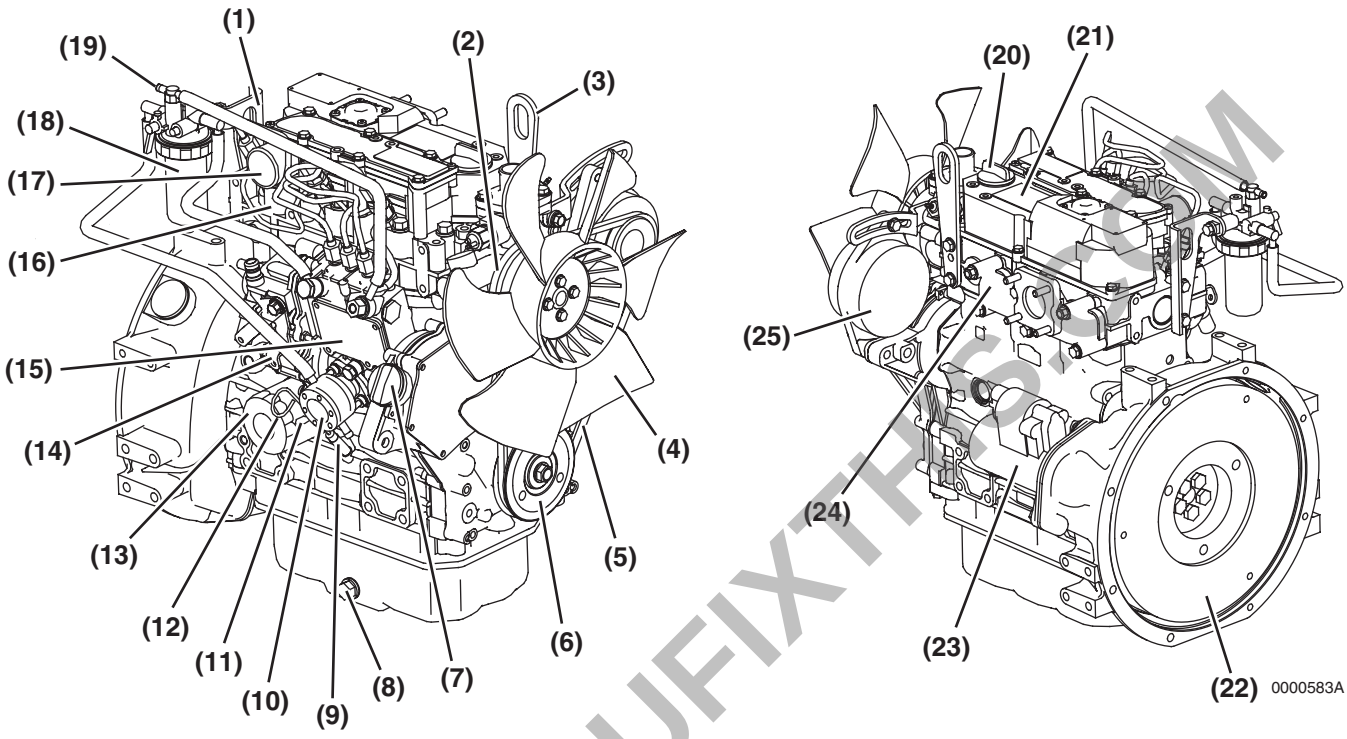
# COMPONENT IDENTIFICATION

**Figure 4-1** shows where major engine components are located.




1. Lifting Eye (Flywheel End)
2. Engine Coolant Pump
3. Lifting Eye (Engine Cooling Fan End)
4. Engine Cooling Fan
5. V-Belt
6. Crankshaft V-Pulley
7. Side Filler Port (Engine Oil)
8. Drain Plug (Engine Oil)*
9. Fuel Inlet
10. Mechanical Fuel Pump (If Equipped)
11. Fuel Priming Lever
12. Dipstick (Engine Oil)
13. Engine Oil Filter
14. Governor Lever
15. Fuel Injection Pump
16. Intake Manifold
17. Air Intake Port (From Air Cleaner)
18. Fuel Filter
19. Fuel Return To Fuel Tank
20. Top Filler Port (Engine Oil)
21. Rocker Arm Cover
22. Flywheel
23. Starter Motor
24. Exhaust Manifold
25. Alternator

*Engine oil drain plug location may vary based on oil pan options.

