

GROUP 12

**ENGINE
LUBRICATION**

CONTENTS

GENERAL DESCRIPTION	12-2	ENGINE OIL PRESSURE CHECK	12-5
SPECIAL TOOL	12-2	ENGINE OIL COOLER	12-6
ON-VEHICLE SERVICE	12-3	REMOVAL AND INSTALLATION	12-6
ENGINE OIL CHECK	12-3	SPECIFICATIONS	12-7
ENGINE OIL REPLACEMENT	12-3	FASTENER TIGHTENING SPECIFICATIONS	12-7
ENGINE OIL FILTER REPLACEMENT ...	12-4	SERVICE SPECIFICATIONS	12-7
		LUBRICANT	12-7

GENERAL DESCRIPTION

M1121000100283

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

ITEM	SPECIFICATION
Oil pump type	Trochoid 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 practical, the risk of skin contact with mineral oils i.e. use enclosed systems for handling used engine oil and decrease components, where practical, before handling them.

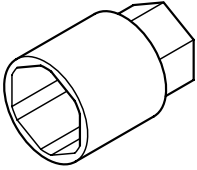
OTHER PRECAUTIONS:

- Avoid prolonged and repeated contact with oil, particularly used engine oil.
- Wear protective clothing, including impervious gloves where practical.
- Avoid contaminating clothes, particularly under wear, with oil.
- Do not put oily rags in pockets.
- Do not wear heavily soiled clothing and oil-soaked 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 i.e. 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, apply lotion, etc., containing lanolin to replace natural skin oils is advised.
- Do not use gasoline, kerosene, diesel fuel, gas oil, thinners or solvents for cleaning skin.
- Apply barrier creams before each work period to help cleaning the skin after work.
- If skin disorders develop, obtain medical advice immediately.

SPECIAL TOOL

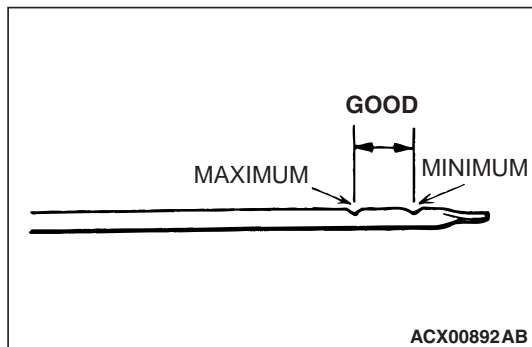
M1121000600426

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998054 Engine oil pressure switch wrench	General service tool or MD998054-01	Removal and installation of engine oil pressure switch

ON-VEHICLE SERVICE

ENGINE OIL CHECK

M1121000900267



1. Pull out the oil dipstick slowly and check that the oil level is within the marks on the oil dipstick.
2. Check that the 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

M1121001000580

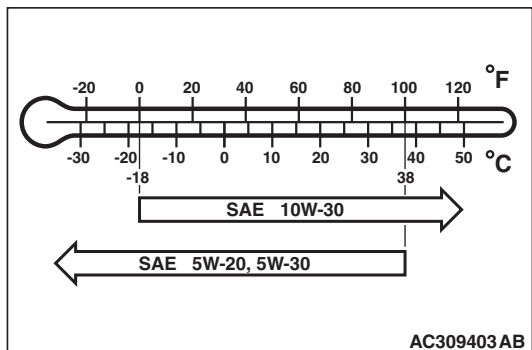
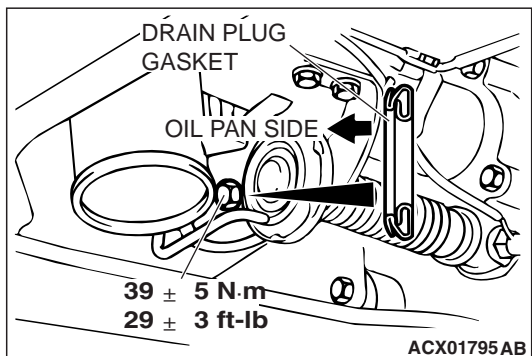
Start the engine and allow it to warm up until the temperature of the coolant reaches 80°C (176°F) to 90°C (194°F).

