Section 1. GENERAL SERVICE INFORMATION

Component Identification

Figure 4-1a, Figure 4-1b shows where the major engine components are located.

4TNV98 ENGINE

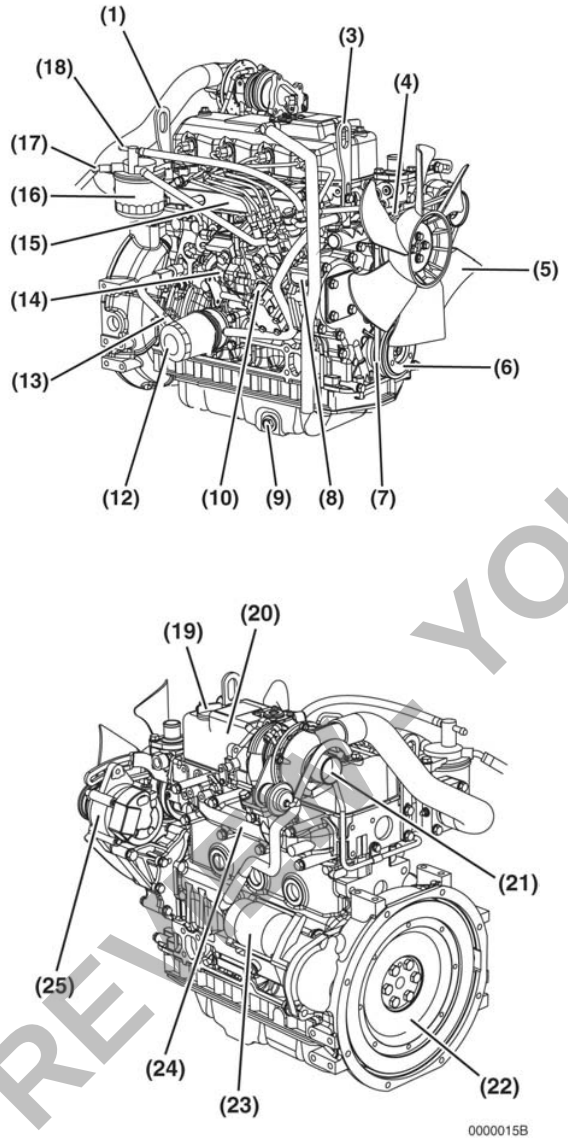


Figure 4-1a

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

4TNE98 ENGINE

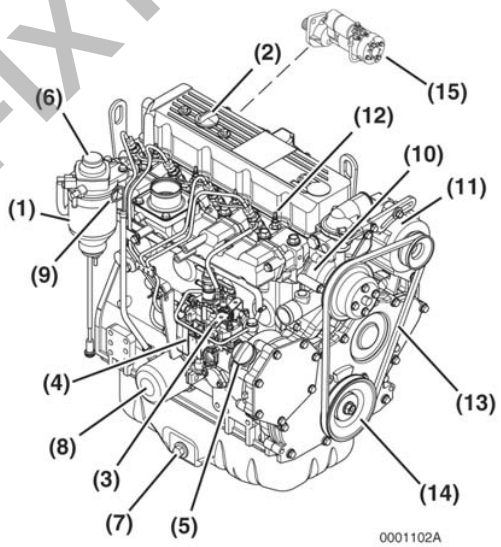


Figure 4-1b

(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 (EngineOil)
(10) Engine Coolant Pump
(11) Alternator
(12) Glow Plug
(13) V-Belt
(14) Crankshaft V-Pulley
(15) Starter Motor

PREVIEW YOUFIXTHIS.COM

Download full manual at youfixthis.com

Principal Engine Specifications

4TNV98 EPA Tier 2

Engine Model	4TNV98	
Version	VM (SDF)	
Type	Vertical In-line Diesel Engine	
Combustion System	Direct Injection	
Aspiration	Natural	
No. of Cylinders	4	
Bore × Stroke	3.858 x 4.331 in. (98 x 110 mm)	
Displacement	202.502 cu in. (3.319 L)	
Max. Rated Output (Net)	RPM	2200
	hp SAE	61.2
	kW	45.6
	PS	62.0
High Idling	RPM	2400±25
Engine Weight (Dry) with Flywheel Housing	518.2 lb (235 kg)	
PTO Position	Flywheel End (Option)	
Direction of Rotation	Counterclockwise Viewed from Flywheel End	
Cooling System	Liquid-Cooled with Radiator	
Lubricating System	Forced Lubrication with Trochoid Pump	
Normal Oil Pressure at Rated Engine Speed	42 - 57 psi (0.29 - 0.39 MPa, 2.96 - 3.98 kgf/cm²)	
Normal Oil Pressure at Low Idle Speed	8.5 psi (0.06 MPa, 0.6 kgf/cm²)or greater	
Starting System	Electric Starting - Starter Motor: DC12V, 3.1 hp (2.3 kW)**	
	Alternator: DC12V, 40A**	
	Recommended Battery Capacity: 12V, 64 Amp-Hour (5h rating)**	
Dimensions (L × W × H)*	28.31 x 19.61 x 29.21 in. (719 x 498 x 742 mm)	
Engine Oil Pan	11.1 / 6.3 qt (10.5 / 6.0 L) (Dipstick Upper Limit / Lower Limit)	
Engine Coolant Capacity	1.1 gal (4.2 L) Engine Only	
Standard Cooling Fan	16.14 in. (410 mm) O.D., 6 Blade Pusher-Type**	

