figure.





8

0

P \mathbf{O}

- Be careful not to deform oil feed and return tube.
- 4. Disconnect exhaust gas temperature sensor 1 harness connector.
- 5. Remove exhaust gas pressure sensor.

YS23DDTT

2.

Ο

ΕM

А

Е

F

Н

Κ

L

M

Ν

Ρ

< REMOVAL AND INSTALLATION >

- 6. Loosen exhaust manifold and turbocharger nuts in the order from 8 to 1 as show in the figure.
 - ${\textstyle \triangleleft} \quad : {\sf Engine front}$



[YS23DDT/YS23DDTT]

- 7. Remove exhaust manifold and turbocharger.
 - CAUTION:
 - Never disassemble or adjust the turbocharger.
 - Be careful not to contact with the vehicle.
 - Never hold turbocharger boost control actuator and actuator rod.
- 8. Remove gasket.
- 9. Remove exhaust gas temperature sensor 1, if necessary.
- 10. Remove stud bolt from cylinder head, if necessary.

Oil Tube and Water Tube

- Clean inside of oil feed tube and oil return tube and water tube, and check tubes for clogging.
- Replace oil feed tube and oil return tube and/or water tube if clogging still exists after cleaning.

INSTALLATION

- If stud bolts were removed, replace them with new ones.
- Tighten the exhaust manifold and turbocharger mounting nuts in the following procedure:
- 1. Install gasket to cylinder head.
- 2. Tighten exhaust manifold and turbocharger nuts in the order from 1 to 8 as shown in the figure.
 - YS23DDT



- O 2nd step: 20.0 N·m (2.0 kg-m, 15 ft-lb)
- O 3nd step: 30.0 N·m (3.1 kg-m, 22 ft-lb)
- : Engine front
- YS23DDTT
 - 1st step: 10.0 N·m (1.0 kg-m, 89 in-lb)
 - O 2nd step: 20.0 N·m (2.0 kg-m, 15 ft-lb)
 - O 3nd step: 30.0 N·m (3.1 kg-m, 22 ft-lb)
- 3. Install in the reverse order of removal.





< REMOVAL AND INSTALLATION >

Inspection

INFOID:000000011999127

А

[YS23DDT/YS23DDTT

TROUBLE DIAGNOSIS OF TURBOCHARGER

Preliminary check:

- Check that the engine oil level is between MIN and MAX of the oil level gauge. (When engine oil amount is more than MAX, engine oil flows into the inlet duct through blow-by gas passage, and turbocharger is misjudged malfunction.)
- Ask the customer if he/she always runs the vehicle in idle engine speed to cool the engine oil down after driving.
- Replace the turbocharger assembly when any malfunction is found after unit inspections specified in the table below.
- If no malfunction is found after the unit inspections, judge that the turbocharger body has no malfunction.
 Check the other parts again.

Inspection itom	Increation result	Symptom (when each inspection item meets each inspection result)					
inspection term	inspection result	Engine oil leakage	Smoke	Noise	Insufficient power/accel- eration malfunction		
	Engine oil leaks	С	А	С	С		
Turbing wheel	Carbon is accumulated	С	А	В	В		
	Friction with housing	С	В	А	В		
	Blades are bent or broken	-	—	А	A		
	Inside the air inlet is seriously contam- inated by engine oil.	В	В	_	_		
Compressor wheel	Friction with housing	С	В	А	В		
	Blades are bent or broken	-	—	А	A		
After checking both turbine and	There is resistance when the rotor shaft is rotated by your fingertips.	_	С	С	В		
compressor, inspect rotor shaft end play.	The rotor shaft sometimes does not rotate by your fingertips.	—	_	_	А		
	There is too much play in the bearing.	С	С	В	С		
Oil return port	Carbon or sludge is accumulated in the waste oil hole.	С	А	С	С		

A: Large possibility

B: Medium possibility

C: Small possibility

INSPECTION AFTER INSTALLATION

Inspection for Leakage

The following are procedures for checking fluid leakage, lubricant leakage.

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If any are less than the required quantity, fill them to the specified level. Refer to <u>MA-32, "Fluids and Lubricants"</u>.
- Follow the procedure below to check for fuel leakage.
- Turn ignition switch to the "ON" position (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
- Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.
 NOTE:

If hydraulic pressure inside chain tensioner drops after removal/installation, slack in guide may generate a pounding noise during and just after the engine start. However, this does not indicate a malfunction. The noise will stop after hydraulic pressure rises.

- Start engine and raise engine speed to check no exhaust emission leaks.
- Warm up engine thoroughly to check that there is no leakage of fuel, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.

EM-177

D23

Ρ

M

L

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

• After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill them to the specified level, if necessary.

Summary of the inspection items:

Items		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission /	AT & CVT Models	Leakage	Level / Leakage	Leakage
transaxle fluid	MT Models Level / Leakage		Leakage	Level / Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gases		_	Leakage	_

*: Power steering fluid, brake fluid, etc.

TURBOCHARGER

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

Exploded View

TURBOCHARGER

INFOID:000000011999128

А



- 4. Remove DPF (diesel particulate filter). Refer to EM-171, "Removal and installation"
- 5. Remove air cleaner assembly. Refer to EM-159, "Exploded View".

EM-179

TURBOCHARGER

[YS23DDT/YS23DDTT]

< REMOVAL AND INSTALLATION >

- 6. Remove air duct 1 and air duct 2. Refer to <u>EM-159</u>, "Exploded View".
- 7. Remove air inlet tube (silencer) and air inlet hose 1. Refer to EM-162, "Removal and Installation".
- 8. Disconnect A/F sensor harness connector.
- 9. Remove A/F sensor.
- 10. Remove heat shield.
- 11. Remove water pipe cover. Refer to EM-168, "Exploded View".
- 12. Remove engine oil level gauge guide. Refer to EM-217, "Exploded View"
- 13. Remove high pressure compressor bypass valve control solenoid valve.
- 14. Remove turbocharger air outlet pipe.
- 15. Remove oil feed and return pipe. CAUTION:

• Be careful not to deform water tube and oil feed and return tube.

- 16. Remove turbocharger bracket.
- 17. Remove turbocharger from exhaust manifold and turbocharger. **CAUTION:**
 - Never disassemble or adjust the turbocharger.
 - Be careful not to contact with the vehicle.
 - Never hold turbocharger boost control actuator and actuator rod.
- 18. Remove gasket.
- 19. Remove stud bolt from exhaust manifold and turbocharger, if necessary.

INSTALLATION

Note the following and install in the reverse order of removal.

CAUTION:

Clean each joint surface before installation.

Inspection

INFOID:0000000011999130

TROUBLE DIAGNOSIS OF TURBOCHARGER

Preliminary check:

- Check that the engine oil level is between MIN and MAX of the oil level gauge. (When engine oil amount is more than MAX, engine oil flows into the inlet duct through blow-by gas passage, and turbocharger is misjudged malfunction.)
- Ask the customer if he/she always runs the vehicle in idle engine speed to cool the engine oil down after driving.
- Replace the turbocharger assembly when any malfunction is found after unit inspections specified in the table below.
- If no malfunction is found after the unit inspections, judge that the turbocharger body has no malfunction. Check the other parts again.

Increasion item	Increation result	Symptom (when each inspection item meets each inspection result)					
inspection term	inspection result	Engine oil leakage	Smoke	Noise	Insufficient power/accel- eration malfunction		
	Engine oil leaks	С	А	С	С		
Turbino whool	Carbon is accumulated	С	А	В	В		
	Friction with housing	С	В	А	В		
	Blades are bent or broken		_	А	А		
	Inside the air inlet is seriously contam- inated by engine oil.	В	В	_	_		
Compressor wheel	Friction with housing	С	В	А	В		
	Blades are bent or broken	—	_	А	А		

TURBOCHARGER

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

	Symptom (when each inspection item meets each inspection result)		Symptom (when each inspection item meets each ir				
Inspection item		Inspection result	Engine oil leakage	Smoke	Noise	Insufficient power/accel- eration malfunction	
After checking both turbin	There is re shaft is ro	esistance when the rotor tated by your fingertips.	—	С	С	В	
compressor, inspect rotor end play.	shaft The rotor rotate by y	shaft sometimes does not our fingertips.	—	—	—	A	
	There is to	oo much play in the bearing.	С	С	В	If any are less than the next of the piping, n points.	
Oil return port	Carbon or the waste	sludge is accumulated in oil hole.	С	А	С	С	
A: Large possibility 3: Medium possibility C: Small possibility							
NSPECTION AFTE	R INSTALLAT	ION					
spection for Leakage							
 Fine following are proceed Before starting enginerequired quantity, fill Follow the procedur Turn ignition switch check for fuel leakage Start engine. With engine to check Run engine to check NOTE: If hydraulic pressure pounding noise during noise during noise during noise and raise 	ures for checking i ne, check oil/flu them to the sp e below to chec to the "ON" po ge at connectio ngine speed ind c for unusual no e inside chain t ing and just aft hydraulic press se engine spee	fluid leakage, lubricant leak iid levels including engi ecified level. Refer to <u>N</u> ck for fuel leakage. osition (with engine sto n points. creased, check again fo bise and vibration. ensioner drops after re er the engine start. Ho ure rises. d to check no exhaust	cage. ine coolan <u>AA-32, "Flu</u> opped). W or fuel leak emoval/ins owever, thi emission le	t and eng uids and i ith fuel p age at co tallation, is does n eaks.	gine oil. If Lubricant pressure ponnection slack in g not indica	f any are less than the ts". applied to fuel piping, n points. guide may generate a tte a malfunction. The	
Warm up engine tho engine coolant. Bleed air from lines After cooling down e the specified level, it Summary of the inspection	oroughly to chec and hoses of a engine, again cl f necessary. n items:	ck that there is no leaka pplicable lines, such as neck oil/fluid levels incl	ige of fuel, in cooling uding engi	or any oi system. ne oil and	il/fluids in d engine	cluding engine oil and coolant. Refill them to	
Items		Before starting engine	En	gine runnin	ıg	After engine stopped	
Engine coolant		Level		Leakage		Level	
Engine oil		Level		Leakage		Level	
Transmission / AT 8	& CVT Models	Leakage	Lev	vel / Leakaç	ge	Leakage	
ransaxle fluid MT I	Models	Level / Leakage		Leakage		Lovel / Lookage	
Other oils and fluids*				Leakage		Level / Leakage	
Other oils and fluids*		Level		Leakage		Level	
Other oils and fluids* Fuel		Level Leakage		Leakage Leakage		Level Leakage	

Ρ

< REMOVAL AND INSTALLATION >

OIL PAN (LOWER)

Exploded View

INFOID:000000011999131



: Sealing point

 \bullet , \blacktriangle : Indicates that the parts is connected at points with same symbols in actual vehicle.

Removal and Installation

REMOVAL

- Drain engine oil. Refer to <u>LU-23, "Draining"</u>. CAUTION: Perform this step when engine is cold.
- 2. Remove oil pan (lower) with the following procedure:
- a. Loosen mounting bolts in the order from 9 to 1 as shown in the figure.
 - \triangleleft : Engine front

- b. Insert the seal cutter [SST:KV10111100 ()] (A) between oil pan (upper) and oil pan (lower). Slide tool by tapping on the side of the tool with a hammer.
 - CAUTION:
 - Be careful not to damage mating surface.
 - Never insert screwdriver, or oil pan flange will be deformed.





c. Remove oil pan (lower).

INSTALLATION

- 1. Install oil pan (lower) with the following procedure:
- a. Use a scraper (A) to remove old liquid gasket from mating surfaces.

CAUTION:

Never scratch or damage the mating surfaces when cleaning off old liquid gasket.

• Remove old liquid gasket from the bolt holes and threads.



INFOID:000000011999132

D

Ε

F

Н

Κ

L

А

OIL PAN (LOWER)

< REMOVAL AND INSTALLATION >

- b. Apply a continuous bead of liquid gasket with the tube presser (commercial service tool) as shown in the figure.
 - (1) : Oil pan (lower)
 - A : 2.5 4.5 mm (0.098 0.177 in)

Use Genuine Liquid Gasket or equivalent CAUTION: Attaching should be done within 5 minutes after coating.

- c. Tighten mounting bolts in the order from 1 to 9 as shown in the figure.
 - : Engine front





 Install in the reverse order of removal, for the rest of parts.
 NOTE: At least 30 minutes after oil pan is installed, pour engine oil.

Inspection

INSPECTION AFTER REMOVAL

Clean oil strainer if any object attached.

INSPECTION AFTER INSTALLATION

- 1. Check the engine oil level and adjust engine oil. Refer to LU-22, "Inspection".
- 2. Start engine, and check there is no leak of engine oil.
- 3. Stop engine and wait for 10 minutes.
- 4. Check the engine oil level again. Refer to LU-22, "Inspection".

INFOID:000000011999133

Revision: 2015 March

[YS23DDT/YS23DDTT]

< REMOVAL AND INSTALLATION >

GLOW PLUG

Exploded View

INFOID:0000000011999134

А



< REMOVAL AND INSTALLATION > VACUUM PUMP

Exploded View

INFOID:000000011999136



: Always replace after every disassembly.

•: Indicates that the parts is connected at points with same symbols in actual vehicle.

Removal and Installation

REMOVAL

1

(A)0

- 1. Remove engine cover. Refer to EM-157, "Removal and Installation".
- 2. Drain engine coolant. Refer to CO-40, "Draining".
- 3. Remove engine slinger (rear). Refer to EM-228, "Exploded View".
- Remove injector rail protector. Refer to <u>EM-189</u>, "Exploded View".
- 5. Disconnect vacuum hose from vacuum pump.
- Remove water pipe assembly. Refer to <u>CO-58, "Exploded View"</u>. 6.
- 7. Remove vacuum pump.

INSTALLATION

Note the following, and install in the reverse order of removal.

Vacuum pump

CAUTION:

Be sure to check that the vacuum pump is in contact with the cylinder head before tightening the mounting bolts.



