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ENGINE MECHANICAL (6VD1 3.2L)

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6A-2 ENGINE MECHANICAL (6VD1 3.2L)

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Service Precaution

WARNING: THIS VEHICLE HAS A SUPPLEMENTAL RESTRAINT SYSTEM (SRS). REFER TO THE SRS COMPONENT AND WIRING LOCATION VIEW IN ORDER TO DETERMINE WHETHER YOU ARE PERFORMING SERVICE ON OR NEAR THE SRS COMPONENTS OR THE SRS WIRING. WHEN YOU ARE PERFORMING SERVICE ON OR NEAR THE SRS COMPONENTS OR THE SRS WIRING, REFER TO THE SRS SERVICE INFORMATION. FAILURE TO FOLLOW WARNINGS COULD RESULT IN POSSIBLE AIR BAG DEPLOYMENT, PERSONAL INJURY, OR OTHERWISE UNNEEDED SRS SYSTEM REPAIRS.

CAUTION: Always use the correct fastener in the proper location. When you replace a fastener, use ONLY the exact part number for that application. ISUZU will call out those fasteners that require a replacement after removal. ISUZU will also call out the fasteners that require thread lockers or thread sealant. UNLESS OTHERWISE SPECIFIED, do not use supplemental coatings (Paints, greases, or other corrosion inhibitors) on threaded fasteners or fastener joint interfaces. Generally, such coatings adversely affect the fastener torque and the joint clamping force, and may damage the fastener. When you install fasteners, use the correct tightening sequence and specifications. Following these instructions can help you avoid damage to parts and systems.

General Description

Engine Cleanliness And Care

An automobile engine is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in the thousandths of a millimeter (ten thousandths of an inch). Accordingly, when any internal engine parts are serviced, care and cleanliness are important. Throughout this section, it should be understood that proper cleaning and protection of machined surfaces and friction areas is part of the repair procedure. This is considered standard shop practice even if not specifically stated.

- A liberal coating of engine oil should be applied to all friction areas during assembly to protect and lubricate the surfaces on initial operation.
- Whenever valve train components, pistons, piston rings, connecting rods, rod bearings, and crankshaft journal bearings are removed for service, they should be retained in order.
- At the time of installation, they should be installed in the same locations and with the same mating surfaces as when removed.
- Battery cables should be disconnected before any major work is performed on the engine. Failure to disconnect cables may result in damage to wire harness or other electrical parts.
- The six cylinders of this engine are identified by numbers; Right side cylinders 1, 3 and 5, Left side cylinders 2, 4 and 6, as counted from crankshaft pulley side to flywheel side.

General Information on Engine Service

The following information on engine service should be noted carefully, as it is important in preventing damage and contributing to reliable engine performance.

- When raising or supporting the engine for any reason, do not use a jack under the oil pan. Due to the small clearance between the oil pan and the oil pump strainer, jacking against the oil pan may cause damage to the oil pick-up unit.
- The 12-volt electrical system is capable of damaging circuits. When performing any work where electrical terminals could possibly be grounded, the ground cable of the battery should be disconnected at the battery.
- Any time the intake air duct or air cleaner is removed, the intake opening should be covered. This will protect against accidental entrance of foreign material into the cylinder which could cause extensive damage when the engine is started.

Cylinder Block

The cylinder block is made of aluminum die-cast casting for 75°V-type six cylinders. It has a rear plate integrated structure and employs a deep skirt. The cylinder liner is cast and the liner inner diameter and crankshaft journal diameter are classified into grades. The crankshaft is supported by four bearings of which width is different between No.2, No.3 and No.1, No.4; the width of No.3 bearing on the body side is different in order to support the thrust bearing. The bearing cap is made of nodular cast iron and each bearing cap uses four bolts and two side bolts.

Cylinder Head

The cylinder head, made of aluminum alloy casting employs a pent-roof type combustion chamber with a spark plug in the center. The intake and exhaust valves are placed in V-type design. The ports are cross-flow type.

Valve Train

Intake and exhaust camshaft on the both side of banks are driven through an camshaft drive gear by timing belt. The valves are operated by the camshaft and the valve clearance is adjusted to select suitable thickness shim.

Intake Manifold

The intake manifold system is composed of the aluminum cast common chamber and intake manifold attached with six fuel injectors.

Exhaust Manifold

The exhaust manifold is made of nodular cast iron.

Pistons and Connecting Rods

Aluminum pistons are used after selecting the grade that meets the cylinder bore diameter. Each piston has two compression rings and one oil ring. The piston pin made of chromium steel is offset 1mm toward the thrust side, and the thrust pressure of piston to the cylinder wall varies gradually as the piston travels. The connecting rods are made of forged steel. The connecting rod bearings are graded for correct size selection.

Crankshaft and Bearings

The crankshaft is made of Ductile cast-iron. Pins and journals are graded for correct size selection for their bearing.

Engine Control Module (ECM)

The ECM location is on the common chamber.

Engine Diagnosis

Hard Starting

1. Starting Motor Does Not Turn Over

Troubleshooting Procedure

Turn on headlights and starter switch.

Condition	Possible cause	Correction
Headlights go out or dim considerably	Battery run down or under charged	Recharge or replace battery
	Terminals poorly connected	Clean battery posts and terminals and connect properly
	Starting motor coil circuit shorted	Overhaul or replace
	Starting motor defective	Overhaul or replace

2. Ignition Trouble — Starting Motor Turns Over But Engine Does Not Start

Spark Test

Disconnect an ignition coil from any spark plug. Connect the spark plug tester 5-8840-0383-0, start the engine, and check if a spark is generated in the spark plug tester. Before starting the engine, make sure that the spark plug

tester is properly grounded. To avoid electrical shock, do not touch the part where insulation of the ignition coil is broken while the engine is running.

