

GROUP 12

**ENGINE
LUBRICATION**

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GENERAL INFORMATION

M1121000100982

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

Item	Specification
Oil pump type	Gear type
Drive method	Crankshaft

ENGINE OILS

⚠ 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:

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 SPECIFICATIONS

M1121000300759

ITEM	STANDARD VALUE
Engine oil pressure kPa (psi)	at idle 29 (4.2) or more
	at 3,500 r/min 294 –686 (43 –100)

SEALANT

M1121000500827

Item	Specified sealant
Engine oil pressure switch	THREE BOND 1215 or 1212D or equivalent

LUBRICANTS

M1121000401715

Item	Engine oil	Quantity dm ³ (qt)
Oil filter	Engine oils displaying ILSAC certification symbol ("Starburst" symbol) or conforming to the API classification SM or higher	0.3 (0.32)
Oil cooler		0.5 (0.52)
Total quantity		5.6 (5.9)

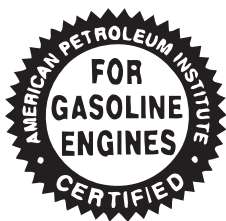
ENGINE OIL

⚠ CAUTION

Never use nondetergent or straight mineral oil.

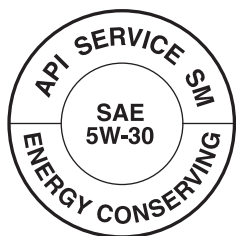
Use only engine oils displaying the ILSAC certification mark ("Starburst" symbol) on the container.

ILSAC certification symbol
("Starburst" symbol)



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API service symbol

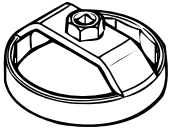
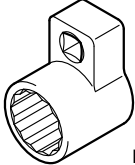
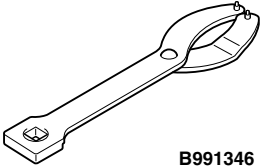


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If these oils are not available, an API classification SM or higher can be used.

SPECIAL TOOLS

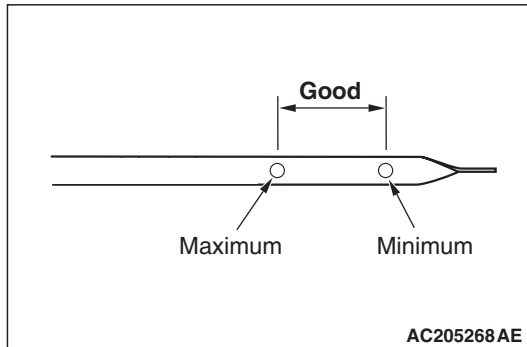
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Tool	Tool number and name	Supersession	Application
 MB991610	MB991610 Oil filter wrench	Oil filter wrench	Removal and installation of engine oil filter (When using oil filter MD356000)
 MB992118	MB992118 Oil pressure switch wrench	Oil pressure switch 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

M1121000900955



1. Pull out the oil dipstick, clean off the engine oil on the oil dipstick, and then reinsert the oil dipstick.
2. Pull out the oil dipstick, and check the engine oil level is within the marks on one side of the oil dipstick (engine cover side).

NOTE:

- *Checking the oil might be difficult shortly after stopping the engine or engine oil replacement.*
 - *If difficult, take some time (approx. 30 sec.) and try again.*
 - *Refer to the information label indicating the engine oil check process on the rocker cover.*
3. Check that the engine oil is not excessively dirty, that there is no coolant or gasoline mixed in, and that it is sufficiently thick and slippery.

