YANMAR

OPERATION MANUAL

INDUSTRIAL ENGINE

TF-M Series
TF-DI Series

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.

California
Proposition 65 Warning

Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer and reproductive harm.
Wash hands after handling.

Disclaimers:

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When exporting or providing YANMAR products to non-residents, please comply with the security trade control laws and regulations of relevant countries.

OPERATION MANUAL	MODEL	TF-M Series, TF-DI Series
	CODE	0ATF0-EN0060

CONTENTS

Operation Manual

YANMAR

INTRODUCTION

Welcome to the world of YANMAR Engines!

- This Operation Manual gives information about engine operation, operation procedures and precautions on maintenance for YANMAR horizontal water-cooled diesel engines.
- Read and understand this Operation Manual before you operate the engine to correctly use it under the best conditions.
- Keep this Operation Manual in a convenient location for easy access.
- If your Operation Manual is lost or damaged, get a new one from your authorized YANMAR dealer or distributor.
- Make sure this Operation Manual is given to future owners.
- YANMAR is always working to enhance the quality and performance of YANMAR products. As a result, some descriptions included in this Operation Manual may be somewhat different from your engine.
  If you have questions about these differences, please consult your authorized YANMAR dealer or distributor.

YANMAR WARRANTIES

YANMAR Limited Warranty

■ What is covered by this warranty?

YANMAR warrants to the original retail purchaser that a new YANMAR TF series industrial engine will be free from defects in material and/or workmanship for the duration of the warranty period.

This warranty is provided in lieu of all other warranties, express or implied. YANMAR specifically disclaims any implied warranties of merchantability or fitness for a particular purpose, except where such disclaimer is prohibited by law. If such disclaimer is prohibited by law, then implied warranties shall be limited in duration to the life of the express warranty.

■ How long is the warranty period?

The YANMAR standard limited warranty period runs for a period of **twelve (12) months or one-thousand (1000) engine operation hours**, whichever occurs first.

■ What the engine owner must do:

If you believe your YANMAR engine has experienced a failure due to a defect in material and/or workmanship, you must contact an authorized YANMAR industrial engine dealer or distributor within thirty (30) days of discovering the failure. You must provide proof of ownership of the engine, proof of the date of the engine purchase and delivery, and documentation of the engine operation hours. Acceptable forms of proof of delivery date include, but are not limited to: the original warranty registration or sales receipts or other documents maintained in the ordinary course of business by YANMAR dealers and/or distributors, indicating the date of delivery of the YANMAR product to the original retail purchaser. This information is necessary to establish whether the YANMAR product is still within the warranty period. Thus, YANMAR strongly recommends you register your engine as soon as possible after purchase in order to facilitate any future warranty matters.

You are responsible for the transportation of the engine to and from the repair location as designated by YANMAR.

■ To locate an authorized YANMAR industrial engine dealer or distributor:

You can locate your nearest authorized YANMAR industrial engine dealer or distributor by visiting the YANMAR CO., LTD. website at:

https://www.yanmar.com/global/ (The English language page will be displayed.)

- "Click" on "Dealer Locator" in the website heading to view the "Dealer Locator" menu.
- Choose the Country from the pull down menu.
- Choose the Product Category from the pull down menu.
- "Click" on "Search" to browse YANMAR dealer or distributor.

You may also contact YANMAR by clicking on "Contact" icon in the website heading and typing in your question or comment.

■ What YANMAR will do:

YANMAR warrants to the original retail purchaser of a new YANMAR engine that YANMAR will make such repairs and/or replacements at YANMAR's option, of any part(s) of the YANMAR product covered by this warranty found to be defective in material and/or workmanship. Such repairs and/or replacements will be made at a location designated by YANMAR at no cost to the purchaser for parts or labor.

■ What is not covered by this warranty?

This warranty does not cover parts affected by or damaged by any reason other than defective materials or workmanship, including, but not limited to, accident, misuse, abuse, "Acts of God," neglect, improper installation, improper maintenance, improper storage, the use of unsuitable attachments or parts, the use of contaminated fuels, the use of fuels, oils, lubricants, or fluids other than those recommended in your YANMAR Operation Manual, unauthorized alterations or modifications, ordinary wear and tear, and rust or corrosion. This warranty does not cover the cost of parts and/or labor required to perform normal/scheduled maintenance on your YANMAR engine. This warranty does not cover consumable parts such as, but not limited to, filters, belts, hoses, fuel injector, lubricants and cleaning fluids. This warranty does not cover the cost of shipping the product to or from the warranty repair facility.

■ Warranty limitations:

The foregoing is YANMAR's only obligation to you and your exclusive remedy for breach of warranty. Failure to follow the requirements for submitting a claim under this warranty may result in a waiver of all claims for damages and other relief. **In no event shall YANMAR or any authorized industrial engine dealer or distributor be liable for incidental, special or consequential damages.** Such consequential damages may include, but not be limited to, loss of revenue, loan payments, cost of rental of substitute equipment, insurance coverage, storage, lodging, transportation, fuel, mileage, and telephone costs. The limitations in this warranty apply regardless of whether your claims are based on breach of contract, tort (including negligence and strict liability) or any other theory. Any action arising hereunder must be brought within one (1) year after the cause of action accrues or it shall be barred. Some states and countries do not allow certain limitations on warranties or for breach of warranties. **This warranty gives you specific legal rights, and you may also have other rights which vary from state to state and country to country.** Limitations set forth in this paragraph shall not apply to the extent that they are prohibited by law.

■ Warranty modifications:

Except as modified in writing and signed by the parties, this warranty is and shall remain the complete and exclusive agreement between the parties with respect to warranties, superseding all prior agreements, written and oral, and all other communications between the parties relating to warranties. **No person or entity is authorized to give any other warranty or to assume any other obligation on behalf of YANMAR, either orally or in writing.**

■ Questions:

If you have any questions or concerns regarding this warranty, please call or write to the nearest authorized YANMAR industrial engine dealer or distributor or other authorized facility.

SAFETY

Safety Statements

YANMAR is concerned for your safety and your machine's condition. Safety statements are one of the primary ways to call your attention to the potential hazards associated with YANMAR TF engine operation. Follow the precautions listed throughout the manual before operation, during operation and during periodic maintenance procedures for your safety, the safety of others and to protect the performance of your engine. Keep the labels from becoming dirty or torn and replace them if they are lost or damaged. Also, if you need to replace a part that has a label attached to it, make sure you order the new part and label at the same time.

This safety alert symbol appears with most safety statements. It means attention, become alert, your safety is involved! Please read and abide by the message that follows the safety alert symbol.

⚠ DANGER — **DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.**

⚠ WARNING — **WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.**

⚠ CAUTION — **CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.**

NOTICE — NOTICE indicates a situation which can cause damage to the machine, personal property and/or the environment or cause the equipment to operate improperly.

■ Before you operate

NOTICE

- Never permit anyone to operate the engine or driven machine without proper training.

- Read and understand this Operation Manual before you operate or service the machine to ensure that you follow safe operating practices and maintenance procedures.
- Machine safety signs and labels are additional reminders for safe operating and maintenance techniques.
- See your authorized YANMAR industrial engine dealer or distributor for additional training.

■ During operation and maintenance

⚠ DANGER

High Pressure Hazard!

- **Do not loosen the high pressure pipe while the engine is running, even in low idle. This is dangerous because fuel under high pressure will blow out.**
- **Failure to comply will result in death or serious injury.**

Scald Hazard!

- **Never remove the radiator cap if the engine is hot. Steam and hot engine coolant will spurt out and seriously burn you. Allow the engine to cool down before you attempt to remove the radiator cap.**
- **Tighten the radiator cap securely after you check the radiator. Steam can spurt out during engine operation if the cap is loose.**
- **Always check the level of the engine coolant by observing the reserve tank.**
- **Failure to comply will result in death or serious injury.**

⚠ DANGER

Explosion Hazard!

- **Keep the area around the battery well-ventilated. While the engine is running or the battery is charging, hydrogen gas is produced which can be easily ignited.**
- **Keep sparks, open flame and any other form of ignition away while the engine is running or battery is charging.**
- **Never short out the battery terminals, including when checking the remaining battery charge. This will result in a spark and may cause an explosion or fire. Use a hydrometer to check the remaining battery charge.**
- **If the electrolyte is frozen, slowly warm the battery before you recharge it.**
- **Failure to comply will result in death or serious injury.**

Prevent Machine Runaway!

- **Do not start engine by shorting across starter terminals. Machine will start in gear if safety circuitry is bypassed.**
- **Never start engine while standing on ground. Start engine only from operator's seat, with transmission in neutral or park position.**
- **Bypass start can cause machine to runaway. It can cause to serious injury or death.**

⚠ DANGER

Fire and Explosion Hazard!

- Diesel fuel is extremely flammable and explosive under certain conditions.

- When you remove any fuel system component to perform maintenance (such as changing the fuel filter) place an approved container under the opening to catch the fuel.
- Never use a shop rag to catch the fuel. Vapors from the rag are flammable and explosive.
- Wipe up any spills immediately.
- Wear eye protection. The fuel system is under pressure and fuel could spray out when you remove any fuel system component.
- Only use the key switch to start the engine (electric starting system).
- Never jump-start the engine. Sparks caused by shorting the battery to the starter terminals may cause a fire or explosion.
- Never use diesel fuel as a cleaning agent.
- Never remove the fuel cap with the engine running.
- Only fill the fuel tank with diesel fuel. Filling the fuel tank with gasoline may result in a fire and will damage the engine.
- Never refuel with the engine running.
- Keep sparks, open flames or any other form of ignition (match, cigarette, static electric source) well away when refueling.
- Never overfill the fuel tank.
- Fill the fuel tank. Store any containers containing fuel in a well-ventilated area, away from any combustibles or sources of ignition.
- Be sure to place the diesel fuel container on the ground when transferring the diesel fuel from the pump to the container. Hold the hose nozzle firmly against the side of the container while filling it. This prevents static electricity buildup which could cause sparks and ignite fuel vapors.

⚠ DANGER

- Never place diesel fuel or other flammable material such as oil, hay or dried grass close to the engine during engine operation or shortly after shutdown.
- Before you operate the engine, check for fuel leaks. Replace rubberized fuel hoses every two years or every 2000 hours of engine operation, whichever comes first, even if the engine has been out of service. Rubberized fuel lines tend to dry out and become brittle after two years or 2000 hours of engine operation, whichever comes first.
- When you prime the fuel system, operate the fuel priming lever of the fuel filter until the fuel filter cup is filled with fuel.
- Failure to comply will result in death or serious injury.

Crush Hazard!

- When you need to transport an engine for repair, have a helper assist you to attach it to a hoist and load it on a truck.
- Never stand under a hoisted engine. If the hoist mechanism fails, the engine will fall on you, causing death or serious injury.
- Failure to comply will result in death or serious injury.

⚠ WARNING

Burn Hazard!

- Batteries contain sulfuric acid. Never allow battery fluid to come in contact with clothing, skin or eyes. Severe burns could result. Always wear safety goggles and protective clothing when servicing the battery. If battery fluid contacts the eyes and/or skin, immediately flush the affected area with a large amount of clean water and obtain prompt medical treatment.
- Failure to comply could result in death or serious injury.

Sever Hazard!

- Keep hands and other body parts away from moving/rotating parts such as the cooling fan, flywheel or PTO shaft.
- Wear tight-fitting clothing and keep your hair short or tie it back while the engine is running.
- Remove all jewelry before you operate or service the machine.
- Never start the engine in gear. Sudden movement of the engine and/or machine could cause death or serious personal injury.
- Never operate the engine without the guards in place.
- Before you start the engine make sure that all bystanders are clear of the area.
- Keep children and pets away while the engine is operating.
- Check before starting the engine that any tools or shop rags used during maintenance have been removed from the area.
- Failure to comply could result in death or serious injury.

⚠ WARNING

Exhaust Hazard!

- Never operate the engine in an enclosed area such as a garage, tunnel, underground room, manhole or ship's hold without proper ventilation.
- Never block windows, vents, or other means of ventilation if the engine is operating in an enclosed area. All internal combustion engines create carbon monoxide gas during operation. Accumulation of this gas within an enclosure could cause illness or even death.
- Make sure that all connections are tightened to specifications after repair is made to the exhaust system.
- Failure to comply could result in death or serious injury.

Alcohol and Drug Hazard!

- Never operate the engine while you are under the influence of alcohol or drugs.
- Never operate the engine when you are feeling ill.
- Failure to comply could result in death or serious injury.

⚠ WARNING

Exposure Hazard!

- Wear personal protective equipment such as gloves, work shoes, eye and hearing protection as required by the task at hand.
- Never wear jewelry, unbuttoned cuffs, ties or loose-fitting clothing when you are working near moving/rotating parts such as the cooling fan, flywheel or PTO shaft.
- Always tie back long hair when you are working near moving/rotating parts such as a cooling fan, flywheel, or PTO shaft.
- Never operate the engine while wearing a headset to listen to music or radio because it will be difficult to hear the alert signals.
- Failure to comply could result in death or serious injury.

Burn Hazard!

- If you drain the engine oil while it is still hot, stay clear of the hot engine oil to avoid being burned. Always wear eye protection when you handle the engine coolant.
- If you must drain the engine oil while it is still hot, stay clear of the hot engine oil to avoid being burned.
- Always wear eye protection.
- Keep your hands and other body parts away from hot engine surfaces such as the muffler, exhaust pipe, turbocharger (if equipped) and engine block during operation and shortly after you shut the engine down. These surfaces are extremely hot while the engine is operating and could seriously burn you.
- Failure to comply could result in death or serious injury.

⚠ WARNING

High-pressure Hazard!

- Avoid skin contact with the high-pressure diesel fuel spray caused by a fuel system leak such as a broken fuel injection line. High-pressure fuel can penetrate your skin and result in serious injury. If you are exposed to high-pressure fuel spray, obtain prompt medical treatment.
- Never check for a fuel leak with your hands. Always use a piece of wood or cardboard. Have your authorized YANMAR industrial engine dealer or distributor repair the damage.
- Failure to comply could result in death or serious injury.

Shock Hazard!

- Turn off the battery switch (if equipped) or disconnect the negative battery cable before servicing the electrical system.
- Check the electrical harnesses for cracks, abrasions, and damaged or corroded connectors. Always keep the connectors and terminals clean.
- Failure to comply could result in death or serious injury.

⚠ WARNING

Entanglement Hazard!

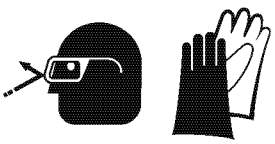
- Stop the engine before you begin to service it.
- Never leave the key in the key switch (if equipped) when you are servicing the engine. Someone may accidentally start the engine and not realize you are servicing it. This could result in a serious injury.
- If you must service the engine while it is operating, remove all jewelry, tie back long hair, and keep your hands, other body parts and clothing away from moving/rotating parts.
- Failure to comply could result in death or serious injury.

Sudden Movement Hazard!

- Engaging the transmission or PTO at an elevated engine speed could result in unexpected movement of the equipment.
- Failure to comply could result in death or serious injury.

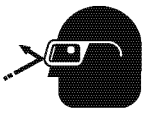
⚠ CAUTION

Coolant Hazard!



- Wear eye protection and rubber gloves when you handle long life or extended life engine coolant. If contact with the eyes or skin should occur, flush eyes and wash immediately with clean water.
- Failure to comply may result in minor or moderate injury.

Flying Object Hazard!



- Always wear eye protection when servicing the engine and when using compressed air or high-pressure water. Dust, flying debris, compressed air, pressurized water or steam may injure your eyes.
- Failure to comply may result in minor or moderate injury.

- The main switch should always be kept in the ON position during operation.
- Before starting the engine, always turn the switches on the working instruments (lighting apparatus, motor, etc.) to their OFF position. If the switches are not OFF, the sudden application of load when the engine is started could be very dangerous.

NOTICE

Never attempt to adjust the low or high idle speed limit screw. This may impair the safety and performance of the machine and shorten its life. If adjustment is ever required, contact your authorized YANMAR industrial engine dealer or distributor.

If any problem is noted during the visual check, the necessary corrective action should be taken before you operate the engine.

- Only use diesel fuels recommended by YANMAR for the best engine performance, to prevent engine damage.
- Only use clean diesel fuel.
- Never remove the primary strainer from the fuel tank filler port. If removed, dirt and debris could get into the fuel system causing it to clog.

Never hold the key (if equipped) in the START position for longer than 15 seconds or the starter motor will overheat.

Make sure the engine is installed on a level surface. If a continuously running engine is installed at an angle greater than (15°) in any direction, engine oil may enter the combustion chamber causing excessive engine speed and white exhaust smoke. This may cause serious engine damage.
In addition, never operate the engine beyond the allowable inclination angle. It may cause the engine to overturn and this is very dangerous.

Never attempt to adjust the low or high idle speed limit screw. This may impair the safety and performance of the machine and shorten its life. If the idle speed limit screws require adjustment, see your authorized YANMAR industrial engine dealer or distributor.

