SECTION ENGINE MECHANICAL C

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Е

CONTENTS

QR25DE

PRECAUTION4
PRECAUTIONS 4 Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TEN-SIONER" SIONER" 4 Precaution for Drain Engine Coolant 4 Precaution for Disconnecting Fuel Piping 4 Precaution for Removal and Disassembly 4 Precaution for Inspection, Repair and Replacement 4
Precaution for Assembly and Installation5 Parts Requiring Angle Tightening5 Precaution for Liquid Gasket5
PREPARATION7
PREPARATION
SYSTEM DESCRIPTION12
NOISE, VIBRATION AND HARSHNESS(NVH) TROUBLESHOOTING12NVH Troubleshooting - Engine Noise12Use the Chart Below to Help You Find the Cause13
PERIODIC MAINTENANCE14
DRIVE BELTS14Exploded View14Checking Drive Belts14Adjustment14Removal and Installation14Removal and Installation of Drive Belt Auto Tensioner15
AIR CLEANER FILTER17

Removal and Installation	17 F
SPARK PLUG	18
Exploded View	18 G
Removal and Installation	18
CAMSHAFT VALVE CLEARANCE	20
Valve Clearance	20 H
COMPRESSION PRESSURE	23
Compression Pressure	23
REMOVAL AND INSTALLATION	25
AIR CLEANER AND AIR DUCT	25 J
Exploded View	25
Removal and Installation	25
INTAKE MANIFOLD	27 K
Exploded View	27
Removal and Installation	27
EXHAUST MANIFOLD AND THREE WAY	L
Exploded View Removal and Installation	31 31 31 M
OIL PAN	33
Exploded View	33 N
Removal and Installation	33
IGNITION COIL	36
Exploded View	36 O
Removal and Installation	36
ROCKER COVER	37 P
Exploded View	37
Removal and Installation	37
FUEL INJECTOR AND FUEL TUBE	39
Exploded View	39
Removal and Installation	39

INTAKE VALVE TIMING CONTROL	Ρ
	Ρ
Finloded View 45	
Removal and Installation	_
	S
Exploded View 54	Ν
Removal and Installation	1)
Removal and Installation of Valve Oil Seal	
Removal and Installation of Front Oil Seal	
Removal and Installation of Rear Oil Seal	Ρ
CYLINDER HEAD67	D
Exploded View 67	
Removal and Installation67	
Exploded View	
Disassembly and Assembly	
UNIT REMOVAL AND INSTALLATION 77	Α
ENGINE ASSEMBLY77	
Exploded View77	_
Removal and Installation77	S
UNIT DISASSEMBLY AND ASSEMBLY 81	
ENGINE UNIT81	С
Exploded View81	•
Disassembly and Assembly 82	~
Inspection After Disassembly	C
HOW TO SELECT PISTON AND BEARING 102	_
How to Select Piston and Bearing102	R
SERVICE DATA AND SPECIFICATIONS	E
(3D3)109	
SERVICE DATA AND SPECIFICATIONS	A
(3D3)	
VQ40DE	IN
PRECAUTION	
PRECAUTIONS	IN
(SRS) "AIR BAG" and "SEAT BELT PRE-TEN-	
SIONER"	
Precaution for Drain Engine Coolant121	Е
Precaution for Disconnecting Fuel Piping121	С
Precaution for Removal and Disassembly	
Precaution for Inspection, Repair and Replace-	
Precaution for Assembly and Installation 122	
Parts Requiring Anale Tightening	0
	-

PREPARATION124
PREPARATION
SYSTEM DESCRIPTION129
NOISE, VIBRATION AND HARSHNESS(NVH) TROUBLESHOOTINGNVH Troubleshooting - Engine NoiseUse the Chart Below to Help You Find the Causeof the Symptom129
PERIODIC MAINTENANCE131
DRIVE BELTS131Exploded View131Checking Drive Belts131Adjustment131Removal and Installation131Drive Belt Auto Tensioner and Idler Pulley132
AIR CLEANER FILTER
SPARK PLUG
CAMSHAFT VALVE CLEARANCE
COMPRESSION PRESSURE
REMOVAL AND INSTALLATION142
ENGINE ROOM COVER
AIR CLEANER AND AIR DUCT
INTAKE MANIFOLD COLLECTOR
INTAKE MANIFOLD
EXHAUST MANIFOLD AND THREE WAY CATALYST

Removal and Installation1	53
IGNITION COIL	59 59 59
ROCKER COVER 1 Exploded View 1 Removal and Installation 1	1 60 160 160
FUEL INJECTOR AND FUEL TUBE 1 Exploded View 1 Removal and Installation 1	1 64 164 164
FRONT TIMING CHAIN CASE 1 Exploded View 1 Removal and Installation 1	1 69 169 169
TIMING CHAIN 1 Exploded View 1 Removal and Installation 1	77 77 77
TIMING CHAIN TENSIONER 1 Exploded View 1 Removal and Installation (Primary Timing Chain	1 85 185
Tensioner)	85 86
Chain Tensioner Shoe)	86
REAR TIMING CHAIN CASE 1 Exploded View 1 Removal and Installation 1	88 88 88
CAMSHAFT	1 93 193 194

OIL SEAL	
Removal and Installation of Valve Oil Seal	Α
Removal and Installation of Front Oil Seal	
Removal and Installation of Rear Oil Seal	
CYLINDER HEAD206	
Exploded View206	
Removal and Installation206	
Exploded View210	С
Disassembly and Assembly210	
Inspection After Disassembly	
,	D
UNIT REMOVAL AND INSTALLATION 217	
ENGINE ASSEMBLY 217	
Evolution 217	F
Pomoval and Installation 217	
UNIT DISASSEMBLY AND ASSEMBLY . 221	F
ENGINE UNIT	
Exploded View221	
Disassembly and Assembly	G
Inspection After Disassembly	
Dowel Pin Alignment	
	Н
HOW TO SELECT PISTON AND BEARING 244	
How to Select Piston and Bearing244	
(CDC)	1
(3D3)	
SERVICE DATA AND SPECIFICATIONS	
(SDS) 240	J
Standard and Limit 240	
Stanuaru anu Liniit	
	K

L

M

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< 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. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the SR and SB section of this Service Manual.

WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which 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 the SR section.
- Do not 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:

- When working near the Airbag Diagnosis Sensor Unit or other Airbag System sensors with the Ignition ON or engine running, DO NOT 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 for Drain Engine Coolant

Drain engine coolant when engine is cooled.

Precaution for Disconnecting Fuel Piping

- · Before starting work, make sure 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.

Precaution for Removal and Disassembly

- When instructed to use special service tools, use the specified tools. Always be careful to work safely, avoid forceful or uninstructed operations.
- Exercise maximum care to avoid damage to mating or sliding surfaces.
- · Cover openings of engine system with tape or equivalent, if necessary, to seal out foreign materials.
- Mark and arrange disassembly parts in an organized way for easy troubleshooting and re-assembly.
- 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.

Precaution for Inspection, Repair and Replacement

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

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PRECAUTIONS

Precaution for Assembly and Installation

- Use torgue 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.
- 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.
- Release air within route when refilling after draining engine coolant.
- Before starting engine, apply fuel pressure to fuel lines with turning ignition switch ON (with engine stopped). Then make sure that there are no leaks at fuel line connections.
- · After repairing, start engine and increase engine speed to check engine coolant, fuel, engine oil, and exhaust gasses for leakage.

Parts Requiring Angle Tightening

For the final tightening of the following engine parts use Tool:

Tool number : KV10112100 (BT-8653-A)

- Cylinder head bolts

< PRECAUTION >

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

Precaution for Liquid Gasket

REMOVAL OF LIQUID GASKET SEALING

· After removing nuts and bolts, separate the mating surface and remove old liquid gasket sealing using Tool.

Tool number : KV10111100 (J-37228)

CAUTION:

Be careful not to damage the mating surfaces.

- Tap seal cutter to insert it (1), and then slide it by tapping on the side (2) as shown.
- In areas where Tool is difficult to use, use plastic hammer to lightly tap the parts, to remove it.

CAUTION:

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

LIQUID GASKET APPLICATION PROCEDURE

- 1. Remove the old liquid gasket adhering to the gasket application surface and the mating surface using suitable tool.
 - Remove liquid gasket completely from the groove of the gasket application surface, bolts, and bolt holes.
- 2. Thoroughly clean the mating surfaces and remove adhering moisture, grease and foreign materials.





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< PRECAUTION >

3. Attach liquid gasket tube to the Tool.

liquid gasket to the groove.

Tool number : WS39930000 ()

Use Genuine RTV Silicone Sealant or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".

4. Apply the liquid gasket without breaks to the specified location with the specified dimensions.



- · Within five minutes of liquid gasket application, install the mating component.
- If the liquid gasket protrudes, wipe it off immediately.
- Do not retighten nuts or bolts after the installation.
- Wait 30 minutes or more after installation, before refilling the engine with engine oil and engine coolant.

CAUTION:

Carefully follow all of the warnings, cautions, notes, and procedures contained in this manual.





WBIA0567E

Description

Removing oil pan and front cover, etc.

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Revision: August 2010

Tool number

(Kent-Moore No.) Tool name KV10111100

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PREPARATION

Special Service Tool

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Tool number (Kent-Moore No.) Tool name		Description
EM03470000 (J-8037) Piston ring compressor	NT044	Installing piston assembly into cylinder bore
ST16610001 (J-23907) Pilot bushing puller	NT045	Removing pilot bushing (M/T models) or pilot converter (A/T models)
WS39930000 (—) Tube presser	NT052	Pressing the tube of liquid gasket
— (J-45488) Quick connector release	PBIC0198E	Removing fuel tube quick connectors in en- gine room (Available in SEC. 164 of PARTS CATALOG: Part No. 16441 6N210)
 (J-46535) Drive belt tension releaser	WBIA0536E	Releasing drive belt tension
(J-44626) Air fuel sensor Socket	LBIA0444E	Loosening or tightening air fuel ratio A/F sen- sor a: 22 mm (0.87 in)
KV10114400 (J-38365) Heated oxygen sensor wrench	A A A A A A A A A A A A A A A A A A A	Loosening or tightening heated oxygen sen- sor 1 a: 22 mm (0.87 in)

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Commercial Service Tool

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(Kent-Moore No.)		Description	-
Tool name			EM
Power tool		Loosening nuts and bolts	
			С
	PBIC0190E		D
(—) Spark plug wrench	\bigcirc	Removing and installing spark plug	E
	14 mm (0.55 in)		F
(—) Pulley holder		Removing and installing crankshaft pulley	G
			Н
	ZZA1010D		
(—) Pulley puller		Removing crankshaft pulley	J
	NT676		K
(—) 1. Compression tester 2. Adapter		Checking compression pressure	L
			M
(J-24239-01)	U ZZA0008D	Loosening and tightening cylinder head bolt,	- N
Cylinder head bolt wrench	a a	and used with the angle wiench [SST. KV10112100 (BT8653-A)] a: 13 (0.51) dia. b: 12 (0.47) c: 10 (0.39)	0
	C NT583	Unit: mm (in)	Ρ

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(Kent-Moore No.) Tool name		Description	A
a: (J-43897-18) b: (J-43897-12) Oxygen sensor thread cleaner	Mating surface shave cylinder	Reconditioning the exhaust system threads before installing a new heated oxygen sensor (Use with anti-seize lubricant shown below.) a = 18 mm (0.71 in) dia. for zirconia heated oxygen sensor b = 12 mm (0.47 in) dia. for titania heated oxygen sensor	EM
(—) Anti-seize lubricant i.e.: (Permatex TM 133AR or equivalent meeting MIL specification MIL-A-907)		Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads	D
	М489		– F

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Revision: August 2010

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

< SYSTEM DESCRIPTION >

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SYSTEM DESCRIPTION

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NVH Troubleshooting - Engine Noise

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NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING [QR25DE]

< SYSTEM DESCRIPTION >

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

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- 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	С	А	_	A	В	_	Tappet noise	Valve clearance	<u>EM-109</u>	E
Rocker cover Cylinder head	Rattle	С	A	_	A	В	С	Camshaft bearing noise	Camshaft journal oil clearance Camshaft runout	<u>EM-54</u> EM-54	F
	Slap or knock	_	A		В	В		Piston pin noise	Piston to piston pin oil clearance Connecting rod bushing oil clearance	<u>EM-91</u> <u>EM-91</u>	(
Crank- shaft pul- ley Cylinder block (Side of	Slap or rap	A	_	_	В	В	А	Piston slap noise	Piston to cylinder bore clearance Piston ring side clear- ance Piston ring end gap Connecting rod bend and torsion	<u>EM-91</u> <u>EM-91</u> <u>EM-91</u> <u>EM-91</u>	ŀ
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-91</u> <u>EM-91</u>	,
	Knock	А	В		A	В	С	Main bear- ing noise	Main bearing oil clear- ance Crankshaft runout	<u>EM-91</u> <u>EM-91</u>	ŀ
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-46</u> <u>EM-46</u>	L
Front of	Squeak- ing or fizz- ing	A	В		В		В	Drive belt (Sticking or slip- ping)	Drive belt deflection	<u>EM-14</u>	N
engine	Creaking	A	В	A	В	A	В	Drive belt (Slipping)	Idler pulley bearing op- eration		
	Squall Creak	A	В		В	A	В	Water pump noise	Water pump operation	<u>CO-22</u>	C

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

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< PERIODIC MAINTENANCE >

PERIODIC MAINTENANCE **DRIVE BELTS**

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- 7. Water pump
- A. Allowable working range

Checking Drive Belts

WARNING:

4.

Be sure to perform when the engine is stopped.

- Remove air duct and resonator assembly when inspecting drive belt. Refer to EM-143, "Removal and 1. Installation".
- 2. Make sure that the auto tensioner indicator is within the allowable working range.
- Visually check entire belt for wear, damage or cracks. 3.
- 4. If the indicator is out of allowable working range or drive belt is damaged, replace the drive belt. Refer to EM-131, "Removal and Installation".

Adjustment

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There is no manual drive belt tension adjustment. The drive belt tension is automatically adjusted by the drive belt auto tensioner.

Removal and Installation

REMOVAL

DRIVE BELTS

< PERIODIC MAINTENANCE >

1. Install Tool on auto tensioner pulley bolt and move in the direction of arrow (loosening direction of tensioner).

Tool number : — (J-46535)

WARNING:

- Avoid placing hand in a location where pinching may occur if the holding tool accidentally comes off.
 CAUTION:
- Do not loosen the auto-tensioner pulley bolt. (Do not turn it counterclockwise.) If turned counterclockwise, the complete auto-tensioner must be replaced as a unit, including pulley.
- 2. Remove drive belt.

INSTALLATION

Installation is in the reverse order of removal.

WARNING:

Avoid placing hand in a location where pinching may occur if the holding tool accidentally comes
off.

CAUTION:

- Do not loosen the auto-tensioner pulley bolt. (Do not turn it counterclockwise.) If turned counterclockwise, the complete auto-tensioner must be replaced as a unit, including pulley.
- Confirm belts are completely set on the pulleys.
- Check that there is no engine oil or engine coolant on the drive belt or pulley grooves. NOTE:
- Turn crankshaft pulley clockwise several times to equalize tension between each pulley.
- Confirm tension of drive belt indicator (fixed side) is within the allowable working range.

Removal and Installation of Drive Belt Auto Tensioner

SEC.117

REMOVAL

- 1. Disconnect battery negative terminal. Refer to PG-79, "Removal and Installation".
- 2. Partially drain engine coolant. Refer to CO-13, "Changing Engine Coolant".
- 3. Remove air cleaner and air duct. Refer to EM-25, "Removal and Installation".
- 4. Remove drive belt. Refer to EM-14, "Removal and Installation".
- 5. Disconnect upper radiator hose from radiator.
- 6. Disconnect coolant reservoir hose from radiator.
- 7. Remove lower and upper shrouds. Refer to CO-17, "Exploded View".



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DRIVE BELTS

< PERIODIC MAINTENANCE >

- 8. Remove the power steering oil pump and position aside. Refer to ST-18, "Removal and Installation".
- 9. Remove generator. Refer to CHG-21, "Removal and Installation QR25DE Models".

10. Remove drive belt auto-tensioner.

INSTALLATION

Installation is in the reverse order of removal.

CAUTION:

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

< PERIODIC MAINTENANCE >

AIR CLEANER FILTER

Removal and Installation

REMOVAL

- 1. Unfasten clips and lift up air cleaner case (upper).
- 2. Remove air cleaner filter.

INSTALLATION Installation is in the reverse order of removal. INFOID:000000006252554 ΕM С D Е LBIA0442E F G Н

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< PERIODIC MAINTENANCE > SPARK PLUG

Exploded View

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1. Ignition coil

2. Spark plug

Removal and Installation

REMOVAL

- 1. Remove the intake manifold. Refer to EM-27.
- 2. Remove the ignition coil. Refer to EM-36.
- Remove the spark plug using a suitable tool.
 CAUTION: Do not drop or shock it.



3.

Rocker cover

INSPECTION AFTER REMOVAL

• Do not use a wire brush for cleaning.



• If the spark plug tip is covered with carbon, spark plug cleaner may be used.

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SPARK PLUG

: Less than 20 seconds

: Less than 588 kPa (5.9 bar, 6 kg/cm², 85 psi)

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Cleaner air pressure

Cleaning time

• Checking and adjusting spark plug gap is not required between change intervals.



INSTALLATION Installation is in the reverse order of removal. CAUTION: Do not drop or shock the spark plug.

Make	NGK	G
Standard type*	PLZKAR6A-11	
Gap (nominal)	1.1 mm (0.043 in)	Н

* : Always check with the Parts Department for the latest parts information.



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CAMSHAFT VALVE CLEARANCE

Valve Clearance

INSPECTION

Perform the following inspection after removal, installation or replacement of camshaft or valve-related parts, or if there are unusual engine conditions due to changes in valve clearance over time (starting, idling or noise).

- 1. Remove rocker cover. Refer to EM-37, "Removal and Installation".
- 2. Remove engine under cover. Refer to EXT-15, "Removal and Installation".
- 3. Remove radiator shroud (lower). Refer to CO-17, "Exploded View".
- 4. Measure the valve clearance as follows:
- a. Set No. 1 cylinder at TDC of its compression stroke.
 - Rotate crankshaft pulley clockwise and align TDC mark to timing indicator on front cover.

- Make sure that intake and exhaust cam noses of No. 1 cylinder are located as shown.
- If not, rotate crankshaft one revolution (360°) and align as shown.

b. Use a feeler gauge to measure the clearance between valve lifter and camshaft.

Cold

0.24 - 0.32 (0.009 - 0.013) 0.26 - 0.34 (0.010 - 0.013) INFOID:000000006252557

[QR25DE]







Hot * (reference data) 0.304 - 0.416 (0.012 - 0.016)

0.308 - 0.432 (0.012 - 0.017)

Unit: mm (in)

Valve clearance:

*: Approximately 80°C (176°F)

Intake

Exhaust

CAMSHAFT VALVE CLEARANCE

< PERIODIC MAINTENANCE >

- Measure the valve clearances at locations marked "x" as shown in the table below (locations indicated with black arrow shown) with feeler gauge.
- No. 1 cylinder compression TDC

Measuring posi	tion	No. 1 CYL.	No. 2 CYL.	No. 3 CYL.	No. 4 CYL.
No. 1 cylinder at	INT	×	×		
compression TDC	EXH	×		×	

Rotate crankshaft one revolution (360°) and align TDC mark to C. timing indicator on front cover.



Mark

No. 1 cylinder compression TDC

No. 2

1701 Timing indicator

6

Engine

TDC mark

front

Intake side

© No. 3 © No. 4

Exhaust side

0

No. 4 cylinder compression TDC

INT

EXH

No. 1 CYL.

If out of standard, perform adjustment. 5.

ADJUSTMENT

No. 4 cylinder at compression TDC

· Perform adjustment depending on selected head thickness of valve lifter.

No. 2 CYL.

×

No. 3 CYL

×

1. Measure the valve clearance.

with feeler gauge.

Measuring position

- Remove camshaft. Refer to EM-54, "Removal and Installation".
- 3. Remove valve lifters at the locations that are out of the standard.
- Measure the center thickness of the removed valve lifters with a 4. micrometer.



5. Use the equation below to calculate valve lifter thickness for replacement.

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PBIC3015E

PBIC3026E

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< PERIODIC MAINTENANCE >

[QR25DE]

Valve lifter thickness calculation: t = t1 + (C1 – C2)

- t = Valve lifter thickness to be replaced
- t1 = Removed valve lifter thickness
- C1 = Measured valve clearance
- C2 = Standard valve clearance:

Intake : 0.28 mm (0.011 in)

- Exhaust : 0.30 mm (0.012 in)
- Thickness of new valve lifter can be identified by stamp marks on the reverse side (inside the cylinder).
 Stamp mark "696" indicates 6.96 mm (0.2740 in) in thickness.



NOTE:

Available thickness of valve lifter: 26 sizes range 6.96 to 7.46 mm (0.2740 to 0.2937 in) in steps of 0.02 mm (0.0008 in) (when manufactured at factory). Refer to <u>EM-109</u>, "<u>Standard and Limit</u>".