INFOID:000000011999137

< REMOVAL AND INSTALLATION >

OIL SEPARATOR

Exploded View

INFOID:000000011999138

А



4. Disconnect blow-by hose from oil separator. Refer to EM-159, "Exploded View".

EM-187

OIL SEPARATOR

< REMOVAL AND INSTALLATION >

- 5. Loosen oil separator mounting bolts in the order from 8 to 1 as shown in the figure.
 - \triangleleft : Engine front



INSTALLATION

- 1. Install oil separator.
 - Tighten mounting bolts in the order from 1 to 8 as shown in the figure.



1st step: 5.0 N·m (0.51 kg-m, 44 in-lb)

- 9 2nd step: 10.0 N·m (1.0 kg-m, 89 in-lb)
 - \triangleleft : Engine front
- Install in the reverse order of removal after this step. 2.



[YS23DDT/YS23DDTT]

< REMOVAL AND INSTALLATION >

INJECTION TUBE AND FUEL INJECTOR

Exploded View

INFOID:000000012006032

А



- Be sure to read "Precautions for Diesel Equipment". Refer to <u>EM-139, "Precaution for Diesel Equip-ment"</u>.
- Wait until the fuel temperature drops before carrying out any work.
- Order the special high pressure injection circuit plug kit.
- It is forbidden to open an fuel injector. If you open an fuel injector by mistake, you will have to change it.

EM-189

INJECTION TUBE AND FUEL INJECTOR

< REMOVAL AND INSTALLATION >

- 1. Disconnect battery cable from negative terminal.
- 2. Remove oil separator. Refer to EM-187, "Removal and Installation".
- 3. Disconnect fuel injector harness connector.
- 4. Remove injection tube.
 - Put a paint mark or tag on injection tubes to identify each cylinder.
- 5. Remove fuel return hose ①.
 - Lift the movable sections of the injector unions away from the fuel return hose.



6. Remove fuel injectors with the following procedure:

Remove cylinder head housing bolts (A)

- a. Remove fuel injector support.
- b. Remove fuel injector head ①

C.





d. Install the support leg (A) of injector extractor [SST: — (Mot. 1966)] on the cylinder head housing in place of the cylinder head hosing bolts.

INJECTION TUBE AND FUEL INJECTOR

< REMOVAL AND INSTALLATION >

f.

e. Install the pull rod (A) of injector extractor [SST: — (Mot. 2093)] on the fuel injector.





1966)].

Install the pressure plate (A) of injector extractor [SST: - (Mot.

- g. Install the pin (B) of injector extractor [SST: (Mot. 1966)] to prevent the pull rod from rotating.
 - Grease the threads of the pull rod.
- h. Install the ball nut (A) of injector extractor [SST: (Mot. 1966)].



e. Turn fuel injector support bolt 5 degrees clockwise (angle tightening). CAUTION:

EM-191

INJECTION TUBE AND FUEL INJECTOR

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

- Check and comfirm the tightening angle by using an angle wrench [SST: KV10112100 (-)] or protractor. Avoid judgment by visual inspection without the tool.
- 2. Install in the reverse order of removal, for the rest of parts.
- When replacing fuel injector, this procedure must be performed. Refer to EC-926, "Description"

Inspection

INFOID:000000011999142

INSPECTION AFTER INSTALLATION

- When replacing fuel injector, this procedure must be performed. Refer to EC-921, "Description"
- Start the engine and check for fuel leak for one minute after starting. CAUTION:

After any operation, check that there are no diesel leaks. Refer to <u>EM-139, "Precaution for Diesel</u> <u>Equipment"</u>.

< REMOVAL AND INSTALLATION >

TIMING CHAIN

Exploded View

INFOID:000000011999148

А





To exhaust manifold and turbocharg-

- 9 : N·m (kg-m, in-lb)
- : Always replace after every disassembly.

< REMOVAL AND INSTALLATION >

- 7 : Should be lubricated with oil.
- : Sealing point
- : Indicates that the part is connected at points with same symbol in actual vehicle.



- Intake camshaft timing sprocket ⓓ
- Exhaust camshaft timing sprocket 4 (front)
- Timing chain $\overline{\mathcal{O}}$
- Crankshaft spacer (crankshaft side) 10
- O-ring (13)
- Front oil seal (16)

- Intake camshaft timing sprocket 2 spacer
- Timing sprocket spacer 5
- Slack guide 8
- (1) Crankshaft sprocket
- Oil filler cap (14)
- (17) Crankshaft pulley

- Exhaust camshaft timing sprocket 3 (rear)
- Tension guide 6
- Timing chain tensioner 9
- Front cover (12)
- (15) Vacuum tank
- Crankshaft spacer 18 (crankshaft pulley side)

EM-194

< REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

(19	Crankshaft pulley bolt	20	High pressure turbine bypass valve control solenoid valve	21	Vacuum hose	А
(22	Low pressure wastegate valve con- trol solenoid valve	23	Vacuum hose	24)	Vacuum hose	
(.	A	Comply with the installation proce- dure when tightening. Refer to <u>EM-</u> <u>195, "Removal and Installation"</u> .	₿	Comply with the installation procedure when tightening. Refer to <u>EM-</u> 203. "Removal and installation".	©	Comply with the installation proce- dure when tightening. Refer to <u>EM-</u> <u>195. "Removal and Installation"</u> .	EM
(D	Comply with the installation proce- dure when tightening. Refer to <u>EM-</u> <u>195, "Removal and Installation"</u> .	Ē	To turbocharger	F	To vacuum pump	С
(G	To turbocharger					
C	0	: N·m (kg-m, ft-lb)					D
	Ŷ	: N·m (kg-m, in-lb)					
(\mathbf{X}	: Always replace after every disassem	nbly.				Ε
		: Should be lubricated with oil.					
		: Sealing point					F
	D , 4	Indicates that the part is connected	datp	oints with same symbol in actual veh	icle.		
Do	m	aval and Installation		,			G
ĸe	III	Jval and installation				INFOID:000000011999149	0
REI	MC	DVAL					
1.	Dr	ain engine oil. Refer to <u>LU-23,</u>	"Dra	aining".			Н
	C/ Pe	AUTION: erform this step when the enc	nine	is cold.			
2.	Re	emove engine cover. Refer to E	M-1	57, "Removal and Installation"			
3.	Re	emove engine cover bracket. R	efer	to EM-157, "Exploded View".	•		
4.	Re	emove drive belt and compress	or b	elt. Refer to EM-151, "Remova	al and	d Installation".	1
5.	Re	emove cooling fan. Refer to <u>CO</u>	-52,	"Removal and Installation".			J
6.	Re	emove water pump pulley. Refe	r to	CO-54, "Exploded View"			
7.	Re	emove compressor and move to	o as	ide. Refer to <u>HA-141, "Explode</u>	ed Vi	ew".	K
8.	Re	emove compressor bracket. Re	fer t	o <u>HA-141, "Exploded View"</u> .			
9.	Re tro	emove turbocharger boost contr of solenoid valve and low press	rol s ure v	olenoid valve (YS23DDT) or h wastegate valve control solenc	igh p bid va	ressure turbine bypass valve con- alve (YS23DDTT).	L
10.	Re	emove vacuum tank.					
11.	Re • ; •	emove crankshaft pulley with th Set the crankshaft pulley lockin Remove crankshaft pulley. CAUTION:	e fo g to	llowing procedure: ol [SST: — (Mot.1770)] (A).			Μ
	I	Be careful not to damage from	nt oi	il seal lip.	/		N
						JPBIA0730ZZ	O P

< REMOVAL AND INSTALLATION >

12. Loosen front cover bolts in the order from 22 to 1 as shown in the figure.





- 13. Align the groove (A) on the crankshaft with the hole (B) on the cylinder block (pistons at mid-stroke).
- 14. Install the TDC set pin [SST: -- (Mot.1766)] (C).

- 15. Turn the crankshaft counterclockwise until it makes contact with the tool.
- 16. Loosen the bolts (A) of the exhaust camshaft timing sprocket.
- 17. Compress the timing chain tensioner (2) with the slack guide (1).
- 18. Lock the timing chain tensioner using a locking pin (B).
- 19. Remove the followings:
 - the timing chain tensioner,
 - the slack guide,
 - the tension guide,
 - the washer of the timing chain sprocket on the camshaft side,
 - the "timing chain sprocket on the camshaft side timing chain timing chain sprocket on the crankshaft side" assemble



< REMOVAL AND INSTALLATION >

INSTALLATION

REFITTING PREPARATION OPERATION

- Use SUPER CLEANING AGENT FOR JOINT FACES to clean:
- the joint face of the front cover on the cylinder block and on the cylinder head,
- the front cover.

WARNING:

Do not scrape the joint faces of the aluminium, any damage caused to the joint face will result in a risk of leaks.

- Remove the residue using a plastic spatula.
- Finish cleaning the joint faces using a GREY ABRASIVE PAD.

WARNING:

To ensure proper sealing, the gasket surfaces must be clean, dry and not greasy (avoid any finger marks).

- 1. Set the engine at TDC.
- Install the TDC set pin [SST: (Mot.1766)].
- 3. Check that the mark (A) on the intake camshaft timing sprocket is opposite the rocker cover boss (B).
- 4. Check that the groove on the exhaust camshaft is horizontal (large offset C facing upwards).
- 5. Refit the tension guide.



- 6. Install tension guide ①.
- Tighten tension guide bolts (A). 7.
- 8. Install crankshaft spacer (crankshaft side) (2). NOTE:

The timing chain does not have a direction of fitting.

- 9. Align the mark on the sprocket with the copper chain links (B).
- 10. Install exhaust camshaft timing sprocket (front) ③.
- 11. Align the mark on the crankshaft spacer (crankshaft side) with the copper chain links ©.



А

ΕM

D

Е

F

Н

Κ

L

Ρ

[YS23DDT/YS23DDTT]

< REMOVAL AND INSTALLATION >

- 12. Install timing sprocket spacer ② to the exhaust camshaft timing sprocket (front) ①.
- 13. Finger tighten the bolts (A). NOTE:

Allow the exhaust camshaft timing sprocket (front) to rotate freely.



JSBIA6432ZZ

- 14. Install timing chain tensioner.
- 15. Install slack guide ①.
- 16. Tighten slack guide bolt (A).
- 17. Install timing chain tensioner (2) with its locking pin (C).
 NOTE: Check that the timing chain tensioner is in contact with the cylinder block before tightening the bolts.
- 18. Tighten timing chain tensioner bolts B.
- 19. Remove locking pin.



20. Engage the collet (A) of the camshaft timing tool [SST: — (Mot. 1769)] (B) into the camshaft groove.
NOTE:

Do not engage the pins of the camshaft timing tool [SST: — (Mot. 1769)] in the holes of the intake camshaft timing sprocket.



< REMOVAL AND INSTALLATION >

- 21. Turn the camshaft timing tool [SST: (Mot. 1769)] (D) to align the shafts on the spacer (A) and the hole (B).
- 22. Detach the collet of the camshaft timing tool [SST: (Mot. 1769)] from the camshaft groove.
- 23. Engage the pins © of the camshaft timing tool [SST: (Mot. 1769)] in the holes of the intake camshaft timing sprocket.
 NOTE:

Do not fit the collet of the camshaft timing tool [SST: — (Mot. 1769)] into the camshaft groove.

- Turn the camshaft timing tool [SST: (Mot. 1769)] to align the shafts on the spacer and the hole.
- 25. Fit the collet of the camshaft timing tool [SST: (Mot. 1769)] into the groove on the camshaft, without forcing it (if necessary, start the previous operations again).
- 26. Fit the bolt (M6 50 mm long) onto the camshaft timing tool [SST: (Mot. 1769)].
- 27. Torque tighten the bolts of the timing chain sprocket on the camshaft side.



- 28. Apply liquid gasket to the front cover side.
 - Apply a bead of SILICONE ADHESIVE SEALANT to the timing face:
 - 1 bead of 5 ± 2 mm (0.20 ± 0.08 in): on the outline of the rocker cover, from ① to ⑥ passing by the points ②, ③, ④ and ⑤.
 - 1 bead of 11 ± 2 mm (0.43 ± 0.08 in) for a length of 10 to 15 mm.on the points (1), (2), (3), (4), (5), (6).
 - 1 bead of 3.5 ± 1 mm (0.138 ± 0.04 in) on the outline of the cylinder head and of the cylinder block, from (6) to (1), on the edge (7).



[YS23DDT/YS23DDTT]

EM

D

Ε

F

Н

А

D23

< REMOVAL AND INSTALLATION >

29. Tighten front cover bolts in the order from 1 to 22 as shown in the figure.



[YS23DDT/YS23DDTT]

- 30. Install crankshaft pulley with the following procedure:
- a. Tighten crankshaft pulley bolt.

: 50 N·m (5.1 kg-m, 37 ft-lb)

- b. Turn 120 degrees clockwise (angle tightening)
- 31. Install in the reverse order of removal, for rest of the parts.

Inspection

INFOID:0000000011999150

INSPECTION AFTER INSTALLATION

Inspection for Leaks

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If less than required quantity, fill to the specified level. Refer to MA-32, "Fluids and Lubricants".
- Use procedure below to check for fuel leakage.
- Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.
- Warm up engine thoroughly to check there is no leakage of fuel, exhaust gases, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to the specified level, if necessary.

Items		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission / transaxle fluid	AT & CVT Models	Leakage	Level / Leakage	Leakage
	MT Models	Level / Leakage	Leakage	Level / Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gases		_	Leakage	_

Summary of the inspection items:

*: Power steering fluid, brake fluid, etc.



< REMOVAL AND INSTALLATION >

TIMING SPROCKET

Exploded View

INFOID:000000011999151

А



[YS23DDT/YS23DDTT]



To exhaust manifold and turbocharg-

- Y : N⋅m (kg-m, in-lb)
- : Always replace after every disassembly.
- : Should be lubricated with oil.
- : Sealing point
- $igodoldsymbol{\Theta}$, igt A : Indicates that the part is connected at points with same symbol in actual vehicle.