NOTICE

Observe the following environmental operating conditions to maintain engine performance and avoid premature engine wear:

- Avoid operating in extremely dusty conditions.
- Avoid operating in the presence of chemical gases or fumes.
- Avoid operating in a corrosive atmosphere such as salt water spray.
- Never install the engine in a floodplain unless proper precautions are taken to avoid being subject to a flood.
- Never expose the engine to the rain.

Observe the following environmental operating conditions to maintain engine performance and avoid premature engine wear:

- The standard range of ambient temperatures for the normal operation of YANMAR engines is from -15 °C (+5 °F) to +45 °C (+113 °F).
- If the ambient temperature exceeds +45 °C (+113 °F) the engine may overheat and cause the engine oil to break down.
- If the ambient temperature is below -15 °C (+5 °F) the engine will be hard to start and the engine oil may not flow easily.
- Contact your authorized YANMAR industrial engine dealer or distributor if the engine will be operated outside of this standard temperature range.

The illustrations and descriptions of optional equipment in this manual, such as the operator's console, are for a typical engine installation. Refer to the documentation supplied by the optional equipment manufacturer for specific operation and maintenance instructions.

If any indicator illuminates during engine operation, stop the engine immediately. Determine the cause and repair the problem before you continue to operate the engine.

NOTICE

- Only use the engine oil specified. Other engine oils may affect warranty coverage, cause internal engine components to seize and/or shorten engine life.
- Prevent dirt and debris from contaminating the engine oil. Carefully clean the oil cap/dipstick and the surrounding area before you remove the cap.
- Never mix different types of engine oil. This may adversely affect the lubricating properties of the engine oil.
- Never overfill. Overfilling may result in white exhaust smoke, engine overspeed or internal damage.

Never use an engine starting aid such as ether.
Engine damage will result.

- Only use the engine coolant specified. Other engine coolants may affect warranty coverage, cause an internal buildup of rust and scale and/or shorten engine life.
- Prevent dirt and debris from contaminating the engine coolant. Carefully clean the radiator cap and the surrounding area before you remove the cap.
- Never mix different types of engine coolants. This may adversely affect the properties of the engine coolant.

- Never overfill the engine with engine oil.
- Always keep the oil level between the upper and lower lines on the oil cap/dipstick.

For maximum engine life, YANMAR recommends that when shutting the engine down, you allow the engine to idle, without load, for five minutes. This will allow the engine components that operate at high temperatures, such as the exhaust system, to cool slightly before the engine itself is shut down.

NOTICE

Never engage the starter motor (if equipped) while the engine is running. This may damage the starter motor pinion and/or ring gear.

- Always be environmentally responsible.
- Follow the guidelines of the EPA or other governmental agencies for the proper disposal of hazardous materials such as engine oil, diesel fuel and engine coolant. Consult the local authorities or reclamation facility.
- Never dispose of hazardous materials irresponsibly by dumping them into a sewer, on the ground, or into ground water or waterways.
- Failure to follow these procedures may seriously harm the environment.

Establish a periodic maintenance plan according to the engine application and make sure you perform the required periodic maintenance at intervals indicated. Failure to follow these guidelines will impair the engine's safety and performance characteristics, shorten the engine's life and may affect the warranty coverage on your engine. Refer to P2 [YANMAR Limited Warranty].

If you continue to operate a defective engine without performing appropriate maintenance or repair, it may cause excess noise and vibration due to abnormal wear and deterioration. This may result in health hazards and parts becoming loose or falling off.
Consult your authorized Yanmar dealer or distributor for the appropriate maintenance.

NOTICE

New engine break-in:

- On the initial engine start-up, allow the engine to idle for approximately 15 minutes while you check for proper engine oil pressure, diesel fuel leaks, engine oil leaks, coolant leaks, and for proper operation of the indicators and/or gauges.
- During the first hour of operation, vary the engine speed and the load on the engine. Short periods of maximum engine speed and load are desirable. Avoid prolonged operation at minimum or maximum engine speeds and loads for the next four to five hours.
- During the break-in period, carefully observe the engine oil pressure and engine temperature.
- During the break-in period, check the engine oil and coolant levels frequently.

Protect the air cleaner and electric components from damage when you use steam or high-pressure water to clean the engine.

Never use high-pressure water or compressed air at greater than 28 PSI (193 kPa; 19686 mmAq) or a wire brush to clean the radiator fins. Radiator fins damage easily.

The tightening torque in the Standard Torque Chart in the Maintenance Section of this manual should be applied only to the bolts with a “7” head. (JIS strength classification: 7T).

- Apply 60 % torque to bolts that are not listed.
- Apply 80 % torque when tightened to aluminum alloy.

NOTICE

If any indicator fails to illuminate when the key switch (if equipped) is in the ON position, see your authorized YANMAR industrial engine dealer or distributor for service before operating the engine.

If no water drips when the fuel filter/water separator drain valve is opened, loosen the air vent screw (if equipped) on the top of the fuel filter/water separator by using a screwdriver to turn it counterclockwise 2 - 3 turns.

This may occur if the fuel filter/water separator is positioned higher than the fuel level in the fuel tank. After draining the fuel filter/water separator, be sure to tighten the air vent screw.

- When the engine is operated in dusty conditions, clean the air cleaner element more frequently.
- Never operate the engine with the air cleaner element(s) removed. This may allow foreign material to enter the engine and damage it.

Make it a habit to perform daily checks. Refer to P37 [Daily Checks].

Periodic maintenance prevents unexpected downtime, reduces the number of accidents due to poor machine performance and helps extend the life of the engine.

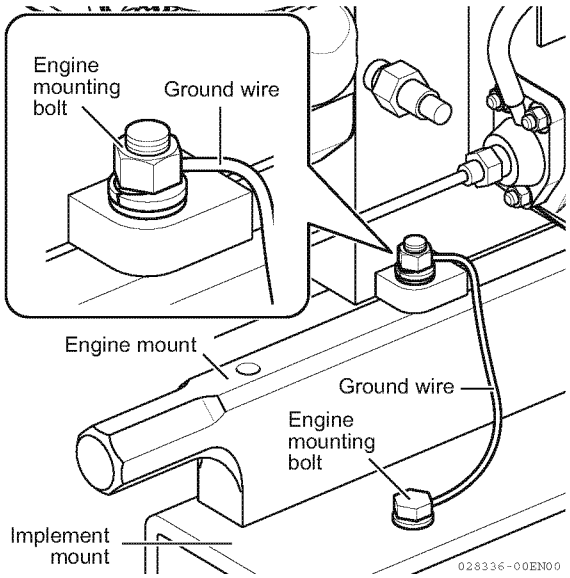
- Never attempt to modify the engine’s design or safety features such as defeating the engine speed limit control or the diesel fuel injection quantity control.
- Modifications may impair the engine’s safety and performance characteristics and shorten the engine’s life. Any alterations to this engine may void its warranty. Be sure to use YANMAR genuine replacement parts.

⚠ CAUTION

Ground Prevent Electrostatic Shock (Electric Shock)

- **When the engine mount (standard) is used as an engine bed, make sure to ground the engine body to the implement mount, or directly to the ground.**
- **If you do not ground the engine, electrostatic energy is charged in the engine body during operation. If you touch the engine, you will get electrostatic shock.**

- Connect the terminal of the ground wire to:
  - 1 engine mounting bolt, which attaches the engine body and the engine mount.
- Ground the other end to:
  - the implement mount, or
  - directly to the ground.
- Remove the paint completely from the parts in contact with the bearing surface of the ground terminal, such as:
  - the thread
  - top surface of the nut
- Use copper wire or its equivalent for the ground wire.



NOTICE

Lengthy operation is not possible on a wooden base.
Set the engine to the implement as follows:

