

# MITSUBISHI

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## Service Manual Supplement

# 4G6 DOHC ENGINE



**4G63 T/C** (2000cc)  
Lancer Evolution IX

**'05-3**  
**No.1039G71**

# Service Manual

## 4G6 DOHC ENGINE

### FOREWORD

This manual contains information about the 4G6 DOHC engine. It only covers those points that are different from the service manuals listed below. Therefore, this manual should be used in conjunction with the following manuals.

- 4G6 DOHC engine Service Manual (No. 1039G46)
- 4G6 DOHC engine Service Manual Supplement (No.1039G63)

This manual is based on the engine specifications as of March 2005. Please note that some engine details may not match those given in this manual due to subsequent changes in engine specifications. The units shown in this manual are the standard international SI units.

(However, conventional units are used for some figures taken from existing documents)

**If you have any opinions, requests or queries regarding this manual, please write them down on the "Servicing Comment Form" on the last page, and fax them to us.**



March 2005  
Mitsubishi Motor Corporation

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## How to Use this Manual

### Range of description

This manual explains the service procedure for the engine after it has been removed from the vehicle. For information on removing the engine from the vehicle, or "on-vehicle" servicing of the engine, please refer to the separate service manual for the relevant vehicle model.

### Understanding the description

#### Service sequence

- (1) A component diagram is provided at the beginning of each section in order to give the reader a clear understanding of where the various parts are installed.
- (2) The numbers in the component diagram indicate the sequence of the service procedure. Tightening torques are shown and non-reusable parts are indicated where appropriate

**Removal sequence:** The part numbers correspond to the numbers in the component diagram and indicate the removal sequence.

**Installation sequence:** This is only shown if the parts cannot be installed in the reverse order to the removal sequence.

**Disassembly sequence:** The numbers of the part names correspond to the symbols in the component diagram and indicate the disassembly sequence.

**Assembly sequence:** This is only shown if the parts cannot be re-assembled in the reverse order to the disassembly sequence.

#### Types of service points

"Service point" notes are used to give a detailed description of essential maintenance and service points, standard values, procedures for using special tools, and other important information at relevant points in the service sequence. The different types of "service point" are shown on the right-hand side.

- ◀ A ▶ : Indicates that there is a removal or disassembly service point
- ▶ A ◀ : Indicates that there is an installation or assembly service point
- ◀\*1 ▶ : Indicates that the removal or disassembly service point is described in the '01-14G6 DOHC Engine Service Manual.
- ▶\*1 ◀ : Indicates that the installation or assembly service point is described in the '01-14G6 DOHC Engine Service Manual.
- ◀\*2 ▶ : Indicates that the removal or disassembly service point is described in the '03-14G6 DOHC Engine Service Manual.
- ▶\*2 ◀ : Indicates that the installation or assembly service point is described in the '03-14G6 DOHC Engine Service Manual.

#### Symbols for lubricants and sealants

Application points for lubricants and sealants are indicated by special symbols (shown right) on the component parts diagram or on the following page.



..... Grease



..... Sealant or liquid gasket (FIPG)



..... Brake fluid



..... Engine oil

### Inspection

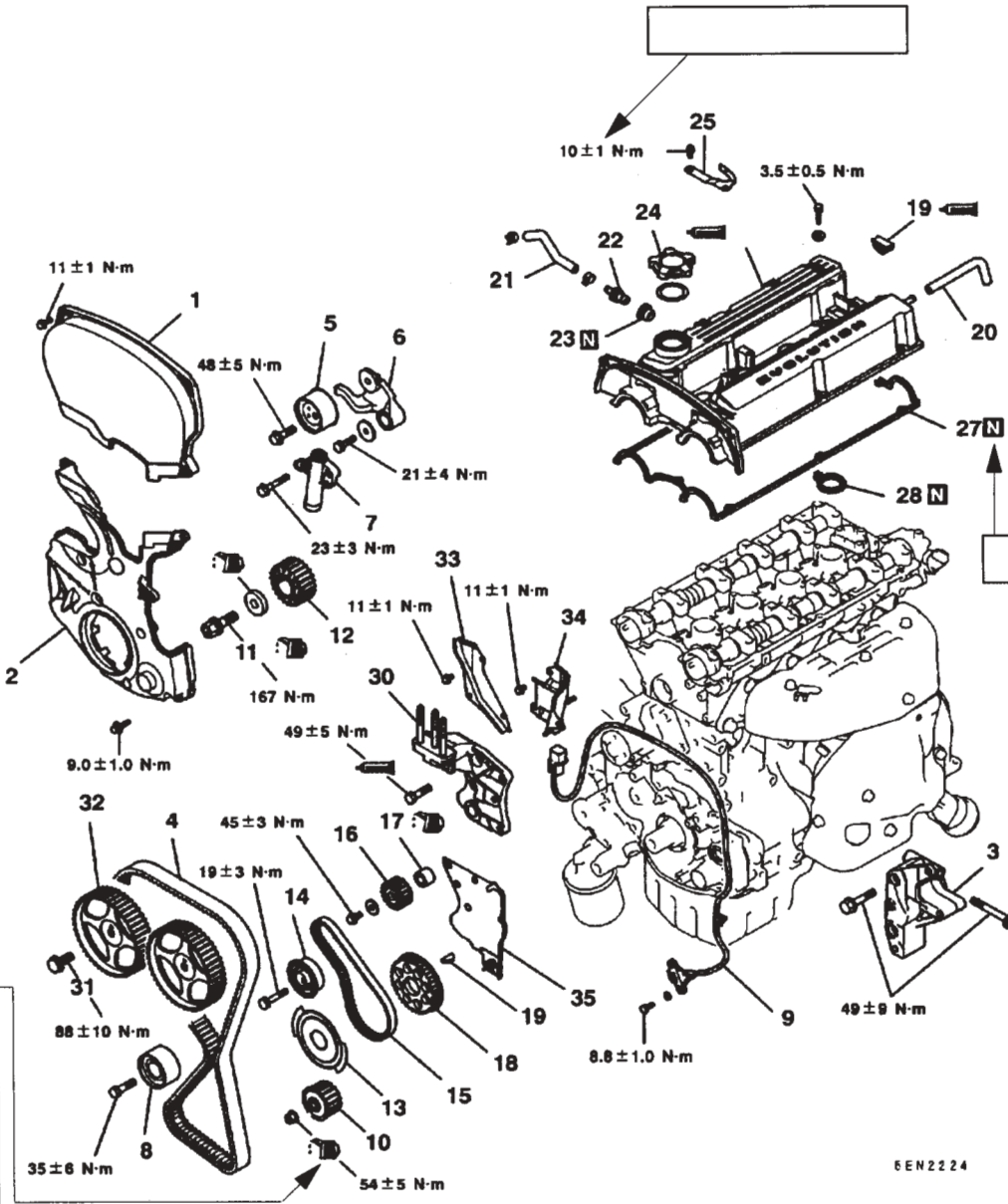
The manual only indicates inspection points where special tools or measuring devices are required. It does not mention general visual checks, part cleaning requirements, and so on, but these must also be carried out as part of the actual service work.

Page number

Engine type

Title

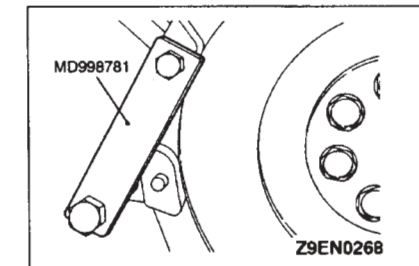
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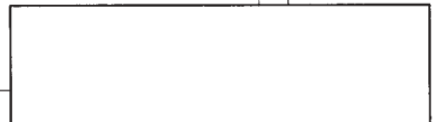
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## General Information

The 4G63 MIVEC T/C engine fitted in the Lancer Evolution IX incorporates the following changes with respect to the previous 4G63 T/C engine.

- Adoption of variable valve timing control system
- Modification to clearance gap in piston No.2 ring coupling
- Addition of air intake temperature sensor
- Addition of boost sensor

## Vehicle Model List

Name	Vehicle model	Engine type	Exhaust capacity cc	Specifications
Lancer Evolution IX	CT9A	4G63-7	1,997	DOHC 16-valve MIVEC – T/C

## Specifications

Item	Specification
Bore x stroke	85 x 88
Total displacement cc	1,997
Combustion chamber shape	Pentroof type
No. of cylinders	4
Valve mechanism	Type DOHC
	Intake valves
	Exhaust valves
	Lash adjuster
	Rocker arm
Compression ratio	8.8
Fuel injection device	Electronically controlled MPI
Ignition device	Electronically controlled two-coil type
Alternator	AC type (with IC regulator)
Starter motor	Deceleration drive

## Servicing Specification Values

Item		Standard value	Limit value
Cylinder head, valves			
Valve spring : free height	mm	50.4	49.4
Valve spring : perpendicularity		2° or less	4°
Pistons, connecting rods			
Piston rings : Clearance between ring and ring groove	No.1	0.03–0.07	0.1
	No.2	0.02–0.06	0.1
Piston rings : Closed gap	No.1	0.20–0.30	0.8
	No.2	0.30–0.45	0.8
	Oil ring	0.10–0.40	1.0

## Tightening Torques

Part	Tightening Torque Nm
<b>Alternator, ignition system</b>	
Oil level gauge guide bolt	13 ± 1
Water pump pulley bolt	8.8 ± 1.0
Auto tension bolt (washer)	44 ± 10
Auto tension bolt (flange)	24 ± 4
Alternator bracket bolt (flange)	24 ± 4
Alternator bracket bolt (washer M8 x 22)	22 ± 4
Alternator bracket bolt (washer M8 x 32)	20 ± 2
Alternator nut	44 ± 10
Crankshaft pulley bolt	25 ± 4
Centre cover bolt	3.0 ± 0.5
Ignition coil bolt	10 ± 2
Spark plug	25 ± 5
<b>Timing belt</b>	
Timing belt cover bolt (flange)	11 ± 1
Timing belt cover bolt (washer)	9.0 ± 1.0
Power steering pump bracket bolt	49 ± 9
Connector bracket bolt	11 ± 1
Locker cover bolt	3.5 ± 0.5
Plug cap	32 ± 2
Tensioner pulley bolt	48 ± 5
Tensioner arm bolt	21 ± 4
Auto tensioner bolt	23 ± 3
Idler pulley bolt	35 ± 6
Crank angle sensor bolt	8.8 ± 1.0
Oil pump sprocket nut	54 ± 5
Crankshaft bolt	167
Tensioner B bolt	19 ± 3
Counterbalance shaft sprocket bolt	45 ± 3
Engine support bracket bolt	49 ± 5
V.V.T. sprocket bolt	65 ± 5
Camshaft sprocket bolt	88 ± 10
<b>Fuel system</b>	
Throttle body bolt	19 ± 3
Cover bolt	12 ± 1
Fuel pressure regulator bolt	8.8 ± 2.0
Delivery pipe and injector bolt	11 ± 1
Vacuum hose and pipe bolt	11 ± 1
Solenoid valve assembly bolt	9.0 ± 1.0
Vacuum tank bracket bolt	9.0 ± 1.0
<b>Secondary air system / Intake manifold</b>	
Exhaust manifold heat protector bolt	20 ± 3
Air pipe assembly	

