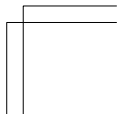
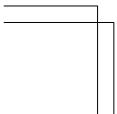
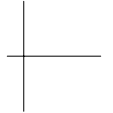


CALIFORNIA
Proposition 65 Warning
Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.



FOREWORD

The ISUZU industrial diesel engines are a product of ISUZU's long years of experience, advanced technology. ISUZU takes great pride in the superior durability and operating economy of these engines.

In order to get the fullest use and benefit from your industrial engine, it is important that you operate and maintain it correctly. This Manual is designed to help you do this.

Please read this Manual carefully and follow its operating and maintenance recommendations. This will ensure many years of trouble-free and economical engine operation.

Should your engine require servicing, please contact your nearest ISUZU engine outlet. He knows your engine best and is ready to meet your satisfaction.

All information, illustrations, and specifications contained in this Manual are based on the latest product information available at the time of publication.

ISUZU reserves the right to make changes in this Manual at any time without prior notice.

WARNING AND CAUTION

SAFETY WARNINGS

WARNING: These mean there is something that could hurt you or other people.

In the warning area, we tell you what the hazard is. Then we tell you what to do to help avoid or reduce the hazard. Please read these warnings. If you don't, you or others could be hurt.

ENGINE OR EQUIPMENT DAMAGE WARNINGS

CAUTION: These mean there is something that could damage your engine or equipment.

In the caution area, we tell you about something that can damage your engine or equipment. Many times, this damage would not be covered by your warranty, and it could be costly. But the caution will tell you what to do to help avoid the damage.

EMPHASIZED WARNINGS

NOTICE: These mean there is something that needs to be emphasized but which does not concern the possibility of personal injury or mechanical damage.

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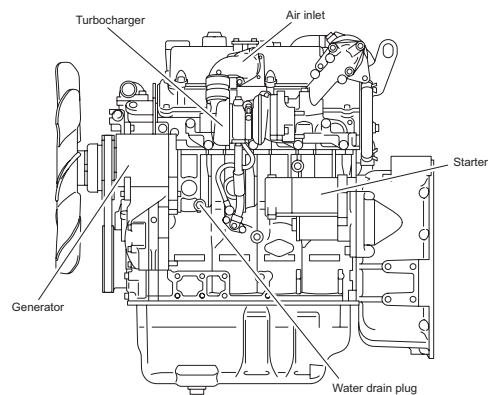
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1. ENGINE EXTERNAL VIEWS

1. MODEL 4LE1T

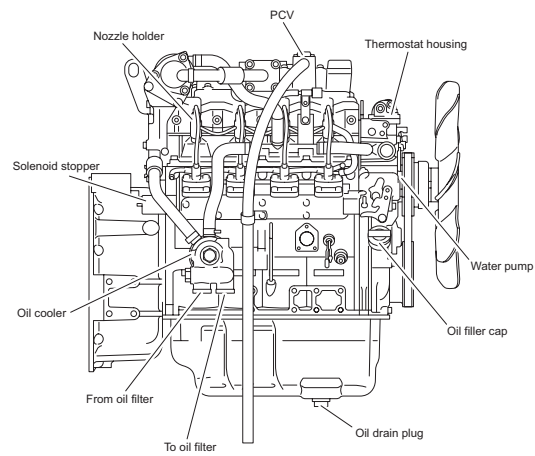
(1) LH



*Note:
Engine details may
vary depending on the
specifications.*

IMLE0085

(2) RH

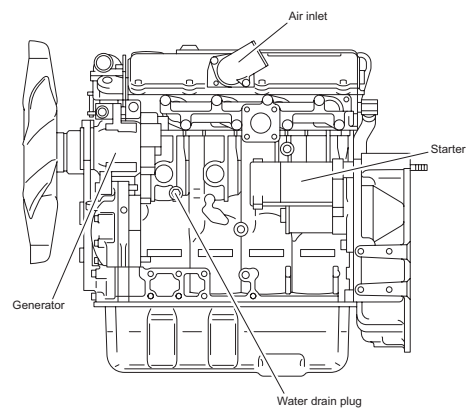


Note:
*Engine details may
vary depending on the
specifications.*

IMLE0086

2. MODEL 4LE1NA

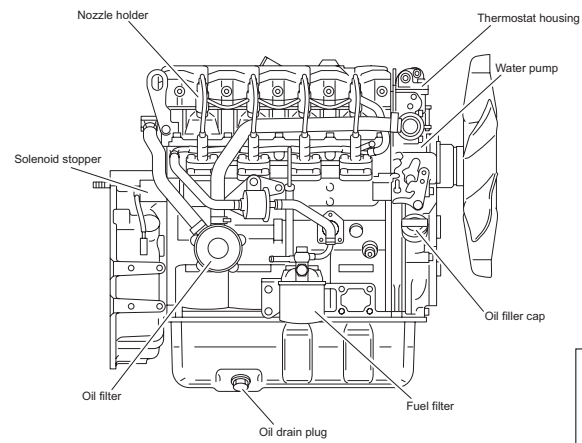
(1) LH



*Note:
Engine details may
vary depending on the
specifications.*

IMLE0087

(2) RH



Note:
*Engine details may
vary depending on the
specifications.*

IMLE0088

2. GENERAL INFORMATION

1. EPA AND CARB CERTIFIED ENGINE DATA AND SPECIFICATIONS

Se rapporter à la fin de ce document pour les informations EPA en français.

(1) Model AU-4LE1T

ISUZU engine model name		AU-4LE1T
Engine family		*SZXL02.2UTA
Engine code		4LE1XXXX-XX
Engine type		Water-Cooled, four cycle, in-line overhead valve type
Combustion type		Swirl chamber type
No. of cylinders – bore x stroke mm(in)		4 – 85 x 96 (3.35 x 3.78)
Engine displacement L(cid)		2.179 (133)
Compression ratio		21.5 to 1
Firing order		1 – 3 – 4 – 2
*2 Rated power: SAE NET kW(hp)/min ⁻¹		40 (53.6) / 2200
*2 Fuel flow at max rated power (mm ³ /stroke)		46.3
Exhaust emission control system		EM, IDI, TC, EGR
Injection pump		Bosch, PFR type
Governor		Variable speed, Mechanical type

* Mark ; Put a letter codes for model year on the top of the letters.

Y : 2000, 1 : 2001, 2 : 2002, 3 : 2003, 4 : 2004, 5 : 2005, 6 : 2006, 7 : 2007, 8 : 2008, 9 : 2009, Model Year
Engine code varies depending on each engine.

ISUZU engine model name			AU-4LE1T
Injection nozzles			Throttle type
Specified fuel			Diesel fuel (ASTM D975 No.2-D)
*2 Starter	(V-kW)		12 – 2.2
*2 Alternator	(V-A)		12 – 50
Specified engine oil (API grade)			Refer to 3.LUBRICANT, Engine Oil Selection.
*2 Lub. oil volume	L(qts)		7.6 (8.0) – 10.3 (10.9)
Coolant volume (Engine only)			2.8 (3.0)
*2 Engine dry weight	kg(lb)		190 (419)
*2 Engine dimensions	Overall length	mm(in)	647.5 (25.5)
	Overall width	mm(in)	523.6 (20.6)
	Overall height	mm(in)	720.8 (28.4)
Valve clearance (cold)			0.4 (0.0157)
Nozzle injection pressure			14.7 (2132)
*2 Injection timing B.T.D.C.			12°
Maker and type of turbocharger			IHI, RHF-3

Specification for items marked with an asterisk (*2) will vary according to the type of equipment in which the engine is installed.

(2) Model BV-4LE1T

ISUZU engine model name		BV-4LE1T
Engine family		*SZXL02.2VTB
Engine code		4LE1XXXX-XX
Engine type		Water-Cooled, four cycle, in-line overhead valve type
Combustion type		Swirl chamber type
No. of cylinders – bore x stroke	mm(in)	4 – 85 x 96 (3.35 x 3.78)
Engine displacement	L(cid)	2.179 (133)
Compression ratio		21.5 to 1
Firing order		1 – 3 – 4 – 2
*2 Rated power: SAE NET	kW(hp)/min ⁻¹	35 (46.9) / 1800
*2 Fuel flow at max rated power	(mm ³ /stroke)	49.7
Exhaust emission control system		EM, IDI, TC
Injection pump		Bosch, PFR type
Governor		Variable speed, Mechanical type

* Mark ; Put a letter codes for model year on the top of the letters.

Y : 2000, 1 : 2001, 2 : 2002, 3 : 2003, 4 : 2004, 5 : 2005, 6 : 2006, 7 : 2007, 8 : 2008, 9 : 2009, Model Year
Engine code varies depending on each engine.

ISUZU engine model name			BV-4LE1T
Injection nozzles			Throttle type
Specified fuel			Diesel fuel (ASTM D975 No.2-D)
*2 Starter	(V-kW)		12 – 2.0
*2 Alternator	(V-A)		12 – 35
Specified engine oil (API grade)			Refer to 3.LUBRICANT, Engine Oil Selection.
*2 Lub. oil volume	L(qts)		7.6 (8.0) – 10.3 (10.9)
Coolant volume (Engine only)			2.8 (3.0)
*2 Engine dry weight	kg(lb)		180 (397)
*2 Engine dimensions	Overall length	mm(in)	753.7 (29.7)
	Overall width	mm(in)	486.2 (19.1)
	Overall height	mm(in)	601.8 (23.7)
Valve clearance (cold)			0.4 (0.0157)
Nozzle injection pressure			14.7 (2132)
*2 Injection timing B.T.D.C.			10°
Maker and type of turbocharger			IHI, RHF-3

Specification for items marked with an asterisk (*2) will vary according to the type of equipment in which the engine is installed.

(3) Model AV-4LE1N

ISUZU engine model name		AV-4LE1N
Engine family		*SZXL02.2VNA
Engine code		4LE1XXXX-XX
Engine type		Water-Cooled, four cycle, in-line overhead valve type
Combustion type		Swirl chamber type
No. of cylinders – bore x stroke	mm(in)	4 – 85 x 96 (3.35 x 3.78)
Engine displacement	L(cid)	2.179 (133)
Compression ratio		21.5 to 1
Firing order		1 – 3 – 4 – 2
*2 Rated power: SAE NET	kW(hp)/min ⁻¹	35.9 (48.1) / 2600
*2 Fuel flow at max rated power	(mm ³ /stroke)	35.5
Exhaust emission control system		EM, IDI
Injection pump		Bosch, PFR type
Governor		Variable speed, Mechanical type

* Mark ; Put a letter codes for model year on the top of the letters.

Y : 2000, 1 : 2001, 2 : 2002, 3 : 2003, 4 : 2004, 5 : 2005, 6 : 2006, 7 : 2007, 8 : 2008, 9 : 2009, Model Year
Engine code varies depending on each engine.

ISUZU engine model name			AV-4LE1N
Injection nozzles			Throttle type
Specified fuel			Diesel fuel (ASTM D975 No.2-D)
*2 Starter	(V-kW)		12 – 2.0
*2 Alternator	(V-A)		12 – 35
Specified engine oil (API grade)			Refer to 3.LUBRICANT, Engine Oil Selection.
*2 Lub. oil volume	L(qts)		5.9 (6.2) – 8.4 (8.8)
Coolant volume (Engine only)		L(qts)	2.8 (3.0)
*2 Engine dry weight		kg(lb)	170 (375)
*2 Engine dimensions	Overall length	mm(in)	695.7 (27.4)
	Overall width	mm(in)	486.2 (19.1)
	Overall height	mm(in)	601.8 (23.7)
Valve clearance (cold)		mm(in)	0.4 (0.0157)
Nozzle injection pressure		MPa(psi)	14.7 (2132)
*2 Injection timing B.T.D.C.			13°

Specification for items marked with an asterisk (*2) will vary according to the type of equipment in which the engine is installed.

(4) **Model BV-4LE1N**

ISUZU engine model name		BV-4LE1N
Engine family		*SZXL02.2VNC
Engine code		4LE1XXXX-XX
Engine type		Water-Cooled, four cycle, in-line overhead valve type
Combustion type		Swirl chamber type
No. of cylinders – bore x stroke		mm(in) 4 – 85 x 96 (3.35 x 3.78)
Engine displacement		L(cid) 2.179 (133)
Compression ratio		21.5 to 1
Firing order		1 – 3 – 4 – 2
*2 Rated power: SAE NET		kW(hp)/min ⁻¹ 26.3 (35.3) / 1800
*2 Fuel flow at max rated power		(mm ³ /stroke) 36.5
Exhaust emission control system		EM, IDI
Injection pump		Bosch, PFR type
Governor		Variable speed, Mechanical type

* Mark ; Put a letter codes for model year on the top of the letters.

Y : 2000, 1 : 2001, 2 : 2002, 3 : 2003, 4 : 2004, 5 : 2005, 6 : 2006, 7 : 2007, 8 : 2008, 9 : 2009, Model Year
Engine code varies depending on each engine.

ISUZU engine model name			BV-4LE1N
Injection nozzles			Throttle type
Specified fuel			Diesel fuel (ASTM D975 No.2-D)
*2 Starter		(V-kW)	12 – 2.0
*2 Alternator		(V-A)	12 – 20
Specified engine oil (API grade)			Refer to 3.LUBRICANT, Engine Oil Selection.
*2 Lub. oil volume		L(qts)	5.9 (6.2) – 8.4 (8.8)
Coolant volume (Engine only)		L(qts)	2.8 (3.0)
*2 Engine dry weight		kg(lb)	170 (375)
*2 Engine dimensions	Overall length	mm(in)	671 (26.4)
	Overall width	mm(in)	496 (19.5)
	Overall height	mm(in)	595 (23.4)
Valve clearance (cold)		mm(in)	0.4 (0.0157)
Nozzle injection pressure		MPa(psi)	14.7 (2132)
*2 Injection timing B.T.D.C.			10°

Specification for items marked with an asterisk (*2) will vary according to the type of equipment in which the engine is installed.

(5) Engine family index

Engine	Engine family	Engine code	Injection nozzle opening pressure MPa(psi)	Injection timing B.T.D.C. (Static)
4LE1T	*SZXL02.2UTA	ALL	—	—
4LE1T	*SZXL02.2VTB	ALL	—	—
4LE1N	*SZXL02.2VNA	ALL	—	—
4LE1N	*SZXL02.2VNC	ALL	—	—

* Mark ; Put a letter codes for model year on the top of the letters.