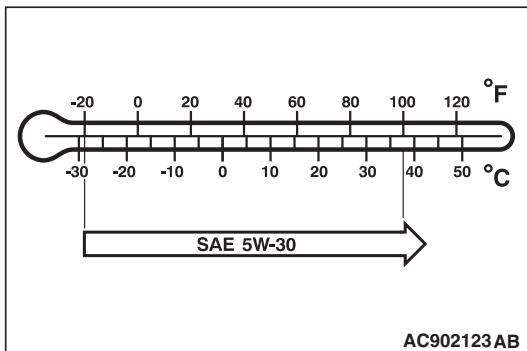
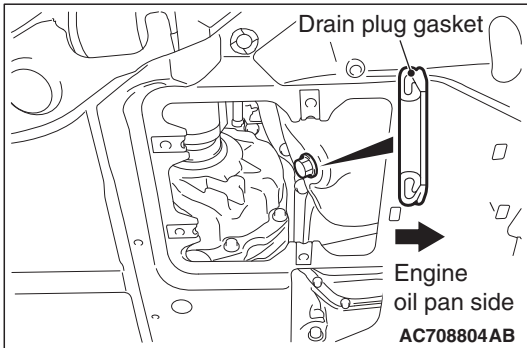
ENGINE OIL REPLACEMENT

M1121001002876

1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80 –90° C (176 –194° F).

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

2. Remove the engine oil filler cap.



3. Remove the engine room under cover extension. (Refer to GROUP 51, Under Cover P.51-15).
4. Remove the drain plug to drain oil.
5. Install a new drain plug gasket so that it faces in the direction shown in the illustration, and then tighten the drain plug to the specified torque.

Tightening torque: 39 ± 5 N· m (29 ± 3 ft-lb)

CAUTION

- Do not use conventional petroleum based motor oil. Using conventional motor oil may cause engine or turbocharger damage.
 - Do not use "blends" of conventional oil and synthetic oil.
 - If engine oil other than 5W-30 is used, the engine may be seized by poor lubrication.
6. Refill the specified quantity of oil.

Specified Engine Oil: Engine oils displaying ILSAC certification symbol ("Starburst" symbol) or conforming to the API classification SM or higher

Total quantity: 5.6 dm³ (5.9 quarts)

7. Install the engine oil filler cap.
8. Let the engine run for a few minutes.
9. Stop the engine, and then check the oil level using the oil dipstick after a few minutes.
10. Install the engine room under cover extension. (Refer to GROUP 51, Under Cover P.51-15).

ENGINE OIL FILTER REPLACEMENT

M1121001101836

Required Special Tool:

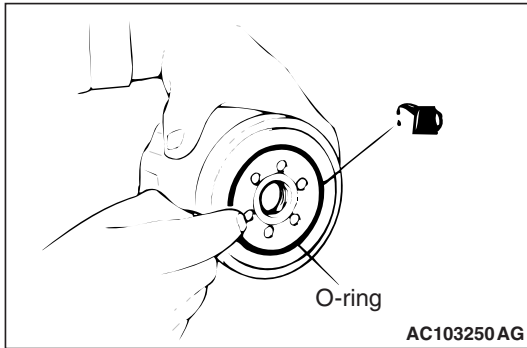
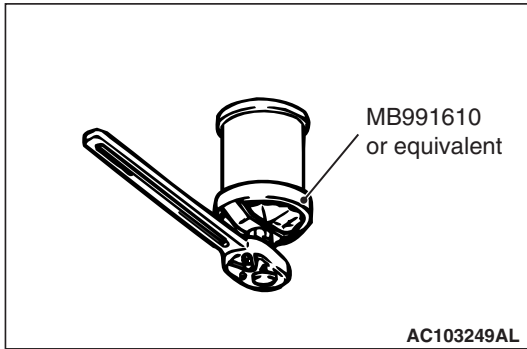
- MB991610: Oil Filter Wrench

1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80 –90° C (176 –194° F)

WARNING

Use care as oil could be hot.

2. Remove the engine oil filler cap.
3. Remove the engine room under cover extension. (Refer to GROUP 51, Under Cover P.51-15).
4. Remove the drain plug to drain oil.