Condition	Possible cause	Correction
Spark jumps across gap	Spark plug defective	Clean, adjust spark gap or replace
	Ignition timing incorrect	Refer to Ignition System
	Fuel not reaching fuel injector(s) or engine	Refer to item 3 (Trouble in fuel system)
	Valve timing incorrect	Adjust
	Engine lacks compression	Refer to item 4 (Engine lacks compression)
No sparking takes place	Ignition coil disconnected or broken	Connect properly or replace
	Electronic Ignition System with module	Replace
	Poor connections in engine harness	Correct
	Engine Control Module cable disconnected or defective	Correct or replace

3. Trouble In Fuel System

Condition	Possible cause	Correction
Starting motor turns over and spark occurs but engine does not start.	Fuel tank empty	Fill
	Water in fuel system	Clean
	Fuel filter clogged	Replace filter
	Fuel pipe clogged	Clean or replace
	Fuel pump defective	Replace
	Fuel pump circuit open	Correct or replace
	Evaporative Emission Control System circuit clogged	Correct or replace
	Multipoint Fuel Injection System faulty	Refer to "Electronic Fuel Injection" section

4. Engine Lacks Compression

Condition	Possible cause	Correction
Engine lacks compression	Spark plug loosely fitted or spark plug gasket defective	Tighten to specified torque or replace gasket
	Valve timing incorrect	Adjust
	Cylinder head gasket defective	Replace gasket
	Valve incorrectly seated	Lap valve
	Valve stem seized	Replace valve and valve guide
	Valve spring weakened or broken	Replace
	Cylinder or piston rings worn	Overhaul engine
	Piston ring seized	Overhaul engine.

Engine Compression Test Procedure

1. Start and run the engine until the engine reaches normal operating temperature.
2. Turn the engine off.
3. Remove all the spark plugs.
4. Remove ignition coil fuse (15A) and disable the ignition system.
5. Remove the fuel pump relay from the relay and fuse box.
6. Engage the starter and check that the cranking speed is approximately 300 rpm.
7. Install cylinder compression gauge into spark plug hole.
8. With the throttle valve opened fully, keep the starter engaged until the compression gage needle reaches the maximum level. Note the reading.
9. Repeat the test with each cylinder.
If the compression pressure obtained falls below the limit, engine overhaul is necessary.

Limit; 1000 kPa (145 psi)

Rough Engine Idling or Engine Stalling

Condition	Possible cause	Correction
Trouble in fuel injection system	Idle air control valve defective	Replace
	Throttle shutting off incomplete	Correct or replace
	Throttle position sensor circuit open or shorted	Correct or replace
	Fuel injector circuits open or shorted	Correct or replace
	Fuel injectors damaged	Replace
	Fuel pump relay defective	Replace
	Mass Airflow Sensor circuit open or poor connections	Correct or replace
	Mass Airflow Sensor defective	Replace
	Manifold Absolute Pressure Sensor circuit open or poor connections	Correct or replace
	Manifold Absolute Pressure Sensor defective	Replace
	Engine Coolant Temperature Sensor circuit open or poor connections	Correct or replace
	Engine Coolant Temperature Sensor defective	Replace
	Intake Air Temperature sensor circuit open or poor connections	Correct or replace
	Intake Air Temperature sensor defective	Replace
	Vehicle Speed Sensor circuit open or shorted	Correct or replace
Vehicle Speed Sensor defective	Replace	
Trouble in emission control system	Engine Control Module defective	Replace
	Canister purge valve circuit open or poor connections	Correct or replace
	Canister purge valve defective	Replace
	Evaporative Emission Canister Purge control valve defective	Replace
	Trouble in ignition system	Refer to "Hard Start"
Others	Engine lacks compression	Refer to "Hard Start"
	Valve incorrectly seated	Lap valve
	Air Cleaner Filter clogged	Replace filter element
	Valve timing incorrect	Readjust
	Idle air control valve broken	Replace
	Fast idle solenoid defective	Replace
	Positive Crankcase Ventilation valve defective or clogged	Replace

Rough Engine Running

Condition	Possible cause	Correction
Engine misfires periodically	Ignition coil layer shorted	Replace
	Spark plugs fouling	Clean or install hotter type plug
	Spark plug(s) insulator nose leaking	Replace
	Fuel injector(s) defective	Replace
	Engine control module faulty	Replace
Engine knocks periodically	Spark plugs running too hot	Install colder type spark plugs
	Engine control module faulty	Replace
Engine lacks power	Spark plugs fouled	Clean
	Fuel injectors defective	Replace
	Mass Airflow Sensor or Intake Airflow Sensor circuit defective	Correct or replace
	Barometric Pressure (BARO) Sensor or Barometric Pressure Sensor circuit defective	Correct or replace
	Engine Coolant Temperature Sensor or Engine Coolant Temperature Sensor circuit defective	Correct or replace
	Engine Control Module faulty	Replace
	Intake Air Temperature Sensor or Intake Air Temperature Sensor circuit defective	Correct or replace
	Throttle Position Sensor or Throttle Position Sensor circuit defective	Correct or replace

