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***Yanmar Limited Warranty - Continued***

## What is Not Covered by this Warranty?

This Warranty does not cover parts affected by or damaged by, 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 nozzles, lubricants and cleaning fluids.

## 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.

# Customer Registration

**Customer registration is very important for the original retail purchaser to enable Yanmar to provide the best support for your engine.**

At the time of purchase, Yanmar highly recommends registering the customer’s information through website http://www.yanmar.co.jp as soon as possible.

*If it is not possible to access the website, please contact the nearest authorized Yanmar industrial engine dealer or distributor.*

# SAFETY PRECAUTIONS

## Before You Operate

**CAUTION**

**NEVER permit anyone to operate the engine or driven machine without proper training.**

- **Read and understand this Operation Manual before you operate 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.**

0000002en

## During Operation and Maintenance

**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.**
- **Securely tighten the radiator cap after you check the radiator. Steam can spurt out during engine operation if the cap is loose.**
- **ALWAYS check the level of engine coolant by observing the reserve tank.**
- **Failure to comply will result in death or serious injury.**

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**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.**
- **Failure to comply will result in death or serious injury.**

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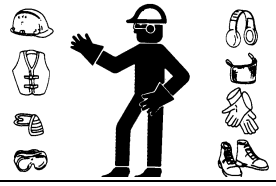
**⚠ WARNING**



**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 long hair back 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 warning signals.
- Failure to comply could result in death or serious injury.

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**⚠ 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 contact with the skin and / or eyes should occur, flush with a large amount of water and obtain prompt medical treatment.
- Failure to comply could result in death or serious injury.

0000007en

**⚠ WARNING**

**HIGH PRESSURE HAZARD!**

- Avoid skin contact with 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.

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## COMPONENT IDENTIFICATION

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

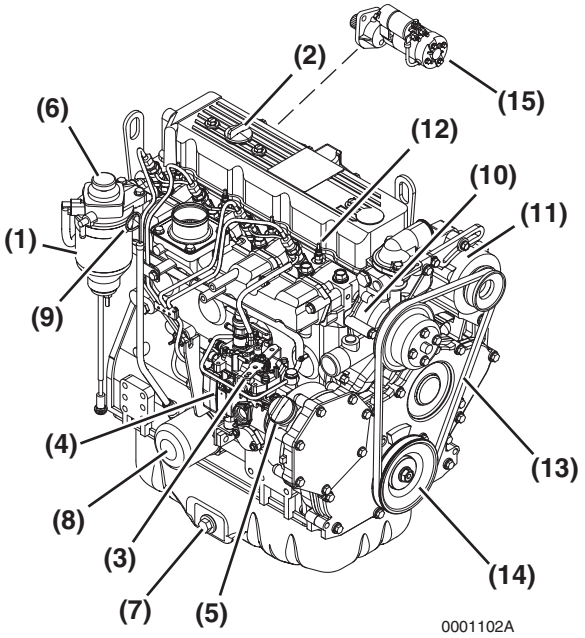



***Figure 4-1***

1. Fuel Filter / Water Separator
2. Top Filler Port (Engine Oil)
3. Governor Lever
4. Fuel Injection Pump
5. Side Filler Port (Engine Oil)
6. Fuel Priming Pump
7. Drain Plug (Engine Oil)
8. Engine Oil Filter
9. Dipstick (Engine Oil)
10. Engine Coolant Pump
11. Alternator
12. Glow Plug
13. V-Belt
14. Crankshaft V-Pulley
15. Starter Motor