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

Number	Special tool
MD356000	Oil filter wrench (MB991610) or equivalent

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

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

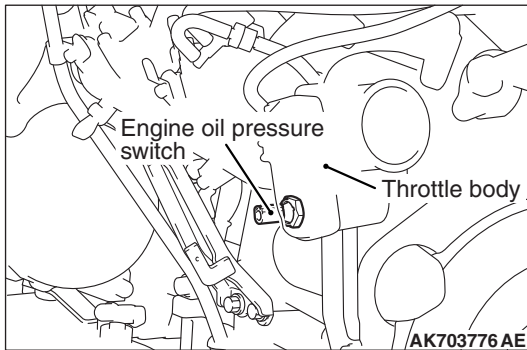
8. Screw on the oil filter by hand until it touches the surface of the flange and then tighten it with an oil filter wrench.

Number	Special tool	Tightening torque
MD356000	MB991610 or equivalent	Approximately 3/4 turn [14 ± 2 N·m (124 ± 17 in·lb)]

9. Install the drain plug and refill engine oil. (Refer to P.12-4).

10. Rev the engine a few times, and check to be sure that no engine oil leaks at the oil filter.

11. Install the engine room under cover extension. (Refer to GROUP 51, Under Cover P.51-15).



OIL PRESSURE CHECK

M1121002301747

1. Check engine oil level.
2. Remove the engine oil pressure switch. (Refer to Oil Pressure Switch Removal And Installation P.12-7.)
3. Install the engine oil pressure gauge.
NOTE: Use a 1/8 pipe thread adapter.
4. Run the engine to warm it.
5. After the engine has been warmed up, check that engine oil pressure is within the standard value.

Standard value:

At idle: 29 kPa (4.2 psi) or more

At 3,500 r/min: 294 –686 kPa (43 –100 psi)

6. Remove the engine oil pressure gauge.
7. Install the engine oil pressure switch. (Refer to Oil Pressure Switch Removal And Installation P.12-7.)

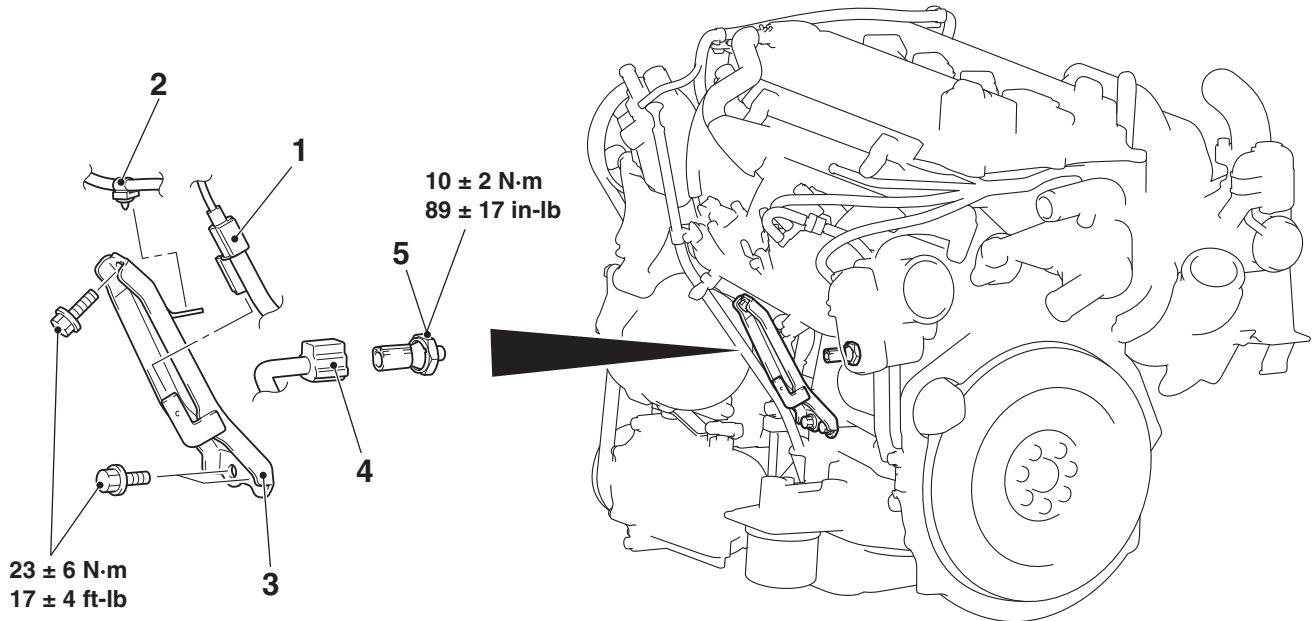
ENGINE OIL PRESSURE SWITCH

REMOVAL AND INSTALLATION

M1121002501149

Pre-removal and post-installation operation

- Engine Room Under Cover Front A, B and Engine Room Under Cover Center Removal and Installation (Refer to GROUP 51, Under Cover P.51-15).



