1. TECHNICAL DATA

2. Technical Data

2-1 Specifications

<>: W/O Quick coupler spec

Item	Unit	ViO80
Main specifications of machine		
Dimensions		

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3. SERVICING STANDARDS

3-7 List of Tightening Torque

3-7-1 Machine

Applicable model			ViO80		
Equipment			Thread size	Tightening torque ft•lbf (N•m)	Adhesive
	No.	Tightening part			
Engine / Electrical equipment					
				195.3 to 224.2	

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FOREWORD

This service manual outlines procedures for servicing YANMAR construction machinery. It contains specifications, servicing instructions and handling cautions. To obtain the maximum life and performance from YANMAR construction machinery, read this manual carefully and follow its instructions.
Please note that all dimensions and numerical values in this manual are for service reference, and are not inspection standards. Descriptions and specifications in this manual are subject to change without notice due to design improvements, etc.

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⚠ WARNING

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.

⚠ WARNING

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.

4-1-5 4-Valve Cylinder Head

4-Valve Cylinder Head Components

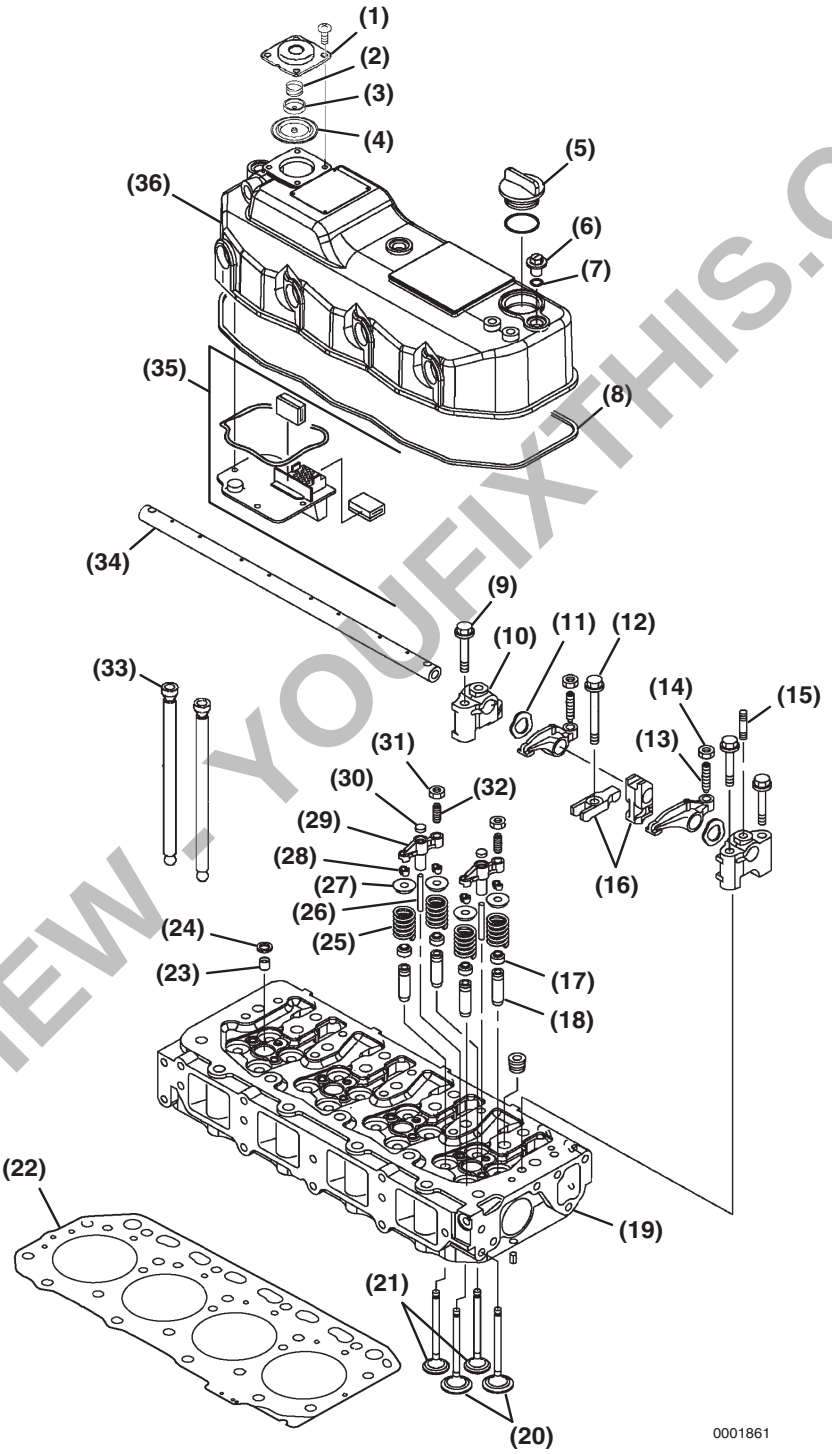
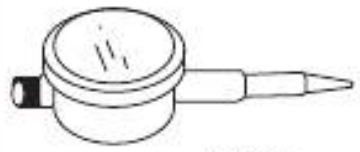