Hesitation

Condition	Possible cause	Correction
Hesitation on acceleration	Throttle Position Sensor adjustment incorrect	Replace throttle valve assembly
	Throttle Position Sensor circuit open or shorted	Correct or replace
	Excessive play in accelerator linkage	Adjust or replace
	Mass Airflow Sensor circuit open or poor connections	Correct or replace
	Mass Airflow Sensor defective	Replace
	Barometric Pressure (BARO) Sensor circuit open or shorted	Correct or replace
	BARO Sensor defective	Replace
	Intake Air Temperature (IAT) Sensor circuit open or poor connections	Correct or replace
	IAT Sensor defective	Replace
Hesitation at high speeds (Fuel pressure too low)	Fuel tank strainer clogged	Clean or replace
	Fuel pipe clogged	Clean or replace
	Fuel filter clogged	Replace
	Defective fuel pump system	Check and replace
	Fuel Pressure Control Valve leaking	Replace
Hesitation at high speeds (Fuel injector not working normally)	Power supply or ground circuit for Multiport Fuel Injection System shorted or open	Check and correct or replace
	Fuel Injector defective	Replace
	Cable of Multiport Fuel Injection System circuit open or poor connections	Correct or replace
Hesitation at high speeds	Engine Control Module defective	Replace
	Throttle Position Sensor cable broken or poor connections	Correct or replace
	Throttle Position Sensor defective	Replace
	Engine Coolant Temperature Sensor circuit open or shorted	Correct or replace
	Engine Coolant Temperature Sensor defective	Replace
	Mass Airflow Sensor circuit open or poor connections	Correct or replace
	Mass Airflow Sensor defective	Replace
	MAP Sensor cable broken or poor connections	Correct or replace
	MAP Sensor defective	Replace
	IAT Sensor circuit open or poor connections	Correct or replace
	IAT Sensor defective	Replace
	Throttle valve not fully opened	Check and correct or replace
	Air Cleaner Filter clogged	Replace filter element
Power supply voltage too low	Check and correct or replace	

Engine Lacks Power

Condition	Possible cause	Correction
Trouble in fuel system	Fuel Pressure Control Valve not working normally	Replace
	Fuel injector clogged	Clean or replace
	Fuel pipe clogged	Clean
	Fuel filter clogged or fouled	Replace
	Fuel pump drive circuit not working normally	Correct or replace
	Fuel tank not sufficiently breathing due to clogged Evaporative Emission Control System circuit	Clean or replace
	Water in fuel system	Clean
	Inferior quality fuel in fuel system	Use fuel of specified octane rating
	Engine Control Module supplied poor voltage	Correct circuit
	Throttle Position Sensor cable broken or poor connections	Correct or replace
	Throttle Position Sensor defective	Replace
	Mass Airflow Sensor not working normally	Replace
	Manifold Absolute Pressure Sensor not working normally	Replace
	Intake Air Temperature Sensor not working normally	Replace
	Engine Coolant Temperature Sensor circuit open or shorted	Correct or replace
Engine Coolant Temperature Sensor defective	Replace	
Engine Control Module defective	Replace	
Trouble in intake or exhaust system	Air Cleaner Filter clogged	Replace filter element
	Air duct kinked or flattened	Correct or replace
Ignition failure	—————	Refer to Hard Start Troubleshooting Guide
	Heat range of spark plug inadequate	Install spark plugs of adequate heat range
	Ignition coil defective	Replace

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Condition	Possible cause	Correction
Engine overheating	Level of Engine Coolant too low	Replenish
	Fan clutch defective	Replace
	Thermostat defective	Replace
	Engine Coolant pump defective	Correct or replace
	Radiator clogged	Clean or replace
	Radiator filler cap defective	Replace
	Level of oil in engine crankcase too low or wrong engine oil	Change or replenish
	Resistance in exhaust system increased	Clean exhaust system or replace defective parts
	Throttle Position Sensor adjustment incorrect	Replace with Throttle Valve ASM
	Throttle Position Sensor circuit open or shorted	Correct or replace
	Cylinder head gasket damaged	Replace
Engine overcooling	Thermostat defective	Replace (Use a thermostat set to open at 82° C (180° F))
Engine lacks compression	—————	Refer to Hard Start
Others	Tire inflation pressure abnormal	Adjust to recommended pressures
	Brake drag	Adjust
	Clutch slipping	Adjust or replace
	Level of oil in engine crankcase too high	Correct level of engine oil

Engine Noisy

Abnormal engine noise often consists of various noises originating in rotating parts, sliding parts and other moving parts of the engine. It is, therefore, advisable to locate the source of noise systematically.

Condition	Possible cause	Correction
Noise from crank journals or from crank bearings (Faulty crank journals and crank bearings usually make dull noise that becomes more evident when accelerating)	Oil clearance increased due to worn crank journals or crank bearings	Replace crank bearings and crankshaft or regrind crankshaft and install the undersize bearing
	Crankshaft out of round	Replace crank bearings and crankshaft or regrind crankshaft and install the undersize bearing
	Crank bearing seized	Crank bearing seized Replace crank bearings and crankshaft or regrind crankshaft and install the undersize bearing

Troubleshooting Procedure

Short out each spark plug in sequence using insulated spark plug wire removers. Locate cylinder with defective bearing by listening for abnormal noise that stops when spark plug is shorted out.

Condition	Possible cause	Correction
Noise from connecting rods or from connecting rod bearings (Faulty connecting rods or connecting rod bearings usually make an abnormal noise slightly higher than the crank bearing noise, which becomes more evident when engine is accelerated)	Bearing or crankshaft pin worn	Replace connecting rod bearings and crankshaft or regrind crankshaft pin and install the undersize bearing
	Crankpin out of round	Replace connecting rod bearings and crankshaft or regrind crankshaft pin and install the undersize bearing
	Connecting rod bent	Correct or replace
	Connecting rod bearing seized	Replace connecting rod bearings and crankshaft or regrind crankshaft pin and install the undersize bearing

Troubleshooting Procedure

Abnormal noise stops when the spark plug on the cylinder with defective part is shorted out.

Condition	Possible cause	Correction
Piston and cylinder noise (Faulty piston or cylinder usually makes a combined mechanical thumping noise which increases when engine is suddenly accelerated but diminishes gradually as the engine warms up)	Piston clearance increased due to cylinder wear	Replace piston and cylinder body
	Piston seized	Replace piston and cylinder body
	Piston ring broken	Replace piston and cylinder body
	Piston defective	Replace pistons and others

Troubleshooting Procedure

Short out each spark plug and listen for change in engine noise.

