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## GROUP 12

# ENGINE LUBRICATION

### CONTENTS

GENERAL INFORMATION .....	<b>12-2</b>	ENGINE OIL REPLACEMENT .....	<b>12-3</b>
SERVICE SPECIFICATION .....	<b>12-2</b>	ENGINE OIL FILTER REPLACEMENT .....	<b>12-4</b>
SEALANT .....	<b>12-2</b>	OIL PRESSURE CHECK .....	<b>12-4</b>
LUBRICANTS .....	<b>12-2</b>	ENGINE OIL PRESSURE SWITCH ..	<b>12-5</b>
		REMOVAL AND INSTALLATION .....	<b>12-5</b>
SPECIAL TOOLS .....	<b>12-3</b>	OIL PUMP CHAIN <4B11> .....	<b>12-7</b>
		REMOVAL AND INSTALLATION .....	<b>12-7</b>
ON-VEHICLE SERVICE .....	<b>12-3</b>	OIL PUMP <4B11> .....	<b>12-9</b>
ENGINE OIL CHECK .....	12-3	REMOVAL AND INSTALLATION .....	<b>12-9</b>

## GENERAL INFORMATION

M1121000101822

The lubrication method is a fully force-fed, full-flow filtration type.

The oil pump is a gear type which is driven by the crankshaft via the engine oil pump chain. <4B11>

The oil pump is a gear type which is driven by the crankshaft via the balancer timing chain. <4B12>

## ENGINE OILS

## HEALTH WARNING

Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities must be provided.

## RECOMMENDED PRECAUTIONS

The most effective precaution is to adapt working practices which prevent, as far as practicable, the risk of skin contact with mineral oils, for example by using enclosed systems for handling used engine oil and by degreasing components, where practicable, before handling them. Other precautions:

- Avoid prolonged and repeated contact with oils, particularly used engine oils.

- Wear protective clothing, including impervious gloves where practicable.
- Avoid contaminating clothes, particularly under-pants, with oil.
- Do not put oily rags in pockets, the use of overalls without pockets will avoid this.
- Do not wear heavily soiled clothing and oil-impregnated foot-wear. Overalls must be cleaned regularly and kept separate from personal clothing.
- Where there is a risk of eye contact, eye protection should be worn, for example, chemical goggles or face shields; in addition an eye wash facility should be provided.
- Obtain first aid treatment immediately for open cuts and wounds.
- Wash regularly with soap and water to ensure all oil is removed, especially before meals (skin cleansers and nail brushes will help). After cleaning, the application of preparations containing lanolin to replace the natural skin oils is advised.
- Do not use petrol, kerosine, diesel fuel, gas oil, thinners or solvents for cleaning skin.
- Use barrier creams, applying them before each work period, to help the removal of oil from the skin after work.
- If skin disorders develop, obtain medical advice without delay.

## SERVICE SPECIFICATION

M1121000301042

Item	Standard value	
Oil pressure kPa	at idle	29 or more
	at 3,500 r/min	294 – 686

## SEALANT

M1121000501477

Item	Specified sealant
Engine oil pressure switch	ThreeBond 1141J, 1215 or 1212D or equivalent

## LUBRICANTS

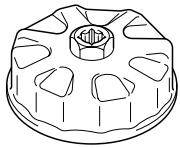
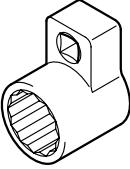
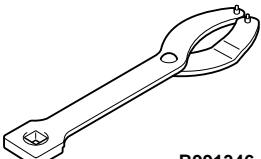
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Item	Specification
Engine oil ACEA classification	A1/B1, A3/B3, A3/B4 or A5/B5

Item	Specification	
Engine oil ILSAC classification	ILSAC certificated oil	
Engine oil API classification	SM or higher	
Engine oil quantity L	Engine oil filter	0.3
	Total	4.3