Figure 4-1-1

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4. ENGINE

4-1-4 Measuring Instruments

No.	Instrument Name		Application	Illustration
1	Dial Indicator	Locally Available	Measure shaft bend and end play	 0000831

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CAUTION

Make sure that the combined total resistance of the battery cable in both directions between the starter motor and the battery is within the value indicated on the wiring diagram. The starter motor will malfunction or break down if the

CAUTION

Removing the battery cables or the battery while the engine is operating may cause damage to the current limiter depending on the electrical equipment being used. This situation could cause loss of control of output voltage. The

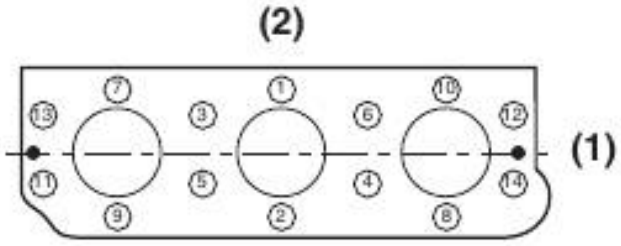
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Reassembly of Cylinder Head

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 4-1-32, (2))** on the cylinder block.
2. Position the cylinder head on the on the cylinder head gasket.



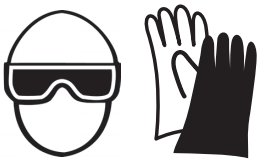
(2)

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⚠ 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.**

0000005en

⚠ CAUTION



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.**

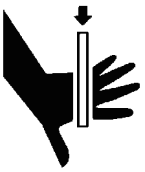
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⚠ CAUTION

Be sure to secure the engine solidly to prevent injury or damage to parts due to the engine falling during work on the engine.

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⚠ 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.

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⚠ CAUTION

If any oil pump component clearance exceeds its limit, the oil pump must be replaced as an assembly.

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CAUTION

- **Only use diesel fuels recommended by Yanmar for the best engine performance, to prevent engine damage and to comply with EPA / ARB warranty requirements.**
- **Only use clean diesel fuel.**
- **NEVER remove the primary strainer (if equipped) from the fuel tank filler port. If removed, dirt and debris could get into the fuel system causing it to clog.**

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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 adjustment is ever required, contact your authorized Yanmar industrial engine dealer or distributor.

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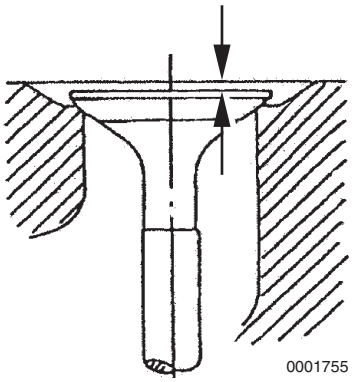


Figure 4-1-21

Valve Face and Valve Seat

Always check the clearance between the valve and valve guide before grinding or lapping the valve seats. If the clearance exceeds the limit, replace the valve and/or valve guide to bring the clearance within the limit.

Roughness or burrs will cause poor seating of a valve. Visually inspect the seating surfaces of each valve and valve seat to determine if lapping or grinding is needed.

Visually inspect all valves faces and valve seats for pitting, distortion, cracking, or evidence of overheating. Usually the valves and valve seats can be lapped or ground to return them to serviceable condition. Severely worn or damaged components will require replacement.

Coat the valve seat with a thin coat of bluing compound. Install the valve and rotate to distribute bluing onto the valve face. The contact pattern should be approximately centered on the valve face **(Figure 4-1-22, (1))** and even in width.

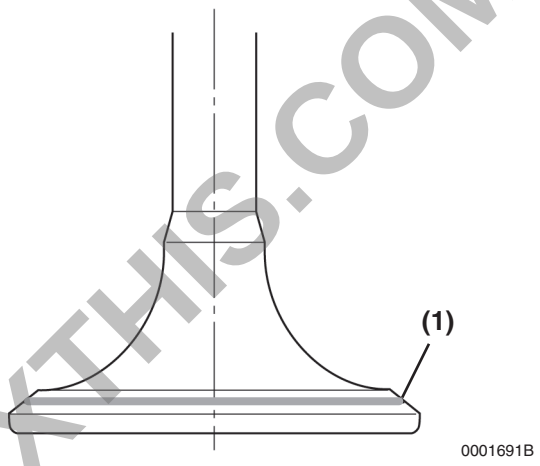


Figure 4-1-22

Also visually inspect the valve seat for even contact.