Condition	Possible cause	Correction
Piston pin noise (Piston makes noise each time it goes up and down)	Piston pin or piston pin hole worn	Replace piston, piston pin and connecting rod assy

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Troubleshooting Procedure

The slapping sound stops when spark plug on bad cylinder is shorted out.

Condition	Possible cause	Correction
Timing belt noise	Timing belt tension is incorrect	Replace pusher or adjust the tension pulley or replace timing belt
	Tensioner bearing defective	Replace
	Timing belt defective	Replace
	Timing pulley defective	Replace
	Timing belt comes in contact with timing cover	Replace timing belt and timing cover
Valve noise	Valve clearance incorrect	Replace adjusting shim
	Valve and valve guide seized	Replace valve and valve guide
	Valve spring broken or weakened	Replace
	Valve seat off-positioned	Correct
	Camshaft worn out	Replace
Crankshaft noise	Crankshaft end play excessive (noise occurs when clutch is engaged)	Replace thrust bearing
Engine knocking	Preignition due to use of spark plugs of inadequate heat range	Install Spark Plugs of adequate heat range
	Carbon deposits in combustion chambers	Clean
	Fuel too low in octane rating	Replace fuel
	Wide Open Throttle enrichment system failure	Refer to Section 6E
	Selection of transmission gear incorrect	Caution operator of incorrect gear selection
	Engine overheating	Refer to "Engine Lacks Power"
Others	Water pump defective	Replace
	Drive belt slipping	Replace auto tensioner or drive belt

Abnormal Combustion

Condition	Possible cause	Correction
Trouble in fuel system	Fuel pressure control valve defective	Replace
	Fuel filter clogged	Replace
	Fuel pump clogged	Clean or replace
	Fuel tank or fuel pipe clogged	Clean or replace
	Fuel injector clogged	Clean or replace
	Fuel pump relay defective	Replace
	Power supply cable for fuel pump broken or poor connections	Reconnect, correct or replace
	Mass Airflow (MAF) Sensor circuit open or defective	Correct or replace
	MAF Sensor defective	Replace
	Manifold Absolute Pressure Sensor circuit open or shorted	Correct or replace
	Manifold Absolute Pressure Sensor defective	Replace
	Engine Coolant Temperature (ECT) Sensor circuit open or shorted	Correct or replace
	ECT Sensor defective	Replace
	Throttle Position Sensor adjustment incorrect	Readjust
	Throttle Position Sensor defective	Replace
	Throttle Position Sensor connector poor connections	Reconnect
	Vehicle Speed Sensor cable poor connections or defective	Correct or replace
	Vehicle Speed Sensor loosely fixed	Fix tightly
	Vehicle Speed Sensor in wrong contact or defective	Replace
Engine Control Module cable poor connections or defective	Correct or replace	
Trouble in emission control system	Heated Oxygen Sensor circuit open	Correct or replace
	Heated Oxygen Sensor defective	Replace
	Signal vacuum hose loosely fitted or defective	Correct or replace
	ECT Sensor circuit open or shorted	Correct or replace
	Canister Purge Valve circuit open or shorted	Correct or replace
	Canister Purge Valve defective	Replace
	ECT Sensor defective	Replace
	Positive Crankcase Ventilation (PCV) valve and hose clogged	Correct or replace
	Evaporator system	Refer to Section 6E
Trouble in ignition system	—————	Refer to "Engine Lacks Power"
Trouble in cylinder head parts	Carbon deposits in combustion chamber	Remove carbon
	Carbon deposit on valve, valve seat and valve guide	Remove carbon

Engine Oil Consumption Excessive

Condition	Possible cause	Correction
Oil leaking	Oil pan drain plug loose	Retighten or replace gasket
	Crankcase fixing bolts loosened	Retighten
	Oil pan setting bolts loosened	Retighten
	Oil pan gasket broken	Replace gasket
	Front cover retaining bolts loose or gasket broken	Retighten or replace gasket
	Head cover fixing bolts loose or gasket broken	Retighten or replace gasket
	Oil cooler adapter cracked	Replace
	Oil cooler center bolt loose	Retighten
	Oil cooler O-ring broken	Replace
	Oil cooler piping loose or broken	Retighten or replace
	Oil filter adapter cracked	Replace
	Oil filter attachments bolt loose or rubber gasket broken	Retighten or replace oil filter
	Oil cooler broken	Replace
	Crankshaft front or rear oil seal defective	Replace oil seal
	Oil pressure unit loose or broken	Retighten or replace
	Blow-by gas hose broken	Replace hose
Positive Crankcase Ventilation Valve clogged	Clean	
Engine/Transmission coupling failed	Replace oil seal	
Oil leaking into combustion chambers due to poor seal in valve system	Valve stem oil seal defective	Replace
	Valve stem or valve guide worn	Replace valve and valve guide
Oil leaking into combustion chambers due to poor seal in cylinder parts	Cylinders and pistons worn excessively	Replace cylinder body assembly and pistons
	Piston ring gaps incorrectly positioned	Correct
	Piston rings set with wrong side up	Correct
	Piston ring sticking	Replace cylinder body assembly and pistons
	Piston ring and ring groove worn	Replace pistons and others
	Return ports in oil rings clogged	Clean piston and replace rings
Positive Crankcase Ventilation System malfunctioning	Positive Crankcase Ventilation Valve clogged	Clean
Others	Improper oil viscosity	Use oil of recommended S.A.E. viscosity
	Continuous high speed driving and/or severe usage such as trailer towing	Continuous high speed operation and/or severe usage will normally cause increased oil consumption