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Removal steps

1. Engine control wiring harness clamp connection
2. Starter wiring harness clamp
3. Intake manifold stay (front)

Removal steps (Continued)

4. Oil pressure switch connector connection
5. Oil pressure switch

Required Special Tool:

- MB992118: Oil Pressure Switch Wrench

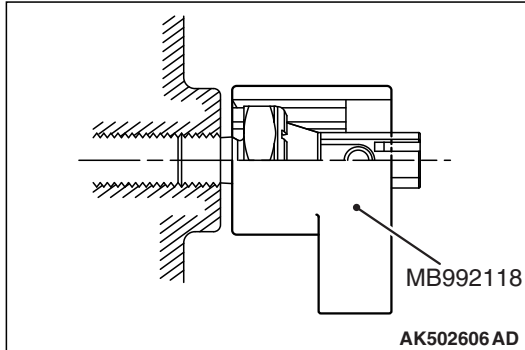
REMOVAL SERVICE POINT

<<A>> OIL PRESSURE SWITCH REMOVAL

⚠ CAUTION

The sealant is applied to the bolt. Remove the bolt with care not to break it.

Use special tool MB992118 to remove the oil pressure switch.

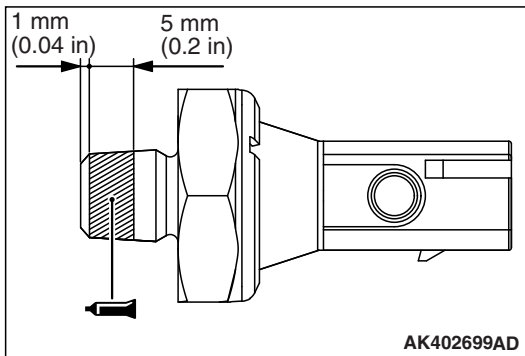


INSTALLATION SERVICE POINT

>>A<< OIL PRESSURE SWITCH INSTALLATION

1. Apply sealant to the oil pressure switch thread.

Specified sealant: Three bond 1215 or equivalent

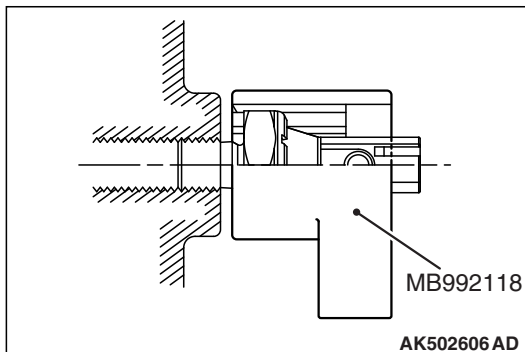
**⚠ CAUTION**

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 MB992118 to tighten the oil pressure switch to the specified torque.

Tightening torque: 10 ± 2 N·m (89 \pm 17 in-lb)