Part	Tightening Torque
Air pipe assembly bolt (eye bolt)	49 ± 5
Air pipe assembly bolt (M6 flange)	11 ± 1
Air pipe assembly bolt (M8 flange)	24 ± 3
Air pipe assembly bolt (M8 washer)	14 ± 1
Air control valve assembly bolt	22 ± 4
Engine hanger bolt	19 ± 3
Intake air temperature sensor	14 ± 1
Boost sensor bolt	5.0 ± 1.0
Intake manifold stay bolt	31 ± 3
Intake manifold bolt (M8)	20 ± 2
Intake manifold bolt nut (M10)	36 ± 6
<b>Exhaust manifold</b>	
Engine hanger bolt	22 ± 3
Turbocharger heat protector bolt	23 ± 3
Oxygen sensor	44 ± 5
Exhaust fitting bracket bolt	35 ± 6
Exhaust filling bolt nut	59 ± 5
Air outlet fitting bolt	19 ± 1
Oil return pipe bolt (flange)	14 ± 1
Oil return pipe bolt (washer)	9.0 ± 1.0
Turbocharger assembly and pipe assembly bolt, nut	64 ± 5
Oil pipe bolt (M10 eye bolt)	17 ± 2
Oil pipe bolt (M12 eye bolt)	31 ± 2
Oil pipe bolt (M12 flange)	11 ± 1
Water pipe bolt (flange)	10 ± 1
Water pipe bolt (eye bolt)	42 ± 7
Exhaust manifold nut (M8)	33 ± 6
Exhaust manifold nut (M10)	55 ± 10
<b>Water pump / Water hose</b>	
Coolant temperature sensor	29 ± 10
Coolant temperature gauge unit	11 ± 1
Water outlet fitting bolt	10 ± 1
Thermostat housing bolt	23 ± 4
Water inlet pipe bolt (M6)	10 ± 1
Water inlet pipe bolt (M8)	13 ± 2
Water pump bolt	14 ± 1
Knock sensor	23 ± 2
<b>Rocker arm / Camshaft</b>	
Cam position sensor bolt	11 ± 1
Cover bolt	10 ± 2
Cam position sensing cylinder bolt	22 ± 4
Cam position sensor support bolt	14 ± 1
Bearing cap bolt	20 ± 1
Oil delivery body bolt	11 ± 1

Part	Tightening Torque
Oil control pump	11 ± 1
Check valve	30 ± 3
Eye bolt	42 ± 2
Oil pipe	11 ± 1
Oil pipe joint	30 ± 3
<b>Oil pump / Sump</b>	
Drain plug	39 ± 5
Sump bolt	9.0 ± 3.0
Oil screen bolt	19 ± 3
Baffle plate bolt	22 ± 4
Oil pressure switch	10 ± 2
Oil cooler bypass valve	54 ± 5
Relief plug	44 ± 5
Oil filter bracket bolt	19 ± 3
Plug cap	23 ± 3
Flange bolt	36 ± 3
Front case bolt	23 ± 3
Oil pump cover bolt	17 ± 2
Oil pump cover screw	10 ± 2
<b>Piston / Connecting rod</b>	
Connecting rod cap nut	20 ± 2 _ +90° ~94°
<b>Crankshaft / Cylinder block</b>	
Flywheel bolt	132 ± 5
Rear plate bolt	11 ± 1
Bell housing cover bolt (flange)	10 ± 2
Bell housing cover bolt (washer)	9.0 ± 1.0
Rear oil seal case bolt	11 ± 1
Beam bearing cap bolt	25 ± 2 _ +90° ~ 100°
Check valve	32 ± 2
<b>Turbocharger</b>	
Waste gate actuator bolt	12 ± 1

## Sealants

Part	Specified Sealant
Cam position sensor support *	MZ100191 or equivalent

Note : \* indicates point where liquid gasket (FIPG) used

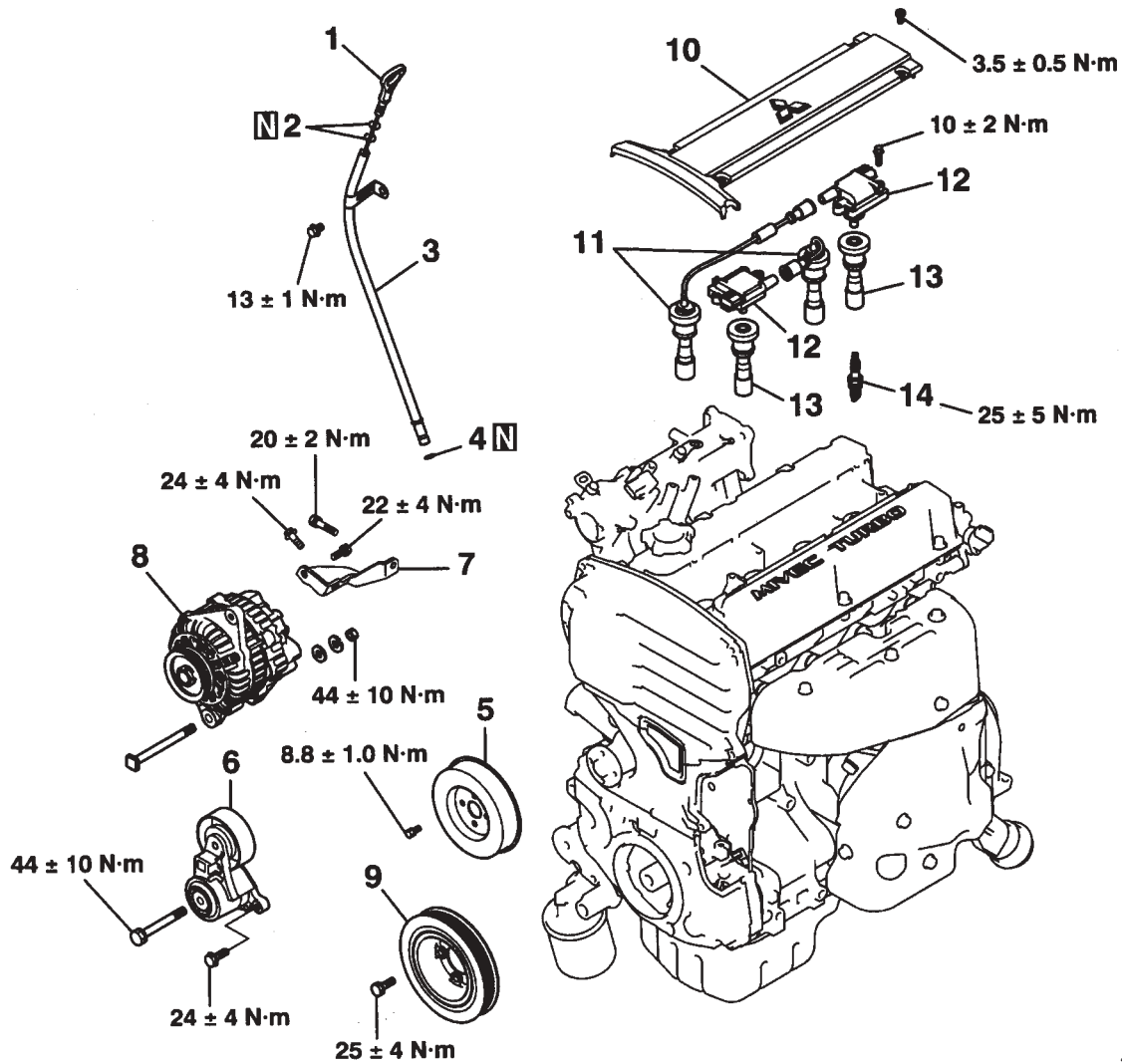


## Alternator / Ignition System

### Removal and Installation

#### Note :

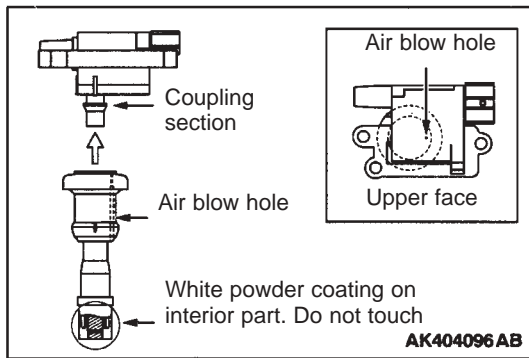
The ignition coil boot must only be removed from the ignition coil when it is to be replaced. If removed, always replace with a new part.



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### Removal sequence

- |                            |                              |
|----------------------------|------------------------------|
| 1. Oil level gauge         | 8. Alternator                |
| 2. O-ring                  | 9. Crankshaft pulley         |
| 3. Oil level gauge guide   | 10. Centre cover             |
| 4. O-ring                  | 11. Spark plug cable         |
| 5. Water pump pulley       | 12. Ignition coil            |
| 6. Auto tensioner assembly | ▶ A ◀ 13. Ignition coil boot |
| 7. Alternator bracket      | 14. Spark plug               |



## Removal Service Point

### ▶ A ◀ Removal of ignition coil boot

#### Note :

- If the ignition coil boot is not installed according to the specifications, then this can lead to various problems, such as malfunction of the ignition coil, damage to the ignition coil, leaking of high voltage to external parts, infiltration of water into the hole, etc.
- The spark plug coupling section of the ignition coil boot is coated with a white powder. This coating helps to prevent the boot from welding to the spark plug, and must not be touched or wiped away.