Fuel Consumption Excessive

Condition	Possible cause	Correction
Trouble in fuel system	Mixture too rich or too lean due to trouble in fuel injection system	Refer to "Abnormal Combustion"
	Fuel cut function does not work	Refer to "Abnormal Combustion"
Trouble in ignition system	Misfiring or abnormal combustion due to trouble in ignition system	Refer to "Hard Start" or "Abnormal Combustion"
Others	Engine idle speed too high	Reset Idle Air Control Valve
	Returning of accelerator control sluggish	Correct
	Fuel system leakage	Correct or replace
	Clutch slipping	Correct
	Brake drag	Correct
	Selection of transmission gear incorrect	Caution operator of incorrect gear selection

Lubrication Problems

Condition	Possible cause	Correction
Oil pressure too low	Wrong oil in use	Replace with correct engine oil
	Relief valve sticking	Replace
	Oil pump not operating properly	Correct or replace
	Oil pump strainer clogged	Clean or replace strainer
	Oil pump worn	Replace
	Oil pressure gauge defective	Correct or replace
	Crankshaft bearing or connecting rod bearing worn	Replace
Oil contamination	Wrong oil in use	Replace with correct engine oil
	Oil filter clogged	Replace oil filter
	Cylinder head gasket damage	Replace gasket
	Burned gases leaking	Replace piston and piston rings or cylinder body assembly
Oil not reaching valve system	Oil passage in cylinder head or cylinder body clogged	Clean or correct

Engine Oil Pressure Check

1. Check for dirt, gasoline or water in the engine oil.
 - a. Check the viscosity of the oil.
 - b. Check the viscosity of the oil.
 - c. Change the oil if the viscosity is outside the specified standard.
 - d. Refer to the "Maintenance and Lubrication" section of this manual.
2. Check the engine oil level.
The level should fall somewhere between the "ADD" and the "FULL" marks on the oil level dipstick.
If the oil level does not reach the "ADD" mark on the oil level dipstick, engine oil must be added.
3. Remove the oil pressure unit.

4. Install an oil pressure gauge.
5. Start the engine and allow the engine to reach normal operating temperature (About 80°C).
6. Measure the oil pressure.
**Oil pressure should be:
392–550 kPa (56.9–80.4 psi) at 3000 rpm.**
7. Stop the engine.
8. Remove the oil pressure gauge.
9. Install the oil pressure unit.
10. Start the engine and check for leaks.

6A-16 ENGINE MECHANICAL (6VD1 3.2L)

Malfunction Indicator Lamp

The instrument panel "CHECK ENGINE" Malfunction Indicator Lamp (MIL) illuminates by self diagnostic system

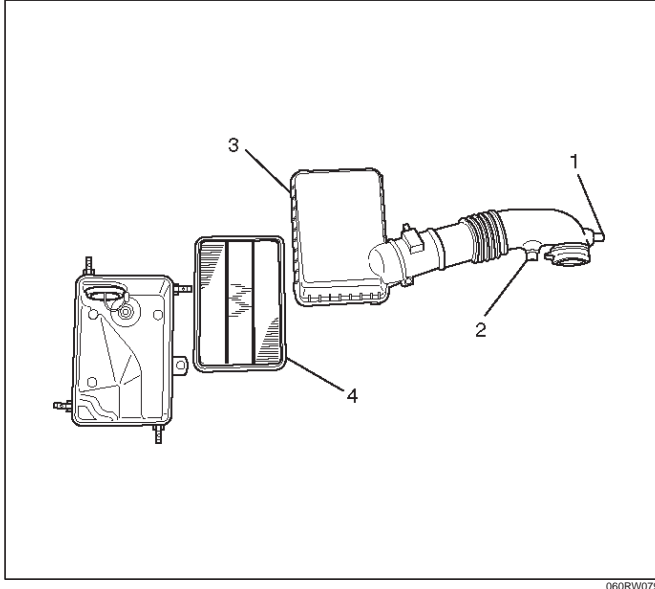
when the system checks the starting of engine, or senses malfunctions.

Condition	Possible cause	Correction
"CHECK ENGINE" MIL does not illuminate at the starting of engine	Bulb defective	Replace
	MIL circuit open	Correct or replace
	Command signal circuit to operate self diagnostic system shorted	Correct or replace
	Engine Control Module (ECM) cable loosely connected, disconnected or defective	Correct or replace
	ECM defective	Replace
"CHECK ENGINE" MIL illuminates, and stays on	Deterioration of heated oxygen sensor internal element	Replace
	Heated oxygen sensor connector terminal improper contact	Reconnect properly
	Heated oxygen sensor lead wire shorted	Correct
	Heated oxygen sensor circuit open	Correct or replace
	Deterioration of engine coolant temperature sensor internal element	Replace
	Engine coolant temperature sensor connector terminal improper contact	Reconnect properly
	Engine coolant temperature sensor lead wire shorted	Correct
	Engine coolant temperature sensor circuit open	Correct or replace
	Throttle position sensor open or shorted circuits	Correct or replace
	Deterioration of crankshaft position sensor	Replace
	Crankshaft position sensor circuit open or shorted	Correct or replace
	Vehicle speed sensor circuit open	Correct or replace
	Manifold absolute pressure sensor circuit open or shorted	Correct or replace
	Intake air temperature sensor circuit open or shorted	Correct or replace
	Fuel injector circuit open or shorted	Correct or replace
	ECM driver transistor defective	Replace ECM
	Malfunctioning of ECM RAM (Random Access Memory) or ROM (Read Only Memory)	Replace ECM