- 1 Intake camshaft timing sprocket
- Exhaust camshaft timing sprocket (front)
- ⑦ Timing chain
- ① Crankshaft spacer (crankshaft side)
- (13) O-ring
- 16 Front oil seal

- ② Intake camshaft timing sprocket spacer
- 5 Timing sprocket spacer
- (8) Slack guide
- (1) Crankshaft sprocket
- (14) Oil filler cap
- (7) Crankshaft pulley

- ③ Exhaust camshaft timing sprocket (rear)
- 6 Tension guide
- (9) Timing chain tensioner
- 12 Front cover
- 15 Vacuum tank
- Crankshaft spacer(crankshaft pulley side)

EM-202

[YS23DDT/YS23DDTT]

< REN	IOVAL AND INSTALLATION	>			[YS23DDT/YS23DDTT]	
(19)	Crankshaft pulley bolt	20	High pressure turbine bypass valve control solenoid valve	21	Vacuum hose	А
22	Low pressure wastegate valve con- trol solenoid valve	23	Vacuum hose	24)	Vacuum hose	
A	Comply with the installation proce- dure when tightening. Refer to <u>EM-195</u> , "Removal and Installation".	₿	Comply with the installation proce- dure when tightening. Refer to <u>EM-</u> <u>203. "Removal and installation"</u> .	©	Comply with the installation proce- dure when tightening. Refer to <u>EM-</u> <u>195. "Removal and Installation"</u> .	EN
D	Comply with the installation proce- dure when tightening. Refer to <u>EM-195. "Removal and Installation"</u> .	Ē	To turbocharger	Ē	To vacuum pump	С
G	To turbocharger					_
0	: N⋅m (kg-m, ft-lb)					D
Ŷ	: N·m (kg-m, in-lb)					
⊗	: Always replace after every disasser	nbly.				E
7	: Should be lubricated with oil.					
Ĺ	: Sealing point					F
• , .	Indicates that the part is connected	d at p	points with same symbol in actual vehi	icle.		
Rem	oval and installation				INFOID:000000011999152	G
REMO	DVAL					

- Remove the timing chain. Refer to <u>EM-195</u>, "Removal and Installation".
- 2. Immobilize the intake camshaft timing sprocket using camshaft timing tool [SST: — (Mot. 1769)].
- Loosen the intake camshaft timing sprocket bolt.
- 4. Place a flat-blade screwdriver in the hole (A), compress the spring of the intake camshaft timing sprocket (1) and remove the exhaust camshaft timing sprocket (rear) 2.
- 5. Remove the exhaust camshaft timing sprocket bolt.
- Remove the flat-blade screwdriver.
- Remove the intake camshaft timing sprocket bolt B.
- 8. Remove the intake camshaft timing sprocket spacer ③.
- 9. Remove the intake camshaft timing sprocket.



NOTE:

- Clean the sprockets using SURFACE CLEANER.
- Check that the teeth on the sprockets are not broken, chipped or scratched.
- Place the base plate of the positioning tool [SST: (Mot. 1773)] 1. in a vice fitted with jaws.



3

B

(2)

Revision: 2015 March

Н

Κ

L

6

JSBIA6438ZZ

< REMOVAL AND INSTALLATION >

2. Fit the key of the intake camshaft timing sprocket ① into the tool groove to stop the sprocket hub from rotating on the intake camshaft timing sprocket.

[YS23DDT/YS23DDTT]



- 3. Place the lever of the positioning tool [SST: (Mot. 1773)] onto the shaft of the base plate.
- 4. Fit the lever teeth into the lower teeth of the intake camshaft timing sprocket.
- 5. Tighten the butterfly nut of the positioning tool [SST: (Mot. 1773)].
- 6. Turn the lever counterclockwise to align the two pinion teeth.
- Place a 4 mm (0.16 in) diameter pin (A) (or a roll pin punch) in the intake camshaft timing sprocket hole (B).
 NOTE:

The Parts Department supplies the new intake camshaft timing sprocket with a locking pin (C).

8. Release the lever to lock the pin.



- 9. Install intake camshaft timing sprocket ① and intake camshaft timing sprocket spacer ②.
- 10. Tighten the bolt (A) by hand.
- 11. Align the mark (B) with the rocker cover boss.





12. Check that the groove A is horizontal (large ring B facing upwards).

< REMOVAL AND INSTALLATION >

- 13. Center the exhaust camshaft timing sprocket (rear) ① openings on the camshaft hub holes.
- 14. Fit the exhaust camshaft timing sprocket (rear) fully onto the camshaft hub.
- 15. Remove the locking pin (A).
- 16. Install the camshaft timing tool [SST: (Mot. 1769)] to immobilize the intake camshaft timing sprocket.
- 17. Tighten the bolt on the intake camshaft timing sprocket.

O : 20 N.m (2.0 kg-m, 15 ft-lb)

- 18. Turn 35 degrees clockwise (angle tightening)
- 19. Install the timing chain. Refer to EM-195, "Removal and Installation".



А

С

D

Ε

F

Н

J

Κ

L

Μ

Ν

Ο

Ρ

INFOID:000000011999162

INFOID:000000011999163

[YS23DDT/YS23DDTT]



(1) Flywheel

Comply with the installation proce-(A) dure when tightening. Refer to EM-206, "Removal and Installation".

- : N·m (kg-m, ft-lb)
- Always replace after every disassembly.

Removal and Installation

REMOVAL

- 1. Remove the transmission. Refer to TM-37, "2WD : Removal and Installation" (2WD) or TM-41, "4WD : Removal and Installation" (4WD).
- 2. Remove clutch cover and clutch disk. Refer to CL-41, "Removal and Installation".
- Remove flywheel.
- Fix flywheel using flywheel locking tool [SST: (Mot. 1431)] a. **CAUTION:**
 - Never disassemble them.
 - Never place them with signal plate facing down.
 - When handling signal plate, take care not to damage or scratch them.
 - Handle signal plate in a manner that prevents them from becoming magnetized.
- Loosen bolts in the order from 8 to 1 as shown in the figure. b.



< REMOVAL AND INSTALLATION >

INSTALLATION CAUTION:

Never damage or scratch and contact surface for clutch disc of flywheel.

- Tighten bolts in the order from 1 to 8 as shown in the figure with the following procedure:
- Tighten mounting bolts.

D) : 40.0 N·m (4.1 kg-m, 30 ft-lb)

- Turn 34 degrees clockwise (angle tightening).



[YS23DDT/YS23DDTT]

Inspection

INFOID:000000012157935

DRIVE PLATE DEFLECTION

· Measure the deflection of flywheel contact surface to torque converter with a dial indicator (A).

Limit : 0.10 mm (0.0039 in) or less.

- If measured value is out of the standard, replace flywheel.
- If a trace of burn or discoloration is found on the surface, repair it with sandpaper.

Δ Н JSBIA645677

А

F

J

Κ

L

Μ

Ν

Ρ
< REMOVAL AND INSTALLATION > DRIVE PLATE

Exploded View

INFOID:000000011999164

INFOID:0000000011999165



Removal and Installation

REMOVAL

- 1. Remove the transmission. Refer to <u>TM-644</u>, "<u>2WD</u> : <u>Removal and Installation</u>" (2WD) or <u>TM-649</u>, "<u>4WD</u> : <u>Removal and Installation</u>" (4WD).
- 2. Remove drive plate. CAUTION:

Never disassemble them.

- a. Fix drive plate using flywheel locking tool [SST: (Mot.1431)].
- b. Loosen bolts in the order from 8 to 1 as shown in the figure.
- 3. Remove pilot bushing using the pilot bushing puller (commercial service tool), if necessary.



INSTALLATION

- 1. Install pilot bushing.
 - Using the drift, force fit the pilot bushing until its front end contacts crankshaft.
- 2. Install drive plate.
- a. Install bolts without tightening them.

< REMOVAL AND INSTALLATION >

- b. Fix drive plate using flywheel locking tool [SST: (Mot.1431)].
- c. Tighten bolts in the order from 1 to 8 as shown in the figure.
 - : 50.0 N·m (5.1 kg-m, 37 ft-lb)



Е

F

G

Н

J

Κ

L

Μ

Ν

Ο

Ρ

< REMOVAL AND INSTALLATION >

OIL SEAL FRONT OIL SEAL

FRONT OIL SEAL : Removal and Installation

INFOID:0000000011999156

REMOVAL

- 1. Remove the following parts.
 - Drive belt and air compressor belt: Refer to EM-151, "Removal and Installation".
 - Cooling fan: Refer to CO-52, "Removal and Installation".
 - Crankshaft pulley: Refer to <u>EM-193</u>, "Exploded View".
- 2. Remove front oil seal using service tool (A). **NOTE:**

The service tool is supplied in the new seal parts kit.



INSTALLATION

- 1. Install front oil seal with the following procedure:
- a. Fit the protector (A) to front oil seal ①.
 - Align the front oil seal notches with front cover notches. **NOTE:**

The protector is supplied in the new seal parts kit.

b. Tighten to front oil seal ① using service tool (A).
 NOTE:
 The convict tool is supplied in the new cool parts

The service tool is supplied in the new seal parts kit.





- c. Remove the protector.
- 2. Install in the reverse order of removal, for the rest of parts. REAR OIL SEAL

REAR OIL SEAL : Removal and Installation

REMOVAL

1. Remove transmission. Refer to followings:

Revision: 2015 March

INFOID:0000000011999157

OIL SEAL

< REMOVAL AND INSTALLATION >

- M/T models (2WD): Refer to <u>TM-37</u>, "2WD : Removal and Installation".
 M/T models (4WD): Refer to <u>TM 41</u>, "4WD : Removal and Installation".
- M/T models (4WD): Refer to <u>TM-41</u>, "4WD : Removal and Installation".
 A/T models (2WD): Refer to <u>TM-644</u>, "2WD : Removal and Installation".
- A/T models (2WD): Refer to <u>TM-649, "4WD : Removal and Installation"</u>.
 A/T models (4WD): Refer to <u>TM-649, "4WD : Removal and Installation"</u>.
- Remove clutch cover and clutch disk. Refer to <u>CL-41, "Exploded View"</u> (M/T models).
- 3. Remove flywheel or drive plate. Refer to <u>EM-206, "Exploded View"</u> (flywheel) or <u>EM-208, "Exploded View"</u> (drive plate).
- 4. Remove rear oil seal retainer.

INSTALLATION

- 1. Install rear oil seal retainer with the following procedure:
- a. Set guide bolt (A) and protector (B) to rear oil seal retainer (1). **NOTE:**

The protector is supplied in the new seal parts kit.

- b. Move the rear oil seal retainer evenly by hand until it makes contact with the cylinder block.
- c. Remove guide bolts and protector.
- d. Tighten mounting bolts in two steps separately in numerical order as shown in the figure.
- i. Tighten bolts No. 1and 5.

♀ : 5.0 N⋅m (0.51 kg-m, 44 in-lb)

ii. Tighten No. 1 to 8 in numerical order as shown.

: 12.0 N·m (1.2 kg-m, 9 ft-lb)

2. Install in the reverse order of removal, for the rest of parts.



ΕM



D

Е

F

Н

Κ

L

Μ

Ν

Ρ





< UNIT REMOVAL AND INSTALLATION > UNIT REMOVAL AND INSTALLATION ENGINE ASSEMBLY

Exploded View

INFOID:0000000011999158



Image: N·m (kg-m, ft-lb)

Removal and Installation

WARNING:

 $\overline{7}$

(A)

- Situate the vehicle on a flat and solid surface.
- Place chocks at front and back of rear wheels.

CAUTION:

- Always be careful to work safely, avoid forceful or uninstructed operations.
- Never start working until exhaust system and coolant are cool enough.
- If items or work required are not covered by the engine section, refer to the applicable sections.
- Always use the support point specified for lifting.
- Use either 2-pole lift type or separate type lift as best you can. If board-on type is used for unavoidable reasons, support at the rear axle jacking point with a transmission jack or similar tool before starting work, in preparation for the backward shift of center of gravity. Refer to GI-30, "2-Pole Lift".
- For supporting points for lifting and jacking point at rear axle, refer to GI-29, "Garage Jack and Safety Stand".

NOTE:

When removing components such as hoses, tubes / lines, etc., cap or plug openings to prevent fluid from spilling.