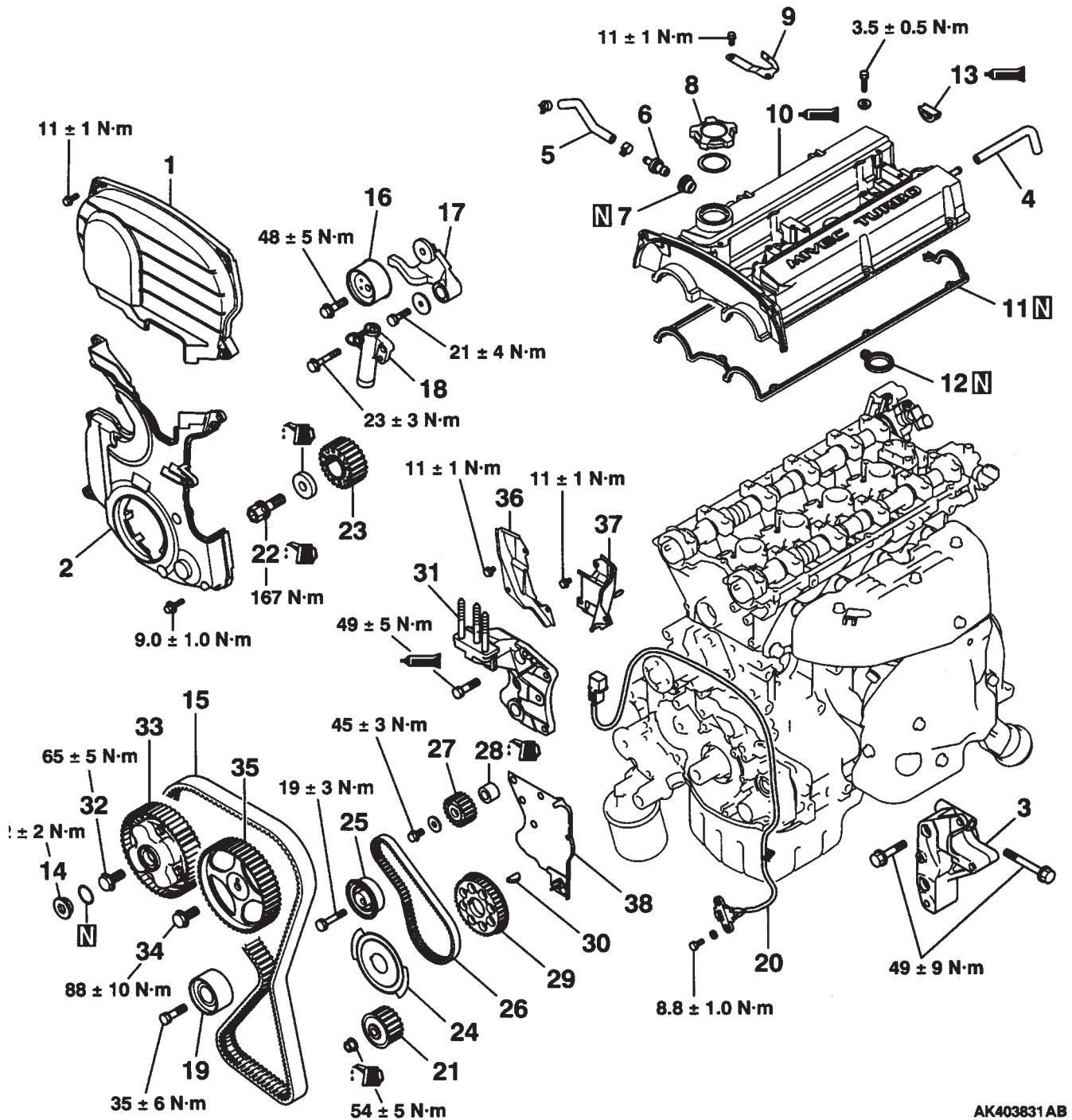
1. Please check that a spring is fitted inside the new ignition coil boot.
2. Press the new ignition coil boot firmly onto the ignition coil, and turn the coupling section 2 or 3 times to seat it correctly in position, ensuring that there are no gaps.
3. After installation, turn the boot until the air blow hole is positioned as shown in the diagram.

## Timing Belt

### Removal and Installation

#### Note :

NEVER disassemble the V.V.T. sprocket.



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### Removal Sequence

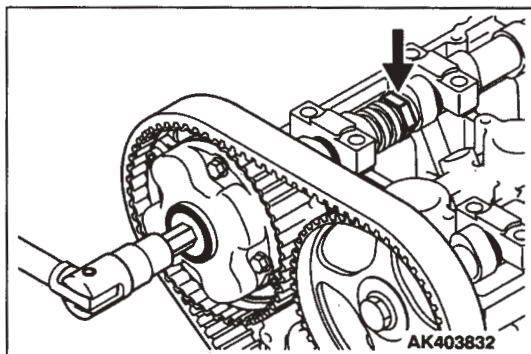
1. Timing belt front upper cover
2. Timing belt front lower cover
3. Power steering pump bracket
4. Breather hose
5. PCV hose
6. PCV valve
7. PCV valve gasket
8. Oil filler cap

- ▶\*1 ◀ 9. Connector bracket
- ▶\*1 ◀ 10. Rocker cover
- ▶\*1 ◀ 11. Rocker cover gasket A
- ▶\*1 ◀ 12. Rocker cover gasket B
- ▶\*1 ◀ 13. Semi-circular packing
- ◀A ▶B ◀ 14. Plug cap
- ◀\*1 ▶\*1 ◀ 15. Timing belt
- ▶\*1 ◀ 16. Tensioner pulley
- ▶\*1 ◀ 17. Tensioner arm
- ▶\*1 ◀ 18. Auto tensioner
- ▶\*1 ◀ 19. Idler pulley
- ▶\*1 ◀ 20. Crank angle sensor
- ◀\*1 ▶\*1 ◀ 21. Oil pump sprocket
- ◀\*1 ▶\*1 ◀ 22. Crankshaft bolt
- ◀\*1 ▶\*1 ◀ 23. Crankshaft sprocket
- ▶\*1 ◀ 24. Crankshaft sensing blade
- ▶\*1 ◀ 25. Tensioner B
- ◀\*1 ▶\*1 ◀ 26. Timing belt B
- ◀\*1 ▶\*1 ◀ 27. Counterbalance shaft sprocket
- ▶\*1 ◀ 28. Spacer
- ◀\*1 ▶\*1 ◀ 29. Crankshaft sprocket B
- ▶\*1 ◀ 30. Crankshaft key
- ▶\*1 ◀ 31. Engine support bracket
- ◀B ▶A ◀ 32. V.V.T. sprocket bolt
- ▶A ◀ 33. V.V.T. sprocket
- ◀\*1 ▶\*1 ◀ 34. Camshaft sprocket bolt
- ▶\*1 ◀ 35. Camshaft sprocket
- ▶\*1 ◀ 36. Timing belt rear right cover
- ▶\*1 ◀ 37. Timing belt rear left upper cover
- ▶\*1 ◀ 38. Timing belt rear left lower cover

### Removal Service Point

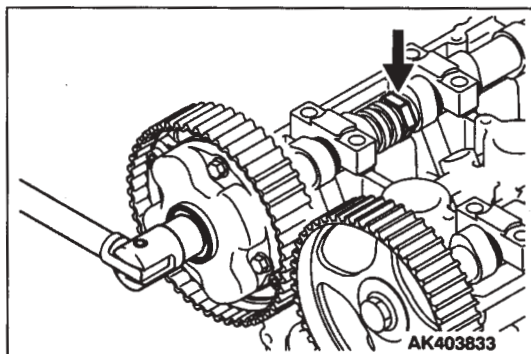
#### ◀A ▶ Removal of plug cap

Hold hexagonal section of camshaft with wrench, and loosen plug cap.



#### ◀B ▶ Removal of V.V.T. sprocket bolt

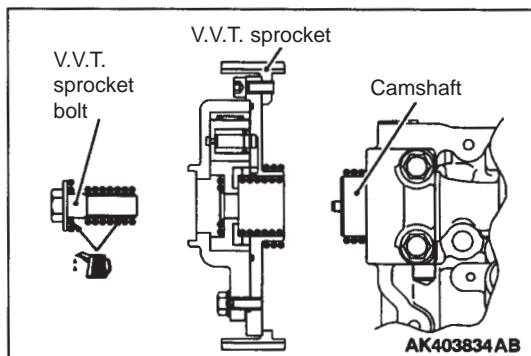
Hold hexagonal section of camshaft with wrench, and loosen V.V.T. sprocket bolt.



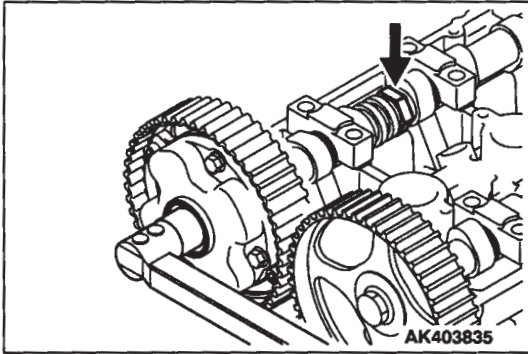
### Installation Service Point

#### ◀A ▶ Installation of V.V.T. sprocket bolt / V.V.T. sprocket

1. Apply the minimum suitable coating of engine oil to the following points:
  - Whole circumference of end of camshaft
  - Inserted part of V.V.T. sprocket (full circumference; inner & outer sides)
  - Bolt seating of V.V.T. sprocket bolt
2. Install the V.V.T. sprocket.



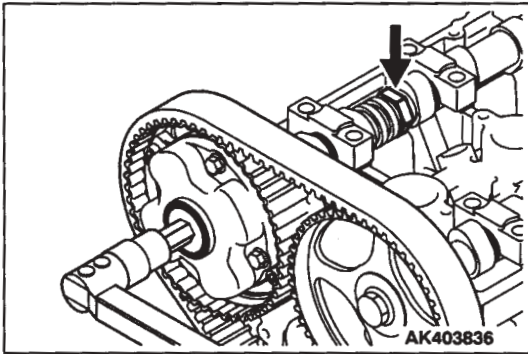
3. Push the V.V.T. sprocket firmly to the end and, holding the hexagonal part of the camshaft with a wrench, check that the V.V.T. sprocket does not rotate.



4. Hold the hexagonal section of the camshaft with a wrench and tighten the V.V.T. sprocket bolt to the specified torque of  $65 \pm 5$  N-m.
5. Hold the hexagonal section of the camshaft with a wrench and check that the V.V.T. sprocket does not rotate.

Note :

This check shows that the V.V.T. sprocket is locked at the maximum delay angle by the interior pin.