1. Remove the wooden base.
2. Install the engine to a steel engine base.

PHOTO OF YANMAR DIESEL ENGINE

■ Model DI-L

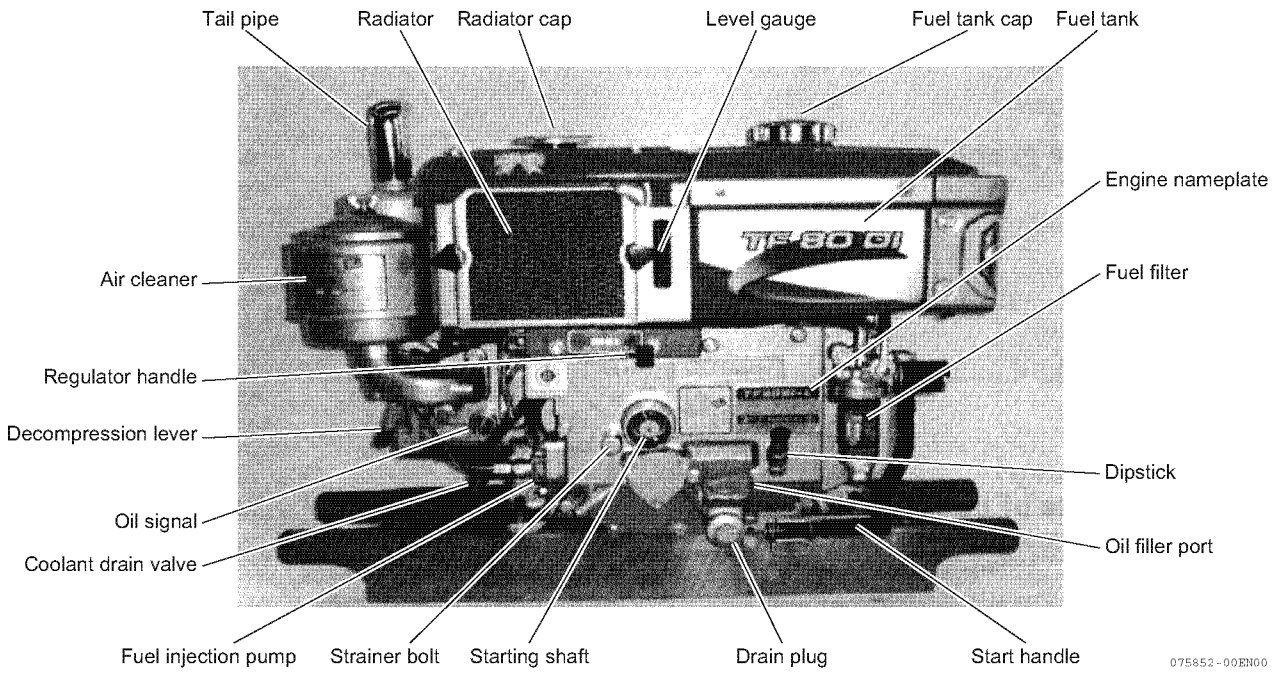


Figure 1

■ Model DI-H

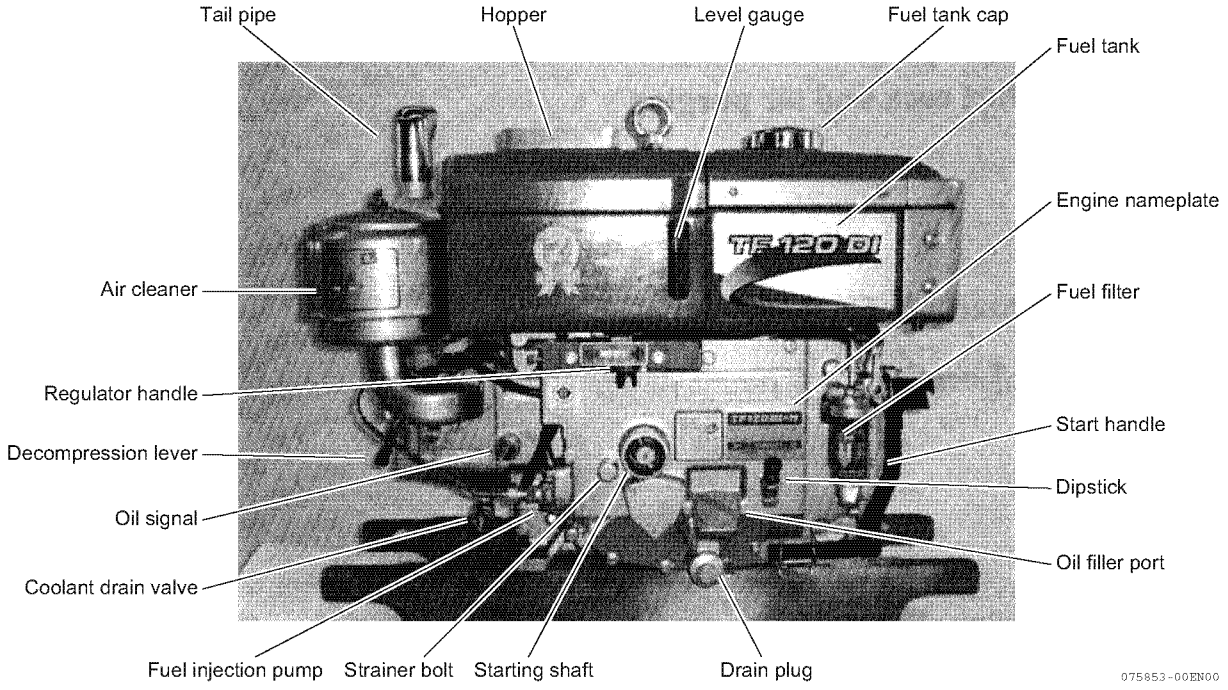


Figure 2

■ Model DI-Y

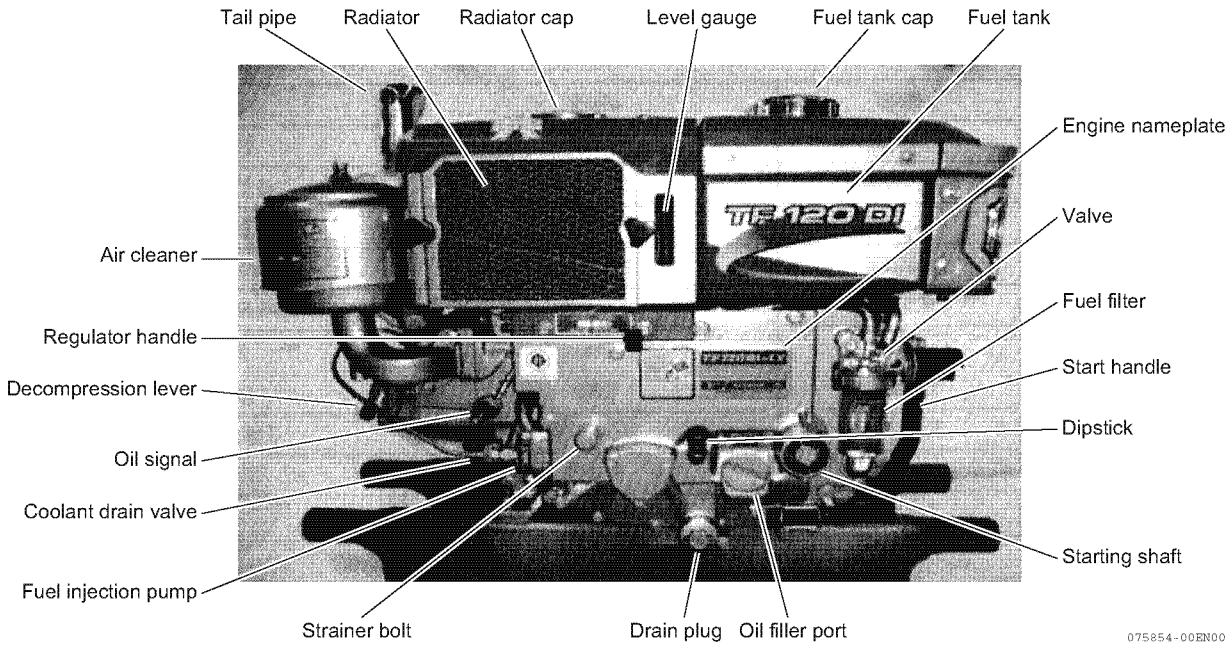


Figure 3

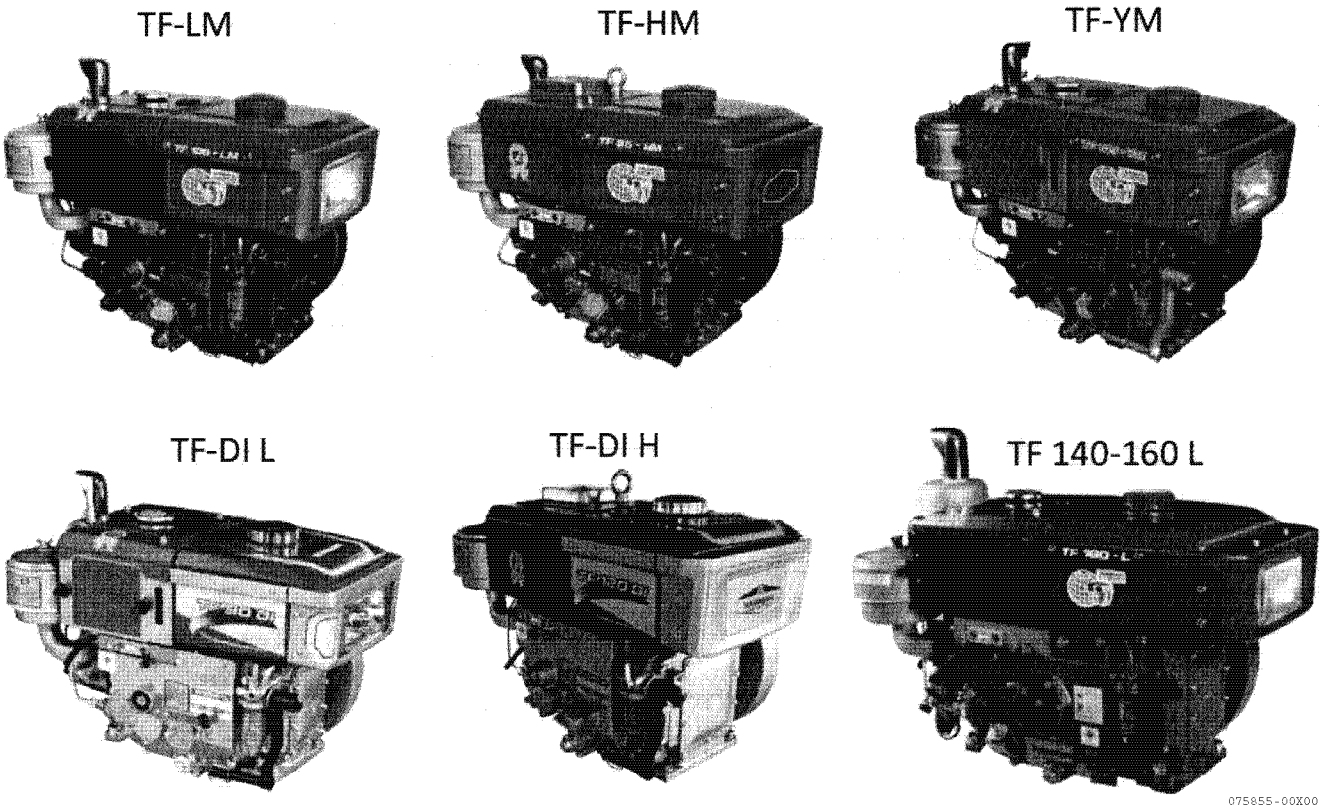


Figure 4

ENGINE SPECIFICATIONS

■ TF-M series

Model		Unit	TF-M series							
			TF85LM	TF85HM	TF105LM	TF105YM	TF105HM	TF115LM	TF115YM	TF115HM
			TF85LME	TF85HME	TF105LME	TF105YME	TF105HME	TF115LME	TF115YME	TF115HME
Type		–	Horizontal water-cooled 4-cycle diesel							
Combustion system		–	Special swirl chamber							
No. of cylinder		–	1							
Bore × Stroke		mm	85 × 87		88 × 96			92 × 96		
Displacement		Liter	0.493		0.583			0.638		
Continuous rating		HP/min^{-1}	7.5/2200		9.5/2400			9.8/2400		
		kW/min^{-1}	5.5/2200		7.0/2400			7.2/2400		
Maximum output		HP/min^{-1}	8.5/2200		10.5/2400			11.5/2400		
		kW/min^{-1}	6.3/2200		7.7/2400			8.5/2400		
Specific fuel consumption at continuous rating		g/HP-hr (g/kW-hr)	219 (298)		206 (280)			209 (284)		
Maximum torque		kgm/min^{-1}	3.10/1600		3.60/1800			3.90/1800		
Compression ratio		–	20.7		19.3			19.4		
Position of PTO		–	Flywheel side							
Direction of rotation		–	Counterclockwise (view from flywheel side)							
Fuel oil		–	Diesel oil							
Fuel injection pump		–	Bosch type							
Fuel injection timing (FID)		deg.	13							
Injection pressure		kgf/cm^2	120							
Valve clearance Int/Exh.		mm	0.20/0.20							
Fuel tank capacity		Liter	10.5		11.0					
Lubrication system		–	Complete enclosed forced lubricating system and trochoid pump with hydraulic pressure regulating valve							
Engine oil specifications		–	SAE 40 API CD/CF							
Air cleaner system		–	Wet type							
Starting motor		V-kW	12 - 1.2							
Lubrication oil capacity		Liter	2.2		2.8					
Cooling system		–	radiator	hopper	radiator	radiator	hopper	radiator	radiator	hopper
Cooling water capacity		Liter	1.6	9.4	2.09	2.09	11.8	2.09	2.09	11.8
Starting system		–	Manual and E: Electric							
Dimensions	Length	mm	676.5		704.0					
			E:706.5		E:737.0					
	Height	mm	504.0		524.0					
	Width	mm	339.5		352.5			355.5		
Dry weight	Manual	kg	93.0	89.5	106.5	103.5	106.5	107.5	105.5	107.5
	Electric		98.0	94.0	111.0	108.0	111.0	112.0	110.0	112.0
Recommended battery		V-Amp.	12-45		12-70					
Ref. YANMAR industrial standard			D-307200-E							

■ TF-DI series

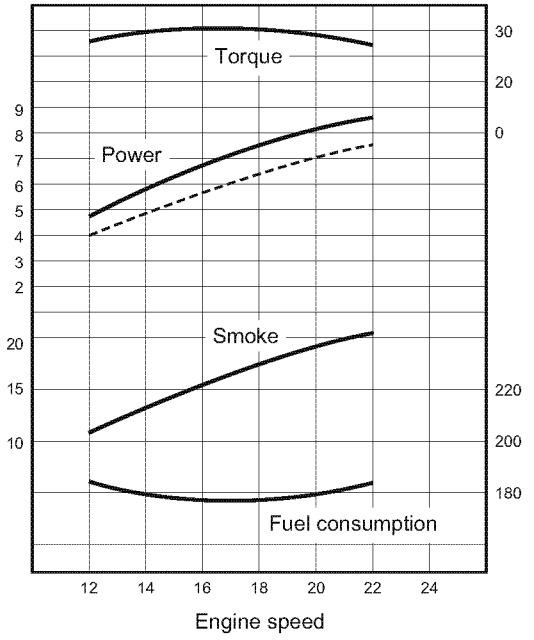
Model		Unit	TF-DI series							
			TF90DI-L	TF90DI-H	TF110DI-L	TF110DI-Y	TF110DI-H	TF120DI-L	TF120DI-Y	TF120DI-H
			TF90DI-LE	TF90DI-HE	TF110DI-LE	TF110DI-YE	TF110DI-HE	TF120DI-LE	TF120DI-YE	TF120DI-HE
Type		–	Horizontal water-cooled 4-cycle diesel							
Combustion system		–	Direct injection							
No. of cylinder		–	1							
Bore × Stroke		mm	85 × 87		88 × 96			92 × 96		
Displacement		Liter	0.493		0.583			0.638		
Continuous rating		HP/min^{-1}	8.0/2400		9.8/2400			10.5/2400		
		kW/min^{-1}	5.9/2400		7.2/2400			7.7/2400		
Maximum output		HP/min^{-1}	9.0/2400		11.0/2400			12.0/2400		
		kW/min^{-1}	6.6/2400		801/2400			8.8/2400		
Specific fuel consumption at continuous rating		g/HP-hr (g/kW-hr)	177 (240)		177 (240)			177 (240)		
Maximum torque		kgm/min^{-1}	3.5/1600		4.0/1700			4.7/1500		
Compression ratio		–	16.6		16.3			16.1		
Position of PTO		–	Flywheel side							
Direction of rotation		–	Counterclockwise (view from flywheel side)							
Fuel oil		–	Diesel oil							
Fuel injection pump		–	Bosch type							
Fuel injection timing		deg.	20		19					
Injection pressure		kgf/cm^2	200							
Valve clearance Int/Exh.		mm	0.20/0.20							
Fuel tank capacity		Liter	10.6		10.7					
Lubrication system		–	Complete enclosed forced lubricating system and trochoid pump with hydraulic pressure regulating valve							
Engine oil specifications		–	SAE 40 API CD/CF							
Air cleaner system		–	Wet type							
Starting motor		V-kW	12 - 1.2							
Lubrication oil capacity		Liter	2.2		2.8					
Cooling system		–	radiator	hopper	radiator	radiator	hopper	radiator	radiator	hopper
Cooling water capacity		Liter	1.6	9.4	2.09	2.09	11.8	2.09	2.09	11.8
Starting system		–	Manual and E: Electric							
Dimensions	Length	mm	676.5		704.0					
			E:706.5		E:737.0					
	Height	mm	524.0		549.0					
	Width	mm	339.5		355.5					
Dry weight	Manual	kg	88.5	85.0	104.5	104.5	101.5	105.5	105.5	102.5
	Electric		93.0	89.5	109.0	109.0	106.0	110.0	110.0	107.0
Recommended battery		V-Amp.	12-45		12-70					
Ref. YANMAR industrial standard			D-307300-E							

Model		Unit	TF-DI series				
			TF140-L	TF140-H	TF150DI-YB	TF160-L	TF160-H
			TF140-LE	TF140-HE	TF150DI-YEB	TF160-LE	TF160-HE
Type		–	Horizontal water-cooled 4-cycle diesel				
Combustion system		–	Direct injection				
No. of cylinder		–	1				
Bore × Stroke		mm	96 × 105		96 × 99	102 × 105	
Displacement		Liter	0.760		0.716	0.857	
Continuous rating		HP/min^{-1}	12.5/2400		13.0/2400	14.0/2400	
		kW/min^{-1}	9.2/2400		9.56/2400	10.3/2400	
Maximum output		HP/min^{-1}	14.0/2400		15.0/2400	16.0/2400	
		kW/min^{-1}	10.3/2400		11.03/2400	11.8/2400	
Specific fuel consumption at continuous rating		g/HP-hr (g/kW-hr)	182 (248)		177 (240)	182 (248)	
Maximum torque		kgm/min^{-1}	4.7/1800		5.2/1400	5.6/1800	
Compression ratio		–	17.7		16.1	17.8	
Position of PTO		–	Flywheel side				
Direction of rotation		–	Counterclockwise (view from flywheel side)				
Fuel oil		–	Diesel oil				
Fuel injection pump		–	Bosch type				
Fuel injection timing		deg.	17		19	17	
Injection pressure		kgf/cm^2	200		220	200	
Valve clearance Int/Exh.		mm	0.20/0.20				
Fuel tank capacity		Liter	14.3				
Lubrication system		–	Complete enclosed forced lubricating system and trochoid pump with hydraulic pressure regulating valve				
Engine oil specifications		–	SAE 40 API CD/CF				
Air cleaner system		–	Wet type				
Starting motor		V-kW	12 - 1.2				
Lubrication oil capacity		Liter	3.0		2.8	3.0	
Cooling system		–	radiator	hopper	radiator	radiator	hopper
Cooling water capacity		Liter	3.0	13.0	2.32	3.0	13.0
Starting system		–	Manual and E: Electric				
Dimensions	Length	mm	826.0		822.5	826.0	
			E:866.0		E:822.5	E:866.0	
	Height	mm	639.0		566.0	639.0	
	Width	mm	384.0		360.0	384.0	
Dry Weight	Manual	kg	145.0	140.0	119.0	145.0	140.0
	Electric		149.5	144.5	123.5	149.5	144.5
Recommended battery		V-Amp.	12-100		12-70	12-100	
Ref. YANMAR industrial standard			D-304304-E		D-307800-E	D304304-E	