## LOCATION OF LABELS

**Figure 4-2** shows the location of regulatory and safety labels on Yanmar TNE series engines.

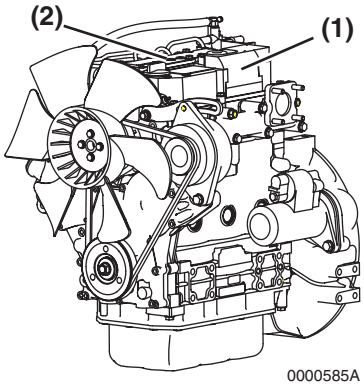
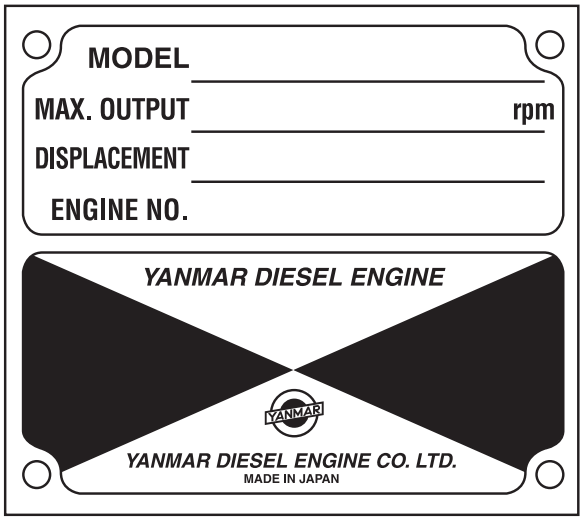



***Figure 4-2***

The typical location of the emission control information label is shown **(Figure 4-2, (1))**.

Typical location of the engine nameplate is shown **(Figure 4-2, (2))**.

***Engine Nameplate (Typical)***

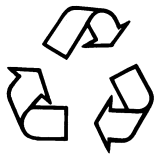


## 4TNE92-NMHA

| | | |
|---|---|---|
| Engine Model | 4TNE92-NMHA | |
| Version | VM | |
| Type | Vertical Inline Diesel Engine | |
| Combustion System | Indirect Injection | |
| Aspiration | Natural | |
| No. of Cylinders | 4 | |
| Bore × Stroke | 3.62 x 3.94 in (92 × 100 mm) | |
| Displacement | 162.3 cu in (2.659 L) | |
| Max. Rated Output (Net) | rpm ($min^{-1}$) | 2050 |
| | hp SAE | 39.0 |
| | kW | 29.1 |
| | PS | 39.6 |
| High Idle Speed (Bare Engine) | 2450 ± 25 rpm | |
| Low Idle Speed (Bare Engine) | 850 ± 25 rpm | |
| Engine Weight (Dry)* | 491.6 lb (194 kg) | |
| PTO Position | Flywheel Side | |
| Direction of Rotation | Counterclockwise Viewed From Flywheel Side | |
| Cooling System | Liquid-Cooled With Radiator | |
| Lubricating System | Forced Lubrication With Trochoid Pump<br>At normal operating speeds, oil pressure is: 42 - 57 psi (0.29 - 0.39 MPa; 3.0 - 4.0 $kgf/cm^2$)<br>At idle, oil pressure is: No less than 8.5 psi (0.06 MPa; 0.6 $kgf/cm^2$) | |
| Starting System | Electric Starting - Starter Motor: DC12V, 3.1 hp (2.3 kW) | |
| | Alternator: DC12V, 60A | |
| | Recommended Battery Capacity: 12V, 622 CCA (Cold Cranking Amps) | |
| Dimensions (L × W × H)* | 24.9 x 19.6 x 26.6 in<br>(632 x 498 x 676 mm) | |
| Engine Oil Pan Capacity | 9.7 / 7.6 qt (9.2 / 7.2 L)<br>(Dipstick Upper Limit / Lower Limit) | |
| Engine Coolant Capacity | 1.11 gal (4.2 L) Engine Only | |

* Engine Specifications Without Cooling Fan, Radiator, Muffler, and Air Cleaner.