EM-212

INFOID:000000011999159

ENGINE ASSEMBLY

< UNIT REMOVAL AND INSTALLATION >

REI	MOVAL	
Des Rer	cription of work nove transmission assembly from vehicle downward. Then hoist the engine from vehicle upward.	А
Pre	paration	
1.	Disconnect battery cable from negative terminal. Refer to PG-211. "Exploded View".	
2.	Drain engine coolant from radiator. Refer to CO-40, "Draining".	
3.	Remove the following parts.	С
	 Front under cover: Refer to <u>EXT-24, "Exploded View"</u>. Hood assembly: Refer to <u>DLK-162, "HOOD ASSEMBLY : Removal and Installation"</u> (WITH INTELLI-GENT KEY SYSTEM) or <u>DLK-372, "HOOD ASSEMBLY : Removal and Installation"</u> (WITHOUT INTEL-LIGENT KEY SYSTEM) 	D
	 Front grill: Refer to <u>EXT-19, "Exploded View"</u>. Engine cover: Refer to <u>EM-157, "Exploded View"</u>. Air duct (inlet), air duct, and air cleaner case: Refer to <u>EM-159, "Exploded View"</u>. Brake pipe lines, fuel pipe lines brackets. 	E
	 Radiator hose (upper and lower): Refer to CO-47, "Exploded View". 	
4.	Discharge refrigerant from A/C circuit. Refer to HA-132, "Recycle Refrigerant".	F
5.	Disconnect engine room harness from the engine side and set it aside for easier work.	
6.	Disconnect all the body-side vacuum hoses and air hoses at engine side.	
7.	Remove air inlet hose. Refer to EM-161, "Exploded View".	G
Eng	ine Room Front	
1.	Remove radiator reservoir tank. Refer to CO-47, "Exploded View".	Н
2.	Remove the radiator shroud (upper and lower). Refer to <u>CO-47, "Exploded View"</u> .	11
3.	Remove compressor belt and drive belt. Refer to EM-151, "Removal and Installation".	
4.	Remove the cooling fan assembly. Refer to <u>CO-52, "Exploded View"</u> .	
5.	Remove the water pump pulley. Refer to CO-54. "Removal and Installation".	
6.	Separate the cooler pipe (HI) (LOW) from condenser side. Refer to <u>HA-145, "Exploded View"</u> .	
7.	Remove the refrigerant pressure sensor harness connector. Refer to <u>HA-151, "REFRIGERANT PRES</u> <u>SURE SENSOR : Removal and Installation"</u> .	J
8.	Separate A/T fluid cooler from the condenser (A/T models). Refer to <u>TM-639</u> , "Removal and Installation".	
9.	Disconnect A/T fluid cooler hose from the radiator (A/T models). Refer to <u>TM-639</u> , " <u>Removal and Installa-</u> tion".	K
10.	Remove radiator assembly along with condenser. Refer to CO-48, "Removal and Installation".	1
11.	Remove alternator. Refer to CHG-39, "YS23DDT, YS23DDTT : Removal and Installation".	L
12.	Remove power steering oil pump mounting bolt, move to the position which does not interfere the work of power steering oil pump. Refer to <u>ST-31, "Exploded View"</u> .	N/I
Eng	ine Room RH	1 V I
1.	Remove brake booster hose in brake booster side. Refer to BR-124, "Removal and Installation".	
2.	Remove air inlet tube (silencer) and air inlet hose. Refer to EM-161, "Exploded View".	Ν
3.	Remove compressor. Refer to <u>HA-142, "COMPRESSOR : Removal and Installation"</u> .	
4.	Remove low-pressure flexible hose. Refer to <u>HA-145, "Exploded View"</u> .	
Eng	ine Room LH	0
1.	Disconnect fuel feed hose and return hose, and plug it to prevent fuel from draining. Refer to <u>FL-29.</u> <u>"Exploded View"</u> .	
2.	Disconnect fuel filter harness connector. Refer to FL-29, "Removal and Installation".	۲
3.	Remove fuel filter and fuel filter bracket mounting bolt. Refer to FL-29, "Exploded View".	
4.	Remove fuel filter and fuel filter bracket. Refer to FL-29, "Exploded View".	
5.	Disconnect A/C piping from heater unit. Refer to <u>HA-145, "Exploded View"</u> .	
6.	Disconnect heater hose, and install plug it to prevent engine coolant from draining. Refer to <u>HA-157</u> . "HEATER & COOLING UNIT ASSEMBLY : Removal and Installation".	

ENGINE ASSEMBLY

< UNIT REMOVAL AND INSTALLATION >

Vehicle Underbody

- 1. Remove Main muffler. Refer to EX-10, "Exploded View".
- 2. Remove DPF (diesel particulate filter). Refer to EM-171, "Removal and installation".
- 3. Remove front propeller shaft. (4WD) Refer to <u>DLN-132, "Exploded View"</u>.
- Remove rear propeller shaft. Refer to <u>DLN-143</u>, "<u>Exploded View</u>" (2WD) or <u>DLN-154</u>, "<u>Exploded View</u>" (4WD).
- 5. Separate the lower joint from the steering gear assembly. Refer to ST-20, "Exploded View".
- 6. Remove clutch operating cylinder from transmission, and move it aside (M/T models). Refer to <u>CL-28.</u> <u>"YS23DDT, YS23DDTT : Exploded View"</u>.
- 7. Remove starter motor. Refer to STR-55, "YS23DDT, YS23DDTT : Exploded View".
- 8. Remove A/T fluid cooler tube B. (A/T models) Refer to TM-638. "Exploded View".
- 9. Remove front cross member.
- 10. Remove transmission cross member.
- 11. Remove transmission assembly. Refer to followings:
 - M/T models (2WD): TM-37, "2WD : Removal and Installation".
 - M/T models (4WD): TM-41, "4WD : Removal and Installation".
 - A/T models (2WD): <u>TM-644. "2WD : Removal and Installation"</u>.
 - A/T models (4WD): <u>TM-649</u>, "4WD : Removal and Installation".

Removal

- 1. Lift with hoist and secure engine in position.
- 2. Loosen LH and RH engine mounting insulator mounting nuts.
- 3. Remove engine.
 - **CAUTION:**
 - During the operation, check that no part interferes with body side.
 - Before and during this lifting, always check if any harnesses are left connected.



INSTALLATION

Install in the reverse order of removal.

- Do not allow engine oil to get on mounting insulator. Be careful not to damage mounting insulator.
- When installation directions are specified, install parts according to the direction marks on them referring to figure of components.
- Check that each mounting insulator is seated properly, and tighten mounting bolts and nuts.
- Insert vacuum hose to vacuum gallery until vacuum hose comes in contact with the stopper when a stopper is provided at vacuum gallery.
- Insert vacuum hose up to 15 mm (0. 59 in) when a stopper is not provided at vacuum gallery.

Inspection

INFOID:000000011999160

INSPECTION AFTER INSTALLATION

Inspection for Leaks

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If less than required quantity, fill to the specified level. Refer to <u>MA-32</u>, "Fluids and Lubricants".
- Use procedure below to check for fuel leakage.
- Turn ignition switch "ON" (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
- Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.

ENGINE ASSEMBLY

< UNIT REMOVAL AND INSTALLATION >

[YS23DDT/YS23DDTT]

- Warm up engine thoroughly to make sure there is no leakage of fuel, exhaust gases, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to the specified level, if necessary.

Summary of the ins	pection items:				_
Items		Before starting engine	Engine running	After engine stopped	
Engine coolant		Level	Leakage	Level	C
Engine oil		Level	Leakage	Level	
Transmission /	AT & CVT Models	Leakage	Level / Leakage	Leakage	
transaxle fluid	MT Models	Level / Leakage	Leakage	Level / Leakage	Ľ
Other oils and fluids	5*	Level	Leakage	Level	
Fuel		Leakage	Leakage	Leakage	E
Exhaust gases		—	Leakage	—	•

*: Power steering fluid, brake fluid, etc.

EM

F

Н

J

Κ

L

Μ

Ν

Ο

Ρ

А

UNIT DISASSEMBLY AND ASSEMBLY ENGINE STAND SETTING

Setting

INFOID:0000000011999161

NOTE:

Explained here is how to disassemble with engine stand supporting transaxle surface. When using different type of engine stand, note with difference in steps and etc.

- 1. Install engine to engine stand with the following procedure:
- a. Remove flywheel or drive plate. Refer to <u>EM-206, "Exploded View"</u> (M/T models) or <u>EM-208, "Exploded View"</u> (A/T models).
- b. Lift the engine with a hoist to install it onto widely use engine stand. CAUTION:

Use the engine stand that has a load capacity [approximately 225 kg (496 lb) or more] large enough for supporting the engine weight.

- If the load capacity of stand is not adequate, remove the following parts beforehand to reduce the potential risk of overturning stand.
- Intake manifold: Refer to EM-166, "Removal and Installation".
- Exhaust manifold: Refer to EM-174, "Removal and Installation".
- Oil separator: Refer to EM-187, "Removal and Installation".

NOTE:

The figure shows an example of widely used engine stand A that can support mating surface of transaxle with flywheel removed.

CAUTION:

Before removing the hanging chains, check the engine stand is stable and there is no risk of overturning.



 Drain engine oil. Refer to <u>LU-23, "Draining"</u>. CAUTION:

Be sure to clean drain plug and install with new gasket.

Exploded View

INFOID:000000011999166

А



< UNIT DISASSEMBLY AND ASSEMBLY >

: Sealing point

 \bullet , \blacktriangle : Indicates that the parts is connected ato points with same symbols in actual vehecle.

Removal and Installation

REMOVAL

- 1. Remove oil pan (lower). Refer to EM-183, "Removal and Installation".
- 2. Remove front cover. Refer to EM-193, "Exploded View".
- 3. Remove oil filter. Refer to LU-24, "Removal and Installation".
- 4. Remove engine oil pressure switch.
- 5. Remove engine oil level sensor.
- 6. Remove engine oil gauge guide.
- 7. Remove rear oil seal retainer. Refer to EM-234, "Exploded View"
- 8. Remove oil pan (upper) with the following procedure:
- a. Loosen mounting bolts in reverse order as shown in the figure.



INSTALLATION

- 1. Install oil pan (upper) with the following procedure:
- a. Use a scraper to remove old liquid gasket from mating surfaces. CAUTION:

Never scratch or damage the mating surfaces when cleaning off old liquid gasket.

- Also remove old liquid gasket from mating surface of cylinder block.
- Remove old liquid gasket from the bolt holes and threads.
- b. Apply a continuous bead of liquid gasket to cylinder block ① with the tube presser (commercial service tool) to areas shown in the figure.

A : \$\phi 3.0 - 7.0 mm (0.118 - 0.276 in)

Use Genuine Liquid Gasket or equivalent CAUTION: Attaching should be done within 5 minutes after coating.



INFOID:0000000011999167

OIL PAN (UPPER)

< UNIT DISASSEMBLY AND ASSEMBLY >

- c. Tighten mounting bolts in two steps separately in the order from 1 to 16 as shown in the figure.
 - **9** 1st step: 5.0 N·m (0.5 kg-m, 44 in-lb)
 - 2nd step: 25.0 N·m (2.6 kg-m, 18 ft-lb)



- 2. Install rear oil seal retainer. Refer to EM-234, "Exploded View".
- Install in the reverse order of removal, for the rest of parts.
 NOTE: At least 30 minutes after oil pan is installed, pour engine oil.

F

G

Н

J

Κ

L

Μ

Ν

Ο

Ρ

EM

С

D

Е

А

FUEL PUMP

Exploded View

INFOID:000000011999143



- 1. Remove the engine assembly. Refer to EM-212, "Removal and Installation".
- 2. Remove water connector pipe. Refer to CO-58. "Exploded View"
- 3. Remove fuel pump cover.
- 4. Remove fuel hose from fuel pump.
- 5. Remove fuel collector and remove fuel tube.

FUEL PUMP

< UNIT DISASSEMBLY AND ASSEMBLY >

6. Remove fuel pump.

А 7. In case of replacement of the fuel pump you need to install the old fuel pump sprocket on the new fuel pump. Refer to EM-221, "Disassembly and Assembly".

INSTALLATION

Note the followings, install in the reverse order of removal.

• Fuel pump. **CAUTION:**

Be sure to check that the fuel pump is in contact with the cylinder head before tightening the mount-С ing bolts.

Disassembly and Assembly

REMOVAL

1. Lock the fuel pump on the work-bench in a vice with protective jaws.

2. Using the high pressure pump pinion locking tool [SST: --(Mot.2047)] ①, lock the fuel pump gear.

3. Remove the nut 2.

Ρ

E1BIA0608ZZ





INFOID:000000011999147



D

< UNIT DISASSEMBLY AND ASSEMBLY >

4. Fit a separator 1 from the puller kit under the fuel pump gear 2.

Revision: 2015 March

5. Put the bracket (3) on the separator.

6. Remove the fuel pump gear.

INSTALLATION

- 1. Refit the fuel pump gear to the new fuel pump.
- 2. Screw in the new fuel pump gear on the work-bench, without tightening it.
- 3. Lock the fuel pump on the work-bench in a vice with protective jaws.
- 4. Tighten the nut.

Inspection

INSPECTION AFTER INSTALLATION

• Start the engine and check for fuel leak for one minute after starting. CAUTION:

After any operation, check that there are no diesel leaks. Refer to <u>EM-139, "Precaution for Diesel</u> <u>Equipment"</u>.

EM-222

D23





[YS23DDT/YS23DDTT]

INFOID:000000011999145

CAMSHAFT

Exploded View

INFOID:0000000011999153

А



- Front cover and timing chain related parts: Refer to EM-193, "Exploded View".
- High pressure fuel pump: Refer to <u>EM-220, "Exploded View"</u>.
- Vacuum pump: Refer to EM-186, "Exploded View".

< UNIT DISASSEMBLY AND ASSEMBLY >

- 2. Remove camshaft position sensor. CAUTION:
 - Handle camshaft position sensor carefully and avoid impacts.
 - Never disassemble camshaft position sensor.
 - Never place sensor where it is exposed to magnetism.
- 3. Remove cylinder head housing with the following procedure:
- a. Loosen mounting bolts in the order from 30 to 1 as shown in the figure.



- b. Remove the cylinder head housing ① using a flat-blade screwdriver (A).
 - B : Protective shim (suitable tool)

CAUTION:

Be careful not to damage the mating surface.



- 4. Remove camshafts with the following procedure:
- a. Install cylinder head housing ① to cylinder head stand [commercial service tool: KV113B0200 (Mot.1573)] (A).
- b. Loosen mounting bolts, and remove camshaft brackets and camshafts.
 - Mark camshafts and camshaft brackets so they are placed in the same position and direction for installation.



5. Remove fuel pump gear from camshaft (right side), if necessary.

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

- Carry out this operation only when replacing the exhaust side camshaft or the high pressure pump drive pinion.
- Immobilize the fuel pump gear ① using a vice with jaws.
- Remove the bolt (A) from the pinion, holding the camshaft (2) steady by hand.



INSTALLATION

- 1. Install cylinder head housing with the following procedure:
- a. Align the crankshaft groove (A) with the cylinder block hole (B).

C : TDC set pin [SST: -- (Mot. 1766)]

NOTE:

This is for the purpose of preventing interferences of valve and piston head.



- b. Remove foreign material completely from cylinder head housing backside and cylinder head installation face.
- c. Apply liquid gasket to cylinder head as shown in the figure.
 - (a) : 0.5 2.5 mm (0.020 0.098 in)

Use Genuine Liquid Gasket or equivalent.



- shown ce the ylinder
- d. Install so that camshafts are positioned in the directions shown in the figure.
 - Parallelize the groove of camshaft (right side) ① to face the offset side upward.
 - Fit the groove of camshaft (left side) ② and boss of cylinder head housing.

\6455ZZ

F

А

ΕM

D

Ε

J

Κ

Н

Μ

Ρ

JPBIA072977



< UNIT DISASSEMBLY AND ASSEMBLY >

e. Note the following, tighten mounting bolts of cylinder head housing in the order from 1 to 30.



i. Tighten bolts in numerical order.

9 : 5.0 N·m (0.51 kg-m, 44 in-lb)

Tighten bolts in numerical order.

: 15.0 N·m (1.5 kg-m, 11 ft-lb)

CAUTION:

After tightening mounting bolts of cylinder head housing, be sure to wipe off excessive liquid gasket from the mating surface of cylinder head.