Y : 2000, 1 : 2001, 2 : 2002, 3 : 2003, 4 : 2004, 5 : 2005, 6 : 2006, 7 : 2007, 8 : 2008, 9 : 2009, Model Year

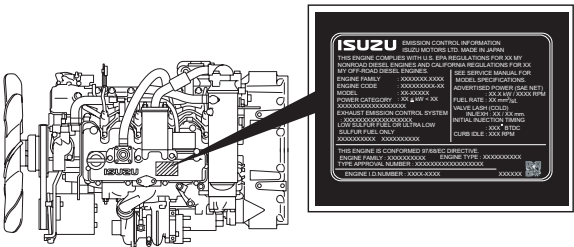
EMISSION CONTROL LABEL: ENGINE LABEL (EPA, EC COMBIND TYPE)

Emission control label is attached at the center of injection pump cover located at the right side of cylinder body, or on the cylinder head cover.

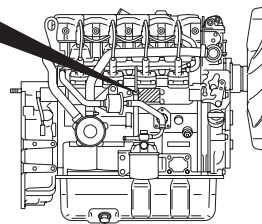
The location of emission control label attached on the engine may vary depending on the engine specification.

The following is the sample of a label required for engine emission control information, along with location.

4LE1T



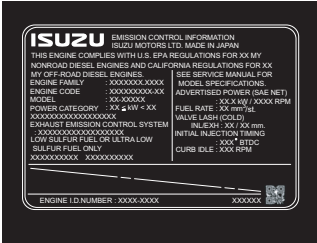
IMLE0097

[illegible]

IMLE0110

EMISSION CONTROL LABEL: ENGINE LABEL (ONLY EPA TYPE)

Emission control label is attached at a visible point on the equipment.



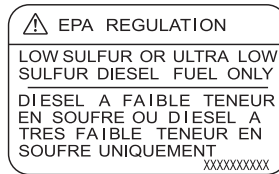
IMLE0105

FUEL TYPE IN USE LIMITATION LABEL (FOR EPA)

The fuel type in use limitation label is attached on the filler neck of the fuel tank.

Contents of the label:

LOW SULFUR OR ULTRA LOW SULFUR DIESEL FUEL ONLY

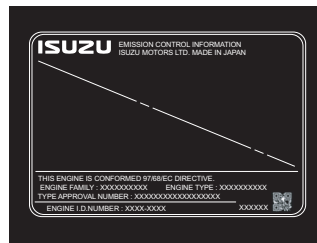


IMLE0066

2. EC EMISSION CONTROL LABEL: ENGINE LABEL (ONLY EC TYPE)

Emission control label is attached at the front of injection pump cover located at the right side of cylinder body or the cylinder head cover.

The following is the detail of a label required for engine emission control information, along with location.



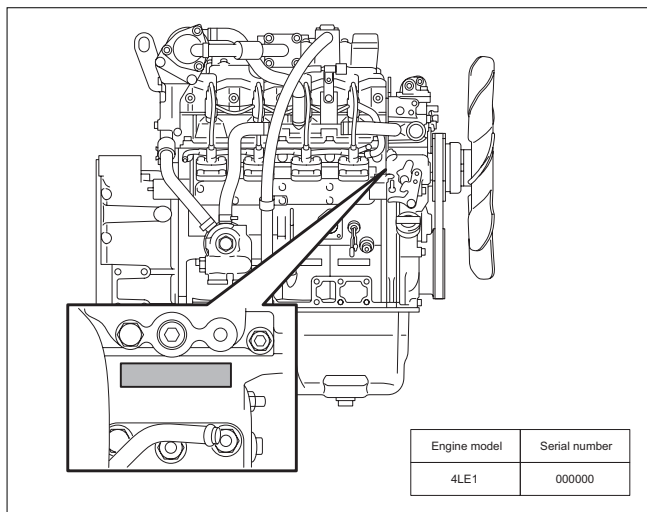
IMLE0106

3. ENGINE IDENTIFICATION

(1) Position of Display

The engine serial number is stamped on the front upper right side of the cylinder body, and the engine model is cast on the rear lower right side of cylinder body just above the oil cooler.

Further, engine model is described also on an ID label on the top of the cylinder head cover.



IMLE0092



(2) Confirmation of Engine Serial Number

It is advisable to check the engine serial number, engine model name and type of machine together with the equipment manufacturer's name, as it is required when you contact the distributor for repair service or parts ordering.

WARNING: Conduct confirmation of engine serial number with the engine stopped.
To avoid being injury, don't check it, while the engine is still hot.

4. ISUZU ENGINE AFTER SERVICE

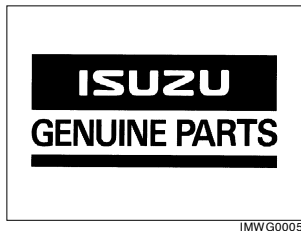
(1) Isuzu Engine After Service

Please feel free to contact your ISUZU dealer for periodical inspection and maintenance.

(2) Isuzu Genuine Parts

The ISUZU genuine parts are identical with those of used in the engine production, and accordingly, they are warranted by ISUZU MOTORS LIMITED.

The ISUZU genuine parts are supplied by the ISUZU distributors or the authorized parts suppliers. Please designate "ISUZU Genuine Parts" when you need engine parts.



3. FUEL, LUBRICANT, AND COOLANT

1. FUEL

(1) Fuel Selection

The following specific advantages are required for the diesel fuel.

- 1) Must be free from minute dust particles.
 - 2) Must have adequate viscosity.
 - 3) Must have high cetane value.
 - 4) Must have high fluidity at low temperature.
 - 5) *Low sulfur or ultra low sulfur diesel fuel only.
 - 6) Must have little residual carbon.
- * EPA regulations

Diesel fuels

Applicable Standard	Recommendation
JIS (JAPANESE INDUSTRIAL STANDARD)	NO. 2
DIN (DEUTSCHE INDUSTRIE NORMEN)	DIN 51601
SAE (SOCIETY OF AUTOMOTIVE ENGINEERS)	
Based on SAE-J-313C	NO. 2-D
BS (BRITISH STANDARD)	
Based on BS/2869-1970	Class A-1

If fuel other than the specified one is used, engine function will be lowered.

(2) Fuel Requirements

CAUTION: Use of other types of fuel than ultra low-sulfur fuel may not conform to emission regulations.

CAUTION: The fuel injection pump, injection nozzle or other parts of the fuel system and engine can be damaged if you use any fuel or fuel additive other than those specifically recommended by Isuzu.

Such damage is not Isuzu's responsibility, and is not covered by the Warranty. To help avoid fuel system or engine damage, please heed the following:

- Some service stations mix used engine oil with diesel fuel. Some manufacturers of large diesel engines allow this; however, for your diesel engine, do not use diesel fuel which has been contaminated with engine oil. Besides causing engine damage, such fuel can also affect emission control. Before using any diesel fuel, check with the service station operator to see if the fuel has been mixed with engine oil.
- Do not use any fuel additive (other than as recommended under "Biocide" in this section). At the time this manual was printed, no other fuel additive was recommended. (See your authorized dealer to find out if this has changed.)
- Take care not to run out of diesel fuel. If you do run out of fuel, you may need to bleed air out of the fuel injection pump to re-start the engine after fuel has been added.

Your engine is designed to use either Number 1-D or Number 2-D diesel fuel. However, for better fuel economy, use Number 2-D diesel fuel whenever possible. At temperatures less than -7°C, (20°F), Number 2-D fuel may pose operating problems (see "Cold Weather Operation" which follows). At colder temperatures, use Number 1-D fuel (if available) or use a "winterized" Number 2-D (a blend of Number 1-D and Number 2-D). This blended fuel is usually called Number 2-D also, but can be used in colder temperatures than Number 2-D fuel which has not been "winterized." Check with the service station operator to be sure you get the properly blended fuel. Note that diesel fuel may foam during a fill-up. This can cause the automatic pump nozzle to shut off even though your tank is not full.

CAUTION: Do not use home heating oil or gasoline in your diesel engine; either may cause engine damage.

(3) Replacement Fasteners

CAUTION: Fuel may be under pressure. Remove the fuel cap slowly to prevent fuel from spraying out and causing injury.

NOTICE: Always use diesel fuel.
Use of low quality fuel may adversely affect the engine parts, and cause failure.
Use of other than specified fuel may adversely affect the engine or emission control system and cause failure.
If other than specified diesel fuel is used, the machine may not conform to specifications.

(4) Handling of the Fuel

The fuel containing dust particles or water will cause engine failure. Therefore, the following notice must be observed.

- 1) Take care to prevent the fuel from entry of dust particles or water when filling the fuel tank.

When fueling is done from an oil drum directly, keep the drum stationary over a long time so that clean fuel can be used after the dust particles or water is completely sedimented.

- 2) Always fully fill the fuel tank. Drain the sedimented particles in the fuel tank frequently by opening the tank draining hole.

(5) Water in Fuel

During refueling, it is possible for water (and other contaminants) to be pumped into your fuel tank along with the diesel fuel. This can happen if a service station does not regularly inspect and clean its fuel tanks, or if a service station receives contaminated fuel from its supplier(s).

To protect your engine from contaminated fuel, there is a fuel filter system on the engine which allows you to drain excess water.

WARNING: The water/diesel fuel mixture is flammable, and could be hot. To help avoid personal injury and/or property damage, do not touch the fuel coming from the drain valve, and do not expose the fuel to open flames or sparks. Be sure you do not overfill the container. Heat (such as from the engine) can cause the fuel to expand. If the container is too full, fuel could be forced out of the container. This could lead to a fire and the risk of personal injury and/or machine or equipment damage.

(6) Fuel Filter

- 1) Be sure to use the genuine fuel filter. The fuel injection system is precision structure so that its filter has a finer mesh than conventional one to extend life of the system. Be sure to use "**Genuine fuel filter**".
- 2) Replacement interval may be shortened depending on the characteristic of fuel. Clogged fuel filter may cause to result in stopping the engine. In a place where fuel gets mixed with foreign matter, perform early inspection and periodic replacement.
Depending on the machine, the electromagnetic type fuel pump is equipped in this engine. Periodical replacement or cleaning is required for this pump filter. (Refer to Filter Replacement or Cleaning)
When the filter exchange of this pump is necessary, please inquire at your machine supply source or contact ISUZU dealer.

(7) Biocides

In warm or humid weather, fungus and/or bacteria may form in diesel fuel if there is water in the fuel.

CAUTION: *Fungus or bacteria can cause fuel system damage by plugging the fuel lines, fuel filters or injector. They can also cause fuel system corrosion.*

If fungus or bacteria has caused fuel system problems, you should have your authorized dealer correct these problems. Then, use a diesel fuel biocide to sterilize the fuel system (follow the biocide manufacturer's instructions). Biocides are available from your dealer, service stations, parts stores and other automotive places. See your authorized dealer for advice on using biocides in your area and for recommendations on which biocides you should use.

(8) Smoke Suppressants

Because of extensive testing of treated fuel versus untreated fuel, the use of a smoke suppressant additive is not recommended because of the greater possibility of stuck rings and valve failure, resulting from excessive ash deposits.

2. LUBRICANT

The quality of engine oil may largely affect engine performance, startability and engine life.

CAUTION: *Use of unsuitable engine oil will result in piston ring, piston and cylinder seizure and accelerate the sliding surface wear causing increased oil consumption, lowered output and, finally engine failure. To avoid this, use the specified engine oil.*

(1) Engine Oil Selection

For engine oil, use API grade: CD,CE,CF,CF-4,CH-4,CI-4,CI-4 plus or ACEA grade: A3/B3,A3/B4,A5/B5,E2,E3,E4,E5,E7 or JASO grade: DH-1.

The brands/types of oil described below can be used regardless of specified API or ACEA grade above. Their qualities are guaranteed by ISUZU.

LUBRICATION	MAKER	BRAND/TYPE	GRADE		
			API	ACEA	JASO
Diesel engine crankcase	ISUZU GENUINE	BESCO MULTI-Z TYPE CE (10W-30)	CE		
	ISUZU GENUINE	*BESCO MULTI-Z (10W-30)	CD/CF/CF-4		
	ISUZU GENUINE	BESCO S-3 (10W, 20W, 30, 40)	CD		
	Caltex/Chevron	Delo CXJ (15W-40/20W-50/40)	CF		DH-1
		Delo 400 Multigrade (15W-40)	CE/CF/CI-4	E3/E5	DH-1
	Shell	Rimula X (15W-40)	CH-4	E3	DH-1
		Rimula D (15W-40/30/40)	CF		
	Elf	Perfo 3F (15W-40)	CF-4/CE	B2/E2	
	Total	Rubia XT (15W-40)	CF-4	E2	
	Castrol	RX Super Plus (15W-40)	CH-4	E3	
		Tecton J Plus (15W-40)	CH-4	E3/B3	DH-1
	BP	BP Vanellus C6 (15W-40)	CH-4	E3	
	IDEMITSU	APOLLOIL EX (10W-40)	CF		DH-1
		APOLLOIL TOUGH RUNNER (10W-30,15W-40)	CF		DH-1
		APOLLOIL MULTI RUNNER (10W-30, 15W-40)	CF-4/CE		DH-1
		*2 APOLLOIL SUPER WIDE DH-1(10W-30, 15W-40)	CF-4		DH-1
	ExxonMobil	Essolube XTJ (15W-40)	CF-4		DH-1
		Exxon/Essolube XD-3 (15W-40)	CI-4		
		Mobil Delvac 1300 Super (15W-40)	CI-4 Plus	E7/E5	DH-1
		Mobil Delvac 1 (5W-40)	CI-4 Plus	E7/E5/E4/E3	DH-1

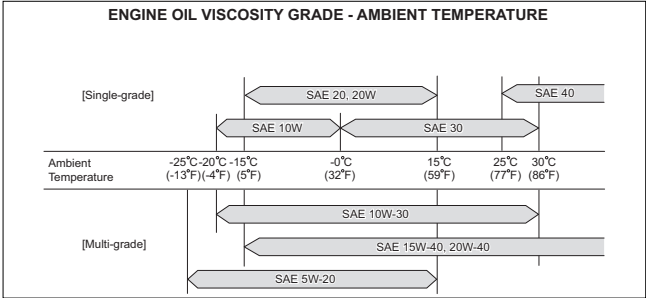
* Initial Engine Oil from Engine plant

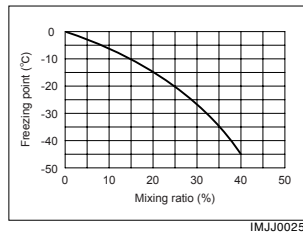
*2 Initial Engine Oil from Engine plant (Only a Part of Models)

(2) Oil Viscosity

Engine oil viscosity largely affect engine startability, performance, oil consumption, speed of wearing and occurrence of seizure, etc. Using lubricants whose viscosity selected according to the atmospheric temperature is important.