**CAUTION**



**Be environmentally responsible. Follow these procedures for hazardous waste disposal. Failure to follow these procedures may seriously harm the environment.**

- **Follow the guidelines of the EPA or other governmental agency 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.**

0000013en

**CAUTION**

**Protect the air cleaner, turbocharger (if equipped) and electric components from damage when you use steam or use high-pressure water to clean the engine.**

0000014en

**CAUTION**

- **NEVER overfill the engine with engine oil.**
- **ALWAYS keep the oil level between upper and lower lines on the dipstick.**

0000015en

**CAUTION**

**NEVER use high pressure water or compressed air at greater than 28 psi or a wire brush to clean the radiator fins. Radiator fins damage easily.**

0000016en

**CAUTION**

**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.**

0000017en

**CAUTION**

**If the fuel filter / water separator is positioned higher than the fuel level in the fuel tank, water may not drip out when the fuel filter / water separator drain cock is opened. If this happens, turn the air vent screw on the top of the fuel filter / water separator 2-3 turns counterclockwise.**

**Be sure to tighten the air vent screw after the water has drained out.**

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**CAUTION**

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

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5. Install the new V-belt. Refer to the table for proper tension.

| New V-belt Tension | | |
|---|---|---|
| **A** | **B** | **C** |
| 5/16 ~7/16 in (8~12 mm) | 3/16 ~5/16 in (5~8 mm) | 1/4 ~7/16 in (7~11 mm) |

6. After adjusting, run the engine for 5 minutes or more. Check the tension again using the specifications for a used V-belt.

| Used V-belt Tension | | |
|---|---|---|
| **A** | **B** | **C** |
| 3/8 ~1/2 in (10~14 mm) | 1/4 ~3/8 in (7~10 mm) | 5/16 ~1/2 in (9~13 mm) |

## Check Battery

**DANGER**

**EXPLOSION HAZARD!**

- **NEVER check the remaining battery charge by shorting out the terminals. 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.**

0000007en

**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 contact with the skin and / or eyes should occur, flush with a large amount of water and obtain prompt medical treatment.**
- **Failure to comply could result in death or serious injury.**

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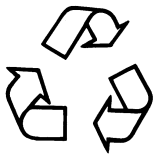
**CAUTION**

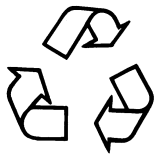


**Be environmentally responsible. Follow these procedures for hazardous waste disposal. Failure to follow these procedures may seriously harm the environment.**

- **Follow the guidelines of the EPA or other governmental agency 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.**

0000013en

**CAUTION**



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- **NEVER dispose of hazardous materials irresponsibly by dumping them into a sewer, on the ground or into ground water or waterways.**

0000013en

**CAUTION**

**For maximum engine life, Yanmar recommends that when shutting the engine down, you allow the engine to idle, without load, for 5 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.**

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Replace the fuel filter at specified intervals to prevent contaminants from adversely affecting the diesel fuel flow.

1. Stop the engine and allow it to cool.
2. Close all fuel cocks in fuel line.
3. Disconnect the fuel filter sensor connector **(Figure 5-14, (1))**.

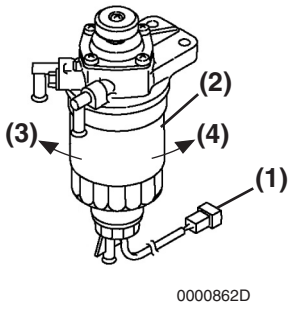


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***Figure 5-14***

4. Place an approved container under fuel filter.
5. Carefully open the drain plug **(Figure 5-15, (1))** to drain fuel from the fuel filter.
6. Remove the fuel filter **(Figure 5-14, (2))** by turning it to the left **(Figure 5-14, (3))**. Wipe up all spilled fuel.
7. Remove the drain plug **(Figure 5-15, (1))** from the fuel filter **(Figure 5-15, (2))** by turning it to the left **(Figure 5-15, (3))**.
8. Check the condition of the drain plug O-ring **(Figure 5-15, (4))**. Replace the O-ring if damaged.