Light cutting can be performed by the use of a hand-operated cutter **(Figure 4-1-23)**.

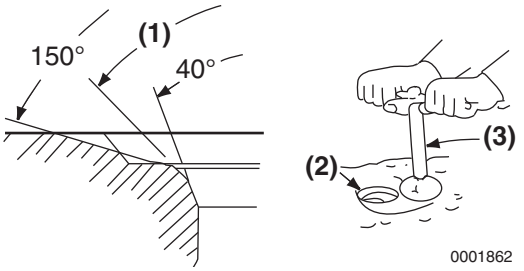


Figure 4-1-23

Valve seat diameter can be adjusted by top-grinding with a 150° stone to make the seat diameter smaller, and bottom-grinding using a 40° stone to make the seat diameter larger. Once the seat location has been corrected, grind and lap the seat angle **(Figure 4-1-23, (1))** to specification. *See "3-2 Engine Service Standard" section for the service limit*.

Grind the valve face and/or valve seat as necessary to return them to serviceable condition. Grinding is needed if the valve and valve seat do not contact correctly. Check the valve margin and valve recession after grinding.

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3. Remove the valve keepers **(Figure 4-1-11, (1))**.
4. Slowly release the tension on the valve spring.
5. Remove the spring retainer **(Figure 4-1-11, (2))**, valve spring **(Figure 4-1-11, (3)).**

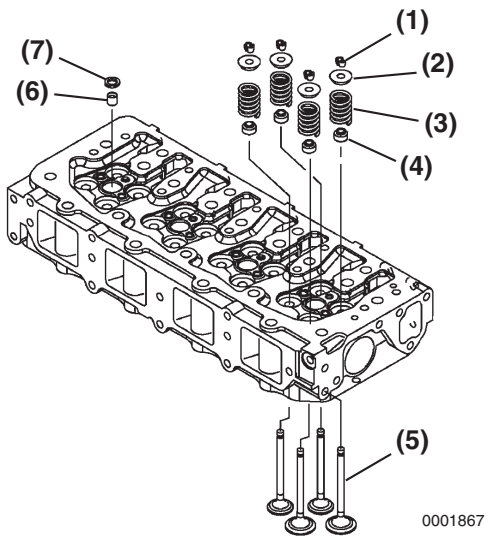


Figure 4-1-11

6. Repeat the procedure with all the remaining valves.

Note: If the valves are to be reused, identify them so they can be installed in their original location.

7. Remove the injector nozzle protectors **(Figure 4-1-11, (6))** and the seats **(Figure 4-1-11, (7)).**
8. Turn the cylinder head so the exhaust port side faces down. Remove the intake and exhaust valves **(Figure 4-1-11, (5))** from the cylinder head.
9. Remove the valve stem seals **(Figure 4-1-11, (4))**.

Removal of Valve Guides

Note: Removal of the valve guides should be postponed until inspection and measurement procedures have been performed. *See Inspection of Valve Guides.*

1. Using a drift pin and hammer, drive the valve guides **(Figure 4-1-12, (1))** out of the cylinder head.

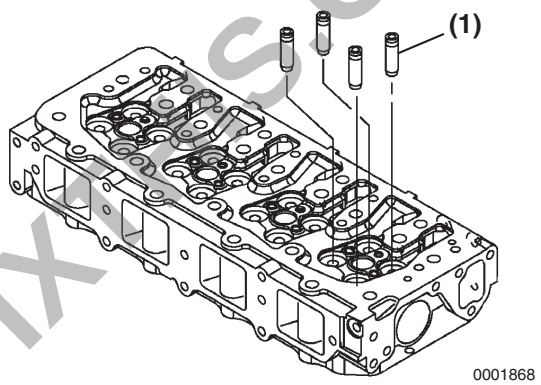


Figure 4-1-12

Cleaning of Cylinder Head Components

⚠ WARNING



FUME / BURN 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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1. GENERAL CAUTIONS FOR MAINTENANCE WORK

1. General Cautions for Maintenance Work

1-1 Correct Work

Correct work means the quickest possible completion of according to the correct procedures and the specified standards.