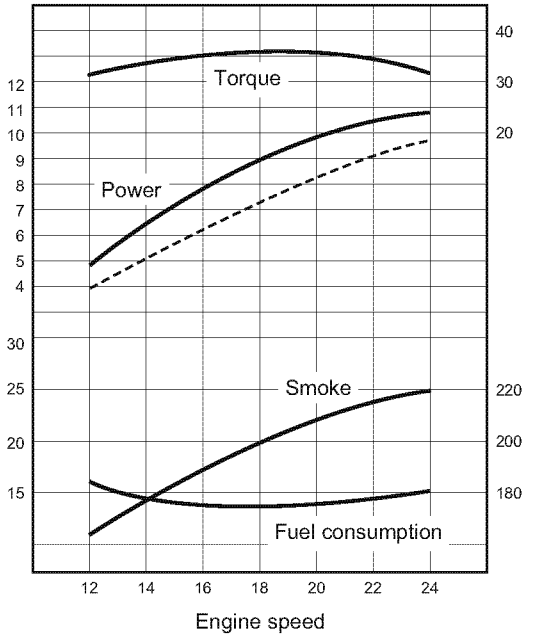
Engine Performance Graph

■ TF-M series

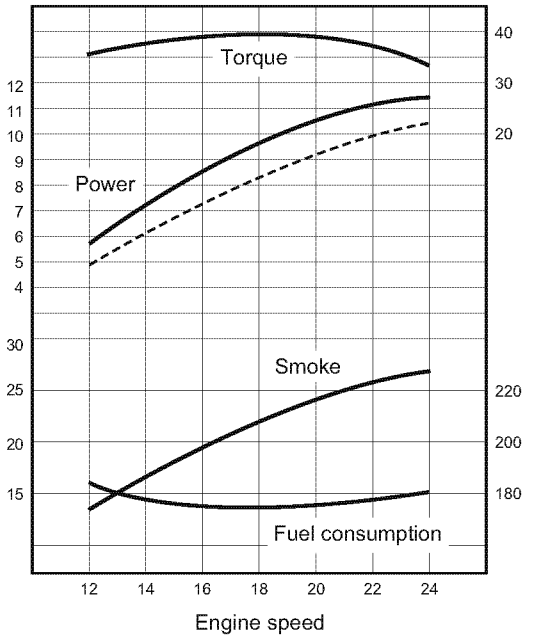
TF85M



TF105M

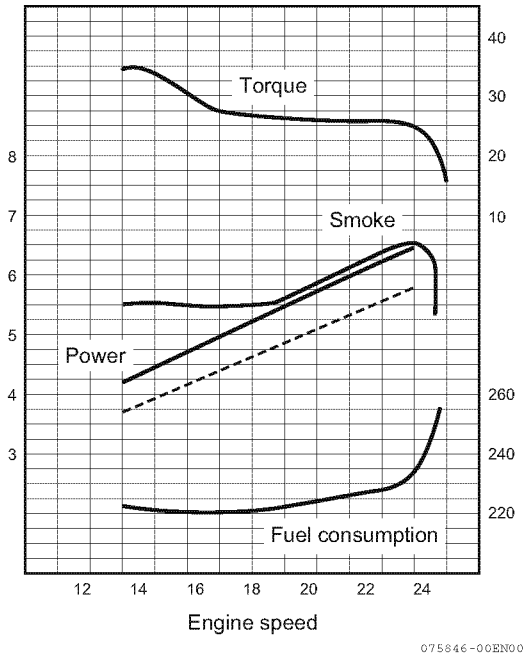


TF115M

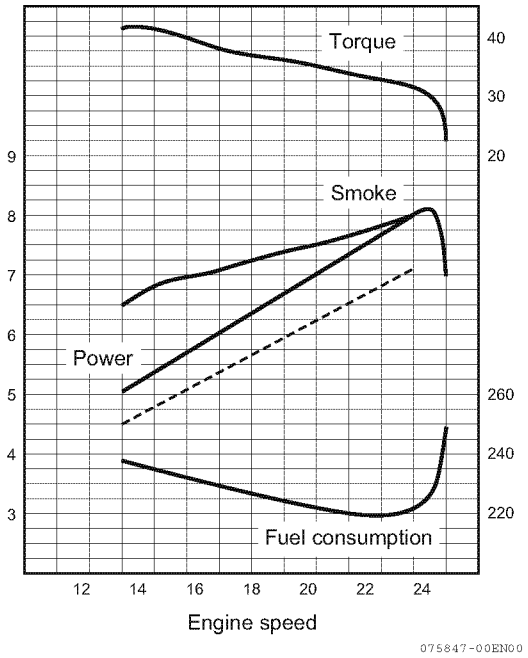


■ TF-DI series

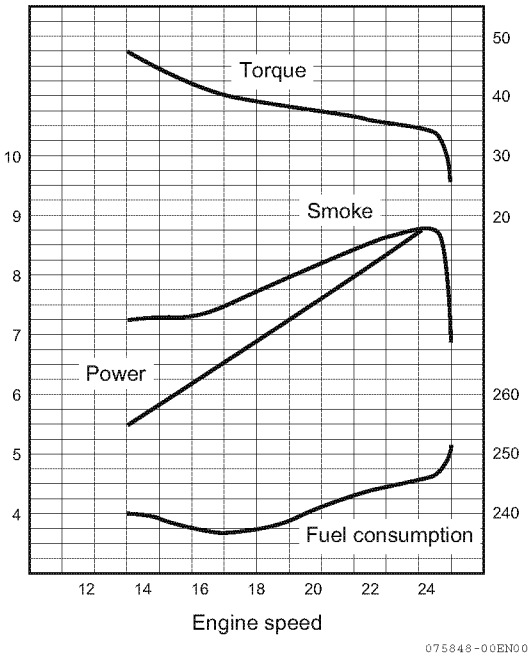
TF90DI



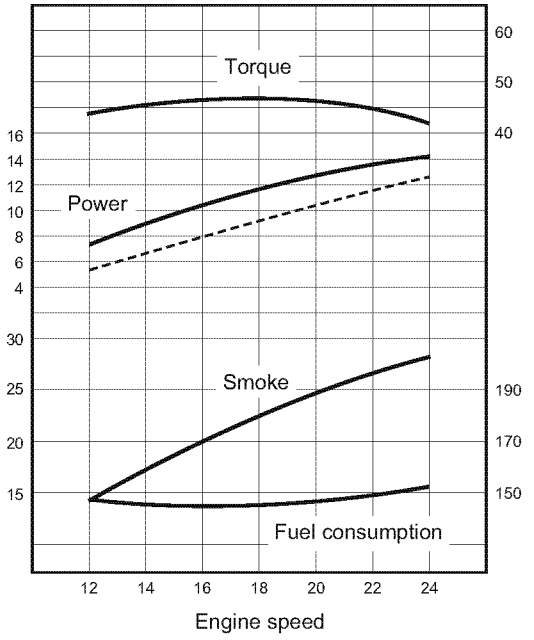
TF110DI



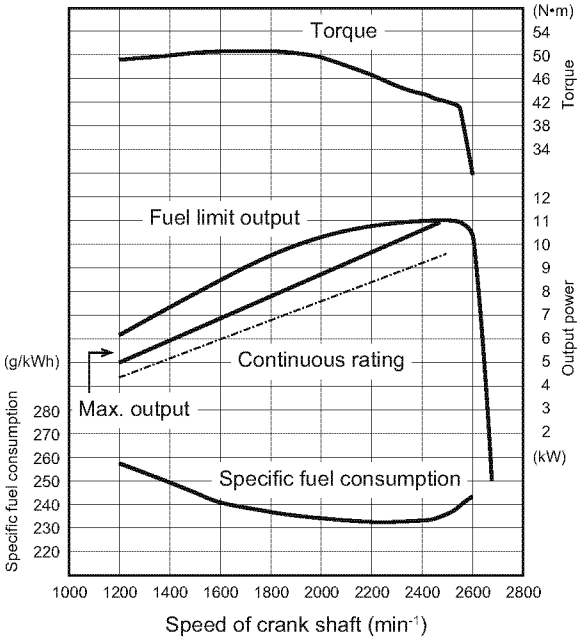
TF120DI



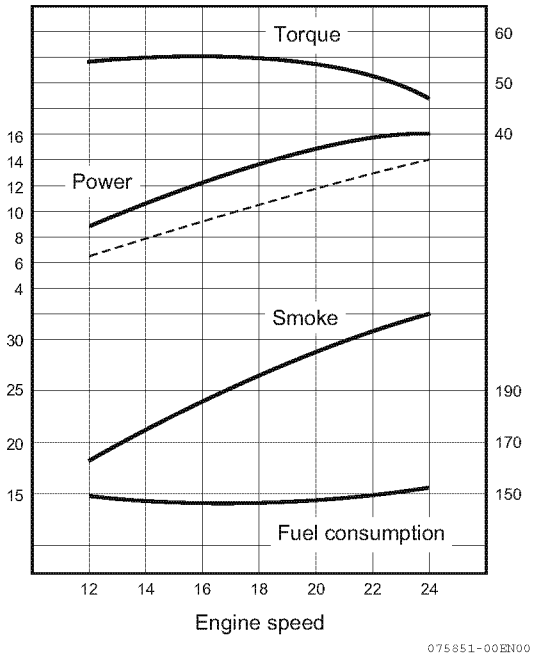
TF140DI



TF150DI



TF160DI



Appearance and Component Identification

■ Operation side

The important device operation and serviceable parts are on the operation side.

Radiator type

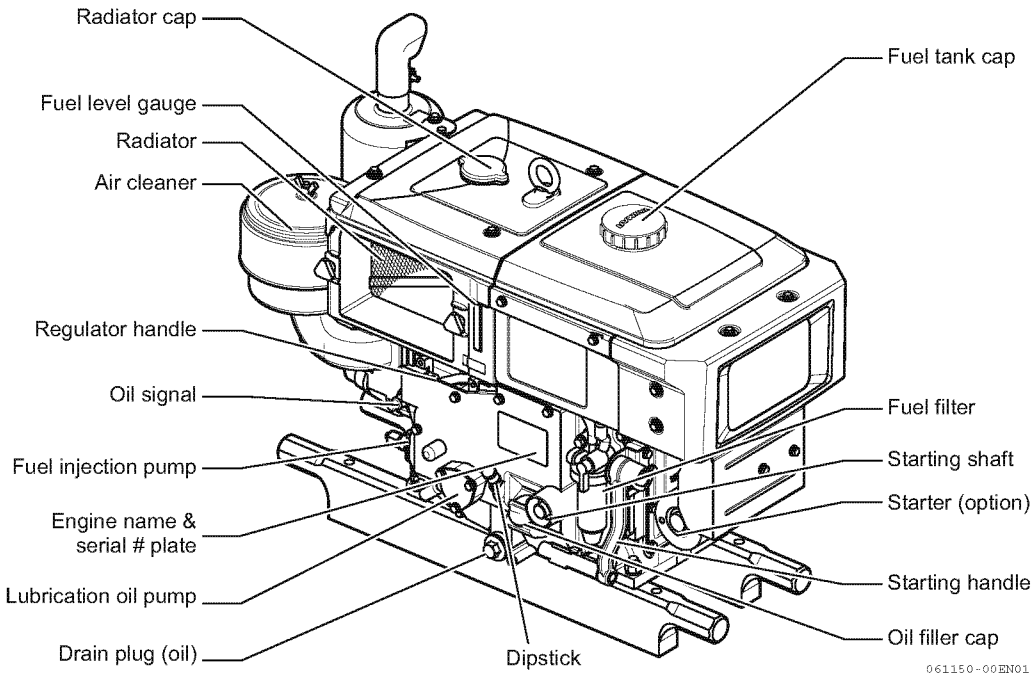


Figure 5

Hopper type

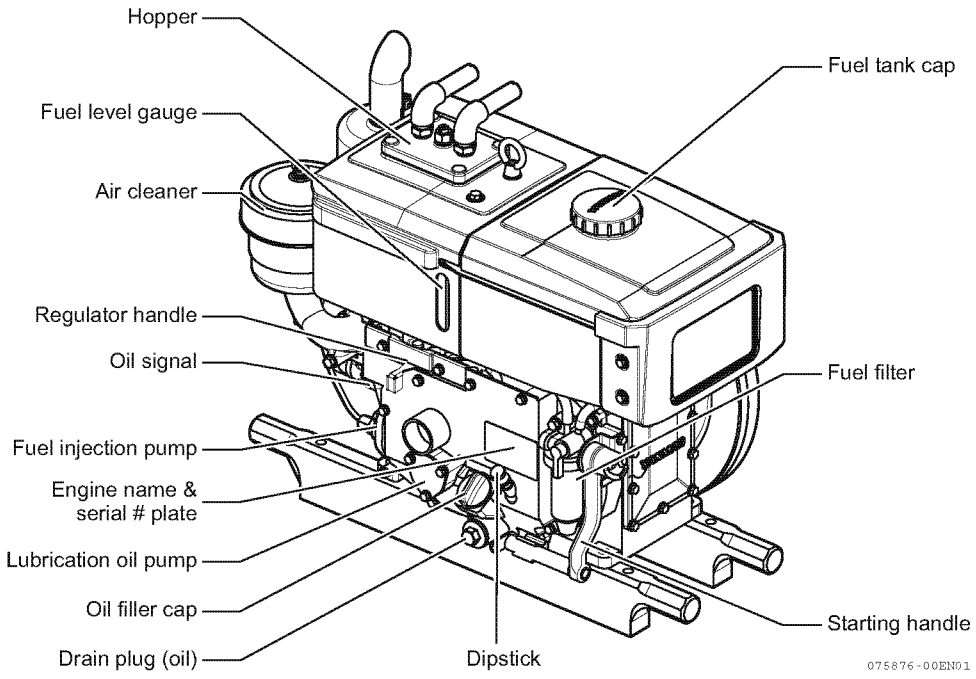


Figure 6

■ Non-operation side

Flywheel PTO side

Radiator type

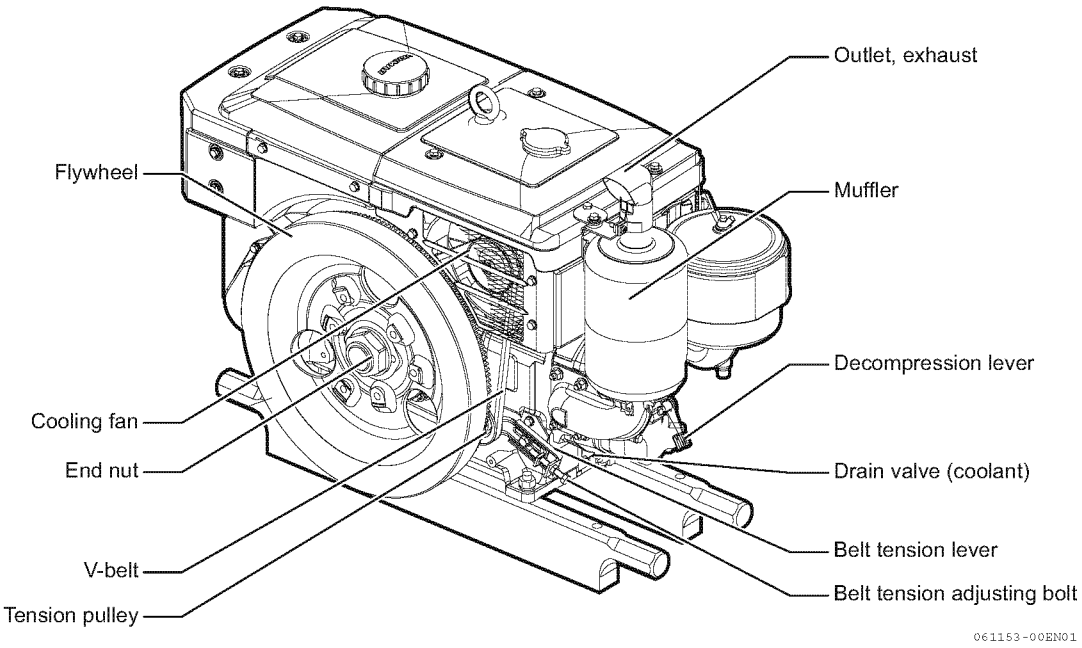


Figure 7

Hopper type

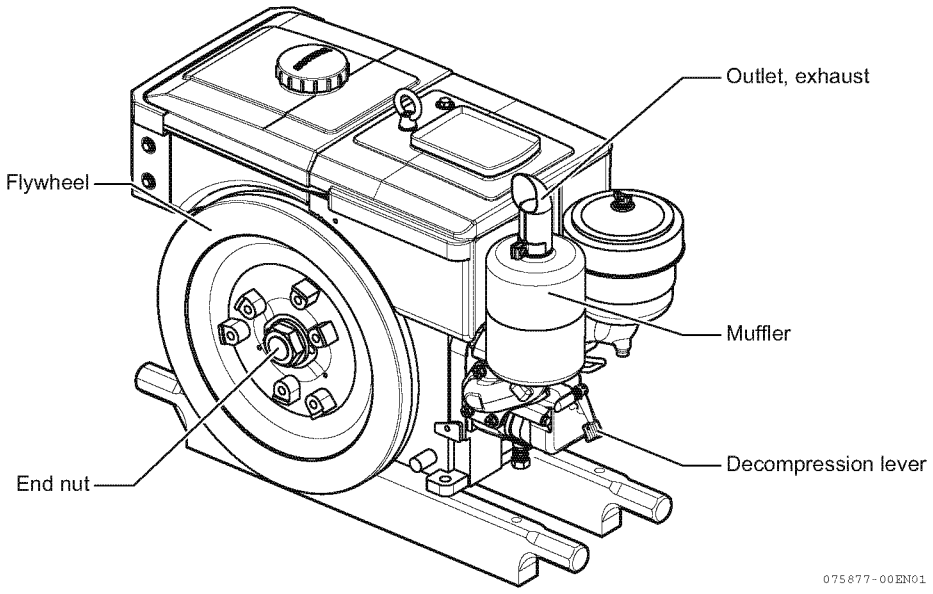


Figure 8

PRODUCT DESCRIPTION

Important Operation and Serviceable Parts

System	Function
Fuel tank	There is a filter mesh in the fuel supply port and a drain plug in the bottom.
Fuel filter	The fuel filter is supplied with the on-off valve. The separation of fuel and water and contamination levels are easily visible through the transparent cup. Periodic replacement of the inner filter paper element is necessary.
Oil filler port	This is the inlet for engine oil.
Dipstick	This is the gauge bar for measuring the oil level of the engine.
Drain plug (engine oil filter)	There is an engine oil filter mesh in the drain plug. When you change the oil: • Remove the filter mesh • Clean the filter mesh
Radiator fan Radiator cap Reserve tank Rubber hose	The radiator is a heat exchanger that contains cooling water. It is cooled by cold air from the blower (exhaust type) operated by a belt. The radiator cap is a cover for the filler port supplied with 2 pressure regulating valves (release valve and retraction valve). There is a reserve tank, which operates as an expansion tank, adjacent to the radiator, though it cannot be seen externally. The radiator and the reserve tank are connected by a rubber hose. When the load increases: • The cooling water temperature increases • The radiator pressure increases • The release valve cap opens • Water vapor and hot water are released to the reserve tank to resolve to cool When the load becomes small: • The cooling water temperature decreases • The radiator pressure becomes negative • The retraction valve opens • Cooling water in the reserve tank is returned to the radiator This decreases the consumption of cooling water.
Air cleaner	The air cooler prevents Intrusion by contaminants. It decreases noise at the air inlet. Periodic maintenance (cleaning) of the inner element (and oil) is necessary.
Fan dynamo (if equipped)	The fan dynamo is a small alternating current generator installed in the radiator fan.
Starter (if equipped)	The starter is a direct current motor for electric starting.

Operation Control Devices

■ Oil pressure indication by oil signal

There is an oil signal on the operation side. The oil signal responds to the engine oil pressure as follows:

Red: Low oil pressure or stopped condition.

Blue: Oil pressure at correct operation level. When the color of the oil signal does not change from red to blue after start or during operation:

- Immediately stop the engine
- Examine the engine oil level

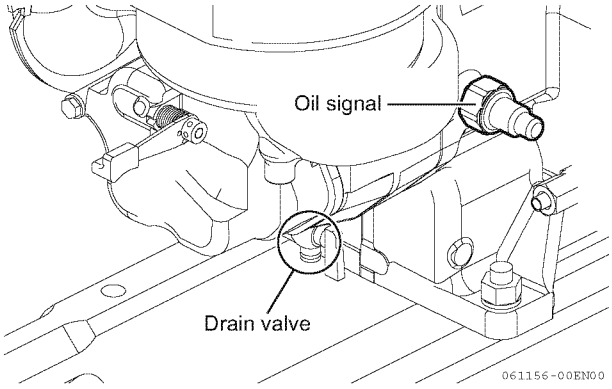


Figure 9

■ Governing and stopping devices

Regulator handle

The regulator handle on the operation side governs the speed and stops the engine.

Align the handle to the START, RUN, and STOP position on the nameplate to operate. The limit screw limits position of maximum speed of the regulator handle.

Do not loosen or remove the limit screw or the nut for the regulator handle. If you loosen or remove them, it can reduce safety or cause shorter engine life. (The limit screw is stamped because of the regulations.)

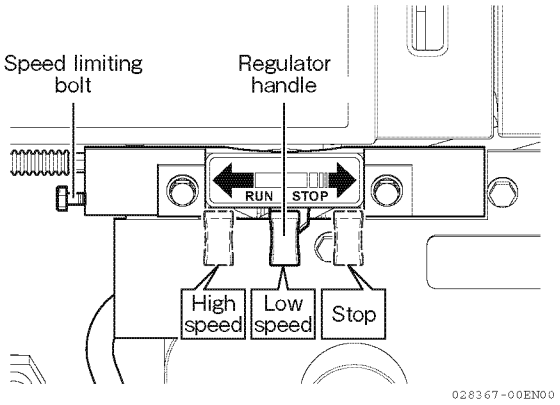


Figure 10

Remote control
(remote control wire operation)

When you operate the engine by remote control with the speed control device (accelerator handle and pedal) located in the control area of the equipment side of the engine:

- Make sure that the regulator handle moves freely as shown below.
- Connect the accelerator wire.