## SPECIAL TOOLS

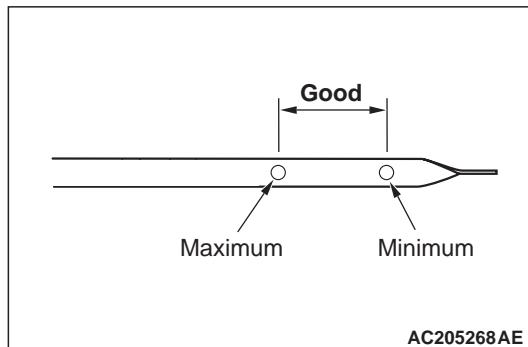
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Tool	Number	Name	Use
 B991396	MB991396	Oil filter wrench	Removal and installation of engine oil filter
 MB992118	MB992118	Oil pressure switch wrench	Removal and installation of engine oil pressure switch
 B991346	MB991346	Top cover wrench	Holding the engine oil pump sprocket

## ON-VEHICLE SERVICE

### ENGINE OIL CHECK

M1121000901505



1. Pull out the engine oil level gauge slowly and check that the oil level is in the illustrated range.
2. Check that the oil is not excessively dirty, that there is no coolant or petrol mixed in, and that it has sufficient viscosity.

### ENGINE OIL REPLACEMENT

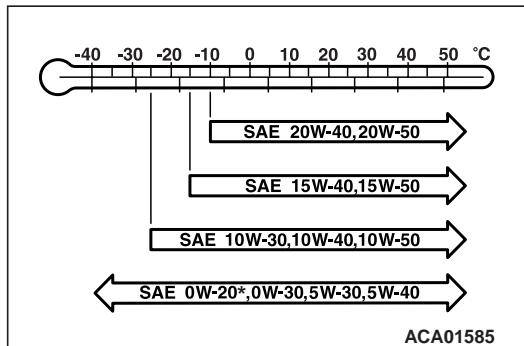
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1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80 °C to 90 °C.

**⚠ WARNING**  
**Use care as engine oil could be hot.**

2. Remove the engine oil filler cap.
3. Remove the engine oil pan drain plug to drain engine oil.
4. Install a new engine oil pan drain plug gasket so that it faces in the direction shown in the illustration, and then tighten the engine oil pan drain plug to the specified torque.

**Tightening torque: 39 ± 5 N·m**



### 5. Refill with specified quantity of engine oil.

#### Specified Engine Oil

- ACEA classification: A1/B1, A3/B3, A3/B4 or A5/B5
- ILSAC classification: ILSAC certificated oil
- API classification: SM or higher

**Total quantity (Includes volume inside engine oil filter): 4.3 L**

**NOTE:** SAE 0W-20\*, 0W-30, 5W-30, and 5W-40 engine oils can only be used if they meet ACEA A3/B3, A3/B4 or A5/B5 and API SM or higher specifications.

### 6. Install the engine oil filler cap.

### 7. Let the engine run for a few minutes.

### 8. Stop the engine, and then check the engine oil level using the oil dipstick after a few minutes.

## ENGINE OIL FILTER REPLACEMENT

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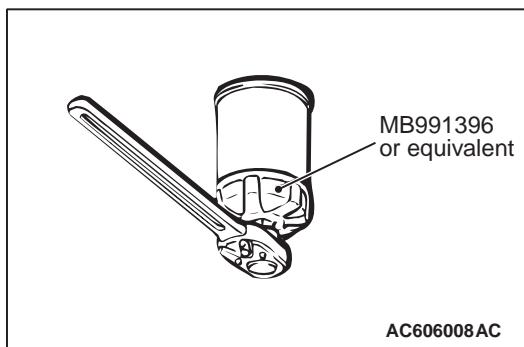
1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80 °C to 90 °C.

#### **WARNING**

**Use care as oil could be hot.**

2. Remove the engine oil filler cap.

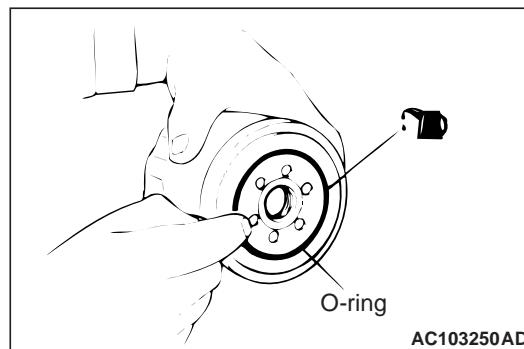
3. Remove the engine oil pan drain plug to drain engine oil.



