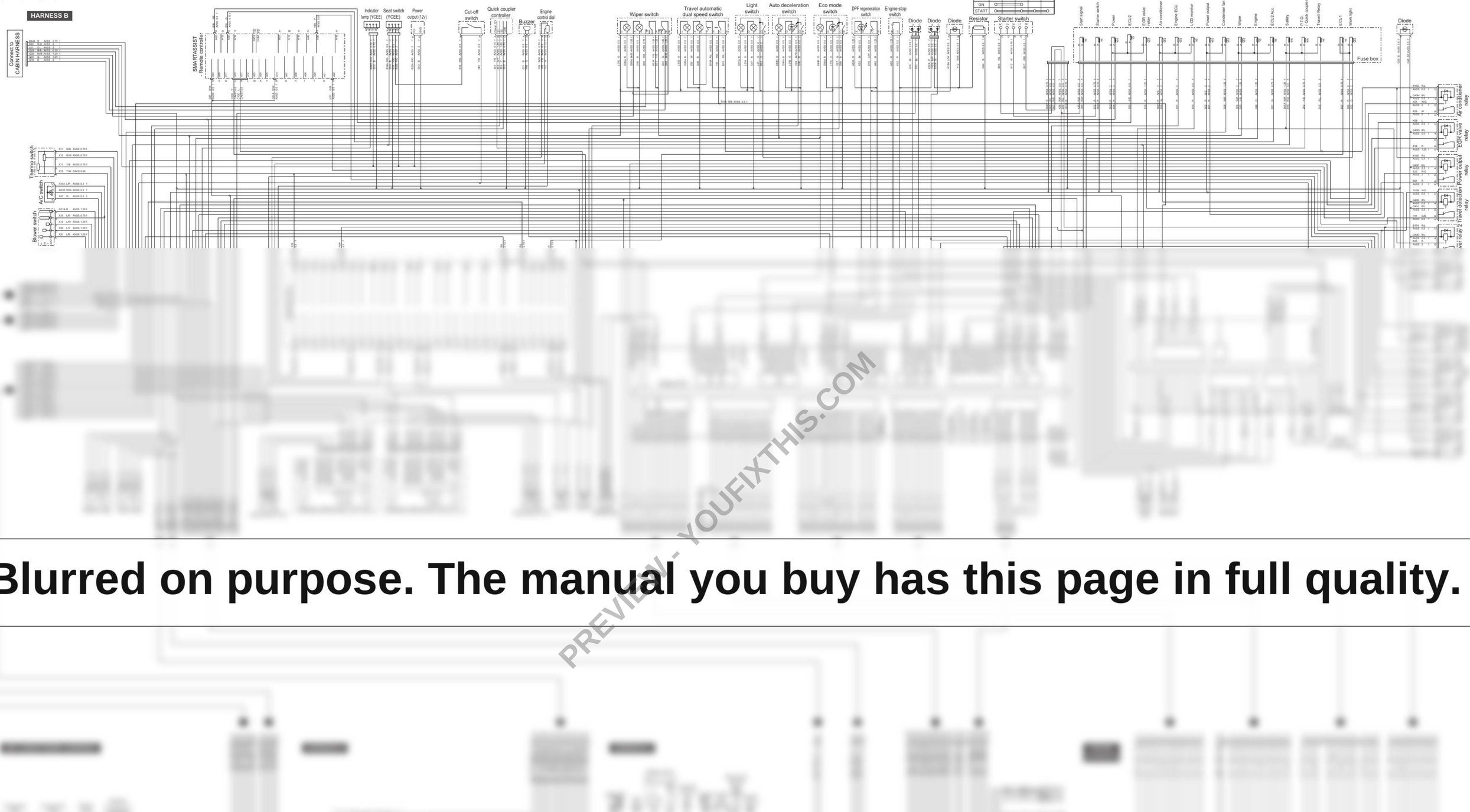
APPENDIX
ViO80-1A(YCEE) Wiring Diagram




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# 6. HYDRAULIC SYSTEM

## 6. Hydraulic System

### 6-1 Outline

The hydraulic system consists of an engine, variable displacement piston pumps, a control valve, a boom cylinder, an arm cylinder, a bucket cylinder, a boom swing cylinder, a blade cylinder, a swing motor, a swivel joint, two travel motors and a hydraulic oil tank. The oil discharged from the piston pumps flow to the actuators through the control valve.

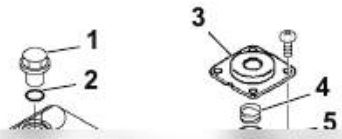
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### 4-2-4 Cylinder Head

## Cylinder Head Components




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# 3. SERVICING STANDARDS

## 3-7 List of Tightening Torque

### 3-7-1 Machine

| Applicable model | | | ViO80-1A | | |
|---|---|---|---|---|---|
| Equipment | | | Thread size | Tightening torque ft•lbf (N•m) | Adhesive |
| | No | Tightening part | | | |
| Engine / Electrical equipment | | | | | |