2. Install in the reverse order of removal, for the rest of parts

Inspection

ii.

INFOID:000000011999155

INSPECTION AFTER REMOVAL

Camshaft Journal Oil Clearance CAMSHAFT JOURNAL

Measure the camshaft journal with a micrometer (A).

Standard : Refer to EM-261, "Camshaft".



CYLINDER HEAD HOUSING AND CAMSHAFT BRACKET INNER DIAMETER

< UNIT DISASSEMBLY AND ASSEMBLY >

• Measure the inner diameter (A) of cylinder head housing and camshaft bracket with a bore gauge.

Standard : Refer to EM-261, "Camshaft".



CAMSHAFT JOURNAL OIL CLEARANCE

• (Oil clearance) = (Bracket inner diameter) – (Camshaft journal diameter)

Standard : Refer to EM-261, "Camshaft".

• If it exceeds the standard, replace camshaft or/and cylinder head housing and cylinder head.

INSPECTION AFTER INSTALLATION

Inspection for Leaks

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If less than required quantity, fill to the specified level. Refer to MA-32, "Fluids and Lubricants".
- Use procedure below to check for fuel leakage.
- Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.
- Warm up engine thoroughly to check there is no leakage of fuel, exhaust gases, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to the specified level, if necessary.

Summary of the ir	nspection items:				
Items		Before starting engine	Engine running	After engine stopped	-
Engine coolant		Level	Leakage	Level	-
Engine oil		Level	Leakage	Level	-
Transmission /	AT & CVT Models	Leakage	Level / Leakage	Leakage	-
transaxle fluid	MT Models	Level / Leakage	Leakage	Level / Leakage	-
Other oils and flui	ds*	Level	Leakage	Level	-
Fuel		Leakage	Leakage	Leakage	-
Exhaust gases		_	Leakage	—	-
					-

*: Power steering fluid, brake fluid, etc.

Ν

Е

F

Н

 \cap

< UNIT DISASSEMBLY AND ASSEMBLY >

CYLINDER HEAD

Exploded View

INFOID:000000011999168



- Water outlet: Refer to CO-58, "Exploded View".
- Front cover, timing chain: Refer to EM-193. "Exploded View".
- Camshaft: Refer to <u>EM-223</u>, "Exploded View"
- High pressure fuel pump: Refer to <u>EM-220, "Exploded View"</u>.

< UNIT DISASSEMBLY AND ASSEMBLY >

• Vacuum pump. Refer to EM-186, "Exploded View".

• Loosen mounting bolts in the order from 10 to 1 as shown in the figure.



3. Remove cylinder head gasket.

INSTALLATION

1. Install cylinder head gasket with the following procedure: CAUTION:

Before installing cylinder head, inspect piston protrusion.

a. Apply liquid gasket to position (A) shown in the figure.

Use Genuine Liquid Gasket or equivalent.

- b. Install cylinder head gasket ①, and apply liquid gasket to position (A) shown in the figure.

Use Genuine Liquid Gasket or equivalent.

EM-229

- Install cylinder head, and tighten mounting bolts in the order from 1 to 10 as shown in figure with the following procedure:
- a. Tighten all bolts.



- b. Tighten all bolts.
 - C : 30.0 N·m (3.1 kg-m, 22 ft-lb)







А

ΕM

С

D

Ε

F

Н

Κ

L

Μ

Ν

Ρ

< UNIT DISASSEMBLY AND ASSEMBLY >

c. Turn all bolts 300 degrees clockwise (angle tightening).
 CAUTION:
 Check and confirm the tightening angle by using an angle wrench [SST: KV10112100 (—)] (A) or protractor. Never judge by visual inspection without the tool.



3. Assemble in the reverse order of disassembly, for the rest of parts.

Disassembly and Assembly

INFOID:000000011999170

DISASSEMBLY

- 1. Set the cylinder head assembly to the cylinder head stand [commercial service tool: KV113B0200 (Mot.1573)].
- 2. Remove rocker arm.
- 3. Remove hydraulic tappet.
- 4. Remove valve collet.
 - Compress valve spring with valve spring compressor (commercial service too).
- 5. Remove valve spring retainer and valve spring.
- 6. Check dimension of valve oil seal mounting position before removing valve and valve oil seal with the following procedure:
- a. Install the push rod (A) of valve seal drift [commercial service tool: KV113B0180 (Mot.1511-01)] on the valve oil seal.
 NOTE:

The inner diameter of the push rod must be identical to that of the valve. In addition, the bottom of the push rod must come into contact with the metal upper section of the valve oil seal.



- b. Install the guide tube (B) over the push rod (A) until the guide tube comes into contact with the cylinder head, locking the push rod with the knurled wheel.
 - Remove the guide tube assembly plus push rod, being careful not to loosen the knurled wheel.

- 7. Push valve stem to combustion chamber side, and remove valve.
 - Identify installation positions, and store them without mixing them up.

< UNIT DISASSEMBLY AND ASSEMBLY >

8. Remove valve oil seal ① with a valve oil seal puller [commercial service tool: KV113B0090 (Mot.1335)] (A).

ASSEMBLY

- Install valve.
 NOTE: Install larger diameter to intake side.
- 2. Install valve oil seal with the following procedure:
- a. Position the protector (A) of valve seal drift [commercial service tool: KV113B0180 (Mot.1511-01)] on the valve.

b. Position a valve oil seal on the protector. Move the valve oil seal past the protector. CAUTION:

Never lubricate valve oil seal.

- c. Remove the protector.
- d. Push in the push rod (A) of valve seal drift [commercial service tool: KV113B0180 (Mot. 1511-01)] with palm of the hand until the guide tube (B) makes contact with the cylinder head.



The intake and exhaust valve springs are identical.

- 4. Install valve spring retainer.
- 5. Install valve collet.
 - Compress valve spring with a valve spring compressor (commercial service tool).
 - Tap valve stem edge lightly with a plastic hammer after installation to check its installed condition.
- 6. Install hydraulic tappet.
 - Check that the tappets are filled with oil before refitting them.
- 7. Install rocker arm.

EM-231



Ρ





[YS23DDT/YS23DDTT]

А

ΕM

D

Ε

F

Н

JPBIA0714ZZ

< UNIT DISASSEMBLY AND ASSEMBLY >

Inspection

JPBIA0176ZZ

INSPECTION AFTER DISASSEMBLY

Cylinder Head Distortion

NOTE:

When performing this inspection, cylinder block distortion should be also checked.

1. Wipe off engine oil and remove water scale (like deposit), gasket, sealant, carbon, etc. with a scraper. CAUTION:

Never allow gasket debris to enter passages for engine oil or water.

2. At each of several locations on bottom surface of cylinder head, measure the distortion in six directions (A) - (F).

Standard: Refer to EM-262, "Cylinder Head".

• If it exceeds the standard, replace cylinder head and cylinder head housing.

NOTE:

Cylinder head cannot be replaced as a single part, because it is machined together with cylinder head housing. Replace whole cylinder head housing and cylinder head assembly.

Valve Dimensions

- Check the dimensions of each valve. For the dimensions, refer to <u>EM-262, "Cylinder Head"</u>.
- If dimensions are out of the standard, replace valve and check valve seat contact.

Valve Guide Clearance

Valve stem diameter

• Measure the diameter of valve stem with micrometer (A).

Standard : Refer to EM-262, "Cylinder Head".

Valve guide inner diameter

• Measure the inner diameter of valve guide with bore gauge.

Standard : Refer to EM-262, "Cylinder Head".

Valve guide clearance

 (Valve guide clearance) = (Valve guide inner diameter) – (Valve stem diameter)

Standard : Refer to EM-262, "Cylinder Head".

• If it exceeds the standard, replace valve and/or cylinder head and cylinder head housing.

Valve Seat Contact

- After confirming that the dimensions of valve guides and valves are within the specifications, perform this procedure.
- Apply prussian blue (or white lead) onto contacting surface of valve seat to check the condition of the valve contact on the surface.



< UNIT DISASSEMBLY AND ASSEMBLY >

- Check if the contact area band is continuous all around the circumference.
 - (A) : OK
 - B : NG
- If not, grind to adjust valve fitting and check again. If the contacting surface still has "NG" conditions even after the re-check, replace cylinder head and cylinder head housing.

Valve Spring Dimensions And Valve Spring Pressure Load

• Check valve spring pressure with valve spring seat installed at the specified spring height.

Standard : Refer to EM-262, "Cylinder Head".

• If the pressure height is out of the standard, replace valve spring.



[YS23DDT/YS23DDTT]



D

Е

F

Н

J

Κ

L

Μ

Ν

0

Ρ

С

А

ΕM

Revision: 2015 March

< UNIT DISASSEMBLY AND ASSEMBLY >

CYLINDER BLOCK

Exploded View

INFOID:000000011999172

[YS23DDT/YS23DDTT]



(16) Adjust shim

(1)

4

 \overline{O}

10

(13)

Revision: 2015 March

- 17 Balancer unit bolt

- (15) Balancer unit
- (18) Crankshaft bearing cap bolt

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]



< UNIT DISASSEMBLY AND ASSEMBLY >

- c. Loosen mounting bolts in the order of 6 to 1 as shown in the figure.



- d. Remove balancer unit and baffle plate.
- e. Remove adjust shims.
- f. Remove TDC set pin.
- 8. Remove piston and connecting rod assembly with the following procedure:
 - Before removing piston and connecting rod assembly, check the connecting rod side clearance. Refer to <u>EM-248, "Inspection"</u>.
- a. Position crankshaft pin corresponding to connecting rod to be removed onto the bottom dead center.
- b. Remove connecting rod cap.Put a paint mark on cap to identify each cylinder.
- c. Using a hammer handle or similar tool, push piston and connecting rod assembly out to the cylinder head side.



CAUTION:

- Be careful not to damage oil jets (A), cylinder wall and crankshaft pin, resulting from an interference of the connecting rod big end.
- Never disassemble oil jets.



- Remove connecting rod bearing shells.
 CAUTION: When removing them, note the installation position. Keep them in the correct.
- 10. Remove piston rings from piston.
 - Before removing piston rings, check the piston ring side clearance. Refer to EM-248, "Inspection".

< UNIT DISASSEMBLY AND ASSEMBLY >

- Use a piston ring expander (commercial service tool) (A). CAUTION:
 - When removing piston rings, be careful not to damage the piston.
 - Be careful not to damage piston rings by expanding them excessively.

[YS23DDT/YS23DDTT]

А

D

Ε

F

Κ

Μ

Ν

Ρ



- 11. Remove the snap rings ① using a screwdriver (A), and then release the piston pin.
 - : Channel B



- 12. Remove main bearing cap mounting bolts with the following procedure:
 - Н Measure crankshaft end play before loosening main bearing cap mounting bolts. Refer to <u>EM-248</u>. "Inspection".
- a. Loosen mounting bolts in the order of 10 to 1 as shown in the figure.
 - : Engine front



- Remove crankshaft bearing caps. b.
- Remove crankshaft. C.
- d. Remove crankshaft bearing shells.

NOTE:

Always mark the position of each crankshaft bearing shell using an indelible marker pen, in relation to the crankshaft bearing number

13. Remove crankshaft position sensor target.

Assembly

1. Fully air-blow engine coolant and engine oil passages in the cylinder block, cylinder bore and crankcase to remove any foreign matter. CAUTION:

Use a goggles to protect your eye.

- 2. Install main bearings and thrust bearings with the following procedure:
- Remove dust, dirt, and engine oil from the bearing mating surfaces of the cylinder block and main bearing а cap.

Revision: 2015 March

- If necessary, adjust the position of the bearing shells. f.
 - Bearings No. 2 and 4 to the value (X2)
 - : 90.61 90.81 mm (3.5673 3.5752 in) **X2**

< UNIT DISASSEMBLY AND ASSEMBLY >

- b. Center the grooved bearing shell on bearing No.1 of the cylinder block while aligning the groove of the bearing shell with the hole of the bearing (A).
 - Secure the flush bearing shell (1) and push from the opposite side the position of the bearing shell flush with the bearing.

- Measure the distance (X1) between the bearing face (7) and the c. edge of the bearing shell at points (A), (B) and (C) using a depth gauge.
- If necessary, adjust the position of the bearing shell to the value d. (X1).

Repeat the previous operations for the bearing shells of the bearings No 2, 4 and 5.

X1 : 182.61 - 182.81 mm (7.19 - 7.20 in)



6 JPBIA0711ZZ

 (\mathbf{C})

JMBIA4332ZZ





[YS23DDT/YS23DDTT]

e.

< UNIT DISASSEMBLY AND ASSEMBLY >

g. Secure the flush bearing shell against the rectified shim ② and push from the opposite side to position the bearing shell flush with the bearing.

Place:

- Dial indicator stand set [SST: KV113B0040 (Mot.251-01)] ① against the mating face of the crankshaft thrust washer on bearing No.3
- the grooved bearing shell against the rectified shim.
- h. Measure the distance (X3) between the bearing face of the thrust washer and the bearing shell edge using a depth gauge.

X3 : 1.9 - 2.1 mm (0.075 - 0.083 in)

- i. Center the grooved bearing shell on the bearing, aligning the shell with the hole groove.
 - Adjust the position of the bearing shell at points (A), (B) and (C) using the dial indicator stand set [SST: KV113B0040 (Mot.251-01)] (5) and a set of feeler gauges (thickness of the shim (6).

Thickness of the shim : 1.9 - 2.1 mm (0.075 - 0.083 in)

j. Secure the flush bearing shell with the bearing cap at ① and push from the opposite side to bring the bearing shell flush with the bearing cap.

Place:

- the bearing cap on a bench,
- a non-grooved bearing shell against the bench.
- k. Measure the distance (X4) between the edge of the bearing shell and the wall of the bearing cap at points (A), (B) and (C) using a depth gauge.
 - X4 : 1.9 2.1 mm (0.075 0.083 in)



D23

E1BIA0539GB





< UNIT DISASSEMBLY AND ASSEMBLY >

I. Adjust the position of the bearing shell at point (A), (B) and (C) using a set of feeler gauges (thickness of the shim (1)).