4. Use the respective tool in the following table to remove the engine oil filter.

Number	Special tool
MD360935	Oil filter wrench (MB991396) or equivalent

5. Clean the engine oil filter bracket side mounting surface and ensure the old O-ring has been removed.



6. Apply a small amount of engine oil to the O-ring of the new engine oil filter.

7. Where the engine oil filter O-ring touches the engine oil filter bracket side mounting surface, tighten the engine oil filter to the specified torque using the special tool.

Number	Special tool	Tightening torque
MD360935	MB991396 or equivalent	Approximately 1 turn (14 ± 2 N·m)

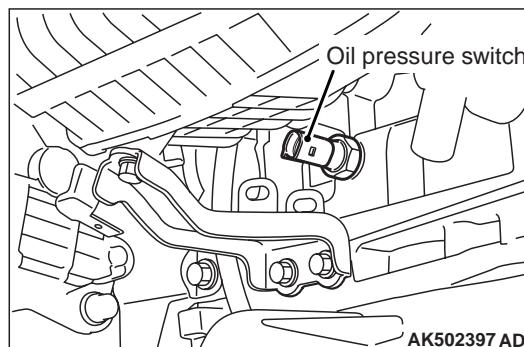
8. Install the engine oil pan drain plug and refill the engine oil (Refer to P.12-3).

9. Rev the engine a few times, and check to be sure that no engine oil leaks from the installation section of the engine oil filter.

## OIL PRESSURE CHECK

M1121002302524

1. Check engine oil level.



2. Remove the engine oil pressure switch.

(Refer to engine oil pressure switch removal and installation P.12-5)

3. Install the oil pressure gauge.
- NOTE: Use an adapter of PT 1/8 thread.
4. Run the engine to warm it.
5. After the engine has been warmed up, check that oil pressure is within the standard value.

**Standard value:**  
**At idle: 29 kPa or more**  
**At 3,500 r/min: 294 – 686 kPa**

6. Remove the oil pressure gauge.
7. Install the engine oil pressure switch.  
 (Refer to engine oil pressure switch removal and installation [P.12-5](#))

## ENGINE OIL PRESSURE SWITCH REMOVAL AND INSTALLATION

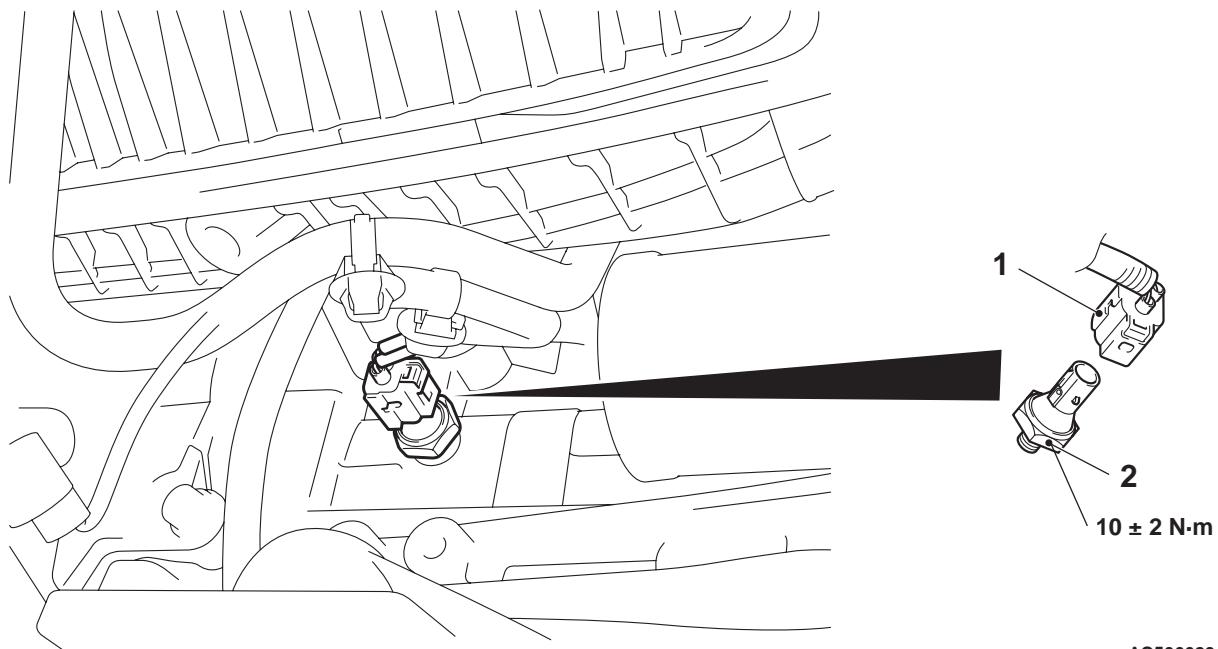
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### Pre-removal Operation