⚠ WARNING

Use care as oil could be hot.

1. Remove the engine oil filler cap.
2. Remove the drain plug to drain oil.
3. 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)



4. Refill the specified quantity of oil.

Specified Engine Oil: Engine oils displaying ILSAC certification symbol ("Starburst" symbol) or conforming the API classification SL, SL/CF

Total quantity: 4.9 dm³ (5.14 quarts)

5. Install the engine oil filler cap.
6. Check oil level.

ENGINE OIL FILTER REPLACEMENT

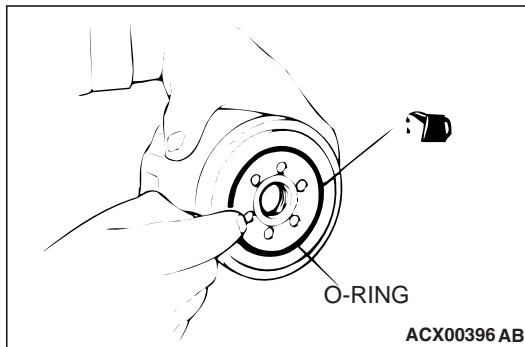
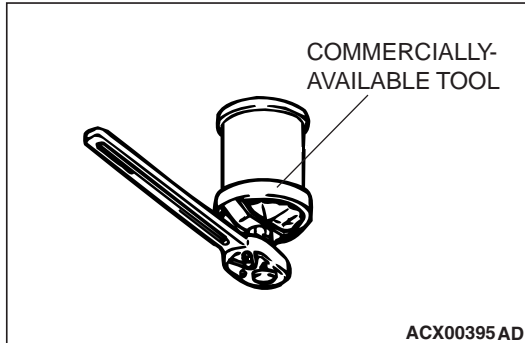
M1121001100297

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

⚠ WARNING

Use care as oil could be hot.

1. Remove the engine oil filler cap.
2. Remove the drain plug to drain oil.
3. Use the commercially-available tool to remove the engine oil filter.
4. Clean the filter bracket side mounting surface and ensure the old O-ring has been removed.



5. Apply a small amount of engine oil to the O-ring of the new oil filter.
6. Where the oil filter O-ring touches the oil pan flange, tighten the oil filter to the specified torque using the commercially-available tool.

Tightening torque: Approximately 3/4 turn [14 ± 2 N·m (124 ± 18 in-lb)]

7. Install the drain plug and refill engine oil. (Refer to Engine Oil Replacement P.12-3.)
8. Rev the engine a few times, and check to be sure that no engine oil leaks from the installation section of the oil filter.

ENGINE OIL PRESSURE CHECK

Required Special Tool:

MD998054: Engine Oil Pressure Switch Wrench

1. Check engine oil quantity.

⚠ CAUTION

Since sealant is applied to the thread of the engine oil pressure switch, take care not to damage the engine oil pressure switch when removing it.

2. Use special tool MD998054 to remove the engine oil pressure switch.

NOTE: Remove the terminal of oil pressure switch where special tool MD998054 is not fitted.

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.