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**Error Code List**

| Error code | Classification | Error description | Detection condition | Causes | Corrective measures |
|---|---|---|---|---|---|
| 00 000051.03 | Caution | Intake throttle position sensor malfunction: High voltage | The sensor voltage is higher than 4.8 V when the engine is not cranking. | 1. Improper connector engagement, 2. Faulty wire harness, 3. Intake throttle position sensor failure, 4. Engine ECU internal circuit failure | Check the connector, wire harness, intake throttle position sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again. |
| 00 000051.04 | Caution | Intake throttle position sensor malfunction: Low voltage | The sensor voltage is lower than 0.2 V when the engine is not cranking. | 1. Improper connector engagement, 2. Faulty wire harness, 3. Intake throttle position sensor failure, 4. Engine ECU internal circuit failure | Check the connector, wire harness, intake throttle position sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again. |
| 00 000091.03 | Caution | Accelerator sensor malfunction: High voltage | The sensor voltage is higher than 4.6 V. | 1. Improper connector engagement, 2. Faulty wire harness, 3. Accelerator sensor failure, 4. Engine ECU internal circuit failure | Check the connector, wire harness, accelerator sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again. |
| 00 000091.04 | Caution | Accelerator sensor malfunction: Low voltage | The sensor voltage is lower than 0.2 V. | 1. Improper connector engagement, 2. Faulty wire harness (Sensor 5V disconnection or short to ground), 3. Accelerator sensor failure, 4. Engine ECU internal circuit failure | Check the connector, wire harness, accelerator sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again. |
| 00 000100.01 | Warning | Low engine oil pressure alarm | After the engine starts, the engine oil pressure switch stays on for a specific period of time at an engine speed of 600 $min^{-1}$ or more and at a battery voltage of 9V or more. | 1. Low engine oil pressure, 2. Engine lubrication system failure, 3. Faulty wire harness (Engine oil pressure switch wire short to ground), 4. Engine oil pressure switch failure (Short to ground on a wire inside the engine oil pressure switch), 5. Engine ECU internal circuit failure | Check the amount of engine oil, engine lubrication system, wire harness, engine oil pressure switch and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again. |
| 00 000100.04 | Warning | Engine oil pressure switch disconnection | Before the engine starts with the starter switch in the "ON" position, the engine oil pressure switch stays off for one second at a battery voltage of 9 V or more. | 1. Improper connector engagement, 2. Faulty wire harness (Engine oil pressure switch wire disconnection or short to power), 3. Engine oil pressure switch failure (Wire disconnection or short to power on a wire inside the engine oil pressure switch), 4. Engine ECU internal circuit failure | Check the connector, wire harness, engine oil pressure switch and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again. |
| 00 000102.03 | Warning | EGR low pressure-side sensor malfunction: High voltage | The sensor voltage is higher than 4.8 V when the engine is not cranking. | 1. Improper connector engagement, 2. Faulty wire harness (Sensor signal wire short to ground), 3. EGR pressure sensor failure (Improper sensor output due to short to ground on a wire inside the EGR pressure sensor), 4. Engine ECU internal circuit failure | Check the connector, wire harness, EGR pressure sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again. |
| 00 000102.04 | Warning | EGR low pressure-side sensor malfunction: Low voltage | The sensor voltage is lower than 0.2 V when the engine is not cranking. | 1. Improper connector engagement, 2. Faulty wire harness, 3. EGR pressure sensor failure, 4. Engine ECU internal circuit failure | Check the connector, wire harness, EGR pressure sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again. |
| 00 000102.13 | Warning | EGR low pressure-side sensor malfunction: Abnormal learning value | The final offset value for the intake manifold pressure is lower than the threshold value or higher than the threshold value. | 1. Improper connector engagement, 2. Faulty wire harness, 3. EGR pressure sensor failure, 4. Engine ECU internal circuit failure | Check the connector, wire harness, EGR pressure sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again. |
| 00 000105.03 | Warning | Intake manifold temperature sensor malfunction: High voltage | The sensor voltage is higher than 4.8 V when the engine is not cranking. | 1. Improper connector engagement, 2. Faulty wire harness, 3. Intake manifold temperature sensor failure, 4. Engine ECU internal circuit failure | Check the connector, wire harness, intake manifold temperature sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again. |
| 00 000105.04 | Warning | Intake manifold temperature sensor malfunction: Low voltage | The sensor voltage is lower than 0.2 V when the engine is not cranking. | 1. Improper connector engagement, 2. Faulty wire harness, 3. Intake manifold temperature sensor failure, 4. Engine ECU internal circuit failure | Check the connector, wire harness, intake manifold temperature sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again. |
| 00 000108.03 | Caution | Atmospheric pressure sensor malfunction: High voltage | The sensor voltage is higher than 4.8 V when the engine is not cranking. | 1. Failure of atmospheric pressure sensor inside engine ECU, 2. Engine ECU internal circuit failure | Check the atmospheric pressure sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again. |
| 00 000108.04 | Caution | Atmospheric pressure sensor malfunction: Low voltage | The sensor voltage is lower than 0.2 V when the engine is not cranking. | 1. Failure of atmospheric pressure sensor inside engine ECU, 2. Engine ECU internal circuit failure | Check the atmospheric pressure sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again. |
| 00 000108.10 | Caution | Abnormal atmospheric pressure sensor characteristics | The final offset values for both the intake manifold pressure and the exhaust manifold pressure remain at 5 kPa or higher for 600 ms. | 1. Failure of atmospheric pressure sensor inside engine ECU, 2. Engine ECU internal circuit failure, 3. Abnormal characteristics of both EGR high pressure-side and low pressure-side sensors, 4. Obstruction due to foreign matter in the sensor area or frozen sensor | Check the atmospheric pressure sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again. |
| 00 000110.00 | Warning | Abnormally-high coolant temperature (Overheating) | 60 seconds after the engine starts, the coolant temperature remains at 110°C or higher for 20 seconds. | 1. Engine overheating, 2. Insufficient engine coolant, 3. Engine cooling system failure, 4. Coolant temperature sensor system failure | Check the amount of engine coolant, engine cooling system and coolant temperature sensor system. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again. |

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# 1. GENERAL CAUTIONS FOR MAINTENANCE WORK

## 1-10 Air Release of Hydraulic Equipment

When operating the machine after disassembly or parts replacement of the hydraulic equipment, piping, etc., be sure to release air from the hydraulic system. This is necessary to prevent seizure and cavitation of the hydraulic equipment. If the air is left in the hydraulic system, the air is compressed or expanded depending on the load, having an adverse effect on the smooth operation of the hydraulic equipment and shortening the service life.