- Engine Room Under Cover Front A, B Removal (Refer to GROUP 51 – Under Cover ).
- Inlet Manifold Stay Removal (Refer to GROUP 15 – Inlet Manifold ).

### Post-installation Operation

- Inlet Manifold Stay Installation (Refer to GROUP 15 – Inlet Manifold ).
- Engine Room Under Cover Front A, B Installation (Refer to GROUP 51 – Under Cover ).

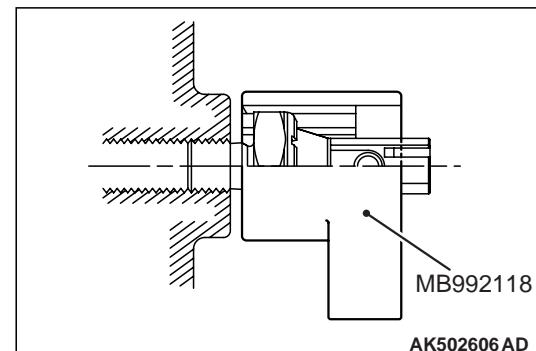


**Removal steps**

1. Engine oil pressure switch connector connection
2. Engine oil pressure switch

<<A>> >>A<< 2

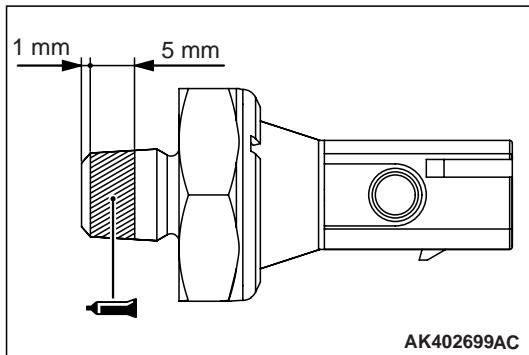
### REMOVAL SERVICE POINT <<A>> ENGINE OIL PRESSURE SWITCH REMOVAL



Use special tool oil pressure switch wrench (MB992118) to remove the engine oil pressure switch.

## INSTALLATION SERVICE POINT

### >>A<< ENGINE OIL PRESSURE SWITCH INSTALLATION



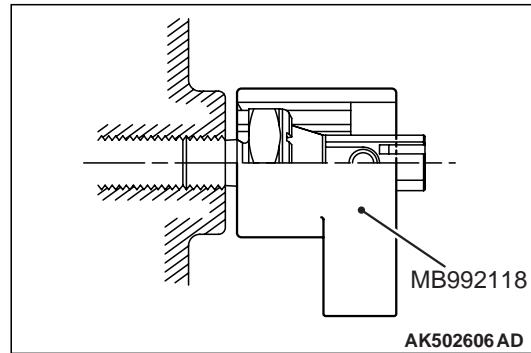
1. Apply sealant to the engine oil pressure switch thread.

**Specified sealant: ThreeBond 1141J or equivalent**

**NOTE:** *Install the engine oil pressure switch immediately after applying sealant.*

#### CAUTION

After the installation, until a sufficient period of time (one hour or more) elapses, do not apply the oil or water to the sealant application area or start the engine.



2. In the same manner as removal, use special tool oil pressure switch wrench (MB992118) to tighten the engine oil pressure switch to the specified torque.