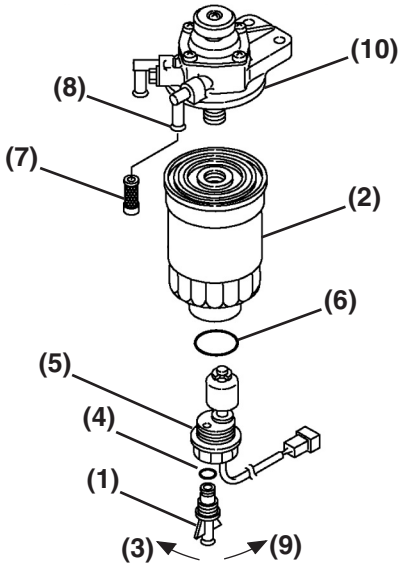


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***Figure 5-15***

9. Set the drain plug aside for reinstallation.

# Gear Train and Camshaft

## Camshaft

| Inspection Item | | | Standard | Limit | Reference Page |
|---|---|---|---|---|---|
| Side Gap | | | 0.0020 - 0.0079 in (0.05 - 0.20 mm) | 0.0118 in (0.30 mm) | *See Removal of Camshaft on page 6-39* |
| Bending (1/2 the Dial Gauge Reading) | | | 0 - 0.0008 in (0 - 0.02 mm) | 0.0020 in (0.05 mm) | *See Inspection of Camshaft on page 6-46* |
| Cam Height | | | 1.6707 - 1.6758 in (42.435 - 42.565 mm) | 1.6608 in (42.185 mm) | |
| Camshaft Oil Clearance | Gear End | Bushing Inside Diameter | 1.9681 - 1.9707 in (49.990 - 50.055 mm) | 1.9736 in (50.130 mm) | |
| | | Camshaft Outside Diameter | 1.9656 - 1.9665 in (49.925 - 49.950 mm) | 1.9642 in (49.890 mm) | |
| | | Oil Clearance | 0.0016 - 0.0051 in (0.04 - 0.130 mm) | 0.0094 in (0.240 mm) | |
| | Intermediate | Bushing Inside Diameter | 1.9685 - 1.9695 in (50.000 - 50.025 mm) | 1.9724 in (50.100 mm) | |
| | | Camshaft Outside Diameter | 1.9650 - 1.9659 in (49.910 - 49.935 mm) | 1.9636 in (49.875 mm) | |
| | | Oil Clearance | 0.0026 - 0.0045 in (0.065 - 0.115 mm) | 0.0089 in (0.225 mm) | |
| | Flywheel End | Bushing Inside Diameter | 1.9685 - 1.9695 in (50.000 - 50.025 mm) | 1.9724 in (50.100 mm) | |
| | | Camshaft Outside Diameter | 1.9656 - 1.9665 in (49.925 - 49.950 mm) | 1.9642 in (49.890 mm) | |
| | | Oil Clearance | 0.0020 - 0.0039 in (0.050 - 0.100 mm) | 0.0083 in (0.210 mm) | |

## Idler Gear Shaft and Bushing

| Inspection Item | Standard | Limit | Reference Page |
|---|---|---|---|
| Shaft Outside Diameter | 1.8091 - 1.9675 in (45.950 - 49.975 mm) | 1.8071 in (45.900 mm) | *See Inspection of Idler Gear and Shaft on page 6-47* |
| Bushing Inside Diameter | 1.8110 - 1.8120 in (46.000 - 46.025 mm) | 1.8140 in (46.075 mm) | |
| Clearance | 0.0010 - 0.0030 in (0.025 - 0.075 mm) | 0.0069 in (0.175 mm) | |

### *Valve Stem Straightness*

Place the valve stem on a flat inspection block or layout bed. Roll the valve until a gap can be observed between a portion of the valve stem and the surface of the block or bed. Use a feeler gauge to measure the gap **(Figure 6-18)**. *See Intake / Exhaust Valve and Guide on page 6-5* for *the service limit.*

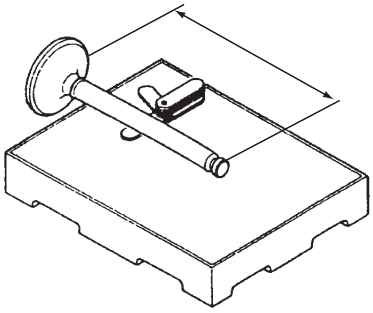

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***Figure 6-18***

### *Valve Sink*

Insert the valves into their proper places and press them down until they are fully seated. Use a depth micrometer **(Figure 6-19)** to measure the difference between the cylinder head surface and the combustion surface of each exhaust and intake valve **(Figure 6-20)**. *See Cylinder Head on page 6-5 for the service limit.*