***Figure 4-1***

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# SPECIAL TORQUE CHART

## Torque for Bolts and Nuts

| Component | Thread Diameter and Pitch | Tightening Torque | Lubricating Oil Application (Thread Portion and Seat Surface) | Reference Page |
|---|---|---|---|---|
| Cylinder Head Bolts | M9 x 1.25 mm | 40 - 43 ft·lbs (53.9 - 57.9 N·m; 5.5 - 5.9 kgf·m) | Applied | *See Reassembly of Cylinder Head on page 6-31* |

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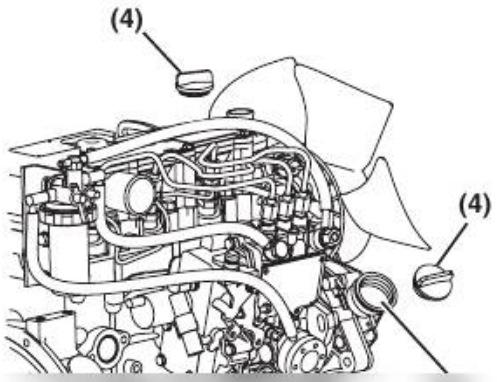
## TROUBLESHOOTING CHARTS

| | Trouble Symptom / Cause | Starting Problem: Engine Does Not Start. | Starting Problem: Engine Starts But Stops Soon. – Exhaust Smoke: None | Starting Problem: Engine Starts But Stops Soon. – Exhaust Smoke: Little | Starting Problem: Engine Starts But Stops Soon. – Exhaust Smoke: Much | Insufficient Engine Output – Exhaust Color: Ordinary | Insufficient Engine Output – Exhaust Color: White | Insufficient Engine Output – Exhaust Color: Black | Poor Exhaust Color – During Work: White | Poor Exhaust Color – During Work: Black | High Knocking Sound During Combustion | Abnormal Engine Sound | Uneven Combustion Sound | Engine Surging: During Idling | Engine Surging: During Work Operation | Excessive Engine Vibration | Difficulty in Returning to Low Speed | Excessive Fuel Consumption | Engine Oil: Excessive Oil Consumption | Engine Oil: Dilution by Diesel Fuel | Engine Oil: Oil with Water | Engine Oil: Low Oil Pressure | Excessive Blow-by Gas | Engine Coolant: Overheat | Engine Coolant: Low Water Temperature | Air Intake: Pressure Drop | Air Intake: Pressure Rise | Exhaust Temperature Rise | Corrective Action | Reference Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Engine System | Improper Intake/Exhaust Valve Clearance | O | O | | | O | | | | | | O | | | | | | | | | | | | | | O | | O | Adjust the Valve Clearance. | *See Measuring and Adjusting Valve Clearance on page 6-34.* |
| | Compression Leakage from Valve Seat | | | | | O | | O | | O | | O | | | | | | O | | | | O | | | | O | | O | Lap the Valve Seat. | *See Valve Face and Valve Seat on page 6-28.* |
| | Intake/Exhaust Valve Seizure | O | | | O | O | | O | | O | | O | | | O | O | | | O | | | O | | | | O | | | Correct or Replace Intake/Exhaust Valve. | *See Inspection of Intake and Exhaust Valves on page 6-27.* |
| | Cylinder Head Gasket Blowout | | | | | O | | | | | | | | | | | | | | O | | | O | | | | | | Replace the Gasket. | *See Disassembly of Cylinder Head on page 6-21.* |
| | Seized or Broken Piston Ring | O | | | O | | O | | O | | | O | | O | | O | | O | O | | | O | O | | | | | O | Replace the Piston Ring. | *See Reassembly of Pistons on page 6-53.* |
| | Worn Piston Ring, Piston or Cylinder | O | | | O | | O | | O | | | | | | | | | O | O | | | O | | | | | | | Perform Honing and Use Oversize Parts. | *See Honing and Boring on page 6-52.* |
| | Seized Crankpin Metal or Bearing | O | O | | | | | | | | | O | | O | O | O | | | | | | O | | | | | | | Repair or Replace. | *See Inspection of Crankshaft and Camshaft Components on page 6-46.* |
| | Improper Arrangement of Piston Ring Gaps | | O | | | | O | | | | | | | | | | | | O | | | | O | | | | | | Correct the Ring Joint Positions. | *See Reassembly of Pistons on page 6-53.* |