**Tightening torque:  $10 \pm 2 \text{ N}\cdot\text{m}$**

## OIL PUMP CHAIN &lt;4B11&gt;

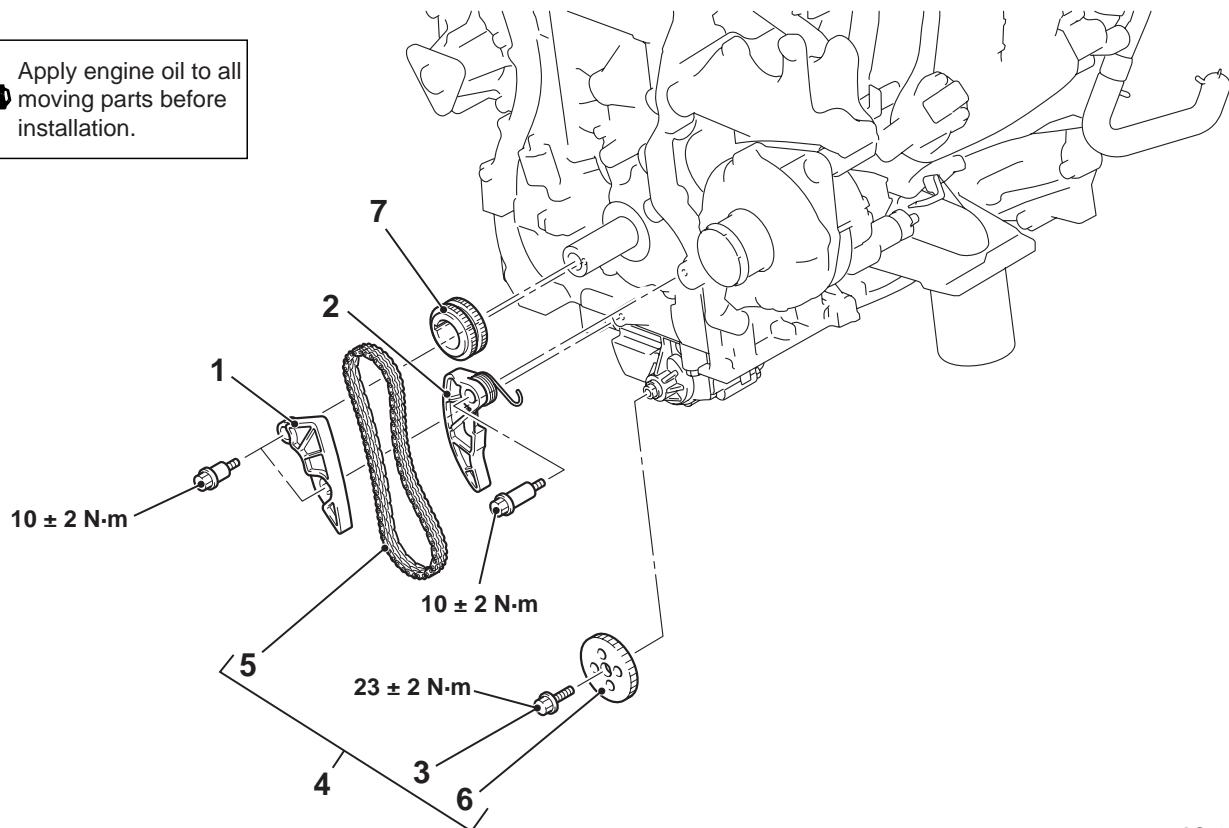
## REMOVAL AND INSTALLATION

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## Pre-removal and Post-installation Operation

- Valve Timing Chain Removal and Installation (Refer to GROUP 11A – Timing Chain ).

Apply engine oil to all moving parts before installation.



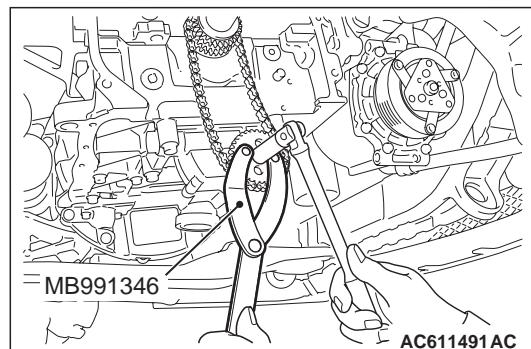
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## Removal steps