- 6. Install the selected valve lifter.
- 7. Install camshaft. Refer to EM-54, "Removal and Installation".
- 8. Manually rotate crankshaft pulley a few rotations.
- 9. Make sure that the valve clearances for cold engine are within specifications by referring to the specified values.
- 10. Installation of the remaining components is in the reverse order of removal.
- 11. Start the engine, and check for unusual noise and vibration.

< PERIODIC MAINTENANCE >

COMPRESSION PRESSURE

Compression Pressure

CHECKING COMPRESSION PRESSURE

- 1. Warm up engine thoroughly.
- 2. Release fuel pressure. Refer to EC-444, "Fuel Pressure Check".
- 3. Disconnect fuel pump fuse to avoid fuel injection during measurement.

- Remove spark plug from each cylinder. Refer to <u>EM-18, "Removal and Installation"</u>.
- Connect engine tachometer (not required in use of CONSULT-III). 5.
- 6. Install compression tester with an adapter into spark plug hole.

• Use the adapter whose pick up end inserted to spark plug hole is smaller than 20 mm (0.79 in) in diameter. Otherwise, it may be caught by cylinder head during removal.

7. With accelerator pedal fully depressed, turn ignition switch to "START" for cranking. When the gauge pointer stabilizes, read the compression pressure and the engine rpm. Perform these steps to check each cylinder.

Compression pressure:

Ρ Unit: kPa (kg/cm², psi) /rpm

Standard	Minimum	Differential limit between cylinders
1,304 (13.3, 189) / 250	1,108 (11.3, 161) / 250	100 (1.0, 14) / 250

CAUTION:

Always use fully a charged battery to obtain the specified engine speed.

If the engine speed is out of the specified range, check battery liquid for proper gravity. Check engine speed again with normal battery gravity.

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COMPRESSION PRESSURE

< PERIODIC MAINTENANCE >

- If compression pressure is below minimum value, check valve clearances and parts associated with combustion chamber (valve, valve seat, piston, piston ring, cylinder bore, cylinder head, cylinder head gasket). After the checking, measure the compression pressure again.
- If some cylinders have low compression pressure, pour small amount of engine oil into the spark plug hole of the cylinder to re-check it for compression.
- If the added engine oil improves the compression, piston rings may be worn out or damaged. Check piston rings and replace if necessary.
- If the compression pressure remains at low level despite the addition of engine oil, valves may be malfunctioning. Check valves for damage. Replace valve or valve seat accordingly.
- If two adjacent cylinders have respectively low compression pressure and their compression remains low even after the addition of engine oil, cylinder head gasket is leaking. In such a case, replace cylinder head gasket.
- 8. After inspection is completed, install removed parts.
- 9. Start engine, and make sure that engine runs smoothly.
- 10. Perform trouble diagnosis. If DTC appears, erase it. Refer to EC-117, "Inspection Procedure".

< REMOVAL AND INSTALLATION > **REMOVAL AND INSTALLATION** AIR CLEANER AND AIR DUCT

Exploded View

[QR25DE]

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- 1. Remove the breather hose from the air duct.
- Disconnect MAF sensor.
- 3. Loosen the air duct clamps and remove the air duct.
- Remove the air duct and resonator assembly bolts and remove air duct and resonator assembly. 4. Remove resonator in fender lifting left fender protector, as necessary.
- Remove air cleaner case.
- 6. Remove MAF sensor, if necessary.

INSPECTION AFTER REMOVAL

Inspect air duct and air duct and resonator assembly for cracks or tears.

· Replace air duct and air duct and resonator assembly, if necessary.

INSTALLATION

Installation is in the reverse order of removal.

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AIR CLEANER AND AIR DUCT

< REMOVAL AND INSTALLATION >

Align marks. Attach each joint. Tighten clamps firmly.
Install air duct and resonator assembly to air cleaner case by aligning "LOCK-UNLOCK" upward.

< REMOVAL AND INSTALLATION >

INTAKE MANIFOLD

Exploded View

INFOID:000000006252561



← Engine front

Removal and Installation

CAUTION:

Do not remove or disassemble parts unless instructed as shown.

REMOVAL

- 1. Release fuel pressure. Refer to EC-444. "Fuel Pressure Check".
- Disconnect battery negative terminal. Refer to <u>PG-79, "Removal and Installation"</u>.
- 3. Partially drain engine coolant. Refer to CO-13, "Changing Engine Coolant".

Revision: August 2010

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INTAKE MANIFOLD

< REMOVAL AND INSTALLATION >

- 4. Remove air cleaner case, air cleaner filter and air duct and resonator assembly. Refer to <u>EM-25</u>. <u>"Exploded View"</u>.
- 5. Disconnect water hoses from electric throttle control actuator. CAUTION:
 - Perform this step when engine is cold.
 - Do not spill engine coolant on drive belt.
- 6. Remove mass air flow sensor from intake manifold. **CAUTION:**

Handle the mass air flow sensor with care:

- Do not shock it.
- Do not disassemble it.
- Do not touch the internal sensor.
- 7. Remove quick connector cap, and disconnect quick connector at the engine side. Refer to <u>EM-39</u>.



- 8. Remove air duct. Refer to EM-25. "Exploded View".
- 9. Remove electric throttle control actuator as follows:
- a. Disconnect harness connector.
- Loosen bolts in reverse order as shown, and remove electric throttle control actuator and gasket.
 CAUTION:
 - Handle carefully to avoid any shock to electric throttle control actuator.
 - Do not disassemble.



- 10. Disconnect harness, vacuum hoses and PCV hoses from intake manifold, and move them aside.
- 11. Remove intake manifold support.
- Loosen nuts and bolts in reverse order as shown, and remove intake manifold, fuel tube protector and gasket.
 CAUTION:
 - Cover engine openings to avoid entry of foreign materials.
 - Do not disassemble intake manifold. NOTE:

Disregard No. 6 when loosening.



- Remove EVAP canister purge volume control solenoid valve and vacuum hose adapter from intake manifold, if necessary.
- 14. Disconnect sub-harness from fuel injector. Refer to EM-39.
- 15. Remove fuel tube and fuel injector assembly from intake manifold. Refer to EM-39.

INTAKE MANIFOLD

< REMOVAL AND INSTALLATION >

INSTALLATION

Installation in the reverse order of removal.

Intake Manifold and Fuel Tube Protector

• If stud bolts were removed, install them and tighten to the specified torque below.

Intake manifold stud : 9.4 N·m (0.96 kg-m, 83 in-lb)

Tighten in numerical order as shown.
 NOTE:

No. 6 means double tightening of bolt No. 1.

Use the following for locating bolts	and nuts.
M8 x 38 mm (1.50 in) (Color green)	: No. 1, 6
M8 x 35 mm (1.38 in)	: No. 2, 3
Nut	: No. 4, 5

Electric Throttle Control Actuator

- Tighten bolts equally and diagonally in several steps and in numerical order as shown.
- Perform the "Throttle Valve Closed Position Learning" when harness connector of electric throttle control actuator is disconnected. Refer to <u>EC-109, "Throttle Valve Closed Position Learning"</u>.
- Perform the "Idle Air Volume Learning" and "Throttle Valve Closed Position Learning" when electric throttle control actuator is replaced. Refer to <u>EC-109</u>, "Idle Air Volume Learning".



INSPECTION AFTER INSTALLATION

- 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-16</u>, "FOR USA AND CANADA : 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. **NOTE:**

If hydraulic pressure inside timing chain tensioner drops after removal and installation, slack in the guide may generate a pounding noise during and just after engine start. However, this is normal. Noise will stop after hydraulic pressure rises.

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

	Item	Before starting engine	Engine running	After engine stopped	-
Engine coolant		Level	Leakage	Level	F
Engine oil		Level	Leakage	Level	_
Transmission/ transaxle fluid	A/T and CVT Models	Leakage	Level/Leakage	Leakage	_
	M/T Models	Level/Leakage	Leakage	Level/Leakage	-
Other oils and fluid	S*	Level	Leakage	Level	-

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Engine front PBIC2988E А

INTAKE MANIFOLD

< REMOVAL AND INSTALLATION >

[QR25DE]

Item	Before starting engine	Engine running	After engine stopped
Fuel	Leakage	Leakage	Leakage
Exhaust gas		Leakage	_

*Power steering fluid, brake fluid, etc.

EXHAUST MANIFOLD AND THREE WAY CATALYST

< REMOVAL AND INSTALLATION >

EXHAUST MANIFOLD AND THREE WAY CATALYST

Exploded View

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EXHAUST MANIFOLD AND THREE WAY CATALYST

< REMOVAL AND INSTALLATION >

6. Loosen nuts in reverse order as shown to remove exhaust manifold and three way catalyst assembly.



[QR25DE]

7. Remove gasket. CAUTION:

Cover engine openings to avoid entry of foreign materials.

INSPECTION AFTER REMOVAL

Surface Distortion

• Check the surface distortion of exhaust manifold and three way catalyst assembly mating surface with straightedge and feeler gauge.

Limit : 0.3 mm (0.012 in)

 If it exceeds the limit, replace exhaust manifold and three way catalyst assembly.



INSTALLATION

installation is in the reverse order of removal.

Exhaust Manifold

1. If stud bolts were removed, install them and tighten to the specified torque.

Exhaust manifold stud bolt : 14.7 N·m (1.5 kg-m, 11 ft-lb)

- 2. Tighten nuts in numerical order as shown.
- 3. Tighten nuts in numerical order as shown again.



Air Fuel Ratio Sensor 1

CAUTION:

- Do not over tighten air fuel ratio sensor 1. Doing so may cause damage to air fuel ratio sensor 1, resulting in the "MIL" coming on.
- Before installing new air fuel ratio sensor 1, clean exhaust system threads using suitable tool and apply anti-seize lubricant.

Oxygen sensor thread cleaner : — (J-43897-12) Oxygen sensor thread cleaner : — (J-43897-18)

OIL PAN

Exploded View

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< REMOVAL AND INSTALLATION >

b. Insert Tool between the oil pan and the cylinder block and remove oil pan.

Tool number : KV10111100 (J-37228)

CAUTION:

- Be careful not to damage the mating surfaces.
- Do not insert a screwdriver, this will damage the mating surfaces.

NOTE:

Tap (1) Tool to insert it and then slide (2) it by tapping on the side of the Tool as shown.

INSPECTION AFTER REMOVAL

Clean oil strainer if any object attached.

INSTALLATION

- 1. Install oil pan with the following procedure:
- a. Use a scraper to remove old liquid gasket from mating surfaces.
 - Also remove the old liquid gasket from mating surface of cylinder block.
 - Remove old liquid gasket from the bolt holes and threads. CAUTION:

Do not scratch or damage the mating surfaces when cleaning off old liquid gasket.





b. Apply a continuous bead of liquid gasket using Tool as shown.

Tool number : WS39930000 (—)

Use Genuine RTV Silicone Sealant or equivalent. Refer to <u>GI-22, "Recommended Chemical Products and Sealants"</u>. CAUTION:

Attaching should be done within 5 minutes after coating.



• Install A/T fluid cooler tube bracket with bolts No.1 and 9 as shown (A/T models).





- 2. Install oil pan drain plug. Refer to <u>LU-10, "Changing Engine Oil"</u>.
- 3. Installation is in the reverse order of removal after this step. **NOTE:**

Pour engine oil at least 30 minutes after oil pan is installed.

OIL PAN

< REMOVAL AND INSTALLATION >

[QR25DE]

INSPECTION AFTER INSTALLATION

- 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-16, "FOR USA AND CANADA : Fluids and Lubricants"</u>.
- · 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.
- NOTE:

If hydraulic pressure inside timing chain tensioner drops after removal and installation, slack in the guide may generate a pounding noise during and just after engine start. However, this is normal. Noise will stop after hydraulic pressure rises.

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

	Item	Before starting engine	Engine running	After engine stopped	•
Engine coolant		Level	Leakage	Level	-
Engine oil		Level	Leakage	Level	- (
Transmission/ transaxle fluid	A/T and CVT Models	Leakage	Level/Leakage	Leakage	-
	M/T Models	Level/Leakage	Leakage	Level/Leakage	ŀ
Other oils and fluid	ls*	Level	Leakage	Level	-
Fuel		Leakage	Leakage	Leakage	-
Exhaust gas		—	Leakage	—	-

*Power steering fluid, brake fluid, etc.

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< REMOVAL AND INSTALLATION > IGNITION COIL

Exploded View

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[QR25DE]



1. Ignition coil

- 2. Spark plug
- Removal and Installation

REMOVAL

- 1. Remove intake manifold. Refer to EM-27.
- 2. Disconnect harness connector from ignition coil.
- Remove ignition coil.
 CAUTION: Do not shock ignition coil.
- INSTALLATION

Installation is in the reverse order of removal.

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3. Rocker cover
ROCKER COVER

Exploded View

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Removal and Installation

REMOVAL

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- 1. Remove intake manifold. Refer to EM-27.
- 2. Disconnect PCV hose from rocker cover.
- 3. Remove ignition coils. Refer to EM-36.
- 4. Remove PCV valve and O-ring from rocker cover, if necessary.
- 5. Remove oil filler cap from rocker cover, if necessary.
- Loosen bolts in reverse order as shown.



- 7. Remove rocker cover gasket from rocker cover.
- Use scraper to remove all traces of liquid gasket from cylinder head and camshaft bracket (No. 1). 8. CAUTION:

Do not scratch or damage the mating surface when cleaning off old liquid gasket.

INSTALLATION

Revision: August 2010

ROCKER COVER

< REMOVAL AND INSTALLATION >

1. Apply liquid gasket using Tool to joint of rocker cover, cylinder head and camshaft bracket (No. 1) as follows:

Tool number : WS39930000 (—)

Use Genuine RTV Silicone Sealant or equivalent. Refer to <u>GI-22, "Recommended Chemical Products and Sealants"</u>.

- a. Apply liquid gasket to joint part of camshaft bracket (a) (No. 1) and cylinder head.
- b. Apply liquid gasket (b) 90° to figure (a).



- 2. Install new rocker cover gasket to rocker cover.
- 3. Install rocker cover.
 - Check to be sure rocker cover gasket is not dropped from installation groove of rocker cover.
- 4. Tighten bolts in two steps in numerical order as shown.

1st step	: 2.0 N·m (0.2 kg-m, 18 in-lb)
2nd step	: 8.3 N·m (0.85 kg-m, 73 in-lb)



5. Installation of the remaining components is in the reverse order of removal.

< REMOVAL AND INSTALLATION >

FUEL INJECTOR AND FUEL TUBE

Exploded View

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2. Disconnect the fuel quick connector on the engine side.



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< REMOVAL AND INSTALLATION >

a. Remove quick connector cap.

b.

Revision: August 2010

With the sleeve side of Tool facing quick connector, install Tool onto fuel tube.

Tool number : — (J-45488)

 Insert Tool into quick connector until sleeve contacts and goes no further. Hold the Tool on that position.
 CAUTION:

Inserting the Tool hard will not disconnect quick connector. Hold Tool where it contacts and goes no further.

- d. Pull the quick connector straight out from the fuel tube. CAUTION:
 - Pull quick connector holding it at the (A) position, as shown.
 - Do not pull with lateral force applied. O-ring inside quick connector may be damaged.
 - Prepare container and cloth beforehand as fuel will leak out.
 - Avoid fire and sparks.
 - Do not expose parts to battery electrolyte or other acids.
 - Do not bend or twist connection between quick connector and fuel feed hose during removal and installation.
 - Be sure to cover openings of disconnected pipes with plug or plastic bag to avoid fuel leakage and entry of foreign materials.



- 4. Disconnect harness connector from fuel injector.
- Loosen bolts in reverse order as shown and remove fuel tube and fuel injector assembly. CAUTION:
 - Be careful to avoid any interference with fuel injector.
 - Use a shop cloth to absorb any fuel leaks from fuel tube.



Plastic bags, etc.





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< REMOVAL AND INSTALLATION >

- 6. Remove fuel injector from fuel tube as follows:
- a. Carefully open and remove clip.
- b. Remove fuel injector from fuel tube by pulling straight. **CAUTION:**
 - Be careful with remaining fuel that may leak out from fuel tube.
 - Do not damage fuel injector nozzles during removal.
 - Do not bump or drop fuel injectors.
 - Do not disassemble fuel injectors.



[QR25DE]

INSTALLATION

۱.	Install new O-rings to fuel injector, paying attention to the following.	Н
	• Upper and lower O-rings are different colors.	
	Fuel tube side :Black	
	Nozzle side : Green	J
	 Handle O-ring with bare hands. Do not wear gloves.)
	 Lubricate O-ring with new engine oil. Do not clean O-ring with solvent. Make sure that O-ring and its mating part are free of foreign material. When installing O-ring, be careful not to scratch it with tool or fingernails. 	K
	 Do not twist or stretch O-ring. If O-ring was stretched while it was being attached, allow it to retract before inserting it into fuel tube. Insert new O-ring straight into fuel tube. Do not angle or twist it. 	L
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< REMOVAL AND INSTALLATION >

- 2. Install fuel injector to fuel tube.
- a. Insert clip into clip mounting groove on fuel injector.
 - Insert new clip so that protrusion of fuel injector matches cutout of clip.

CAUTION:

- Do not reuse clip. Replace it with a new one.
- Do not allow the clip to interfere with the O-ring. If interference occurs, replace O-ring.
- b. Insert the fuel injector into the fuel tube with the clip attached.
 - Insert it while matching it to the axial center.
 - Insert fuel injector so that protrusion of fuel tube matches cutout of clip.
 - Make sure that fuel tube flange is securely fixed in flange fixing groove on clip.
- c. Make sure that installation is complete by checking that the fuel injector does not rotate or come off.
 - Make sure that protrusions of the fuel injectors are aligned with cutouts of clips after installation.



3. Install fuel tube and fuel injector assembly as follows: CAUTION:

Do not let the tip of the injector nozzle come in contact with other parts.

- a. Insert the tip of each fuel injector into intake manifold.
- b. Tighten bolts in two steps in numerical order as shown.

Fuel tube bolts

1st step	: 12.8 N·m (1.3 kg-m, 9 ft-lb)
2nd step	: 28.0 N·m (2.9 kg-m, 21 ft-lb)



- 4. Connect harness connectors to fuel injectors.
- 5. Install intake manifold. Refer to EM-27, "Removal and Installation".
- 6. Connect quick connector at the engine side as follows:
- a. Check the connection for foreign material and damage.
- b. Align center to insert quick connector straight into fuel tube. **NOTE:**
 - The figure shows the engine side as an example.
 - Insert quick connector to fuel tube until the top spool on fuel tube is inserted completely and the second level spool is positioned slightly below quick connector bottom end. CAUTION:
 - Hold (A) position as shown when inserting fuel tube into quick connector.
 - Carefully align center to avoid inclined insertion to prevent damage to O-ring inside quick connector.
 - Insert until you hear a "click" sound and actually feel the engagement.
 - To avoid misidentification of engagement with a similar sound, be sure to perform the next step.



Revision: August 2010

EM-42

[QR25DE]

< REMOVAL AND INSTALLATION >

- Before clamping fuel feed hose with quick connector cap, pull quick connector hard by hand holding (A) C. position. Make sure it is completely engaged (connected) so that it does not come out from fuel feed tube.
- Install quick connector cap to quick connector connection. d. (engine side)
 - Install so that the arrow mark on the side faces up. CAUTION:
 - Make sure that guick connector and fuel tube are securely fit into quick connector cap installation groove.
 - If quick connector cap cannot be installed smoothly, quick connector may have not been installed correctly. Check the connection again.
- Install fuel feed hose to hose clamp.
- 8. Installation is in the reverse order of removal after this step.

INSPECTION AFTER INSTALLATION

- · 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-16. "FOR USA AND CANADA : 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.

NOTE:

If hydraulic pressure inside timing chain tensioner drops after removal and installation, slack in the guide may generate a pounding noise during and just after engine start. However, this is normal. Noise will stop after hydraulic pressure rises.

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

					-
Item		Before starting engine	Engine running	After engine stopped	
Engine coolant		Level	Leakage	Level	K
Engine oil		Level	Leakage	Level	- 1
Transmission/ transaxle fluid	A/T and CVT Models	Leakage	Level/Leakage	Leakage	_
	M/T Models	Level/Leakage	Leakage	Level/Leakage	L
Other oils and fluids*		Level	Leakage	Level	
Fuel		Leakage	Leakage	Leakage	
Exhaust gas		_	Leakage	_	IV

*Power steering fluid, brake fluid, etc.

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Fuel feed hose side

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Fuel tube side

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Quick

connector cap

INTAKE VALVE TIMING CONTROL

Intake Valve Timing Control Solenoid Valve

REMOVAL

- 1. Disconnect intake valve timing control solenoid valve connector.
- 2. Remove intake valve timing control solenoid valve bolt.
- 3. Remove intake valve timing control solenoid valve (1) and Oring (2) from intake valve timing control solenoid valve cover.

INSTALLATION

Installation is in the reverse order of removal.

Replace the O-ring for the intake valve timing control solenoid valve with a new one, then lubricate O-ring with engine oil before installing.