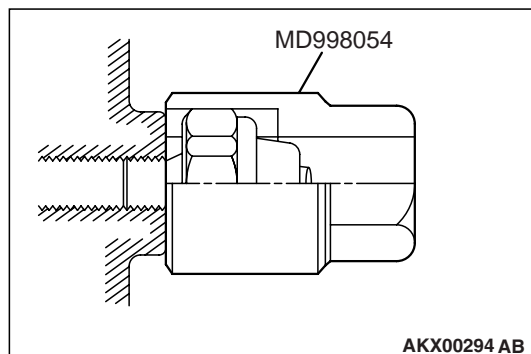
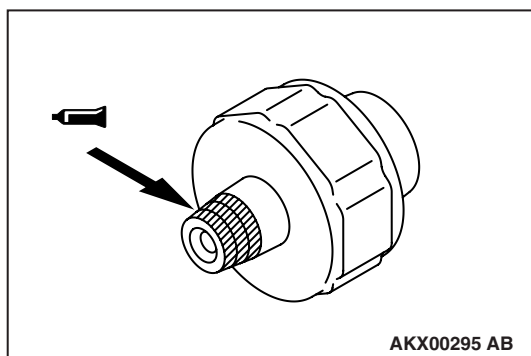
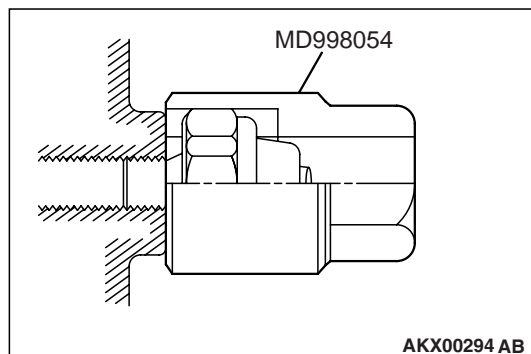
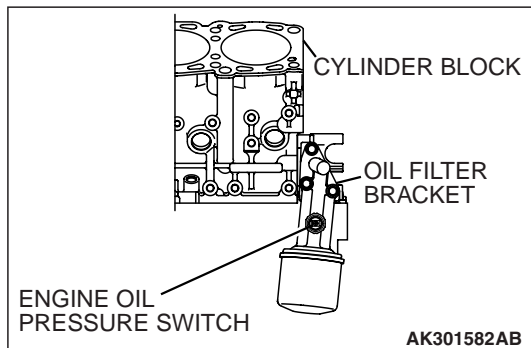
7. Apply the specified sealant 3M™ AAD Part number 8672 or equivalent to thread of the engine oil pressure switch.

⚠ CAUTION

Do not start the engine within one hour after the engine oil pressure switch has been installed.

8. Use special tool MD998054 to tighten the engine oil pressure switch to the specified torque.

Tightening torque: 10 ± 2 N·m (87 ± 17 in-lb)