CAUTION: 1. Using a mixture of different brand or quality oils will adversely affect the original oil quality; therefore, never mix up different brand or different type oils.
2. Don't use API, CA, CB grade and reconstituted engine oil.
3. Engine damage due to improper maintenance, or using oil of the improper quality and/or viscosity, is not covered by the warranty.





3. COOLANT

Always refer to the chart to determine the correct cooling water to antifreeze solution mixing ratio.

CAUTION:

1. Supplement inhibitors or additives claiming to provide increases cooling capability that have not been specifically approved by Isuzu are not recommended for addition to the cooling system.
2. When supplying or replacing coolant, do not use water of well or river, but be sure to use tap water (soft water), distilled water or demineralized water.
3. It is strongly recommended to use Isuzu genuine engine coolant or equivalent for addition or replacement.
4. Coolants from other brands often do not contain anti-corrosive, and use of such products could result in corrosion of the engine and radiator.
5. If the density of Isuzu genuine engine coolant exceeds 60%, the reduced specific heat characteristic of the coolant could result in overheating. If the density is below 20%, the anticorrosion characteristic may degrade. Adjust the coolant density in the range from 20% to 60% according to the situation.

4. ENGINE OPERATION

Engine Exhaust Gas Caution (Carbon Monoxide)

WARNING: Do not breathe exhaust gas because it contains carbon monoxide, which by itself has no color or odor. Carbon monoxide is a dangerous gas. It can cause unconsciousness and can be lethal.

We recommend that the exhaust system be inspected by competent technician:

- Each time the machine has an oil change.
- Whenever a change is noticed in the sound of the exhaust system.
- Whenever the exhaust system is damaged or becomes corroded.

See "Maintenance Schedule" in Section 8 of this manual for parts requiring inspection.

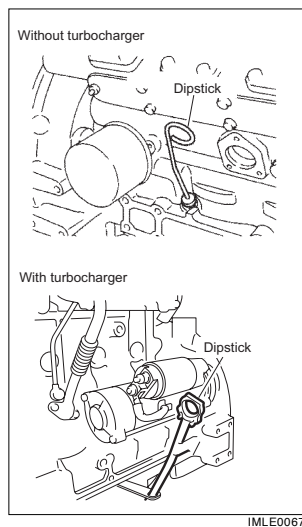
Do not run the engine in confined areas (such as garages or next to a building) any more than needed to move the machine or the equipment.

Keep the exhaust tailpipe area clear of snow and other material to help reduce the buildup of exhaust gases or the equipment. This is particularly important when parked in blizzard conditions.

1. CHECK BEFORE OPERATION

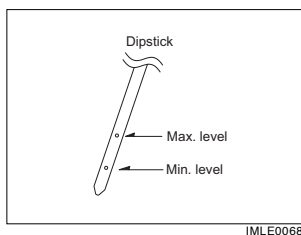
WARNING: For Safety's sake, conduct the inspection before start-up with the engine stopped.

CAUTION: As the remote filter is used, the engine oil is filled above the specified level. (Turbocharged engine only)
Adjust the engine oil level as required.



(1) Engine Oil Level

- 1) Place the engine on a level surface.
- 2) Remove the dipstick from the crankcase, wipe it with clothing. Insert it fully and take out it gently again.



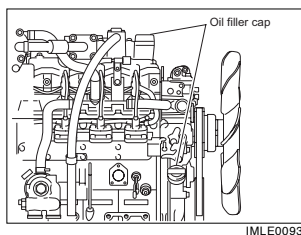
Check the oil level by the level marks on the dipstick. The oil level must be between the "Max" level mark and the "Min" level mark as illustrated.

Take care not to add too much engine oil.

- Drain oil to the max. oil level if oil level is above the max. level mark.
- Add oil to the max. oil level if oil level is below the min. level mark.

- 3) Also check the sample oil on the dipstick for fouling and degrees of viscosity.

CAUTION: Oil level check must be made ten or twenty minutes later after the engine has been stopped. When the oil level check is necessary while the engine is running, stop the engine and keep it stationary ten or twenty minutes until the oil thoroughly flows down to the crankcase.



- 4) Oil is poured either through the oil filler at the front of the cylinder head cover or through the oil filler on the right side of the timing gear case. A certain period of time is required before the engine oil completely flows down from the oil filler to the crankcase.

Check the oil level ten or twenty minutes after oil replenishment.

CAUTION: If the engine oil is splashed on the fan belt, it causes belt slippage or slackness; therefore, take care to avoid it.

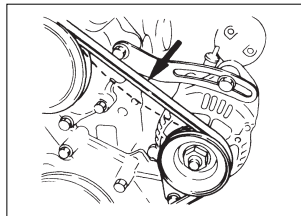
WARNING: 1. In adding oil, take care not to spill it. If you spill oil on engine or equipment, wipe it properly, or this could lead to a fire and the risk of personal injury and/or equipment damage.

2. For model that employs the closed PCV, excessive oil may cause hunting in oil pressure, increase in the oil temperature, oil seepage from the intake system and engine oil intrusion into the combustion chamber, resulting in engine damage.

(2) Fan Belt Check

Check the fan belt for tension and abnormalities.

WARNING: For the sake of safety, before conducting fan belt check, make sure that the engine is stopped and is not be operated during check.



- 1) When the belt is depressed with the thumb (about 100 N (22 lb) pressure) at the midway between the alternator pulley and fan pulley, the belt tension is correct as the following:
Fan belt slackness : 8 – 10 mm (0.31 – 0.39 in)
When the belt tension is too high, it will result in alternator failure.
Contrarily, loose belt will cause belt slippage which may result in damaged belt and abnormal noise.

- 2) Check the belts. Replace them if any damage is found.

CAUTION: *Replace all belts as a set even when one is not usable. Single belt of similar size must not be used as a substitute for a matched belt set. Otherwise, premature belt wear would result because of uneven belt length.*

(3) Coolant Level Check

1) Without the reserve tank

Remove the radiator filler cap, and check the coolant level as well as the degrees of fouling.

Proper coolant level is about 10 mm higher from the radiator core top.

2) With the reserve tank

The coolant level must be between "FULL" and "LOW" marks on the reserve tank.

Check and see that the level is correct.

When the coolant level is lower than the "LOW" mark, replenish the reserve tank by the filler port, but when the reserve tank is empty, replenish by the radiator filler port.

WARNING: *When removing the radiator filler cap while the engine is still hot, cover the cap with clothing, then turn it slowly to gradually release the internal steam pressure. This will prevent you from getting burnt with hot steam spouted out from the filler port.*

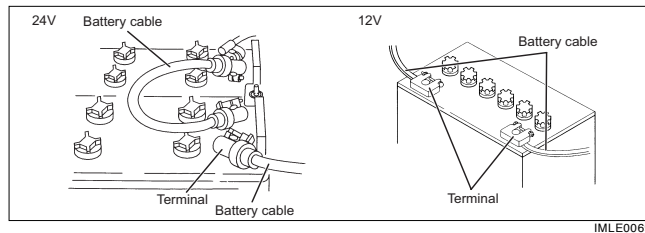
CAUTION: *Use Isuzu genuine anti-freeze (ethylene-glycol based) or equivalent with the specified mixing ratio.*

(4) Radiator Cap Condition

After the replenishment of the coolant, install the radiator cap.
Make sure the cap is securely installed.

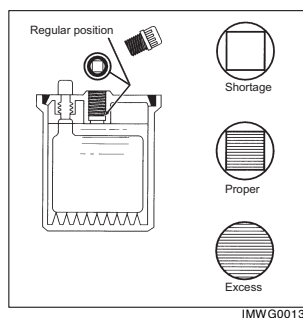
(5) Battery Cable Connection

Check the battery cable connections for looseness or corrosion.
The loosened cable connection will result in hard engine starting or
insufficient battery charge.
The battery cables must be tightened securely.



IMLE0069

CAUTION: Never reverse "+" and "-" terminals when reconnecting cables after disconnection.
Even a short period of reverse connection will damage the electrical parts.



(6) Battery Electrolyte Level

The amount of electrolyte in the batteries will be reduced after repeated discharge and recharge.

Check the electrolyte for the level in the batteries, replenish with a commercially available electrolyte such as distilled water, if necessary. The battery electrolyte level checking procedure will vary with battery type. Follow the equipment manufacturer's instructions.

CAUTION: Do not replenish with dilute sulfuric acid in the daily service.

WARNING:

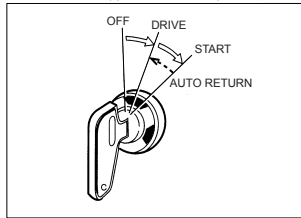
1. When inspecting the batteries, be sure to stop the engine.
2. As diluted sulfuric acid is used as electrolyte, be careful not to stain your eyes, hands, clothes, and metals with the electrolyte. If it gets in your eye, wash with a large amount of water at once. Then go and see a doctor.
3. As highly flammable hydrogen gas is rising from the batteries, do not make a spark or use fire in any other way near the batteries.
4. When handling such metallic articles as a tool near the batteries, be sure not to contact $\oplus$ terminal. As the machine body is $\ominus$, it may cause a big danger.
5. When disconnecting the terminals, start with $\ominus$ terminal. When connecting them, connect the $\ominus$ terminal last.

2. ENGINE STARTING

(1) Pre-starting Preparation

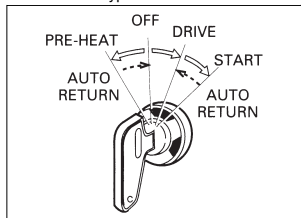
- 1) Make sure that all hydraulic control levers etc. on the equipment are in the NEUTRAL position.
- 2) Set the engine stop knob in the START position. (It is unnecessary for the engine equipped with the engine shutdown switch.)
- 3) Switch ON the battery switch (if so equipped).
- 4) Insert the starter switch key into the switch key hole.
Turn the key clockwise to DRIVE position and, make sure that the meters and warning lamps are actuated.

In case of the type with QOS system



IMWG0014

In case of the type with control resistance



IMLE0041

(2) Pre-heating Procedures

As an engine starting aid, pre-heating is required in a cold engine starting.

The type with QOS system:

This pre-heating uses "QOS," a quick pre-heating system which automatically controls pre-heating time utilizing coolant temperature to conduct the irreducible minimum of pre-heating.

- 1) Turn the key to the DRIVE position, and the glow plugs built in the engine will grow red-hot to pre-heat the engine. At this time the pre-heating indicator lamp on the meterboard is actuated.
- 2) When the pre-heating indicator lamp goes out, try starting the engine at once.

Relationship between water temperature and pre-heating time (For ref.)

20°C (68°F) About 0.5 sec.

5°C (35°F) About 1.5 sec.

0°C (32°F) About 2 sec.

-15°C (5°F) About 6.3 sec.

The type with a control resistance

- 1) Turn the starter switch key counter-clockwise to PRE-HEAT position in order to heat the glow plugs on the engine.
The Pre-heating time of 5 seconds is required until the control resistance coil becomes red.
- 2) Turn the starter switch key clockwise to START position as soon as the control resistance coil red heat.

WARNING: Make sure that there is no flammable near outlet port of exhaust gas at engine starting. It is very dangerous due to deformation, discoloration or a fire.

(3) Engine Starting

- 1) Depress the engine throttle lever or throttle pedal and turn the starter switch key clockwise to START position.
The cranking period must not exceed ten seconds.
Continuous starter operation of more than ten seconds will lead to overdischarge of the batteries as well as starter seizure.
Release the starter switch after the engine starts.
The switch will return to the "DRIVE" position automatically.
For the engine equipped with a safety unit, the starter circuit is automatically turned off when the engine starts. This prevents the starter from overrunning.
If the engine cannot be started in one time attempt, keep the batteries and the starter stationary at least 30 seconds for their functional recovery, then repeat the pre-heating and the starting operations.

CAUTION: Continuous re-engagement of the starter to the flywheel ring gear without giving them a break will result in the damaged starter pinion gear and flywheel ring gear.

- 2) If, despite repeated operations, the engine does not start, wait for a minute or more until the functions of the batteries and starter are recovered and then repeat pre-heating and starting operations.

-
- 3) When repeating starting operation, return the key to the OFF position and then pre-heat and start the engine once again.
If the engine still remains unstated, something may be wrong with the engine. Check the repeated parts to locate the cause.

CAUTION: Do not use starting "aids" in the air intake system. Such aids can cause immediate engine damage.

3. CHECK AND OPERATION AFTER THE ENGINE START-UP

(1) Warming-up Operation

Do the warming-up operation at 1000 min^{-1} about ten minutes after the engine has started.

As the lubrication for the entire engine systems will be done in this warming-up, do not speed up and load it abruptly.

Particularly, observe this in cold season operation.

(2) Check after the Engine Start-up

Check the following items in the engine warming-up operation.

Engine oil pressure

Although the engine oil pressure gauge readings vary depending on ambient temperature, a type of oil or engine specification, the gauge registers the values of the following in the warming-up.

Oil pressure : $147 \text{ kPa (21 psi) / } 1000 \text{ min}^{-1}$

$294 \text{ kPa (43 psi) / } 1800 \text{ min}^{-1}$

$343 \text{ to } 686 \text{ kPa (50 to 100 psi) / } 2200 \text{ min}^{-1}$

In the oil pressure warning lamp type, make sure that the lamp is off.

Charge condition

The charge condition is normal when once the ammeter registers plus side greatly in the engine starting, then gradually the meter registering will be minimized.

In the warning lamp type, make sure that the lamp is completely off during the warming-up.

Engine noise and exhaust smoke color

Pay attention to engine noise and, if any abnormal noise is heard, check the engine to detect the cause.

Check the fuel combustion condition by exhaust smoke color.

The exhaust smoke color after engine warming-up and at no-load operation.