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# 5. ELECTRIC SYSTEM

## 5-2 Circuit Description of Engine Start and Stop

### 1. Engine Start

Starter switch is in "OFF" position.

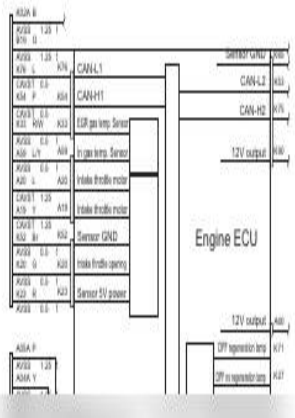
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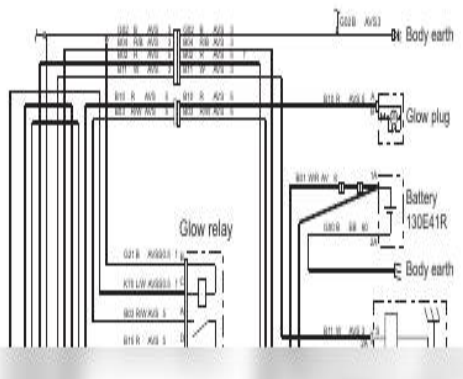
Engine ECU is supplied with electric current.

↓

Starter switch **30** is always supplied with electric current from battery.
(Battery - Slow blow fuse 100A - Fuse 5A - Starter switch **30**)

Engine ECU **K1**, **K3** and **K5** are also always supplied with electric current from battery.




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# 8. TROUBLESHOOTING

## 8-2 Quick Reference Table for Troubleshooting

The following table summarizes the general trouble symptoms and their causes.
If any trouble symptom occurs, take corrective action before it becomes a serious problem.

Trouble symptoms are shown in columns and their causes are shown in rows.

Whether boxes where the column and rows intersect are marked with a circle should be checked.

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# 2. TECHNICAL DATA

## 2. Technical Data

### 2-1 Specifications

| Item | Unit | ViO80-1A |
|---|---|---|
| Main specifications of machine | | |
| Dimensions | | |
| Overall length (Transportation position) | in. (mm) | 252.4 (6410) |

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## 2-6 Periodic Inspection and Servicing

◇ : Check ○ : Supply ● : Replace □ : Adjust (clean) ■ : Oil & grease

| Check & service items | | | Daily | Every 50 hrs | Every 100 hrs | Every 250 hrs | Every 500 hrs | Every 1000 hrs | Every 1500 hrs | Every 2000 hrs | Every 3000 hrs |
|---|---|---|---|---|---|---|---|---|---|---|---|
| General | Check falling off, breakage of parts | | ◇ | | | | | | | | |
| | Check loosened bolts & nuts, retighten | | ◇ | | | | | | | | |
| | Check engine condition | | ◇ | | | | | | | | |
| | Clean | | □ | | | | | | | | |
| Fuel oil | Check & supply of oil to the tank | | ◇(○) | | | | | | | | |
| | Drain the fuel tank | | | □ | | | | | | | |
| | Water separator | Check, drain | ◇ | | | | | | | | |
| | | Clean | | □ | | | | | | | |
| | Replace the fuel filter element | | | | | | ● | | | | |
| Lube oil | Engine oil | Check, resupply | ◇ | | | | | | | | |
| | | Replace | | ● 1st time | | ● | | | | | |
| | Replace the engine oil filter element | | | ● 1st time | | ● | | | | | |
| | Travel reduction gear oil | Check, resupply | | | | ○ | | | | | |
| | | Replace | | | ● 1st time | | | ● | | | |
| Cooling water | Check & supply of cooling water | | ◇ | | | | | | | | |
| | Check cooling water leakage | | ◇ | | | | | | | | |
| | Check & clean radiator fins | | | | | □ | | | | | |
| | Check & adjust the fan-belt tension | | ◇ | ◇ 1st time | | ◇ | | | | | |
| | Clean & check the cooling water system, and replace the cooling water | | | | | | | ● within one year | | | |
| Rubber hose | Check & replace fuel oil pipe, cooling water pipe | | ◇ | | | | | | | ● | |
| Air cleaner | Clean air cleaner | | | | | □ | | | | | |
| | Replace air cleaner element | | | | | | ● | | | | |
| Hydraulic system | Hydraulic oil | Check, resupply | ◇ | | | | | | | | |
| | | Replace | | | | | | ● | | | |
| | Clean suction filter | | | | | □ 1st time | | □ | | | |
| | Replace return filter | | | | | ● 1st time | ● | | | | |
| | Replace line filter | | | | | | | ● | | | |
| | Check for abnormality of hydraulic pump | | ◇ | | | | | | | | |
| | Check function of accumulator | | | | | | | | | ◇ | |
| Grease | Check grease-up positions, grease | | ■ | | | | | | | | |
| | Greasing the swing gears and the swing bearings | | | ■ | | | | | | | |
| Undercar-riage | Check, adjust track tension | | ◇ | | | | | | | | |