It is important when conducting certain operations always to bear in mind the equipment, tools, gauges, materials, oil and grease, etc. that you must have ready, as well as items to be checked, adjusted, or disassembled, and cautions to watch out for.

1-2 Safety Precautions

(1) Never attempt servicing while engine is running or immediately after stopping operation.
(2) Wear work cloths, safety shoes and helmet.
(3) Check the equipment and tools before use. Especially, be sure to check the crane, lifting equipment and tools.
(4) When working together with other persons, allocate everyone's share of job, arrange the signals and act in concert with the other persons.
(5) The operation of the crane and slinging work must be performed by qualified persons.
(6) Do not enter or pass under the raised load.
(7) Lift and support the massive parts by crane before removing the installation bolts.
(8) Disconnect cables from battery before repairing the electric system.
(9) Remove the battery when welding the machine.

1-3 Preparations

(1) Check the service record of the machine. (That is, check how many months or hours the machine has been used since the preceding overhaul, what was the trouble then and what parts were replaced.)
(2) Have all servicing tools ready, i.e., tools, measuring devices (which have received periodic maintenance), containers, oil & grease, etc.
(3) Have the service literature (operation manual, parts catalog, etc.) ready.

1-4 Cautions for Disassembly and Reassembly

(1) Clean the machine before disassembly.
(2) Check and record the condition of the machine before disassembly :
  • Model, machine number, operation hours
  • Reasons for repair, history of repair
  • Contamination of filters
  • Fuel and oil condition
  • Damage to parts, etc.
(3) Place alignment marks on the necessary parts to facilitate reassembly.
(4) Clean all the removed parts and new replacement parts and put them in order.
(5) Use new seals, split pins, etc. for reassembly.

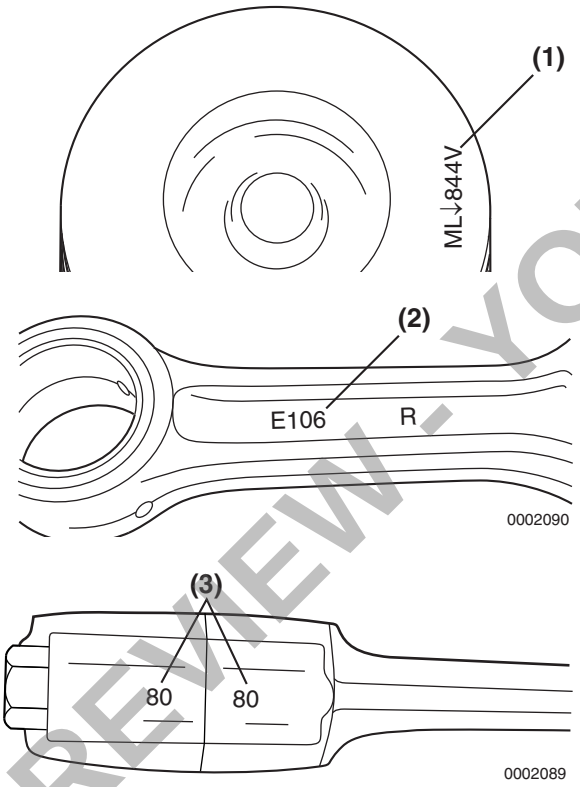
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IMPORTANT

*The piston and connecting rod must be assembled together in the correct orientation. The orientation of the piston and connecting rod are **different** depending on engine model.*

Piston to Connecting Rod Orientation
Orient the piston identification mark stamped on top of the piston on the same side as the rod and cap match marks stamped on the connecting rod.

Note: The actual appearance of the match marks on the piston and connecting rod may vary, but they will always be in the same locations.



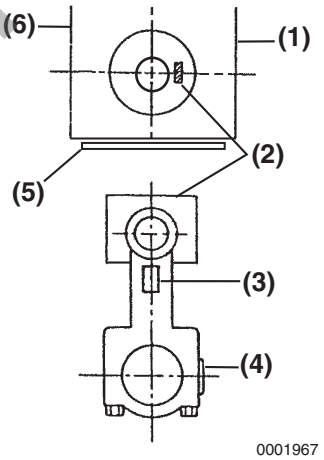
1 – Piston Identification Mark
2 – Embossed Mark on Connecting Rod
3 – Rod and Cap Match Marks

Figure 4-1-89

Piston Assembly

When correctly assembled, the piston identification mark **(Figure 4-1-90, (2))** stamped into the top of the piston will be on the same side of the connecting rod as the match marks **(Figure 4-1-90, (4))** stamped into the connecting rod and connecting rod cap.