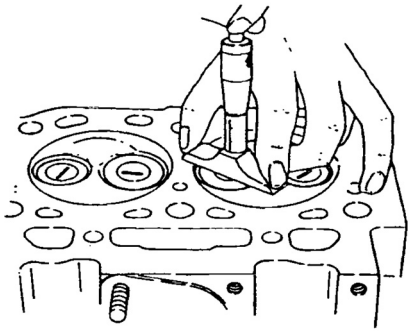

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***Figure 6-19***

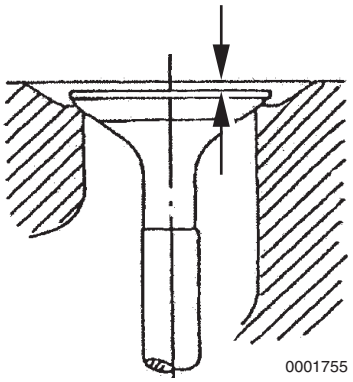

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***Figure 6-20***

### *Valve Seat*

Always check the clearance between the valve and valve guide before correcting the valve seat **(Figure 6-21, (1))**. If the clearance exceeds the limit, replace the valve or valve guide to bring the clearance within the limit.

Roughness, or burrs will cause poor seating of a valve. Visually inspect the seating of each valve and determine if lapping or grinding is needed. Grinding is needed if the cylinder head's seat width exceeds standard limits. *See Cylinder Head on page 6-5 for the service limit.*

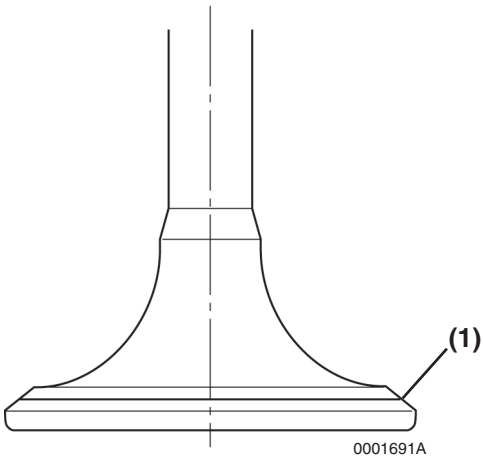


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***Figure 6-21***

Lap the valve seat and cylinder head with a mixture of valve compound and engine oil.

- Maintain the up-and-down motion for thirty to forty seconds.
- When the honing is completed, wash the cylinder block with hot water and soap. Use brushes to clean all passages and crevices. Rinse with hot water and blow dry with compressed air. Apply engine oil to all steel surfaces to prevent rusting.

## Assembly of Drive Train and Camshaft Components

Notes:

- Proceed slowly. Make no forced assemblies unless a pressing operation is called for. All parts must be perfectly clean and lightly lubricated when assembled.
- Use new gaskets, seals and O-rings during assembly.

### Assembly of Pistons

1. Select the parts needed to assemble the piston and connecting rod for the No.1 cylinder.
2. Lubricate and insert the wrist pin bushing **(Figure 6-70, (1))** into the small end of the piston rod.

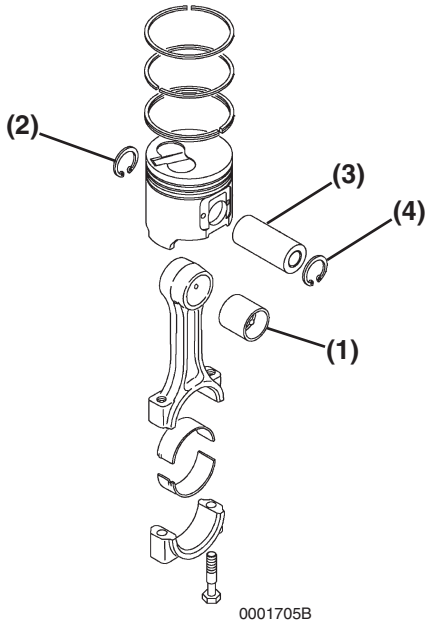


***Figure 6-70***

3. Install one circlip **(Figure 6-70, (2))** into the piston.
4. Position the connecting rod into the piston under the skirt. The match marks on the connecting rod must be opposite of the piston identification mark (ID) on the top of the piston.