- | | | |
|---|-----------------------------|--|
| { | Colorless or light blue.... | Normal (Perfect combustion) |
| | Black color..... | Abnormal (Imperfect combustion) |
| | White color | Abnormal (Oil coming up and coming down) |

CAUTION: Engine noise after start-up might be noisy than that of warmed-up engine and, the exhaust smoke color also being more whitish than the normal condition. However, it will be normalized after warming-up engine.

Leakage in the systems

CAUTION: When checking, leaking liquid from engine may be splattered during engine operation. It may cause a burn. Approach the engine gradually from a long distance and then check it.
--

Check the following items:

- Lube oil leakage
Check both sides and bottom of the engine assembly for lube oil leaks, paying particular attention to the lube oil pressure gauge pipe joint, lube oil filter and lube oil pipe joints.
- Fuel leakage
Check the fuel injection pump, fuel lines and fuel filter for leakage.
- Coolant leakage
Check the radiator and water pump hose connections also the water drain cocks on the radiator and cylinder body for leakage.
- Exhaust smoke or gas leakage.

Checking coolant level

The coolant level could drop depending on the equipment because the mixed air is expelled in about 5 minutes after the engine started. Stop the engine, remove radiator cap, and add coolant.

WARNING: Hot steam will rush out and you could get burnt, if the radiator cap is removed when the engine is hot.
Cover the radiator cap with a thick cloth and loosen the cap slowly to reduce the pressure, then remove the cap.

4. CARE IN THE ENGINE OPERATION

In the engine operation, always pay attention to the following items if the engine indicates any sign of abnormalities.

(1) Engine Oil Pressure

Engine oil pressure is normal when the oil pressure gauge shows the values of the following in the engine warmed-up condition.

Oil pressure : 147 kPa (21 psi) /1000min⁻¹

294 kPa (43 psi) /1800min⁻¹

343 to 686 kPa (50 to 100 psi) /2200min⁻¹

In the continuous engine operation, engine oil pressure is slightly lower than the pressure at start-up time.

Also, make sure that the oil warning lamp is off.

If, in continuous engine operation, the engine oil pressure warning lamp is off, engine oil pressure is normal.

When the engine oil pressure gauge shows the following abnormal conditions, stop the engine immediately and check the engine oil amount in the oil sump and oil leakage:

- The engine oil pressure gauge shows below 200 kPa (28 psi) though the engine speed is raised.
- The oil pressure gauge indicator oscillates greatly in the engine low speed range.
- When the engine oil pressure warning lamp goes on and off repeatedly.

When not lack of engine oil or no oil leakage is found, contact your equipment supplier to determine the cause of the abnormal reading.

(2) Coolant Temperature

The engine performance will be adversely affected if engine coolant temperature is too hot or too cold.

The normal coolant temperature is 75 to 90°C (167 to 194°F).

Overheating

WARNING: *If the Engine Coolant Temperature Gage shows an overheat condition or you have other reason to suspect the engine may be overheating, continued operation of the engine (other than as spelled out here) even for a short period of time may result in a fire and the risk of personal injury and severe vehicle or equipment damage. Take immediate action as outlined following.*

If you see or hear escaping steam or have other reason to suspect there is a serious overheat condition, stop and park the machine or equipment as soon as it is safe to do so and then turn off the engine immediately and get out of the machine or equipment.

The engine cooling system may overheat if the engine coolant level is too low, if there is a sudden loss of engine coolant (such as hose splitting) or if other problems occur. It may also temporarily overheat during severe operating condition such as:

- Climbing a long hill on a hot day.
- Stopping after high rpm.

If the Engine Coolant Temperature gage shows an overheat condition, or you have reason to suspect the engine may be overheating, take the following step:

- If your air conditioner (if equipped) is on, turn it off. And turn on the heater.
- Don't turn off your engine.
- With the transmission in Neutral, increase the engine speed to about one-half full operating speed or 1200 RPM, maximum. Bring the idle speed back to normal after two or three minutes.

If the engine coolant temperature does not start to drop within a minute or two:

- Let the engine run at normal idle speed for two or three minutes.

If the engine coolant temperature does not start to drop, turn off the engine and get out of the machine or equipment then proceed as follows:

WARNING: *To help avoid being burned-*

- *Do not open the engine access cover if you see or hear steam or engine coolant escaping from the engine compartment. Wait until no steam or engine coolant can be seen or heard before opening the engine cover.*
- *Do not remove the radiator cap or engine coolant reserve tank cap if the engine coolant in the tank is boiling. Also do not remove the radiator cap while the engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if either cap is taken off too soon.*

If no steam or engine coolant can be seen or heard, open the engine access cover. If the engine coolant is boiling, wait until it stops before proceeding. Look at the see-through reserve tank. The engine coolant level should be between the "MAX" and "MIN" marks on the reserve tank. If necessary, pour engine coolant into the reserve tank only, never directly into the radiator. Also, do not check engine coolant level at the radiator.

Make sure the fan belts are not broken, or off the pulleys and that the fan turns when the engine is started.

If the engine coolant level in the reserve tank is low, look for leaks at the radiator hoses and connections, heater hoses and connections, radiator, and water pump. If you find major leaks, or spot other problems that may have caused the engine to overheat, do not run the engine until these problems have been corrected. If you do not find a leak or other problem, carefully add engine coolant to the reserve tank. (Engine coolant is a mixture of ethylene glycol antifreeze and tap water (soft water), distilled water or demineralized water. See "Engine Care in cold season" in Section 6 for the proper antifreeze and mixture.)

WARNING: To help avoid being burned, do not spill antifreeze or engine coolant on the exhaust system or hot engine parts. Under some conditions the ethylene glycol in engine coolant is combustible.

If the engine coolant level in the reserve tank is at the correct level but there is still an indication on the instrument panel of an overheat condition:

- **YOU MUST LET ENGINE COOL FIRST.** You may then add engine coolant directly to the radiator.

Once the Engine Coolant Temperature Gage no longer signals an overheat condition, you can resume operating at a reduced speed. Return to normal operating after about ten minutes if the gage pointer does not again show an overheat condition.

If no cause for the overheat condition was found, see a qualified service technician.

Overcooling

The engine operation at low coolant temperature will not only increase the oil and fuel consumption but also will lead to premature parts wear which may result in engine failure.

(3) Engine Hourmeter (Engine Operation Hour Indicating)
(If so equipped)

This meter indicates the engine operation hours. Make sure that the meter is always working during engine operation. Periodical engine maintenance is scheduled on the operation hours indicated on the hourmeter.

(4) Liquid and Exhaust Smoke Leakage

Be careful with lubricant, fuel, coolant and exhaust smoke leakage.

(5) Abnormal Engine Noise

Pay attention to the noise from the engine or other related parts, checking if the noise is normal.

(6) State of the Exhaust Smoke

Be careful with exhaust smoke color, check if it is whitish or blackish.

5. ENGINE STOPPING

- 1) Make sure that all of the control levers on the equipment are in NEUTRAL position.
- 2) Before stopping the engine, cool down the engine by operating it at low idle speed about three minutes.

In this operation, check the engine noise and the engine oil pressure for abnormalities.

CAUTION: *In the turbocharged engine, if the engine is stopped instantaneously, a dry condition produced by high temperature will take place in the turbocharger rotating parts which may cause lack of lubrication. This will result in turbocharger failure.*

- 3) To stop the engine, turn the starter switch key to OFF position. The engine stop solenoid automatically shut off the fuel to stop the engine. Switch off the battery (if so equipped).

CAUTION: *Leaving the starter switch key in the DRIVE position for a long while after the engine has been stopped, will discharge the batteries wastefully.*

6. OPERATION AND CARE FOR NEW ENGINE

Your ISUZU engine is carefully tested and adjusted in the factory, however, further, thorough run-in (i.e. break-in) operation is necessary.

If the new engine is harshly operated, lubricating oil film will be reduced leading to abnormal wear or seizure. Particularly, avoid a harsh engine operation within the initial 100 operation hours observing the following notice.

- 1) Do the warming-up operation continuously until the engine is warmed-up. In this operation, do not race the engine.
- 2) Also do not operate the engine with rapid acceleration, rapid machine starting and continuous high speed operation.

7. ENGINE CARE FOR OVER-COOLING

Engine over-cooling cause premature wear and increased fuel consumption. When the coolant temperature is not raised to 75 to 90°C (167 to 194°F) indefinitely, take an action to recover this with means of radiator curtain or such like.

8. OPERATION AND CARE FOR TURBOCHARGED ENGINE

(1) Engine Starting

The warming-up operation of the engine should be done in the way separately described. In addition, ensure the bearings supporting the rotating parts of the turbocharger are sufficiently lubricated.

- 1) Do not race cold engine.
- 2) When starting the engine after a long period (more than one month) of standing, proceed as follows:
Pour engine oil into the turbocharger through the oil inlet port with the air intake duct and oil inlet side pipe removed. Then turn the impeller by hand to thoroughly lubricate the bearings.
- 3) When pouring oil in, do not allow dust particles and other foreign materials to enter through the opening.
On completion of this operation, securely install the oil pipe and air intake duct.

(2) Engine Stopping

Whenever stopping the engine, the last about 3 minutes of operation should be at idle. After hard operation, at least 5 minutes of operation should be at idle until the turbocharger cools down. This allows the turbocharger to return to idle speed while engine oil pressure is available for lubrication.

CAUTION: Failure to cool down turbocharger at idle could result in insufficient lubrication of its bearings and their shortened life.
--

9. STARTING THE ENGINE AFTER BEING LEFT UNUSED FOR A LONG PERIOD OF TIME

When the machine or equipment is left unused for "more than three months" without running the engine (warming up), conduct a thorough inspection of the machine before starting the engine.

Crank the engine for 10 seconds and then stop it for 30 seconds with the fuel cut. Repeat this procedure for three times. This sends the oil to each part.

After starting the engine, be sure to warm it up for more than ten minutes at 1000 min^{-1} .

5. PERIODICAL INSPECTION AND MAINTENANCE

1. LUBRICATING SYSTEM

WARNING: 1. During inspection and service, a burn injury may occur due to hot engine body, coolant or engine oil. For the sake of safety, conduct service work after the engine is stopped and cools down sufficiently.

2. It is very dangerous to inspect and service the rotating parts. For the sake of safety, conduct service work after the engine is stopped. Also, make sure that it is not started during work.

Servicing of the engine oil or the oil filter element will affect on the engine performance as well as the engine life.

Change the engine oil and the oil filter element periodically with the specified ones. (Refer to 3.2. LUBRICANT.)

(1) Engine Oil and Oil Filter Element Change

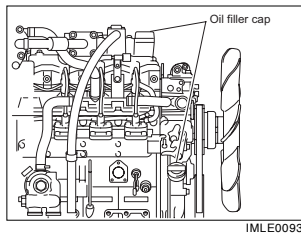
Engine oil change and oil filter element change must be made according to the following change schedule. For the engine equipped with the oil filter warning lamp, if the lamp comes on while driving, the filter element is clogged. Replace the element regardless of the change interval.

Change interval

Engine Oil Cartridge type : Every 250 operating hours

Remote filter type : Every 500 operating hours

Oil Filter Element Every 500 operating hours

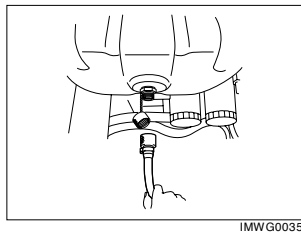


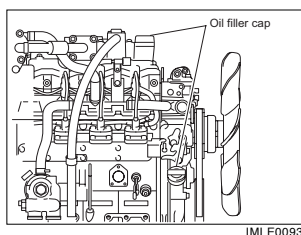
Engine oil draining

WARNING: To help avoid the damage of being burned, do not drain oil while the engine is still hot.

One-touch type

- 1) Wipe clean around the oil filler cap taking care so that no foreign particles entry. Remove the filler cap.
- 2) Loosen the cap of oil drain cock and remove it. Connect the oil drain hose to the oil drain cock and drain the oil.
- 3) After the completion of draining, disconnect the hose and wipe off the oil on the drain cock.
- 4) Turn the cap of oil drain cock slightly and settle it. From that position, turn more about 60 to 90 degrees.



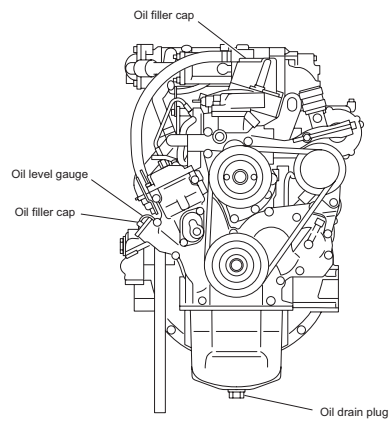


Drain plug type

- 1) Wipe clean around the oil filler cap taking care so that no foreign particles entry. Remove the filler cap.
- 2) Remove the drain plug by loosening it, and then drain oil.
- 3) After oil has been drained completely, replace the packing of the drain plug with a new one, and then install the plug.
- 4) Tighten the drain plug.
Torque (drain plug) : 78.4 Nm (8.0 kgm)

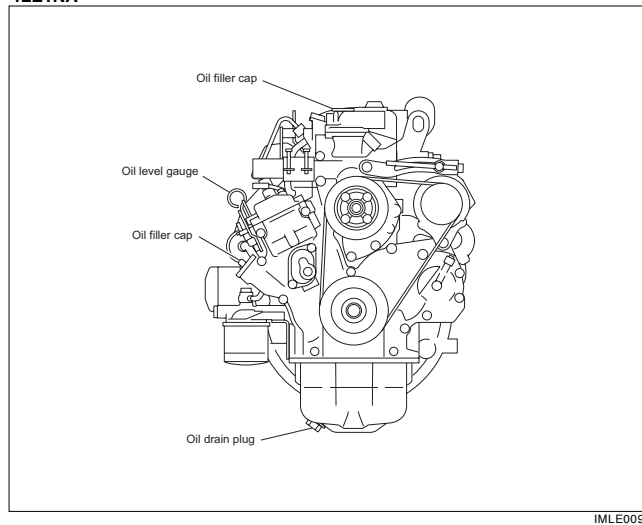
CAUTION: Use a receptacle to receive the drained oil so that the engine and equipment may not be stained with the drained oil.