Exploded View



- 1. O-ring
- Chain tensioner 4.
- 7. Timing chain slack guide
- 10. Chain guide
- 13. Oil ring
- 16. Crankshaft pulley bolt
- 19. Balancer unit timing chain tensioner
- 22. Balancer unit sprocket
- Β. Refer to EM-46, "Removal and Installation"

- 2. Camshaft sprocket (INT)
- 5. Spring
- 8. Timing chain
- Intake valve timing control solenoid 11. valve
- 14. Front oil seal
- 17. Crankshaft sprocket
- 20. Timing chain tension guide
- 23. Balancer unit timing chain

- WBIA0834E
- 3. Camshaft sprocket (EXH)
- 6. Chain tensioner plunger
 - Front cover
- 12. Intake valve timing control cover
- 15. Crankshaft pulley
- 18. Spacer

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- 21. Balancer unit
- Α. Refer to EM-46, "Removal and Installation"

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Removal and Installation

REMOVAL

- 1. Remove engine under cover. Refer to EXT-15, "Removal and Installation".
- 2. Release the fuel pressure. Refer to EC-444, "Fuel Pressure Check".
- 3. Remove the air cleaner case and air duct and resonator assembly. Refer to <u>EM-25. "Removal and Instal-</u> lation".
- 4. Remove the spark plugs. Refer to EM-18. "Removal and Installation".
- 5. Remove the rocker cover. Refer to EM-37, "Removal and Installation".
- 6. Remove the coolant overflow reservoir tank.
- 7. Remove the drive belt auto-tensioner. Refer to <u>EM-15</u>, "Removal and Installation of Drive Belt Auto Tensioner".
- 8. Remove the generator. Refer to CHG-21, "Removal and Installation QR25DE Models".
- 9. Remove the strut tower brace. Refer to FSU-12, "Component".
- 10. Dismount and position aside the A/C compressor with the piping attached.
- 11. Dismount and position aside the power steering pump and reservoir tank with the piping attached.
- 12. Remove the oil pan, and oil strainer. Refer to EM-33, "Removal and Installation".
- 13. Remove IVT control cover bolts in the order as shown.
- 14. Remove the IVT control cover by cutting the sealant using Tool.

Tool number : KV10111100 (J-37228)

15. Pull chain guide between camshaft sprockets out through front cover.



- 16. Set the No.1 cylinder at TDC on the compression stroke with the following procedure:
- a. Rotate the crankshaft pulley clockwise and align the mating marks to the timing indicator on the front cover.



- Mating mark (Peripheral stamp line) Camshaft sprocket (INT side)
- b. At the same time, make sure that the mating marks on the camshaft sprockets are lined up as shown.
- If not lined up, rotate the crankshaft pulley one more turn to line up the mating marks to the positions as shown.

< REMOVAL AND INSTALLATION >

- 17. Remove crankshaft pulley with the following procedure:
- a. Hold the crankshaft pulley with a suitable tool, then loosen the crankshaft pulley bolt, and pull the pulley out about 10 mm (0.39 in). Remove the crankshaft pulley bolt.

b. Attach a pulley puller in the M6 (0.24 in diameter) thread hole on crankshaft pulley, and remove crankshaft pulley.

18. If the front oil seal needs to be replaced, remove it using a suitable tool.

- 19. Remove the front cover as follows:
- Loosen the front cover bolts in the reverse order as shown, and a. remove them.
- b. Remove the front cover.
 - **CAUTION:**
 - Be careful not to damage the mating surface.





Suitable tool



Crankshaft pulley

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< REMOVAL AND INSTALLATION >

- 20. Remove timing chain with the following procedure:
- a. Push in chain tensioner plunger. Insert a stopper pin into hole on chain tensioner body to secure chain tensioner plunger and remove chain tensioner.

NOTE:

Use approximately 0.5 mm (0.02 in) dia. hard metal pin as a stopper pin.



b. Remove timing chain.

CAUTION:

Do not rotate crankshaft or camshaft while timing chain is removed. It causes interference between valve and piston.

- 21. Remove camshaft sprockets. Refer to EM-54.
- 22. Remove timing chain slack guide, timing chain tension guide and spacer.
- 23. Remove balancer unit timing chain tensioner with the following procedure:
- a. Lift lever up, and release ratchet claw for return proof.
- b. Push tensioner sleeve in, and hold it.
- Matching the hole on lever with the one on body, insert a stopper pin to secure tensioner sleeve.
 NOTE:

Use approximately 1 mm (0.04 in) dia. hard metal pin as a stopper pin.

d. Remove balancer unit timing chain tensioner.



- 24. Secure the hexagonal portion of the balancer shaft using a suitable tool. Loosen the balancer unit sprocket bolt.
- 25. Remove balancer unit timing chain, balancer unit sprocket and crankshaft sprocket.

NOTE:

When removing balancer unit timing chain, remove crankshaft sprocket and balancer unit sprocket at the same time.

26. Loosen bolts in reverse order as shown, and remove balancer unit.

CAUTION:

Do not disassemble balancer unit.

NOTE:

Use TORX socket (size E14) for bolts No.1 to 4.



INSPECTION AFTER REMOVAL

Timing Chain

< REMOVAL AND INSTALLATION >

Check timing chain for cracks and any excessive wear at the roller links of timing chain. Replace timing chain if necessary.

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Balancer Unit Bolt Outer Diameter

- Measure outer diameters [(d1), (d2)] at two positions as shown.
- If reduction appears in (A) range, regard it as (d2).

Limit [(d1) – (d2)] : 0.15 mm (0.0059 in)

· If it exceeds the limit (large difference in dimensions), replace balancer unit bolt with a new one.



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Balancer Unit Bolt Length

Measure balancer unit bolt length. If it exceeds the limit, replace balancer unit bolt with a new one.

: 172 mm (6.77 in) Limit

INSTALLATION

NOTE:

The figure shows the relationship between the mating mark on each timing chain and that on the corresponding sprocket, with the components installed.

Make sure that crankshaft key points straight up. 1.



2. Install O-ring to balancer unit.

< REMOVAL AND INSTALLATION >

3. Tighten bolts in numerical order as shown with the following procedure to install balancer unit, using Tool.

Tool number : KV10112100 (BT8653-A)

CAUTION:

If bolts are re-used, check their outer diameter before installation. Follow the "Balancer Unit Bolt Outer Diameter" procedure.

CAUTION:

- Check tightening angle using Tool or a protractor. Do not make judgment by visual check alone.
- In step 3, loosen bolts in reverse order as shown. NOTE:

Apply new engine oil to threads and seat surfaces of bolts.

Balancer bolt torque

Step 1 bolts 1 - 4	: 48.1 N·m (4.9 kg-m, 35 ft-lb)
Step 2 bolts 1 - 4	: 100° clockwise
Step 3 bolts 1 - 4	: 0 N·m (0 kg-m, 0 ft-lb)
Step 4 bolts 1 - 4	: 48.1 N·m (4.9 kg-m, 35 ft-lb)
Step 5 bolts 1 - 4	: 100° clockwise
Step 6 bolts 5 - 6	: 30.1 N·m (3.1 kg-m, 22 ft-lb)

- 4. Install crankshaft sprocket, balancer unit sprocket and balancer unit timing chain.
 - Make sure that crankshaft sprocket is positioned with mating marks on cylinder block and crankshaft sprocket meeting at the top.
 - Install it by aligning mating marks on each sprocket and balancer unit timing chain.
 - Secure the hexagonal portion of the balancer shaft using a suitable tool. Tighten the balancer unit sprocket bolt to the specified torque.

NOTE:

Install crankshaft sprocket, balancer unit sprocket and balancer unit timing chain at the same time.

- 5. Install balancer unit timing chain tensioner.
 - After installation, make sure the mating marks have not slipped, then remove stopper pin and release tensioner sleeve.



[QR25DE]







< REMOVAL AND INSTALLATION >

6. Install timing chain and related parts.

- Install by aligning mating marks on each sprocket and timing chain.
- Before and after installing chain tensioner, check again to make sure that mating marks have not slipped.
- After installing chain tensioner, remove stopper pin, and make sure that tensioner moves freely.
 - CAUTION:
 - For the following note, after the mating marks are aligned, keep them aligned by holding them with a hand.
 - To avoid skipped teeth, do not rotate crankshaft and camshaft until front cover is installed.

NOTE:

Before installing chain tensioner, it is possible to change the position of mating mark on timing chain for that on each sprocket for alignment.

- 7. Install front oil seal to front cover. Refer to EM-63, "Removal and Installation of Front Oil Seal".
- 8. Install O-rings to cylinder head and cylinder block.
- 9. Apply a continuous bead of liquid gasket with the tube presser to front cover as shown, using Tool.

Tool number : WS39930000 (—)

Use Genuine RTV Silicone Sealant or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants". NOTE:

Application instruction differs depending on the position.

- Detail of A : Cross over the start of the application and the end.
- Detail of B : Apply liquid gasket outside of bolt holes. (For all bolt holes other than B, apply to the inside.)
- Detail of C : Between here only, apply 4.5 5.5 mm (0.177 - 0.217 in) dia.



10. Make sure that mating marks of timing chain and each sprocket are still aligned. Then install front cover. CAUTION:

Be careful not to damage front oil seal by interference with front end of crankshaft.



Balancer unit

sprocket

Revision: August 2010

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(stamp)

Yellow link

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< REMOVAL AND INSTALLATION >

- 11. Tighten bolts in numerical order as shown.
 - Use the following for locating M6 bolts.

Bolt position	Bolt length
5, 10, 14, 17	: 45 mm (1.77 in)
Except the above (Except 1 through 4)	: 20 mm (0.79 in)

Tighten bolts to the specified torque.

Bolt position	Torque specification
5 through 17	: 12.8 N·m (1.3 kg-m, 9 ft-lb)
1 through 4	: 49.0 N·m (5.0 kg-m, 36 ft-lb)

12. After all bolts are tightened, retighten them to the specified torque in numerical order as shown. CAUTION:

Be sure to wipe off any excessive liquid gasket leaking to surface for fitting oil pan.



- 13. Install chain guide between camshaft sprockets.
- 14. Install O-rings to the camshaft sprocket (INT) insertion points on backside of intake valve timing control cover.

- 15. Install O-ring to front cover.
- 16. Apply a continuous bead of liquid gasket using Tool to intake valve timing control cover as shown.

Tool number : WS39930000 ()

Use Genuine RTV Silicone Sealant or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".





17. Tighten bolts in numerical order as shown.

- 18. Install intake valve timing control solenoid valve to intake valve timing control cover if removed.
- 19. Connect ground cables, and install harness clip.
- 20. Insert crankshaft pulley by aligning with crankshaft key.
 - When inserting crankshaft pulley with a plastic hammer, tap on its center portion (not circumference). CAUTION:

Do not damage front oil seal lip section.

< REMOVAL AND INSTALLATION >

- 21. Tighten crankshaft pulley bolt.
 - Secure crankshaft pulley using suitable tool, and tighten crankshaft pulley bolt.
- a. Apply new engine oil to thread and seat surfaces of crankshaft pulley bolt.
- b. Tighten crankshaft pulley bolt.

: 42.1 N·m (4.3 kg-m, 31 ft-lb)

- c. Put a paint mark on crankshaft pulley, mating with any one of six easy to recognize angle marks on bolt flange.
- d. Turn another 60° degrees clockwise (angle tightening).
 - Check the tightening angle with movement of one angle mark.



22. Installation is in the reverse order of removal.

INSPECTION AFTER INSTALLATION

- 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-16</u>. "FOR USA AND CANADA : 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.
- NOTE:

If hydraulic pressure inside timing chain tensioner drops after removal and installation, slack in the guide may generate a pounding noise during and just after engine start. However, this is normal. Noise will stop after hydraulic pressure rises.

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

Item		Before starting engine	Engine running	After engine stopped	_
Engine coolant		Level	Leakage	Level	-
Engine oil		Level	Leakage	Level	
Transmission/ transaxle fluid	A/T and CVT Models	Leakage	Level/Leakage	Leakage	_
	M/T Models	Level/Leakage	Leakage	Level/Leakage	Ν
Other oils and fluids*		Level	Leakage	Level	_
Fuel		Leakage	Leakage	Leakage	_
Exhaust gas		_	Leakage	_	_ (

*Power steering fluid, brake fluid, etc.

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CAMSHAFT

Exploded View

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- Front cover 4.
- 7. Spring

1.

10. Oil ring

16. O-ring

19. Camshaft (EXH)

- 5. Chain guide
- 8. Chain tensioner plunger
- 11. O-ring
- 14. Camshaft sprocket (INT)
- 17. Valve lifter
- 20. O-ring

- Chain tensioner 6.
- 9. O-ring
- Intake valve timing control solenoid 12. valve
- 15. Camshaft sprocket (EXH)
- 18. Camshaft (INT)
- 21. Camshaft position sensor (PHASE)

Refer to EM-54, "Removal and Installation" Α.

Removal and Installation

13. Intake valve timing control cover

NOTE:

This section describes removal/installation procedure of camshaft without removing front cover. If front cover is removed or installed, refer to EM-46.

REMOVAL

- Remove the rocker cover. Refer to EM-37, "Removal and Installation". 1.
- 2. Remove the drive belt. Refer to EM-14, "Removal and Installation".
- Disconnect and remove the camshaft position sensor (PHASE). 3.
- 4. Disconnect the IVT control solenoid electrical connector.
- 5. Disconnect the ground electrical connections from the front cover.

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< REMOVAL AND INSTALLATION >

Tool number

- 6. Remove IVT control cover bolts in the order as shown.
- 7. Remove the IVT control cover by cutting the sealant using Tool.

: KV10111100 (J-37228)

Set the No.1 cylinder at TDC on its compression stroke as follows:

a. Rotate crankshaft pulley clockwise, and align mating marks for TDC with timing indicator on front cover, as shown.

- b. Make sure that the mating marks on camshaft sprockets are lined up with the yellow links in the timing chain, as shown.
 - If not, rotate crankshaft pulley one more turn to line up the mating marks to the yellow links, as shown.

- 9. Pull the timing chain guide out between the camshaft sprockets through front cover.
- Line up the mating marks on camshaft sprockets with the yellow links in the timing chain, and paint an indelible mating mark on the sprocket and timing chain link plate.
 CAUTION:

Do not rotate the crankshaft or camshaft while the timing chain is removed. It causes interference between valve and piston. NOTE:

Maintaining chain tension is not necessary. Crankshaft sprocket and timing chain do not disconnect structurally while front cover is attached.

EM-55

- 11. Push in the tensioner plunger and hold. Insert a stopper pin into the hole on tensioner body to hold the chain tensioner. Remove the timing chain tensioner.
 - Use a wire with 0.5 mm (0.02 in) diameter for a stopper pin.







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< REMOVAL AND INSTALLATION >

12. Secure the camshaft using a suitable tool as shown. Loosen the camshaft sprocket bolts and remove the camshaft sprockets.

- 13. Loosen the camshaft bracket bolts in the order as shown, and remove the camshaft brackets and camshafts.
 - Remove No.1 camshaft bracket by slightly tapping it with a rubber mallet.
 - Note positions, and set them aside in the order removed.
- 14. Remove the valve lifters.
 - Note positions, and set them aside in the order removed.





INSPECTION AFTER REMOVAL

Camshaft Runout

 Put V-block on a precise flat table, and support No. 2 and 5 journals of camshaft. CAUTION:

Do not support No. 1 journal (on the side of camshaft sprocket) because it has a different diameter from the other four locations.

- 2. Set a dial indicator vertically to No. 3 journal.
- 3. Turn camshaft to one direction with hands, and measure the camshaft runout on the dial indicator. (Total indicator reading)

Standard: Less than 0.02 mm (0.0008 in).

4. If out of the standard, replace camshaft.

Camshaft Cam Height

2.

1. Measure the camshaft cam height with a micrometer.

Standard: Intake : 45.015 - 45.205 mm (1.7722 - 1.7797 in)

Exhaust : 43.975 - 44.165 mm (1.7313 - 1.7388 in) Cam wear limit

: 0.2 mm (0.008 in)

If wear is beyond the limit, replace camshaft.

Camshaft Journal Oil Clearance CAMSHAFT JOURNAL DIAMETER





[QR25DE]

< REMOVAL AND INSTALLATION >

Measure the outer diameter of camshaft journal with a micrometer.

Standard:

No. 1	: 27.935 - 27.955 mm (1.0998 - 1.1006 in)
No. 2, 3, 4, 5	: 23.435 - 23.455 mm (0.9226 - 0.9234 in)



CAMSHAFT BRACKET INNER DIAMETER

- Tighten camshaft bracket bolts with the specified torque. Refer to EM-54, "Removal and Installation".
- Measure inner diameter "A" of camshaft bracket with a bore gauge.

Standard: No. 1 : 28.000 - 28.021 mm (1.1024 - 1.1032 in) No. 2, 3, 4, 5 : 23.500 - 23.521 mm (0.9252 - 0.9260 in)



CAMSHAFT JOURNAL OIL CLEARANCE

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

Standard : 0.045 - 0.086 mm (0.0018 - 0.0034 in)

• If out of the standard, replace either or both camshaft and cylinder head. **NOTE:**

Camshaft brackets cannot be replaced as single parts, because they are machined together with cylinder head. Replace whole cylinder head assembly.

Camshaft End Play

- 1. Install camshaft in cylinder head. Refer to <u>EM-54</u>, "Removal and Installation".
- 2. Install a dial indicator in thrust direction on front end of camshaft. Measure the camshaft end play on the dial indicator when camshaft is moved forward/backward (in direction to axis).

Standard : 0.115 - 0.188 mm (0.0045 - 0.0074 in)



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< REMOVAL AND INSTALLATION >

- · Measure the following parts if out of the standard.
- Dimension "A" for camshaft No. 1 journal

Standard : 25.800 - 25.848 mm (1.0157 - 1.0176 in)

- Dimension "B" for cylinder head No. 1 journal bearing

Standard : 25.660 - 25.685 mm (1.0102 - 1.0112 in)

· Use the standards above, and then replace camshaft and/or cylinder head, if necessary.

Camshaft Sprocket Runout

Put V-block on precise flat table, and support No. 2 and 5 journals of camshaft. 1. **CAUTION:**

Do not support No. 1 journal (on the side of camshaft sprocket) because it has a different diameter from the other four locations.

2. Measure the camshaft sprocket runout with a dial indicator. (Total indicator reading)

Limit : 0.15 mm (0.0059 in)

If it exceeds the limit, replace camshaft sprocket.

Check if surface of valve lifter has any wear or cracks.





Valve Lifter Clearance VALVE LIFTER OUTER DIAMETER

"Standard and Limit".

Valve Lifter

· Measure the outer diameter of valve lifter with a micrometer.

Standard : 33.965 - 33.980 mm (1.3372 - 1.3378 in)



VALVE LIFTER HOLE DIAMETER



[QR25DE]

< REMOVAL AND INSTALLATION >

Measure the diameter of valve lifter hole of cylinder head with an inside micrometer.

Standard : 34.000 - 34.021 mm (1.3386 - 1.3394 in)



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VALVE LIFTER CLEARANCE

• (Valve lifter clearance) = (Valve lifter hole diameter) – (Valve lifter outer diameter)

Standard : 0.020 - 0.056 mm (0.0008 - 0.0022 in)

• If out of the standard, referring to the standard of valve lifter outer diameter and valve lifter hole diameter, replace either or both valve lifter and cylinder head.

INSTALLATION

- 1. Install valve lifters.
 - Install them in the original positions.
- 2. Install camshafts.
 - Distinction between intake and exhaust camshafts is performed with the different shapes of rear end.

Intake : Signal plate shape for camshaft position sensor (PHASE)

Exhaust : Cone end shape



• Install camshafts so that camshaft dowel pins on the front side are positioned as shown.



- 3. Install camshaft brackets with the following procedure:
- Remove foreign material completely from camshaft bracket backside and from cylinder head installation face.

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< REMOVAL AND INSTALLATION >

Install camshaft brackets (No. 2 to 5) aligning the identification marks on upper surface as shown.
 NOTE:

Install so that identification mark can be correctly read when viewed from the exhaust side.



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10.5 mm-

- c. Install camshaft bracket (No. 1) with the following procedure:
- Apply liquid gasket to camshaft bracket (No. 1) as shown. Use Genuine RTV Silicone Sealant or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants". CAUTION:

After installation, be sure to wipe off any excessive liquid gasket leaking from part (A).

ii. Apply liquid gasket to camshaft bracket (No. 1) contact surface on the front cover backside.

Use Genuine RTV Silicone Sealant or equivalent. Refer to <u>GI-22, "Recommended Chemical Products and Sealants"</u>.

Apply liquid gasket to the outside of bolt hole on front cover.

iii. Locate camshaft bracket (No. 1) near installation position, and install it without disturbing the liquid gasket applied to the surfaces.









2.0 - 3.0 mm

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< REMOVAL AND INSTALLATION >

Intake side

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 Step 1 (bolts 9 - 11)
 : 2.0 N⋅m (0.2 kg-m, 17 in-lb)

 Step 2 (bolts 1 - 8)
 : 2.0 N⋅m (0.2 kg-m, 17 in-lb)

 Step 3 (bolts 1 - 11)
 : 5.9 N⋅m (0.6 kg-m, 52 in-lb)

 Step 4 (bolts 1 - 11)
 : 10.4 N⋅m (1.1 kg-m, 92 in-lb)

CAUTION:

After tightening bolts of camshaft brackets, be sure to wipe off excessive liquid gasket from the parts.