<<A>>    >>B<<	1. Balancer timing chain guide 2. Engine oil pump chain tensioner 3. Engine oil pump sprocket centre bolt
<<A>>	4. Engine oil pump drive chain and engine oil pump sprocket
>>B<<	5. Engine oil pump drive chain
>>B<<	6. Engine oil pump sprocket
>>A<<	7. Crankshaft sprocket

## REMOVAL SERVICE POINT

**<<A>> ENGINE OIL PUMP SPROCKET  
CENTRE BOLT/ENGINE OIL PUMP DRIVE  
CHAIN AND ENGINE OIL PUMP  
SPROCKET REMOVAL**



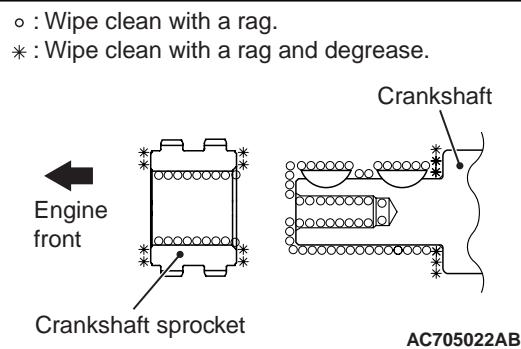
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1. Hold the engine oil pump sprocket with special tool top cover wrench (MB991346).

2. Loosen the engine oil pump sprocket centre bolt and remove the engine oil pump drive chain and engine oil pump sprocket.

## INSTALLATION SERVICE POINTS

### >>A<< CRANKSHAFT SPROCKET INSTALLATION



1. Wipe off the dirt off the crankshaft sprocket and crankshaft as shown in the figure using a rag, and then degrease the areas.

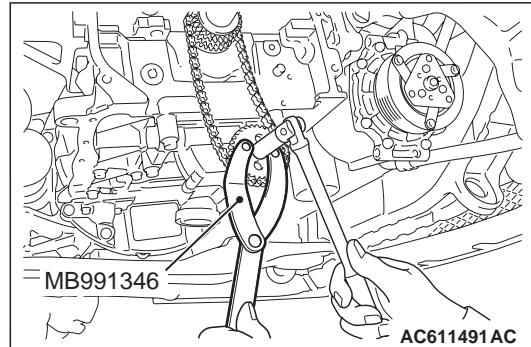
*NOTE: Degrease to prevent a drop in the coefficient of friction of the pressing portion caused by adhesion of oil.*

2. Install the crankshaft sprocket to the crankshaft.

### >>B<< ENGINE OIL PUMP SPROCKET/ENGINE OIL PUMP DRIVE CHAIN/ENGINE OIL PUMP SPROCKET CENTRE BOLT INSTALLATION

1. Set the No.1 cylinder at top dead centre of the compression stroke.

2. Install the engine oil pump sprocket to the engine oil pump drive chain.
3. Install the engine oil pump drive chain in the crankshaft sprocket while the engine oil pump sprocket is installed in the engine oil pump drive chain.
4. Install the engine oil pump sprocket in the engine oil pump assembly while the engine oil pump sprocket is installed in the engine oil pump drive chain.



5. Hold the engine oil pump sprocket with special tool top cover wrench (MB991346) in the same manner as removal.
6. Tighten the engine oil pump sprocket centre bolt to the specified torque.