Thickness of the shim : 1.9 - 2.1 mm (0.075 - 0.083 in)

• Repeat the previous operations for the other bearing caps.



[YS23DDT/YS23DDTT]

E1BIA0540ZZ



- m. Position the crankshaft thrust washers on the cylinder block (washer plug ① in the cylinder block notch)
 - Use engine oil to lubricate the crankshaft journal bearing shells and thrust washers (only the face making contact with the crankshaft).

NOTE:

Ensure the bearing shells and the thrust washers do not move when refitting the crankshaft and bearing caps.

- 3. Install crankshaft position target.
- 4. Install crankshaft, the bearing caps and the crankshaft bearing bolts. **NOTE:**

Check that the bearing caps are in contact with the cylinder block before tightening the bearing cap bolts.

- 5. Align the identification number to the journal position to install as shown in the figure.
 - <□ : Engine front



JPBIA1801ZZ

: Engine front

shown in the figure

C : 20.0 N·m (2.0 kg-m, 15 ft-lb)

b. Turn main bearing cap bolts 70 degrees clockwise (angle tightening) in the order from 1 to 10 as shown in the figure.

Tighten main bearing cap bolts with the following procedure:

Tighten main bearing cap bolts in the order from 1 to 10 as

CAUTION:

6.

a.

< UNIT DISASSEMBLY AND ASSEMBLY >

Confirm the tightening angle by using angle wrench [SST: KV10112100] (A) or protractor. Never judge by visual inspection without the tool.



- 7. After installing mounting bolts, check that crankshaft can be rotated smoothly by hand.
- 8. Check crankshaft end play. Refer to EM-248, "Inspection".
- If replacing the crankshaft, always identify the piston height category to refit in each cylinder to guarantee that the piston protrusion in relation to the cylinder block remains within the tolerance, before refitting the connecting rod - piston assemblies. Refer to EM-248, "Inspection".
- 9. Install piston to connecting rod with the following procedure: CAUTION:

When replacing connecting rod or the piston, identify the new piston grade to fit on the engine by calculating the height of the piston pin to guarantee a piston protrusion in relation to the cylinder block within the tolerances

- Install connecting rod bearing (upper) and connecting rod bearing (lower) to connecting rod and connectа ing rod cap.
- i. Place the connecting rod body on the bench.
- Secure the flush bearing shell of the connecting rod body mating ii. face on side (1) and push from the opposite side (2) until the connecting rod body mating face is flush.

Flush bearing	Upper	: 19.3 mm (0.76 in)
shell width	Lower	: 18.3 mm (0.72 in)



b. Measure the distance (X) between the edge of the bearing shell and the wall of the connecting rod body at points (A), (B) and (C).

Х : 1.9 - 2.1 mm (0.075 - 0.083 in)



Ρ

А

ΕM

С

D

Е

F

Н

Κ

L

< UNIT DISASSEMBLY AND ASSEMBLY >

- c. Center the bearing shell on the connecting rod body.
 - Adjust the position of the bearing shell at points (A), (B) and (C) using a set of feeler gauges.

Feeler gauges : 1.9 - 2.1 mm (0.075 - 0.083 in)

• Repeat the previous operations on the remaining connecting rod bodies and caps



- d. Install snap ring to the groove of the piston rear side.Insert it fully into the groove.
- e. Assemble piston to connecting rod.
 - Point the mark engraved (A) on the piston head facing and the bosses (B) of the big end as shown in the figure.
 - Piston pin can be pushed in by hand without excessive force. From the front to the rear, insert piston pin into piston and connecting rod.



- f. Install snap ring to the groove of the piston front side.
 - Insert it fully into the groove.
 - After installing, check that connecting rod moves smoothly.
- 10. Using a piston ring expander (commercial service tool), install piston rings. CAUTION:
 - Be careful not to damage piston.
 - Be careful not to damage piston rings by expanding them excessively.
 - Position each ring with the gap as shown in the figure referring to the piston front mark.



- 11. Lubricate piston pin with engine oil.
 - Position the connecting rod in relation to the piston (piston marking ① "V" is opposite the machined bosses ② on the big end)

NOTE:

Piston marking V engine flywheel or drive plate end, connecting rod marking (machined bosses) timing end.



12. Engage the pin in the piston and in the small end.

[YS23DDT/YS23DDTT]

< UNIT DISASSEMBLY AND ASSEMBLY >

А

ΕM

D

Е

F

Н

Κ

L

M

Ν

E1BIA0505ZZ

NOTE:

Check that the piston pin slides and rotates easily in the piston and the small end.

- 13. Refit the snap ring to the piston pin using a flat screwdriver
 - (apply pressure in the groove ①). **NOTE:**

Position the opening in the snap ring towards the piston crown.

- 14. Install piston and connecting rod assembly to crankshaft with the following procedure:
- a. Lubricate with engine oil the following parts
 - Cylinder block barrels
 - Piston rings
 - Piston skirts
 - Crankshaft crank pins
- Check that the piston rings are correctly engaged in the piston grooves
 - Put the piston on a plane and clean surface.
 - Verify the absence of over lap (1) of the tips of the scraper ring. NOTE:

Manipulate the piston exclusively by the skirt or the connecting rod, without touching the scraper ring.



- c. Position crankshaft pin corresponding to connecting rod to be installed onto the bottom dead center.
- d. Place the position in the mounting ring [allow the piston skirt to protrude by approximately 1 cm (0.39 in)].
- e. Compress the piston rings by tightening the bolts (6).
- f. Check that the pistons correspond to the cylinder block barrels (No.1 timing end)
- g. Place the connecting rod and piston assembly in the cylinder.
- h. Position the point of the "V" (7) engaged on the piston towards the flywheel end or drive plate end.

WARNING:

Failure to observe the following procedure may result in destruction of the engine.

- Gradually insert the "connecting rod piston" assembly in the cylinder (avoid any contact between the connecting rod and the oil jet) using only of the hand.
- Position the big end on the crankshaft crank pin.
- Refit the connecting rod cap, ensuring that the connecting rod caps and bodies correspond. Refer to <u>EM-248</u>, "<u>Inspection</u>".

CAUTION:

The piston ring compressor tool on the piston has to be made without forcing. If resistance during the engagement occurs, put off the tool and to re-engage it.

- 15. Install connecting rod cap bolts wit the following procedure:
- a. Tighten new connecting rod cap bolts.



Р
< UNIT DISASSEMBLY AND ASSEMBLY >

: 25.0 N·m (2.6 kg-m, 18 ft-lb)

b. Turn bolts 55 degrees clockwise (angle tightening). CAUTION:

Confirm the tightening angle by using an angle wrench [SST: KV10112100 (-)] (A) or protractor. Never judge by visual inspection without the tool.

- After tightening connecting rod cap bolt, check that crankshaft rotates smoothly.
- Check the connecting rod side clearance. Refer to <u>EM-248</u>, <u>"Inspection"</u>.
- Check the piston protrusion. Refer to EM-248, "Inspection".



16. Install balancer unit with the following procedure:
 CAUTION:
 When any one of the parts listed below is replaced, adjust backlash of the balancer unit. Refer to

EM-245, "Backlash Adjustment".

- Crankshaft
- Cylinder block
- Balancer unit
- a. Obtain No.1 cylinder at the TDC of its compression stroke. Refer to EM-148. "Inspection".
- b. Screw in the TDC set pin [SST: (Mot. 1766)] (A).
- c. Align the bolt hole of the balancer unit shim with bolt hole © on the cylinder block side, and place shim [®] of balancer unit as shown in the figure.



d. Install the balancer unit fixed with fixing pin (A) to cylinder block together with baffle plate ①.

CAUTION:

The balancer unit weights must be positioned on the opposite side to the crankshaft.

e. Temporarily tighten balancer unit mounting bolt (A).

: Engine front





< UNIT DISASSEMBLY AND ASSEMBLY >

f. Press shim ① of balancer unit to the mounting bolt side (in the direction shown by arrow).

<⊐: Engine front

g. Tighten new balancer unit bolts in the order from 1 to 6 as shown in the figure with the following procedure:

<□: Engine front

i. Tighten balancer unit bolts.

🖸: 15.0 N·m (1.5 kg-m, 11 ft-lb)

Turn bolts 85 degrees clockwise (angle tightening).
 CAUTION:
 Confirm the tightening angle by using an angle wrench

[SST: KV10112100 (—)] or protractor. Never judge by visual inspection without the tool.

- h. Remove the TDC set pin [SST: (Mot. 1766)].
- i. Remove fixing pin.
- 17. Install rear oil seal retainer with the following procedure:
- a. Set guide bolt (A) and protector (B) to rear oil seal retainer ①. NOTE:

The protector is supplied in the new oil seal parts kit.

- b. Move the rear oil seal retainer evenly by hand until it makes contact with the cylinder block.
- c. Tighten mounting bolts in two steps separately in numerical order as shown in the figure.
- i. Tighten mounting bolts No.1 and 5.

🔮 : 5.0 N·m (0.51 kg-m, 44 in-lb)

ii. Tighten mounting bolts No. 1 to 8 in numerical order as shown.

└┘ : 12.0 N⋅m (1.2 kg-m, 9 ft-lb)

18. Assemble in the reverse order of disassembly.

Backlash Adjustment

CAUTION:

Revision: 2015 March

When any one of the parts listed below is replaced, adjust backlash as per the following steps.

EM-245







0

ור



А

ΕM

С

D

Ε

Н

Κ

L

Μ

Ν

INFOID:0000000012075571

Crankshaft

Cylinder block

Balancer unit

1. Measure the backlash between gears of balancer unit and crank shaft, according to the following instructions.

CAUTION:

To measure backlash, use adjust shim [2.80 mm (0.11 in)] for shim of balancer unit.

a. Set dial gauge (A) on the gear of balancer unit.

TDC set pin and balancer unit fixing pin must be removed beforehand.











NOTE:

b.

• To measure backlash with a dial gauge, rotate crank shaft in steps of 90 degrees in the rotation direction of the engine and measure backlash at 4 points.







2. Select shim of balancer unit according to the instructions below.

< UNIT DISASSEMBLY AND ASSEMBLY >

- Calculate the mean value of the backlash measured at 4 points. a.
- А b. Plug the calculated mean value into the following formula and calculate the dimensions of the shim of balancer unit.
 - 2.80 [0.5 (mean value of backlash) / 2]
- c. Refer to the shim selection table and select shim of balancer unit. NOTE:

Round off to two decimal places.

	Shim selec	ction table	
Grade of shim	Backlash measure	Grade of shim	Backlash measure
12 43 758 79R	2.4	12 43 725 59R	2.62
12 43 754 23R	2.42	12 43 788 07R	2.64
12 43 744 53R	2.44	12 43 702 42R	2.66
12 43 709 80R	2.46	12 43 713 60R	2.68
12 43 717 52R	2.48	12 43 715 52R	2.70
12 43 761 79R	2.50	12 43 700 24R	2.72
2 43 751 88R	2.52	12 43 706 11R	2.74
2 43 797 98R	2.54	12 43 757 00R	2.76
12 43 786 07R	2.56	12 43 725 83R	2.80
12 43 774 62R	2.58	12 43 739 19R	2.62
12 43 718 09R	2.60		

3. Remove balancer unit. Refer to EM-235, "Disassembly and Assembly".

4. Install balancer unit by using the selected shim. Refer to EM-235, "Disassembly and Assembly".

- 5. Measure the backlash between gears of balancer unit and crank shaft, according to the following instructions.
- Set dial gauge (A) on the gear of balancer unit. a. **CAUTION:**

TDC set pin and balancer unit fixing pin must be removed beforehand.







ΕM

Κ

L

Μ

< UNIT DISASSEMBLY AND ASSEMBLY >

 Measure backlash as shown in the figure.
 CAUTION: Never rotate the gear of balancer unit 360 degrees.



NOTE:

To measure backlash with a dial gauge, rotate crank shaft in steps of 90 degrees in the rotation direction of the engine and measure backlash at 4 points.

Heasuring point



c. Check that the mean value of the four measured values is within the reference values.

Standard $0.05 \pm 0.03 \text{ mm} (0.002 \pm 0.0012 \text{ in})$

d. If the mean value is outside the reference value, then select a shim of balancer unit.

Inspection

CRANKSHAFT END PLAY

• Measure the clearance between thrust bearings and crankshaft arm when crankshaft is moved fully forward or backward with a dial indicator (A).

Standard : Refer to EM-263, "Cylinder Block".

• If it exceeds the standard, replace thrust bearings, and measure again. If it still exceeds the standard, also replace crankshaft.

CRANKSHAFT DEFORMATION OF THE BEARING FACE

- Position the feeler of the dial indicator (A) on the flywheel or drive plate face of the crankshaft avoiding the holes of the flywheel or drive plate bolts.
- Rotate the crankshaft once to measure the mounting flange of the flywheel face.

Standard : Refer to EM-263, "Cylinder Block"





CRANKSHAFT CONCENTRICITY OF CRANKSHAFT JOURNAL

EM-248

INFOID:000000011999174

< UNIT DISASSEMBLY AND ASSEMBLY >

- Support the feeler of dial indicator (A) on the centre of the mating face of the crankshaft journal check.
- Rotate the crankshaft once to check the concentricity of the journal.

Standard : Refer to EM-263, "Cylinder Block".



CRANKSHAFT PIN JOURNAL DIAMETER

 Measure the outer diameter of crankshaft pin journal with a micrometer (A).

Standard : Refer to EM-263, "Cylinder Block".

 If it exceeds the standard, measure the connecting rod bearing oil clearance. Refer to "CONNECTING ROD BEARING OIL CLEAR-ANCE".

CRANKSHAFT MAIN JOURNAL DIAMETER

• Measure the outer diameter of crankshaft main journals with a micrometer.

Standard : Refer to EM-263, "Cylinder Block".

• If it exceeds the standard, measure the main bearing oil clearance. Refer to "MAIN BEARING OIL CLEAR-ANCE".

CONNECTING ROD SIDE CLEARANCE

• Measure the side clearance between connecting rod and crankshaft arm with a feeler gauge (A).

Standard : Refer to EM-263, "Cylinder Block".