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## GENERAL CAUTIONS FOR MAINTENANCE WORK


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# 4. Engine

## 4-1 Safety

### 4-1-1 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 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.

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## CHAPTER 4
## ENGINE

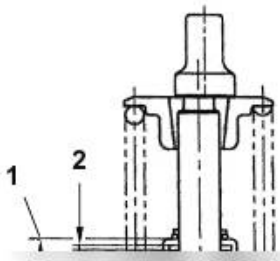
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| Applicable model | | | | 4TNV98C-WBV | |
|---|---|---|---|---|---|
| Item | | | Unit | Standard | Allowable limit |
| Cam shaft and timing gear train | | | | | |
| Cam shaft | End play | | in. (mm) | 0.0020 to 0.0079 (0.05 to 0.20) | 0.0118 (0.030) |
| | Bend (1/2 the dial gauge reading) | | in. (mm) | 0 to 0.0008 (0 to 0.02) | 0.0020 (0.05) |
| | Cam lobe height | | in. (mm) | 1.6707 to 1.6758 (42.435 to 42.565) | 1.6608 (42.185) |
| | Gear end | Bush inside diameter | in. (mm) | 1.9681 to 1.9707 (49.990 to 50.055) | 1.9736 (50.130) |
| | | Cam shaft outside diameter | in. (mm) | 1.9655 to 1.9665 (49.925 to 49.950) | 1.9642 (49.890) |
| | | Oil clearance | in. (mm) | 0.0016 to 0.0051 (0.040 to 0.130) | 0.0094 (0.240) |
| | Intermediate | Bore inside diameter | in. (mm) | 1.9685 to 1.9695 (50.000 to 50.025) | 1.9724 (50.100) |
| | | Cam shaft outside diameter | in. (mm) | 1.9650 to 1.9659 (49.910 to 49.935) | 1.9636 (49.875) |
| | | Oil clearance | in. (mm) | 0.0026 to 0.0045 (0.065 to 0.115) | 0.0089 (0.225) |
| | Flywheel end | Bore inside diameter | in. (mm) | 1.9685 to 1.9695 (50.000 to 50.025) | 1.9724 (50.100) |
| | | Cam shaft outside diameter | in. (mm) | 1.9655 to 1.9665 (49.925 to 49.950) | 1.9642 (49.890) |
| | | Oil clearance | in. (mm) | 0.0020 to 0.0039 (0.50 to 0.100) | 0.0083 (0.210) |
| Idler gear shaft | Idler gear A | Shaft outside diameter | in. (mm) | 1.8091 to 1.8100 (45.950 to 45.975) | 1.8071 (45.900) |
| | | Bush inside diameter | in. (mm) | 1.8110 to 1.8120 (46.000 to 46.025) | 1.8140 (46.075) |
| | | Oil clearance | in. (mm) | 0.0010 to 0.0030 (0.025 to 0.075) | 0.0068 (0.175) |
| | Idler gear B | Shaft outside diameter | in. (mm) | 1.8091 to 1.8100 (45.950 to 45.975) | 1.8071 (45.900) |
| | | Bush inside diameter | in. (mm) | 1.8110 to 1.8120 (46.000 to 46.025) | 1.8140 (46.075) |
| | | Oil clearance | in. (mm) | 0.0010 to 0.0030 (0.025 to 0.075) | 0.0068 (0.175) |
| Timing gear backlash | | Crank gear, cam gear, idler gear, fuel injection pump drive gear and P.T.O. gear | in. (mm) | 0.0031 to 0.0055 (0.08 to 0.14) | 0.0063 (0.16) |

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### Reassembly of cylinder head

1. Carefully clean both the combustion surface of the cylinder head and the top surface of the cylinder block. Then place a new cylinder head gasket **(Figure 4-2-32, (2))** on the cylinder block.
2. Position the cylinder head on the cylinder head gasket.

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### 4-4-5 Engine Coolant System Check

Check the engine coolant system for leakage.

1. With the radiator properly filled, install a cooling system tester **(Figure 4-4-3, (1))**.

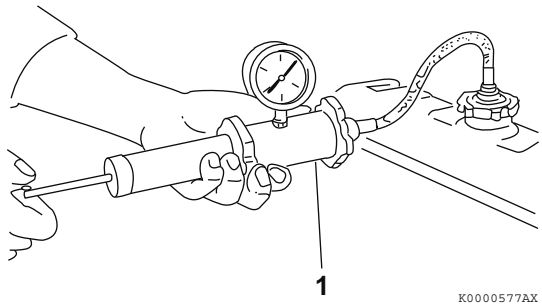



***Figure 4-4-3***

2. Apply 10.8 - 14.8 psi (75 - 105 kPa; 0.75 - 1.05 kgf/cm²) to the cooling system. If the pressure reading drops, the engine coolant system is leaking. Identify the source of the leak and repair it.

### 4-4-6 Engine Coolant Pump

## Removal of Engine Coolant Pump

Verify the condition of the engine coolant pump before disassembling it from the engine. Check the engine coolant pump shaft bearing for abnormal noise, sticking, excessive play and water leakage. Replace the coolant pump if any of these conditions are present.