**Tightening torque:  $23 \pm 2 \text{ N}\cdot\text{m}$**

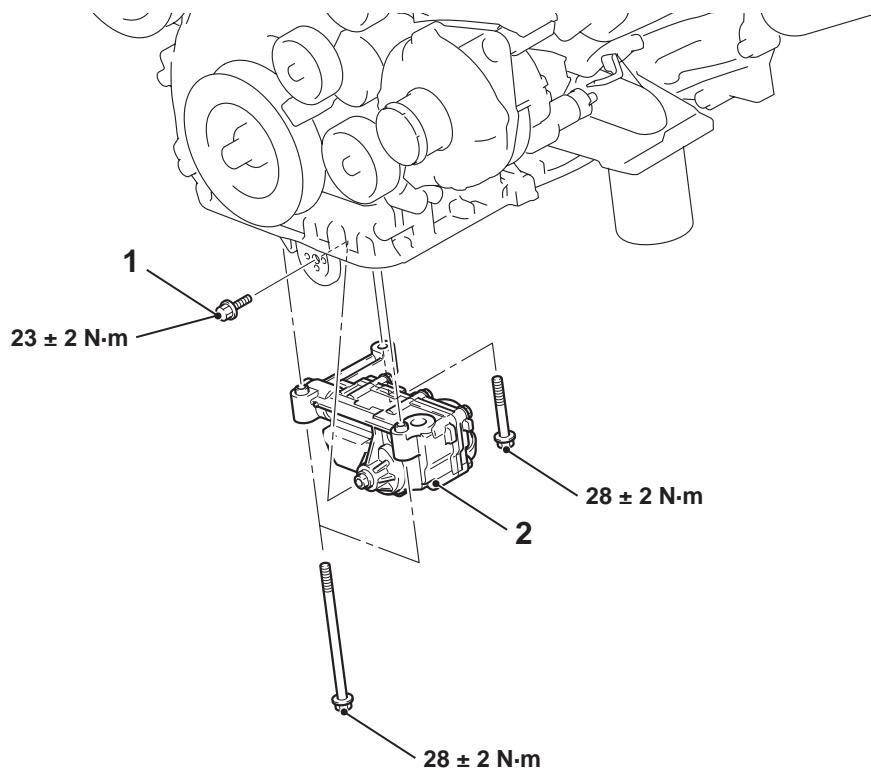
## OIL PUMP &lt;4B11&gt;

## REMOVAL AND INSTALLATION

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## Pre-removal and Post-installation Operation

- Engine Oil Pan Removal and Installation (Refer to GROUP 11A – Oil Pan ).

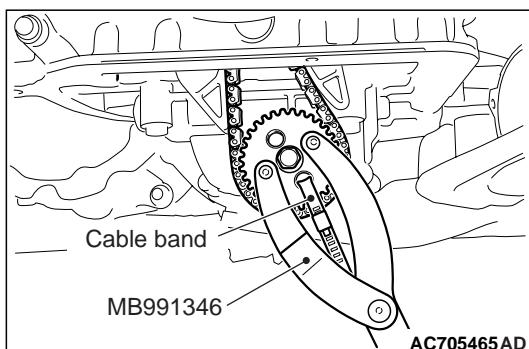


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<<A>> >>A<< 1. Removal steps

1. Engine oil pump sprocket centre bolt
2. Engine oil pump assembly

## REMOVAL SERVICE POINT

<<A>> ENGINE OIL PUMP SPROCKET  
CENTRE BOLT REMOVAL

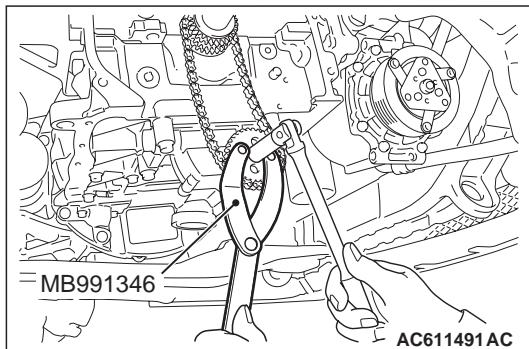
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1. Secure the engine oil pump sprocket and the engine oil pump drive chain with cable band to prevent slippage between the engine oil pump sprocket and the engine oil pump drive chain.
2. Hold the engine oil pump sprocket with special tool top cover wrench (MB991346).
3. After removing the engine oil pump sprocket centre bolt, disconnect the engine oil pump sprocket from the engine oil pump assembly while the engine oil pump sprocket is installed in the engine oil pump drive chain.

## INSTALLATION SERVICE POINT

>>A<< ENGINE OIL PUMP SPROCKET  
CENTRE BOLT INSTALLATION

1. Install the engine oil pump sprocket in the engine oil pump assembly while the engine oil pump sprocket is installed in the engine oil pump drive chain.



2. Hold the engine oil pump sprocket with special tool top cover wrench (MB991346) in the same manner as removal.
3. Tighten the engine oil pump sprocket centre bolt to the specified torque.  
**Tightening torque:  $23 \pm 2 \text{ N}\cdot\text{m}$**
4. Remove the cable band securing the engine oil pump sprocket and engine oil pump drive chain to prevent the slippage between them.