• If it exceeds the standard, replace connecting rod, and measure again. If it still exceeds the standard, also replace crankshaft.



CONNECTING ROD BIG END DIAMETER

- Install connecting rod cap without connecting rod bearing installed, and tightening connecting rod cap bolts to the specified torque. Refer to <u>EM-235, "Disassembly and Assembly"</u>.
 - (1) : Connecting rod
- Measure the inner diameter of connecting rod big end with an inside micrometer.

Standard : Refer to EM-263, "Cylinder Block".

• If it exceeds the standard, replace connecting rod assembly.

CONNECTING ROD BUSHING OIL CLEARANCE

Connecting Rod Bushing Inner Diameter



[YS23DDT/YS23DDTT]

L

Κ



D23



EM

С

D

JSBIA6099ZZ

IPBIA022877

А

F

Н

< UNIT DISASSEMBLY AND ASSEMBLY >

Measure the inner diameter of connecting rod bushing with an inside micrometer (A).

Standard : Refer to EM-263, "Cylinder Block".

Measure the outer diameter of piston pin with a micrometer (A).

: Refer to EM-263, "Cylinder Block".

[YS23DDT/YS23DDTT]





PISTON PROTRUSION

Piston Pin Outer Diameter

Standard

Measure the protrusion of piston with the following procedure:

- 1. Set piston at a point close to the TDC.
- Set the dial indicator stand set [SST: KV113B0040 (Mot.251-01)] (B) and [SST: KV113B0050 (Mot.252-01)] (A) at the location as shown in the figure.
- 3. Set the indicator scale to "0" where the piston protrusion is maximized.
- 4. Move the dial indicator stand so that the tip of dial indicator can contact the cylinder block. Read the difference.

Standard : Refer to EM-263, "Cylinder Block".

5. If measured value is out of the standard, replace piston. Select a piston in "Piston Protrusion Grade".

Piston Protrusion Grade:

Refer to EM-263, "Cylinder Block".

PISTON TO PISTON PIN OIL CLEARANCE

Piston Pin Hole Diameter Measure the inner diameter of piston pin hole with an inside micrometer (A).

Standard : Refer to EM-263, "Cylinder Block".





< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

Piston Pin Outer Diameter

Measure the outer diameter of piston pin with a micrometer (A).

Standard : Refer to EM-263, "Cylinder Block".



A

PISTON RING SIDE CLEARANCE

- Measure the side clearance of piston ring ① and piston ring groove with a feeler gauge (C).
 - : NG (A)
 - : OK B

Standard : Refer to EM-263, "Cylinder Block".

 If it exceeds the standard, replace piston ring, and measure again. If it still exceeds the standard, also replace piston.

PISTON RING END GAP

- Check that cylinder bore inner diameter is within specification. Refer to "PISTON TO CYLINDER BORE CLEARANCE".
- Lubricate with new engine oil to piston (1) and piston ring (2), and then insert (A) piston ring until middle of cylinder with piston, and measure piston ring end gap with a feeler gauge (B).
 - \bigcirc : Measuring point

: Refer to EM-263, "Cylinder Block". Standard

• If it exceeds the standard, replace piston ring, and measure again. If it still exceeds the standard, replace cylinder block and piston rings.

CYLINDER BLOCK TOP SURFACE DISTORTION

 Using a scraper, remove gasket on the cylinder block surface, and also remove engine oil, scale, carbon, or Μ other contamination. **CAUTION:**

Be careful not to allow gasket flakes to enter engine oil or engine coolant passages.

• Check using a ruler (4) and a dial gauge - support assembly (5) or a cylinder head rule and a set of feeler gauges the flatness of the gasket surfaces of the cylinder block:

: Refer to EM-263, "Cylinder Block". Standard

If it exceeds the standard, replace cylinder block.



B JPBIA0219ZZ



MAIN BEARING HOUSING INNER DIAMETER

 Install main bearing cap without main bearings installed, and tighten main bearing cap mounting bolts to the specified torgue. Refer to EM-235, "Disassembly and Assembly".

EM-251

D23

ΕM

Ε

Н

Κ

L

Ν

Ρ

А

ⓓ

< UNIT DISASSEMBLY AND ASSEMBLY >

- Measure the inner diameter of main bearing housing with a bore gauge.
 - (1) : Cylinder block
 - (2) : Main bearing cap

Standard : Refer to EM-263, "Cylinder Block".

• If it exceeds the standard, replace cylinder block and main bearing caps assembly.

NOTE:

Main bearing caps cannot be replaced individually, because it is machined together with the cylinder block.

PISTON TO CYLINDER BORE CLEARANCE

Cylinder Bore Inner Diameter

• Using a bore gauge, measure the cylinder bore for wear, out-of-round and taper at six different points on each cylinder.

Standard:

Cylinder bore inner diameter

: Refer to EM-263, "Cylinder Block".

• If it exceeds the standard, or if there are scratches and/or seizure on the cylinder inner wall, replace cylinder block.

Piston Skirt Diameter

Measure the outer diameter of piston skirt with a micrometer (A).

Standard : Refer to EM-263, "Cylinder Block".

Measure point : Refer to EM-263, "Cylinder Block".



Piston to Cylinder Bore Clearance

Calculate by piston skirt diameter and cylinder bore inner diameter. (Clearance) = (Cylinder bore inner diameter) – (Piston skirt diameter)

Standard : Refer to EM-263, "Cylinder Block".

• If it exceeds the standard, replace piston and piston pin assembly and/or cylinder block.

CONNECTING ROD THICKNESS

Measure using a external micrometer the thickness (X13) of the big end flank.

Standard : Refer to EM-263, "Cylinder Block".



CONNECTING ROD BEARING OIL CLEARANCE

EM-252

[YS23DDT/YS23DDTT]

(2)

JPBIA0225ZZ

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

Method of Using Plastigage

- Remove engine oil and dust on crankshaft pin and the surfaces of each bearing completely.
- Cut a plastigage slightly shorter than the bearing width, and place it in crankshaft axial direction, avoiding oil holes.
- Install connecting rod bearings to connecting rod and cap, and tighten connecting rod cap bolts to the specified torque. Refer to <u>EM-235</u>, "Disassembly and Assembly".
 CAUTION:

Never rotate crankshaft.

 Remove connecting rod cap and bearing, and using the scale on the plastigage bag, measure the plastigage width.
 NOTE:

The procedure when the measured value exceeds the standard is the same as that described in "Method by Calculation".



Method by Calculation

Install connecting rod bearings ① to connecting rod ② and connecting rod bearing cap, and tighten connecting rod cap bolts to the specified torque. Refer to <u>EM-235</u>, "<u>Disassembly and Assembly</u>".



MAIN BEARING OIL CLEARANCE

Method of Using Plastigage

- Remove engine oil and dust on crankshaft main journal and the surfaces of each bearing completely.
- Cut a plastigage slightly shorter than the bearing width, and place it in the crankshaft axial direction, avoiding oil holes.
- Install main bearings to cylinder block and main bearing cap, and tighten main bearing cap mounting bolts to the specified torque. Refer to <u>EM-235, "Disassembly and Assembly"</u>.
 CAUTION:

Never rotate crankshaft.

 Remove main bearing cap and bearings, and using the scale on the plastigage bag, measure the plastigage width.
 NOTE:

The procedure when the measured value exceeds the standard is the same as that described in "Method by Calculation".



EM

Κ

А

< UNIT DISASSEMBLY AND ASSEMBLY >

HOW TO SELECT PISTON AND BEARING

Description

INFOID:000000011999175

Selection points	Selection parts	Selection items	Selection methods
Between cylinder block and crankshaft	Main bearing	Main bearing grade (bearing thickness)	Determined by match of cylinder block bearing housing grade (inner diameter of housing) and crankshaft journal grade (outer diameter of journal)
Between crankshaft and connecting rod	Connecting rod bearing	Connecting rod bearing grade (bearing thickness)	Combining service grades for connecting rod big end diameter and crankshaft pin outer diameter determine connecting rod bearing selection
Between cylinder block and piston	Piston and piston pin as- sembly (piston is available to- gether with piston pin as an assembly.)	Piston grade	Piston grade = Piston pin height

• The identification grade stamped on each part is the grade for the dimension measured in new condition. This grade cannot apply to reused parts.

• For reused or repaired parts, measure the dimension accurately. Determine the grade by comparing the measurement with the values of each selection table.

• For details of the measurement method of each part, the reuse standards and the selection method of the selective fitting parts, refer to the text.

Piston

INFOID:000000011999176

PISTON IDENTIFICATION

- Piston marking
 - (1) : Date of manufacture
 - (2) : Piston pin height class
 - (3) : Modification in production suffix
 - (4) : Piston fitting direction
 - (towards the flywheel or drive plate)
 - (5) : Piston axis of symmetry
 - (6) : Axis of the gudgeon pin hole

NOTE:

Piston pin height class which corresponds to the height between the piston pin and the piston crown.

• Piston pin height class

NOTE:

There are two types of piston

- Without piston pin bronze ring

H1 : Piston pin height





[YS23DDT/YS23DDTT]

< UNIT DISASSEMBLY AND ASSEMBLY >

- With piston pin bronze ring
 - H1 : Piston pin height
 - : Piston pin bronze ring $\overline{7}$

NOTE:

The piston pin bronze ring cannot be replaced.



PISTON SELECTION TABLE

Piston protrusion grade

: Refer to EM-263, "Cylinder Block"

Connecting Rod Bearing

CONNECTING ROD BEARING IDENTICATION

- Apply connecting rod big end diameter grade stamped on con-1. necting rod side face.
 - : Big end diameter value (\mathbf{f})
 - 2 : Day
 - : Weighty class 3
 - (4) : Year
 - (5) : Team
 - : Centre to centre distance (6)
 - : Class of centre to centre distance $\overline{(7)}$

Connecting rod big end diameter

: Refer to EM-263, "Cylinder Block"

- Apply crankshaft pin journal diameter grade stamped on crank-2. shaft rear side.
 - $(\mathbf{1})$: Line indicating the diameter class of the journals.
 - (2) : Line indicating the diameter class of the crankpins.
 - : Last three numbers of the crankshaft part number. 3
 - (4) : Line reserved for the factory.

Crankshaft pin : Refer to EM-263, "Cylinder Block" journal diameter

Apply the symbol obtained to the "Connecting Rod Bearing Selection Table" to select connecting rod bear-3. ing.

CONNECTING ROD BEARING SELECTION TABLE

Upper bearing shell





[YS23DDT/YS23DDTT]

А

С

D

Ε

INFOID:0000000011999177

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

		Big end diameter grade																				
		А	В	С	D	Е	F	G	Н		I	J	Κ	L	М	Ν	0	Р	Q	R	S	Т
	А		l	R											N							
	В				R	1										N						
	С					R		1									N					
	D					R											Ν					
	Е						R						N									
	F							R				Ν										
	G	В							R			N										
	Н		В									R								Ν		
Cra	I	В											R								N	
nk- sha	J	В													R							Ν
ft	к					В											R					
pin ara	L					В						R										
de	М	В									R											
	Ν							В											R			
	0	J							В										I	R		
	Р		J									В								I	R	
	Q			J									В								R	
	R	J								В								R				
	S	J								В												
	Т	J								В												
	U	J														В						

• B: Blue

• R: Red

• J: Yellow

• N: Black

Lower bearing shell

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

		Big end diameter grade										А															
		А	В	С	D	Е	F	G	Н		I	J	Κ	L		Μ	1	٧	0	Р		Q	R	S	Т	U	
	А		R					E	В											J							
	В		R					E	В								J									EIVI	
	С		R	ł													1					J					
	D			R							В												J				С
	Е			R							В												J				
	F			R						В										J							
	G			R						1				В										J			D
Cr	Н				R										В					J							
an	Ι				F	R				В									J						Е		
ksh aft	J	Ν				F	२			В						В	3					J					
pin	К	N					F	२		В							3						J				
gra de	L	N					F	२								В						J		F			
uo	М		Ν		1			F	२											В						J	
	Ν		N							R											В					J	G
	0		N							R							1				В					J	
	Р			Ν							R												В				
	Q		N						R							В							Н				
	R	Ν										2						В									
	S	N						R								В						.					
	Т	N										R						В									

B: Blue

R: RedJ: Yellow

N: Black

Main Bearing

MAIN BEARING INDETIFICATION

- 1. "Cylinder Block Bearing Diameter Table" rows correspond to main bearing housing grade on rear side of cylinder block.
 - () : Cylinder block bearing diameter category
 - (2) : Cylinder diameter category
 - (3) : Marking only for factory use

NOTE:

Cylinder block bearing diameter category

- Identification by letter of the crankshaft bearing diameter.
- The order of the marking letters goes from the bearing on the timing end to the bearing on the flywheel end.



Ρ

INFOID:0000000011999178

J

< UNIT DISASSEMBLY AND ASSEMBLY >

- 2. Apply crankshaft journal diameter grade stamped on crankshaft as shown in the figure.
 - 1 : Line indicating the diameter class of the journals.
 - 2 : Line indicating the diameter class of the crankpins.
 - ③ : Last three numbers of the crankshaft part number.
 - (4) : Line reserved for the factory.