Cylinder Head Cover LH

Removal

1. Disconnect battery ground cable.
2. Remove air cleaner duct assembly.

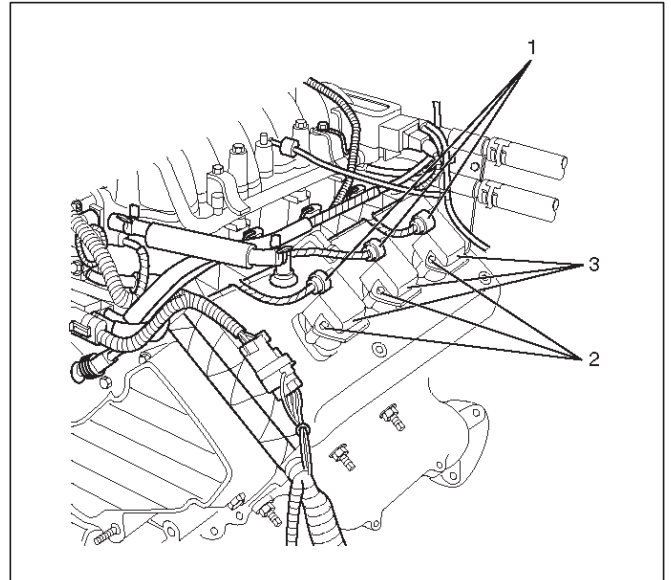


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Legend

- (1) Positive Crankcase Ventilation Hose Connector
- (2) Intake Air Temperature Sensor
- (3) Air Cleaner Duct Assembly
- (4) Air Cleaner Element

3. Disconnect positive crankcase ventilation hose.
4. Remove camshaft angle sensor connector.
5. Remove ground cable fixing bolt on cylinder head cover.
6. Ignition coil connector and ignition coil.
 - Disconnect the three connectors from the ignition coils.
 - Remove harness bracket bolt on cylinder head cover.
 - Remove fixing bolts on ignition coils.

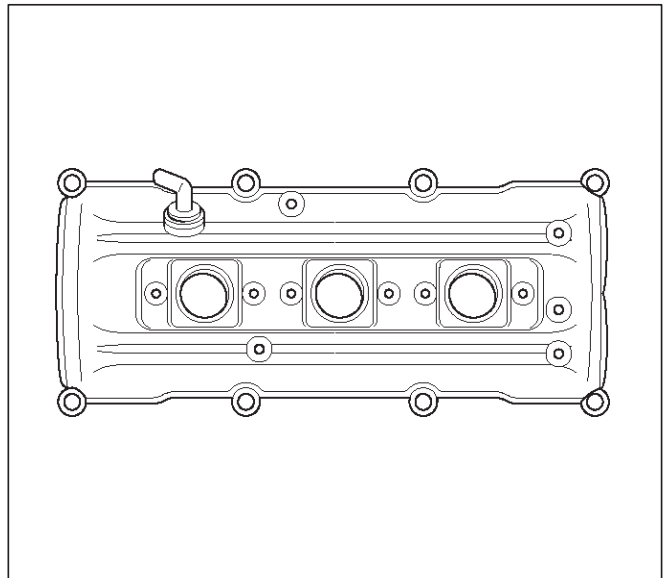


060RW078

Legend

- (1) Ignition Coil Connector
- (2) Bolt
- (3) Ignition Coil Assemblies

7. Remove fixing bolt for fuel injector harness bracket.
8. Remove eight fixing bolts, then the cylinder head cover.



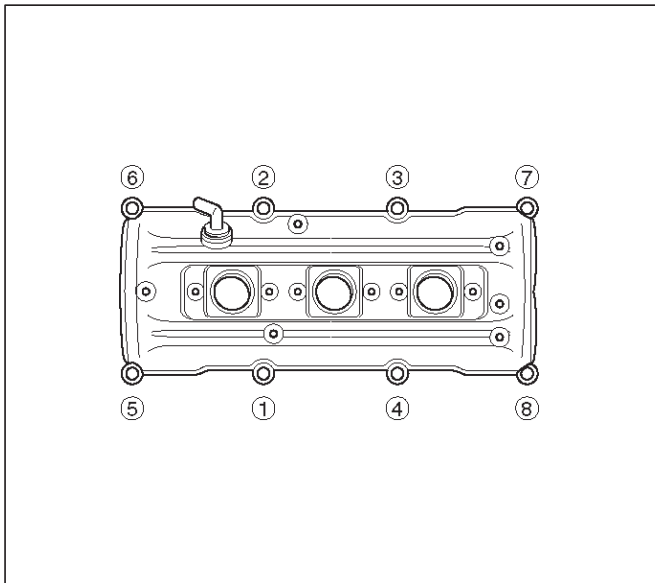
010RW001

Installation

1. Install cylinder head cover.

- Clean the sealing surface of cylinder head and cylinder head cover to remove oil and sealing materials completely.
- Apply sealant (TB-1207B or equivalent) of bead diameter 2-3 mm at eight place of arched area of camshaft bracket on front and rear sides.
- The cylinder head cover must be installed within 5 minutes after sealant application to prevent hardening of sealant.
- Tighten bolts to the specified torque.

