⚠ WARNING

Entanglement Hazard!



- Stop the engine before you begin to service it.

- Never leave the key in the key switch 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!

- Before engaging the transmission or PTO, warm up the engine for at least 5 minutes and then set the speed back to normal. 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.

⚠ WARNING

Precaution regarding the ECU (Engine Controller) of Electronic Controlled Engine

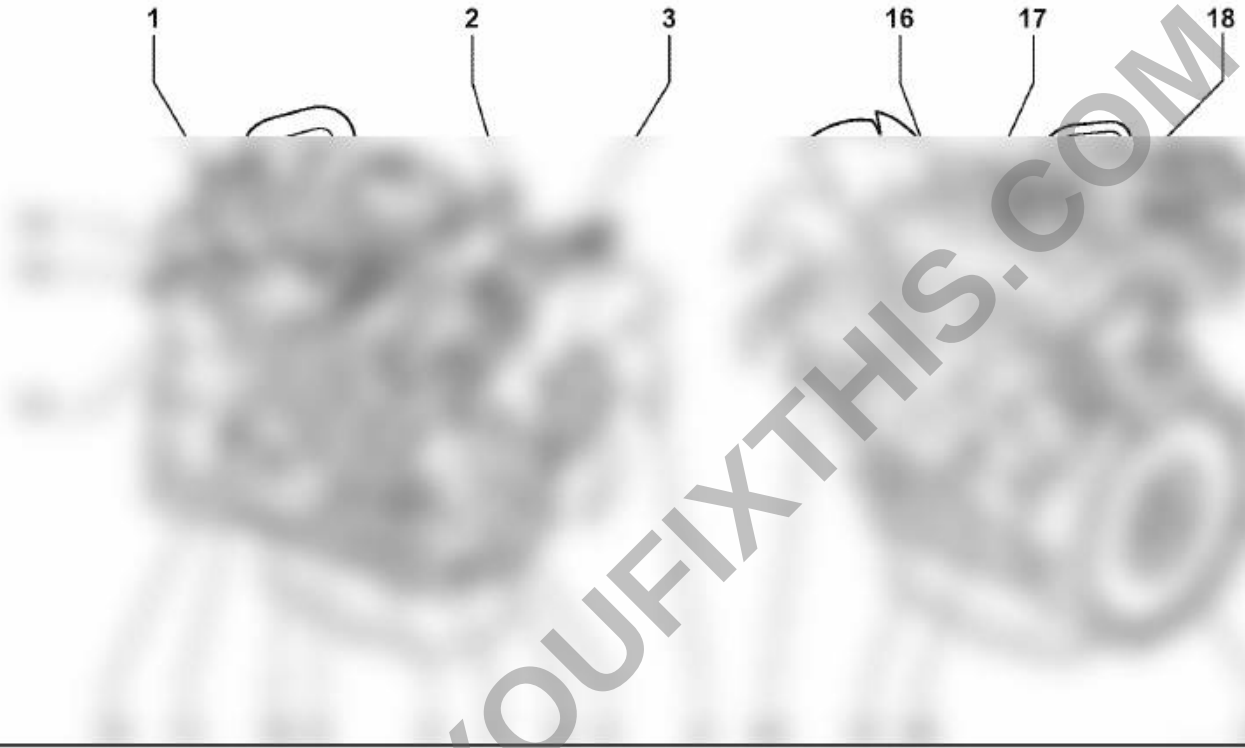
- Never use the ECU for purposes that are not intended by YANMAR; such as using unauthorized ECU, writing unauthorized data to ECU, leaving it broken, or removing sensors and actuators. Doing so could result in the violation of emission control regulations and will void the product warranty.
- Be sure to use the ECU in conjunction with the engines whose models or serial numbers are specified by YANMAR.
  Other ECU/engine combinations than specified will void the engine warranty.
- Replacing the fuel injection pump involves rewriting the fuel injection data in the ECU.
  Be sure to contact your local YANMAR dealer before replacing the fuel injection pump.
  Failure to rewrite the fuel injection data before replacing the fuel injection pump will void the engine warranty.
- Replacing the ECU involves migrating the fuel injection data to the existing ECU to the new unit. Be sure to contact your local YANMAR dealer before replacing the ECU.
  Failure to migrate the fuel injection data before replacing the ECU will void the engine warranty.
- Improper use or misuse of the ECU may result in death or serious injury due to an abrupt and unexpected increase in engine speed.

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3TNV88F

In **Figure 4**, each position of the major parts in the specification of 3TNV88F-E (Electronic controlled DI engine) is indicated. Note that, for 3TNV88F, there is another type known as 3TNV88F-U with mechanical governor DI, and the main parts are about the same without the “18-EGR valve”.