**⚠ CAUTION**

**Pinch Hazard!**



**Carefully rotate the alternator toward the cylinder block while loosening the V-belt. Failure to comply may result in minor or moderate injury.**

***NOTICE***

If the engine coolant pump must be replaced, replace the engine coolant pump as an assembly only. Do not attempt to repair the engine coolant pump or replace individual components.

***NOTICE***

Make sure the engine and engine coolant are not hot.

---

1. Before removing the engine coolant pump or thermostat, it will be necessary to drain the engine coolant. Drain the coolant into a clean container if the coolant is to be reused. Otherwise, properly dispose of the coolant.
2. Remove the radiator cap **(Figure 4-4-4, (1))**.
3. Remove the drain plug or open the drain cock **(Figure 4-4-4, (1))** at the lower portion of the radiator and drain the coolant.

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## Fuel Temperature Sensor (equipped on supply pump)

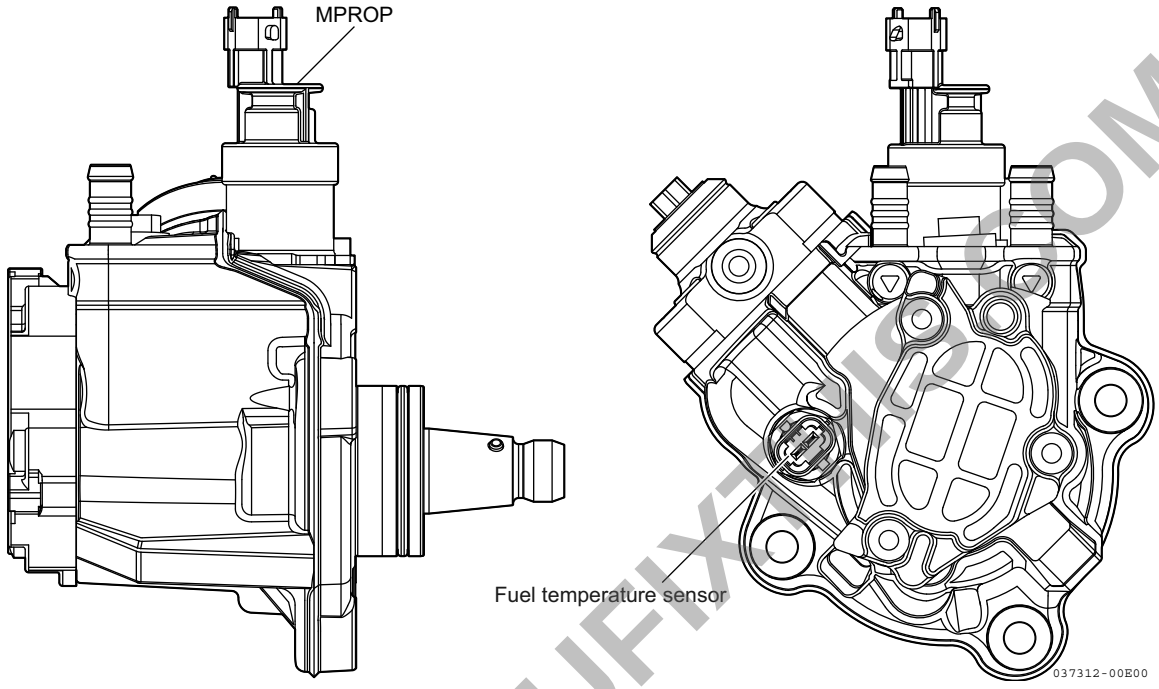



*Figure 4-8-21*

| | |
|---|---|
| Part No. | 129A00-51200 |
| Sensor installation tightening torque | 28 ± 2 N·m |

## Cooling Water Temperature Sensor

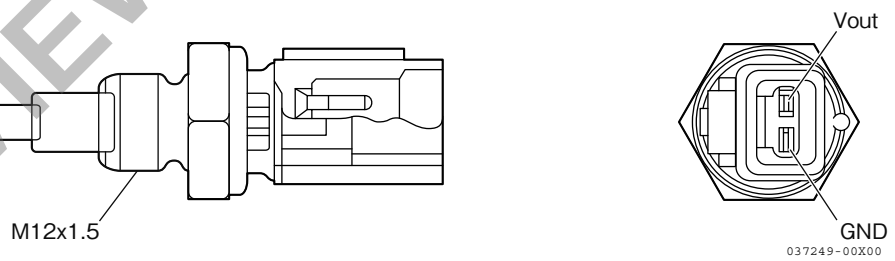



*Figure 4-8-22*

| | |
|---|---|
| Part No. | 129927-44900 |
| Sensor installation tightening torque | 22 ± 2 N·m |