- 5. Install camshaft position sensor (PHASE).
- 6. Install camshaft sprockets.
 - Install them by aligning the mating marks on each camshaft sprocket with the paint marks on the timing chain link plates during removal.

CAUTION:

- Aligned mating marks could slip. Therefore, after matching them, hold the timing chain in place by hand.
- Before and after installing chain tensioner, make sure again that mating marks have not slipped.
 NOTE:

Before installation of chain tensioner, it is possible to re-match the marks on timing chain with the ones on each sprocket.

- Install chain tensioner.
 CAUTION: After installation, pull the stopper pin off completely, and make sure that chain tensioner plunger is released.
- 8. Install chain guide.
- Install O-rings to the camshaft sprocket (INT) insertion points on backside of intake valve timing control cover.
- 10. Install O-ring to front cover.
- 11. Apply liquid gasket using Tool to intake valve timing control cover as shown.

Use Genuine RTV Silicone Sealant or equivalent. Refer to GI-22, "Recommended Chemical Products and Sealants".



12. Tighten bolts in numerical order as shown.



- 13. Install intake valve timing control solenoid valve to intake valve timing control cover if removed.
- 14. Connect ground cables, and install harness clip.
- 15. Check and adjust valve clearance. Refer to EM-109, "Standard and Limit".

10 5 3 \bigcirc 6 4 8 A 6) 2 4 8 $\widehat{\mathbf{1}}$ 5 3 $\overline{7}$ 60 Exhaust side Engine front SBIA0255E

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< REMOVAL AND INSTALLATION >

16. Installation is in the reverse order of removal after this step.

NOTE:

If hydraulic pressure inside timing chain tensioner drops after removal and installation, slack in the guide may generate a pounding noise during and just after the engine start. However, this is normal. Noise will stop after hydraulic pressure rises.

INSPECTION AFTER INSTALLATION

Inspection of Camshaft Sprocket (INT) Oil Groove CAUTION:

- Perform this inspection only when DTC P0011 is detected in self-diagnostic results of CONSULT-III and it is directed according to inspection procedure of EC section. Refer to <u>EC-134</u>, <u>"Component Inspection"</u>.
- Check when the engine is cold so as to prevent burns from any splashing engine oil.
- 1. Check the engine oil level. Refer to LU-9, "Inspection".
- 2. Perform the following procedure so as to prevent the engine from being unintentionally started while checking.
- a. Release fuel pressure. Refer to EC-444, "Fuel Pressure Check".
- b. Disconnect ignition coil and injector harness connectors.
- c. Remove drive belt. Refer to EM-14, "Removal and Installation".
- 3. Remove intake valve timing control solenoid valve. Refer to EM-45, "Exploded View".
- Crank the engine, and then make sure that engine oil comes out from intake valve timing control cover oil hole. Stop cranking after checking.

WARNING:

Be careful not to touch rotating parts (drive belt, idler pulley, and crankshaft pulley, etc.).

CAUTION:

Engine oil may squirt from intake valve timing control solenoid valve installation hole during cranking. Use a shop cloth to protect the engine components and the vehicle. Do not allow engine oil to get on rubber components such as drive belt or engine mount insulators. Immediately wipe off any splashed engine oil.



- Clean oil groove between oil strainer and intake valve timing control solenoid valve if engine oil does not come out from intake valve timing control cover oil hole. Refer to <u>LU-7</u>, "Lubrication Circuit".
- 5. Remove components between intake valve timing control solenoid valve and camshaft sprocket (INT), and then check each oil groove for clogging.
 - Clean oil groove if necessary. Refer to <u>LU-7, "Lubrication Circuit"</u>.
- 6. Installation is in the reverse order of removal.

< REMOVAL AND INSTALLATION > OIL SEAL

Removal and Installation of Valve Oil Seal

REMOVAL

- 1. Remove fan shroud (lower). Refer to CO-17, "Exploded View".
- 2. Turn crankshaft until the cylinder requiring new oil seals is at TDC. This will prevent valve from dropping into cylinder.
- 3. Remove camshaft relating to valve oil seal to be removed. Refer to EM-54.
- 4. Remove valve lifters. Refer to EM-54.
- Remove valve collet, valve spring retainer and valve spring using Tool. CAUTION:
 - When working, be careful not to damage valve lifter holes.
 - Do not remove valve spring seat from valve spring.

Tool numbers : KV10116200 (J-26336-A) : KV10115900 (J-26336-20)

- Compress valve spring using Tool. Remove valve collet with magnetic hand.
- 6. Remove valve oil seal using Tool.

Tool numbers : KV10107902 (J-38959)



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INSTALLATION

- 1. Apply new engine oil to valve oil seal joint surface and seal lip.
- 2. Press in valve oil seal to the height (H) as shown using Tool.

Tool numbers : KV10115600 (J-38958)



3. Installation of the remaining components is in the reverse order of removal.

Removal and Installation of Front Oil Seal

REMOVAL

- 1. Remove engine under cover. Refer to EXT-15, "Removal and Installation".
- 2. Remove fan shroud (lower). Refer to CO-17, "Exploded View"
- 3. Remove cooling fan. Refer to CO-20. "Removal and Installation (Crankshaft driven type)".
- 4. Remove drive belt. Refer to EM-14, "Removal and Installation".

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- 5. Remove crankshaft pulley with the following procedure:
- a. Hold the crankshaft pulley with a suitable tool, then loosen the crankshaft pulley bolt, and pull the pulley out about 10 mm (0.39 in). Remove the crankshaft pulley bolt.



b. Attach a pulley puller in the M6 (0.24 in diameter) thread hole on crankshaft pulley, and remove crankshaft pulley.



 Remove front oil seal using a suitable tool.
 CAUTION: Be careful not to damage front cover and crankshaft.



INSTALLATION

- 1. Apply new engine oil to both oil seal lip and dust seal lip of new front oil seal.
- 2. Install front oil seal.
 - Install front oil seal so that each seal lip is oriented as shown.



OIL SEAL

< REMOVAL AND INSTALLATION >

- Press-fit front oil seal until it is flush with front end surface of front cover using suitable tool.
 CAUTION:
 - Be careful not to damage front cover and crankshaft.
 Press-fit straight and avoid causing burrs or tilting oil seal.



- 3. Tighten crankshaft pulley bolt.
 - Secure crankshaft pulley using suitable tool, and tighten crankshaft pulley bolt.
- a. Apply new engine oil to thread and seat surfaces of crankshaft pulley bolt.
- b. Tighten crankshaft pulley bolt.

: 42.1 N·m (4.3 kg-m, 31 ft-lb)

- c. Put a paint mark on crankshaft pulley, mating with any one of six easy to recognize angle marks on bolt flange.
- d. Turn another 60° degrees clockwise (angle tightening).
 Check the tightening angle with movement of one angle mark.



4. Installation is in the reverse order of removal after this step.

Removal and Installation of Rear Oil Seal

REMOVAL

- 1. Remove transmission assembly. Refer to <u>TM-20</u>, "Removal and Installation from Vehicle" (M/T models), <u>TM-300</u>, "Removal and Installation for QR25DE" (A/T models).
- 2. Remove clutch cover and clutch disk (M/T models). Refer to CL-20, "5M/T : Removal and Installation".
- Remove drive plate (A/T models) or flywheel (M/T models) with power tool. Refer to <u>EM-81</u>, "<u>Exploded</u> <u>View</u>".
- Remove rear oil seal with a suitable tool.
 CAUTION: Be careful not to damage crankshaft and cylinder block.

INSTALLATION

- 1. Apply new engine oil to new rear oil seal joint surface and seal lip.
- 2. Install rear oil seal so that each seal lip is oriented as shown.



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- Install new rear oil seal using suitable tool. [outside diameter 102 mm (4.02 in), inside diameter 86 mm (3.39 in)].
 CAUTION:
 - Be careful not to damage crankshaft and cylinder block.
 - Press-fit oil seal straight to avoid causing burrs or tilting.
 - Do not touch grease applied onto oil seal lip.



• Press in rear oil seal to the position as shown.



3. Installation of the remaining components is in the reverse order of removal.

CAUTION:

- When replacing an engine or transmission you must make sure the dowels are installed correctly during reassembly.
- Improper alignment caused by missing dowels may cause vibration, oil leaks or breakage of drivetrain components.

CYLINDER HEAD

Exploded View



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	WBIA0835E	G
	1. Cylinder head assembly 2. Cylinder head gasket 3. Cylinder head bolt A. Refer to EM-67, "Removal and Installation" 3. Cylinder head bolt	Н
Re	emoval and Installation	
RE		
∩∟ 1	Release fuel pressure Refer to EC-444 "Fuel Pressure Check"	
2.	Drain engine coolant. Refer to <u>CO-13, "Changing Engine Coolant"</u> .	J
	CAUTION: Perform this step when the engine is cold.	
	 Do not spill engine coolant on drive belt. 	Κ
3.	Drain engine oil. Refer to <u>LU-10, "Changing Engine Oil"</u> .	
	 Perform this step when the engine is cold. Do not spill engine oil on drive belt. 	L
4.	Remove intake manifold. Refer to <u>EM-27</u> .	
5.	Remove fuel injector and fuel tube assembly. Refer to <u>EM-39</u> .	\mathbb{N}
6.	Remove exhaust manifold and three way catalyst assembly. Refer to <u>EM-31</u> .	
7.	Remove water outlet. Refer to <u>CO-29, "Removal and Installation"</u> .	
8.	Remove heater outlet. Refer to <u>CO-29, "Exploded View"</u> . NOTE:	Ν
	Can be removed and installed even when assembled with cylinder head.	
9.	Remove front cover and timing chain. Refer to <u>EM-46</u> .	0
10.	Remove camshafts. Refer to EM-54.	
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< REMOVAL AND INSTALLATION >

- 11. Loosen cylinder head bolts in reverse order as shown using power tool.
- 12. Remove cylinder head.
- 13. Remove cylinder head gasket.



[QR25DE]

INSPECTION AFTER REMOVAL

Cylinder Head Bolts Outer Diameter

• Cylinder head bolts are tightened by plastic zone tightening method. Whenever the size difference between (d1) and (d2) exceeds the limit, replace them with a new one.

Limit [(d1) (d2)]: 0.23 mm (0.0091 in)

• If reduction of outer diameter appears in a position other than (d2), use it as (d2) point.



Cylinder Head Distortion

NOTE:

When performing this inspection, cylinder block distortion should also be checked. Refer to <u>EM-91, "Inspection</u> <u>After Disassembly"</u>.

1. Using suitable tool, wipe off oil, scale, gasket, sealant and carbon deposits from surface of cylinder head. CAUTION:

Do not allow gasket fragments to enter engine oil or engine coolant passages.

2. At each of several locations on bottom surface of cylinder head, measure the distortion in six directions.

Limit : 0.1 mm (0.004 in)

• If it exceeds the limit, replace cylinder head.



INSTALLATION

- 1. Install new cylinder head gasket.
- Install cylinder head following the steps below to tighten cylinder head bolts in numerical order as shown.
 CAUTION:

If cylinder head bolts re-used, check their outer diameters before installation. Follow the "Cylinder Head Bolts Outer Diameter" procedure. NOTE:

Apply new engine oil to threads and seating surfaces of mounting bolts.



Tool number : KV10112100 (BT-8653-A)

Step a	: 98.1N·m (10.0 kg-m, 73 ft-lb)
Step b	: Loosen to 0 N·m in the reverse order of tightening.
Step c	: 39.2 N·m (4.0 kg-m, 29 ft-lb)
Step d	: 75° clockwise
Step e	: 75° clockwise



3. Installation of the remaining parts is in reverse order of removal.

INSPECTION AFTER INSTALLATION

- 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-16</u>, "FOR USA AND CANADA : 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. **NOTE:**

If hydraulic pressure inside timing chain tensioner drops after removal and installation, slack in the guide may generate a pounding noise during and just after engine start. However, this is normal. Noise will stop after hydraulic pressure rises.

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

	Item	Before starting engine	Engine running	After engine stopped	K
Engine coolant		Level	Leakage	Level	-
Engine oil		Level	Leakage	Level	L
Transmission/ transaxle fluid	A/T and CVT Models	Leakage	Level/Leakage	Leakage	-
	M/T Models	Level/Leakage	Leakage	Level/Leakage	-
Other oils and fluid	S*	Level	Leakage	Level	M
Fuel		Leakage	Leakage	Leakage	-
Exhaust gas		_	Leakage	_	N

*Power steering fluid, brake fluid, etc.

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< REMOVAL AND INSTALLATION >

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- Valve collet 1
- 4. Valve oil seal
- Valve seat 7
- 10. Spark plug tube

Disassembly and Assembly

DISASSEMBLY

- 1. Remove spark plug.
- 2. Remove valve lifter.
 - · Identify installation positions, and store them without mixing them up.

2.

5.

8.

Valve spring retainer

Valve guide

Valve (INT)

11. Spark plug

3. Remove valve collet, valve spring retainer and valve spring using Tool.

Tool numbers : KV10116200 (J-26336-A)

: KV10115900 (J-26336-20)

CAUTION:

- · When working, be careful not to damage valve lifter holes.
- Do not remove valve spring seat from valve spring.



Valve spring (with valve spring seat)

3.

6.

9.

Cylinder head

Valve (EXH)

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

INFOID:000000006252583

< REMOVAL AND INSTALLATION >

5. Remove valve oil seal using Tool.

Tool numbers : KV10115600 (J-38958)



- When valve seat must be replaced, refer to EM-72, "Inspection After Disassembly".
- 7. When valve guide must be replaced, refer to EM-72, "Inspection After Disassembly".
- 8. Remove spark plug tube, if necessary.
 - Remove it from cylinder head using suitable tool. CAUTION:
 - · Be careful not to damage cylinder head.
 - F Once removed, spark plug tube will be deformed and cannot be reused. Do not remove it unless absolutely necessary.

ASSEMBLY

- 1. Install valve guide if removed. Refer to EM-72, "Inspection After Disassembly".
- Install valve seat if removed. Refer to <u>EM-72, "Inspection After Disassembly"</u>.
- 3. Install valve oil seal using Tool.

Tool numbers : KV10115600 (J-38958)

NOTE:

Install with the valve oil seal to match dimension as shown.

Height (H) : 11.8 - 12.4 mm (0.465 - 0.488 in)



Install valve. NOTE:

Install larger diameter to intake side.

- 5. Install valve spring (with valve spring seat). NOTE:
 - Install smaller pitch (valve spring seat side) to cylinder head side.
 - Confirm identification color of valve spring.

Intake : Blue Exhaust : Yellow



- 6. Install valve spring retainer.
- Install valve collet using Tool. 7.

Tool numbers : KV10116200 (J-26336-A) : KV10115900 (J-26336-20)

Revision: August 2010

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< REMOVAL AND INSTALLATION >

- Install valve collet with a magnet hand.
 CAUTION:
 When working the comful patts down
- When working, be careful not to damage valve lifter holes.
 Tap valve stem edge lightly with a plastic hammer after installation to check its installed condition.



- 8. Install valve lifter.
 - Install it in the original position.
- 9. Install spark plug tube if removed.Press-fit it into cylinder head as follows:
- a. Remove old sealant from cylinder head side installation hole.
- b. Apply sealant within approximately 12 mm (0.47 in) from edge of spark plug tube press-fit side.
 Use Genuine High Strength Locking Sealant or equivalent.
 Refer to <u>GI-22, "Recommended Chemical Products and Sealants"</u>.
- c. Press-fit spark plug tube so that its height (H) is as specified using suitable tool.



Standard press-fit : 41.2 - 42.2 mm (1.622 - 1.661 in) height (H)

CAUTION:

- When press-fitting, be careful not to deform spark plug tube.
- After press-fitting, wipe off any protruding sealant on top surface of cylinder head.
- 10. Install spark plug.

Inspection After Disassembly

VALVE DIMENSIONS

- Check dimensions of each valve. For dimensions, refer to <u>EM-109</u>, <u>"Standard and Limit"</u>.
- If dimensions are out of the standard, replace valve and check the valve seat contact.



VALVE GUIDE CLEARANCE

Valve Stem Diameter

INFOID:000000006252584
CYLINDER HEAD

< REMOVAL AND INSTALLATION >

Measure the diameter of valve stem with micrometer.

Standard

Intake	: 5.965 - 5.980 mm (0.2348 - 0.2354 in)
Exhaust	: 5.955 - 5.970 mm (0.2344 - 0.2350 in)



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Valve Guide Inner Diameter

Measure the inner diameter of valve guide with inside micrometer.

Standard

Intake and Exhaust : 6.000 - 6.018 mm (0.2362 - 0.2369 in)

Valve Guide Clearance

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

Valve guide	clearance:
Standard	
Intake	: 0.020 - 0.053 mm (0.0008 - 0.0021 in)
Exhaust	: 0.030 - 0.063 mm (0.0012 - 0.0025 in)
Limit	
Intake	: 0.08 mm (0.003 in)
Exhaust	: 0.09 mm (0.004 in)

• If it exceeds the limit, replace valve guide and/or valve.

VALVE GUIDE REPLACEMENT

When valve guide is removed, replace with oversized [0.2 mm (0.008 in)] valve guide.

1. To remove valve guide, heat cylinder head to 110° to 130°C (230° to 266°F) by soaking in heated oil.



2. Drive out valve guide with a press [under a 20 kN (2 ton, 2.2 US ton, 2.0 Imp ton) force] or suitable tool. WARNING:

Cylinder head contains heat, when working, wear protective equipment to avoid getting burned.



CYLINDER HEAD

< REMOVAL AND INSTALLATION >

3. Ream cylinder head valve guide hole using suitable tool.

Valve guide hole diameter (for service parts): Intake and exhaust : 10.175 - 10.196 mm (0.4006 - 0.4014 in)

Heat cylinder head to 110° to 130°C (230° to 266°F) by soaking 4. in heated oil.

Press valve guide from camshaft side to the dimensions as 5. shown using suitable tool.

Projection (H)

Intake	: 10.1 - 10.3 mm (0.398 - 0.406 in)
Exhaust	: 10.0 - 10.4 mm (0.394 - 0.409 in)

WARNING:

Cylinder head contains heat, when working, wear protective equipment to avoid getting burned.

6. Apply reamer finish to valve guide using suitable tool.

Standard Intake and exhaust: 6.000 - 6.018 mm (0.2362 - 0.2369 in)









VALVE SEAT CONTACT



[QR25DE]

CYLINDER HEAD

< REMOVAL AND INSTALLATION >

- After confirming that the dimensions of valve guides and valves are within 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.
- Check if the contact area band is continuous all around the circumference.
- If not, grind to adjust valve fitting and check again. If the contacting surface still has NG conditions even after the re-check, replace valve seat.



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VALVE SEAT REPLACEMENT

When valve seat is removed, replace with oversized [0.5 mm (0.020 in)] valve seat.

 Bore out old seat until it collapses. Boring should not continue beyond the bottom face of the seat recess in cylinder head. Set the machine depth stop to ensure this. Refer to <u>EM-109</u>, "<u>Standard and Limit</u>". CAUTION:

Prevent scratching cylinder head by excessive boring.

2. Ream cylinder head recess diameter for service valve seat.

Oversize [0.5 mm (0.020 in)] Intake : 37.000 - 37.016 mm (1.4567 - 1.4573 in) Exhaust : 32.000 - 32.016 mm (1.2598 - 1.2605 in)

• Be sure to ream in circles concentric to the valve guide center. This will enable valve seat to fit correctly.





 Heat cylinder head to 110° to 130°C (230° to 266°F) by soaking in heated oil.

Provide valve seats cooled well with dry ice. Force fit valve seats into cylinder head.
 WARNING:

- Cylinder head contains heat. When working, wear protective equipment to avoid getting burned. $$_{\rm N}$$ CAUTION:

- Avoid directly touching cold valve seats.
- Finish seat to the specified dimensions using suitable tool. Refer to <u>EM-109</u>, "<u>Standard and Limit</u>". CAUTION:

When using valve seat cutter, firmly grip cutter handle with both hands. Then, press on the contacting surface all around the circumference to cut in a single drive. Improper pressure on the cutter or cutting many different times may result in staged valve seat.



< REMOVAL AND INSTALLATION >

- 6. Using compound, grind to adjust valve fitting.
- 7. Check again for normal contact.

VALVE SPRING SQUARENESS

 Set a try square along the side of valve spring and rotate spring. Measure the maximum clearance between the top face of spring and try square.
 CAUTION:

Do not remove valve spring seat from valve spring.

Limit	
Intake	: 1.8 mm (0.071 in)
Exhaust	: 1.9 mm (0.075 in)

• If it exceeds the limit, replace valve spring.

VALVE SPRING DIMENSIONS AND VALVE SPRING PRESSURE LOAD

 Check valve spring pressure with valve spring seat installed at the specified spring height. Refer to <u>EM-109</u>, "Standard and Limit". CAUTION:

Do not remove valve spring seat from valve spring.

• If the installation load or load with valve open is out of the standard, replace valve spring.