4LE1T



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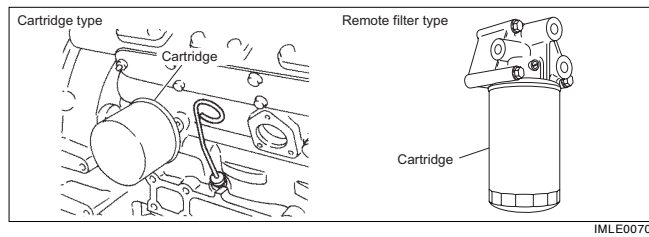
4LE1NA

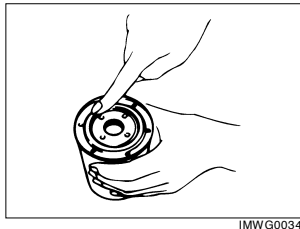


IMLE0095

Oil filter element removal

Use a filter wrench to remove the cartridge type oil filter element. There may remain the used engine oil in the cartridge, and care should be taken not to spill it when removing the filter. Discard the used filter.





Oil filter element installation

- 1) Apply lightly engine oil to the O-ring.
 - 2) Turn in new cartridge until its sealed face comes in contact with the O-ring.
 - 3) Use a filter wrench to further turn in the cartridge.
- Oil filter element tightening torque : 14.7 – 20.6 Nm (1.5 – 2.1 kgm)

Engine oil refilling

- 1) Disconnect the oil drain hose and reinstall the cap of drain cock. (One - touch type)
Install the drain plug. (Drain plug type)
- 2) Fill with new engine oil by the oil filler port.
Wait about fifteen minutes until the oil gets down to the oil pan.
Then check the oil level with a dipstick.
Do not insert the dipstick by force. The dipstick may be broken.

WARNING: 1. In adding oil, take care not to spill it. If you spill oil, wipe it properly, or this could lead to a fire.
2. Do not leave any flammables such as cloth or gloves in the engine compartment. It may result in a fire.

CAUTION: 1. Prevent dust particles from entering through filler port at replenishment. Be careful, entry of dust particles may cause engine damage or accident.
2. Replenishment of oil above "Max" level or below "Min" level may cause engine damage or accident. Drain oil to the "Max" level if the oil level is above "Max" level. Also, replenish oil to the "Max" level if the oil level is below "Min" level.

(2) Check after Oil and Filter Changes

The remote-type oil filter is used so that it takes time to pressure-feed oil to each part of engine after oil filter is changed. Idle approx. 30 seconds at the first start-up after oil filter is changed. Do not perform sudden loading or rapid acceleration. In addition, the time to pressure-feed oil can be shortened by filling engine oil into oil filter.

Oil leakage check

Idle the engine to raise the oil pressure, then check for oil leakage.

Oil level recheck

Stop the engine and keep it stationary about twenty minutes.

Use the dipstick to recheck the oil level.

Replenish with engine oil, if necessary, to the specified level.

CAUTION: When the engine is started, the oil level will slightly drop from the initial level as the oil fully comes into the entire oil circuit.

(3) Engine Oil Additives

Engine oils contain a variety of additives. Your engine should not need any extra additives if you use the recommended oil quality and change intervals.

(4) Used Oil Disposal

Do not dispose of used engine oil (or any other oil) in a careless manner such as pouring it on the ground, into sewers, or into streams or bodies of water. Instead, recycle it by taking it to a used oil collection facility which may be found in your community. If you have a problem disposing of your used oil, it is suggested that you contact your dealer or service station.

(This also applies to diesel fuel which is contaminated with water. See "Diesel Fuel" in Section 3.)

(5) Used Engine Oil

WARNING: *Used engine oil contains harmful contaminants that have caused skin cancer in laboratory animals. Avoid prolonged skin contact. Clean skin and nails thoroughly using soap and water - not mineral oil, fuels, or solvents. Launder or discard clothing, shoes or rags containing used engine oil.*

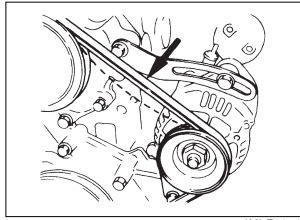
Discard used engine oil and other oils properly.

2. COOLING SYSTEM

(1) Fan Belt Tension Adjustment

Adjust fan belt tension when belt slackness is greater than the specified amount and when the belts are replaced.

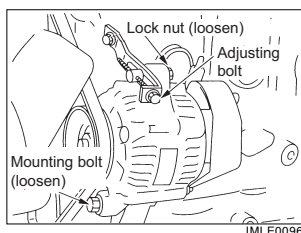
WARNING: To help avoid being injury, check and adjust fan belt tension with engine stopped.



Belt tension

Belt tension is normal when it is depressed with the thumb at the midway between the fan pulley and alternator pulley. (about 100 N (22 lb) depressing force.)

Fan belt slackness : 8 – 10 mm (0.31 – 0.39 in)



Adjusting procedure

Belt tension adjustment is made by pivoting the alternator at the alternator mounting bolt.

- 1) Loosen the lock nut and the alternator mounting bolt.
 - 2) Pivot the alternator at the mounting bolt by adjusting the adjusting bolt.
 - 3) Tighten the mounting bolt and the lock nut.
- Tightening torque : 23.5 Nm (2.4 kgm) (M8 bolt or nut)
48.1 Nm (4.9 kgm) (M10 bolt or nut)

CAUTION: Belt tension may vary slightly after the alternator is fixed.
Therefore, recheck the belt tension after tightening the bolts.

- 4) After the adjustment, operate the engine about five minutes at a low idle speed and recheck the belt tension. Particularly, pay attention to this matter when installing new belts. Belt tension may vary due to the initial belt conforming.

(2) Fan Belt Change

Use of fan belt with poor quality will result in premature belt wear or belt elongation leading to engine damage such as overheat. Therefore use of the ISUZU genuine fan belts are highly recommended.

When you check the belt and find the following condition, replace the belt with new one.

- 1) No adjustment margin of the belt.
- 2) Abnormal wear, damages, or cracks on the belt.
- 3) Brake noise occurs while driving even if belt tension is adjusted.

(3) Coolant Change

CAUTION: Use Isuzu genuine anti-freeze (ethylene-glycol based) or equivalent with the specified mixing ratio.

If oil is in coolant, contact "ISUZU Distributor" as soon as possible.

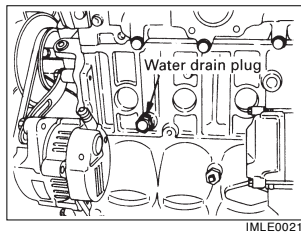
CAUTION: The coolant must be changed at intervals of **12 months**.
If the coolant is being fouled greatly, it will lead to engine overheat or coolant blow-off from the radiator and cause a burn. Shorten the interval of changing.

Coolant draining

- 1) Remove the radiator cap.

Open the drain cock at the radiator lower part to drain the coolant in the radiator.

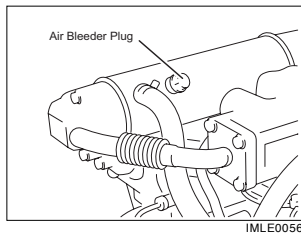
WARNING: When removing the radiator filler cap while the engine is still hot, cover the cap with a rag, then turn it slowly to release the internal steam pressure. This will prevent a person from scalding with hot steam spouted out from the filler port.



- 2) Drain away the coolant from the engine by loosening the water drain plug at the rear of alternator on the left side of cylinder body.

Filling with coolant

- 1) Close or tighten the coolant drain plug.
- 2) Fill up the radiator with the coolant until the level comes up to the filler port neck.
Fill gradually to prevent air entry.
Coolant volume (Engine only) :
Refer to "Main Data Specifications"
- 3) Loosen the air bleeder plug of the EGR cooler to bleed air from the EGR cooler. (Turbocharged engine only)



CAUTION: If loosening the air bleeder plug, be sure to replace it with new one.

- 4) Tighten the plug when the coolant spills over from the air bleeder plug.
(Turbocharged engine only)

CAUTION: 1. Take care to prevent the spilt coolant from getting the exhaust system parts wet.
2. If you spill coolant, wipe it properly, or this could lead to a fire.

Torque (Air bleeder plug) : 24.5 to 30.5 Nm (2.5 to 3.1 kgm)

- 5) Add coolant in the radiator and reservoir tank.
6) With the coolant poured, operate the engine about five minutes at a low idle speed, then the air contained in the coolant circuit is bled. The coolant level will drop.
Stop the engine to replenish with the coolant.

(4) Cleaning outside of Radiator

Mud or dried grass caught between radiator fins will block the air flow, resulting in lower cooling efficiency.

Clean the radiator fins with steam or compressed water.

For the cleaning interval, refer to the instruction manual prepared by the equipment manufacturer.

If the fins are stuffed, however, clean them at any time. Further, if the fins are deformed, repair or replace them.

(5) Cooling System Circuit Cleaning

When the cooling system circuit is fouled with water scales or sludge particles, cooling efficiency will be lowered.

Periodically clean the circuit interior with a cleaner.

Cooling system cleaning interval : Every 12 months or 1000 operation hours.

3. FUEL SYSTEM

The fuel injection pump and fuel injection nozzle are precisely manufactured, and therefore, using the fuel which contains water or dust particles will result in either injection pump plunger seizure or injection nozzle seizure, and the fouled fuel filter element with sludge or dust particles lead to decreased engine output.

In addition, clogged filter element can cause low output or automatic air bleeding failure.

Perform inspection and maintenance periodically as follows:

(1) Removal of Water from the Fuel

The water sedimenter is provided to separate the water contained in the fuel.

The sedimenter housing contains a float which moves up and down in accordance with level change of the separated water.

Be sure to drain the separated water when the float has come up to the element part.

Draining procedure:

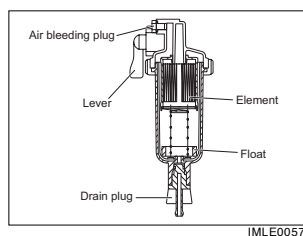
With the water sedimenter lever positioned just above the fuel remains off, loosen the air bleeding plug at the top of the water sedimenter, and then loosen the drain plug at the bottom of the case to drain the separated water.

After draining, be sure to tighten the plugs and conduct air bleeding of fuel.

Be careful not to over-tighten the air bleeding plug.

Torque (Drain plug) : 1.0 to 2.0 Nm (0.1 to 0.2 kgm)

Torque (Air bleeding plug) : 1.5 to 3.0 Nm (0.15 to 0.31 kgm)



CAUTION:

1. If the cup is removed without turning the fuel filter lever just above, the fuel may flow out.
2. The cartridge and cup contain fuel. Take care not to spill it during disassembly.
3. Perform the "fuel system air bleeding" after the water in the fuel is drained.

(2) Fuel System Air Bleeding

The entry of air into the fuel system will cause hard engine starting or engine malfunction.

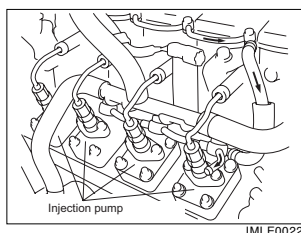
When once the servicing such as emptying the fuel tank, draining for the water sediment, and the fuel filter element change is done, be sure to conduct air bleeding.

Because of the "automatic air-bleeding system" being employed, turn the starter switch to the "Drive" position and activate the "electromagnetic pump" to bleed the air.

Air bleeding procedure:

- 1) When the "starter switch" is set to the "Drive" (ON) position to activate the electromagnetic pump, fuel is forcibly sent to the fuel valve of each injection pump and further to the leak-off pipe of each nozzle holder, where air in the fuel leaks off automatically to the fuel tank.
- 2) Start the engine and check the fuel system for leakage.

CAUTION: Start the engine and check the fuel system for leakage. Leakage causes a fire.

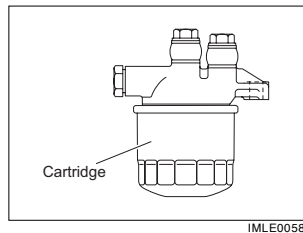


(3) Fuel Filter Element Change

Change interval

Fuel filter element change interval: Every 500 operating hours

CAUTION: *The fuel filter element may be clogged faster depending on the amount of dust particles in the fuel. Therefore, the element may need to change more often than Change interval above. If the low engine output or engine stall is found, the change of fuel filter element may recover them.*



Change procedure

- 1) Use a specified filter wrench to remove the cartridge.
- 2) Apply lightly fuel to the gasket of a new cartridge, and turn in the cartridge until its sealed face comes in contact with the O-ring. Then, tighten the cartridge to the correct tightening torque.
Torque (Cartridge) : 13.7 Nm (1.4 kgm)

(4) Water Sedimenter Element Cleaning

Cleaning interval

Fuel filter element cleaning interval : Every 500 operating hours

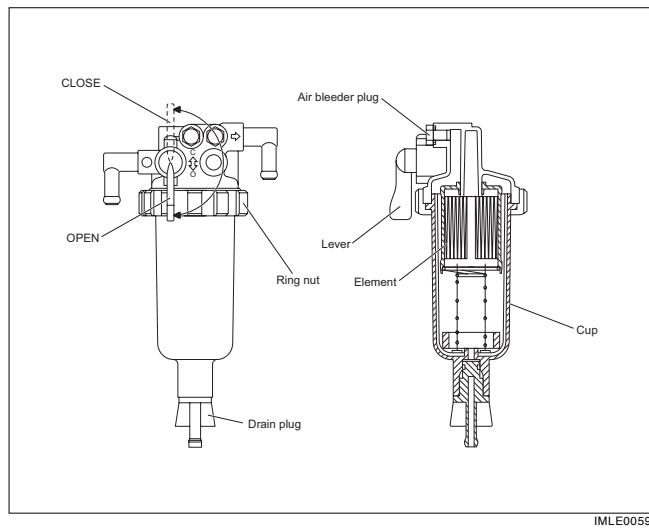
Cleaning procedure

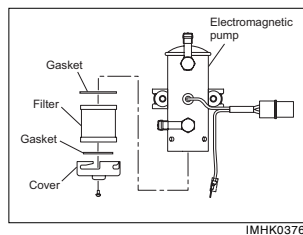
- 1) Turn the water sedimenter lever to the closed position.

CAUTION: *If the cup is removed without turning the lever as instructed, the fuel may flow out.*

- 2) Loosen the ring nut, remove the cup, and take out the element.
- 3) Clean the cup and element, install new packing on the ring nut.
- 4) Tighten the cup to the body securely with the ring nut.
- 5) After installation, turn the water sedimenter lever to the open position.