When installed in the cylinder, the piston identification mark **(Figure 4-1-90, (2))** stamped on the top of the piston must face the fuel injection pump side **(Figure 4-1-90, (1))** of the engine and the embossed mark on the connecting rod **(Figure 4-1-90, (3))** must face the flywheel end **(Figure 4-1-90, (5))** of the engine.



1 – Fuel Injection Pump Side of Engine
2 – Piston Identification Mark
3 – Embossed Mark on Connecting Rod
4 – Rod and Cap Match Marks
5 – Flywheel End of Engine
6 – Camshaft Side of Engine

Figure 4-1-90

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CONTENTS

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4. Engine

4-1 Engine

4-1-1 Safety Precautions

⚠ 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.

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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 while the engine is running or battery is charging.
- Failure to comply will result in death or serious injury.

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⚠ DANGER



FIRE AND EXPLOSION HAZARD!

- Diesel fuel is 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.
- Failure to comply will result in death or serious injury.

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⚠ DANGER



FIRE AND EXPLOSION HAZARD!

- Only use the key switch to start the engine.
- NEVER jump-start the engine. Sparks caused by shorting the battery to the starter terminals may cause a fire or explosion.
- Failure to comply will result in death or serious injury.

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Inspection of Idler Gear and Shaft

1. Measure the outside diameter **(Figure 4-1-85, (1))** of the idler gear shaft **(Figure 4-1-85, (2))**. *See "3-2 Engine Service Standard" section for the service limit.*
2. Measure the inside diameter **(Figure 4-1-85, (3))** of the idler gear bushing **(Figure 4-1-85, (4))**. *See "3-2 Engine Service Standard" section for the service limit.*

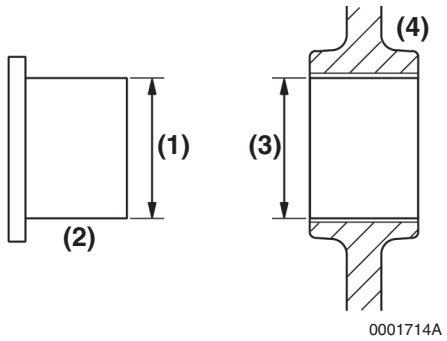


Figure 4-1-85

Honing and Boring

Pistons must move freely in the cylinders while maintaining adequate compression and oil sealing. If the cylinder walls are scuffed, scored, out-of-round, or tapered beyond specifications, rebore and hone to restore cylinders to usable condition. Slight imperfections can be corrected by honing alone.

1. **Boring** - Significant cylinder damage may be corrected by boring the cylinder to an oversize dimension. Refer to the appropriate parts catalog for available oversize pistons and piston rings.
   - Boring a cylinder should always be done in a properly equipped machine shop.
   - A bored cylinder should always be finished with a hone to properly prepare the cylinder surface so the new piston rings will seat properly.
   - After the cylinder has been bored and honed, install the appropriate oversize pistons and piston rings.
2. **Honing** - Minor cylinder imperfections may be corrected by using a rigid cylinder hone **(Figure 4-1-87, (1))**. Be sure not to exceed the maximum cylinder bore specification.

   Deglazing - A used cylinder that did not require boring or honing, should always be deglazed with a ball hone **(Figure 4-1-87, (2))** before installing new piston rings. This will properly prepare the cylinder surface to allow new piston rings to seat properly.

Note: When honing a cylinder, with either a ridged hone or a ball hone **(Figure 4-1-86, (1))**, move the rotating hone up and down in the cylinder bore to accomplish a 30° to 40° crosshatch pattern **(Figure 4-1-86,** . This will provide the ideal surface for the proper seating of new piston rings.

CAUTION

Do not allow the honing tool to operate in one position for any length of time. Damage to the cylinder wall will occur. Keep the tool in constant up-and-down motion.

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4. ENGINE

4-4-4 Checking Engine Oil Pressure

Perform an engine oil pressure check if there is any indication of low oil pressure such as the oil pressure indicator is on or the oil pressure gauge indicates low oil pressure.

Engine Oil Pressure

4-4-5 Trochoid Oil Pump

Oil Pump Components

The oil pump on these model engines is located in the front gear case and is driven by the same gear train that drives the camshaft and fuel injection pump. You must remove the front gear case cover to gain access to the oil pump.

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5-3-7 Travel

1) Forward Travel (Right)

(1) Pilot pressure flow

When the right travel lever is pushed forward, the oil from the pilot pump P4 flows through the port B of the cut-off valve and the port 1 of the travel pilot valve to the port Pa3 of the travel section to move its spool.

(2) Oil Flow from Hydraulic Pump

The oil from the piston pump P1 flows through the port P1 of the inlet section, the port A3 of the right travel section and the port F of the swivel joint to the port P2 of the right travel motor to rotate it.