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

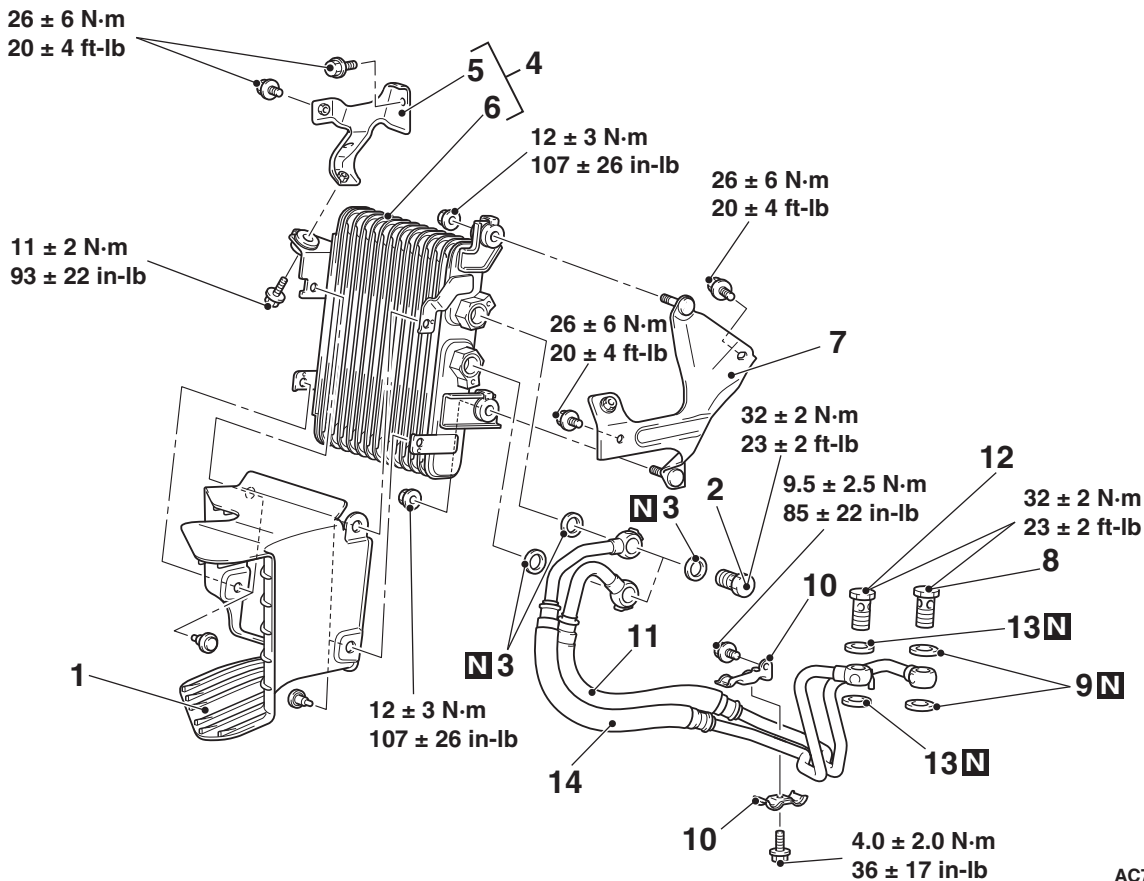


ENGINE OIL COOLER

REMOVAL AND INSTALLATION

M1121001300871

<p>Pre-removal operation</p> <ul style="list-style-type: none"> • Engine Room Under Cover Front A, B, Engine Room Under Cover Center and Engine Room Side Cover (RH) Removal (Refer to GROUP 51, Under Cover P.51-15). • Front Bumper and Radiator Grille Assembly Removal (Refer to GROUP 51, Front Bumper Assembly and Radiator Grille P.51-3). 	<p>Post-installation operation</p> <ul style="list-style-type: none"> • Front Bumper and Radiator Grille Assembly Installation (Refer to GROUP 51, Front Bumper Assembly and Radiator Grille P.51-3). • Engine Room Under Cover Front A, B, Engine Room Under Cover Center and Engine Room Side Cover (RH) Installation (Refer to GROUP 51, Under Cover P.51-15). • Engine Oil Refilling (Refer to P.12-4).
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- Removal steps**
1. Engine oil cooler air guide
 2. Eye bolt
 3. Gasket
 4. Engine oil cooler assembly
 5. Engine oil cooler bracket (RH)
 6. Engine oil cooler
 7. Engine oil cooler bracket (LH)

- Removal steps (Continued)**
8. Eye bolt
 9. Gasket
 10. Hose clamp
 11. Engine oil cooler feed hose
 12. Eye bolt
 13. Gasket
 14. Engine oil cooler return hose