CAUTION: *1. With the lever positioned just above the fuel remains off, and therefore, the engine cannot be started.
2. During removal, be careful not to stain the parts around with the fuel in the cup.
3. After changing fuel filter element, conduct fuel air bleeding.*





(5) Filter Replacement or Cleaning

Depending on the machine, the electromagnetic type fuel pump is equipped in this engine.

Filters inside of the pump consist of paper type and steel mesh type. Replace the paper-type filter at intervals of 500 operating hours. Clean the steel mesh-type filter at intervals of 500 operating hours.

CAUTION: When removing the filter, always replace the gasket and clean the magnet part inside of the cover.

- 1) Remove the wirings attached on the pump cover. Rotate the cover with a wrench and remove it.

CAUTION: In detaching the cover, place a tray to prevent the fuel contained in the pump from spilling over the engine. Also, make sure that there is no flammable near the fuel pump.

- 2) Remove the filter and replace or clean it.

Paper type

Remove the filter and the gasket, then install new ones.

Make the interval of replacement service shorten depending on fuel management and supply.

Steel mesh type

Remove the filter and the gasket. Clean the filter with the compressed air and rinse it in the fuel oil before installing the filter and the gasket.

Make the interval of cleaning service shorten depending on fuel management and supply.

- 3) Install the cover. When installing, use a wrench and fully tighten it to the end.

CAUTION: *After installing the cover, be sure to check airtightness.*

(6) Governor Control Seals

As the governor (timing gear case) is precisely adjusted, most of the controls are sealed, please do not break them. When the adjustment is necessary, contact with your machine supply source.

CAUTION: *The manufacturer does not warrant the claim on the engine with the broken governor seals.*

4. AIR INTAKE SYSTEM

(1) Air Cleaner

Engine performance and life vary with the air intake conditions.

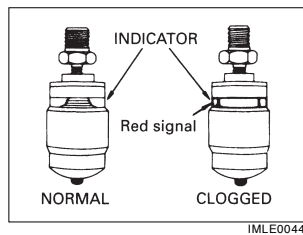
A dirty air cleaner element reduces the amount of intake air, causing reduced engine output or disordered engine.

Also, a damaged element leads to abrasion of cylinders and valves, resulting in increased oil consumption, reduced output and shortened engine life.

Handling of air cleaner varies with the equipment model.

Perform periodic inspection and maintenance following the equipment manufacturer's instructions.

CAUTION: 1. Shorten the cleaning or change interval when the equipment is used in dusty areas. 2. Change the element, if element damage is found during air cleaner cleaning. 3. Take care not to cause air leakage (sucking) when reassembling the air cleaner.
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(2) Air Cleaner with Dust Indicator

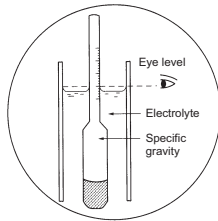
This indicator is attached to the air cleaner. When the air cleaner element is clogged, air intake resistance becomes greater and the dust indicator signal turns into red indicating the element change timing. When the signal turns into red, clean the air cleaner or replace the element. Then press the dust indicator button to reset the indication.

5. ENGINE ELECTRICAL

The ISUZU engines uses a 24 volt or 12 volt system and a negative grounding type for the electrical system.

CAUTION: 1. Take care not to connect reversely the polarity of battery terminal. Reverse connection damage the electrical parts, causing a fire or accident.
2. When disconnecting the terminals, do the negative terminal first. When connecting the terminals, do the positive terminal first then negative terminal next.

WARNING: 1. When checking the battery and cables, be sure to stop the engine.
2. Dilute sulfuric acid is used as battery electrolyte. Be careful not to let your eyes, hands, skin, clothes or metals come in contact with it.
If it gets on your eyes, hands or skin, wash with a large amount of water for five minutes at once. Then see a doctor for treatment.
If it gets on clothes or metal, wash with a large amount of water as well.
3. Highly flammable hydrogen gas is generated from battery. Never make a spark or use fire near the batteries.
4. When handling such metallic articles as a tool near batteries, be sure not to contact positive terminal. As the machine body is negative, it may be very dangerous due to shorting causing a burn.



IMWG0025

(1) Battery Servicing

Battery maintenance schedules will vary with equipment and battery types.

Follow the equipment manufacturer's instructions.

Gravity of the batteries

The battery charge condition is judged by the electrolyte gravity measurement.

Periodically measure the electrolyte gravity of the batteries.

For the internal check follow the equipment manufacturer's standard.

The relationship between the electrolyte specific gravity and the battery conditions are as follows:

Electrolyte Specific Gravity	Battery Conditions
Over 1.300	Over 100% (Over charged)
1.290 ~ 1.270	100%
1.260 ~ 1.240	75%
Below 1.230	Below 50% (Insufficiently charged)

CAUTION: The battery electrolyte is dilute sulfuric acid. So, be careful not to stain your body and clothes with it. If stained, rinse portion in clean water.

Gravity conversion

The specified electrolyte temperature for the gravity measurement is 20°C (68°F).

Measure the electrolyte temperature and do the conversion in accordance with the following formula when the temperature does not fall to the specified temperature.

$$S_{20} = St + 0.0007 (t - 20)$$

S_{20} ; gravity at 20°C

St ; gravity measured

t ; electrolyte temperature when measured

Battery terminal connections

Periodically, check the battery terminals for loose connection and corrosion.

For the check interval, follow the machine manufacturer's standard. Loose connection will cause hard engine starting or deficient battery charging.

If the terminals are excessively corroded, disconnect the battery cables and polish them with a wire brush or sandpaper.

Never reverse the "+" and "-" terminals when reconnecting the cables. Even a short period of reverse connection could damage the electrical parts.

Cleaning of Battery

When the battery is fouled clean it with clean water or tepid water and wipe them with a dry cloth to remove the water.

Apply a light coat of vaseline or a grease to the battery post.

(2) Alternator Servicing

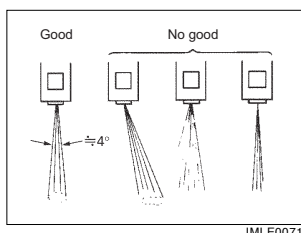
- 1) The polarity of the alternator is negative grounding type.
When an inverted circuit connection takes place, the circuit will be in short circuit instantaneously resulting the alternator failure.
- 2) Do not put water directly on the alternator. Entry of water into the alternator leads an electrolyte corrosion causing an alternator failure. Pay attention particularly when cleaning the engine.
- 3) When the battery is charged with an external electric source, be sure to disconnect the battery cables.

(3) Wiring Connections

Check all of the electric wiring connections for looseness and damage.

6. ENGINE ASSEMBLY AND OTHERS

To continue trouble free engine operation over a long period of time, the servicing items need a skilled maintenance technician, therefore, consult your machine supply source on the following items when necessary.



(1) Fuel Injection Nozzle

Use an injection nozzle tester to check the static injection starting pressure and the fuel spray conditions.

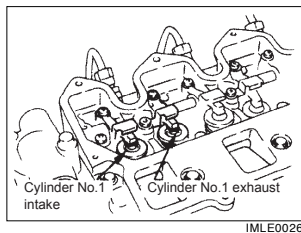
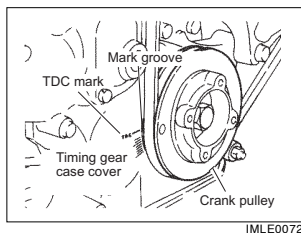
Injection nozzle pressure test interval : Every 500 operation hours

When the injection starting pressure is too high or too low or the fuel spray pattern is improper, an abnormal fuel combustion take place in the engine leading a lowered output and blackish exhaust smoke. Further, it causes a piston seizure or piston damage etc. In such cases, contact ISUZU dealer or Bosch dealer to adjust the injection starting pressure or replace the nozzle.

Injection starting pressure

Refer to the Engine Family Index.

WARNING: While using a nozzle tester, it may happen that high pressure blow off the fuel oil and injure the worker. Keep off the nozzle end.



(2) Valve Clearance Adjustment

The valve clearance must be adjusted **every 1000** operating hours, or whenever the tappet is abnormally noisy, or in an engine malfunction though the fuel system is properly working.

Valve clearance : 0.40 mm (0.0157 in) (When the engine is cold.)

The model 4LE1 engine has two types of the valve clearance adjusting method. Confirm the aligning marks (mark grooves) on the outside diameter of the crank pulley.

Type I method with an aligning mark on the outside diameter of the crank pulley.

Adjustment Procedure

- 1) Turn the crankshaft clockwise so that the mark groove on the crank pulley is aligned with the TDC mark (cast out) on the timing gear case cover.
- 2) Remove the cylinder head cover and check that the cylinder No. 1 is at TDC in the compression stroke or at TDC in the exhaust stroke. When the intake and exhaust valves are closed, the cylinder is at TDC in the compression stroke, and when the intake and exhaust valves are open, it is at TDC in the exhaust stroke.
- 3) In accordance with the conditions of cylinder No. 1, measure and adjust, if required the clearance of the valves marked with either ○ or ◎ in the table below.

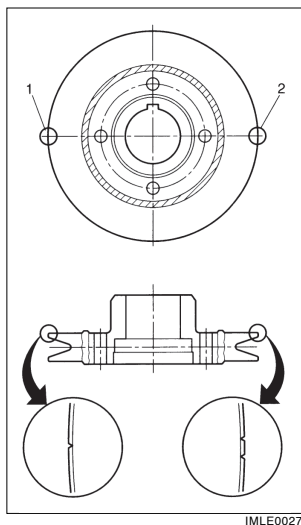
Cylinder No.	1		2		3		4	
Valve arrangement	E	I	E	I	E	I	E	I
When No. 1 cylinder is at TDC in the compression stroke	○	○		○	○			
When No. 4 cylinder is at TDC in the compression stroke			⊙			⊙	⊙	⊙

I: Intake E: Exhaust

- 4) On completion of the valve clearance adjustment in 3) above, make mark alignment as in 1) above by giving a turn to the crankshaft in normal direction.
Then measure and adjust the clearance of the other valves.

CAUTION: The rocker arm is made of die-cast aluminum. Therefore, be careful not to tighten the adjusting screw to excess.

Type II method with two aligning marks at point 180 degrees apart on the outside diameter of the crank pulley.



Adjustment Procedure

- 1) Turn the crankshaft clockwise so that the TDC mark groove (1) on the crank pulley is aligned with the TDC mark (cast out) on the timing gear case cover.
- 2) Remove the cylinder head cover and check that the cylinder No. 1 is at TDC in the compression stroke or at TDC in the exhaust stroke. When the intake and exhaust valves are closed, the cylinder is at TDC in the compression stroke, and when the intake and exhaust valves are open, it is at TDC in the exhaust stroke.
- 3) Valve clearance is adjusted on 4 progressive steps as following.
 - Step 1: When the cylinder No. 1 is at TDC in the compression stroke, measure and adjust the valve clearance of the cylinder No. 1 marked with 'O' in the table below.
 - Step 2: Turn the crankshaft clockwise 180 degrees from the step 1 condition to align the mark groove (2) with TDC mark on the timing gear case cover.
Measure and adjust the valve clearance of the cylinder No. 3 marked with 'O' in the table below.
 - Step 3: Turn the crankshaft clockwise 180 degrees from the step 2 condition to align the mark groove (1) with TDC mark on the timing gear case cover.
Measure and adjust the valve clearance of the cylinder No. 4 marked with 'O' in the table below.
 - Step 4: Turn the crankshaft clockwise 180 degrees from the step 3 condition to align the mark groove (2) with TDC mark on the timing gear case cover.
Measure and adjust the valve clearance of the cylinder No. 2 marked with 'O' in the table below.

Cylinder No.	1		2		3		4	
Valve arrangement	I	E	I	E	I	E	I	E
Step 1: Aligning mark groove (1) with TDC mark	○	○						
Step 2: Aligning mark groove (2) with TDC mark					○	○		
Step 3: Aligning mark groove (1) with TDC mark							○	○
Step 4: Aligning mark groove (2) with TDC mark			○	○				

I: Intake E: Exhaust

(3) Adjustment of Injection Timing

The injection timing may not be readjusted.

Take care not to forget to insert a shim on the mounting surface when reassembling the injection pump after it was removed.

(4) Cylinder Compression Pressure Measurement

The cylinder compression pressure measurement must be done **every 1000** operation hours, or whenever the engine output is reduced.

Compression pressure: 3.04 MPa (31.0 kg/cm² / 441 psi)

Test condition: Cranking speed 250 min⁻¹

Coolant temperature 70 – 85°C (158 – 185°F)

Repair the engine and/or replace some parts of engine if compression pressure is lower than 2.5 MPa (26 kg/cm² / 363 psi)

(5) Starter and Alternator Servicing

Do the starter and the alternator servicing **every 1000** operating hours on the following items.

- Starter commutator cleaning.
- Alternator slip ring cleaning.
- Carbon brushes and the brush contact check.

(6) Radiator Pressurization Valve Check

A pressurization valve is incorporated in the radiator cap assembly. Check the valve actuating pressure with a radiator compression tester. For the pressurization valve actuating pressure and the check interval, follow the equipment manufacturer's standards.

6. ENGINE CARE IN COLD SEASON

1. FUEL

(1) Fuel Selection

In the cold zone, the fuel might be frozen resulting in hard engine starting; therefore, select a suitable fuel for such engine operation.

Use ASTM 975 No. 2-D fuel if you expect temperature above -7°C (20°F).

Use Number 1-D if you expect temperatures below -7°C (20°F).

If Number 1-D is not available, a "winterized" blend of 1-D and 2-D is available in some areas during the winter months.

Check with the service station operator to be sure you get the properly blended fuel.

2. COOLANT

Where the atmospheric temperature falls below freezing point, the cooling system should be drained after engine operation, but to eliminate the need for repeated draining and refilling, the use of anti-freeze solution is highly recommended.

A 50/50 mix Ethylene glycol base antifreeze/tap water (soft water), distilled water or demineralized water.

(which provides protection to -37°C (-34°F) is recommended for use in these ISUZU diesel engines).

Concentrations over 65% adversely affect freeze protection, heat transfer rates, and silicate stability which may cause water pump leakage.

Never exceed a 60/40 mix antifreeze/tap water (soft water), distilled water or demineralized water.

(which provides protection to about -50°C (-58°F)).

WARNING: Under some conditions the ethylene glycol in the engine coolant is combustible. To help avoid being burned when adding engine coolant, do not spill it on the exhaust system or engine parts that may be hot. If there is any question, have this service performed by a qualified technician.