#### ►B◄ Installation of plug cap

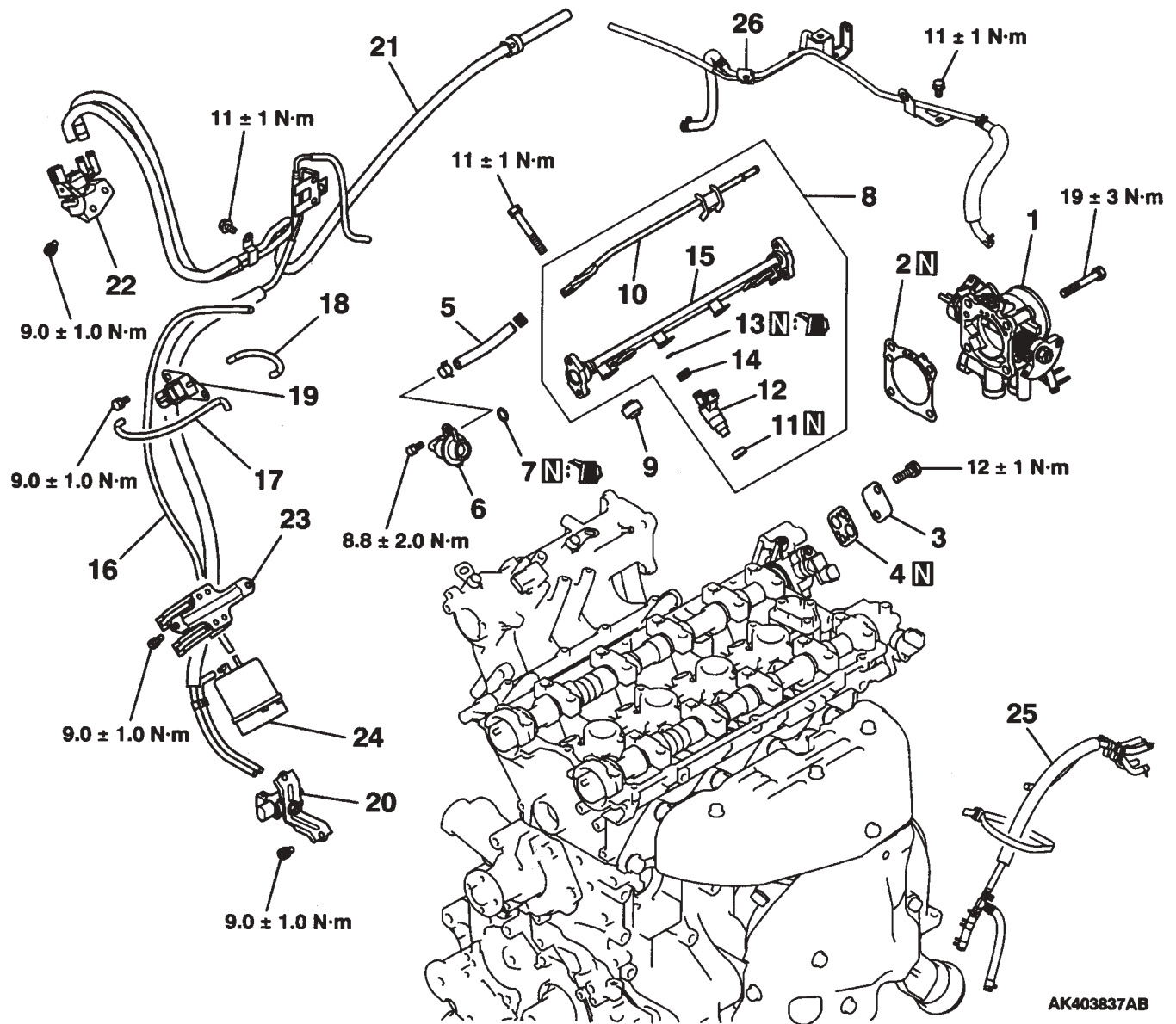
Note :

The washer must not be reused.

1. Install the washer on the plug cap.
2. Hold the hexagonal section of the camshaft with a wrench and tighten the plug cap to the specified torque of  $32 \pm 2$  N-m.

# Fuel System

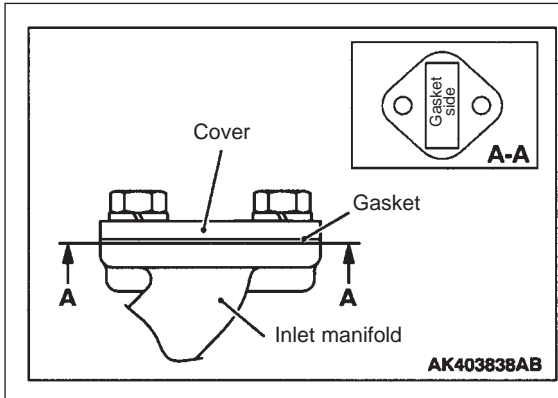
## Removal and Installation



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### Removal Sequence

- |                                 |                             |
|---------------------------------|-----------------------------|
| 1. Throttle body assembly       | 14. Grommet                 |
| ▶*1◀ 2. Throttle body gasket    | 15. Delivery pipe           |
| ▶A◀ 3. Cover                    | 16. Vacuum hose             |
| 4. Gasket                       | 17. Vacuum hose             |
| 5. Fuel hose                    | 18. Vacuum hose             |
| ▶*1◀ 6. Fuel pressure regulator | 19. Solenoid valve assembly |
| 7. O ring                       | 20. Solenoid valve assembly |
| 8. Delivery pipe and injector   | 21. Vacuum hose and pipe    |
| 9. Insulator                    | 22. Solenoid valve assembly |
| 10. Fuel return pipe            | 23. Vacuum tank bracket     |
| 11. Insulator                   | 24. Vacuum tank             |
| ▶*1◀ 12. Injector               | 25. Vacuum hose assembly    |
| 13. O ring                      | 26. Vacuum hose and pipe    |



## Installation Service Point

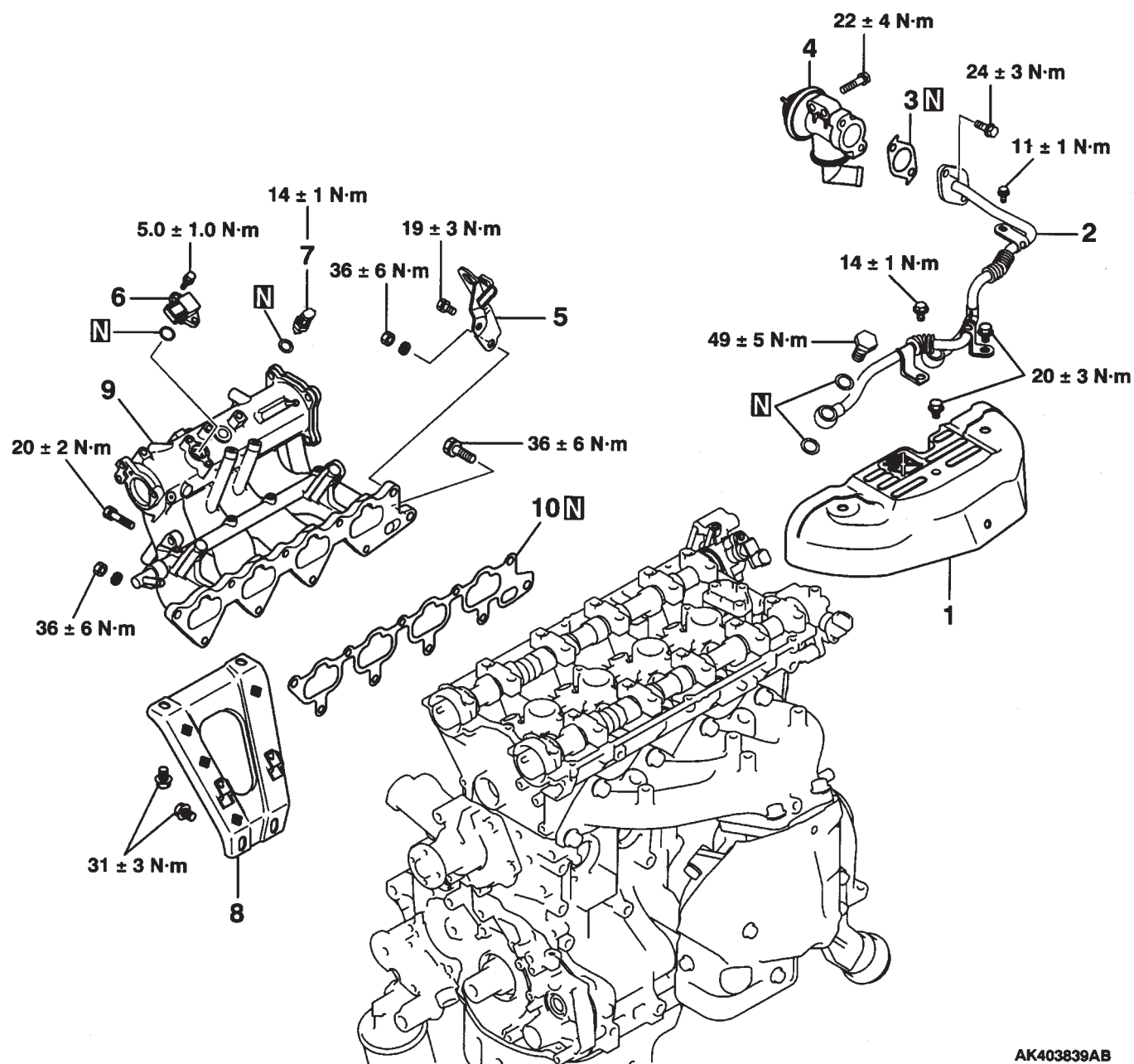
### ▶ A ◀ Installation of cover

The side of the cover marked "gasket side" should be assembled facing the inlet manifold.