Torque : 9 N·m (0.9 kg·m/80 lb in)

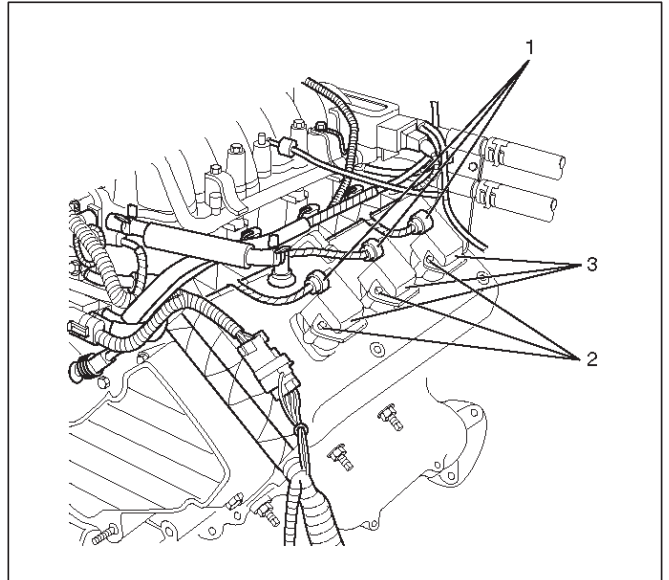


2. Install fuel injection harness bracket and tighten bolt to the specified torque.

Torque : 9 N·m (0.9 kg·m/80 lb in)

3. Connect ignition coil connector and ignition coil, then tighten bolt to the specified torque.

Torque : 4 N·m (0.4 kg·m/35 lb in)



Legend

- (1) Ignition Coil Connector
- (2) Bolt
- (3) Ignition Coil Assembly

4. Connect ground cable and tighten bolts to the specified torque.

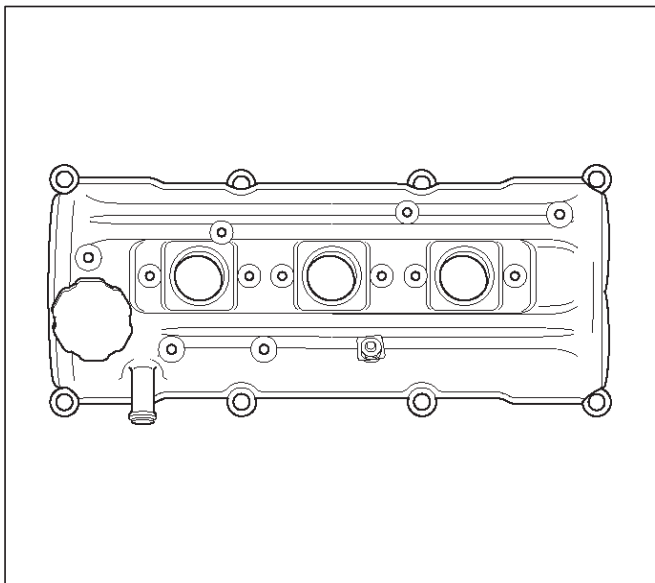
Torque : 9 N·m (0.9 kg·m/80 lb in)

5. Connect camshaft angle sensor connector.
6. Install positive crankcase ventilation hose.
7. Install air cleaner duct assembly.

Cylinder Head Cover RH

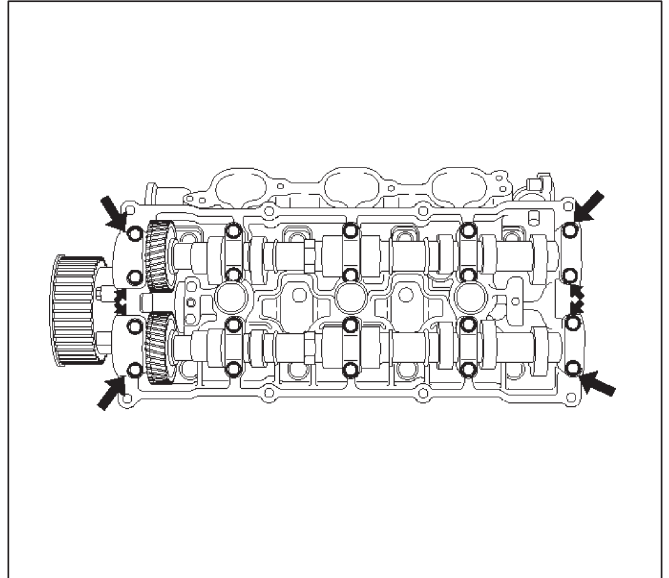
Removal

1. Disconnect battery ground cable.
2. Disconnect ventilation hose from cylinder head cover.
3. Disconnect three ignition coil connectors from ignition coils and remove harness bracket bolts on cylinder head cover then remove ignition coil fixing bolts on ignition coils and remove ignition coils.
4. Remove heater pipe fixing bolts from the bracket.
5. Disconnect fuel injector harness connector then remove fuel injector harness bracket bolt.
6. Remove eight fixing bolts then the cylinder head cover.



- The cylinder head cover must be installed within 5 minutes after sealant application to prevent premature hardening of sealant.
- Tighten bolts to the specified torque.

Torque : 9 N·m (0.9 kg·m/80 lb in)



2. Install exhaust gas recirculation pipe and tighten to specified torque.

Torque:

Exhaust manifold side: 28 N·m (2.9 kg·m/21 lb ft)

Flare nut: 44 N·m (4.5 kg·m/33 lb ft)

Cylinder head side: 25 N·m (2.6 kg·m/18 lb ft)

3. Tighten fuel injector harness bracket bolts to specified torque then reconnect fuel injector harness connector.

Torque : 7.8 N·m (0.8 kg·m/5.7 lb ft)

4. Install heater pipe bolt to the specified torque.

Torque : 21 N·m (2.1 kg·m/15 lb ft)

5. Connect ignition coil connector and tighten ignition coil fixing bolts to specified torque.

Torque : 4 N·m (0.4 kg·m/35 lb in)

6. Connect ventilation hose to cylinder head.

Installation

1. Install cylinder head cover.
 - Clean the sealing surface of cylinder head and cylinder head cover to remove oil and sealing materials completely.