CAUTION: 1. Methyl alcohol base antifreeze is not recommended because of its effect on the non-metallic components of the cooling system and because of its low boiling point.
2. High silicate antifreeze is not recommended because of causing serious silica gelation problems.
3. Usage and mixing ratio etc. should be followed to the antifreeze manufacturer's recommendations.

3. ENGINE OIL

Engine oil viscosity largely affects engine startability, so the use of lubricant with selected viscosity according to the atmospheric temperature is important. (Refer to 3.2 LUBRICANT.)

At low atmospheric temperature, engine oil viscosity will increase to cause hard engine starting.

4. BATTERY

- 1) Always pay attention to charging the batteries completely in cold season.

As the discharge current from the battery is large in cold engine starting, it takes a comparatively long while to recharge the batteries than the recharge after the normal engine starting.

Particularly, as the gravity of the insufficiently charged battery's electrolyte is low, it will easily be frozen.

Pay attention to keep the batteries warm in the cold season.

- 2) To replenish the battery with distilled water, do it immediately before the engine operation.

CAUTION: *If the work is done after the engine has already been in an operation, the distilled water replenished will not be mixed with the original electrolyte, allowing the danger of freezing not mixed distilled water staying in the battery cell upper part.*

5. ENGINE STARTING

In cold engine starting at atmospheric temperature of below 0°C (32°F), pay attention to the following items:

- 1) Do the preheating operation before cranking the engine with the starter.
- 2) Set the engine throttle lever or pedal to the 1/3 position of the full lever or pedal stroke.
- 3) If the engine does not start with the initial cranking, keep the batteries stationary a while to recover their power and, reattempt the preheating and the cranking operation.
- 4) In order to protect the starter, one time cranking must be limited to within 10 seconds.
- 5) In cranking operation, when a phenomenon, that the starter pinion and the flywheel ring gear engagement to repeated disengage and engage take place, as this is a sign of weakened battery power, charge the batteries with an external electrical source.
- 6) In an extreme cold temperature engine starting, do the engine cranking a while with setting the throttle lever at no fuel position to allow the engine rotating or traveling parts come to an unrestricted condition from the adhesive cold lubricant, after then do preheating and cranking to start the engine.

CAUTION: Do not use starting "aids" in the air intake system. Such aids can cause immediate engine damage.

7. ENGINE MAINTENANCE SCHEDULE

When performing the following items, the daily inspection items should also be carried out.

NO.	Description of check and maintenance	Daily	(operation hours)						Remark
			250	500	750	1000	1250	1500	
1.	Oil level and oil fouling	○							See "EXPLANATION OF MAINTENANCE SCHEDULE"
2.	Oil leakage check	○							
3.	Oil pressure gauge registration	○							
4.	Oil pressure warning lamp	○							
5.	Engine oil replacement (Cartridge type)		○	○	○	○	○	○	
6.	Engine oil replacement (Remote filter type)			○		○		○	
7.	Oil filter element replacement			○		○		○	
8.	Fuel leakage check	○							
9.	Draining water in fuel filter	○							
	w/water sedimenter								
10.	Fuel filter element replacement		○★	○	○★	○	○★	○	
11.	Water sedimenter element cleaning		○★	○	○★	○	○★	○	

★ This is a recommended maintenance. The failure to perform this maintenance item will nullify the emission warranty or limit recall liability prior to the completion engine useful life. Isuzu, however, urges that recommended maintenance service is performed at the indicated intervals.

NO.	Description of check and maintenance	Daily	(operation hours)						Remark
			250	500	750	1000	1250	1500	
12.	Electromagnetic pump filter replacement or cleaning		○★	○	○★	○	○★	○	See "EXPLANATION OF MAINTENANCE SCHEDULE"
13.	Injection nozzle check (*)			○★		○★		○◎	
14.	Coolant level and fouling check	○							
15.	Coolant leakage check	○							
16.	Radiator filler cap fitting condition	○							
17.	Fan belt tension check (Replace if necessary.)	○		○		○		○	
18.	Coolant temperature registration	○							
19.	Coolant replacement								
20.	Intercooler and radiator external face cleaning								
21.	Cooling system circuit cleaning					○			
22.	Radiator filler cap function check (*)								

★ This is a recommended maintenance. The failure to perform this maintenance item will nullify the emission warranty or limit recall liability prior to the completion engine useful life. Isuzu, however, urges that recommended maintenance service is performed at the indicated intervals.

◎ This is a required maintenance. The failure to perform this maintenance item will nullify the emission warranty or limit recall liability prior to the completion engine useful life. Isuzu, however, urges that required maintenance service is performed at the indicated intervals.

NO.	Description of check and maintenance		Daily	(operation hours)						Remark
				250	500	750	1000	1250	1500	
23.	Electrolyte level check		☐							See "EXPLANATION OF MAINTENANCE SCHEDULE"
24.	Battery cleaning		☐							
25.	Battery charge condition	Ammeter registration	☐							
		Charge warning lamp	☐							
26.	Electrolyte gravity check									
27.	Starter and alternator check and cleaning (*)						☐			
28.	Wiring and connection check									
29.	Preheating condition check		☐							
30.	Air cleaner element replacement									
31.	Turbocharger check								☐	
32.	EGR valve check and cleaning								☐	
33.	EGR lead valve cleaning								☐	
34.	EGR cooler cleaning								☐	

NO.	Description of check and maintenance	Daily	(operation hours)						Remark
35.	Fuel & cooling water rubber hoses replacement								See "EXPLANATION OF MAINTENANCE SCHEDULE"
36.	Engine starting conditions and noise conditions	○							
37.	Exhaust smoke condition	○							
38.	Cylinder compression pressure (*)					○			
39.	Valve clearance check (*)					○			
40.	Positive crankcase ventilation valve cleaning							○ [◎]	

◎ This is a required maintenance. The failure to perform this maintenance item will nullify the emission warranty or limit recall liability prior to the completion engine useful life. Isuzu, however, urges that required maintenance service is performed at the indicated intervals.

Note:

1. The service intervals after 1500 operation hours should also be made every 250 operation hours in accordance with this check and maintenance schedule.
2. When the servicing on the asterisked (*) items are necessary, consult the equipment supplier.

EXPLANATION OF MAINTENANCE SCHEDULE

The following is a brief explanation of the services listed in the preceding Engine Maintenance schedule.

- 1. Oil level and oil fouling** Check that the oil level is between the max. level mark and the min. level mark.
Drain oil to the max. level mark if oil level is above the max. level mark. Add oil to the max. level mark if oil is below the min. level mark.
- 2. Oil leakage check** Replace any damaged or malfunctioning parts which could cause leakage.
- 3. Oil pressure gauge registration** Engine oil pressure is normal at the values of the following in warmed-up condition.
Oil pressure :147 kPa (21 psi) /1000min⁻¹
294 kPa (43 psi) /1800min⁻¹
343 to 686 kPa (50 to 100 psi) /2200min⁻¹
Check and repair the lubrication oil system, if it is abnormal.
- 4. Oil pressure warning lamp** Warning lamp is off while engine running. If it stays on, check and repair the lubrication system.
- 5. Engine oil replacement** Change oil every 250 hours. (Cartridge type)
- 6. Engine oil replacement** Change oil every 500 hours. (Remote filter type)
- 7. Oil filter element replacement** Change element every 500 hours.
- 8. Fuel leakage check** Inspect the fuel lines for damage which could cause leakage. Replace any damaged or malfunctioning parts.
- 9. Draining water in fuel filter** The fuel system without the water sedimenter.
Drain the sedimented water in fuel filter every 250 operating hours.

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- | | |
|--|---|
| 10. Fuel filter element replacement | Change element every 500 hours.
★ Shorten depending on fuel management. |
| 11. Water sedimenter element cleaning | Clean the water sedimenter element every 500 hours.
★ Shorten depending on fuel management. |
| 12. Electromagnetic pump filter cleaning | Replace the paper-type filter at intervals of 500 operating hours. Clean the steel mesh-type filter at intervals of 500 operating hours.
★ Shorten depending on fuel management. |
| 13. Injection nozzle check | Clean the injection nozzle tips every 1500 hours. (This is a required maintenance)
Check injection opening pressure and spray condition. |
| 14. Coolant level and fouling check | Check coolant level and add coolant if necessary. |
| 15. Coolant leakage check | Repair part for coolant leakage. |
| 16. Radiator filler cap fitting condition | The radiator cap must be installed tightly. |
| 17. Fan belt tension check | Check and adjust fan belt deflection. Look for cracks, fraying and wear. |
| 18. Coolant temperature registration | Coolant temperature is normal at about 75 to 90°C (167 to 194°F). Check and repair the cooling system if coolant temperature is abnormal. |
| 19. Coolant replacement | Change coolant at intervals of 12 months if coolant is long life coolant (LLC). |
| 20. Intercooler and radiator external face cleaning | According to the equipment manufacturer's specification. |

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- | | |
|--|--|
| 21. Cooling system circuit cleaning | Clean the cooling system circuit every 12 months or 1000 hours. |
| 22. Radiator filler cap function check | Check radiator pressure cap periodically for proper operation according to the equipment manufacturer's specifications. |
| 23. Electrolyte level check | Replenish with distilled water if necessary. |
| 24. Battery cleaning | Clean the terminals. |
| 25. Battery charge condition | Ammeter registration goes to plus (+) side while engine running. In the lamp type, the lamp is completely being off while engine running. Check charging circuit if the lamp is not off. |
| 26. Electrolyte gravity check | Check according to the equipment manufacturer's specifications. |
| 27. Starter and alternator check and cleaning | Check wear condition of brush and commutator. |
| 28. Wiring and connection check | Check according to the equipment specifications. |
| 29. Preheating condition check | Check preheating condition of the system. |
| 30. Air cleaner element replacement | Change element according to the manufacturer's specifications. |
| 31. Turbocharger check | Check turbocharger every 1500 hours. (Clean blower as necessary.) |

32. EGR valve check and cleaning	Check and clean EGR valve every 1500 hours.
33. EGR lead valve cleaning	Clean EGR lead valve every 1500 hours.
34. EGR cooler cleaning	Clean EGR cooler every 1500 hours.
35. Fuel & cooling water rubber hoses replacement	Check and replace every 24 months.
36. Engine starting conditions and noise conditions	Check engine stability and noise.
37. Exhaust smoke condition	Check exhaust smoke color.
38. Cylinder compression pressure	Check every 1000 hours.
39. Valve clearance check	Incorrect valve clearance will result in increased engine noise and lower engine output. Thereby adversely affecting engine performance. Check and adjust every 1000 hours.
40. Positive crankcase ventilation valve cleaning	Perform the adjustment, cleaning, repair or replacement every 1500 hours. (This is a required maintenance)

8. SIMPLE ENGINE TROUBLESHOOTING

This section contents simple troubleshooting. Refer this section in case of engine failure.

If the cause can not be identified or if it is hard to correct, contact ISUZU dealer as soon as possible.

The items marked with "⊙" in "Action" are necessary to be repaired or adjusted. Contact ISUZU dealer.

Symptom		Cause	Action
Engine does not start.	Starter does not turn.	Battery discharged.	Charge or change.
		Imperfect cable connections.	⊙
		Starter or starter switch failure.	⊙
		Safety relay failure.	⊙
	Starter turns but engine does not ignite.	Engine stop solenoid return failure.	⊙
		No fuel in the fuel tank.	Make sure that there is no fuel leakage and replenish.
		Clogged fuel filter element.	Remove water and change element.
		Air in the fuel system.	Bleed air.
		Control rack is stuck at no fuel position.	⊙
		Unproper preheating operation.	⊙
		Glow plug malfunction.	⊙
		Incorrect injection timing.	⊙
		Low cylinder compression pressure.	⊙
Engine ignites but stalls immediately.	Air in the fuel system.		Bleed air.
	Improper low idling speed adjustment.		⊙
	EGR valve fixing. (Open position.)		⊙

Symptom	Cause	Action
Unstable engine running.	Crack in injection pipe.	○
	Injection nozzle failure.	○
	Engine stop solenoid return failure.	○
	Uneven compression pressure between cylinders.	○
	Incorrect control lever adjustment.	○
	Governor interior malfunction.	○
	Governor spring deteriorated.	○
	Air in the fuel system.	Bleed air.
	Clogged fuel filter element.	Remove water and change element.
	Piping failure (squeezed, etc.) in the fuel system.	○
	Uneven fuel injection amount between plungers.	○
	Incorrect valve clearance adjustment.	Make a readjustment.
	Deteriorated valve spring.	Change valve spring.
	Engine control restriction or seizure.	○
Engine overheat.	Insufficient coolant amount.	Replenish.
	Fan belt slippage.	Make an adjustment.
	Thermostat malfunction.	Change thermostat.
	Radiator filler cap malfunction.	Change radiator filler cap.
	Cooling system interior fouled.	Clean cooling system interior.

Symptom	Cause	Action
Engine overheat.	Radiator clogging.	Clean with soft brush.
	Engine over-loaded.	Check your driving.
	Air cleaner element clogging.	Clean or change element.
	Insufficient ventilator.	Check the ventilation.
	Stopped coolant flow (high concentration of antifreezer, etc.).	Clean inside of radiator and change coolant.
Low oil pressure.	Oil leakage.	⊙
	Large oil consumption.	⊙
	Wrong selection of kind and viscosity.	Change with oil of correct viscosity.
	Over heat	Stop vehicle operation, and reduce engine rotation to 1000 revolutions for cooling drive for five minutes, and stop engine.
	Clogged filter and strainer.	⊙
	Worn bearings and oil pump.	⊙
	Faulty relief valve.	⊙
Lack engine output.	Too advance of injection timing.	⊙
	Too retard of injection timing.	⊙
	Incorrect injection pressure adjustment.	⊙
	Incorrect spray condition.	⊙
	Lack of fuel in tank.	Make sure that there is no fuel leakage and replenish.

Symptom		Cause	Action
Lack engine output.		Air mixing in injection pump.	Bleed air.
		Fuel filter clogged.	Change element.
		Overflow valve malfunction.	⊙
		Incorrect engine control adjustment.	⊙
		Deteriorated governor spring.	⊙
		Incorrect valve clearance adjustment.	Make a readjustment.
		Nozzle holder misalignment.	⊙
		Cylinder bore wear.	⊙
		Air cleaner clogging.	Clean element.
		Such as inferior ventilation.	Check engine condition. Ventilate and improve it.
At low speed, insufficient torque.		EGR valve fixing. (Open position.)	⊙
Excessive oil consumption.	Improper oil.	Wrong selection of kind of viscosity.	Change with oil of correct viscosity.
		Too much oil quantity.	⊙
	Oil coming up.	Wrong selection of cylinder liner and piston ring.	⊙
	Oil coming down.	Faulty valve stem seal.	⊙
	Oil leakage.	Damaged packing.	Change packing.
		Improper tightening.	Retighten oil filler cap.
		Improper installation of filter and piping.	