## Secondary Air System / Inlet Manifold

### Removal and Installation



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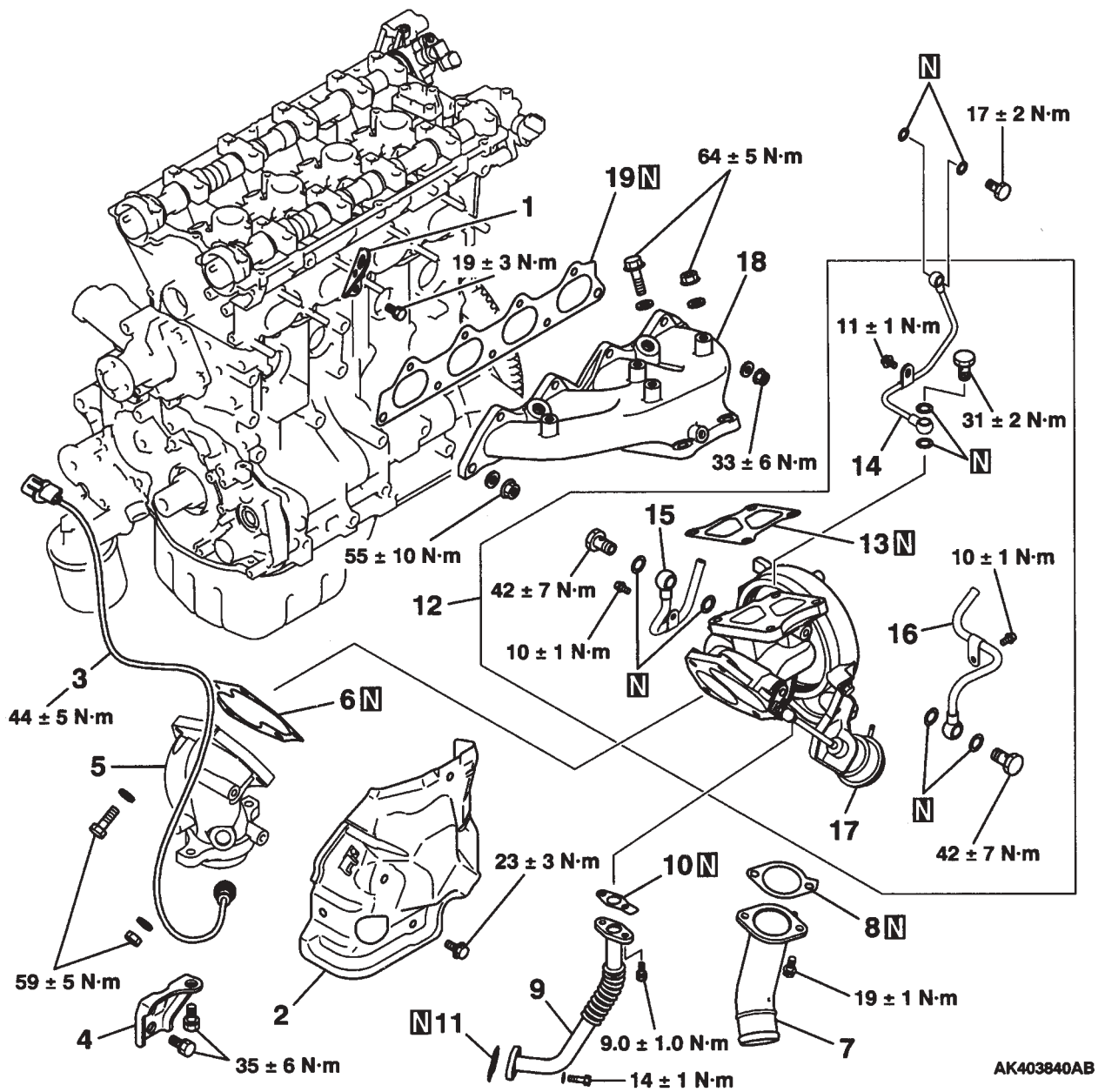
### Removal Sequence

- |       |                                    |       |                                  |
|-------|------------------------------------|-------|----------------------------------|
| ▶*1 ◀ | 1. Exhaust manifold heat protector | ▶*1 ◀ | 6. Intake air temperature sensor |
| ▶*1 ◀ | 2. Air pipe assembly               | ▶*1 ◀ | 7. Boost sensor                  |
|       | 3. Air control valve gasket        | ▶*1 ◀ | 8. Inlet manifold stay           |
|       | 4. Air control valve assembly      |       | 9. Inlet manifold                |
|       | 5. Engine hanger                   |       | 10. Inlet manifold gasket        |



## Exhaust Manifold

## Removal and Installation



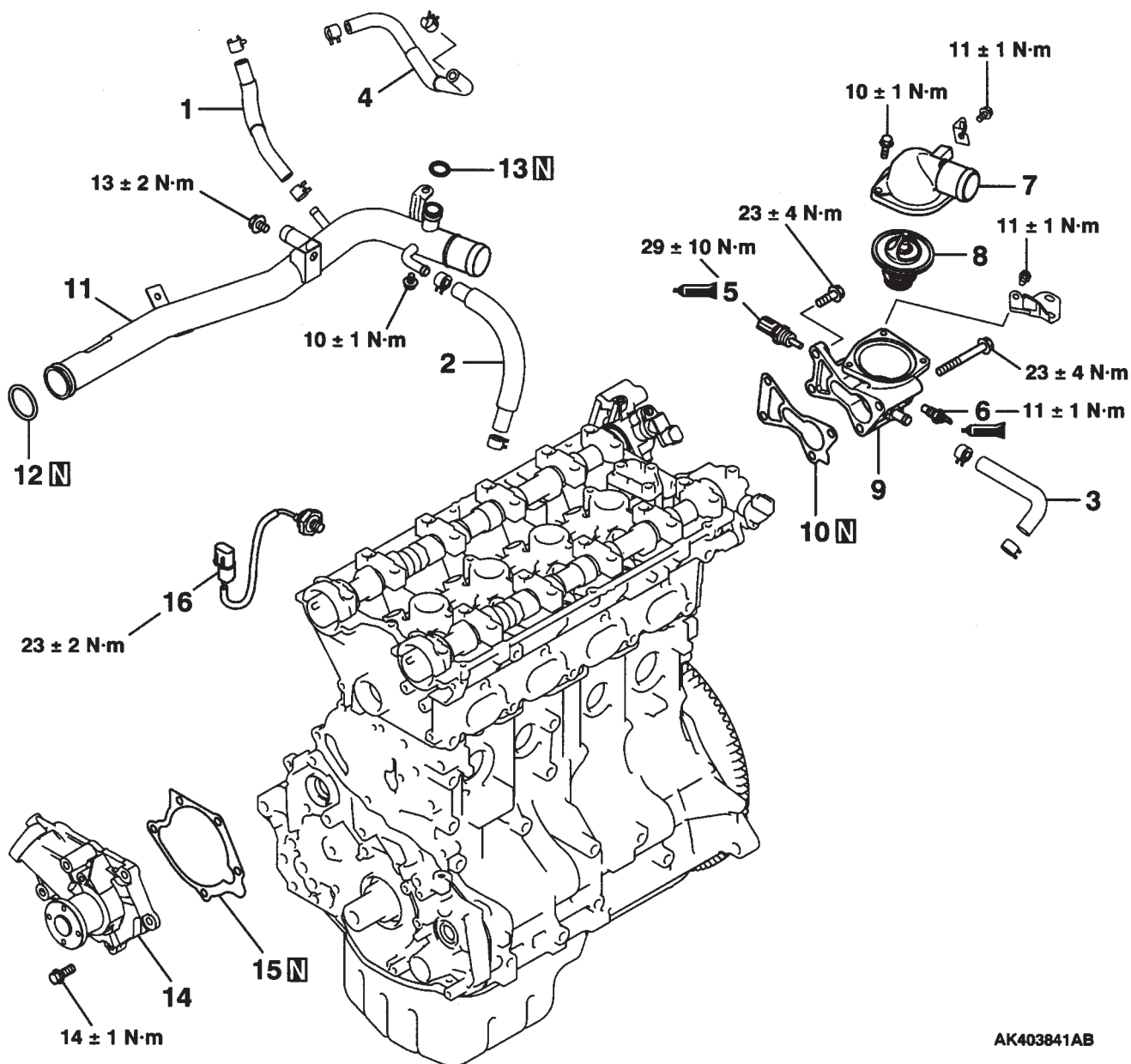
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## Removal Sequence

- |                                   |   |
|-----------------------------------|---|
| 1. Engine hanger                  | 10. Oil return pipe gasket                |
| 2. Turbocharger heat protector    | ▶*1◀ 11. Oil return pipe gasket           |
| 3. Oxygen sensor                  | 12. Turbocharger assembly & pipe assembly |
| 4. Exhaust fitting bracket        | 13. Turbocharger gasket                   |
| 5. Exhaust fitting                | 14. Oil pump                              |
| 6. Exhaust fitting gasket         | 15. Water pipe B                          |
| 7. Air outlet fitting             | 16. Water pipe A                          |
| ▶*1◀ 8. Air outlet fitting gasket | 17. Turbocharger assembly                 |
| 9. Oil return pipe                | ▶*1◀ 18. Exhaust manifold                 |
|                                   | 19. Exhaust manifold gasket               |

## Water Pump / Water Hose

## Removal and Installation



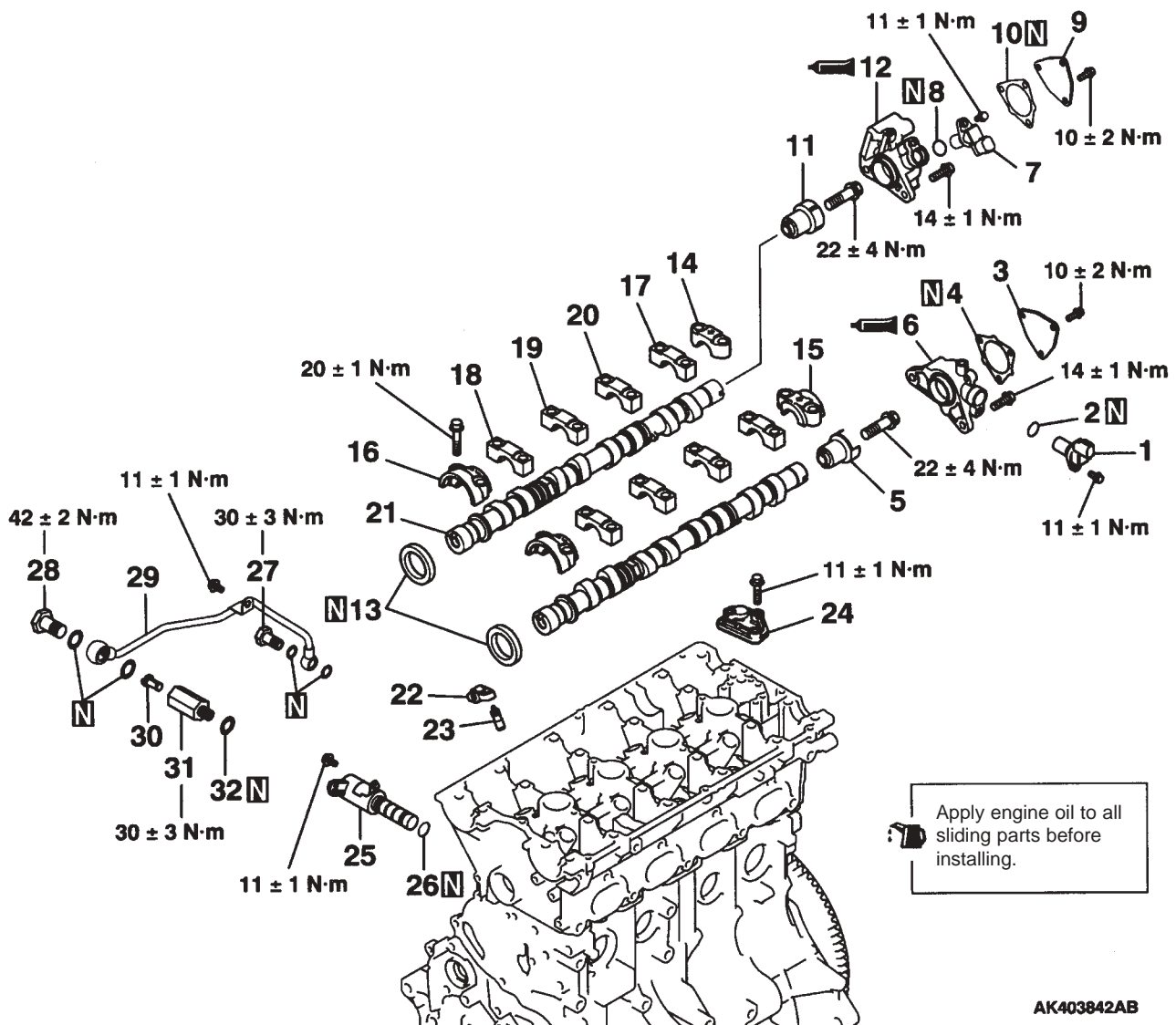
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## Removal Sequence