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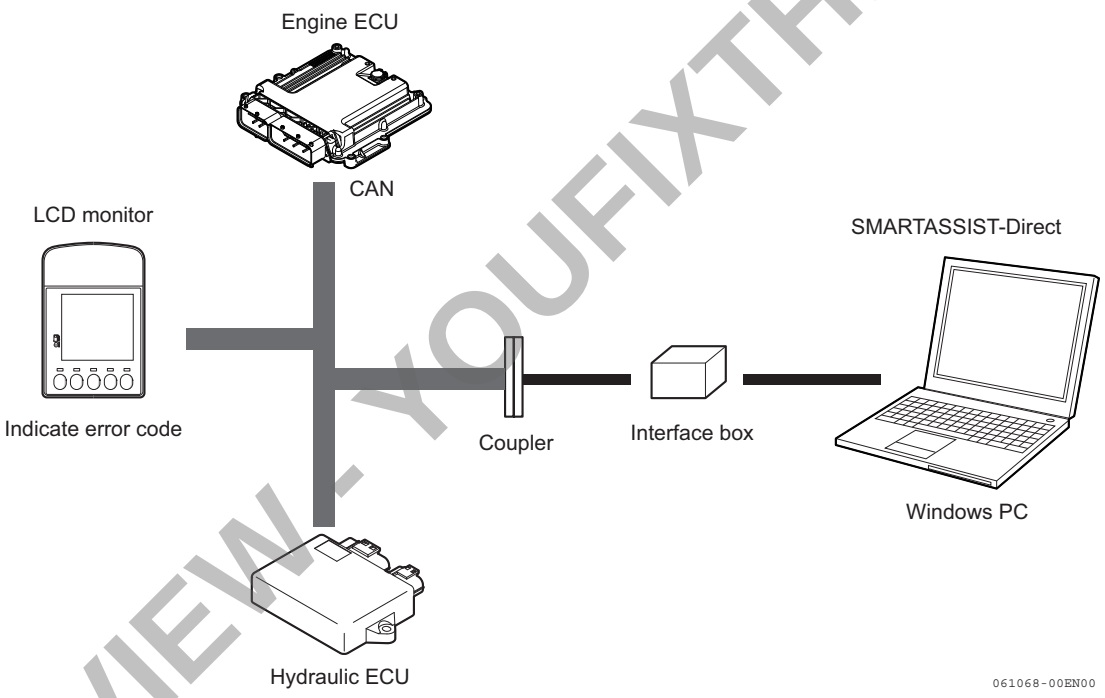
## 5-5 Error Code

The LCD monitor and the controllers including the engine ECU and hydraulic ECU are connected via CAN.
If the LCD monitor or any of the controllers detects an abnormality, an error code corresponding to the abnormality is displayed on the LCD monitor. For detailed description of error codes, refer to the error code list.

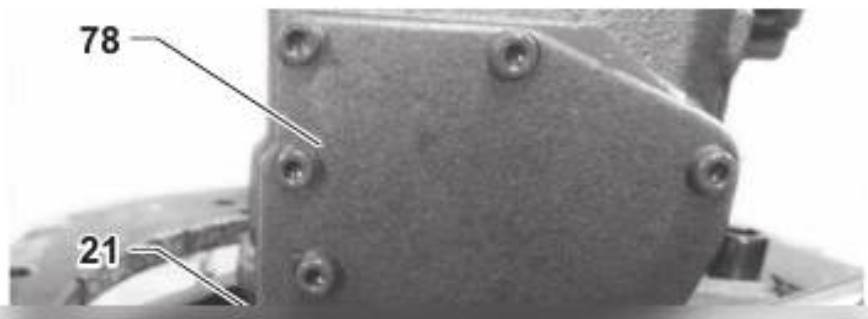
Connecting SMARTASSIST-Direct (SA-D), a controller failure diagnosis tool, to the controllers allows checking of detailed failure information and history for the engine ECU and hydraulic ECU as well as implementation of status monitoring and diagnostic tests.
For detailed information and operation of SA-D, refer to the SMARTASSIST-Direct operation manual and the engine troubleshooting manual.

***Note:***

*Information on the LCD monitor cannot be checked by SA-D.*




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| Procedure | |
|---|---|
| (4) Remove the hexagon socket head bolts **21**, the top cover assembly **78** and the sheet packing T **65**. Then take the feedback lever assembly **82** out of the pump casing (F) **14**.<br><br>***Note:***<br>*Since the pump can be held in a stable position and disassembled easily by placing it with its top cover side down, the* |  |

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# 6. HYDRAULIC EQUIPMENT




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**2. Motor-Incorporated Valve Function**

Troubleshooting table

| Problem | Probable Cause | Corrective Action |
|---|---|---|
| 1. The motor will not run or its rotating speed is too slow. | (1) Equipment other than the piston motor, valves (incorporated in the motor) and reduction gear has failed. | Check to see if oil at the specified pressure is present at the inlet of the valve, then check each piece of equipment and repair any defective one. |
| | (2) The amount of internal leak increased because the O-ring in the relief valve was cut. | Replace the O-ring or the back-up ring with a new one. |
| | (3) The amount of leak increased because of poor sealing of the valve or the piston area. | Either repair the damaged area or replace the piston and the rear cover with new ones. |
| | (4) The seat of the make-up valve is faulty or the valve itself failed.<br>1) Foreign matter is present.<br>2) The sliding surface of the check valve is rough or damaged.<br>3) The spring is broken. | <br>1) Remove foreign matter completely, repair any damaged part, completely wash all parts, then reassemble them. If the damage is too deep causing a large amount of leak, replace the valve.<br>2) Correct the sliding surface or replace the valve with a new one.<br>3) Replace the broken spring. When replacing the spring, remove foreign matter completely, repair any damaged part, wash all parts completely, then reassemble them. If the damage is too deep causing a large amount of leak, replace the valve. |
| | (5) The seat of the relief valve is faulty.<br>1) Foreign matter is present.<br>2) The spring is broken. | <br>1) Remove foreign matter completely, repair any damaged part, completely wash all parts, then reassemble them. If the damage is too deep causing a large amount of leak, replace the valve.<br>2) Replace the relief valve assembly. |
| | (6) The cracking pressure of the relief valve has dropped.<br>1) The spring has settled.<br>2) The poppet orifice is clogged. | <br>1) Replace the relief valve assembly.<br>2) Wash the orifice with treated oil and reassemble it. |
| 2. The motor will not stop or it is too slow to come to a stop. | (1) The seat of the make-up valve is faulty or the valve itself failed.<br>1) Foreign matter is present.<br>2) The sliding surface of the check valve is rough or damaged.<br>3) The spring is broken. | <br>1) Remove foreign matter completely, repair any damaged part, completely wash all parts, then reassemble them. If the damage is too deep causing a large amount of leak, replace the valve.<br>2) Correct the sliding surface or replace the valve with a new one.<br>3) Replace the broken spring. When replacing the spring, remove foreign matter completely, repair any damaged part, wash all parts completely, then reassemble them. If the damage is too deep causing a large amount of leak, replace the valve. |

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# 6. HYDRAULIC EQUIPMENT

The pressure of the port **D** at stopping is as follows.