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## Engine Oil Capacity (Typical)

Note: These are the engine oil capacities associated with a “Deep Standard” oil pan. Oil capacity will vary dependant 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

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○:Check ◇:Replace ●: Contact your authorized Yanmar industrial engine dealer or distributor

| System | Check Item | Daily | Periodic Maintenance Interval | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Every 50 hours | Every 250 hours | Every 500 hours | Every 1000 hours | Every 1500 hours | Every 2000 hours |
| Cooling System | Check & Refill Engine Coolant | ○ | | | | | | |
| | Check & Clean Radiator Fins | | | ○ | | | | |
| | Check & Adjust Cooling Fan V-belt | | ○ 1st time | ○ 2nd & after | | | | |
| | Drain, Flush and Refill Cooling System With | | | | | ◇ or | | |

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1. Baffle Plate
2. Oil Fill Cap
3. Valve Cover / Intake Manifold
4. Gasket
5. Rocker Arm Shaft
6. Rocker Arm Shaft Support
7. Adjuster Lock Nut
8. Valve Adjuster Screw
9. Rocker Arm
10. Retaining Ring
11. Valve Cap
12. Keeper
13. Valve Spring Retainer
14. Valve Spring
15. Valve Stem Seal
16. Valve Guide
17. Cylinder Head
18. Exhaust Valve
19. Intake Valve
20. Cylinder Head Gasket
21. Push Rod (2 per cylinder)
22. Glow Plug
23. Glow Plug Wiring Harness
24. Cylinder Head Bolt
25. Rocker Arm Shaft Spring
26. Rocker Arm Shaft Alignment Set Screw
27. Crankcase Breather Diaphragm
28. Cup
29. Spring
30. Crankcase Breather Cover

## Disassembly of Cylinder Head

Prepare a clean, flat working surface on a workbench large enough to accommodate the cylinder head assembly. Discard all gaskets, O-rings and seals. Use new gaskets, O-rings and seals on reassembly of cylinder head.

**IMPORTANT**

*Mark all valve train components so they can be installed in their original locations.*

Note: Record all measurements taken during disassembly.

1. Drain coolant from engine into a suitable container. *See Drain, Flush and Refill Cooling System with New Coolant on page 5-34.*

**CAUTION**

**Identify all parts and their location using an appropriate method. It is important that all parts are returned to the same position during the reassembly process.**

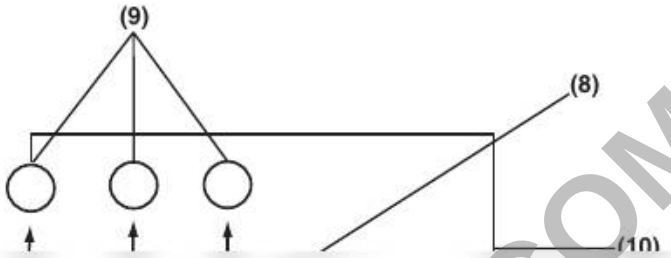
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2. Remove the coolant pump. *See Disassembly of Engine Coolant Pump on page 8-7.*
3. Remove the high-pressure fuel lines and fuel injectors from the cylinder head. *See Removal of Fuel Injectors on page 7-24.*

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## FUEL SYSTEM DIAGRAM




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## ELECTRIC WIRING

Note: The following wiring diagram is “representative” of a common installation using a Yanmar engine. The actual installation may be equipped with a variety of electrical components and wiring harnesses. Contact the machine manufacturer for specific information.