OIL PUMP CHAIN

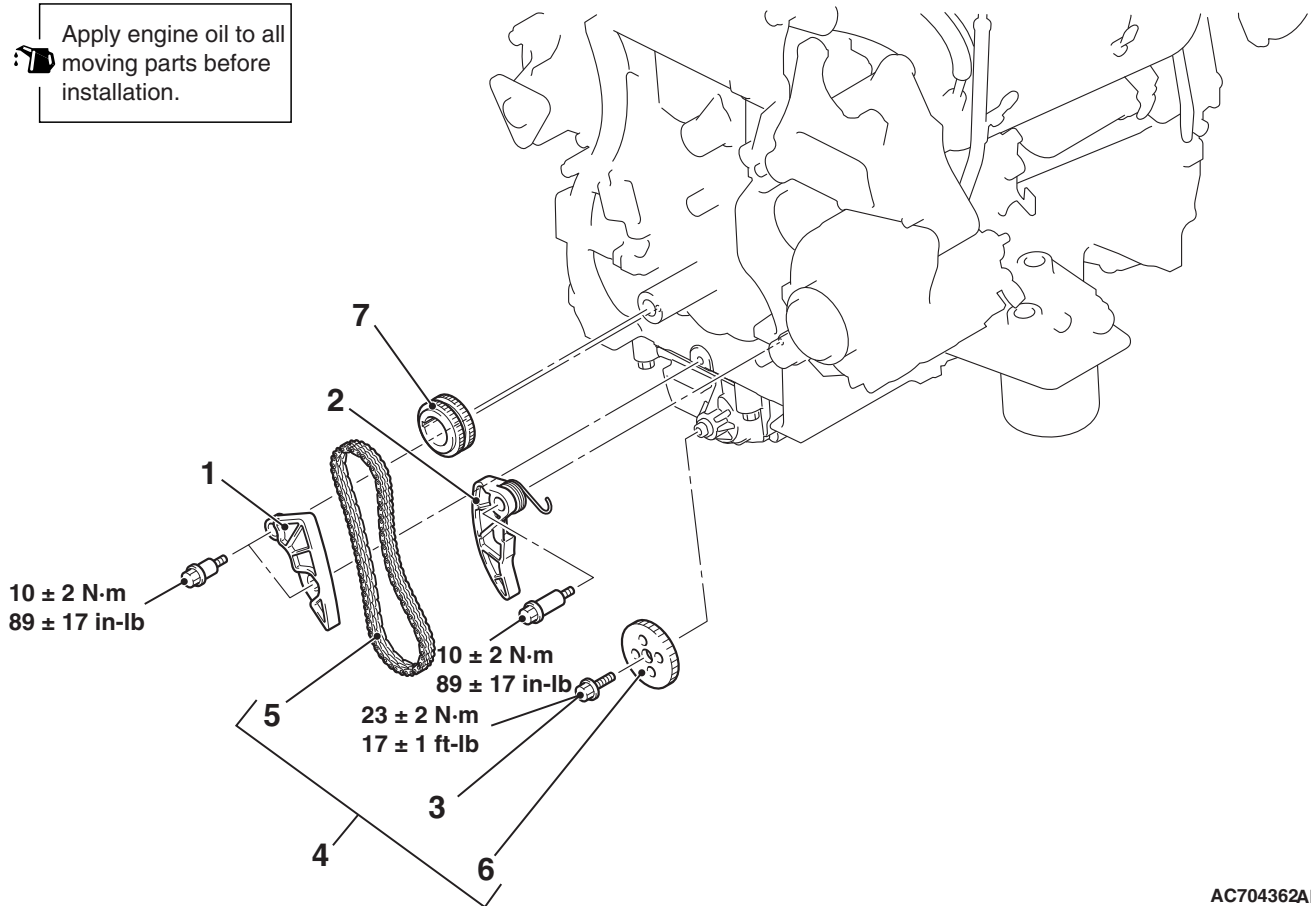
REMOVAL AND INSTALLATION

M1121003100196

Pre-removal and post-installation operation

- Timing Chain Removal and Installation (Refer to GROUP 11A, Timing Chain P.11A-66).