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ELECTRONIC CONTROL SYSTEM

3TNV88F-E

3TNV80FT, 3TNV80F-Z

⚠ WARNING

- **Never use the ECU for purposes that are not intended by YANMAR; such as using unauthorized ECU, writing unauthorized data to ECU, leaving it broken, or removing sensors and actuators. Doing so could result in the violation of emission control regulations and will void the product warranty.**
- **Be sure to use the ECU in conjunction with the engines whose models or serial numbers are specified by YANMAR.**
  Other ECU/engine combinations than specified will void the engine warranty.
- **Replacing the fuel injection pump involves rewriting the fuel injection data in the ECU.**
  Be sure to contact your local YANMAR dealer before replacing the fuel injection pump.
  Failure to rewrite the fuel injection data before replacing the fuel injection pump will void the engine warranty.
- **Replacing the ECU involves migrating the fuel injection data to the existing ECU to the new unit. Be sure to contact your local YANMAR dealer before replacing the ECU.**
  Failure to migrate the fuel injection data before replacing the ECU will void the engine warranty.
- **Improper use or misuse of the ECU may result in death or serious injury due to an abrupt and unexpected increase in engine speed.**

NOTICE

Shut down the engine if the engine failure lamp comes on.

Continuing running the engine with the engine failure lamp being on may result in a serious malfunction of or damage to the engine, and will void the engine warranty.

NOTICE

Do not energize the starter for a period of longer than 15 seconds.

Take a pause of at least 30 seconds between energization of the starter.

Otherwise the starter could suffer damage.

NOTICE

- High-pressure washing not recommended.
- Avoid using high-pressure washing for electronic or electric devices installed in, on or around the engine, including the ECU, relays and harness couplers.

Otherwise such devices may suffer malfunction due to water ingress into them.

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The key switch for the operator's console illustrated in **Figure 15** has three positions - OFF, ON and START.

1 OFF (key straight up and down)

2 ON

This is the position the key will be in when the engine is running. When the engine is not running, use this position to energize the gauges, indicators, electric fuel pump and auxiliary devices.

3 START

Turn the key to this position to start the engine. As soon as the engine starts, release the key and it will automatically return to the ON position. Some key switches may be equipped with a feature that prevents you from turning the key to the START position while the engine is running. When operating a key switch with this feature, you cannot turn the key to the START position without first returning the key to the OFF position.

NOTICE

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 turbocharger (if equipped) and exhaust system, to cool slightly before the engine itself is shut down.

NOTICE

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

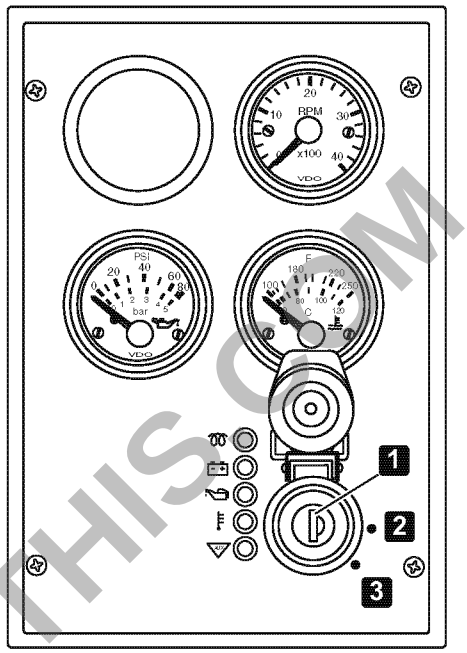


Figure 15

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Engine Oil Capacity (Typical)

These are the engine oil capacities associated with a “Deep Standard” oil pan. Oil capacity will vary dependent upon which optional oil pan is used. Refer to the operation manual provided by the driven machine manufacturer for the actual engine oil capacity of your machine.

The following are the engine oil capacities for various YANMAR TNM and TNV engines.

Engine oil capacity (typical)



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STARTING ENGINE

Use the following procedure to start the engine. Note that two typical operator's consoles are shown for illustrative purposes only.

1. Make sure you follow the procedures stated in the *Daily Checks on page 55*.
2. Before first starting electronic controlled engines (3TNV88F-E, 3TNV80FT, 3TNV80F-Z):
   The ECU of the electronic controlled engines shown above needs to be initialized at initial power up. When the engine failure lamp comes on at initial power up, the ECU has finished initialization. Then always turn the key switch to the OFF position once before starting the engine. (The ECU has usually been initialized before the driven machine is delivered).
   From the second power up, make sure the engine failure lamp is on for 2 sec. when turning the key switch to the ON position.
3. Make sure the water separator fuel valve (1, **Figure 1**) is in the ON position (2, **Figure 1**).