Exploded View

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- RH engine mounting bracket (upper)
 LH engine mounting bracket (upper)
- RH engine mounting insulator
 LH engine mounting insulator
- 3. RH engine mounting bracket (lower)
- 6. LH engine mounting bracket (lower)

INFOID:000000006252586

7. Rear engine mounting insulator

Removal and Installation

WARNING:

- Situate vehicle on a flat and solid surface.
- Place chocks at front and back of rear wheels.
- For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.

CAUTION:

- Always be careful to work safely, avoid forceful or uninstructed operations.
- Do not start working until exhaust system and engine coolant are cooled sufficiently.
- If items or work required are not covered by the engine section, follow the procedures in the applicable procedures.
- Always use the support point specified for lifting.
- Use either 2-pole lift type or separate type lift. If board-on type is used for unavoidable reasons, support at the rear axle jacking point with transmission jack or similar tool before starting work, in preparation for the backward shift of center of gravity.
- For supporting points for lifting and jacking point at rear axle, refer to <u>GI-38</u>, <u>"Garage Jack and Safety Stand"</u>.

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ENGINE ASSEMBLY

< UNIT REMOVAL AND INSTALLATION >

REMOVAL

- 1. Remove engine under cover. Refer to EXT-15. "Removal and Installation".
- Drain engine coolant. Refer to <u>CO-13, "Changing Engine Coolant"</u>. NOTE:
 - Cap or plug opening(s) to prevent fluid from spilling.
- Partially drain A/T fluid (A/T models). Refer to <u>TM-265, "Changing the A/T Fluid (ATF)"</u>. NOTE:
 - Cap or plug opening(s) to prevent fluid from spilling.
- Release fuel pressure. Refer to <u>EC-444, "Fuel Pressure Check"</u>.
- 5. Disconnect battery negative terminal. Refer to PG-79. "Removal and Installation".
- 6. Remove the engine hood. Refer to DLK-127. "Removal and Installation of Hood Assembly".
- 7. Remove the air duct and resonator assembly and air cleaner case. Refer to <u>EM-25, "Removal and Instal-</u><u>lation"</u>.
- 8. Disconnect vacuum hose between vehicle and engine and set it aside.
- 9. Remove the radiator assembly and hoses. Refer to CO-17, "Removal and Installation".
- 10. Remove the drive belt. Refer to EM-14, "Removal and Installation".
- 11. Remove the engine cooling fan. Refer to CO-20, "Removal and Installation (Crankshaft driven type)".
- 12. Disconnect the engine room harness from the engine side and set it aside for easier work.
- 13. Disconnect the engine harness grounds.
- 14. Disconnect the reservoir tank for power steering from engine compartment without disconnecting the hoses and move it aside for easier work.
- 15. Disconnect power steering oil pump from engine and position out of the way for easier work. Refer to <u>ST-</u> <u>18. "Removal and Installation"</u>.
- 16. Remove the A/C compressor bolts and set aside. Refer to <u>HA-28, "Removal and Installation for Compressor"</u>.
- 17. Disconnect brake booster vacuum line.
- 18. Disconnect EVAP line.
- 19. Disconnect the fuel hose at the engine side connection. Refer to EM-39, "Removal and Installation".
- 20. Disconnect the heater hoses at cowl, and install plugs to avoid leakage of engine coolant. **NOTE:**

Cap or plug opening(s) to prevent fluid from spilling.

- 21. Remove the A/T oil level indicator and indicator tube (A/T models).
- 22. Remove front exhaust pipe. Refer to EM-31, "Removal and Installation".
- 23. Install front and rear engine slingers.

Engine slinger torque

Front engine slinger: 48.1 N·m (4.9 kg-m, 35 ft-lb)Rear engine slinger: 22.0 N·m (2.2 kg-m, 16 ft-lb)

24. Remove transmission. Refer to <u>TM-20</u>, "Removal and Installation from Vehicle" (M/T models), <u>TM-300</u>, "Removal and Installation for QR25DE" (A/T models).



26. Remove engine assembly from vehicle, avoiding interference with vehicle body. CAUTION:

• Before and during this lifting, always check if any harnesses are left connected.

27. Remove the parts that may restrict installation of engine to engine stand. **NOTE:**

The procedure is described assuming that you use a engine holding the surface, to which transmission is installed.

- a. Remove drive plate (A/T models) or flywheel (M/T models).
 - Holding crankshaft pulley bolts, lock crankshaft to remove flywheel or drive plate bolts.



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22.0 (2.2, 16)

48.1 (4.9, 35)

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ENGINE ASSEMBLY

< UNIT REMOVAL AND INSTALLATION >

teeth (circumference position).

face facing other than downward.

Keep magnetic materials away from signal plate.

Loosen bolts diagonally.

CAUTION:



CAUTION:

Use an engine stand that has a load capacity [approximately 240kg (529 lb) or more] large enough for supporting the engine weight.

- If the load capacity of the stand is not adequate, remove the following parts beforehand to reduce the potential risk of overturning the stand.
- Remove fuel tube and fuel injector assembly. Refer to EM-39, "Removal and Installation".
- Remove intake manifold. Refer to EM-27, "Removal and Installation".
- Remove rocker cover. Refer to EM-37, "Removal and Installation".
- Other removable brackets.

CAUTION:

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

- Remove generator. Refer to CHG-21, "Removal and Installation QR25DE Models".
- 29. Remove engine mounting insulator bracket (upper) with power tool.

INSTALLATION

Installation is in the reverse order of removal.

CAUTION:

- When replacing an engine or transmission you must make sure the dowels are installed correctly during reassembly.
- Improper alignment caused by missing dowels may cause vibration, oil leaks or breakage of drivetrain components.
- Do not allow engine oil to get on engine mounting insulator. Be careful not to damage engine mounting insulator.
- When installation directions are specified, install parts according to the direction marks on them referring to L the figure of components.
- Make sure that each mounting insulator is seated properly, and tighten nuts and bolts.

INSPECTION AFTER INSTALLATION

- · 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-16, "FOR USA AND CANADA : 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. NOTE:

If hydraulic pressure inside timing chain tensioner drops after removal and installation, slack in the guide may generate a pounding noise during and just after engine start. However, this is normal. Noise will stop P after hydraulic pressure rises.

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

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ENGINE ASSEMBLY

< UNIT REMOVAL AND INSTALLATION >

Item		Before starting engine	Engine running	After engine stopped
Engine coolant		Level	Leakage	Level
Engine oil		Level	Leakage	Level
Transmission/	A/T and CVT Models	Leakage	Level/Leakage	Leakage
transaxle fluid	M/T Models	Level/Leakage	Leakage	Level/Leakage
Other oils and fluids*		Level	Leakage	Level
Fuel		Leakage	Leakage	Leakage
Exhaust gas		—	Leakage	_

*Power steering fluid, brake fluid, etc.

Revision: August 2010



UNIT DISASSEMBLY AND ASSEMBLY ENGINE UNIT

Exploded View





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< UNIT DISASSEMBLY AND ASSEMBLY >

- 1. Cylinder block
 - 4. Knock sensor
 - Oil level gauge 7
 - 10. Lower cylinder block
 - 13. Connecting rod
 - 16. Connecting rod bolt
 - 19. Second ring
 - 22. Thrust bearing
 - 25. Crankshaft key
 - 28. Pilot convertor (A/T models)
 - 31. Signal plate (type 2)
 - 34. Flywheel (M/T models)
 - C. Refer to EM-82, "Disassembly and Assembly"

- 2. O-ring
- 5. Oil pressure switch
- 8. Oil level gauge guide
- Lower cylinder block mounting bolt 11.
- Connecting rod bearing 14.
- 17. Piston
- 20. Top ring
- 23. Main bearing upper
- 26. Main bearing lower
- 29. Pilot bushing (M/T models)
- Reinforcement plate (A/T models) 32.
- Refer to EM-82, "Disassembly and A. Assembly"
- D. Refer to EM-82, "Disassembly and Assembly"
 - Block Heater Canada Only

- 3. Crankshaft position sensor (POS)
- 6. Water drain plug
- 9. O-ring
- 12. Snap ring
- Connecting rod bearing cap 15.
- 18. Oil ring

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- 21. Piston pin
- 24. Crankshaft
- 27. Rear oil seal
- Signal plate (type 1) 30.
- 33. Drive plate (A/T models)
 - Refer to EM-82, "Disassembly and Assembly"



- 1. Cylinder block
 - Connector protector cap

Disassembly and Assembly

INFOID:000000006252588

DISASSEMBLY

NOTE:

4.

Explained here is how to disassemble with engine stand supporting transmission surface. When using different type of engine stand, some steps may be different.

- 1 Remove the engine and the transmission assembly from the vehicle, and separate the transmission assembly from the engine. Refer to EM-77.
- Remove clutch cover and clutch disc (M/T models). Refer to CL-20, "5M/T : Removal and Installation". 2.

EM-82

< UNIT DISASSEMBLY AND ASSEMBLY >

- 3. Remove flywheel (M/T models) or drive plate (A/T models) with suitable tool.
 - · Secure crankshaft with a stopper plate, and remove bolts.
 - Loosen bolts using suitable tool.

Flywheel (M/T models)

: size T55 (commercial service tool)

Drive plate (A/T models)

: size E20

CAUTION:

Be careful not to damage or scratch drive plate (A/T models) and contact surface for clutch disc of flywheel (M/T models). NOTE:

The flywheel, two block construction, allows movement in response to transmission side pressure, or when twisted in its rotational direction. Therefore, some amount of noise is normal.

Lift engine, and mount to engine stand. 4.

CAUTION:

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

A widely used engine stand can be used.

CAUTION:

Use engine stand that has a load capacity [approximately 240kg (529 lb) or more] large enough for supporting the engine weight.



- Drain engine oil. Refer to <u>LU-10, "Changing Engine Oil".</u>
- 6. Drain engine coolant by removing water drain plug from side of the engine.



- 7. Remove cylinder head. Refer to EM-67. "Removal and Installation".
- 8. Remove knock sensor. CAUTION: Carefully handle knock sensor avoiding shocks.



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< UNIT DISASSEMBLY AND ASSEMBLY >

- 9. Remove crankshaft position sensor (POS). CAUTION:
 - Avoid impacts such as a dropping.
 - Do not disassemble.
 - Keep it away from metal particles.
 - Do not place the sensor in a location where it is exposed to magnetism.



[QR25DE]

10. Remove oil pressure switch using a suitable tool. CAUTION:

Do not drop or shock oil pressure switch.

11. Remove pilot converter (A/T models) or pilot bushing (M/T models) using Tool.

Tool number : ST16610001 (J-23907)



- 12. Remove piston and connecting rod assembly as follows:
 - Before removing piston and connecting rod assembly, check the connecting rod side clearance. Refer to <u>EM-91. "Inspection After Disassembly"</u>.

CAUTION:

Be careful no to drop connecting rod bearing, and to scratch the surface.

- 13. Position crankshaft pin corresponding to connecting rod to be removed onto the bottom dead center.
- 14. Remove connecting rod bearing cap.
- 15. Push piston and connecting rod assembly out to the cylinder head side using suitable tool.

CAUTION:

Be careful not to damage the cylinder wall and crankshaft pin, resulting from an interference of the connecting rod big end.



16. Remove connecting rod bearings from connecting rod and connecting rod bearing cap. **CAUTION:**

Identify installation position, and store them without mixing them up.

- 17. Remove piston rings from piston.
 - Before removing piston rings, check the piston ring side clearance. Refer to <u>EM-91, "Inspection After</u> <u>Disassembly"</u>.

< UNIT DISASSEMBLY AND ASSEMBLY >

- Remove piston rings using piston ring expander or suitable tool.
 CAUTION:
 - When removing piston rings, be careful not to damage piston.
 - Be careful not to damage piston rings by expanding them excessively.



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- 18. Remove piston from connecting rod as follows:
- a. Remove snap rings using snap ring pliers.







c. Push out piston pin with stick of outer diameter approximately 19 mm (0.75 in).



19. Remove lower cylinder block bolts.

< UNIT DISASSEMBLY AND ASSEMBLY >

- Before loosening lower cylinder block bolts, measure crankshaft end play. Refer to <u>EM-91, "Inspection</u> <u>After Disassembly"</u>.
- Loosen lower cylinder block bolts in reverse order as shown in several different steps.

NOTE:

Use TORX socket (size E14) for bolts No. 1 to 10.



- 20. Remove lower cylinder block.
 - Use Tool to cut liquid gasket for removal.

Tool number : KV10111100 (J-37228)

CAUTION:

Be careful not to damage the mounting surfaces.

21. Remove crankshaft.

CAUTION:

- Be careful not damage or deform signal plate mounted on crankshaft.
- When setting crankshaft on a flat floor surface, use a block of wood to avoid interference between signal plate and the floor surface.
- Do not remove signal plate unless it is necessary to do so.

NOTE:

When removing or installing signal plate, use TORX socket (size T30).

22. Pull rear oil seal out from rear end of crankshaft.

NOTE:

When replacing rear oil seal without removing lower cylinder block, use a suitable tool to remove the oil seal installed between crankshaft and cylinder block out.

Be careful not to damage crankshaft and cylinder block.

- 23. Remove main bearings and thrust bearings from cylinder block and lower cylinder block. CAUTION:
 - Do not drop main bearing, or scratch the surface.
 - Identify installation positions, and store them without mixing them up.

ASSEMBLY

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

WARNING:

Use approved safety glasses to protect your eyes.



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< UNIT DISASSEMBLY AND ASSEMBLY >

- 2. Apply Silicone RTV Sealant to the drain plugs. Install the drain plugs on the cylinder block.
 - Use Genuine Silicone RTV Sealant, or equivalent. Refer to <u>GI-</u> <u>22, "Recommended Chemical Products and Sealants"</u>.
 - Replace the copper washers with new ones.

- 3. Install main bearings and thrust bearings as follows:
- a. Remove dust, dirt, and engine oil from the bearing mating surfaces of the cylinder block and lower cylinder block.
- b. Install the thrust bearings to both sides of the No. 3 main bearing journal on the cylinder block.
 - Install the thrust bearings with the oil groove facing the crankshaft arm (outside).
- c. Install the main bearings paying attention to their position and direction.
 - The main bearing with an oil hole and groove goes on the cylinder block. The one without them goes on the lower cylinder block.
 - Only the main bearing (on the cylinder block) for No. 3 journal has different specifications.
 - Before installing the bearings, apply engine oil to the bearing friction surface (inside). Do not apply oil to the back surface, but thoroughly clean it.
 - When installing, align the bearing stopper to the notch.
 - Make sure that the oil holes on the cylinder block and those on the corresponding bearing are aligned.
- 4. Install the signal plate to the crankshaft.
- a. Position the crankshaft and signal plate using a positioning dowel pin, and tighten the signal plate bolts to specification.

Signal plate bolts

Type 1	: 18.5 N·m (1.9 kg-m, 14 ft-lb)
Type 2	: 22.0 N·m (2.2 kg-m, 16 ft-lb)

b. Remove the dowel pin.

CAUTION:

Be sure to remove dowel pin before installing the crankshaft. NOTE:

Dowel pins for the crankshaft and signal plate are supplied as a set for each.

EM-87

5. Install crankshaft to the cylinder block.

• While turning the crankshaft by hand, check that it turns smoothly. CAUTION:

Do not install rear oil seal at this time.





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< UNIT DISASSEMBLY AND ASSEMBLY >

6. Apply a continuous bead of liquid gasket using Tool to positions shown and install the lower cylinder block.

Tool number : WS39930000 (-)

• Use Genuine RTV Silicone Sealant, or equivalent. Refer to <u>GI-22</u>, "Recommended Chemical Products and Sealants". CAUTION:

After liquid gasket is applied, the lower cylinder block installation must be finished within 5 minutes. NOTE:

Cylinder block and lower cylinder block are machined together. Neither of them can be replaced separately.

7. Tighten lower cylinder block bolts in three steps in the order as shown using Tool.

NOTE:

• Apply new engine oil to threads and seat surfaces of the bolts.

Tool number : KV10112100 (BT-8653-A)

CAUTION:

There are more processes to complete the tightening of lower cylinder bolts. However stop procedure after step 1 and install rear oil seal.

Lower cylinder block bolts

 Step 1 (bolts 11 - 22)
 : 25.1 N·m (2.6 kg-m, 19 ft-lb)

 Step 2 (bolts 1 - 10)
 : 39.2 N·m (4.0 kg-m, 29 ft-lb)

 Step 3 (bolts 1 - 10)
 : 60° - 65° (target: 60°)

Apply new engine oil to new rear oil seal and install it using a suitable tool.

CAUTION:

- Do not touch grease applied onto oil seal lip.
- Be careful not to damage crankshaft and/or cylinder block.
- Press fit oil seal straight to avoid causing burrs or tilting.



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• Install new oil seal in the direction shown.

< UNIT DISASSEMBLY AND ASSEMBLY >

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CAUTION:

Check tightening angle using Tool. Do not tighten by visual inspection.

Tool number : KV10112100 (BT-8653-A)

- Wipe off completely any protruding Silicone RTV Sealant on the exterior of engine.
- Check crankshaft side clearance. Refer to EM-109, "Standard and Limit".
- After installing the bolts, make sure that the crankshaft can be rotated smoothly by hand.

Install the piston to the connecting rod. Assemble the components in their original positions.

- a. Using a snap ring pliers, install the snap ring into the grooves of the piston's rear side.
 - · Insert the piston pin snap ring fully into groove.
- Install the piston to the connecting rod. b.
 - Using a heat gun, heat the piston [approximately 60° 70° C (140° 158° F)] until the piston pin can be pushed in by hand without excessive force. From the front to the rear, insert the piston pin into the piston and the connecting rod.
 - Assemble so that the front mark on the piston crown and the oil holes and the cylinder No. on the connecting rod are positioned as shown.
- C. Install the piston pin snap ring into the front of the piston.
 - · Check that the connecting rod moves smoothly.



- 9. Using a piston ring expander, install the piston rings. Assemble the components in their original positions. CAUTION:
 - · When installing piston rings, 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, referencing the piston front mark as the starting point.
 - · Install the top ring and the second ring with the stamped surface facing upward.

Stamped mark : 2ND (second ring)





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< UNIT DISASSEMBLY AND ASSEMBLY >

- 10. Install the connecting rod bearings to the connecting rod and the connecting rod cap. Assemble the components in their original positions.
 - When installing the connecting rod bearings, apply engine oil to the bearing friction surface (inside). Do not apply oil to the back surface, but thoroughly clean the back.
 - When installing, align the connecting rod bearing stopper protrusion with the notch of the connecting rod to install.
 - Check the oil holes on the connecting rod and those on the corresponding bearing are aligned.
- 11. Install the piston and connecting rod assembly to the crankshaft. Assemble the components in their original positions.
 - Rotate the crankshaft so the pin corresponding to the connecting rod to be installed is at the bottom dead center position.
 - Apply engine oil sufficiently to the cylinder bore, piston, and crankshaft pin.
 - Match the cylinder position number with the cylinder No. on the connecting rod for installation.
 - Install the piston with the front mark on the piston crown facing the front of the engine using Tool.

Tool number : EM03470000 (J-8037)

CAUTION:

lows:

bolts.

Step 1

Step 2

Step 3 Step 4

Tool number

Be careful not to damage the cylinder wall and crankshaft pin, resulting from an interference of the connecting rod big end.

12. Install the connecting rod bearing caps. Assemble the components in their original positions.

13. Tighten the connecting rod bolts using Tool in four steps as fol-

Apply engine oil to the threads and seats of the connecting rod

Always use either an angle wrench or protractor. Avoid

: 27.4 N·m (2.8 kg-m, 20 ft-lb)

: 19.6 N·m (2.0 kg-m, 14 ft-lb)

: 90° - 95° (target 90° degrees)

: 0 N·m (0 kg-m, 0 ft-lb)

tightening based on visual check alone.

: KV10112100 (BT-8653-A)

Check the connecting rod side clearance. Refer to EM-91, "Inspection After Disassembly".

• Match the stamped cylinder number marks on the connecting rod with those on the cap to install.



Big-end diameter grade

Oil splash

Small-end diameter grade

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Revision: August 2010

< UNIT DISASSEMBLY AND ASSEMBLY >

- 14. Install flywheel (M/T Models), or drive plate (A/T Models).
 - Install drive plate, reinforcement plate and pilot converter as shown.
 - Using a drift with 33 mm (1.30 in) diameter, push pilot converter into the end of the crankshaft.
 - · Press fit pilot bushing into the crankshaft as shown; using a suitable drift of 19 mm (0.75 in)



15. Install the cylinder block heater.

Cylinder block heater : 73.5 N·m (7.5 kg-m, 54 ft-lb)

- 16. Install the knock sensor.
 - · Make sure that there is no foreign material on the cylinder block mating surface and the back surface of the knock sensor.
 - Install the knock sensor with the connector facing lower left by 45° as shown.
 - Do not tighten the knock sensor bolt while holding the connector.
 - Make sure that the knock sensor does not interfere with other components.

Knock sensor bolt : 21.1 N·m (2.2 kg-m, 16 ft-lb)

CAUTION:

If the knock sensor is dropped, replace it with new one.