The return oil from the port P1 of the right travel motor flows back to the hydraulic oil tank through the port D of the swivel joint, the port B3 of the right travel section, the ports T1 and T2 of the control valve and the oil cooler.

2) Forward Travel (Left)

(1) Pilot pressure flow

When the left travel lever is pushed forward, the oil from the pilot pump P4 flows through the port B of the cut-off valve and the port 3 of the travel pilot valve to the port Pa4 of the travel section to move its spool.

(2) Oil Flow from Hydraulic Pump

The oil from the piston pump P2 flows through the port P2 of the inlet section, the port A4 of the left travel section and the port C of the swivel joint to the port P1 of the left travel motor to rotate it.

The return oil from the port P2 of the left travel motor flows back to the hydraulic oil tank through the port E of the swivel joint, the port B4 of the left travel section, the ports T1 and T2 of the control valve and the oil cooler.

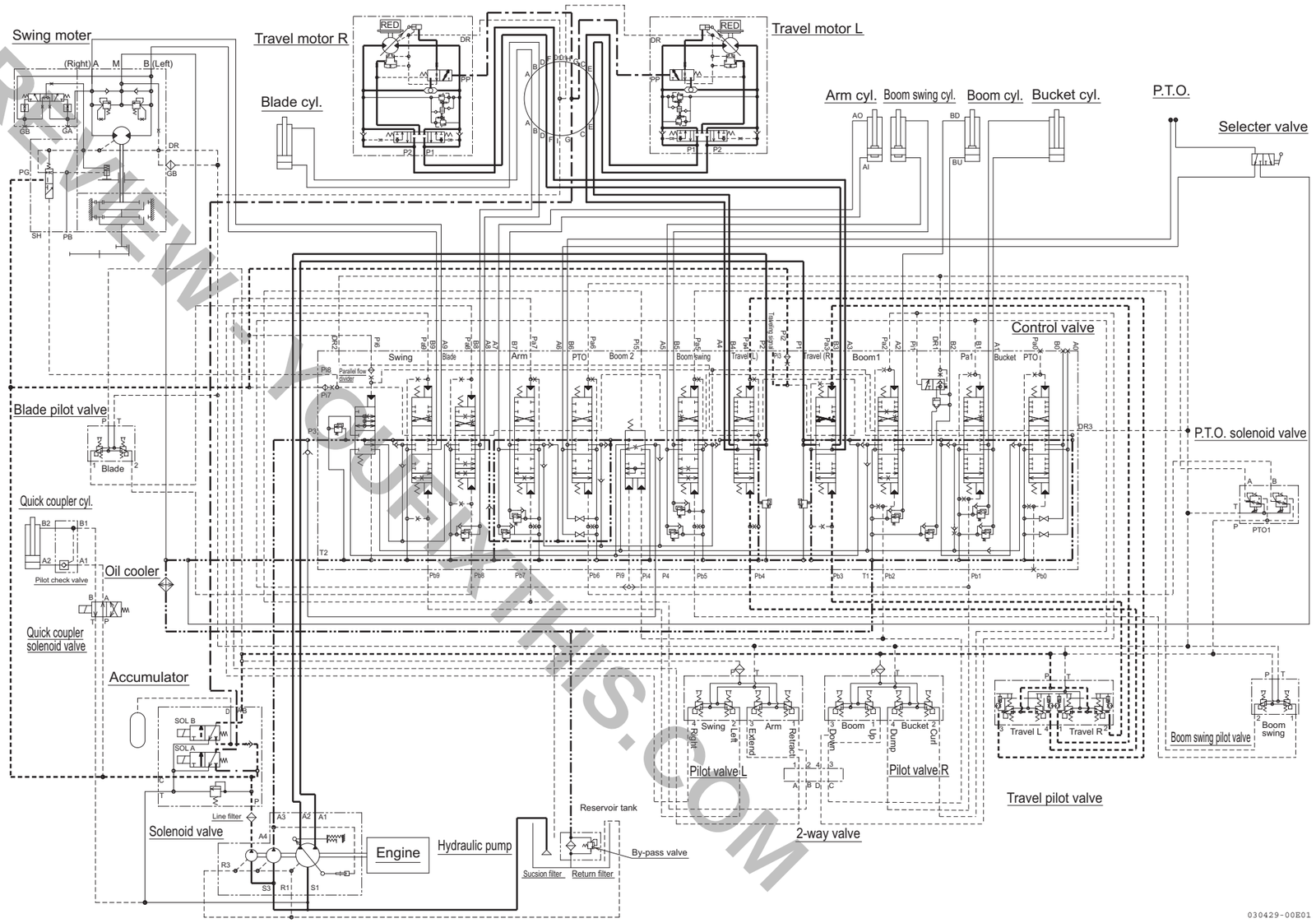
3) Reverse Travel (Right and Left)

(1) Pilot pressure flow

When the right (left) travel lever is pulled backwards, the oil from the pilot pump P4 flows through the port B of the cut-off valve and the port 2 (4) of the travel pilot valve to the port Pb3 (Pb4) of the travel section to move its spool.