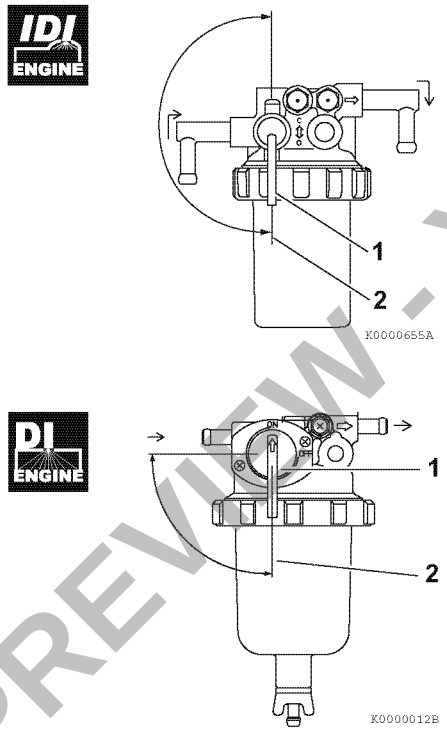


Figure 1

4. Set the transmission (if equipped) in the NEUTRAL position.
5. Disengage the PTO (if equipped).
6. Set the engine speed control to the mid-position.

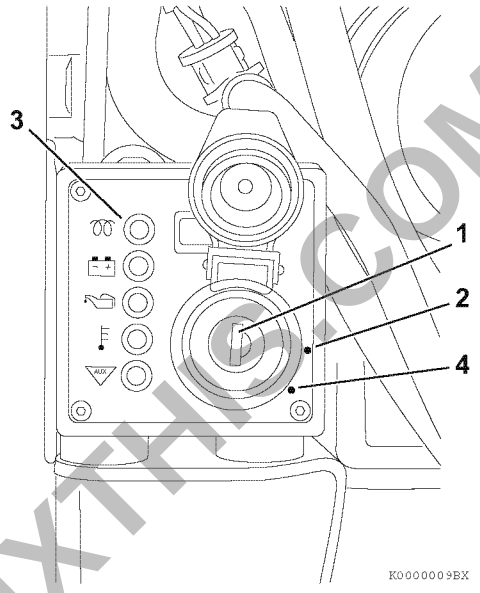


Figure 2

NOTICE

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

7. Insert the key into the key switch (1, **Figure 2**) or (1, **Figure 3**).

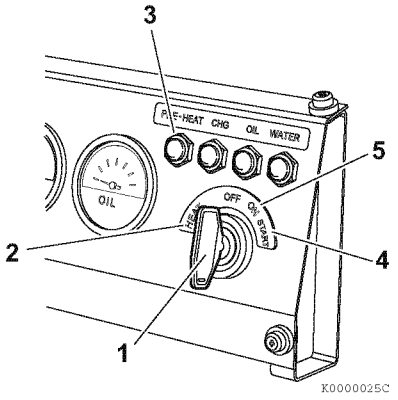


Figure 3

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■ Check battery and recharge

⚠ DANGER

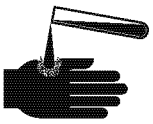
Explosion Hazard!



- **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.**

⚠ 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.**

NOTICE



- 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.

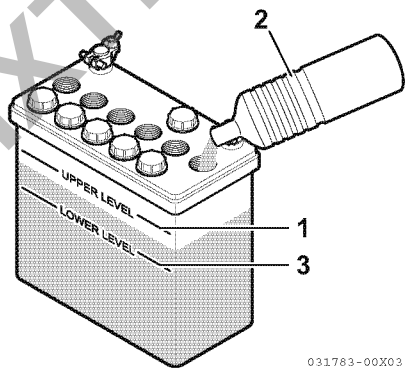


Figure 6

- When the amount of fluid nears the lower limit (3, **Figure 6**), fill with distilled water (2, **Figure 6**) so it is at the upper limit (1, **Figure 6**). If operation continues with insufficient battery fluid, the battery life is shortened, and the battery may overheat and explode. During the summer, check the fluid level more often than specified.