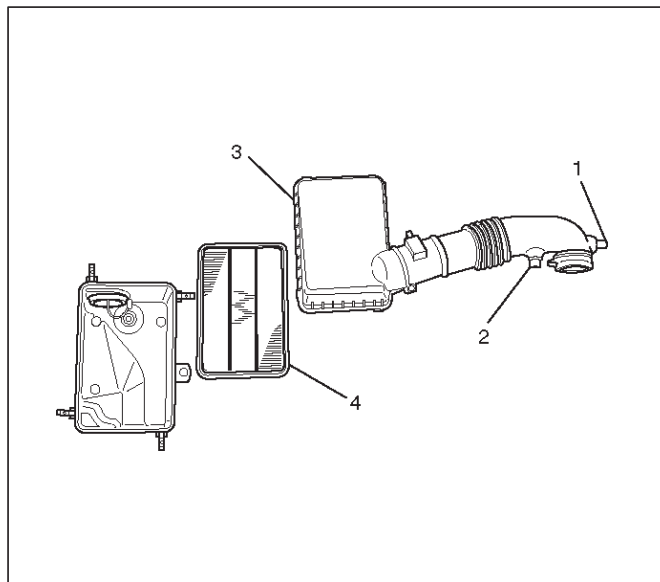
Apply sealant (TB-1207B or equivalent) of bead diameter 2-3 mm at eight place of arched area of camshaft bracket on front and rear sides.

6A-20 ENGINE MECHANICAL (6VD1 3.2L)

Common Chamber

Removal

1. Disconnect battery ground cable.
2. Remove air cleaner duct assembly.

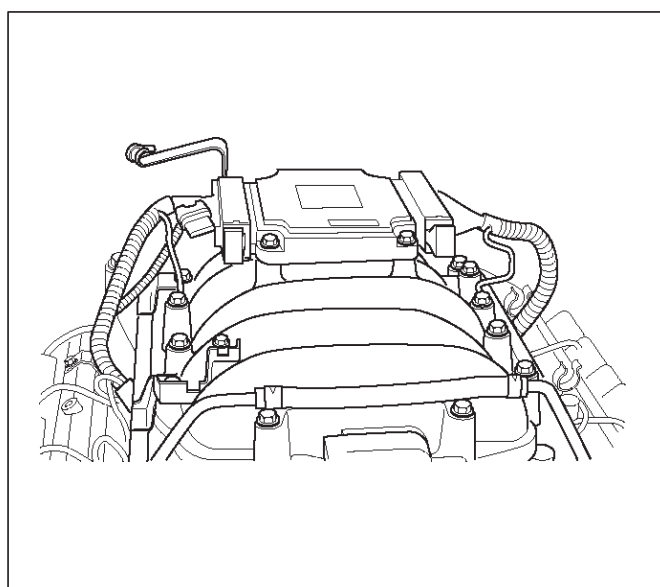


060RW079

Legend

- (1) Positive Crankcase Ventilation Hose Connector
- (2) Intake Air Temperature Sensor
- (3) Air Cleaner Duct Assembly
- (4) Air Cleaner Element

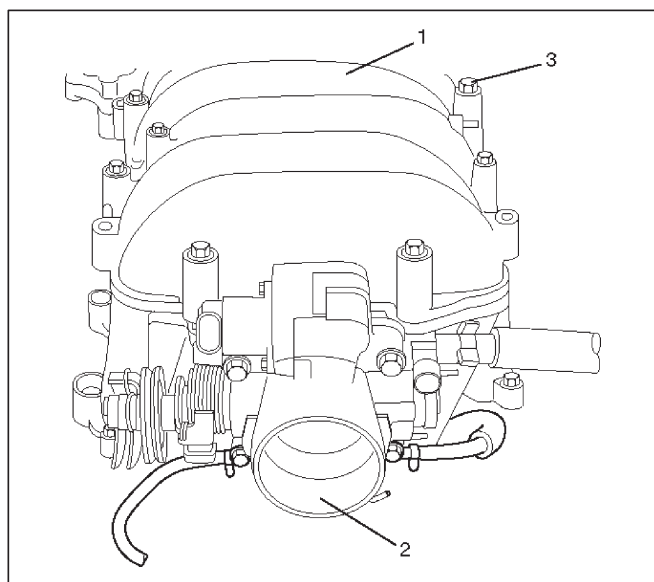
3. Remove the ECM.
 - Disconnect the two connectors from the ECM.
 - Remove fixing bolts on the common chamber.
 - Remove fixing bolts for ground cable.



060RW025

4. Disconnect accelerator pedal cable from throttle body and cable bracket.
5. Disconnect vacuum booster hose from common chamber.

6. Disconnect connector from manifold absolute pressure sensor, idle air control valve, throttle position sensor, solenoid valve, electric vacuum sensing valve.
7. Disconnect vacuum hose on canister VSV and positive crankcase ventilation hose, fuel rail assembly with pressure control valve bracket.
8. Remove ventilation hose from throttle valve and intake duct and remove water hose.
9. Remove the four throttle body fixing bolts.
10. Remove exhaust gas recirculation valve assembly fixing bolt and nut on common chamber.
11. Remove two bolts from common chamber rear side for remove fuel hose bracket.
12. Remove common chamber four bolts and four nuts then remove the common chamber.



025RW001

Legend

- (1) Common Chamber
- (2) Throttle Valve Assembly
- (3) Bolt

Installation

1. Install common chamber and tighten bolts and nuts to the specified torque.

Torque :
Bolt : 25 N·m (2.6 kg·m/18 lb ft)
Nut : 25 N·m (2.6 kg·m/18 lb ft)
2. Install fuel hose bracket and tighten bolts to specified torque.

Torque : 10 N·m (1.0 kg·m/89 lb in)
3. Install throttle body and tighten bolts to the specified torque.

Torque : 25 N·m (2.6 kg·m/18 lb ft)
4. Install ventilating hose to throttle valve and intake duct.