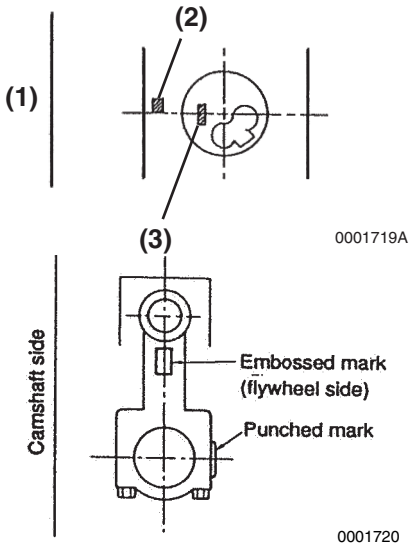


***Figure 6-71***

5. Lubricate and install the piston wrist pin **(Figure 6-70, (3))** through the piston and wrist pin bushing.
6. Install the second circlip **(Figure 6-70, (4))**.
7. Install the piston rings:
   - Use piston ring pliers to install the piston rings.
   - Install each piston ring on the piston with the punched manufacturer's mark **(Figure 6-72, (1))** facing upward.

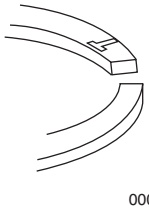


***Figure 6-72***

- Install the top compression ring, second compression ring and oil ring.

This section of the *Service Manual* describes the theory of operation of the fuel injection pump, the procedures necessary to remove and install the fuel injection pump and the procedures for inspecting and testing the fuel injectors.

**⚠ WARNING**

**SEVER 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.**

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**⚠ WARNING**

**SUDDEN MOVEMENT HAZARD!**

- **Allow the engine to warm-up for at least 5 minutes to allow the engine idle speed to return to normal before engaging the transmission or any PTO attachments. Engaging the transmission or PTO at an elevated engine speed could result in an unexpected movement of the equipment.**
- **Failure to comply could result in death or serious injury.**

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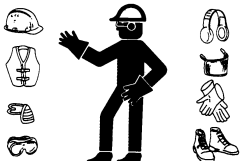
**⚠ WARNING**



**EXPOSURE HAZARD!**

- **Always read and follow safety related precautions found on containers of hazardous substances like parts cleaners, primers, sealants, and sealant removers.**
- **Failure to comply could result in death or serious injury.**

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**⚠ CAUTION**

**FLYING OBJECT HAZARD!**

- **ALWAYS wear eye protection when servicing 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.**