Symptom		Cause	Action
Excessive fuel consumption.	Fuel leakage.	Damaged packing.	Change packing.
		Improper installation or tightening.	Reinstall or retighten air bleeder plug.
	Too much injection amount.	Injection pump misadjustment.	⊙
	Excessive mechanical loads.	Operation	Check the mechanical loads.
Improper exhaust.	Much black smoke.	Clogged air cleaner.	Clean or change element.
		Nozzle damage.	⊙
		Nozzle misadjustment.	Make a readjustment.
		Injection timing failure.	⊙
		Injection amount misadjustment.	⊙
		Improper fuel.	Use fuel in this instruction manual.
		EGR valve fixing. (Open position.)	⊙
	Much white smoke.	Oil coming up or down.	Change oil.
		Water mixing in fuel.	Remove water.
		Low compression pressure.	⊙
		Injection timing failure.	⊙
Battery overdischarge.	Low electrolyte level.	Low coolant temperature.	Inspect or change thermostat.
		Crack in battery body.	Change battery.
		Natural consumption.	Change battery.

Symptom		Cause	Action
Battery overdischarge.	Charging failure.	Loose or damaged belt.	Retighten or change belt.
		Faulty alternator.	Change alternator.
		Damaged wiring or contact failure.	Make an adjustment.
		Low speed driving.	Charge or change.
	Excessive electrical loads.	Insufficient battery capacity.	Reduce electrical load or change battery capacity.

2. INFORMATION GENERALE

1. CARACTERISTIQUES TECHNIQUES ET DONNEES DU MOTEUR CARTIFIE EPA ET CARB

(1) Modèle AU-4LE1T

Désignation du modèle du moteur ISUZU	AU-4LE1T
Famille de moteur	*SZXL02.2XXX
Code de moteur	4LE1XXXX-XX
Type de moteur	Type de soupape en tête en ligne, quatre temps, à refroidissement à eau.
Type de combustion	Swirl chambre
No. de cylindres – alésage × course mm(in)	4 – 85 × 96 (3,35 × 3,78)
Cylindrée du moteur L(cid)	2,179 (133)
Rapport de compression	21,5 to 1
Séquence d'allumage	1 – 3 – 4 – 2
Puissance nominale: SAE NET kW(cv)/min ⁻¹	40 (53,6) / 2200
Débit de combustible au couple max. (mm ³ /course)	46,3
Système de commande d'émission d'échappement	EM, IDI, TC, EGR
Pompe à injection	Type PFR, Bosch
Régulateur	Type mécanique, vitesse variable

* Marque ; Placer un code de lettres pour l'année du modèle sur la partie supérieure des lattes.

Année du modèle Y : 2000, 1 : 2001, 2 : 2002, 3 : 2003, 4 : 2004, 5 : 2005, 6 : 2006, 7 : 2007, 8 : 2008,
9 : 2009

Le code du moteur varie selon chaque moteur.

Désignation du modèle du moteur ISUZU			AU-4LE1T
Buses à injection			Type à papillon
Combustible spécifié			Combustible Diesel (ASTM D975 No.2-D)
Démarrreur	(V-kW)		12 – 2,2
Alternateur	(V-A)		12 – 50
Huile moteur spécifiée (API grade)			Référez-vous à 3. LUBRIFIANT, choix D'Huile à moteur.
Volume d'huile de lubrification	L(qts)		7,6 (8,0) – 10,3 (10,9)
Volume du liquide de refroidissement (seulement moteur)	L(qts)		2,8 (3,0)
Poids à sec du moteur	kg(lb)		190 (419)
Dimensions du moteur	Longueur hors-tout	mm(in)	647,5 (25,5)
	Largeur hors-tout	mm(in)	523,6 (20,6)
	Hauteur hors-tout	mm(in)	720,8 (28,4)
Jeu de soupape (à froid)		mm(in)	0,4 (0,0157)
Pression d'injection d'injecteur	MPa(psi)		14,7 (2132)
Calage d'injection B.T.D.C.			12°
Fabricant et type de turbochargeur			IHI, RHF-3

(2) **Modèle BV-4LE1T**

Désignation du modèle du moteur ISUZU	BV-4LE1T
Famille de moteur	*SZXL02.2XXX
Code de moteur	4LE1XXXX-XX
Type de moteur	Type de soupape en tête en ligne, quatre temps, à refroidissement à eau.
Type de combustion	Swirl chambre
No. de cylindres – alésage x course mm(in)	4 – 85 x 96 (3,35 x 3,78)
Cylindrée du moteur L(cid)	2,179 (133)
Rapport de compression	21,5 to 1
Séquence d'allumage	1 – 3 – 4 – 2
Puissance nominale: SAE NET kW(cv)/min ⁻¹	35 (46,9) / 1800
Débit de combustible au couple max. (mm ³ /course)	49,7
Système de commande d'émission d'échappement	EM, IDI, TC
Pompe à injection	Type PFR, Bosch
Régulateur	Type mécanique, vitesse variable

* Marque ; Placer un code de lettres pour l'année du modèle sur la partie supérieure des lattes.
 Année du modèle Y : 2000, 1 : 2001, 2 : 2002, 3 : 2003, 4 : 2004, 5 : 2005, 6 : 2006, 7 : 2007, 8 : 2008, 9 : 2009

Le code du moteur varie selon chaque moteur.

Désignation du modèle du moteur ISUZU			BV-4LE1T
Buses à injection			Type à papillon
Combustible spécifié			Combustible Diesel (ASTM D975 No.2-D)
Démarrreur	(V-kW)		12 – 2,0
Alternateur	(V-A)		12 – 35
Huile moteur spécifiée (API grade)			Référez-vous à 3. LUBRIFIANT, choix D'Huile à moteur.
Volume d'huile de lubrification	L(qts)		7,6 (8,0) – 10,3 (10,9)
Volume du liquide de refroidissement (seulement moteur)	L(qts)		2,8 (3,0)
Poids à sec du moteur	kg(lb)		180 (397)
Dimensions du moteur	Longueur hors-tout	mm(in)	753,7 (29,7)
	Largeur hors-tout	mm(in)	486,2 (19,1)
	Hauteur hors-tout	mm(in)	601,8 (23,7)
Jeu de soupape (à froid)		mm(in)	0,4 (0,0157)
Pression d'injection d'injecteur	MPa(psi)		14,7 (2132)
Calage d'injection B.T.D.C.			10°
Fabricant et type de turbochargeur			IHI, RHF-3

(3) **Modèle AV-4LE1N**

Désignation du modèle du moteur ISUZU		AV-4LE1N
Famille de moteur		*SZXL02.2XXX
Code de moteur		4LE1XXXX-XX
Type de moteur		Type de soupape en tête en ligne, quatre temps, à refroidissement à eau.
Type de combustion		Swirl chambre
No. de cylindres – alésage × course	mm(in)	4 – 85 × 96 (3,35 × 3,78)
Cylindrée du moteur	L(cid)	2,179 (133)
Rapport de compression		21,5 to 1
Séquence d'allumage		1 – 3 – 4 – 2
Puissance nominale: SAE NET	kW(cv)/min ⁻¹	35,9 (48,1) / 2600
Débit de combustible au couple max.	(mm ³ /course)	35,5
Système de commande d'émission d'échappement		EM, IDI
Pompe à injection		Type PFR, Bosch
Régulateur		Type mécanique, vitesse variable

* Marque ; Placer un code de lettres pour l'année du modèle sur la partie supérieure des lattes.
 Année du modèle Y : 2000, 1 : 2001, 2 : 2002, 3 : 2003, 4 : 2004, 5 : 2005, 6 : 2006, 7 : 2007, 8 : 2008, 9 : 2009

Le code du moteur varie selon chaque moteur.

Désignation du modèle du moteur ISUZU			AV-4LE1N
Buses à injection			Type à papillon
Combustible spécifié			Combustible Diesel (ASTM D975 No.2-D)
Démarrreur	(V-kW)		12 – 2,0
Alternateur	(V-A)		12 – 35
Huile moteur spécifiée (API grade)			Référez-vous à 3. LUBRIFIANT, choix D'Huile à moteur.
Volume d'huile de lubrification	L(qts)		5,9 (6,2) – 8,4 (8,8)
Volume du liquide de refroidissement (seulement moteur)	L(qts)		2,8 (3,0)
Poids à sec du moteur	kg(lb)		170 (375)
Dimensions du moteur	Longueur hors-tout	mm(in)	695,7 (27,4)
	Largeur hors-tout	mm(in)	486,2 (19,1)
	Hauteur hors-tout	mm(in)	601,8 (23,7)
Jeu de soupape (à froid)		mm(in)	0,4 (0,0157)
Pression d'injection d'injecteur	MPa(psi)		14,7 (2132)
Calage d'injection B.T.D.C.			13°

(4) **Modèle BV-4LE1N**

Désignation du modèle du moteur ISUZU		BV-4LE1N
Famille de moteur		*SZXL02.2XXX
Code de moteur		4LE1XXXX-XX
Type de moteur		Type de soupape en tête en ligne, quatre temps, à refroidissement à eau.
Type de combustion		Swirl chambre
No. de cylindres – alésage × course	mm(in)	4 – 85 × 96 (3,35 × 3,78)
Cylindrée du moteur	L(cid)	2,179 (133)
Rapport de compression		21,5 to 1
Séquence d'allumage		1 – 3 – 4 – 2
Puissance nominale: SAE NET	kW(cv)/min ⁻¹	26,3 (35,3) / 1800
Débit de combustible au couple max.	(mm ³ /course)	36,5
Système de commande d'émission d'échappement		EM, IDI
Pompe à injection		Type PFR, Bosch
Régulateur		Type mécanique, vitesse variable

* Marque ; Placer un code de lettres pour l'année du modèle sur la partie supérieure des lattes.
 Année du modèle Y : 2000, 1 : 2001, 2 : 2002, 3 : 2003, 4 : 2004, 5 : 2005, 6 : 2006, 7 : 2007, 8 : 2008, 9 : 2009

Le code du moteur varie selon chaque moteur.

Désignation du modèle du moteur ISUZU			BV-4LE1N
Buses à injection			Type à papillon
Combustible spécifié			Combustible Diesel (ASTM D975 No.2-D)
Démarrreur	(V-kW)		12 – 2,0
Alternateur	(V-A)		12 – 20
Huile moteur spécifiée (API grade)			Référez-vous à 3. LUBRIFIANT, choix D'Huile à moteur.
Volume d'huile de lubrification	L(qts)		5,9 (6,2) – 8,4 (8,8)
Volume du liquide de refroidissement (seulement moteur)	L(qts)		2,8 (3,0)
Poids à sec du moteur	kg(lb)		170 (375)
Dimensions du moteur	Longueur hors-tout	mm(in)	671 (26,4)
	Largeur hors-tout	mm(in)	496 (19,5)
	Hauteur hors-tout	mm(in)	595 (23,4)
Jeu de soupape (à froid)		mm(in)	0,4 (0,0157)
Pression d'injection d'injecteur	MPa(psi)		14,7 (2132)
Calage d'injection B.T.D.C.			10°

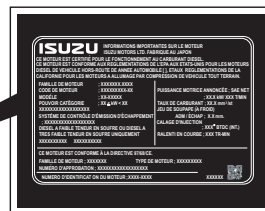
(5) Famille indice de moteur

Moteur	Famille de moteur	Code de moteur	Pression d'injection d'injecteur MPa(psi)	Catage d'injection B.T.D.C. (degre)
4LE1T	*SZXL02.2UTA	Tout	—	—
4LE1T	*SZXL02.2VTB	Tout	—	—
4LE1N	*SZXL02.2VNA	Tout	—	—
4LE1N	*SZXL02.2VNC	Tout	—	—

* Marque ; Placer un code de lettres pour l'année du modèle sur la partie supérieure des lattes.
Année du modèle Y : 2000, 1 : 2001, 2 : 2002, 3 : 2003, 4 : 2004, 5 : 2005, 6 : 2006, 7 : 2007, 8 : 2008,
9 : 2009

Ces étiquettes sont traduites de l'anglais en français.

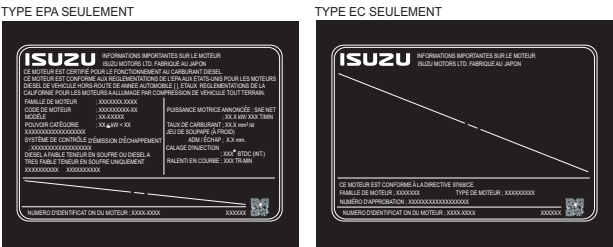
A technical line drawing of a diesel engine. A callout line points from the 'DURASHIFT' label to a specific component on the engine block.



A blank coordinate plane with a horizontal x-axis and a vertical y-axis intersecting at the origin. The axes are represented by thin black lines.



ETIQUETTE DE COMMANDE D’ EMISSION : ETIQUETTE DU MOTEUR
L’étiquette de commande d’émission est fixé sur un emplacement visible de l’équipement.
Ces étiquettes sont traduites de l’anglais en français.



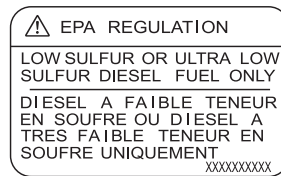
IMLE0101

ETIQUETTE DE RESTRICTION DE TYPE DE CARBURANT UTILISE (POUR EPA)

L'étiquette de restriction du type de carburant utilisé se trouve sur le goulot de remplissage du réservoir de carburant.

Contenu de l'étiquette:

DIESEL A FAIBLE TENEUR EN SOUFRE OU DIESEL A TRES FAIBLE TENEUR EN SOUFRE UNIQUEMENT



IMLE0066

All information, illustrations and specifications contained in this manual are based on the latest product information available at the time of publication. The right is reserved to make changes at any time without notice.

INSTRUCTION MANUAL (INDUSTRIAL)

**4LE1
INTERIM TIER4/ STAGE 3A**

IDE-6260

Issued by

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