Crankshaft journal: Refer to EM-263, "CylinderdiameterBlock"

CYLINDER BLOCK BEARING DIAMETER TABLE



	Unit: mm (in)
Cylinder block bearing diameter category	Cylinder diameter caterory
A	≥ 63.9975 to < 63.9985 (≥ 2.51958 to < 2.51962)
В	≥ 63.9985 to < 63.9995 (≥ 2.51962 to < 2.51966)
C	≥ 63.9995 to < 64.0005 (≥ 2.51996 to < 2.51969)
E	≥ 64.0005 to < 64.0015 (≥ 2.51969 to < 2.51973)
Н	≥ 64.0015 to < 64.0025 (≥ 2.51973 to < 2.51977)
J	$\geq 64.0025 \text{ to} < 64.0035$ ($\geq 2.51977 \text{ to} < 2.51981$)
К	≥ 64.0035 to < 64.0045 (≥ 2.51981 to < 2.51985)
L	≥ 64.0045 to < 64.0055 (≥ 2.51985 to < 2.51989)
М	≥ 64.0055 to < 64.0065 (≥ 2.51989 to < 2.51993)
Р	$\geq~64.0065$ to < 64.0075 (≥ 2.51993 to < 2.51997)
S	≥ 64.0075 to < 64.0085 (≥ 2.51997 to < 2.52001)
Т	≥ 64.0085 to < 64.0095 (≥ 2.52001 to < 2.52005)
U	≥ 64.0095 to < 64.0105 (≥ 2.52005 to < 2.52009)
Z	≥ 64.0105 to < 64.0115 (≥ 2.52009 to < 2.52013)

MAIN BEARING SELECTION TABLE

Upper bearing shell

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

Cylinder block bearing diameter grade																	
		А	В	С	Е	Н	J	K	L	М	Р	S	Т	U	Z		
	А		R							N							
	В		R							Ν						E	
	С			R							N						
	D			R		1					Ν					(
	Е				R							N					
	F				R							Ν					
	G					R				Ν				[
	Н					l	R	N									
Crank	I		В					R		N			F				
shaft iour-	J		В						R	N							
nal di-	К			В			R										
amet er	L			В		1	R										
grade	М				В		R										
	Ν				В							R					
	0					В							R			C	
	Р						В			1			I	२			
	Q		J					В						R		ŀ	
	R		J						В				r.		R		
	S J							В									
	Т			J		1	В										
	U				J							В					

• R: Red

• J: Yellow

• N: Black

Lower bearing shell

L

Μ

Ν

Ο

Ρ

< UNIT DISASSEMBLY AND ASSEMBLY >

[YS23DDT/YS23DDTT]

	Cylinder block bearing diameter grade																	
		А	В	С	E	Н	J	К	L	М	Р	S	Т	U	Z			
	А				R			Ν										
	В				R					N								
	С				I	२					Ν							
	D						R							N				
	Е	I	В					R						Ν				
	F		В						R	I	N							
	G			В									Ν					
	Н			В														
Crank	I		1	В														
shaft iour-	J				В						R							
nal di-	К				I	3							R					
amet er	L					В												
grade	М		J			В						R						
	Ν		J						В				R					
	0			J						В					R			
	Р			J			В											
	Q				J						E	3						
	R				J						В							
	S J												В					
	Т						J							В				
	U	J												В				

• B: Blue

• R: Red

• J: Yellow

• N: Black

< SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS) SERVICE DATA AND SPECIFICATIONS (SDS)

General Specification

GENERAL SPECIFICATIONS

Engine type				YS23DDT / YS23DDTT						
Cylinder arrangement				In-line 4						
Displacement			cm ³ (cu in)	2,299 (140.28)						
Bore and stroke			mm (in)	85.0 x 101.0 (3.346 x 3.976)						
Valve arrangement				DOHC						
Firing order				1-3-4-2						
Number of piston rings		Compression		2						
Number of ploton hings		Oil		1						
Compression ratio				15.5						
Drive Belts				INFOID:000000011999						
DRIVE BELT										
Tension of drive belt	Belt tensi	oning is not nece	ssary, as it is automatically adju	sted by drive belt auto-tensioner.						
Tension of compressor belt	There are	e no adjustments	of compressor belt.							
ntake Manifold				INFOID:000000011999						
INTAKE MANIFOLD										
				Unit: mm (i						
Items			Standard							
Surface distortion			0.05 (0.0020)							
Exhaust Manifold				INFOID:000000011999						
EXHAUST MANIFOLD										
			0	Unit: mm (i						
Items			Standard							
Surface distortion			0.7 (0.028)							
Camshaft				INFOID:000000011999						
CAMSHAFT										
				Unit: mm (i						
Item	S		Standard Lim							
Camshaft runout [TIR*]			0.05 (0.002)							
				2.45 (0.0050)						

Camshaft end play

Crankshaft radial play

Camshaft journal diameter

0.08 - 0.18 (0.0031 - 0.0071)

24.98 - 25.0 (0.9835 - 0.9846) 0.04 - 0.08 (0.0016 - 0.0031) (YS23DDT/YS23DDTT]

А

INFOID:000000011999179

[YS23DDT/YS23DDTT] < SERVICE DATA AND SPECIFICATIONS (SDS) Items Standard Limit SEM671 Cam height "A" Intake / Exhaust 39.03 - 39.13 (1.5366 - 1.5405) *: Total indicator reading Cylinder Head INFOID:000000011999185 **CYLINDER HEAD** Unit: mm (in) Items Standard 0.05 (0.0020) Head surface distortion **a** JPBIA079277 Normal cylinder head height "(a) 132.5 (5.22) VALVE DIMENSIONS Unit: mm (in) Χ1



lt	Standard	
Valve head diameter "D"	Intake	27.58 - 27.82 (1.0858 - 1.0953)
	Exhaust	25.88 - 26.12 (1.0189 - 1.0283)
Valvo longth "I "	Intake	103.89 (4.090)
	Exhaust	103.78 (4.086)

SERVICE DATA AND SPECIFICATIONS (SDS) ID SPECIFICATIONS (SDS) [YS23DDT/YS23DDTT]

< SERVICE DATA AND SPECIFICATIONS (SDS)

Volue store dispestor "d"	Intake	5.970 - 5.990 (0.2350 - 0.2358)					
valve stem diameter d	Exhaust	5.960 - 5.980 (0.2346 - 0.2354)					
Measuring point "X1"		35.0 (1.378)					
Valve seat angle "a"		45°- 45°15′	EN				
	Intake	1.1(0.043)					
valve margin "1"	Exhaust	0.94 (0.037)					
Valve lift amount		8.0 (0.315)	С				

VALVE GUIDE

Unit: mm (in)

	(a)				 (
	Items			Standard	-			
Valve guide	Inner diameter (X3)			6.00 - 6.02 (0.2362 - 0.2370)				
.,,	Ir	ntake		0.02 - 0.06 (0.0008 - 0.0024)				
Valve guide clearance	E	xhaust		0.03 - 0.07 (0.0012 - 0.0028)				
Valve guide angle "a"	ŀ			90°				
VALVE SPRING				Unit: mn	n (in)			
Free height				46.70 (1.8390)	<u>``</u>			
	200 - 220 N (20.4 - 22.4 kg, 45	- 49 lb)		34.90 (1.3740)				
Pressure neight	353 - 387 N (36.0 - 39.5 kg, 79	- 87 lb)	26.90 (1.0591)					
Diameter of the wire	1	2.78 - 2.82 (0.1094 - 0.1110)						

Inner diameter
Outer diameter
Valve spring squareness

Cylinder Block

CRANKSHAFT

INFOID:0000000011999186

13.90 - 14.30 (0.5472 - 0.5630)

19.50 - 19.90 (0.7677 - 0.7835)

1.2 (0.047)

Ν

Μ

0

Ρ

< SERVICE DATA AND SPECIFICATIONS (SDS)

[YS23DDT/YS23DDTT] Unit: mm (in)

Item

Standard



E1BIA0067ZZ



	GRADE mark A	55.985 (2.2041)
	GRADE mark B	55.986 (2.2042)
	GRADE mark C	55.987 (2.2042)
	GRADE mark D	55.988 (2.2042)
	GRADE mark E	55.989 (2.2043)
	GRADE mark F	55.990 (2.2043)
	GRADE mark G	55.991 (2.2044)
	GRADE mark H	55.992 (2.2044)
	GRADE mark I	55.993 (2.2044)
	GRADE mark J	55.994 (2.2045)
Crankshaft main journal diameter "Dm"	GRADE mark K	55.995 (2.2045)
	GRADE mark L	55.996 (2.2046)
	GRADE mark M	55.997 (2.2046)
	GRADE mark N	55.998 (2.2046)
	GRADE mark O	55.999 (2.2047)
	GRADE mark P	56.000 (2.2047)
	GRADE mark Q	56.001 (2.2048)
	GRADE mark R	56.002 (2.2048)
	GRADE mark S	56.003 (2.2048)
	GRADE mark T	56.004 (2.2049)
	GRADE mark U	56.005 (2.2049)
Crankshaft pin journal diameter "Dp"		52.000 - 52.020 (2.0472 - 2.0480)
Crankshaft end play		0.05 - 0.70 (0.002 - 0.028)
Crankshaft for deformation		Less than 0.03 (0.0012)
Concentricity of the crankshaft journal		Less than 0.02 (0.0008)

CONNECTING ROD

	Unit: mm (in)	
Item	Standard	
Center distance (big end and small end)	157.23 - 157.27 (6.1901 - 6.1917)	

< SERVICE DATA AND SPECIFICATIONS (SDS)

Item		Standard	_
	GRADE mark A	55.581 (2.1882)	- A
	GRADE mark B	55.582 (2.1883)	_
	GRADE mark C	55.583 (2.1883)	EM
	GRADE mark D	55.584 (2.1883)	_
	GRADE mark E	55.585 (2.1884)	_
	GRADE mark F	55.586 (2.1884)	С
	GRADE mark G	55.587 (2.1885)	_
	GRADE mark H	55.588 (2.1885)	D
	GRADE mark I	55.589 (2.1885)	
Connecting red hig and diameter	GRADE mark J	55.590 (2.1886)	_
Connecting rod big end diameter	GRADE mark K	55.591 (2.1886)	E
	GRADE mark L	55.592 (2.1887)	_
	GRADE mark M	55.593 (2.1887)	
	GRADE mark N	55.594 (2.1887)	_ 1
	GRADE mark O	55.595 (2.1888)	_
	GRADE mark P	55.596 (2.1888)	G
	GRADE mark Q	55.597 (2.1889)	_
	GRADE mark R	55.598 (2.1889)	
	GRADE mark S	55.599 (2.1889)	- п
	GRADE mark T	55.600 (2.1890)	_
Connecting rod bushing end diameter		32.02 - 32.04 (1.1819 - 1.1827)	-
Connecting rod bushing end oil clearance		0.020 - 0.038 (0.0008 - 0.0015)	_
Connecting rod side clearance		0.021 - 0.48 (0.0083 - 0.0189)	-

PISTON PROTRUSION GRADE

		Unit: mm (in)	
Item		Standard	K
ſ b		JPBIA0767ZZ	M
	Grade A	47.86 - 47.90 (1.8842 - 1.8858)	0
	Grade B	47.90 - 47.94 (1.8858 - 1.8874)	
Piston height " _(a) "	Grade C	47.94 - 47.98 (1.8874 - 1.8890)	Р
	Grade D	47.99 - 48.03 (1.8894 - 1.8909)	
	Grade E	48.03 - 48.07 (1.8909 - 1.8952)	
Piston pin hole diameter "(b)"	1	31.99 - 32.01 (1.2594 - 1.2604)	
Piston to cylinder bore clearance		0.192 - 0.236 (0.0076 - 0.0093)	

AVAILABLE PISTON

< SERVICE DATA AND SPECIFICATIONS (SDS)

[YS23DDT/YS23DDTT]





Piston protrusion "a"

PISTON RING

0.36 - 0.52 mm (0.0142 - 0.0205 in)

		Unit: mm (in)
Items		Standard
	Тор	0.09 - 0.13 (0.0035 - 0.0051)
Piston ring side clearance	2nd	0.03 - 0.07 (0.0012 - 0.0028)
	Oil ring	0.05 (0.002)
	Тор	0.23 - 0.38 (0.0091 - 0.0150)
Piston ring end gap	2nd	0.60 - 0.80 (0.0236 - 0.0315)
	Oil ring	0.25 - 0.50 (0.0098 - 0.020)

PISTON PIN

Unit: mm (in)

Items	Standard	
Length	65.7 - 24.15 (0.9390 - 0.9508)	
Piston pin inner diameter	13.8 - 14.1 (0.543 - 0.555)	
Piston pin outer diameter	31.99 - 32.01 (1.2594 -1.2602)	

CYLINDER BLOCK

	Unit: mm (in)
Item	Standard
Cylinder block top surface distortion	0.05 (0.0020)
Cylinder bore inner diameter	59.998 - 60.012 (2.3621 - 2.3627)

SERVICE DATA AND SPECIFICATIONS (SDS) D SPECIFICATIONS (SDS) [YS23DDT/YS23DDTT]

< SERVICE DATA AND SPECIFICATIONS (SDS)

	Grade mark A	59 9975 - 59 9985 (2 36210 - 2 36214)	
			А
	Grade mark B	59.9985 - 59.9995 (2.36214 - 2.36218)	1
	Grade mark C	59.9995 - 60.0005 (2.36218 - 2.36221)	
	Grade mark E	60.0005 - 60.0015 (2.36221 - 2.36226)	ΕM
Cylinder block main bearing housing inner diameter	Grade mark H	60.0015 - 60.0025 (2.36226 - 2.36230)	
	Grade mark J	60.0025 - 60.0035 (2.36230 - 2.36233)	
	Grade mark K	60.0035 - 60.0045 (2.36233 - 2.36238)	С
	Grade mark L	60.0045 - 60.0055 (2.36238 - 2.36242)	
	Grade mark M	60.0055 - 60.0065 (2.36242 - 2.36246)	D
	Grade mark P	60.0065 - 60.0075 (2.36426 - 2.36250)	
	Grade mark S	60.0075 - 60.0085 (2.36250 - 2.36253)	
	Grade mark T	60.0085 - 60.0095 (2.36253 - 2.36257)	E
	Grade mark U	60.0095 - 60.0105 (2.36257 - 2.36261)	
	Grade mark Z	60.0105 - 60.0115 (2.36261 - 2.36265)	F

Main Bearing

INFOID:000000011999187

G

MAIN BEARING GRADE TABLE

			Unit: mm (in)
	Marking	Thickness	Identification color	- -
	7943R	1.989 (0.0783)	Black	- 1
Lower shell	6716R	1.984 (0.0781)	Red	_
bearing 6129R 1323R	bearing 6129R 1.980 (0.	1.980 (0.0780)	Blue	
	1.976 (0.0778)	Yellow	_	
8933R	1.987 (0.0782)	Black	-	
Upper shell	5724R	1.983 (0.0781)	Red	- J
bearing 5296R 2773R	1.979 (0.0779)	Blue	-	
	1.975 (0.0778)	Yellow	ĸ	

L

Ν

0

Р