1. Loosen the regulator handle cover mounting bolts to remove the cover.
2. Loosen the nut for the handle fulcrum bolt to make the handle move through.
3. Put the accelerator wire through the adjusting screw. Put its point into the wire mounting bracket.
4. Put the speed control device and the handle in the STOP position.
   Tighten the wire mounting bracket screw.
5. Operate the speed control device to examine for misalignment on the handle side.
   Adjust with the adjustment screw.
6. Install the regulator handle cover.

Follow the instructions provided with the remote control for the operation of remote control device.

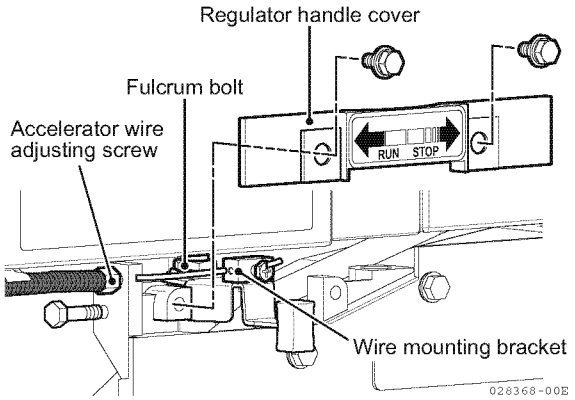


Figure 11

How to Use a PTO

The PTO of this engine is mainly operated by installation of a V-pulley to flywheel and driven machinery by V-belt. A more detailed description is as follows.

■ Choose a pulley

It is important to select the correct pulley in order to get full performance from your engine/machinery and achieve efficient operation.

Pulley diameter

Use the formula below to calculate the pulley diameter for engine and machinery.

Here,

Engine side pulley diameter (mm)	:D1
Engine rated speed (min^{-1})	:N1
Machinery side pulley diameter (mm)	:D2
Machinery rated speed (min^{-1})	:N2

- When the engine side pulley is already determined.

  Machinery side pulley diameter $D2 = \frac{D1 \times N1}{N2}$

- When the machinery side pulley is already determined.

  Engine side pulley diameter $D1 = \frac{D2 \times N2}{N1}$

Pulley shape

Use YANMAR standard parts for the engine side pulley.

When you use a special pulley:

- The mounting dimension must match the shape of flywheel.
- The position of the belt outer groove must be in the range of the figure on the right.
  For implement side pulley, choose the one that aligns the belt groove position of engine side pulley.
  For V-belts, use 2 or less type A or type B belts.

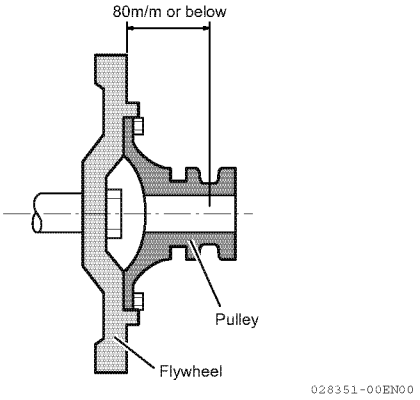


Figure 12

V-belt tension

Adjust the tension of the V-belt:

- Press the middle of the belt (in a location that is not in contact with the pulley) with your finger.
- Align the deflection dimension according to the formula on the right.

  Here,

  Belt span : L (mm)
  Belt deflection dimension : A (mm)

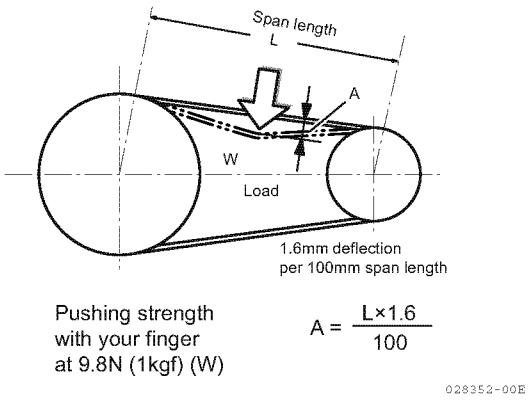


Figure 13

BEFORE YOU OPERATE

Diesel Fuel

Diesel fuel specifications

Diesel fuel should comply with the following specifications.

Diesel fuel specification	Location
ISO 8217 DMX	International
JIS K2204 Grade No. 2	Japan

■ Additional technical fuel requirements

- The fuel cetane number should be equal to 45 or higher.
- The sulfur content must not exceed 0.5 % by volume. Less than 0.05 % is preferred.
  A higher sulfur content fuel may cause sulfuric acid corrosion in the cylinders of the engines.
- Bio-diesel fuels
  See P29 [Bio-diesel fuels].
- Never mix kerosene, used engine oil, or residual fuels with the diesel fuel.
- Water and sediment in the fuel should not exceed 0.05 % by volume.
- Keep the fuel tank and fuel-handling equipment clean at all times.
- Poor quality fuel can reduce engine performance and/or cause engine damage.
- Fuel additives are not recommended. Some fuel additives may cause poor engine performance.
  Consult your YANMAR representative for more information.

■ Bio-diesel fuels

In Europe and in the United States, as well as some other countries, non-mineral oil based fuel resources such as RME (Rapeseed Methyl Ester) and SOME (Soybean Methyl Ester), collectively known as FAME (Fatty Acid Methyl Esters), are being used as extenders for mineral oil derived diesel fuels.

YANMAR approves the use of bio-diesel fuels that do not exceed a blend of 7 % (by volume) of FAME with 93 % (by volume) of approved mineral oil derived diesel fuel. Such bio-diesel fuels are known in the marketplace as B7 diesel fuels.

These B7 diesel fuels must meet certain requirements.

- The bio-fuels must meet the minimum specifications for the country in which they are used.
  - In Europe, bio-diesel fuels must comply with the European Standard for both EN14214 and EN590 (for Oxidation stability).
  - In the United States, bio-diesel fuels must comply with the American Standard for both ASTM D-6751 and ASTM D-7467 (for Oxidation stability).
- Bio-fuels should be purchased only from recognized and authorized diesel fuel suppliers.

Precautions and concerns regarding the use of bio-fuels:

- Free methanol in FAME may result in corrosion of aluminum and zinc FIE components.
- Free water in FAME may result in plugging of fuel filters and increased bacterial growth.
- High viscosity at low temperatures may result in fuel delivery problems, supply pump seizures, and poor injector spray atomization.
- FAME may have adverse effects on some elastomers (seal materials) and may result in fuel leakage and dilution of the engine lubricating oil.
- Even bio-diesel fuels that comply with a suitable standard as delivered, will require additional care and attention to maintain the quality of the fuel in the equipment or other fuel tanks. It is important to maintain a supply of clean, fresh fuel. Regular flushing of the fuel system, and/or fuel storage containers, may be necessary.
- Use bio-diesel fuel within 2 months after filling it to the fuel tank, or within 3 months after its production at the manufacturer.
  The use of bio-diesel fuels that do not comply with the standards as agreed to by the diesel engine manufacturers and the diesel fuel injection equipment manufacturers, or bio-diesel fuels that have degraded as per the precautions and concerns above, may affect the warranty coverage of your engine. For details, refer to P2 [YANMAR Limited Warranty].

■ Filling the fuel tank

⚠ DANGER

Fire and Explosion Hazard!

- **Diesel fuel is flammable and explosive under certain conditions.**
- **Only fill the fuel tank with diesel fuel. Filling the fuel tank with gasoline may result in a fire and will damage the engine.**
- **Never refuel with the engine running.**
- **Wipe up all spills immediately.**
- **Keep sparks, open flames or any other form of ignition (match, cigarette, static electric source) well away when refueling.**
- **Never overfill the fuel tank.**
- **Fill the fuel tank. Store any containers containing fuel in a well-ventilated area, away from any combustibles or sources of ignition.**
- **Be sure to place the diesel fuel container on the ground when transferring the diesel fuel from the pump to the container. Hold the hose nozzle firmly against the side of the container while filling it. This prevents static electricity buildup which could cause sparks and ignite fuel vapors.**
- **Never place diesel fuel or other flammable material such as oil, hay or dried grass close to the engine during engine operation or shortly after shutdown.**
- **Before you operate the engine, check for fuel leaks. Replace rubberized fuel hoses every two years or every 2000 hours of engine operation, whichever comes first, even if the engine has been out of service. Rubberized fuel lines tend to dry out and become brittle after two years or 2000 hours of engine operation, whichever comes first.**
- **Failure to comply will result in death or serious injury.**

NOTICE

- Only use diesel fuels recommended by YANMAR for the best engine performance, to prevent engine damage and to comply with local government warranty requirements.
- Only use clean diesel fuel.
- Never remove the primary strainer from the fuel tank filler port. If removed, dirt and debris could get into the fuel system causing it to clog.

Note that a typical fuel tank is shown. The fuel tank on your equipment may be different.

1. Clean the area around the fuel cap (1, **Figure 14**).
2. Remove the fuel cap from the fuel tank (2, **Figure 14**).
3. Observe the fuel level sight gauge (3, **Figure 14**) and stop filling when gauge shows fuel tank is full. Never overfill the fuel tank.
4. Replace the fuel cap (**1, Figure 14**), hand tighten. Over tightening the fuel cap will damage it.

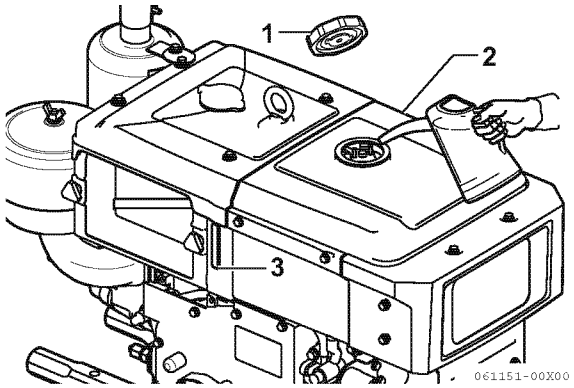


Figure 14

■ Priming the fuel system

⚠ DANGER

Fire and Explosion Hazard!

- **Diesel fuel is flammable and explosive under certain conditions.**
- **Failure to comply will result in death or serious injury.**

The fuel system needs to be primed under certain conditions:

- Before starting the engine for the first time.
- After running out of fuel and fuel has been added to the fuel tank.
- After fuel system maintenance such as changing the fuel filter and draining the fuel filter/water separator, or replacing a fuel system component.

1. Turn the on-off valve to the “AIR” position for 10 to 15 seconds to prime the fuel system.

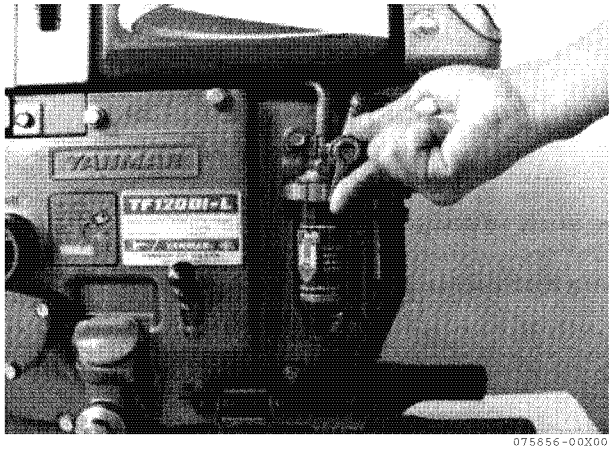


Figure 15

When the lever is released the valve automatically returns to the operation position.

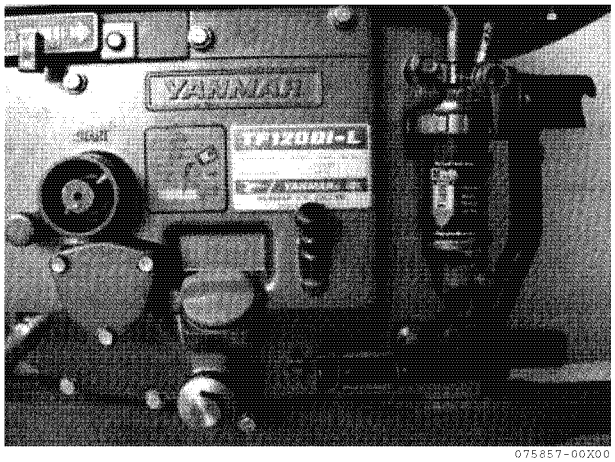


Figure 16

2. Never use the starter motor (if equipped) to crank the engine in order to prime the fuel system. This may cause the starter motor to overheat and damage the coils, pinion and/or ring gear.

Engine Oil

NOTICE

- Only use the engine oil specified. Other engine oils may affect warranty coverage, cause internal engine components to seize and/or shorten engine life.
- Prevent dirt and debris from contaminating the engine oil. Carefully clean the oil cap/dipstick and the surrounding area before you remove the cap.
- Never mix different types of engine oil. This may adversely affect the lubricating properties of the engine oil.
- Never overfill. Overfilling may result in white exhaust smoke, engine overspeed or internal damage.

■ Engine oil specifications

Use an engine oil that meets or exceeds the following guidelines and classifications:

■ Service categories

- API service categories CD or higher
- ACEA service categories E-3, E-4 and E-5
- JASO service category DH-1

■ Definitions

- API Classification (American Petroleum Institute)
- ACEA Classification (Association des Constructeurs Europeens d'Automobilies)
- JASO (Japanese Automobile Standards Organization)

NOTICE

- Be sure the engine oil, engine oil storage containers, and engine oil filling equipment are free of sediments and water.
- Change the engine oil after the first 20 hours of operation and then at every 100 hours thereafter.
- Select the oil viscosity based on the ambient temperature where the engine is being operated. See the SAE service grade viscosity chart (**Figure 17**).
- YANMAR does not recommend the use of engine oil "additives".

■ Additional technical engine oil requirements:

The engine oil must be changed when the Total Base Number (TBN) has been reduced to 1.0 mgKOH/g. TBN (mgKOH/g) test method; JIS K-201-5.2-2 (HCl), ASTM D4739 (HCl).

■ Engine oil viscosity

Select the appropriate engine oil viscosity based on the ambient temperature and use the SAE service grade viscosity chart in **Figure 17**.

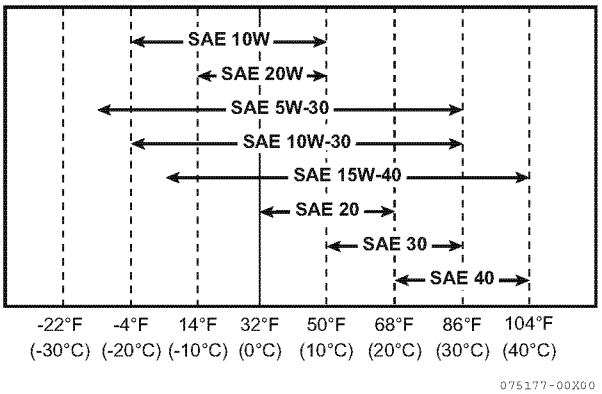


Figure 17

■ Checking engine oil

1. Make sure engine is level.
2. Remove dipstick (1, **Figure 18**) and wipe with clean cloth.
3. Fully reinsert dipstick.
4. Remove dipstick. The oil level should be between upper (2, **Figure 18**) and lower (3, **Figure 18**) lines on the dipstick.
5. Fully reinsert dipstick.

■ Adding engine oil

1. Make sure engine is level.
2. Remove oil cap (4, **Figure 18**).
3. Add indicated amount of engine oil at the top or side engine oil filler port (5, **Figure 18**).
4. Wait three minutes and check oil level.
5. Add more oil if necessary.
6. Reinstall oil cap (4, **Figure 18**) and hand-tighten. Over-tightening may damage the cap.

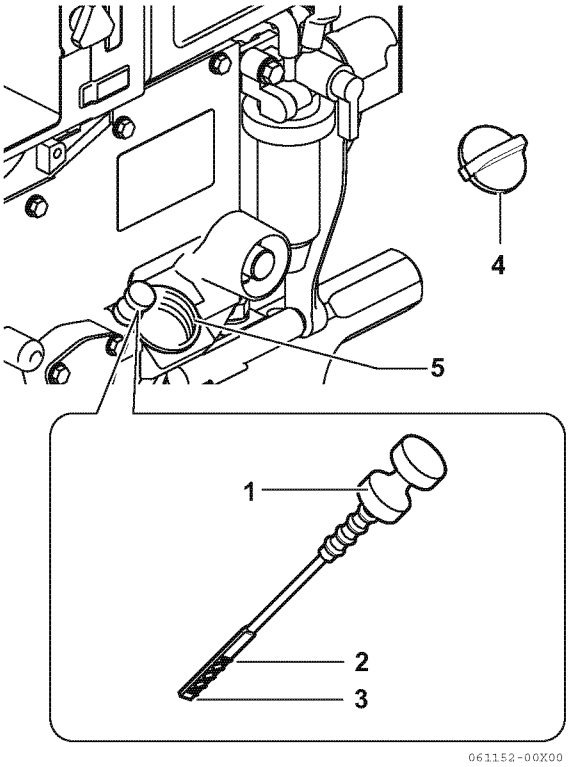


Figure 18

Genuine oil trade name	Viscosity number	Capacity/part code number		
		4 L	20 L	200 L
Super Oil Deluxe	10W-30	YS301100	YS301010	YS301020
Super Royal Oil	10W-30	YS302100	YS302105	YS302010
	15W-40	YS302015	YS302020	YS302025

Engine Coolant

⚠ DANGER

Scald Hazard!