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 center bolt

<<A>>

Removal steps (Continued)

- >>B<< >>B<< >>A<<
4. Engine oil pump drive chain and engine oil pump sprocket
 5. Engine oil pump drive chain
 6. Engine oil pump sprocket
 7. Crankshaft sprocket

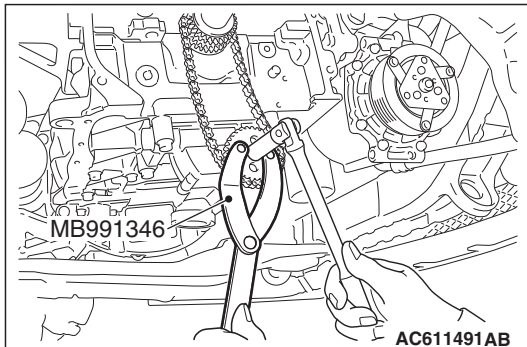
Required Special Tool:

- MB991346: Top Cover Wrench

REMOVAL SERVICE POINT

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

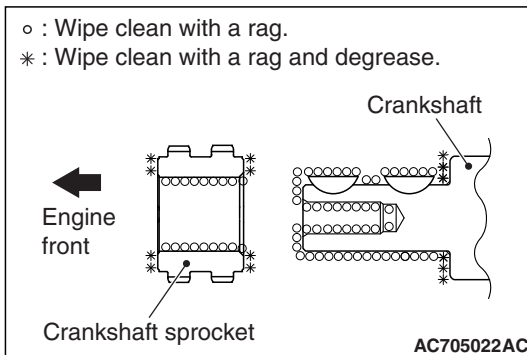
1. Hold the engine oil pump sprocket with special tool MB991346.
2. Loosen the engine oil pump sprocket center bolt and remove the engine oil pump drive chain and engine oil pump sprocket.



INSTALLATION SERVICE POINTS

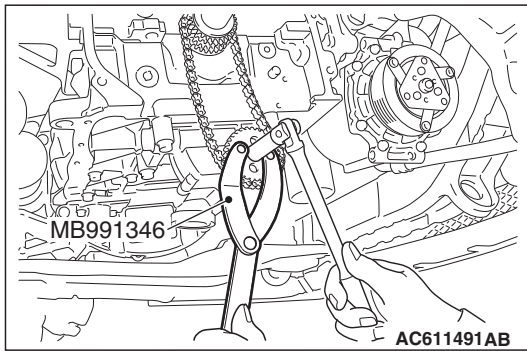
>>A<< CRANKSHAFT SPROCKET INSTALLATION

1. Wipe off the dirt on the crankshaft sprocket and crankshaft as shown in the figure using a rag, and then degrease them.
NOTE: Degrease them to prevent drop in the friction coefficient of the pressed area, which is caused by oil adhesion.
2. Install the crankshaft sprocket to the crankshaft.



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

1. Set the number 1 cylinder to the top dead center of compression.
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 MB991346 in the same manner as removal.
6. Tighten the engine oil pump sprocket center bolt to the specified torque.

Tightening torque: 23 ± 2 N·m (17 ± 1 ft-lb)