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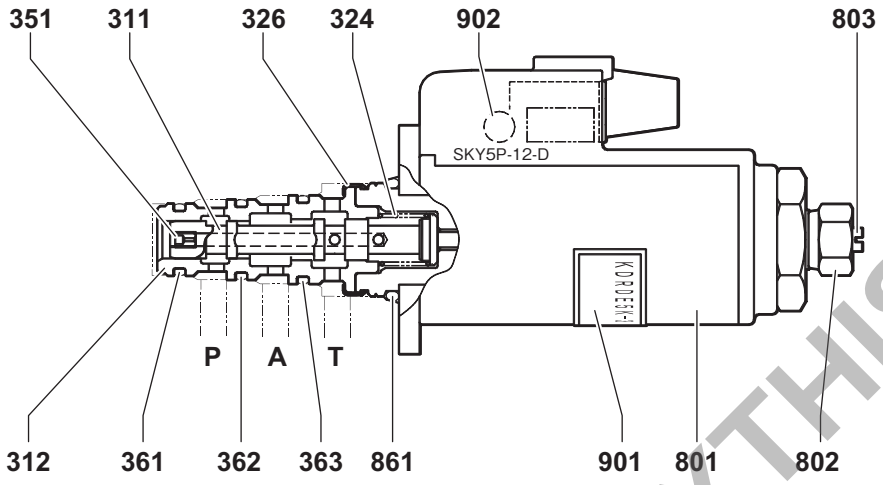
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**4. Theory of Operation**

**Proportional solenoid pressure reducing valve**

**1) Structure**




| | |
|---|---|
| **902** | Code plate |
| **901** | Name plate |
| **861** | O-ring |
| **803** | Adjusting screw |
| **802** | Seal nut |
| **801** | Solenoid |
| **363** | O-ring |
| **362** | O-ring |
| **361** | O-ring |
| **351** | Throttle |
| **326** | Retaining ring |
| **324** | Spring |
| **312** | Sleeve |
| **311** | Spool |

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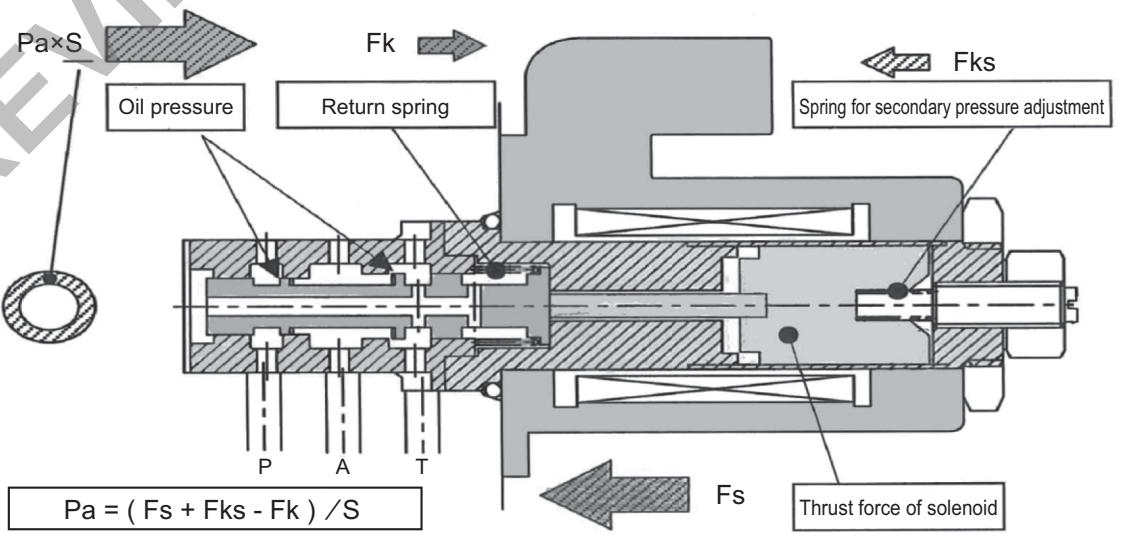
**2) Theory of operation**

Proportional solenoid **801** generates a thrust force proportional to the input current and pushes spool **311** with the thrust force. Accordingly, oil is led from the supply side (port P) via the notch of the spool into the secondary side (port A), resulting in a rise in pressure at port A.

The pressure (Pa) at port A acts on the pressure receiving area (S) of the spool and pushes the spool toward the solenoid.

The spool is moved to the point where the sum of the oil pressure (Pa x S) and the force (Fk) of spring **324** is balanced by the thrust force (Fs) of the solenoid. In this state, secondary pressure corresponding to the thrust force of the solenoid is generated due to the relationship between the opening areas on the supply and discharge sides of the spool.