17. Install the crankshaft position sensor (POS).

Crankshaft position : 7.0 N·m (0.71 kg-m, 62 in-lb) sensor bolt

18. Installation of remaining components is in reverse order of removal.

Inspection After Disassembly

CRANKSHAFT END PLAY

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

Standard : 0.10 - 0.26 mm (0.0039 - 0.0102 in) Limit : 0.30 mm (0.0118 in)

 If the measured value exceeds the limit, replace thrust bearings, and measure again. If it still exceeds the limit, replace crankshaft also.

CONNECTING ROD SIDE CLEARANCE





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Revision: August 2010

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- < UNIT DISASSEMBLY AND ASSEMBLY >
- Measure the side clearance between connecting rod and crankshaft arm with a feeler gauge.

Standard : 0.20 - 0.35 mm (0.0079 - 0.138 in) Limit : 0.50 mm (0.0197 in)

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

PISTON TO PISTON PIN OIL CLEARANCE

Piston Pin Hole Diameter

Measure the inner diameter of piston pin hole with an inside micrometer.

Standard: 19.993 - 20.005 mm (0.7871 - 0.7876 in)



Piston Pin Outer Diameter Measure the outer diameter of piston pin with a micrometer.

Standard: 19.989 - 20.001 mm (0.7870 - 0.7874 in)

Piston to Piston Pin Oil Clearance (Piston to piston pin oil clearance) = (Piston pin hole diameter) – (Piston pin outer diameter)

Standard: 0.002 - 0.006 mm (0.0001 - 0.0002 in)

- If oil clearance is out of the standard, replace piston and piston pin assembly.
- When replacing piston and piston pin assembly, refer to <u>EM-109</u>, "<u>Standard and Limit</u>". **NOTE**:
 - Piston is available together with piston pin as assembly.
 - Piston pin (piston pin hole) grade is provided only for the parts installed at the plant. For service parts, no grades can be selected. (Only grade "0" is available.)

PISTON RING SIDE CLEARANCE



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< UNIT DISASSEMBLY AND ASSEMBLY >

• Measure the side clearance of piston ring and piston ring groove with a feeler gauge.

Standard:

Top ring	: 0.045 - 0.080 mm (0.0018 - 0.0031 in)
2nd ring	: 0.030 - 0.070 mm (0.0012 - 0.0028 in)
Oil ring	: 0.065 - 0.135 mm (0.0026 - 0.0053 in)

Limit:

Top ring: 0.11 mm (0.0043 in)2nd ring: 0.10 mm (0.0039 in)



• If the measured value exceeds the limit, replace piston ring, and measure again. If it still exceeds the limit, replace piston also.

PISTON RING END GAP

- Make sure that cylinder bore inner diameter is within the specification. Refer to <u>EM-109</u>, "Standard and Limit".
- Lubricate with new engine oil to piston and piston ring, and then insert piston ring until middle of cylinder with piston, and measure piston ring end gap with a feeler gauge.

Standard:

Top ring	: 0.21 - 0.31 mm (0.0083 - 0.0122 in)
2nd ring	: 0.32 - 0.47 mm (0.0126 - 0.0185 in)
Oil ring (rail ring)	: 0.20 - 0.60 mm (0.0079 - 0.0236 in)



Limit:

Top ring	: 0.54 mm (0.0213 in)
2nd ring	: 0.65 mm (0.0256 in)
Oil ring (rail ring)	: 0.95 mm (0.0374 in)

• If the measured value exceeds the limit, replace piston ring, and measure again.

CONNECTING ROD BEND AND TORSION

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< UNIT DISASSEMBLY AND ASSEMBLY >

• Check with a connecting rod aligner.

Bend:

Limit: 0.15 mm (0.0059 in) per 100 mm (3.94 in) length Torsion:

Limit: 0.30 mm (0.0118 in) per 100 mm (3.94 in) length

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



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CONNECTING ROD BIG END DIAMETER

- Install connecting rod bearing cap without connecting rod bearing installed, and tightening connecting rod bolts to the specified torque. Refer to <u>EM-82</u>, "<u>Disassembly and Assembly</u>" for the tightening procedure.
- Measure the inner diameter of connecting rod big end with an inside micrometer.

Standard: 48.000 - 48.013 mm (1.8898 - 1.8903 in)

· If out of the standard, replace connecting rod assembly.



CONNECTING ROD BUSHING OIL CLEARANCE

Connecting Rod Bushing Inner Diameter

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

Standard: 20.000 - 20.012 mm (0.7874 - 0.7879 in)



Piston Pin Outer Diameter

< UNIT DISASSEMBLY AND ASSEMBLY >

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Measure the outer diameter of piston pin with a micrometer.

Standard: 19.989 - 20.001 mm (0.7870 - 0.7874 in)



Connecting Rod Bushing Oil Clearance

(Connecting rod bushing oil clearance) = (Connecting rod bushing inner diameter) – (Piston pin outer diameter)

Standard: 0.005 - 0.017 mm (0.0002 - 0.0007 in)

- If the measured value is out of the standard, replace connecting rod assembly and/or piston and piston pin assembly.
- If replacing piston and piston pin assembly, refer to EM-109, "Standard and Limit".
- If replacing connecting rod assembly, refer to EM-109, "Standard and Limit" to select connecting rod bearing.



Factory installed parts grading:

Service parts apply only to grade "0".

Service parts apply c	only to grade "0".	Unit: mm (in)	Piston grade number	k
Grade	0	1	Front	
Connecting rod bushing inner diameter*	20.000 - 20.006 (0.7874 - 0.7876)	20.006 - 20.012 (0.7876 - 0.7879)	mark	L
Piston pin hole diameter	19.993 - 19.999 (0.7871 - 0.7874)	19.999 - 20. 005 (0.7874 - 0.7876)	Distan	_
Piston pin outer diameter	19.989 - 19.995 (0.7870 - 0.7872)	19.995 - 20.001 (0.7872 - 0.7874)	pin grade number	ĪV
			DDIOODIOE	

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*: After installing in connecting rod.

CYLINDER BLOCK DISTORTION

 Remove gasket on the cylinder block surface, and also remove engine oil, scale, carbon, or other contamination; using suitable tool. CAUTION:

Do not allow any debris to enter engine oil or engine coolant passages.

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< UNIT DISASSEMBLY AND ASSEMBLY >

• Measure the distortion on the cylinder block upper face at some different points in six directions with straightedge and feeler gauge.

Limit: 0.1 mm (0.004 in)

• If it exceeds the limit, replace cylinder block and lower cylinder block assembly.

NOTE:

Cylinder block cannot be replaced as a single part, because it is machined together with lower cylinder block.

MAIN BEARING HOUSING INNER DIAMETER

- Install lower cylinder block without main bearings installed, and tighten lower cylinder block bolts to the specified torque. Refer to EM-82, "Disassembly and Assembly" for the tightening procedure.
- Measure the inner diameter of main bearing housing with a bore gauge.

Standard: 58.944 - 58.968 mm (2.3206 - 2.3216 in)

• If out of the standard, replace cylinder block and lower cylinder block assembly.

NOTE:

Cylinder block cannot be replaced as a single part, because it is machined together with lower cylinder block.

PISTON TO CYLINDER BORE CLEARANCE

Cylinder Bore Inner Diameter

 Using a bore gauge, measure the cylinder bore for wear, out-ofround and taper at six different points on each cylinder. [(X) and (Y) directions at (A), (B) and (C)] [(Y) is in longitudinal direction of the engine].

NOTE:

When determining cylinder bore grade, measure cylinder bore at (B) position.

Standard inner diameter:

89.010 - 89.030 mm (3.5043 - 3.5051 in)

Wear limit:

0.2 mm (0.008 in)

Out-of-round [Difference between (X) and (Y)]:

0.015 mm (0.0006 in)

Taper limit [Difference between (A) and (C)]:

0.01 mm (0.0004 in)

• If the measured value exceeds the limit, or if there are scratches and/or seizure on the cylinder inner wall, hone or re-bore the cylinder inner wall.

Piston Skirt Diameter







< UNIT DISASSEMBLY AND ASSEMBLY >

Measure the outer diameter of piston skirt with a micrometer.

Measure point : Distance from the top 42.98 mm (1.692 in) ΕM Standard : 88.990 - 89.010 mm (3.5035 - 3.5043 in) Micrometer PBIC0125E D Piston to Cylinder Bore Clearance Calculate by piston skirt diameter and cylinder bore inner diameter [direction (X), position (B)]. (Clearance) = (Cylinder bore inner diameter) – (Piston skirt diameter) Е Standard : 0.010 - 0.030 mm (0.0004 - 0.0012 in) Limit : 0.08 mm (0.0031 in) If it exceeds the limit, replace piston and piston pin assembly. Refer to EM-102, "How to Select Piston and Bearing". Re-boring Cylinder Bore Cylinder bore size is determined by adding piston to cylinder bore clearance to piston skirt diameter. Re-bored size calculation: D = A + B - C Н where, **D: Bored diameter** A: Piston diameter as measured B: Piston - to - cylinder bore clearance (standard value) C: Honing allowance 0.02 mm (0.0008 in) Install lower cylinder block, and tighten bolts to the specified torque. Otherwise, cylinder bores may be distorted in final assembly. Refer to EM-82, "Disassembly and Assembly" for the tightening procedure. Cut cylinder bores. Κ NOTE: • When any cylinder needs boring, all other cylinders must also be bored. Do not cut too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time. Hone cylinders to obtain the specified piston to cylinder bore clearance. 5. Measure the finished cylinder bore for out-of-round and taper. M NOTE: Measurement should be done after cylinder bore cools down. CRANKSHAFT MAIN JOURNAL DIAMETER Ν · Measure the outer diameter of crankshaft main journals with a micrometer. Micrometer Standard: 54.955 - 54.979 mm (2.1636 - 2.1645 in) dia. If out of the standard, measure the main bearing oil clearance. Then use undersize bearing. Refer to EM-109, "Standard and Ρ Limit". PBIC0270E

CRANKSHAFT PIN JOURNAL DIAMETER

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< UNIT DISASSEMBLY AND ASSEMBLY >

• Measure the outer diameter of crankshaft pin journal with a micrometer.

Standard: 44.956 - 44.974 mm (1.7699-1.7706 in) dia.

• If out of the standard, measure the connecting rod bearing oil clearance. Then use undersize bearing. Refer to <u>EM-109</u>, "Standard and Limit".

OUT-OF-ROUND AND TAPER OF CRANKSHAFT

- Measure the dimensions at four different points as shown on each main journal and pin journal with a micrometer.
- Out-of-round is indicated by the difference in dimensions between (X) and (Y) at (A) and (B).
- Taper is indicated by the difference in dimension between (A) and (B) at (X) and (Y).

Limit:

Out-of-round [Difference between (X) and (Y)] : 0.0025 mm (0.0001 in)

Taper [Difference between (A) and (B)]

: 0.0025 mm (0.0001 in)

- · If the measured value exceeds the limit, correct or replace crankshaft.
- If corrected, measure the bearing oil clearance of the corrected main journal and/or pin journal. Then select
 main bearing and/or connecting rod bearing. Refer to <u>EM-109</u>, "<u>Standard and Limit</u>".

CRANKSHAFT RUNOUT

- Place a V-block on a precise flat table to support the journals on the both end of crankshaft.
- Place a dial indicator straight up on the No. 3 journal.
- While rotating crankshaft, read the movement of the pointer on the dial indicator. (Total indicator reading)

Limit : 0.05 mm (0.0020 in)

• If it exceeds the limit, replace crankshaft.





CONNECTING ROD BEARING OIL CLEARANCE

Method by Calculation

- Install connecting rod bearings to connecting rod and cap, and tighten connecting rod bolts to the specified torque. Refer to <u>EM-82</u>, "<u>Disassembly and Assembly</u>" for tightening procedure.
- Measure the inner diameter of connecting rod bearing with an inside micrometer.

(Bearing oil clearance) = (Connecting rod bearing inner diameter) – (Crankshaft pin journal diameter)

Standard : 0.035 - 0.045 mm (0.0014 - 0.0018 in)

 If the clearance exceeds the limit, select proper connecting rod bearing according to connecting rod big end diameter and crankshaft pin journal diameter to obtain the specified bearing oil clearance. Refer to <u>EM-102</u>, "How to Select Piston and Bearing".



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 bolts to the specified torque. Refer to <u>EM-82</u>, "<u>Disassembly and Assembly</u>" for the tightening procedure.

< UNIT DISASSEMBLY AND ASSEMBLY >

the plastigage bag, measure the plastigage width.

same as that described in the "Method by Calculation".

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MAIN BEARING OIL CLEARANCE

Method by Calculation

CAUTION:

NOTE:

Do not rotate crankshaft.

- Install main bearings to cylinder block and lower cylinder block, and tighten lower cylinder block bolts to the specified torque. Refer to EM-82, "Disassembly and Assembly" for the tightening procedure.
- Measure the inner diameter of main bearing with a bore gauge. (Bearing oil clearance) = (Main bearing inner diameter) - (Crankshaft main journal diameter)

Standard:

No. 1, 3 and 5 journals

: 0.028 - 0.042 mm (0.0011 - 0.0017 in)

No. 2 and 4 journals

: 0.041 - 0.056 mm (0.0016 - 0.0022 in)

: 0.1 mm (0.004 in) Limit



 If the clearance exceeds the limit, select proper main bearing according to main bearing inner diameter and crankshaft main journal diameter to obtain the specified bearing oil clearance. Refer to EM-102, "How to Select Piston and Bearing".

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 crankshaft axial direction, avoiding oil holes.
- Install main bearings to cylinder block and lower cylinder block, and tighten lower cylinder block bolts to the specified torque. Refer to EM-82, "Disassembly and Assembly" for the tightening procedure. **CAUTION:**

Do not rotate crankshaft.

· Remove lower cylinder block and bearings, and using the scale on the plastigage bag, measure the plastigage width. NOTE:

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



MAIN BEARING CRUSH HEIGHT

- < UNIT DISASSEMBLY AND ASSEMBLY >
- When lower cylinder block is removed after being tightened to the specified torque with main bearings installed, the tip end of bearing must protrude. Refer to EM-82, "Disassembly and Assembly" for the tightening procedure.

Standard: There must be crush height.

CONNECTING ROD BEARING CRUSH HEIGHT

Standard: There must be crush height.

If the standard is not met, replace connecting rod bearings.

and Assembly" for the tightening procedure.

If the standard is not met, replace main bearings.





LOWER CYLINDER BLOCK MOUNTING BOLT OUTER DIAMETER

- · Perform only with M10 bolts.
- Measure the outer diameters [(d1), (d2)] at two positions as shown.
- If reduction appears in (A) range, regard it as (d2).

Limit $[(d_1) - (d_2)]: 0.13 \text{ mm} (0.0051 \text{ in})$

 If it exceeds the limit (a large difference in dimensions), replace lower cylinder block bolt with a new one.



CONNECTING ROD BOLT OUTER DIAMETER

- Measure the outer diameter (d) at position as shown.
- If reduction appears in a position other than (d), regard it as (d).

Limit: 7.75 mm (0.3051 in)

• When (d) falls below the limit (when it becomes thinner), replace connecting rod bolt with a new one.



MOVEMENT AMOUNT OF FLYWHEEL (M/T MODELS) CAUTION:

Do not disassemble double mass flywheel.

Movement Amount of Thrust (Fore-and-Aft) Direction

 Measure the movement amount of thrust (fore-and-aft) direction when 100 N (10.2 kg, 22 lb) force is added at the portion of 125 mm (4.92 in) radius from the center of flywheel.

Standard : 1.3 mm (0.051 in) or less

< UNIT DISASSEMBLY AND ASSEMBLY >

• If measured value is out of the standard, replace flywheel.

Movement Amount in Radial (Rotation) Direction

Check the movement amount of radial (rotation) direction with the following procedure:

- 1. Install a bolt to clutch cover mounting hole, and place a torque wrench on the extended line of the flywheel center line.
 - Tighten bolt at a force of 9.8 N·m (1.0 kg-m, 87 in-lb) to keep it from loosening.
- 2. Put a mating mark on circumferences of the two flywheel masses without applying any load (Measurement standard points).
- 3. Apply a force of 9.8 N·m (1.0 kg-m, 87 in-lb) in each direction, and mark the movement amount on the mass on the transmission side.
- 4. Measure the dimensions of movement amounts (A) and (B) on circumference of flywheel on the transmission side.

Standard: 44.3 mm (1.744 in) or less.

• If measured value is out of the standard, replace flywheel.

DRIVE PLATE (A/T MODELS)

- Check drive plate and signal plate for deformation or cracks. CAUTION:
 - Do not disassemble drive plate.
 - Do not place drive plate with signal plate facing down.
 - When handling signal plate, take care not to damage or scratch it.
 - Handle signal plate in a manner that prevents it from becoming magnetized.
- If anything is found, replace drive plate.







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How to Select Piston and Bearing

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DESCRIPTION

Selection points	Selection parts	Selection items	Selection methods
Between cylinder block and crankshaft	Main bearing	Main bearing grade (bearing thickness)	Determined by match of cylin- der block bearing housing grade (inner diameter of hous- ing) and crankshaft journal grade (outer diameter of jour- nal)
Between crankshaft and con- necting rod	Connecting rod bearing	Connecting rod bearing grade (bearing thickness)	Combining service grades for connecting rod big end diame- ter and crankshaft pin outer di- ameter determine connecting rod bearing selection.
Between cylinder block and pis- ton	Piston and piston pin assembly (piston is available together with piston pin as an assembly.)	Piston grade (piston skirt diam- eter)	Piston grade = cylinder bore grade (inner diameter of bore)
Between piston and connecting rod [*]	_	_	_

*For the service parts, the grade for fitting cannot be selected between piston pin and connecting rod. (Only grade "0" is available.) The information at the shipment from the plant is described as a reference.

- 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, follow the applicable procedures.

HOW TO SELECT PISTON

When New Cylinder Block Is Used

- Check the cylinder bore grade on rear-left side of cylinder block, and select piston of the same grade.
- If there is a corrected stamp mark on cylinder block, use it as a correct reference.





< UNIT DISASSEMBLY AND ASSEMBLY >

- 1. Measure the cylinder bore inner diameter. Refer to EM-91, "Inspection After Disassembly".
- Determine the bore grade by comparing the measurement with the values under the cylinder bore inner diameter of the "Piston Selection Table".
- 3. Select piston of the same grade.

Piston Selection Table

Grade number (Mark)	2 (or no mark)	3
Cylinder bore Inner diameter	89.010 - 89.020 (3.5043 - 3.5047)	89.020 - 89.030 (3.5047 - 3.5051)
Piston skirt diameter	88.990 - 89.000 (3.5035 - 3.5039)	89.000 - 89.010 (3.5039 - 3.5043)

NOTE:

- There is no piston grade "1".
- Piston is available together with piston pin as an assembly.
- The piston pin (piston pin hole) grade is provided only for the parts installed at the plant. For service parts, no grades can be selected. (Only grade "0" is available.)

HOW TO SELECT CONNECTING ROD BEARING

When New Connecting Rod and Crankshaft Are Used

1. Apply connecting rod big end diameter grade stamped on connecting rod side face to the row in the "Connecting Rod Bearing Selection Table".



 Apply crankshaft pin journal diameter grade stamped on crankshaft front side to the column in the "Connecting Rod Bearing Selection Table".

- Read the symbol at the cross point of selected row and column in the "Connecting Rod Bearing Selection N Table".
- 4. Apply the symbol obtained to the "Connecting Rod Bearing Grade Table" to select connecting rod bearing.

When Crankshaft and Connecting Rod Are Reused

- 1. Measure the dimensions of the connecting rod big end diameter and crankshaft pin journal diameter individually. Refer to <u>EM-91, "Inspection After Disassembly"</u> and <u>EM-91, "Inspection After Disassembly"</u>.
- 2. Apply the measured dimension to the "Connecting Rod Bearing Selection Table".
- 3. Read the symbol at the cross point of selected row and column in the "Connecting Rod Bearing Selection Table".
- 4. Apply the symbol obtained to the "Connecting Rod Bearing Grade Table" to select connecting rod bearing.