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## 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 TNV 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 (the word "DANGER" is in white letters with a red rectangle behind it) – indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Danger is limited to the most extreme situations.**

0000001en

**⚠ WARNING**

**Warning (the word "WARNING" is in black letters with an orange rectangle behind it) – indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**

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**⚠ CAUTION**

**Caution (the word "CAUTION" is in black letters with a yellow rectangle behind it) – indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.**

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**CAUTION**

**Caution without the safety alert symbol indicates a potentially hazardous situation that can cause damage to the machine, personal property and / or the environment or cause the machine to operate improperly.**

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11. Remove the bearing inserts **(Figure 6-53, (2))**.
12. Remove the compression rings **(Figure 6-53, (3))** from the piston using a piston ring expander.
13. Remove the oil ring **(Figure 6-53, (4))** from the piston using a piston ring expander.

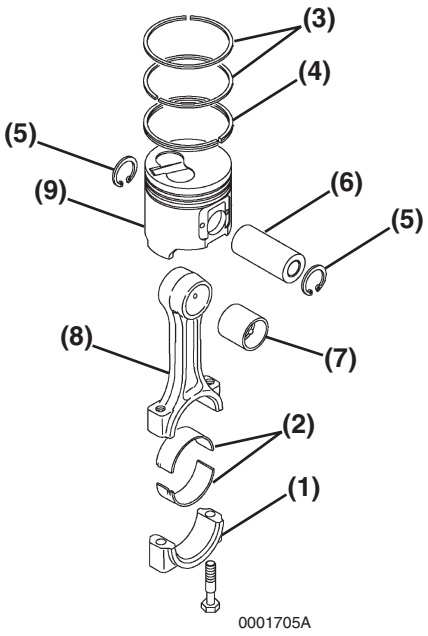



*Figure 6-53*

14. Remove the circlips **(Figure 6-53, (5))** from the wrist pin.
15. Remove the wrist pin **(Figure 6-53, (6))** and connecting rod **(Figure 6-53, (8))** from the piston **(Figure 6-53, (9))**.
16. Repeat steps until all pistons are removed and dissembled.

## Removal of Crankshaft

1. Remove the flywheel **(Figure 6-54, (1))** from the crankshaft.
2. Remove the bolts from the flywheel housing assembly **(Figure 6-54, (2-3))**. Remove the flywheel housing from the engine.

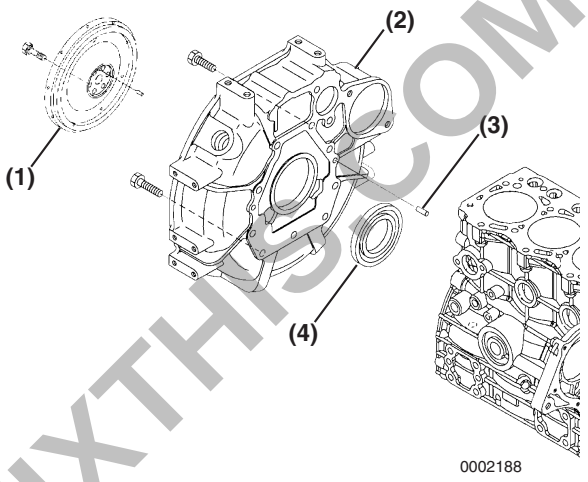



*Figure 6-54*

3. Before removing the main bearing caps, measure the crankshaft end play. Use either of the following two methods:
   - **Method A:** Install a dial gauge **(Figure 6-55, (1))** on the cylinder block. Move the crankshaft **(Figure 6-55, (2))** back and forth to measure the end play. Record the measurement.

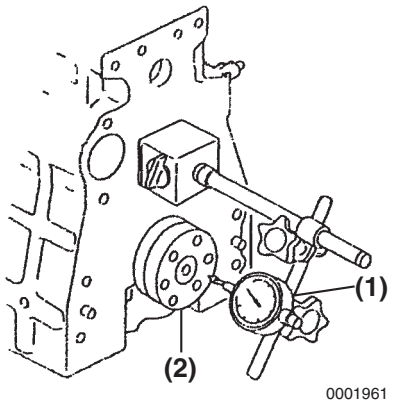



*Figure 6-55*

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