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# ALL -SPEED GOVERNOR

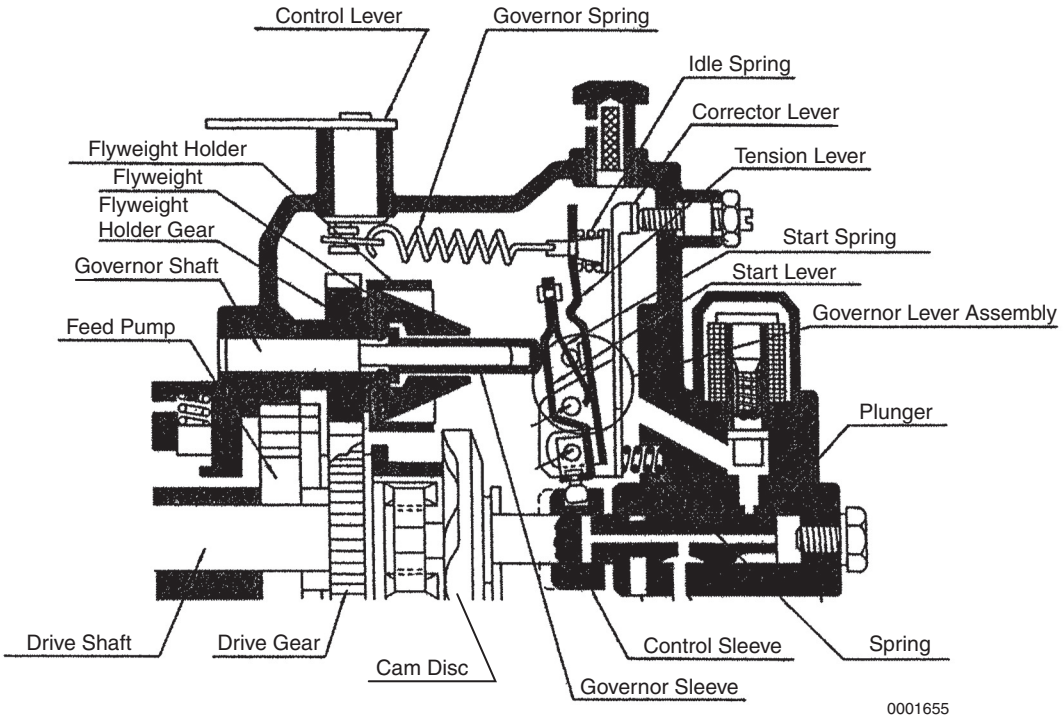


***Figure 7-22***

**Figure 7-22** shows the composition of the all-speed governor.

Revolution of the shaft is transferred to the flyweight holder acceleration gear via the drive gear to turn the flyweight holder.

The flyweight holder is supported by the governor shaft. There are four flyweights in the holder which are installed in such a way that they open outwardly by means of centrifugal force.

The flyweight movement presses the governor sleeve and presses the governor lever assembly to the right. The governor lever assembly mainly consists of the corrector leer, tension lever and start lever. Corrector lever fulcrum M, is fixed by the pivot bolt of the pump housing. Furthermore, the corrector lever cannot move since it is pressed both by the spring at the bottom and the full load adjusting screw at the top. The tension and start levers move around shaft $M_2$ as the fulcrum fixed on the corrector lever.

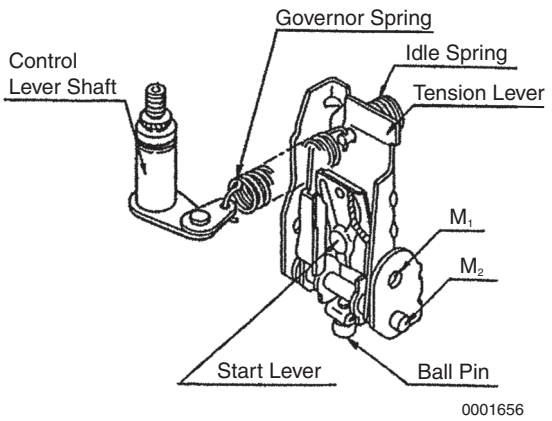


***Figure 7-23***

The start spring presses the start lever into the governor sleeve at engine start. The start lever turns counterclockwise around fulcrum $M_2$ to move the control sleeve to the start offset position.

This section of the *Service Manual* describes the procedures necessary to service the engine coolant pump.

**⚠ 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.**
- **Securely tighten the radiator cap after you check the radiator. Steam can spurt out during engine operation if the cap is loose.**
- **ALWAYS check the level of engine coolant by observing the reserve tank.**
- **Failure to comply will result in death or serious injury.**

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**⚠ 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.**

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**⚠ WARNING**

**SEVER 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.**

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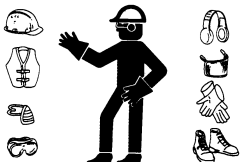
**⚠ WARNING**



**EXPOSURE HAZARD!**

- **Always read and follow safety related precautions found on containers of hazardous substances like parts cleaners, primers, sealants, and sealant removers.**
- **Failure to comply could result in death or serious injury.**

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