- **Never remove the radiator cap if the engine is hot. Steam and hot engine coolant will spurt out and seriously burn you. Allow the engine to cool down before you attempt to remove the radiator cap.**
- **Tighten the radiator cap securely after you check the radiator. Steam can spurt out during engine operation if the cap is loose.**
- **Always check the level of the engine coolant by observing the reserve tank.**
- **Failure to comply will result in death or serious injury.**

⚠ WARNING

Burn Hazard!

- **Wait until the engine cools before you drain the engine coolant. Hot engine coolant may splash and burn you.**
- **Failure to comply could result in death or serious injury.**

NOTICE

- Only use the engine coolant specified. Other engine coolants may affect warranty coverage, cause an internal buildup of rust and scale and/or shorten engine life.
- Prevent dirt and debris from contaminating the engine coolant. Carefully clean the radiator cap and the surrounding area before you remove the cap.
- Never mix different types of engine coolants. This may adversely affect the properties of the engine coolant.

■ Engine coolant specifications

Use a Long Life Coolant (LLC) or an Extended Life Coolant (ELC) that meets or exceeds the following guidelines and specifications.

■ Alternative engine coolant

If an Extended or Long Life Coolant is not available, alternatively, you may use an ethylene glycol or propylene glycol based conventional coolant.

NOTICE

- Always use a mix of coolant and water. Never use water only.
- Mix coolant and water per the mixing instructions on the coolant container.
- Water quality is important to coolant performance. YANMAR recommends that soft, distilled or demineralized water be used to mix with coolants.
- Never mix extended or long life coolants and conventional (green) coolants.
- Never mix different types and/or colors of extended life coolants.
- Replace the coolant every 1000 engine hours or once a year.

■ Additional technical coolant specifications:

- ASTM D6210, D4985 (US)
- JIS K-2234 (Japan)
- SAE J814C, J1941, J1034 or J2036 (International)

■ Filling radiator with engine coolant

Fill the radiator and reserve tank as follows. This procedure is for filling the radiator for the first time or refilling it after it is flushed.

1. Check to be sure the radiator drain plug is installed and tightened or the drain valve (1, **Figure 19**) is closed.

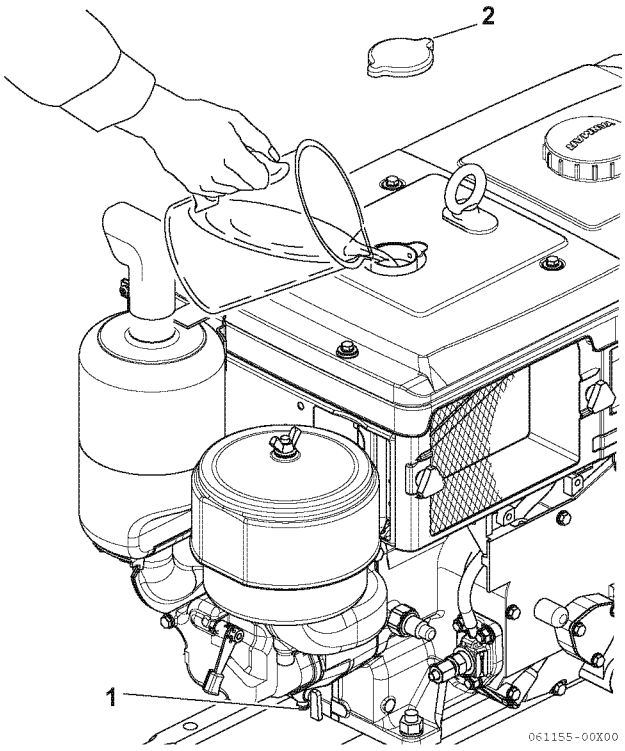


Figure 19

2. Remove the radiator cap (2, **Figure 19**) by turning it counterclockwise about 1/3 of a turn.
3. Pour the engine coolant slowly into the radiator until it is even with the lip of the engine coolant filler port. Make sure that air bubbles do not develop as you fill the radiator.
4. Reinstall the radiator cap (2, **Figure 19**). Align the tabs on the back side of the radiator cap with the notches on the engine coolant filler port. Press down and turn the cap clockwise about 1/3 of a turn.
5. Run the engine until it reaches operating temperature. Check the level of engine coolant in the radiator after engine shutting down and cooling down the coolant. If the coolant is not full, add the coolant into the radiator until it is even with the lip of the coolant filler port again.

■ Filling hopper with engine coolant

1. Check to be sure the drain valve is closed.
2. Fresh cooling water should be filled up to the bottom of the dust-guard net.
3. Run the engine until it reaches operating temperature. Check the level of engine coolant and add additional engine coolant if necessary.

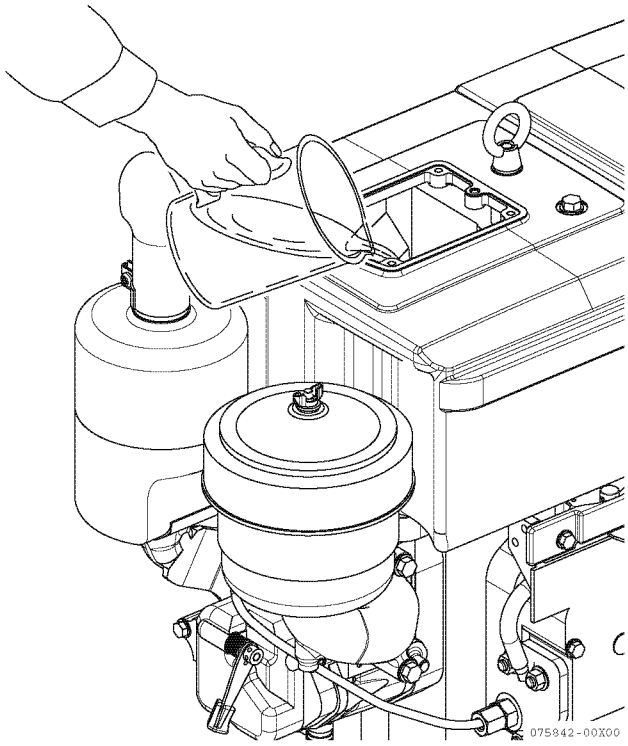


Figure 20

■ Daily check of the cooling system

1. Check the level of engine coolant in the radiator/hopper.
2. Add additional engine coolant into the radiator/hopper if necessary.

For Radiator system

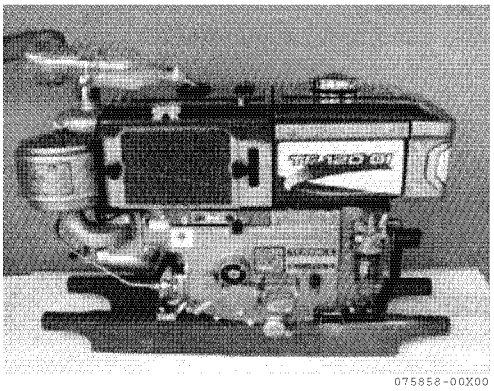


Figure 21

For Hopper system

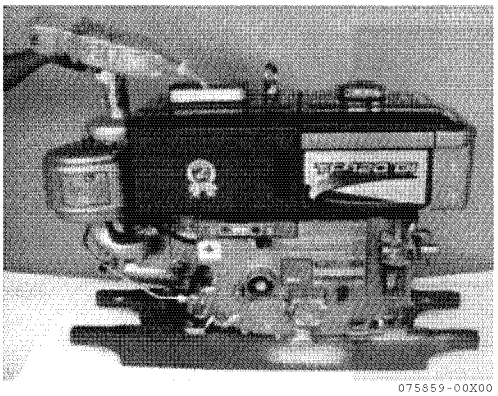


Figure 22

Trade name	Capacity	Part code number	Remarks
YANMAR antifreeze fluid Royal Freeze	1 L	YS340278	Long Life Coolant You must use coolant at a mixture percentage in the range between 30 % and 55 %. It must be in accordance with the minimum temperature during cold weather.
	2 L	YS340238	
	4 L	YS340208	
	18 L	YS340240	

Daily Checks

Before you begin any job, make sure the YANMAR TF engine is in good operating condition. Make sure you check the following items before you start your shift and have any repairs completed before you start work.

⚠ DANGER

- **Do not remove the radiator cap while the engine is hot during operation and immediately after you stop the engine. Hot water or steam can spurt out, and it is dangerous. When the engine becomes cool, wrap the radiator cap with cloth and slowly loosen it. Correctly tighten the radiator cap after you examine the radiator.**

⚠ WARNING

High-pressure Hazard!

- **Avoid skin contact with the high-pressure diesel fuel spray caused by a fuel system leak such as a broken fuel injection line. High-pressure fuel can penetrate your skin and result in serious injury. If you are exposed to high-pressure fuel spray, obtain prompt medical treatment.**
- **Never check for a fuel leak with your hands. Always use a piece of wood or cardboard. Have your authorized YANMAR industrial engine dealer or distributor repair the damage.**
- **Failure to comply could result in death or serious injury.**

NOTICE

Make it a habit to perform daily checks.

Periodic maintenance prevents unexpected downtime, reduces the number of accidents due to poor machine performance and helps extend the life of the engine.

■ Visual checks

- Check for engine oil leaks.
- Check for fuel leaks.
- Check for engine coolant leaks.
- Check for damaged or missing parts.
- Check for loose, missing or damaged fasteners.
- Check the electrical harnesses for cracks, abrasions, and damaged or corroded connectors.
- Check hoses for cracks, abrasions, and damaged, loose or corroded clamps.
- Check and clean radiator fins as necessary. For details, refer to P49 [Examine the radiator fins].
- Check the fuel filter for presence of water and contaminants. If you find any water or contaminants, drain the fuel filter/water separator. For details, refer to P51 [Clean or replace the fuel filter]. If you have to drain the fuel filter frequently, drain the fuel tank and check for the presence of water in your fuel supply.

NOTICE

If any problem is noted during the visual check, the necessary corrective action should be taken before you operate the engine.

■ Check the diesel fuel, engine oil and engine coolant levels

Follow the procedures in P29 [Diesel Fuel], P32 [Engine Oil] and P34 [Engine Coolant] to check these levels.

NOTICE

If the level of cooling water in the radiator is frequently dropping too low, there can be water leak or air tightness problem. If this happens, consult your authorized YANMAR dealer or distributor immediately.

■ Check engine speed control

Check the engine speed control for smooth operation, adjust and lubricate or clean as necessary.

■ Check operator's console

Before you operate the engine you should make sure that all of the indicators are functioning properly.

ENGINE OPERATION

Before you operate the engine, review the P5 [SAFETY].

Start Operation

■ Manual starting

⚠ WARNING

- **If the tip of the starter handle is cracked, the handle slips. If the handle is engaged to the shaft firmly, the handle cannot be pulled easily and keeps rotating. If the tip, shaft hole, or grip of the starter handle is deformed, replace with new ones.**
- **If you put the starter handle in the wrong position or loose your grip of the handle, the handle might turn in the reverse direction due to the compressed air. This will cause the handle to rotate without load and it is dangerous.**
- **Do not release your hand from the starter handle after the engine has started. If you release your hand, the handle will turn with the starting shaft.**

1. Open the fuel valve.
2. Remove the starter handle from the mounting bracket. Put the starter handle into the starting shaft and make sure it is inserted smoothly. When it is hard to put the starter handle into the shaft, check the shaft hole and clean the inside if there is any unwanted material.
3. Turn the starter handle slowly. Make sure that you can feel resistance to the compression against your hand. The correct handle position is at the raising angle in compressed state. When compressing the air, it requires maximum turning strength. Therefore, if the handle is positioned at the raising angle in compressed state, the engine will be started safely. In contrast, if the handle position is at the lowering angle in compressed state, change the handle position 180-degree in the opposite direction.

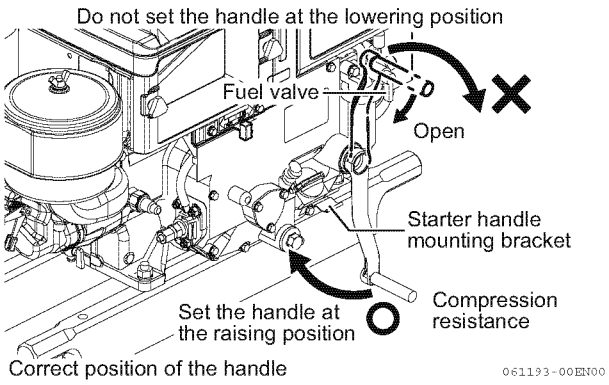


Figure 23

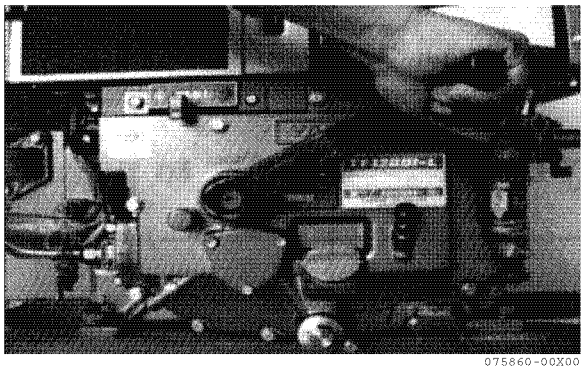


Figure 24

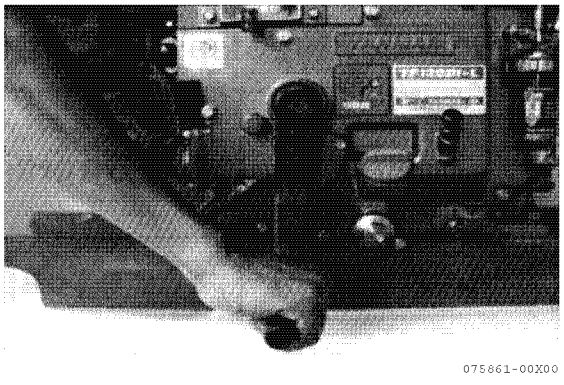


Figure 25

4. Set the regulator lever (or engine speed control) to the leftmost position (RUN).

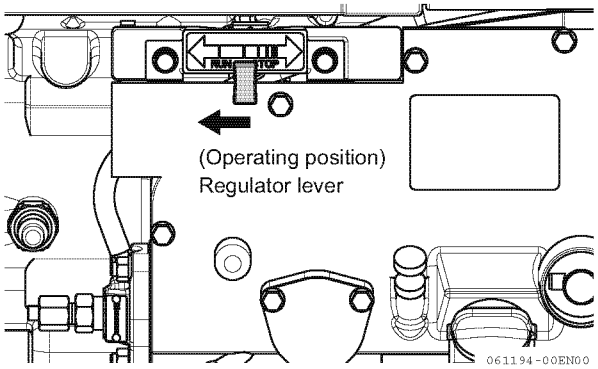


Figure 26

5. Lift and hold the decompression lever with your left hand.

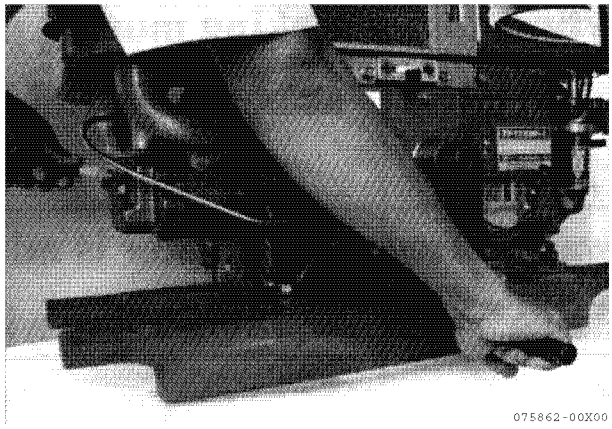


Figure 27

6. Turn the starter handle. If you keep turning the handle, you will hear the fuel injecting sound. Keep turning the handle until the handle turns at continuous speed, then release your hand from the decompression lever. Engine will start. Do not release your right hand from the starter handle. The starter handle is pulled out from the starting shaft once the engine starts.
7. Once the engine starts, set the regulator lever (engine speed control) to the low speed position.
8. Put the starter handle back to the original position and fix it with the mounting bracket.
9. Check that the oil signal is in blue.

Note: When you cannot hear the fuel injection sound at engine start, fuel is not being supplied and the engine will not start. Bleed the fuel injection system.