In addition, the load (Fks) of the spring for secondary pressure adjustment (the spring of the solenoid) acts in the direction (leftward in the figure below) in which the thrust force of the solenoid is supported.




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# 7. ADJUSTMENT AND REPAIR

## 7-2-11 Installation of Floating Seal

### 1) Inspection for Damage

(1) Check for flaws or breakages on the sliding surface of the floating seal.

(2) Check for flaws, breakages or distortion on the O-ring.

(3) Check for fins or burrs on the collar and roller bush.

***Note:***

*The fins or burrs will cause damage to the O-ring. Remove any fin or burr with sand paper or the like*

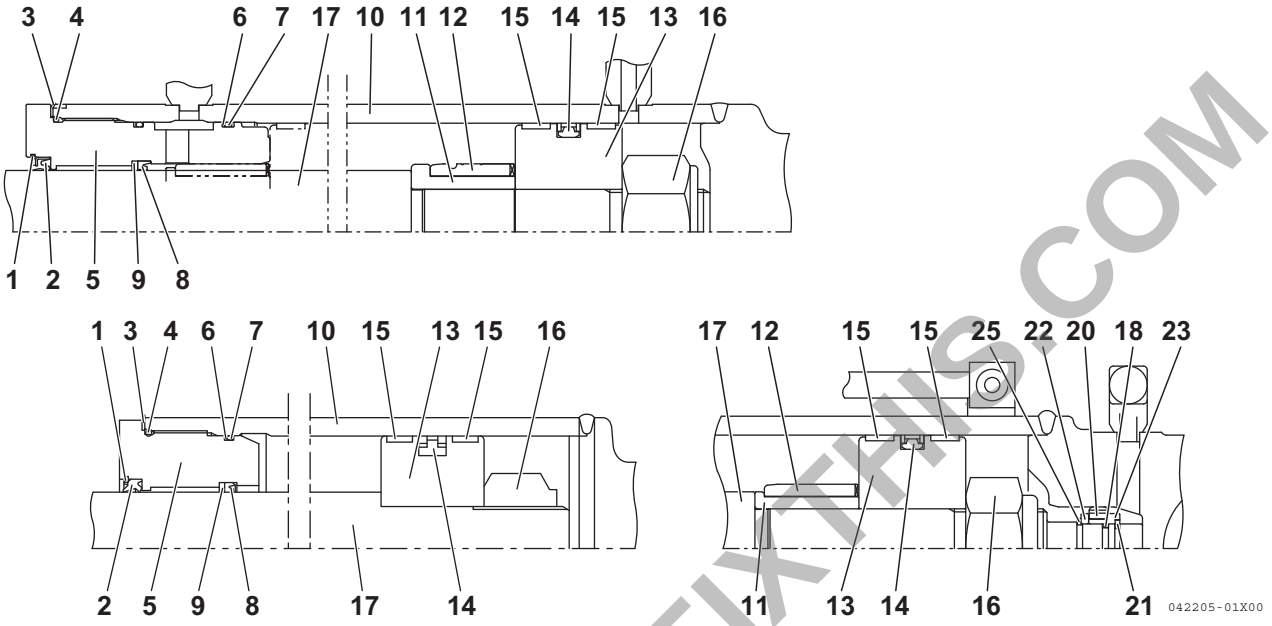
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**2. Boom, Bucket, Boom swing and Blade Cylinders (Applicable serial number: 1A001 to 1A156)**

**1) Sectional View and Parts**




Unit: in. (mm)

| No. | Part | Boom | Bucket | Boom swing | Blade |
|---|---|---|---|---|---|
| 1 | Spring ring | ○ | ○ | ○ | ○ |
| 2 | Dust seal | ○ | ○ | ○ | ○ |
| 3 | Lock washer | ○ | ○ | ○ | ○ |
| 4 | O-ring | ○ | ○ | ○ | ○ |
| 5 | Head | ○ | ○ | ○ | ○ |
| 6 | Back-up ring | ○ | ○ | ○ | ○ |
| 7 | O-ring | ○ | ○ | ○ | ○ |
| 8 | ISI packing | ○ | ○ | ○ | ○ |
| 9 | Back-up ring | ○ | ○ | ○ | ○ |
| 10 | Cylinder tube (Inside diameter) | Ø4.5(Ø115) | Ø3.7(Ø95) | Ø4.7(Ø120) | Ø5.1(Ø130) |
| 11 | Cushion collar | ○ | — | ○ | — |
| 12 | Cushion plunger | ○ | — | ○ | — |
| 13 | Piston | ○ | ○ | ○ | ○ |
| 14 | Piston seal | ○ | ○ | ○ | ○ |
| 15 | Wearing ring | ○ | ○ | ○ | ○ |
| 16 | U-nut | M45×3.0 | M42×3.0 | M42×3.0 | M48×3.0 |
| 17 | Rod (Outside diameter) | Ø2.6 (Ø65) | Ø2.4 (Ø60) | Ø2.4 (Ø60) | Ø2.6 (Ø65) |
| 18 | O-ring | — | — | ○ | — |
| 19 | Cushion plunger | — | — | — | — |
| 20 | Cushion ring | — | — | ○ | — |
| 21 | Stopper | — | — | ○ | — |
| 22 | Spacer | — | — | ○ | — |
| 23 | Cushion collar | — | — | ○ | — |
| 24 | Cover (stopper) | — | — | — | — |
| 25 | External snap ring C | — | — | ○ | — |

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