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Unit[.] mm (in)

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< UNIT DISASSEMBLY AND ASSEMBLY >

Connecting Rod Bearing Selection Table

\backslash	Connecting rod big end diameter	Mark	0	1	2	3	4	5	6	7	8	9	А	в	С
Cranks pin jou diamet	shaft Irrnal ter	Inner diameter Unit: mm (in)	01 (1.8898 - 1.8898)	02 (1.8898 - 1.8898)	03 (1.8898 - 1.8899)	04 (1.8899 - 1.8899)	05 (1.8899 - 1.8900)	06 (1.8900 - 1.8900)	07 (1.8900 - 1.8900)	08 (1.8900 - 1.8901)	09 (1.8901 - 1.8901)	10 (1.8901 - 1.8902)	11 (1.8902 - 1.8902)	12 (1.8902 - 1.8902)	13 (1.8902 - 1.8903)
Mark	Outer diameter Unit: mm (in)		48.000 - 48.0	48.001 - 48.0	48.002 - 48.0	48.003 - 48.0	48.004 - 48.0	48.005 - 48.0	48.006 - 48.0	48.007 - 48.0	48.008 - 48.0	48.009 - 48.0	48.010 - 48.0	48.011 - 48.0	48.012 - 48.0
А	44.974 - 44.973 (1.770	6 - 1.7706)	0	0	0	0	01	01	01	1	1	1	12	12	12
В	44.973 - 44.972 (1.770	6 - 1.7705)	0	0	0	01	01	01	1	1	1	12	12	12	2
С	44.972 - 44.971 (1.770	5 - 1.7705)	0	0	01	01	01	1	1	1	12	12	12	2	2
D	44.971 - 44.970 (1.770	5 - 1.7705)	0	01	01	01	1	1	1	12	12	12	2	2	2
Е	44.970 - 44.969 (1.770	5 - 1.7704)	01	01	01	1	1	1	12	12	12	2	2	2	23
F	44.969 - 44.968 (1.770	4 - 1.7704)	01	01	1	1	1	12	12	12	2	2	2	23	23
G	44.968 - 44.967 (1.770	4 - 1.7704)	01	1	1	1	12	12	12	2	2	2	23	23	23
н	44.967 - 44.966 (1.770	4 - 1.7703)	1	1	1	12	12	12	2	2	2	23	23	23	3
J	44.966 - 44.965 (1.770	3 - 1.7703)	1	1	12	12	12	2	2	2	23	23	23	3	3
к	44.965 - 44.964 (1.770	3 - 1.7702)	1	12	12	12	2	2	2	23	23	23	3	3	3
L	44.964 - 44.963 (1.770	2 - 1.7702)	12	12	12	2	2	2	23	23	23	3	3	3	34
м	44.963 - 44.962 (1.770	2 - 1.7701)	12	12	2	2	2	23	23	23	3	3	3	34	34
Ν	44.962 - 44.961 (1.770	2 - 1.7701)	12	2	2	2	23	23	23	3	3	3	34	34	34
Р	44.961 - 44.960 (1.770	1 - 1.7701)	2	2	2	23	23	23	3	3	3	34	34	34	4
R	44.960 - 44.959 (1.770	1 - 1.7700)	2	2	23	23	23	3	3	3	34	34	34	4	4
S	44.959 - 44.958 (1.770	0 - 1.7700)	2	23	23	23	3	3	3	34	34	34	4	4	4
Т	44.958 - 44.957 (1.770	0 - 1.7700)	23	23	23	3	3	3	34	34	34	4	4	4	4
			1		10	10	2	34	34	34	4	4	1	1	4

Connecting Rod Bearing Grade Table

Unit: mm (in)

Grade number*	0	1	2	3	4
Thickness	1.493 - 1.496 (0.0588 - 0.0589)	1.496 - 1.499 (0.0589 - 0.0590)	1.499 - 1.502 (0.0590 - 0.0591)	1.502 - 1.505 (0.0591 - 0.0593)	1.505 - 1.508 (0.0593 - 0.0594)
Identification col- or	Black	Brown	Green	Yellow	Blue

*: Always check with the Parts Department for the latest parts information.

Undersize Bearings Usage Guide

• When the specified connecting rod bearing oil clearance is not obtained with standard size connecting rod bearings, use undersize (US) bearings.

• When using undersize (US) bearing, measure the connecting rod bearing inner diameter with bearing installed, and grind the crankshaft pin so that the connecting rod bearing oil clearance satisfies the standard. **CAUTION:**

[QR25DE]



There are two main bearing selection tables. One is for odd-numbered journals (No. 1, 3 and 5) and the other is for even-numbered journals (No. 2 and 4). Make certain to use the appropriate table. This is due to differences in the specified clearances.

 Apply the symbol obtained to the "Main Bearing Grade Table" to select main bearing. NOTE:
 Service part is available as a set of both upper and lower.

Service part is available as a set of both upper and lower.

When Cylinder Block and Crankshaft Are Reused

< UNIT DISASSEMBLY AND ASSEMBLY >

- Measure the dimensions of the cylinder block main bearing housing inner diameter and crankshaft main journal diameter individually. Refer to <u>EM-91</u>, "Inspection After Disassembly" and <u>EM-91</u>, "Inspection After <u>Disassembly"</u>.
- 2. Apply the measured dimension to the "Main Bearing Selection Table".
- 3. Read the symbol at the cross point of selected row and column in the "Main Bearing Selection Table".

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< UNIT DISASSEMBLY AND ASSEMBLY >

CAUTION:

There are two main bearing selection tables. One is for odd-numbered journals (No. 1, 3 and 5) and the other is for even-numbered journals (No. 2 and 4). Make certain to use the appropriate table. This is due to differences in the specified clearances.

4. Apply the symbol obtained to the "Main Bearing Grade Table" to select main bearing. **NOTE:**

Service part is available as a set of both upper and lower.

Main Bearing Selection Table (No. 1, 3 and 5 journals)

\backslash	Cylinder block	Mark	A	в	С	D	E	F	G	н	J	к	L	м	N	Р	R	S	Т	U	v	w	x	Y	4	7
	main bearing		(22)	(1)	(2C	8	(8)	(60	(60	(60	<u>(</u>)	10)	11	11)	Ē	12)	12)	13)	13)	13)	14)	14)	15)	15)	15)	16)
	housing inner		32(.32(.32(32(.32(32(32(.32(32	32	33	32	32	32	32	32	32.	.32	32	32.	32	32	.32	32
	diameter	1	~	~	- 2	~	~	~	~	~	~	~	~	~	∩ 	~	~	- 2	~	- 2	- 5	- 5	~	- 2	- 5	- 2
		linner diameter	206	207	207	207	208	208	509	209	209	510	510	211	5	211	212	212	213	213	213	214	214	215	215	215
Cra	inkshaft	Unit: mm	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
ma	in journal	(in)	45 (46 (47 (48	49 (20	5	52 (53 (54 (55 (56 (21	58	59 (60 (61	62 (63 (64 (65 (99	67 (68 (
dia	meter		8.0	6.0	8.9	6.0	6.8	8	8.9	8.9	6.8	8.0	8.9	8	6.0	8.0	6.8	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9
		\backslash		- 20	2 - 2	10	- 20	- 2	- 2	۵	- C	- 2	- 0 -	1.0		- 2	- 22	- 5	- 2	-	6	- 2	- 0 - 1	- 2	- 2	- 2
Mark	Outer diameter		947	946	946	947	948	946	950	951	952	953	957	955	956	957	956	956	960	961	962	963	96	396	966	967
			58.	58.	58.	58.	58.	58.	58.	58.	58.	58.	58.	58.	58.	58.	58.	58.	58.	58.	58.	58.	58.	58.	58.	58.
Α	54.979 - 54.978 (2.1645	5 - 2.1645)	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4
В	54.978 - 54.977 (2.1645	5 - 2.1644)	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4
С	54.977 - 54.976 (2.1644	- 2.1644)	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4
D	54.976 - 54.975 (2.1644	- 2.1644)	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45
E	54.975 - 54.974 (2.1644	- 2.1643)	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45
F	54.974 - 54.973 (2.1643	8 - 2.1643)	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45
G	54.973 - 54.972 (2.1643	3 - 2.1642)	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5
н	54.972 - 54.971 (2.1642	2 - 2.1642)	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5
J	54.971 - 54.970 (2.1642	2 - 2.1642)	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5
К	54.970 - 54.969 (2.1642	2 - 2.1641)	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56
L	54.969 - 54.968 (2.1641	- 2.1641)	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56
М	54.968 - 54.967 (2.1641	- 2.1641)	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56
N	54.967 - 54.966 (2.1641	- 2.1640)	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6
Р	54.966 - 54.965 (2.1640) - 2.1640)	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6
R	54.965 - 54.964 (2.1640) - 2.1639)	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6
S	54.964 - 54.963 (2.1639	9 - 2.1639)	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67
Т	54.963 - 54.962 (2.1639	9 - 2.1639)	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67
U	54.962 - 54.961 (2.1639	9 - 2.1638)	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67
V	54.961 - 54.960 (2.1638	8 - 2.1638)	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	7
W	54.960 - 54.959 (2.1638	8 - 2.1637)	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	7	7
X	54.959 - 54.958 (2.1637	' - 2.1637)	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	7	7	7
Y	54.958 - 54.957 (2.1637	' - 2.1637)	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	7	7	7	7
4	54.957 - 54.956 (2.1637	7 - 2.1636)	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	7	7	7	7	7
7	54.956 - 54.955 (2.1636	6 - 2.1636)	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	7	7	7	7	7	7

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< UNIT DISASSEMBLY AND ASSEMBLY >

Main Bearing Selection Table (No. 2 and 4 journals)

\square	Cylinder block	Mark	A	в	С	D	Е	F	G	н	J	к	L	м	Ν	Р	R	s	т	U	٧	w	x	Y	4	7	A
	main bearing housing inner diameter		- 2.3207)	- 2.3207)	- 2.3207)	- 2.3208)	- 2.3208)	- 2.3209)	- 2.3209)	- 2.3209)	- 2.3210)	- 2.3210)	- 2.3211)	- 2.3211)	- 2.3211)	- 2.3212)	- 2.3212)	- 2.3213)	- 2.3213)	- 2.3213)	- 2.3214)	- 2.3214)	- 2.3215)	- 2.3215)	- 2.3215)	- 2.3216)	EM
Cra mai	inkshaft in journal	Inner diameter Unit: mm (in)	45 (2.3206	46 (2.3207	47 (2.3207	48 (2.3207	49 (2.3208	50 (2.3208	51 (2.3209	52 (2.3209	53 (2.3209	54 (2.3210	55 (2.3210	56 (2.3211	57 (2.3211	58 (2.3211	59 (2.3212	60 (2.3212	61 (2.3213	62 (2.3213	63 (2.3213	64 (2.3214	65 (2.3214	66 (2.3215	67 (2.3215	68 (2.3215	
			- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	- 58.9	U
Mark	Outer diameter Unit: mm (in)		58.944	58.945	58.946	58.947	58.948	58.949	58.950	58.951	58.952	58.953	58.954	58.955	58.956	58.957	58.958	58.959	58.960	58.961	58.962	58.963	58.964	58.965	58.966	58.967	D
Α	54.979 - 54.978 (2.1645	- 2.1645)	0	0	0	0	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	
В	54.978 - 54.977 (2.1645	- 2.1644)	0	0	0	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	
С	54.977 - 54.976 (2.1644	- 2.1644)	0	0	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	_
D	54.976 - 54.975 (2.1644	- 2.1644)	0	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	
E	54.975 - 54.974 (2.1644	- 2.1643)	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	
F	54.974 - 54.973 (2.1643	- 2.1643)	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	
G	54.973 - 54.972 (2.1643	- 2.1642)	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	F
н	54.972 - 54.971 (2.1642	- 2.1642)	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	
J	54.971 - 54.970 (2.1642	- 2.1642)	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	
к	54.970 - 54.969 (2.1642	- 2.1641)	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	
L	54.969 - 54.968 (2.1641	- 2.1641)	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	G
М	54.968 - 54.967 (2.1641	- 2.1641)	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	
N	54.967 - 54.966 (2.1641	- 2.1640)	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	
Р	54.966 - 54.965 (2.1640	- 2.1640)	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	н
R	54.965 - 54.964 (2.1640	- 2.1639)	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	
S	54.964 - 54.963 (2.1639	- 2.1639)	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	
Т	54.963 - 54.962 (2.1639	- 2.1639)	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	
U	54.962 - 54.961 (2.1639	- 2.1638)	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	
v	54.961 - 54.960 (2.1638	- 2.1638)	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	
w	54.960 - 54.959 (2.1638	- 2.1637)	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	
X	54.959 - 54.958 (2.1637	- 2.1637)	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	
Y	54.958 - 54.957 (2.1637	- 2.1637)	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	J
4	54.957 - 54.956 (2.1637	- 2.1636)	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	
7	54.956 - 54.955 (2.1636	- 2.1636)	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	
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Main Bearing Grade Table (All Journals)

Unit: mm (in)			
Remarks	Identification color	Thickness	Grade number*
	Black	1.973 - 1.976 (0.0777 - 0.0778)	0
	Brown	1.976 - 1.979 (0.0778 - 0.0779)	1
	Green	1.979 - 1.982 (0.0779- 0.0780)	2
Grade and color are the same	Yellow	1.982 - 1.985 (0.0780 - 0.0781)	3
for upper and lower bearings.	Blue	1.985 - 1.988 (0.0781 - 0.0783)	4
	Pink	1.988 - 1.991 (0.0783 - 0.0784)	5
	Purple	1.991 - 1.994 (0.0784 - 0.0785)	6
	White	1.994 - 1.997 (0.0785 - 0.0786)	7

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< UNIT DISASSEMBLY AND ASSEMBLY >

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Grade	number*	Thickness	Identification color	Remarks
01	UPR	1.973 - 1.976 (0.0777 - 0.0778)	Black	
01	LWR	1.976 - 1.979 (0.0778 - 0.0779)	Brown	
10	UPR	1.976 - 1.979 (0.0778 - 0.0779)	Brown	
12	LWR	1.979 - 1.982 (0.0779 - 0.0780)	Green	
23	UPR	1.979 - 1.982 (0.0779- 0.0780)	Green	
	LWR	1.982 - 1.985 (0.0780 - 0.0781)	Yellow	Crado and color are different
24	UPR	1.982 - 1.985 (0.0780 - 0.0781)	Yellow	for upper and lower bearings.
34	LWR	1.985 - 1.988 (0.0781 - 0.0783)	Blue	
45	UPR	1.985 - 1.988 (0.0781 - 0.0783)	Blue	
40	LWR	1.988 - 1.991 (0.0783 - 0.0784)	Pink	
56	UPR	1.988 - 1.991 (0.0783 - 0.0784)	Pink	
50	LWR	1.991 - 1.994 (0.0784 - 0.0785)	Purple	
67	UPR	1.991 - 1.994 (0.0784 - 0.0785)	Purple	
07	LWR	1.994 - 1.997 (0.0785 - 0.0786)	White	

*: Always check with the Parts Department for the latest parts information.

Undersize Bearing Usage Guide

- When the specified main bearing oil clearance is not obtained with standard size main bearings, use undersize (US) bearing.
- When using undersize (US) bearing, measure the main bearing inner diameter with bearing installed, and grind main journal so that the main bearing oil clearance satisfies the standard.

CAUTION:

In grinding crankshaft main journal to use undersize bearings, keep fillet R [1.5 - 1.7 mm (0.059 - 0.067 in)].



Bearing undersize table

Unit: mm (in)

Size	Thickness
US 0.25 (0.0098)	2.106 - 2.114 (0.0829 - 0.0832)
< SERVICE DATA AND SPECIFICATIONS (SDS)

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

Standard and Limit

GENERAL SPECIFICATIONS

Cylinder arrangement		In-line 4
Displacement	cm ³ (cu in)	2,488 (151.82)
Bore and stroke	mm (in)	89.0 x 100.0 (3.504 x 3.937)
Valve arrangement		DOHC
Firing order		1-3-4-2
Number of pictor rings	Compression	2
Number of piston rings	Oil	1
Compression ratio		9.5
0	Standard	1,304 (13.3, 189)
Compression pressure	Minimum	1,108 (11.3, 161)
Ki a (kg/offi , p3/) / 200 ipin	Differential limit between cylinders	100 (1.0, 14)

DRIVE BELT

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Tension of drive belt	Auto adjustment by auto-tensioner	
	VET VEENDIV	

EXHAUST MANIFOLD AND THREE WAY CATALYST ASSEMBLY

	Unit: mm (in)	
Item	Limit	
Surface distortion	0.3 (0.012)	J

SPARK PLUG

Make	NGK	K
Standard type*	PLZKAR6A–11	
Gap (nominal)	1.1 mm (0.043 in)	1

*: Always check with the Parts Department for the latest parts information

CYLINDER HEAD

	Unit: mm (in)	IVI
Items	Limit	
Head surface distortion	0.1 (0.004)	N
Items	Standard	

[QR25DE]

INFOID:000000006252591

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< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

Items	Limit
Camshaft bearing surface length	25.660 - 25.685 (1.0102 - 1.0112)



H = 129.4 mm (5.09 in) PBIC0283E

VALVE

Valve Timing



Valve Dimensions



Valve head diameter "D"	Intake	35.5 - 35.8 (1.398 - 1.409)
	Exhaust	30.5 - 30.8 (1.201 - 1.213)
Valve length "L"	Intake	97.16 (3.8252)
	Exhaust	98.82 (3.8905)
Valve stem diameter "d"	Intake	5.965 - 5.980 (0.2348 - 0.2354)
	Exhaust	5.955 - 5.970 (0.2344 - 0.2350)

< SERVICE DATA AND SPECIFICATIONS (SDS)

Intake	45°15′ - 45°45′	
Exhaust		A
Intake	1.1 (0.043)	
Exhaust	1.3 (0.051)	Ε
	Intake Exhaust Intake Exhaust	Intake 45°15′ - 45°45′ Exhaust 1.1 (0.043) Exhaust 1.3 (0.051)

Valve Clearance

Unit: mm (in)

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[QR25DE]

Items	Cold	Hot* (reference data)	-
Intake	0.24 - 0.32 (0.009 - 0.013)	0.304 - 0.416 (0.012 - 0.016)	-
Exhaust	0.26 - 0.34 (0.010 - 0.013)	0.308 - 0.432 (0.012 - 0.017)	

*: Approximately 80°C (176°F)

Available Valve Lifter

Thickness mm (in)	Identification mark*



vaive	liπer	

	KBIA0119E	I
6.96 (0.2740)	696	
6.98 (0.2748)	698	
7.00 (0.2756)	700	0
7.02 (0.2764)	702	
7.04 (0.2772)	704	K
7.06 (0.2780)	706	
7.08 (0.2787)	708	1
7.10 (0.2795)	710	L
7.12 (0.2803)	712	
7.14 (0.2811)	714	M
7.16 (0.2819)	716	
7.18 (0.2827)	718	
7.20 (0.2835)	720	N
7.22 (0.2843)	722	
7.24 (0.2850)	724	0
7.26 (0.2858)	726	
7.28 (0.2866)	728	
7.30 (0.2874)	730	P
7.32 (0.2882)	732	
7.34 (0.2890)	734	
7.36 (0.2898)	736	
7.38 (0.2906)	738	
7.40 (0.2913)	740	

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

Thickness mm (in)	Identification mark*
7.42 (0.2921)	742
7.44 (0.2929)	744
7.46 (0.2937)	746

*: Always check with the Parts Department for the latest parts information

Valve Spring

Items	Intake	Exhaust
Free height	43.72 - 43.92 mm (1.7213 - 1.7291 in)	45.29 - 45.49 mm (1.7831 - 1.7909 in)
Installation height	35.30 mm (1.390 in)	35.30 mm (1.390 in)
Installation load	151 - 175 N (15.4 - 17.8 kg, 34 - 39 lb)	151 - 175 N (15.4 - 17.8 kg, 34 - 39 lb)
Height during valve open	25.3 mm (0.996 in)	26.76 mm (1.0535 in)
Load with valve open	351 - 394 N (35.8 - 40.2 kg, 79 - 89 lb)	318 - 362 N (32.4 - 36.9 kg, 71 - 81 lb)
Identification color	Pink	Green
Squareness limit	1.8 mm (0.071 in)	1.9 mm (0.075 in)

Valve Lifter

Unit: mm (in)

Valve lifter outer diameter 33.965 - 33.980 (1.3372 - 1.3378) Valve lifter hole diameter 34.000 - 34.021 (1.3386 - 1.3394) Valve lifter clearance 0.020 - 0.056 (0.0008 - 0.0022)	Items	Standard
Valve lifter hole diameter 34.000 - 34.021 (1.3386 - 1.3394) Valve lifter clearance 0.020 - 0.056 (0.0008 - 0.0022)	Valve lifter outer diameter	33.965 - 33.980 (1.3372 - 1.3378)
	Valve lifter hole diameter	34.000 - 34.021 (1.3386 - 1.3394)
	Valve lifter clearance	0.020 - 0.056 (0.0008 - 0.0022)

Valve Guide

Unit: mm (in)



	PBIC0184E				
Items		Standard part	Service part		
Valve guide	Outer diameter	10.023 - 10.034 (0.3946 - 0.3950)	10.223 - 10.234 (0.4025 - 0.4029)		
	Inner diameter (Finished size)	6.000 - 6.018 (0.2362 - 0.2369)			
Cylinder head valve guide hole diameter		9.975 - 9.996 (0.3927 - 0.3935) 10.175 - 10.196 (0.4006			
Interference fit of valve guide		0.027 - 0.059 (0.0011 - 0.0023)			
Items		Standard	Limit		
Valve guide clearance	Intake	0.020 - 0.053 (0.0008 - 0.0021)	0.08 (0.003)		
	Exhaust	0.030 - 0.063 (0.0012 - 0.0025)	0.09 (0.004)		
Projection length "I"	Intake	10.1 - 10.3 (0.398 - 0.406)			
	Exhaust	10.0 - 10.4 (0.394 - 0.409)			

Valve Seat

[QR25DE]

Unit: mm (in)

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< SERVICE DATA AND SPECIFICATIONS (SDS)