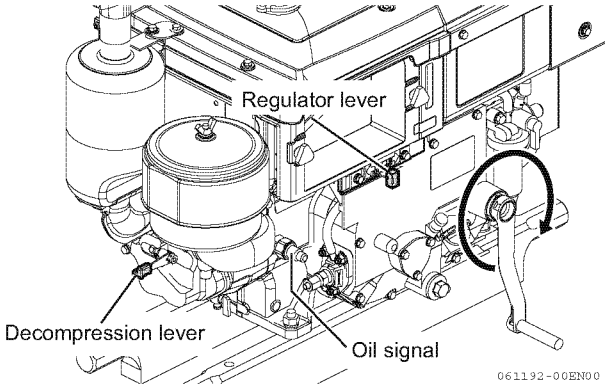


Figure 28

■ Electric starting (option)

1. Open the on-off valve on the fuel filter.
2. Turn the key switch (equipped on the vehicle/unit) one step to the right (clockwise) direction to the ON position. Make sure that the charge lamp (if equipped) is ON at that time.
3. Set the regulator handle (or engine speed control) to the START position.
4. Pull up the decompression lever with your left hand.
5. Start the engine. Turn the key fully to the right to the START position. The self-starter motor starts to turn the engine. When it starts to turn, the ripping sound of fuel injection is heard. Let go of the decompression lever when the speed increases. Let go of the key when the engine starts. The key will move to the ON position.
6. Move the regulator handle (engine speed control) to low idle speed once the engine starts.

NOTICE

- Do not hold the key in the START position for longer than 15 seconds. If you cannot start the engine at one go, start it again after approximately one minute. If you energize too long, it can cause the starter motor to become too hot.
- Keep the key in the ON position after you start the engine. The battery cannot be charged in the OFF position.

7. Make sure that the charge lamp (if equipped) is OFF.

8. Make sure that the oil signal is in blue.

NOTICE

When you cannot hear the sound of fuel injection at start, the fuel is not supplied. The engine cannot be started. Bleed the fuel system. (Refer to P31 [Priming the fuel system].)

Typical key switch pattern (function layout)

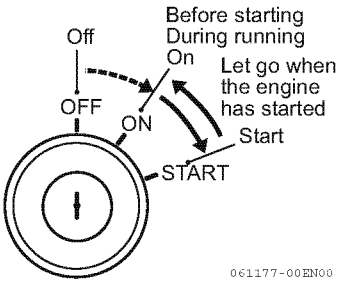


Figure 29

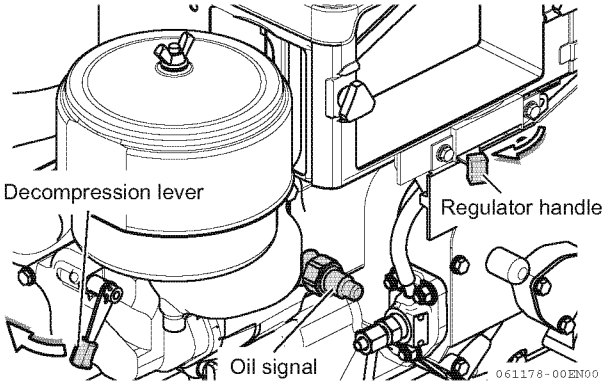


Figure 30

Start again after start trouble

Make sure that the engine comes to a complete stop before you try to start it again.

NOTICE

If you start the engine before it comes to a complete stop, this will cause damage to the starting gears.

Adjust and Stop the Engine

■ Adjust speed

Move the regulator handle (engine speed control) in the operation indication range to increase or decrease the speed. Operate the accelerator slowly.

■ Engine stop

Stop the engine by the procedures below.

1. Stop all the loads (such as load switch and clutch, etc.) so that the engine has no load.
2. Move the regulator handle (engine speed control) to the Low Speed position to operate the engine without load for approximately 5 minutes. (This is known as cooling the engine.)
3. Set the regulator handle (engine speed control) to the STOP position to stop the engine.
4. Tighten the fuel on-off valve.
5. Move the starter key switch (if equipped on the vehicle/unit) to the OFF position.
6. Remove the starter key.
7. Keep the starter key in a safe location.

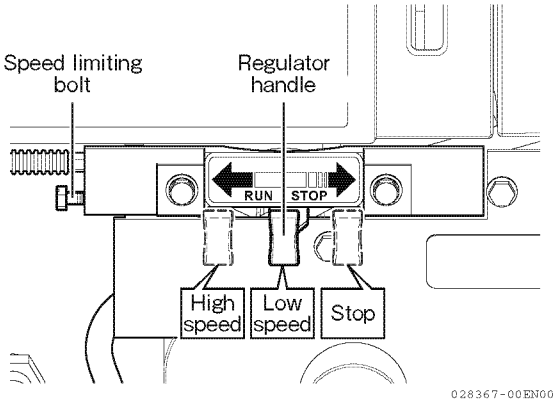


Figure 31

NOTICE

- Do not forcibly operate the new engine for the initial 50 hours. Such operation includes drastic acceleration/deceleration and overloaded operation.
- If you stop the engine abruptly from a high speed, the engine temperature will increase drastically. It can cause troubles such as the deterioration of oil and the sticking of the moving parts.
- You can operate the decompression lever to make an uncompressed condition to stop the engine. This must be done only in an emergency situation. In this case, the engine stops while injecting fuel and incorrect combustion occurs when you start again, which is not desirable.
- If you keep the engine outdoors after use, cover it with vinyl sheets. If you do not obey, rain water intrusion to silencer and electrical components can cause the engine malfunction.

During Operation

Always be on the lookout for the problems during engine operation as shown below.

■ Bad exhaust color?

Do not operate the engine in the condition in which black smoke exhausts continuously. Black exhaust smoke could mean that the engine is forcibly operated. Overloaded use will cause shorter engine life.

■ Unusual noise during operation

If you hear an unusual noise, stop the engine immediately. If you continue the operation, it will cause a disruptive accident. Examine the cause (loosening in bolts and nuts) and find solution.

■ Prevent operation in the resonance speed range

Because of the implement structure, the engine can resonate at some engine speeds. It will cause unusual and fast vibrations at the same time. Prevent operation in the adjacent of that speed. If you continue the operation, it will cause a disruptive accident.

■ Is there spurting of cooling water or water leak?

Stop the engine to examine and find solution when a trouble occurs. If you continue the operation without water, the engine becomes too hot. It will cause the internal parts to seize.

■ Is the engine oil warning lamp (If equipped) ON? Is there a red indication of the oil signal? Is there oil leak?

Stop the engine to examine and find solution.
If you continue the operation without oil, it will cause the internal parts to seize.

■ Is the charge lamp ON?

If the charge lamp is ON, it is not charged.

■ If you smell scorch or see fumes, stop the engine immediately

■ Is there sufficient fuel?

Refuel on time to prevent out of fuel during operation. Do not refuel while the engine is in operation.

When a trouble occurs and you cannot find the cause, do not continue to use the engine. Consult your authorized YANMAR dealer or distributor for repair.

Long-Term Storage

Before you put the engine in long-term storage, do maintenance for the subsequent time you use it.

1. Make sure to drain cooling water:
   - In cold weather
   - At long-term storage

   (you do not need to drain, when antifreeze fluid is used.)

   Make sure to open the coolant drain valve below the cylinder head to drain cooling water.

   Remove the radiator cap before you drain.

NOTICE

If you neglect to drain, the cooling water remaining in the engine can possibly freeze and expand. It can cause the water line parts to break.

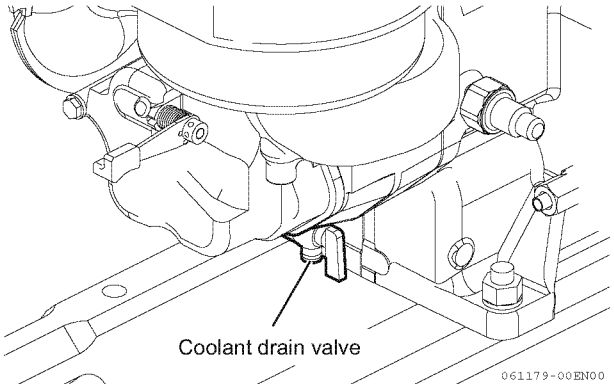


Figure 32

2. Clean the engine to remove:
   - Mud
   - Dirt
   - Oil dirt
3. Do the subsequent scheduled maintenance procedure at shown interval.
4. Replace the oil.
5. To keep the fuel tank free of dew, do one of the items described below:
   - Drain the fuel tank fully
   - Fill the fuel tank fully
6. Remove the battery cable (if equipped) from the negative (-) terminal. To adjust for self-discharging of the battery, charge the battery monthly (minimum) while the engine is in storage (electric starting only).
7. Lubricate connections of:
   - The engine speed control system
   - The accelerator wire
8. Cover the items below with vinyl sheets to keep them protected from water and dirt:
   - Air cleaner
   - Muffler
   - Electrical components (if equipped)
9. Turn the flywheel to set the position of engine Top Dead Center.

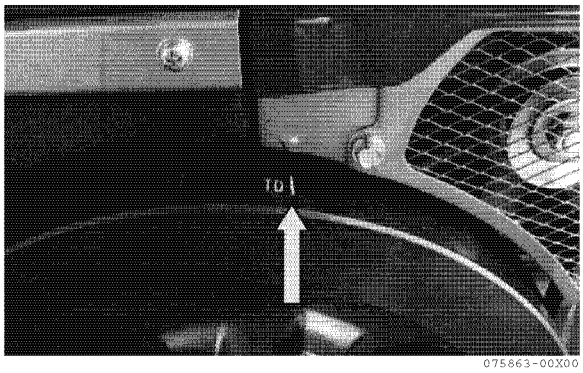


Figure 33

10. Choose a storage location that is:
    - Well-ventilated
    - Free of exposure to high humidity
    - Dirt

NOTICE

Prepare for operation after long term storage in the same way as when using a new engine for the first time.

11. Rotate the engine without starting, every four to six months.

MAINTENANCE

Maintenance Work

■ The importance of periodic maintenance

Engine deterioration and wear occur in relation to the length of time and conditions of use.
That deterioration and wear can cause shorter engine life because of:

- Untimely accident
- High consumption of fuel and lubricating oil
- Increased exhaust gas and noise

Daily maintenance prevents accidents.

■ The importance of daily checks

Periodic Maintenance Schedules contain the daily checks you do on a regular basis. Make it a habit to do daily checks before you start operate of the engine each day. (Refer to P37 [Daily Checks]).

■ Keep a record and do periodic maintenance

Keep a record of:

- Daily engine operation hours
- Daily maintenance done

Periodic maintenance intervals are:

- Short periods of operation
- 100 engine hours interval
- 300 engine hours interval
- 600 engine hours interval

Make sure to do periodic maintenance when the hours of operation go near the intervals.

■ YANMAR replacement parts

YANMAR recommends that you use genuine YANMAR parts when replacement parts are necessary.
Genuine replacement parts help ensure long engine life.

■ Necessary tools

Before you start periodic maintenance procedures, make sure that you have the necessary tools to do all of the necessary tasks.

■ Help for your maintenance and maintenance work

Our professional service technicians have the expertise and skills to help you with maintenance or service-related procedures. Contact your authorized YANMAR dealer or distributor.

■ Tightening fasteners

If you apply too much torque, this can break the fastener or parts. If you do not apply sufficient torque, this can cause a leak or parts malfunction.

Use the correct torque when you tighten fasteners.

For important parts, it is necessary to tighten with a torque wrench and the:

- Correct tightening force
- Correct tightening procedure
- Correct tightening sequence

If servicing, such as the removal of parts, is necessary, consult your authorized YANMAR dealer or distributor.

The below shows the standard tightening torque for tightening fasteners.

NOTICE

- The tightening torque in the below must be applied only to the bolts with a “7” head. (JIS strength classification: 7T).
- Use 60 % of the force in the table for the bolts with no indication.
- For parts with a material made of lightweight-alloy-aluminum, tighten it to 80 % of the torque shown in the table.

Standard Torque Chart

Screw dia. × pitch	mm	M6 × 1.0	M8 × 1.25	M10 × 1.5	M12 × 1.75	M14 × 1.5	M16 × 1.5
Tightening torque	N·m (kgf·m)	10.8 ± 1.0 (1.1 ± 0.1)	25.5 ± 2.9 (2.6 ± 0.3)	49.0 ± 4.9 (5.0 ± 0.5)	88.3 ± 9.8 (9.0 ± 1.0)	137 ± 9.8 (14.0 ± 1.0)	226.0 ± 9.8 (23.0 ± 1.0)

Periodic Maintenance Schedule

Daily and periodic maintenance is important to keep the engine in good operation condition.
The below table is a summary of maintenance items by periodic maintenance intervals. Periodic maintenance intervals are different by intended use of engine, loads, diesel fuel and lubricating oil used. They are hard to specify definitively. Only general items are given here.

NOTICE

Make sure to do maintenance in accordance with your periodic maintenance schedule. If you neglect to do periodic maintenance, it can cause the engine damage and durability loss.
Consult your authorized YANMAR dealer or distributor for aid when you examine items with a ● mark.

○: Inspection ◇: Part replacement ●: Consult your authorized YANMAR dealer or distributor

System	Inspection Item	Daily inspection	Periodic maintenance interval			
			Short periods of operation initial inspection	100 hours interval	300 hours interval	600 hours interval
Fuel oil	Examine and refuel the fuel level in the fuel tank	○				
	Clean or replace the fuel filter	○			○	◇
	Drain the fuel tank				○	
Lubricating oil	Examine the engine oil level	○				
	Replace the engine oil		20 Hrs ◇	◇		
	Clean the lubricating oil filter		20 Hrs ○	○		
	Examine the oil signal	○				
Cooling water	Examine and fill the cooling water	○				
	Replace the cooling water				◇	
	Examine and clean the radiator fins	○		○		
	Adjust the fan belt tension		10 Hrs ○	○		
Air cleaner	Check engine oil level			○		◇: Refer to Note
Electrical components	Examine the warning lamps	○				
	Examine the battery fluid			○		
Cylinder head	Adjust the intake and exhaust valve clearance				●	
	Lap the intake and exhaust valve seat (if necessary)					●
Fuel injection	Examine or adjust the fuel injection valve pressure					●
	Examine or adjust the fuel injection timing					●

Note: When you operate the engine in a dirty area, replacement intervals can be shorter because of the dirty conditions.

Periodic Inspection Procedures

■ Inspections after the initial period of operation

Adjust the initial fan belt tension (after initial 10 hours of operation)

As there is an initial elongation in the belt, adjust the tension according to the procedures as follows. Lower belt tension can cause the belt to slip. This makes the fan malfunction and the engine to become too hot. In electrical start, the dynamo installed in the fan can fail to operate (generate). Higher belt tension can cause the belt to wear faster and the bearing to break.

1. Push the belt down with your finger (49 N·m (approx. 5 kgf)) to examine the deflection.
   The appropriate deflection is 15 - 20 mm.

NOTICE

Prevent oils getting on the belt. This causes the belt to slip and stretch.

2. Belt tension adjustment procedures.
   1- Loosen the tension pulley lever mounting bolt.
   2- Move the lever with the belt tension adjustment screw to adjust the belt tension.

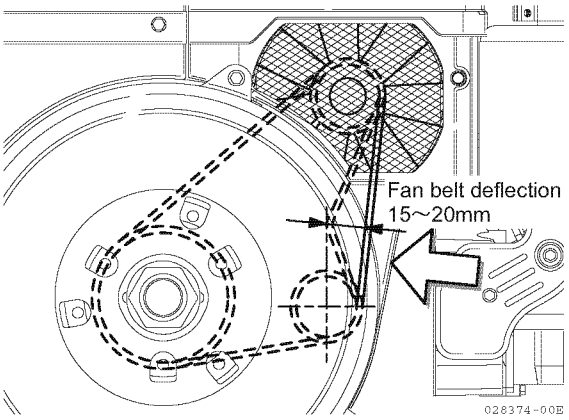


Figure 34

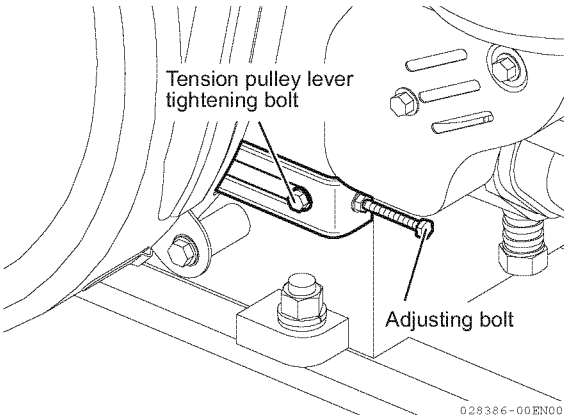


Figure 35

Replace the engine oil, Clean the lubricating oil filter (after initial 20 hours of operation)

During short periods of operation, the oil contamination occurs because of initial wear of internal parts.
Change the engine oil sooner than usual.
Clean the lubricating oil filter at the same time.
The time necessary to drain the oil can be decreased when the engine is warm. Prepare an oil pan to catch the drained oil.

⚠ CAUTION

- **If you try to drain oil while it is hot, prevent being burned by droplets of oil.**

The lubricating oil filter is installed in the drain plug. Remove it to clean the lubricating oil filter at the same time as you drain the engine oil.