(2) Oil Flow from Hydraulic Pump

The oil flows in the opposite direction to the oil flow in the Forward Travel operation with regard to the right or left travel motor.



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6. HYDRAULIC EQUIPMENT

4. Installing the accessories

Install the relief valves **18**, **19**, **20**, **21** in Fig. 2-1.

Tightening torque: 50.9 to 57.5 ft lbf (69 to 78 N•m)

Install the shutoff valve assembly **24** (Fig. 2-15) in the same way. Install in this order (from 1 to 3):

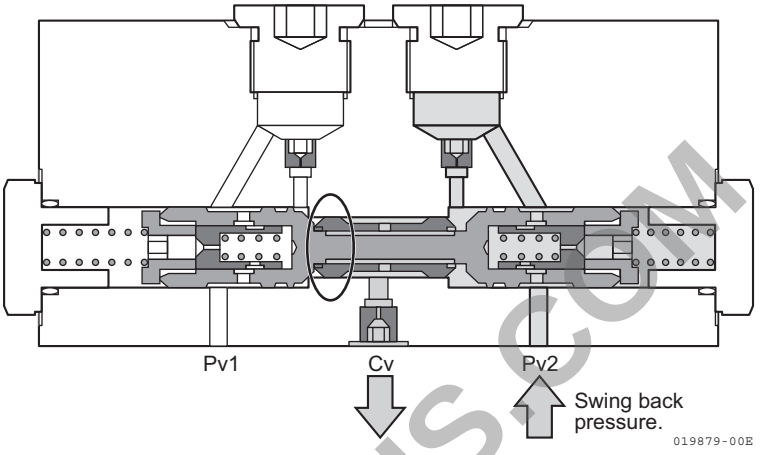
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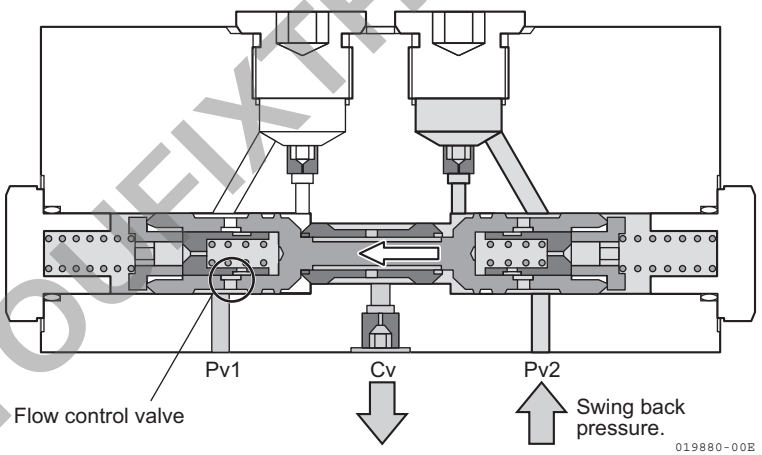
• **Swing back condition 1**

After swing stop, the slew motor start to swing back due to the swing back pressure.
This pressure pushes the sleeve in the direction of the check valve (Low pressure side) and makes sleeve contact with check valve.
At the same time, the passage from Pv2 to Cv is opened.
The pressure is led to Cv trough this passage.



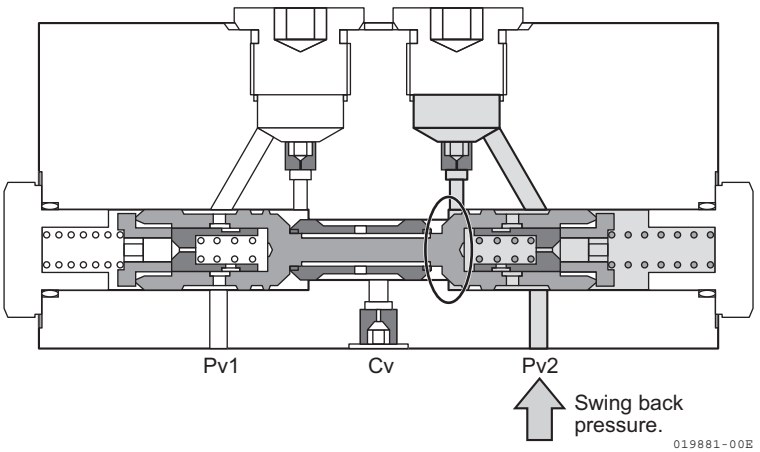
• **Swing back condition 2**

Swing back pressure pushes also the check valve in the direction of the arrow.
Check valve moves constant speed because Flow control valve restricts the flow from damping chamber 1.