- |      |                                   |      |                       |
|------|-----------------------------------|------|-----------------------|
| 1.   | Water hose                        | 9.   | Thermostat housing    |
| 2.   | Water hose                        | 10.  | Gasket                |
| 3.   | Water hose                        | ▶*1◀ | 11. Water inlet pipe  |
| 4.   | Water hose                        | ▶*1◀ | 12. O-ring            |
| ▶*1◀ | 5. Coolant temperature sensor     |      | 13. O-ring            |
| ▶*1◀ | 6. Coolant temperature gauge unit |      | 14. Water pump        |
|      | 7. Water outlet fitting           |      | 15. Water pump gasket |
|      | 8. Thermostat                     |      | 16. Knock sensor      |

## Rocker Arm / Camshaft

## Removal and Installation



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## Removal Sequence

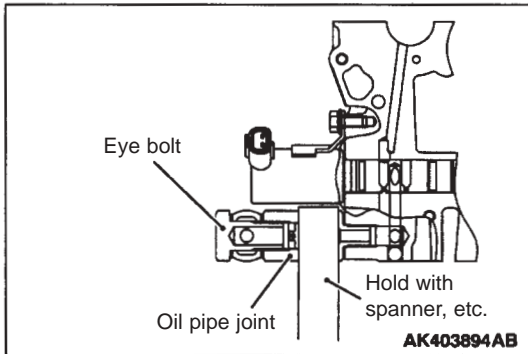
- |      |                                   |          |                             |
|------|-----------------------------------|----------|-----------------------------|
| ▶E◀  | 1. Cam position sensor            | ▶*1◀     | 17. Bearing cap No. 5       |
| ▶E◀  | 2. O ring                         | ▶*1◀     | 18. Bearing cap No. 2       |
| ▶E◀  | 3. Cover                          | ▶*1◀     | 19. Bearing cap No. 3       |
| ▶D◀  | 4. Gasket                         | ▶*1◀     | 20. Bearing cap No. 4       |
| ▶C◀  | 5. Cam position sensing cylinder  | ▶*1◀     | 21. Camshaft                |
|      | 6. Cam position sensor support    |          | 22. Rocker arm              |
|      | 7. Cam position sensor            | ◀*1▶▶*1◀ | 23. Lash adjuster           |
|      | 8. O ring                         |          | 24. Oil delivery body       |
| ▶E◀  | 9. Cover                          |          | 25. Oil control valve (OCV) |
| ▶E◀  | 10. Gasket                        |          | 26. O ring                  |
| ▶D◀  | 11. Cam position sensing cylinder |          | 27. Check valve             |
| ▶C◀  | 12. Cam position sensor support   | ▶B◀      | 28. Eye bolt                |
| ▶*1◀ | 13. Camshaft oil seal             | ▶A◀      | 29. Oil pump                |
| ▶*1◀ | 14. Bearing cap : rear right      |          | 30. OCV filter              |
| ▶*1◀ | 15. Bearing cap : rear left       |          | 31. Oil pump joint          |
| ▶*1◀ | 16. Bearing cap : front           |          | 32. Gasket                  |

## Installation Service Point

### ▶ A ◀ Installation of OCV filter

Note :

Before fitting the filter, check that it is clean and is not damaged or deformed in any way.



### ▶ B ◀ Installation of eye bolt

Note :

The oil pump may be damaged if the oil pipe joint turns with the eye bolt when it is fitted.

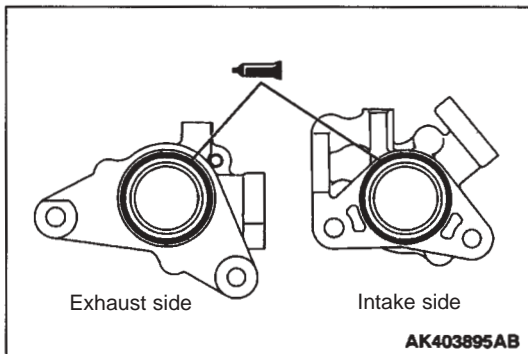
Hold the oil pipe joint in place with a spanner, etc., and then tighten the eye bolt to the specified torque  $42 \pm 2$  N-m.

### ▶ C ◀ Installation of cam position sensor support

1. Wipe away all traces of the old liquid gasket left on the cam position sensor support and the cylinder head.
2. Apply a 3 mm-thick coat of the liquid gasket to the parts of the cam position sensor support indicated on the diagram.

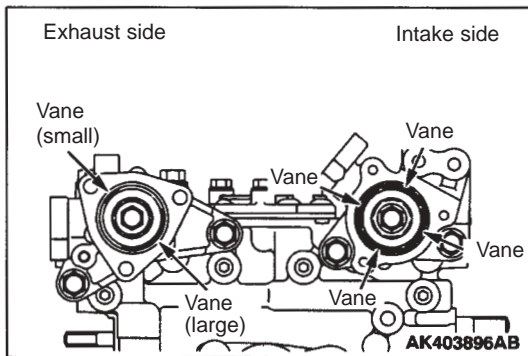
Liquid Gasket

Product name : MZ100191 or equivalent



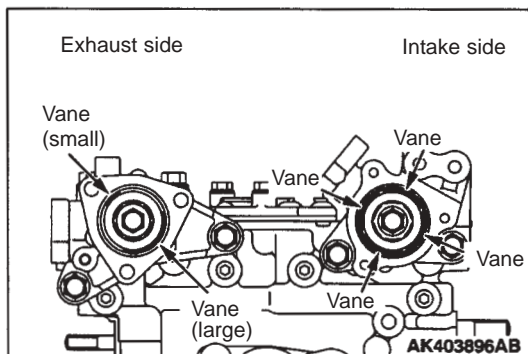
### ▶ D ◀ Installation of cam position sensing cylinder

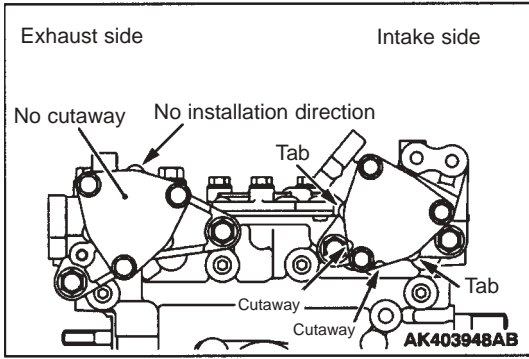
1. Set the camshaft to the top dead centre for No.1.
2. Install the various vanes of the cam position sensing cylinder at the positions indicated on the diagram.



### ▶ E ◀ Installation of cover / gasket

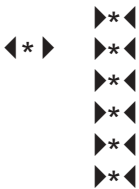
1. Before installing the cover and gasket, put the camshaft to the No.1 top dead centre position, and check that the vanes of the respective sensing cylinders are located in the positions shown in the diagram.





2. Ensure that the cutaways in the intake side cover and the tabs on the gasket are aligned with the positions shown in the diagram, and tighten at the specified torque of  $14 \pm 1$  N-m. The exhaust side cover and gasket do not have a specified installation direction.

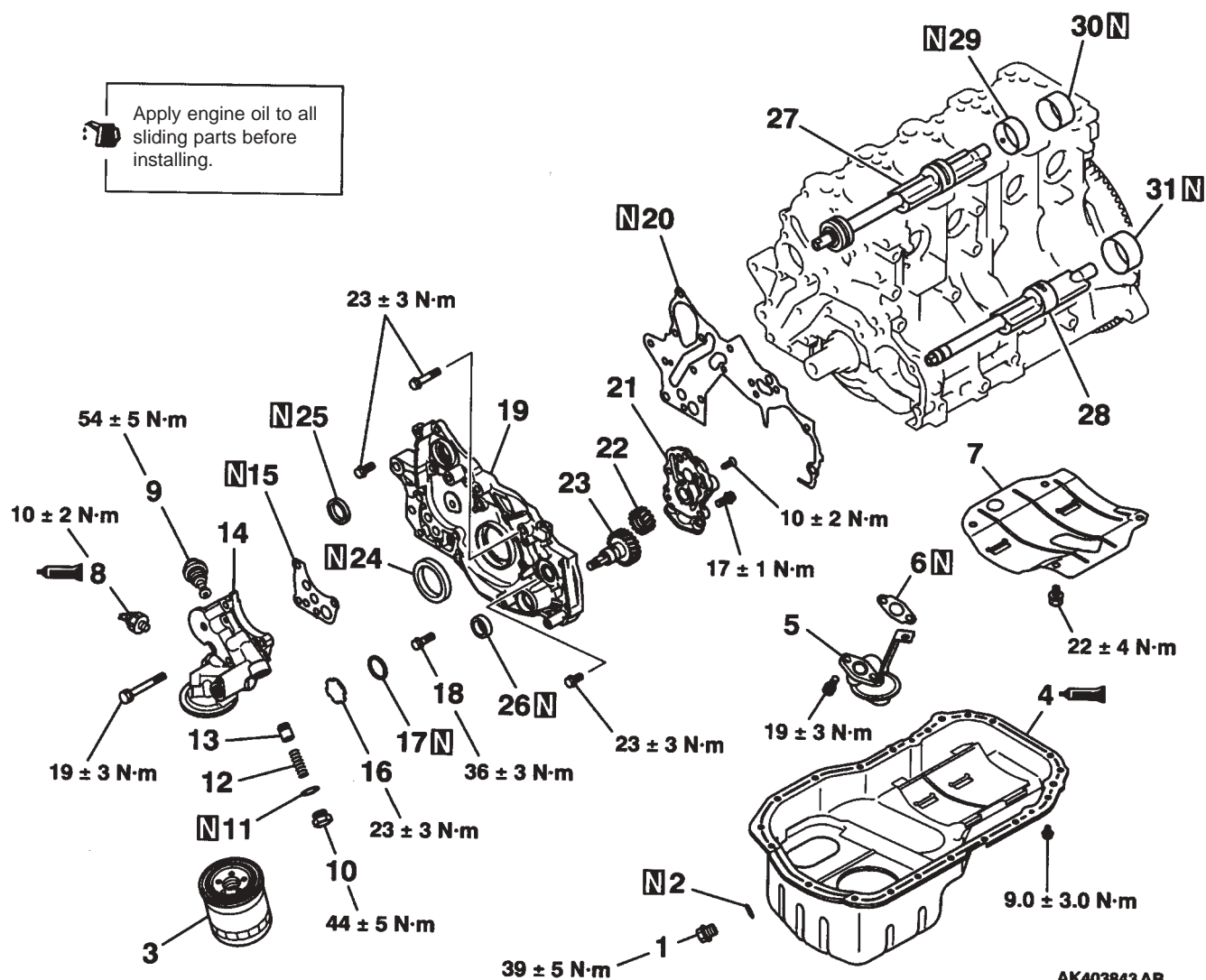
Comment :  
The cover and gasket do not have distinct front and rear sides.