1. Remove the drain plug at the bottom of the gear case to drain the oil.
2. Remove the items below in the drain plug:
   - Pressing spring
   - Lubricating oil filter
3. Clean them with kerosene.
4. Drain all oil from the engine.
5. Engage the items below into the drain hole while you push the drain plug:
   - Lubricating oil filter
   - Pressing spring
6. Correctly tighten the drain plug.

Tightening torque	25.4 ± 2.0 N·m (2.5 ± 0.2 kgf·m)

7. Fill new engine oil from the oil filler port. (Refer to P33 [Adding engine oil])

Do test operation for 5 minutes. Examine for oil leaks carefully during the test operation.

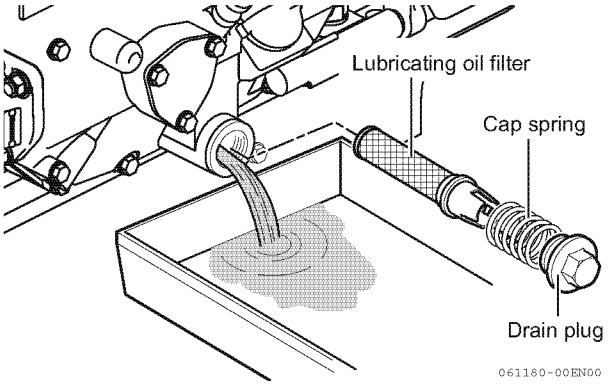


Figure 36

■ Inspection at 100 hour intervals

Replace the engine oil, Clean the lubricating oil filter (second time and onward)

Change the engine oil at an interval of 100 hours of operation intervals from the second time onward. When you operate the engine in a dirty area, use a shorter replacement interval. Clean the lubricating oil filter at the same time. (Refer to P48 [Replace the engine oil, Clean the lubricating oil filter (after initial 20 hours of operation)])

Examine the radiator fins

Dirt attached to the radiator fins decreases the cooling performance. It will cause the engine to become too hot. Make it a rule to examine the radiator fins daily and clean as necessary.

1. Remove the screen.
2. Remove any large bits of dirt attached to the radiator fins.
3. Spray tap water to clean while you operate the engine. For heavy contaminations, clean with a neutral detergent.

NOTICE

- Do not use high pressure water or compressed air at greater than 28 psi (193 kPa; 19686 mmAq).
- Do not clean mechanically with a brush, as this can cause damage to the radiator fins.

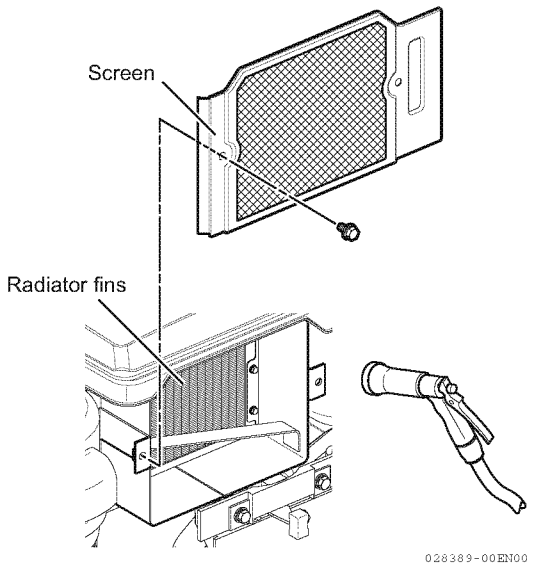


Figure 37

Examine the air cleaner

A clogged air cleaner with dirt has a bad effect on engine performance. If the combustion chamber intakes dirt, it causes drastic wear on the moving parts. This also causes the engine to stall. When you operate the engine in a dirty area, Use a shorter inspection interval.

1. Loosen the wing nut at the top of the center bolt to remove the air cleaner cap. Remove the inner filter element and oil bath, and then disassemble them.
2. Prepare a washing can and clean the filter and the boil bath with kerosene or diesel fuel.
3. Fill the engine oil up to the oil level indicated inside the oil bath.
4. Install the filter element and the air cleaner cap again.

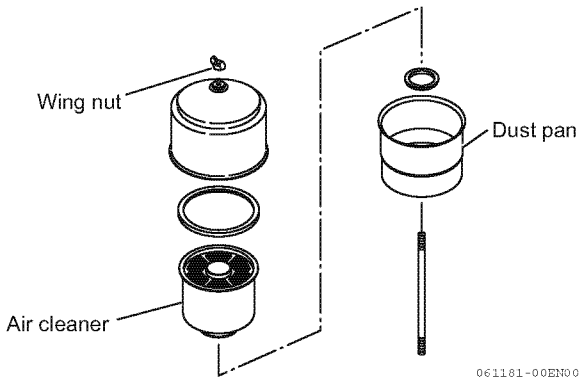


Figure 38

⚠ CAUTION

Do not overfill oil bath with engine oil. The amount of engine oil should not exceed the indicated oil level. If oil is taken into the combustion chamber, the engine will run at excessively high speed, and it is extremely dangerous.

Examine the battery fluid (if equipped)

⚠ WARNING

- **When you examine the electrical system, make sure to move the battery switch to the OFF position, or disconnect the ground cable (-) terminal at the battery side. Accidentally short-circuiting the electrical system can cause a fire.**

- **Give an airflow to the space around the battery when you charge the battery. No flames. The battery makes hydrogen gas, which can cause an explosion.**

- **Battery fluid is diluted sulfuric acid. It can blind you if it gets in your eyes, or burn your skin. Wear glasses and rubber gloves to move the battery fluid. If you touch it, clean it off immediately with a large quantity of freshwater and consult your doctor for treatment.**

1. If operation continues without sufficient battery fluid, the battery will be broken.
   Examine the battery fluid regularly and add distilled water (commercialized product) as necessary.
   (Examine the battery fluid level more frequently than specified during summer times, when the battery fluid level lowers sooner because of vaporization.)
2. If the engine speed does not increase while engine is cranking, measure the gravity of the fluid with a hydrometer (commercialized product).
   The gravity at full charge is 1.27 or above (at 20 °C).
   It is necessary to charge the battery for fluid with a gravity of below 1.24.
   If the gravity cannot be increased as you charge, it is necessary to replace the battery.

Examine and adjust the fan belt tension (second time and onward)

Examine the belt tension at an interval of 100 hours of operation interval from the second time onward.
Replace the V-belt if it is damaged.
(Refer to P47 [Adjust the initial fan belt tension (after initial 10 hours of operation)])

■ Inspection at 300 hour intervals

Clean or replace the fuel filter

The clogged fuel filter with contaminations in the fuel has a bad effect on the diesel fuel flow.
If the float ring (red ring) floats up in the transparent cup, disassemble and clean the inner side.
The element is a paper filter type and it can be cleaned while clogging is minimal. However, you must replace it with a new one at regular intervals.

1. Close the on-off valve on the fuel filter.
2. Loosen the retainer ring (turn to the left).
3. Remove the cup.
4. Remove the element downward.
5. Prepare a washing can.
6. Clean the surface and inner surface of the cup with clean fuel.
7. Replace the element with a new one if the element is damaged, too dirty or oily.
8. Install the element.
9. Cover the cup.
10. Tighten the retainer ring (turn to the right) to assemble.
11. Open the on-off valve.
12. There is air in the fuel system after disassembly of the fuel filter. Bleed the fuel system.
    (Refer to P31 [Priming the fuel system].)

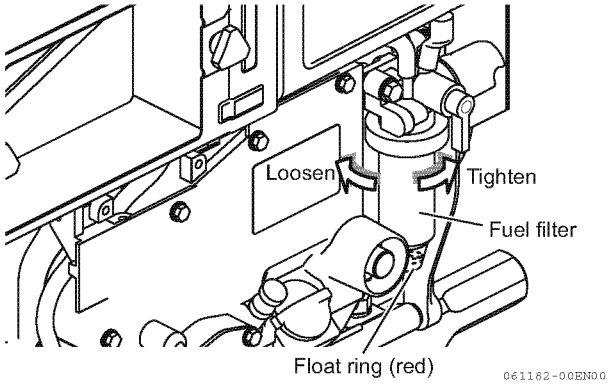


Figure 39

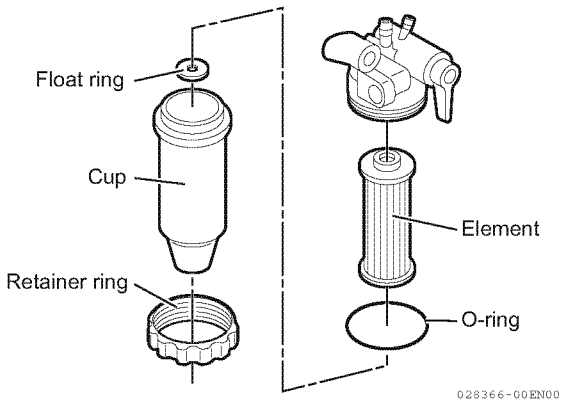


Figure 40

Replace the cooling water

⚠ DANGER

Scald Hazard!

- **Never remove the radiator cap if the engine is hot. Steam and hot engine coolant will spurt out and seriously burn you. Allow the engine to cool down before you attempt to remove the radiator cap.**
- **Tighten the radiator cap securely after you check the radiator. Steam can spurt out during engine operation if the cap is loose.**

Cooling water with contamination (rust or scale) decreases the cooling.
Even when antifreeze fluid is correctly mixed, the engine cooling water gets contaminated as its ingredients deteriorate. The cooling water must be changed yearly (minimum).

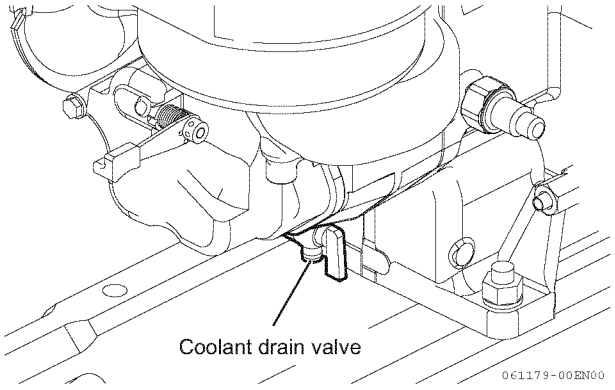


Figure 41

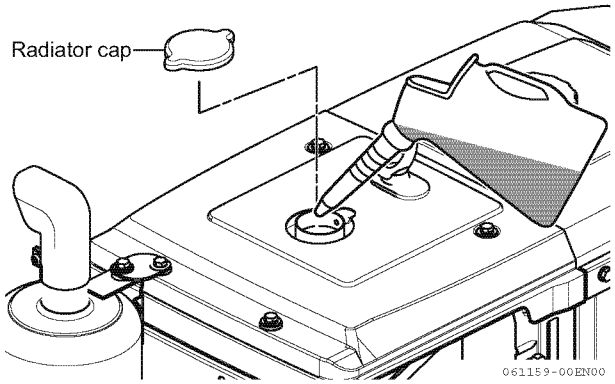


Figure 42

For Radiator system

1. Remove the radiator cap.
2. Make sure to open the coolant drain valve below the cylinder head to drain the cooling water.
3. Tighten the coolant drain valve.
4. Fill the radiator with new cooling water.
   (Refer to P35 [Filling radiator with engine coolant])
5. Correctly tighten the radiator cap.

For Hopper system

1. Open the coolant drain valve below the cylinder head to drain the cooling water.
2. Tighten the coolant drain valve after completing the drain the cooling water.
3. Fresh cooling water should be filled up to the bottom of the dust-guard net.

Examine and adjust the intake and exhaust valve clearance

Operation for a long time can cause the clearance between intake and exhaust valve and rocker arm to change. This has effects on the operation performance. Inspection or adjustment of the clearance is necessary. Special knowledge and skill are necessary for maintenance. Consult your authorized YANMAR dealer or distributor.

■ Inspection at 600 hour intervals

The inspection and maintenance described below are necessary at an interval of 600 hours of operation. As special knowledge and skill are necessary for these works, consult your authorized YANMAR dealer or distributor.

Examine and adjust the fuel injector

Optimize the fuel injection conditions so that the engine can give its maximum performance.

Examine and adjust the fuel injection timing

Adjust the fuel injection timing to optimize the engine performance.

Lap the intake and exhaust valves (if necessary)

Examine the intake valve and exhaust valve seat wear condition to maintain the cylinder head air tightness. Consult your authorized YANMAR dealer or distributor.

TROUBLESHOOTING

Symptom	Probable cause	Solution	Refer to
Alarm lamp is ON while in operation	If indicator illuminates during engine operation, stop the engine immediately to examine.		
• The oil signal is indicated in red (during operation)	• Low level of engine oil	• Examine and refuel the oil level	• Refer to P33 [Adding engine oil].
	• Engine oil contamination	• Replace the oil	• Refer to P48 [Replace the engine oil, Clean the lubricating oil filter (after initial 20 hours of operation)].
	• Clogged lubricating oil filter	• Clean the lubricating oil filter	• Refer to P48 [Replace the engine oil, Clean the lubricating oil filter (after initial 20 hours of operation)].
• Charge lamp is ON (if quipped on the vehicle/unit)	• Belt broken or loose	• Replace the belt or adjust the tension	• Refer to P47 [Adjust the initial fan belt tension (after initial 10 hours of operation)].
	• Defective battery	• Examine the fluid level and gravity	• Refer to P50 [Examine the battery fluid (if equipped)].
	• Defective dynamo	• See your authorized YANMAR dealer or distributor	
Malfunction of alarm lamp	Do not continue to use the engine while the lamp is defective. If you do not realize the defect, it can cause more dangerous accidents.		
Even when the key switch (if equipped on the vehicle/unit) is moved (OFF → ON)			
• Charge lamp is not ON (equipped on the vehicle/unit)	• Defective electrical wire or defective lamp	• See your authorized YANMAR dealer or distributor	
Even when the key switch (if equipped on the vehicle/unit) is moved back after start (START→ON)			
• Oil signal color is not changed from red to blue	• Defective sensors and switches	• See your authorized YANMAR dealer or distributor	
High oil consumption	• Dirty radiator fins	• Clean the radiator fins	• Refer to P49 [Examine the radiator fins].
	• Belt loose or damaged	• Examine and adjust the belt tension	• Refer to P47 [Adjust the initial fan belt tension (after initial 10 hours of operation)].
	• Internal contamination of cooling water passages	• Replace or clean the cooling water	• Refer to P52 [Replace the cooling water].
	• Air tightness malfunction of radiator	• See your authorized YANMAR dealer or distributor	

Symptom	Probable cause	Solution	Refer to
Engine does not start	• No fuel	• Refuel or bleed	• Refer to P30 [Filling the fuel tank].
	• Incorrect fuel	• Replace with the recommended fuel	• Refer to P29 [Diesel Fuel].
	• Clogged fuel filter	• Replace the fuel filter	• Refer to P51 [Clean or replace the fuel filter].
	• Weak fuel injection sound	• See your authorized YANMAR dealer or distributor	
	• Compressed air leakage from intake and exhaust valves	• See your authorized YANMAR dealer or distributor	
• Starter motor (if equipped) does not operate or rotates too slowly	• Battery charge necessary	• Examine the fluid and charge again	• Refer to P50 [Examine the battery fluid (if equipped)].
	• Defective cable connection at battery terminals	• Clean the terminals and retighten	
	• Defective starter switch	• See your authorized YANMAR dealer or distributor	
	• Defective starter motor	• See your authorized YANMAR dealer or distributor	
Bad exhaust gas color	• Overload	• Lower load	
• Black exhaust smoke	• Clogged air cleaner	• Clean the element	• Refer to P49 [Examine the air cleaner].
	• Incorrect fuel	• Replace with the recommended fuel	• Refer to P29 [Diesel Fuel].
	• Poor fuel injection	• See your authorized YANMAR dealer or distributor	
	• Too much intake and exhaust valve clearance	• See your authorized YANMAR dealer or distributor	
• White exhaust smoke	• Incorrect fuel	• Replace with the recommended fuel	• Refer to P29 [Diesel Fuel].
	• Unsatisfactory fuel injection	• See your authorized YANMAR dealer or distributor	
	• Delayed fuel injection timing	• See your authorized YANMAR dealer or distributor	
	• Combustion and unusual consumption of lubricating oil	• See your authorized YANMAR dealer or distributor	

■ Troubleshooting data

If you have inquiries about engine malfunction, please consult your authorized YANMAR dealer or distributor.
Consult your authorized YANMAR dealer or distributor with the data as follows:

- Model name and serial number of your engine
- The driven machine type (tractor, generator, skid steer loader), manufacturer's name, model and serial number
- How long the engine is used
  The number of engine hours or the number of calendar months
- The operation condition of implement right before problem (work type, engine speed, load condition, etc.)
- Conditions when the problem occurs:
  Exhaust color, operation noise, start condition, fuel used, lubricating oil brand, viscosity number, and etc.
- Engine maintenance history and prior problems

Operation Manual

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