• **Swing back condition 3**

Finally, Check valve shut the passage between Pv2 and Cv2.



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6-5-5 Troubleshooting

Problem 1	Problem 2	Possible cause	Action
Motor does not turn	Pressure will not increase	Relief set pressure is too low	Check the main relief valve
		Pump failure	Repair
		Direction switching valve is damaged	Repair
	Pressure does increase	Brake valve failure	Replace or repair brake valve
		Hydraulic motor failure	Repair
		Gear (reduction) damage	Replace motor assy
		Excessive load applied	Remove excessive load
Oil leakage	Leaking from mating surface	Flaws in surface	Repair flaws with grinder, sand-paper, etc.
		Bolts loose	Retighten
	Leaking from case	Plug loose	Retighten
		Cracked by stone etc.	Replace motor assy
	Leaking from floating seal	Worn-out sliding surface	Replace motor assy
		O-ring leaks	Replace motor assy
	Leaking from hydraulic motor	Bolts loose	Retighten
		O-ring damaged	Replace O-ring
		Seal surface flawed	Repair flaws with grinder, sand-paper, etc.
During use, rotates under load	Increased leakage of working fluid	Reduced hydraulic motor capacity	Replace motor assy
		Increased internal brake valve leakage	Replace or repair brake valve
	Parking brake does not function	Spring damage	Replace spring
		Friction plate worn down	Replace friction plate, mating plate
Reduction gear case surface temperature too high		Shortage gear oil	Fit to recommended level
		Pitching in bearings	Replace motor assy
		Working oil in gear case	Replace oil seal

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4. Troubleshooting

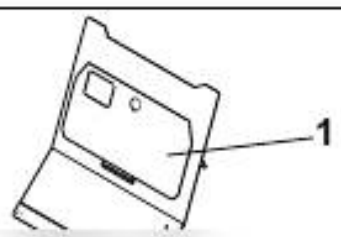
Trouble	Cause	Corrective measure
The pressure of the port B do not increase or port A do not drop, when the SOL is on.	• Shortage of the voltage.	• Check the voltage.
	• Malfunction of the coil of **3** solenoid.	• Replace **3** solenoid coil.
	• Malfunction of **2** spool.	• Disassemble, wash and attach them. If unrepairable, replace the valve assy.
	• Have got contaminant.	• Repair the flaws. If unrepairable, replace the valve assy.
The pressure of the port A do not increase or port B do not drop, when the SOL is off.	• The breakage of **1** spring.	• Replace **1** spring with new one.
	• Malfunction of **2** spool.	• Disassemble, wash and attach them. If unrepairable, replace the valve assy.
	• Have got contaminant.	• Repair the flaws. If unrepairable, replace the valve assy.
External leakage of oil.	• The breakage of the O-ring.	• Replace O-rings with new ones.

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7. ADJUSTMENT AND REPAIR

7-1-9 Removal and Reinstallation of Fan Belt and Compressor Driving Belt

1) Removal

Procedure	
(1) Remove center cover **1**. (2) Loosen adjuster bolt **3** of generator **2** to loosen tension of fan belt **4**. And loosen installation bolt 6 of tension pulley **5** to loosen	

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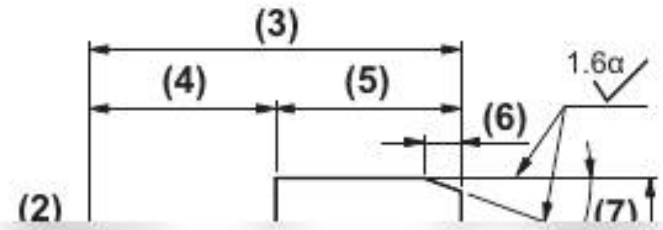
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7. ADJUSTMENT AND REPAIR

[4-4-2] Cover

Material: S25C or equivalent



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7. ADJUSTMENT AND REPAIR

7-8 Air Conditioner

7-8-1 Removal and Reinstallation of Air Conditioner

1) Removal

Procedure	
(1) Swing the upperstructure so that drain plug **1** for cooling water is positioned halfway between the right and left	

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