ENGINE OIL COOLER

REMOVAL AND INSTALLATION

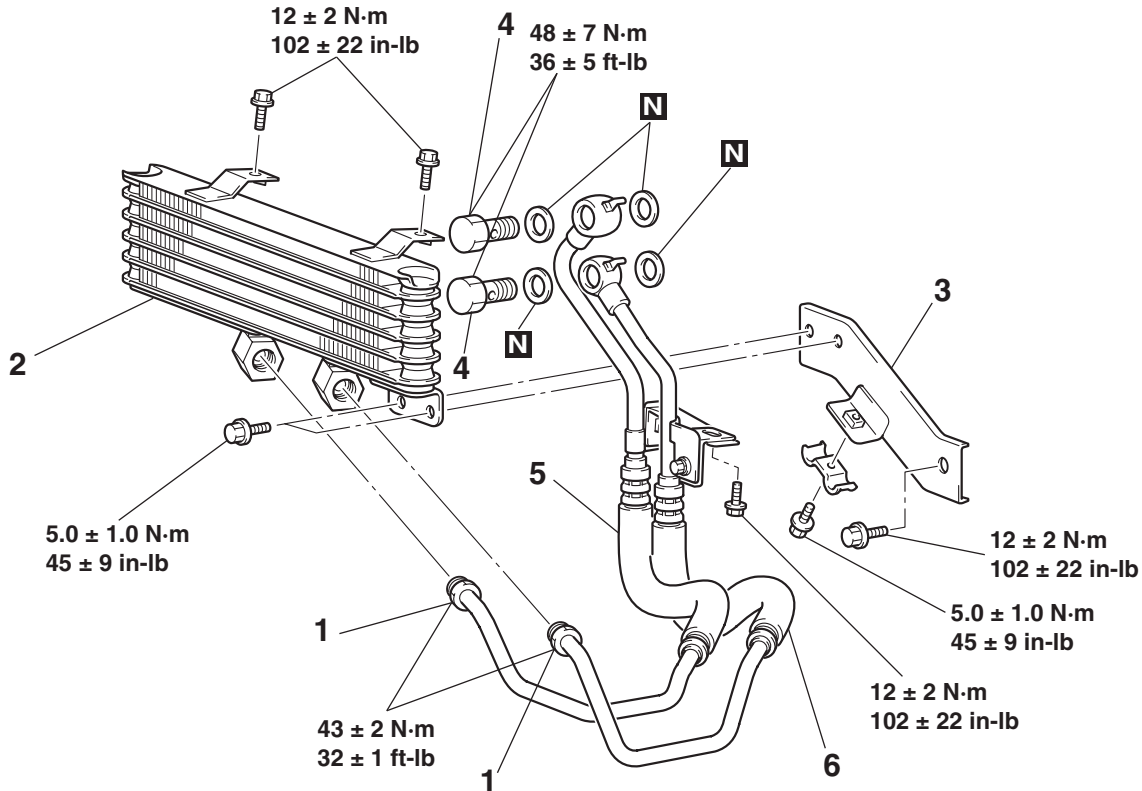
M1121001300202

Pre-removal Operation

- Skid Plate Under Cover Removal
- Radiator Shroud Lower Cover Removal (Refer to GROUP 14, Radiator P.14-8.)

Post-installation Operation

- Skid Plate Under Cover Installation
- Radiator Shroud Lower Cover Installation (Refer to GROUP 14, Radiator P.14-8.)
- Engine Oil Refilling and Level Check (Refer to P.12-3.)



AC001605AC

REMOVAL STEPS

1. OIL COOLER HOSE CONNECTION
OIL COOLER SIDE
2. OIL COOLER ASSEMBLY
3. BRACKET

REMOVAL STEPS (Continued)

4. EYE BOLTS
5. OIL COOLER RETURN HOSE
6. OIL COOLER FEED HOSE

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1121002200402

ITEM	SPECIFICATION
Engine oil pan drain plug	39 ± 5 N·m (29 ± 3 ft-lb)
Engine oil pressure switch	10 ± 2 N·m (87 ± 17 in-lb)
Engine oil cooler	
Oil cooler bolt (6 × 20)	5.0 ± 1.0 N·m (45 ± 9 in-lb)
Oil cooler bolt (8 × 20)	12 ± 2 N·m (102 ± 22 in-lb)
Oil cooler bracket bolt	12 ± 2 N·m (102 ± 22 in-lb)
Oil cooler eye bolt	48 ± 7 N·m (36 ± 5 ft-lb)
Oil cooler hose bracket bolt	12 ± 2 N·m (102 ± 22 in-lb)
Oil cooler hose clamp bolt	5.0 ± 1.0 N·m (45 ± 9 in-lb)
Oil cooler hose joint	43 ± 2 N·m (32 ± 1 ft-lb)

SERVICE SPECIFICATIONS

M1121000300298

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

LUBRICANT

M1121000400604

ITEM	ENGINE OIL	QUANTITY dm ³ (qt)
Oil cooler	Engine oils displaying ILSAC certification symbol ("Starburst" symbol) or conforming to the API classification SL, SL/CF	0.3 (0.32)
Oil filter		0.3 (0.32)
Total quantity		4.9 (5.14)

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 MARK
("STARBURST" SYMBOL)



ACX00394 AI

API SERVICE SYMBOL



AC309404 AB

If these oils are not available, an API classification SL, SL/CF can be used.