# Oil Pump / Oil Pan

## Removal and Installation

Apply engine oil to all sliding parts before installing.



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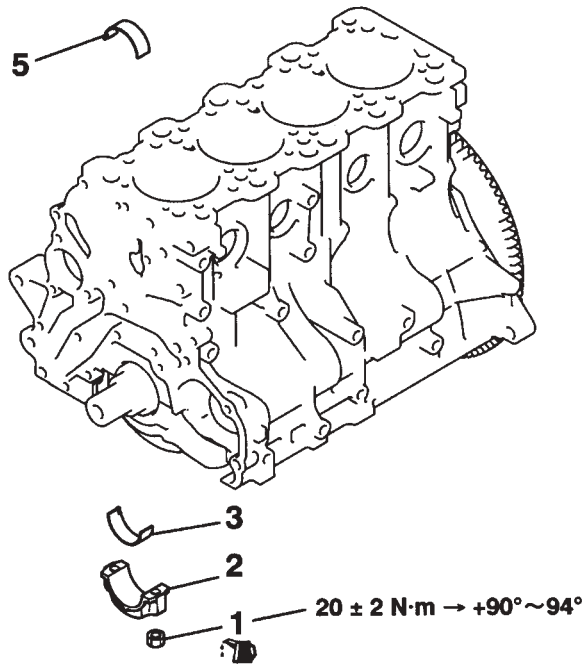
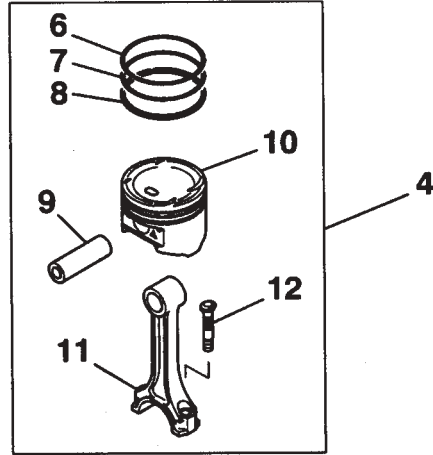
## Removal Sequence

- |            |                               |            |  |
|------------|-------------------------------|------------|--|
| ▶*1 ◀      | 1. Drain plug                 | ◀*1 ▶▶*1 ◀ | 18. Flange bolt                              |
| ▶*1 ◀      | 2. Drain plug gasket          | ▶*1 ◀      | 19. Oil pump case                            |
| ▶*1 ◀      | 3. Oil filter                 | ▶*1 ◀      | 20. Oil pump case gasket                     |
| ◀*1 ▶▶*1 ◀ | 4. Oil pan                    | ▶*1 ◀      | 21. Oil pump cover                           |
|            | 5. Oil screen                 | ▶*1 ◀      | 22. Oil pump driven gear                     |
|            | 6. Oil screen gasket          | ▶*1 ◀      | 23. Oil pump drive gear                      |
|            | 7. Baffle plate               | ▶*1 ◀      | 24. Crankshaft front oil seal                |
| ▶*1 ◀      | 8. Oil pressure switch        | ▶*1 ◀      | 25. Counterbalance shaft oil seal            |
|            | 9. Oil cooler bypass valve    | ▶*1 ◀      | 26. Oil pump oil seal                        |
|            | 10. Relief plug               | ◀*1 ▶▶*1 ◀ | 27. Counterbalance shaft, right              |
|            | 11. Gasket                    | ◀*1 ▶▶*1 ◀ | 28. Counterbalance shaft, left               |
|            | 12. Relief spring             | ◀*1 ▶▶*1 ◀ | 29. Counterbalance shaft front bearing       |
|            | 13. Relief plunger            | ◀*1 ▶▶*1 ◀ | 30. Counterbalance shaft rear bearing, right |
|            | 14. Oil filter bracket        | ◀*1 ▶▶*1 ◀ | 31. Counterbalance shaft rear bearing, left  |
| ◀*1 ▶▶*1 ◀ | 15. Oil filter bracket gasket |            |  |
|            | 16. Plug cap                  |            |  |
|            | 17. O ring                    |            |  |

Piston / Connecting Rod

Removal and Installation

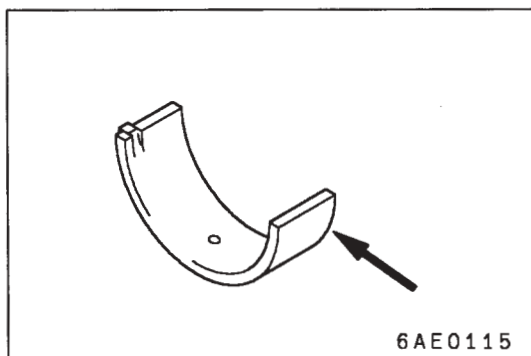
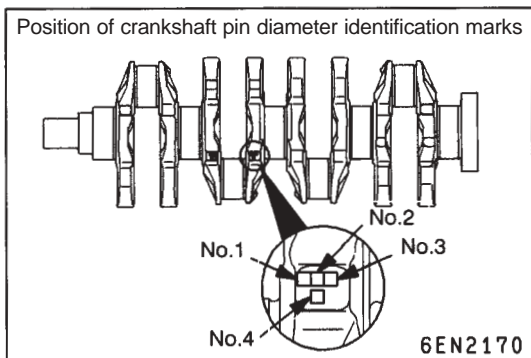
Apply engine oil to all sliding parts before installing.



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Removal Sequence

- |            |                           |            |                      |
|------------|---------------------------|------------|----------------------|
| ▶*1 ◀      | 1. Connecting rod cap nut | ▶*1 ◀      | 7. Piston ring No. 2 |
| ◀*1 ▶▶*1 ◀ | 2. Connecting rod cap     | ▶*2 ◀      | 8. Oil ring          |
| ▶A ◀       | 3. Connecting rod bearing | ◀*1 ▶▶*1 ◀ | 9. Piston pin        |
| ▶*1 ◀      | 4. Piston connecting rod  |            | 10. Piston           |
| ▶A ◀       | 5. Connecting rod bearing |            | 11. Connecting rod   |
| ▶*1 ◀      | 6. Piston ring No. 1      |            | 12. Bolt             |



## Installation Service Point

### ▶ ◀ Installation of bearings on connecting rod

1. When replacing a bearing, connecting rod or crankshaft, choose a bearing of the correct size which corresponds to the external diameter of the crankshaft pin, in accordance with the identification marks on the crankshaft pin and the connecting rod bearing given in the table below.
2. The crankshaft identifier is engraved in the position shown in the diagram.
3. The bearing identifier is engraved or printed at the position shown in the diagram.

Crankshaft pin		Connecting rod bearing
Identification mark	External diameter of pin (mm)	Identification mark
I	44.995 – 45.005	0
II	44.985 – 44.995	1
III	44.980 – 44.985	2

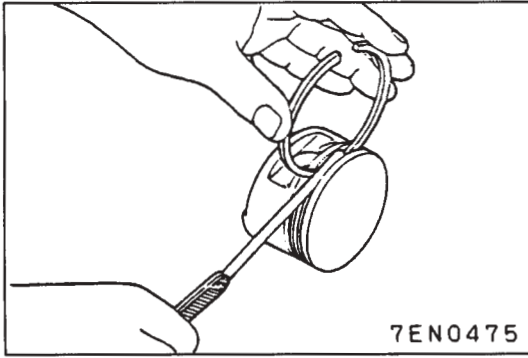
(Selecting a bearing : Example)

If the crankshaft identification mark is I, then choose a bearing with the identification mark 0.

If it is difficult to make out the crankshaft identifier, measure the external diameter of the pin and then choose the bearing that corresponds to that diameter.

4. The selected bearing should be installed in the larger end of the connecting rod and the cap.





## Inspection

### Piston rings

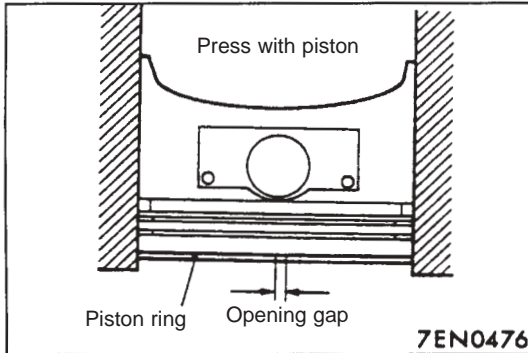
1. Check the clearance between the piston rings and the piston grooves. If it exceeds the clearance limit value, replace the piston ring, or both the piston ring and the piston.

#### Standard values :

No. 1 0.03 – 0.07 mm

No. 2 0.02 – 0.06 mm

Limit value : 0.1 mm



2. Insert the piston ring and the side rail of the oil ring into the cylinder bore, and press in using the top surface of the piston. After reaching a right-angle position, measure the opening gaps in the rings using a thickness gauge.

#### Remark :

Press the openings of the piston ring and the oil ring side rail with the piston in the position shown in the diagram, and measure the opening gaps in this position.