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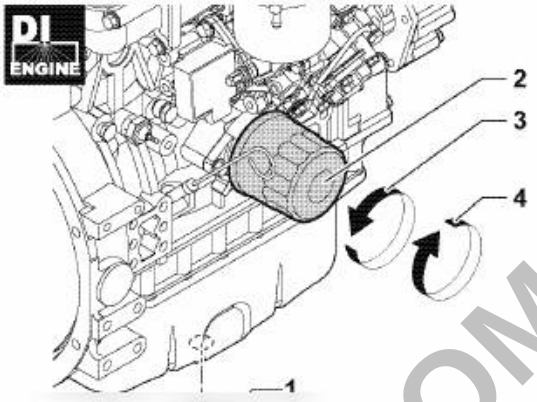
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■ Replace the engine oil filter

⚠ CAUTION

To refuel the engine oil, refuel slowly after removing the dipstick and both caps. If you refuel rapidly, the oil intrusion to the intake occurs through the PCV valve of the valve cover. It will result in an oil hammer at engine start, which may cause damage to the engine.

1. Turn the engine oil filter (2, **Figure 20**)



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LIST OF POSSIBLE FAULTS OF ELECTRONIC CONTROLLED ENGINES

DI ENGINE **3TNV88F-E** IDI ENGINE **3TNV80FT, 3TNV80F-Z**

No.	Fault (alarm) location	Fault/alarm condition	Engine status	Reset condition	Availability of detection features	No. of flashes/flashing pattern of engine failure lamp
1	Coolant temperature sensor	Sensor voltage is over 4.8 V or under 0.2 V	Continues to run at a coolant temperature of 30 °C	Voltage returns to normal	Standard	4
2	Accelerator sensor	Sensor voltage is over 4.8 V or under 0.2 V	Continues to run at 1500 min^{-1} (rpm)	Voltage returns to normal	Default	5
3	Speed sensor	Engine start switch (E8) is on, but engine speed is zero	Is shut down. (When optional auxiliary speed sensor is equipped: Auxiliary speed senor works in place of faulty speed sensor and engine continues to run at up to 1800 min^{-1} (rpm). If auxiliary sensor also fails, engine is shut down.	Key switch is turned to OFF	Standard	6
		Engine speed momentarily decreased to lower than specified lower limit				
4	Rack position sensor	Rack position relative to rack actuator is without specified limits.	Continues to run without rack position sensing at up to 150 % of low idling speed or 80 % of high idling speed, whichever is lower	Key switch is turned to OFF	Standard	7
5	Rack actuator	Rack actuator output is without specified limits	Is shut down	Key switch is turned to OFF	Standard	8
		Engine accelerates even though rack actuator output is minimized				
		Engine stalls while rack position sensor fails				
6	EGR valve (3TNV80F-E)	LOW status was detected even though port was off	Continues to run at up to 92 % of rated power output and up to 1800 min^{-1} (rpm)	Key switch is turned to OFF	Default	1-3
		HIGH status was detected even though port was on				
7	CSD solenoid valve (3TNV80F-E)	LOW status was detected even though port was on	Continues to run while CSD feature is canceled	Key switch is turned to OFF	Standard	1-4
		HIGH status was detected even though port was off				
8	Starting aid relay	LOW status was detected even though port was off	Continues to run while starting aid relay is off	Key switch is turned to OFF	Optional	1-5
		HIGH status was detected even though port was on				

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TABLE OF CONTENTS

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ENGINE COOLANT 52
Engine Coolant Specifications 53
Filling Radiator with Engine Coolant 53
Daily Check of the Cooling System 54
Engine Coolant Capacity (Typical) 54
DAILY CHECKS 55
Visual Checks 55
Check Diesel Fuel, Engine Oil and Engine Coolant Levels 55
Check Engine Speed Control 55
Check Operator's Console 55
Check Indicators 55
ENGINE OPERATION 59
STARTING ENGINE 60
Cold start device for electronic controlled engines 61
High-Altitude Injection Control Device 62
CHECKING THE ENGINE DURING OPERATION 62
Adjust Engine Speed 64
SHUTTING DOWN THE ENGINE 64
PERIODIC MAINTENANCE 65
PRECAUTIONS 66
The Importance of Periodic Maintenance 66
Performing Periodic Maintenance 66
The Importance of Daily Checks 66
Keep a Log of Engine Hours and Daily Checks 66
YANMAR Replacement Parts 66
Tools Required 66
Ask Your Authorized YANMAR Industrial Engine Dealer or Distributor For Help 66
Required EPA/ARB Maintenance USA Only 67
EPA/ARB Installation Requirements USA Only 67
Tightening Fasteners 67
STANDARD TORQUE CHART 68
PERIODIC MAINTENANCE SCHEDULE 68
Periodic Maintenance Chart 68
PERIODIC MAINTENANCE PROCEDURES 70
After Initial 50 Hours of Operation 70
Every 50 Hours of Operation 72
Every 250 Hours of Operation 75
Every 500 Hours of Operation 81
Every 1000 Hours of Operation 87
Every 1500 Hours of Operation 88
Every 2000 Hours of Operation 89
Every 3000 Hours of Operation 91

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