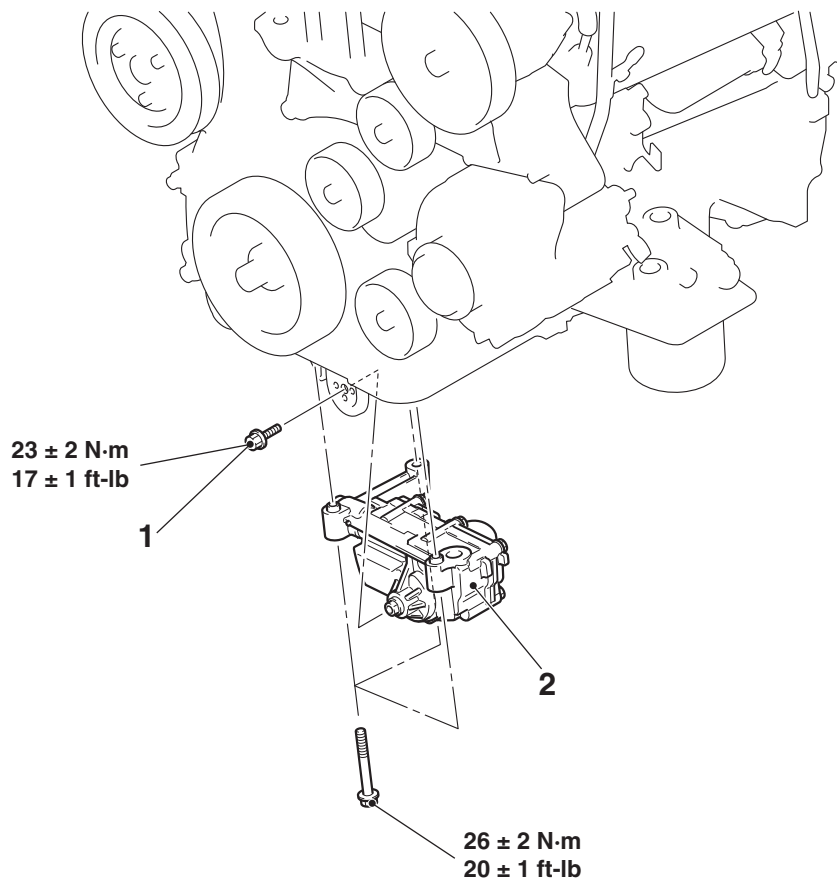
OIL PUMP

REMOVAL AND INSTALLATION

M1121001600203

Pre-removal and post-installation operation

- Engine Oil Pan Removal and Installation (Refer to GROUP 11A, Oil Pan [P.11A-48](#)).



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Removal steps

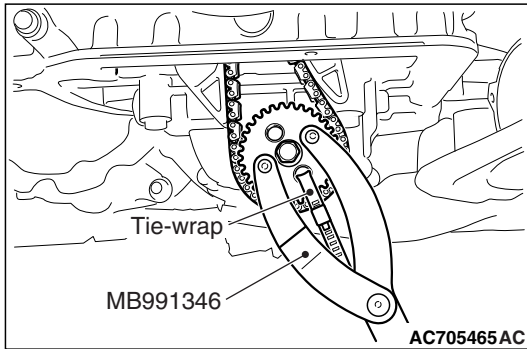
- <<A>> <<A>>
1. Engine oil pump sprocket center bolt
 2. Engine oil pump assembly

Required Special Tool:

- MB991346: Top Cover Wrench

REMOVAL SERVICE POINT

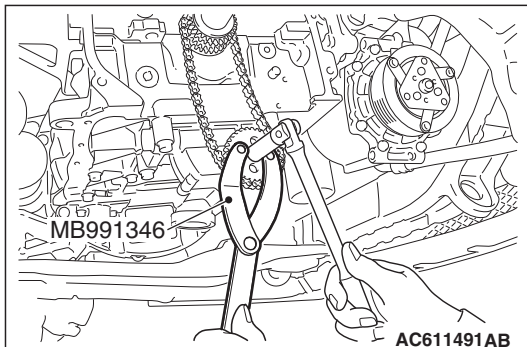
<<A>> ENGINE OIL PUMP SPROCKET CENTER BOLT REMOVAL



1. Secure the engine oil pump sprocket and the engine oil pump drive chain with tie-wrap 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 MB991346.
3. After removing the engine oil pump sprocket center 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 CENTER 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 MB991346 in the same manner as removal.
3. Tighten the engine oil pump sprocket center bolt to the specified torque.

Tightening torque: 23 ± 2 N·m (17 ± 1 ft-lb)

4. Remove the tie-wrap securing the engine oil pump sprocket and engine oil pump drive chain to prevent the slippage between them.

NOTES