I PBIC2745E

Items		Standard Oversize [0.5 (0.02)] (Service)		
Cylinder bood cost record diameter "D"	Intake	36.500 - 36.516 (1.4370 - 1.4376) 37.000 - 37.016 (1.4567 - 1		
Cylinder nead seat recess diameter D	Exhaust	31.500 - 31.516 (1.2402 - 1.2408) 32.000 - 32.016(1.2598 - 1.260		
Volve east outer diameter "d"	Intake	36.597 - 36.613 (1.4408 - 1.4415)	37.097 - 37.113 (1.4605 - 1.4611)	
valve seat outer diameter d	Exhaust	31.600 - 31.616 (1.2441 - 1.2447)	32.100 - 32.116 (1.2638 - 1.2644)	
Value east interference fit	Intake	0.081 - 0.113 (0.0032 - 0.0044)		
valve seat interference in	Exhaust	0.084 - 0.116 (0	0.0033 - 0.0046)	
D : (14)*1	Intake	33.5 (1.319)	
Diameter "d1"**	Exhaust	28.0 (1.102)	
D'	Intake	35.1 - 35.3 (1.382 - 1.390)		
	Exhaust	29.9 - 30.1 (1.177 - 1.185)		
Angela (1. 4)	Intake	60°		
	Exhaust	60°		
Angle "s2"		88°45′	- 90°15′	
Angle az	Exhaust	88°45′ - 90°15′		
	Intake	120°		
Angle a3	Exhaust	120°		
o	Intake	1.05 - 1.35 (0.0413 - 0.0531)		
Contacting width "W"**	Exhaust	1.25 - 1.55 (0.0492 - 0.0610)		
11-:	Intake	5.9 - 6.0 (0.232 - 0.236)	5.0 - 5.1 (0.197 - 0.201)	
Height "n"	Exhaust	5.9 - 6.0 (0.232 - 0.236)	4.91 - 5.01 (0.1933 - 0.1972)	
Depth "H"		6.0 (0.236)		

*1: Diameter made by intersection point of conic angles $\alpha 1$ and $\alpha 2$

 $^{*2}\!\!:$ Diameter made by intersection point of conic angles $\alpha 2$ and $\alpha 3$

*3: Machining data

Valve Seal

	Unit: mm (in)
Items	Standard
Valve seal installed height	11.8 - 12.4 (0.465 - 0.488)

Spark Plug Tube

Items	Standard
Spark plug tube installed height	41.2 - 42.2 (1.622 - 1.661)

CAMSHAFT AND CAMSHAFT BEARING

Unit[.] mm (in)

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< SERVICE DATA AND SPECIFICATIONS (SDS)

			Unit: mm (in)	
Items		Standard	Limit	
Camshaft journal oil clearance		0.045 - 0.086 (0.0018 - 0.0034)	—	
Comehaft bracket inner diameter	No. 1	28.000 - 28.021 (1.1024 - 1.1032)	—	
	No. 2, 3, 4, 5	23.500 - 23.521 (0.9252 - 0.9260)	_	
Compositiournal outer diameter	No. 1	27.935 - 27.955 (1.0998 - 1.1006)	—	
	No. 2, 3, 4, 5	23.435 - 23.455 (0.9226 - 0.9234)	—	
Camshaft journal length No. 1		25.800 - 25.848 (1.0157 - 1.0176)	—	
Camshaft end play		0.115 - 0.188 (0.0045 - 0.0074)	—	
Comebaft com boight "A"	Intake	45.015 - 45.205 (1.7722 - 1.7797)	0.2 (0.008)* ¹	
	Exhaust	43.975 - 44.165 (1.7313 - 1.7388)		
Camshaft runout [TIR* ²]		Less than 0.02 (0.0008)	—	
Camshaft sprocket runout [TIR*2]			0.15 (0.0059)	



*1: Cam wear limit

*2: Total indicator reading

CYLINDER BLOCK



Surface distortion		Limit		0.1 (0.004)
Cylinder bore Inner diameter		Standard*	Grade No. 2	89.010 - 89.020 (3.5043 - 3.5047)
			Grade No. 3	89.020 - 89.030 (3.5047 - 3.5051)
	Î	Wear limit		0.2 (0.008)
Out-of-round (Difference between "X" and "Y")		- Limit		0.015 (0.0006)
Taper (Difference between "A" and "C")				0.01 (0.0004)

< SERVICE DATA AND) SPECIFIC	ATIONS (SDS)		[QR25DE]
Main bearing housing inner diameter grade*		* () () () () () () () () () ()	Grade No. A Grade No. B Grade No. C Grade No. D Grade No. E Grade No. F Grade No. G Grade No. H Grade No. J Grade No. K Grade No. K Grade No. N Grade No. N Grade No. R Grade No. R Grade No. R Grade No. R Grade No. S Grade No. C Grade No. V Grade No. V Grade No. V Grade No. X Grade No. X Grade No. X	58.944 - 58.945 (2.3206 - 2.3207) 58.945 - 58.946 (2.3207 - 2.3207) 58.946 - 58.947 (2.3207 - 2.3207) 58.946 - 58.947 (2.3207 - 2.3208) 58.947 - 58.948 (2.3207 - 2.3208) 58.948 - 58.949 (2.3208 - 2.3209) 58.950 - 58.951 (2.3209 - 2.3209) 58.951 - 58.952 (2.3209 - 2.3209) 58.952 - 58.953 (2.3209 - 2.3210) 58.953 - 58.954 (2.3210 - 2.3211) 58.955 - 58.956 (2.3211 - 2.3211) 58.956 - 58.957 (2.3211 - 2.3211) 58.957 - 58.958 (2.3211 - 2.3211) 58.957 - 58.958 (2.3211 - 2.3212) 58.958 - 58.959 (2.3212 - 2.3212) 58.958 - 58.959 (2.3212 - 2.3212) 58.958 - 58.960 (2.3212 - 2.3213) 58.960 - 58.961 (2.3213 - 2.3213) 58.961 - 58.962 (2.3213 - 2.3213) 58.962 - 58.963 (2.3213 - 2.3213) 58.962 - 58.964 (2.3214 - 2.3214) 58.963 - 58.964 (2.3214 - 2.3214) 58.964 - 58.965 (2.3214 - 2.3215) 58.965 - 58.966 (2.3215 - 2.3215)
Difference in inner diameter	between cyling	ders Standard	Grade No. 4 Grade No. 7	58.966 - 58.967 (2.3215 - 2.3215) 58.967 - 58.968 (2.3215 - 2.3216) Less than 0.03 (0.0012)
*·Always check with the Parts	Department fo	or the latest parts inform	nation	
				Unit: mm (in)
		H		-
				2BIC0188E
		Grade*		Dimension
Piston skirt diameter "A" Standard		Grade No. 2		88.990 - 89.000 (3.5035 - 3.5039)
		Grade No. 3		89.000 - 89.010 (3.5039 - 3.5043)

	Grade No. 3	89.000 - 89.010 (3.5039 - 3.5043)	
Piston height "H" dimension		42.98 (1.692)	N
Diston nin hala diamatar	Grade No. 0	19.993 - 19.999 (0.7871 - 0.7874)	
Piston pin hole diameter	Grade No. 1	19.999 - 20.005 (0.7874 - 0.7876)	0
Diatan ta avlindar hara algaranga	Standard	0.010 - 0.030 (0.0004 - 0.0012)	
FISION to cylinder bore clearance	Limit	0.08 (0.0031)	
* Always also also with the Deute Deventure	and fourth a late at words information		P

*: Always check with the Parts Department for the latest parts information

Piston Ring

Items	Standard	Limit

< SERVICE DATA AND SPECIFICATIONS (SDS)

	Тор	0.045 - 0.080 (0.0018 - 0.0031)	0.11 (0.0043)
Side clearance	2nd	0.030 - 0.070 (0.0012 - 0.0028)	0.10 (0.0039)
	Oil ring (rail ring)	0.065 - 0.135 (0.0026 - 0.0053)	_
	Тор	0.21- 0.31 (0.0083 - 0.0122)	0.54 (0.0213)
End gap	2nd	0.32 - 0.47 (0.0126 - 0.0185)	0.65 (0.0256)
	Oil ring (rail ring)	0.20 - 0.60 (0.0079 - 0.0236)	0.95 (0.0374)

Piston Pin

Unit: mm (in)

Unit: mm (in)

[QR25DE]

	Grade*	Dimension
Piston pin outer diameter	Grade No. 0	19.989 - 19.995 (0.7870 - 0.7872)
	Grade No. 1	19.995 - 20.001 (0.7872 - 0.7874)
Piston to piston pin oil clearance	Standard	0.002 - 0.006 (0.0001 - 0.0002)
Connecting rod bushing oil clearance	Standard	0.005 - 0.017 (0.0002 - 0.0007)

*: Always check with the Parts Department for the latest parts information

CONNECTING ROD

Items	Grade ¹	
Center distance		143.00 - 143.10 (5.630 - 5.634)
Bend [per 100 (3.94)]	Limit	0.15 (0.0059)
Torsion [per 100 (3.94)]	Limit	0.30 (0.0118)
Occurrent in a set bucking in an diameter?	Grade No. 0	20.000 - 20.006 (0.7874 - 0.7876)
Connecting rod busning inner diameter-	Grade No. 1	20.006 - 20.012 (0.7876 - 0.7879)
Side clearance	Standard	0.20 - 0.35 (0.0079 - 0.0138)
Side clearance	Limit	0.50 (0.0197)
Connecting rod big end diameter	Grade No. 0 Grade No. 1 Grade No. 2 Grade No. 3 Grade No. 3 Grade No. 5 Grade No. 6 Grade No. 7 Grade No. 8 Grade No. 9 Grade No. A Grade No. B Grade No. B Grade No. C	48.000 - 48.001 (1.8898 - 1.8898) 48.001 - 48.002 (1.8898 - 1.8898) 48.002 - 48.003 (1.8898 - 1.8899) 48.003 - 48.004 (1.8899 - 1.8899) 48.004 - 48.005 (1.8899 - 1.8900) 48.005 - 48.006 (1.8900 - 1.8900) 48.006 - 48.007 (1.8900 - 1.8900) 48.007 - 48.008 (1.8900 - 1.8901) 48.008 - 48.009 (1.8901 - 1.8901) 48.009 - 48.010 (1.8901 - 1.8902) 48.010 - 48.011 (1.8902 - 1.8902) 48.011 - 48.012 (1.8902 - 1.8903)

¹: Always check with the Parts Department for the latest parts information

²: After installing in connecting rod

CRANKSHAFT

Revision: August 2010

< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE] Unit: mm (in)



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< SERVICE DATA AND SPECIFICATIONS (SDS)

[QR25DE]

	Grade ²	Dimension
	Grade No. A Grade No. B	44.974 - 44.973 (1.7706 - 1.7706) 44.973 - 44.972 (1.7706 - 1.7705)
	Grade No. C	44.972 - 44.971 (1.7705 - 1.7705)
	Grade No. D	44.971 - 44.970 (1.7705 - 1.7705)
	Grade No. E	44.970 - 44.969 (1.7705 - 1.7704)
	Grade No. F	44,969 - 44,968 (1,7704 - 1,7704)
	Grade No. G	44.968 - 44.967 (1.7704 - 1.7704)
	Grade No. H	44.967 - 44.966 (1.7704 - 1.7703)
Pin journal diameter grade. "DP"	Grade No. J	44.966 - 44.965 (1.7703 - 1.7703)
	Grade No. K	44.965 - 44.964 (1.7703 - 1.7702)
	Grade No. L	44.964 - 44.963 (1.7702 - 1.7702)
	Grade No. M	44.963 - 44.962 (1.7702 - 1.7702)
	Grade No. N	44.962 - 44.961 (1.7702 - 1.7701)
	Grade No. P	44.961 - 44.960 (1.7701 - 1.7701)
	Grade No. R	44.960 - 44.959 (1.7701 - 1.7700)
	Grade No. S	44.959 - 44.958 (1.7700 - 1.7700)
	Grade No. T	44.958 - 44.957 (1.7700 - 1.7700)
	Grade No. U	44.957 - 44.956 (1.7700 - 1.7699)
	Grade No. A	54.979 - 54.978 (2.1645 - 2.1645)
	Grade No. B	54.978 - 54.977 (2.1645 - 2.1644)
	Grade No. C	54.977 - 54.976 (2.1644 - 2.1644)
	Grade No. D	54.976 - 54.975 (2.1644 - 2.1644)
	Grade No. E	54.975 - 54.974 (2.1644 - 2.1643)
	Grade No. F	54.974 - 54.973 (2.1643 - 2.1643)
	Grade No. G	54.973 - 54.972 (2.1643 - 2.1642)
	Grade No. H	54.972 - 54.971 (2.1642 - 2.1642)
	Grade No. J	54.971 - 54.970 (2.1642 - 2.1642)
	Grade No. K	54.970 - 54.969 (2.1642 - 2.1641)
	Grade No. L	54.969 - 54.968 (2.1641 - 2.1641)
Main journal diamator grada "Dm"	Grade No. M	54.968 - 54.967 (2.1641 - 2.1641)
Main journal diameter grade. Din	Grade No. N	54.967 - 54.966 (2.1641 - 2.1640)
	Grade No. P	54.966 - 54.965 (2.1640 - 2.1640)
	Grade No. R	54.965 - 54.964 (2.1640 - 2.1639)
	Grade No. S	54.964 - 54.963 (2.1639 - 2.1639)
	Grade No. T	54.963 - 54.962 (2.1639 - 2.1639)
	Grade No. U	54.962 - 54.961 (2.1639 - 2.1638)
	Grade No. V	54.961 - 54.960 (2.1638 - 2.1638)
	Grade No. W	54.960 - 54.959 (2.1638 - 2.1637)
	Grade No. X	54.959 - 54.958 (2.1637 - 2.1637)
	Grade No. Y	54.958 - 54.957 (2.1637 - 2.1637)
	Grade No. 4	54.957 - 54.956 (2.1637 - 2.1636)
	Grade No. 7	54.956 - 54.955 (2.1636 - 2.1636)

¹: Total indicator reading

²: Always check with the Parts Department for the latest parts information

MAIN BEARING



< SERVICE DATA AND SPECIFICATIONS (SDS)

0	1.973 - 1.976 (0.0777 - 0.0778)	Black		
1	1.976 - 1.979 (0.0778 - 0.0779)	Brown		A
2	1.979 - 1.982 (0.0779 - 0.0780)	Green		
3	1.982 - 1.985 (0.0780 - 0.0781)	Yellow	Grade and color are the same	EM
4	1.985 - 1.988 (0.0781 - 0.0783)	Blue	for upper and lower bearings.	
5	1.988 - 1.991 (0.0783 - 0.0784)	Pink	-	
6	1.991 - 1.994 (0.0784 - 0.0785)	Purple	-	С
7	1.994 - 1.997 (0.0785 - 0.0786)	White	-	
UPR	1.973 - 1.976 (0.0777 - 0.0778)	Black		D
LWR	1.976 - 1.979 (0.0778 - 0.0779)	Brown	-	D
UPR	1.976 - 1.979 (0.0778 - 0.0779)	Brown	-	
LWR	1.979 - 1.982 (0.0779 - 0.0780)	Green	-	E
UPR	1.979 - 1.982 (0.0779 - 0.0780)	Green	-	
LWR	1.982 - 1.985 (0.0780 - 0.0781)	Yellow	Crade and color are different	E
UPR	1.982 - 1.985 (0.0780 - 0.0781)	Yellow	for upper and lower bearings.	Г
LWR	1.985 - 1.988 (0.0781 - 0.0783)	Blue		
UPR	1.985 - 1.988 (0.0781 - 0.0783)	Blue	-	G
LWR	1.988 - 1.991 (0.0783 - 0.0784)	Pink	-	
UPR	1.988 - 1.991 (0.0783 - 0.0784)	Pink	-	
LWR	1.991 - 1.994 (0.0784 - 0.0785)	Purple	-	Н
UPR	1.991 - 1.994 (0.0784 - 0.0785)	Purple		
LWR	1.994 - 1.997 (0.0785 - 0.0786)	White		
	0 1 2 3 4 5 6 7 UPR	0 1.973 - 1.976 (0.0777 - 0.0778) 1 1.976 - 1.979 (0.0778 - 0.0779) 2 1.979 - 1.982 (0.0779 - 0.0780) 3 1.982 - 1.985 (0.0780 - 0.0781) 4 1.985 - 1.988 (0.0781 - 0.0783) 5 1.988 - 1.991 (0.0783 - 0.0784) 6 1.991 - 1.994 (0.0784 - 0.0785) 7 1.994 - 1.997 (0.0785 - 0.0786) UPR 1.976 - 1.979 (0.0778 - 0.0779) LWR 1.976 - 1.979 (0.0778 - 0.0779) UPR 1.979 - 1.982 (0.0779 - 0.0780) UPR 1.982 - 1.985 (0.0780 - 0.0781) UPR 1.982 - 1.985 (0.0780 - 0.0781) UPR 1.985 - 1.988 (0.0781 - 0.0783) UPR 1.985 - 1.988 (0.0781 - 0.0783) UPR 1.985 - 1.991 (0.0783 - 0.0784) UPR 1.988 - 1.991 (0.0783 - 0.0784) UPR 1.988 - 1.991 (0.0784 - 0.0785) UPR 1.991 - 1.994 (0.0784 - 0.0785) UPR 1.991 - 1.994 (0.0784 - 0.0785)	0 1.973 - 1.976 (0.0777 - 0.0778) Black 1 1.976 - 1.979 (0.0778 - 0.0779) Brown 2 1.979 - 1.982 (0.0779 - 0.0780) Green 3 1.982 - 1.985 (0.0780 - 0.0781) Yellow 4 1.985 - 1.988 (0.0781 - 0.0783) Blue 5 1.988 - 1.991 (0.0783 - 0.0784) Pink 6 1.991 - 1.994 (0.0784 - 0.0785) Purple 7 1.994 - 1.997 (0.0785 - 0.0786) White UPR 1.976 - 1.979 (0.0778 - 0.0779) Black LWR 1.976 - 1.979 (0.0778 - 0.0779) Brown UPR 1.976 - 1.979 (0.0778 - 0.0779) Brown UPR 1.976 - 1.979 (0.0778 - 0.0779) Brown UPR 1.976 - 1.979 (0.0778 - 0.0779) Brown UVR 1.979 - 1.982 (0.0779 - 0.0780) Green UVR 1.982 - 1.985 (0.0780 - 0.0781) Yellow UPR 1.982 - 1.985 (0.0780 - 0.0781) Yellow UPR 1.985 - 1.988 (0.0781 - 0.0783) Blue UPR 1.985 - 1.988 (0.0781 - 0.0783) Blue UPR 1.	0 1.973 - 1.976 (0.0777 - 0.0778) Black 1 1.976 - 1.979 (0.0778 - 0.0779) Brown 2 1.979 - 1.982 (0.0779 - 0.0780) Green 3 1.982 - 1.985 (0.0780 - 0.0781) Yellow 4 1.985 - 1.988 (0.0781 - 0.0783) Blue 5 1.988 - 1.991 (0.0783 - 0.0784) Pink 6 1.991 - 1.994 (0.0784 - 0.0785) Purple 7 1.994 - 1.997 (0.0785 - 0.0786) White UPR 1.976 - 1.979 (0.0778 - 0.0779) Black LWR 1.976 - 1.979 (0.0778 - 0.0779) Brown UPR 1.976 - 1.979 (0.0778 - 0.0779) Brown UPR 1.976 - 1.979 (0.0778 - 0.0779) Brown UPR 1.979 - 1.982 (0.0779 - 0.0780) Green UPR 1.979 - 1.982 (0.0779 - 0.0780) Green UPR 1.985 - 1.988 (0.0781 - 0.0783) Blue UPR 1.985

*: Always check with the Parts Department for the latest parts information

Undersize

		Unit: mm (in)	J
Item	Thickness	Main journal diameter	
US 0.25 (0.0098)	2.106 - 2.114 (0.0829 - 0.0832)	Grind so that bearing clearance is the specified value.	K

Bearing Oil Clearance

			Unit: mm (in)	
	Standard	No. 1, 3 and 5	0.028 - 0.042 (0.0011 - 0.0017)	L
Main bearing oil clearance	Stanuaru	No. 2 and 4	0.041 - 0.056 (0.0016 - 0.0022)	
	Limit		0.1 (0.004)	M

CONNECTING ROD BEARING

Grade number*	Thickness mm (in)	Identification color	Ν
0	1.493 - 1.496 (0.0588 - 0.0589)	Black	
1	1.496 - 1.499 (0.0589 - 0.0590)	Brown	0
2	1.499 - 1.502 (0.0590 - 0.0591)	Green	0
3	1.502 - 1.505 (0.0591 - 0.0593)	Yellow	
4	1.505 - 1.508 (00.593 - 0.0594)	Blue	Ρ

*: Always check with the Parts Department for the latest parts information

Undersize

Unit: mm (in)

J

[QR25DE]

Item	Thickness	Crank pin journal diameter	
US 0.25 (0.0098)	1.624 - 1.632 (0.0639 - 0.0643)	Grind so that bearing clearance is the specified value.	

< SERVICE DATA AND SPECIFICATIONS (SDS)

Bearing Oil Clearance

[QR25DE]

Connecting rod bearing oil clearance	Standard	0.035 - 0.045 (0.0014 - 0.0018)
	Limit	0.10 (0.0039)