#### Standard value

No. 1 0.20 – 0.30 mm

No. 2 0.35 – 0.45 mm

Oil ring 0.10 – 0.40 mm

#### Standard value

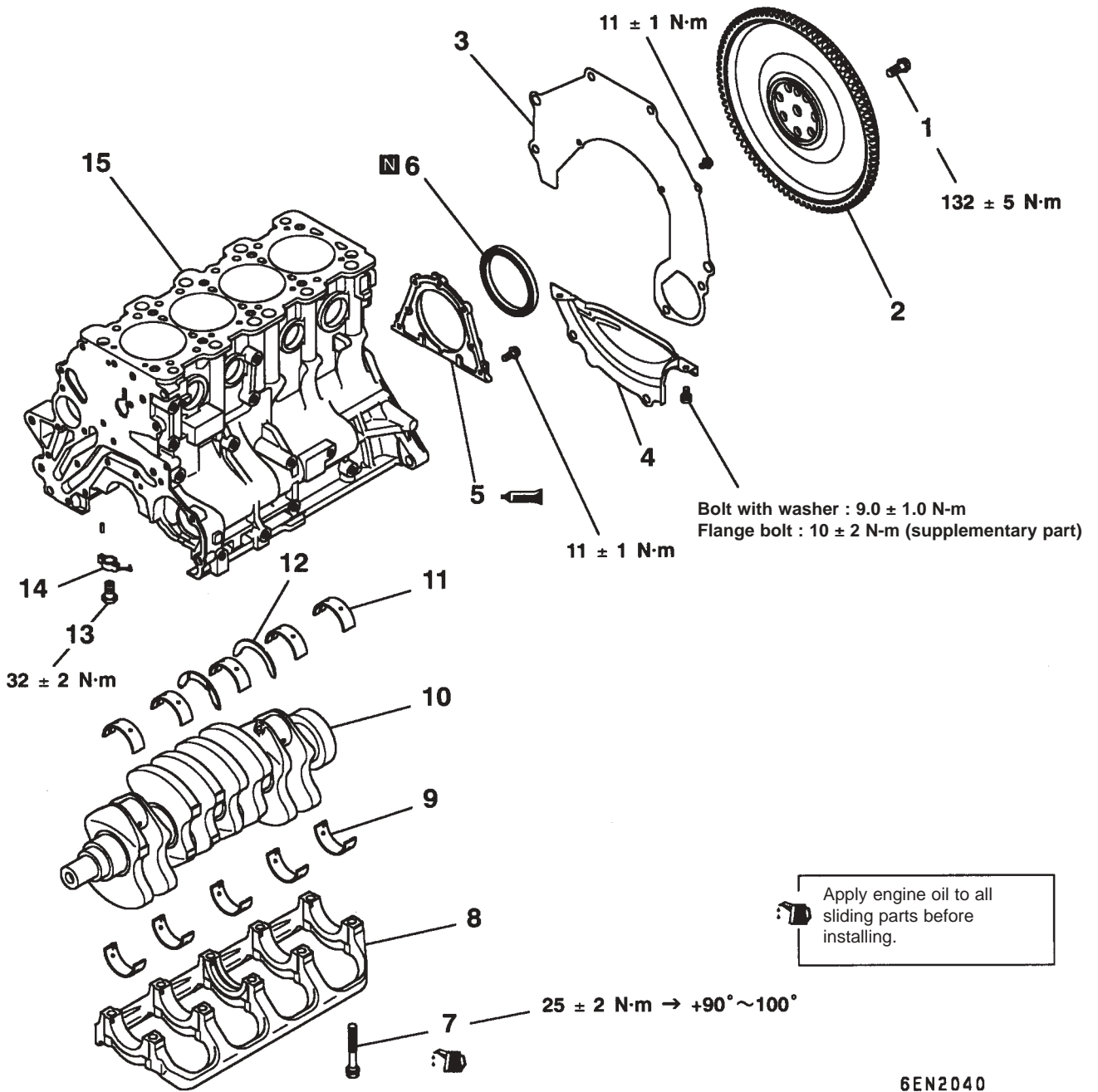
No. 1 0.8 mm

No. 2 0.8 mm

Oil ring 1.0 mm

Crankshaft / Cylinder Block

Removal and Installation



Removal Procedure

- |                             |                                    |
|-----------------------------|------------------------------------|
| 1. Flywheel bolt            | ▶ A ◀ 9. Crankshaft bearing lower  |
| 2. Flywheel                 | ▶ A ◀ 10. Crankshaft               |
| 3. Rear plate               | ▶*1 ◀ 11. Crankshaft bearing upper |
| 4. Bell housing cover       | ▶*1 ◀ 12. Thrust bearing           |
| ▶*1 ◀ 5. Rear oil seal case | ▶*1 ◀ 13. Check valve              |
| ▶*1 ◀ 6. Rear oil seal      | ▶*1 ◀ 14. Oil jet                  |
| ▶*1 ◀ 7. Bearing cap bolt   | ▶*1 ◀ 15. Cylinder block           |
| ▶*1 ◀ 8. Beam being cap     |                                    |

## Installation Service Point

### ▶ A ◀ Installation of crankshaft bearings

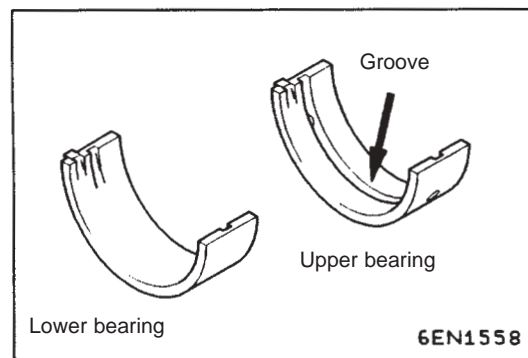
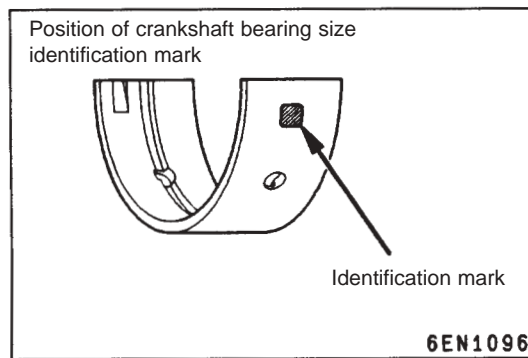
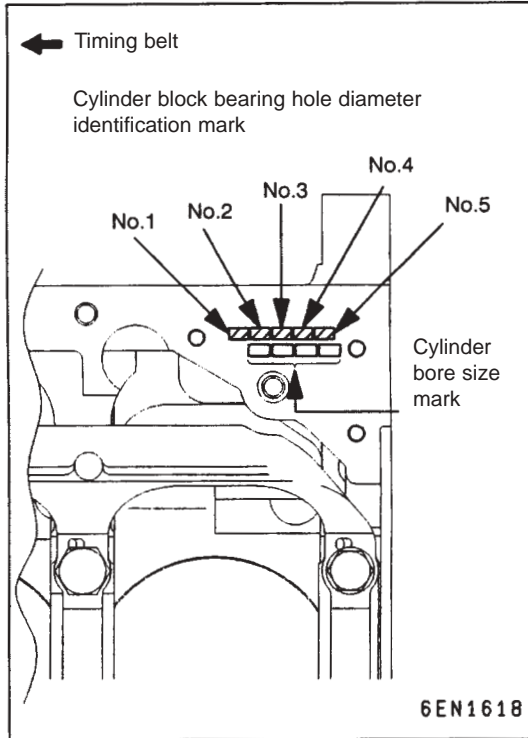
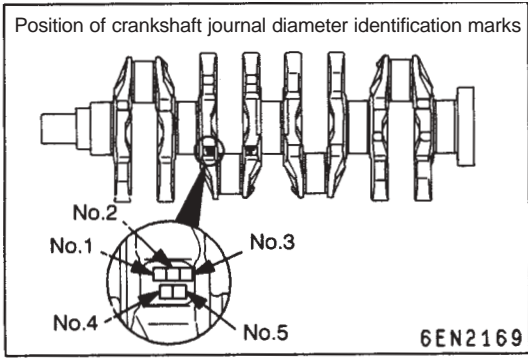
- Using the table below, select a bearing of the correct size corresponding to the diameter of the crankshaft journal.

(Selecting a bearing : Example)

If the identifier on the crankshaft journal is 0, and the identifier on the cylinder block bearing is 1, then a bearing with identification mark 1 should be chosen.

If the identifier on the crankshaft is difficult to make out, measure the diameter of the journal and choose the bearing that corresponds to the measured diameter.

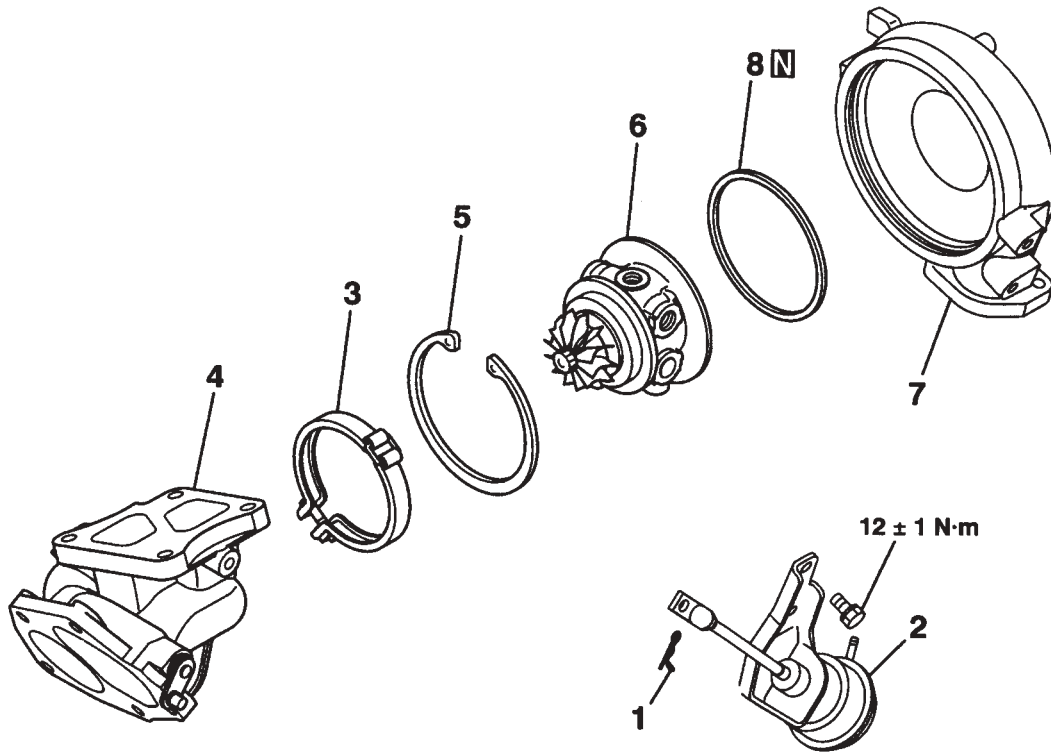
Crankshaft journal diameter		Cylinder block bearing	Crankshaft bearing
Identification mark	Journal diameter (mm)		
0	56.994~57.000	0	0
		1	1
		2	2
1	56.988~56.994	0	0
		1	1
		2	2
2	56.982~56.988	0	0
		1	1
		2	2



- Install grooved bearing on cylinder block side.
- Install bearing without oil groove on bearing cap side.

# Turbocharger

## Disassembly and Reassembly



AK403845AB

### Disassembly Procedure

- 1. Snap pin
- 2. Waste gate actuator
- ▶\*1◀ 3. Cap ring
- ▶\*1◀ 4. Turbine housing
- ◀\*1▶▶\*1◀ 5. Snap ring
- ◀\*1▶▶\*1◀ 6. Cartridge assembly
- 7. Compressor cover
- ▶\*1◀ 8. O ring

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<Notes>