* Engine specifications without radiator

** May vary depending on application.

*** Engine oil capacity for a “Deep Standard” oil pan. Refer to the operation manual provided by the driven machine manufacturer for the actual engine oil capacity of your machine.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Engine Service Standards

Inspection Item		Standard	Limit	Reference page
Intake / Exhaust Valve Clearance		0.006 - 0.010 in. (0.15 - 0.25 mm)	-	See Measuring and Adjusting Valve Clearance on page 104
Fuel Injection Timing	4TNV98	See Checking and Adjusting Fuel Injection Timing on page 157.		
	[illegible]	[illegible]		With Plunger Lifted

PREVIEW - YOUFIXTHIS.COM

Blurred on purpose. The manual you buy has this page in full quality.

Download full manual at youfixthis.com

○:Check ◇:Replace

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
	Check and Refill Engine Cool	○						
	Check and Clean Radiator Fins			○				
	Check Engine Coolant Temp. Indicator	○						

PREVIEW - YOUFIXTHIS.COM

Blurred on purpose. The manual you buy has this page in full quality.

Download full manual at youfixthis.com

Periodic Maintenance Procedures

Daily

Perform the following procedures daily.

- Drain Fuel Filter / Water Separator
- Check Fuel Hoses and Engine Coolant Hoses

[redacted]

4TNE98 For D25S-5 Only

⚠ WARNING



HIGH PRESSURE HAZARD!

- **Avoid skin contact with high pressure diesel**

[redacted]

Blurred on purpose. The manual you buy has this page in full quality.

[redacted]

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Checking Engine Oil

1. Make sure the engine is level.

2. Remove the dipstick **(Figure 4-5, (1))** and wipe it with clean cloth.

3. Fully reinsert the dipstick.

4. Remove the dipstick. The oil level should be between the upper **(Figure 4-5, (2))** and lower **(Figure 4-5, (3))** lines on the dipstick.

5. Fully reinsert the dipstick.

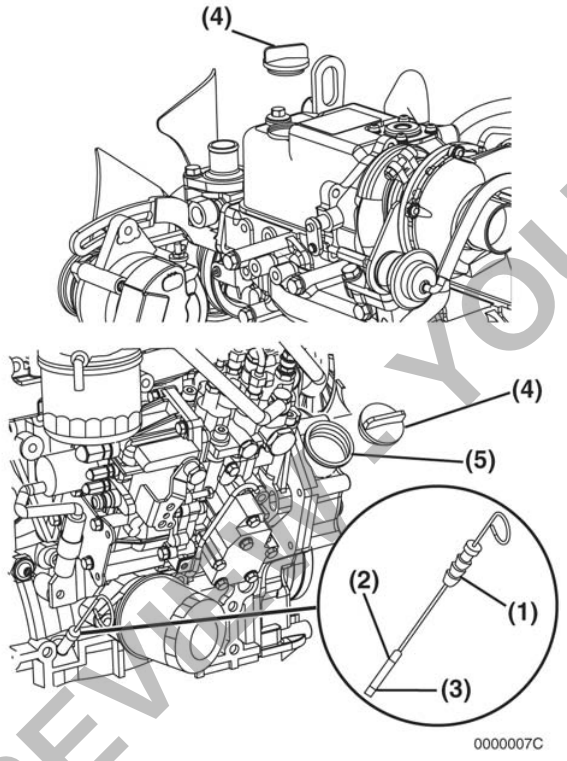


Figure 4-5

Adding Engine Oil

1. Make sure the engine is level.

2. Remove the oil cap **(Figure 4-5, (4)).**

3. Add the indicated amount of engine oil at the top or the side engine oil filler port **(Figure 4-5, (5)).**

4. Wait three minutes and check the oil level.

5. Add more oil if necessary.

6. Reinstall the oil cap **(Figure 4-5, (4))** and hand-tighten. Over-tightening may damage the cap.

Engine Oil Capacity (Typical)

NOTE: These are the engine oil capacities associated with a “deep standard” oil pan. The 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 various Yanmar engines.

Engine Model	Dipstick Upper Limit / Lower Limit
4TNV98	11.1 / 6.3 qt (10.5 / 6.0 L)
4TNE98	9.7 / 7.6 qt (9.2 / 7.2 L)

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Troubleshooting Charts

Trouble Symptom / Cause	Starting Problem			Insufficient Engine Output			Poor Exhaust Color		Abnormal Engine Sound	Uneven Combustion Sound	Engine Surging		Excessive Engine Vibration	Difficulty In Returning to Low Speed	Excessive Fuel Consumption	Engine Oil				Excessive Blow-by Gas	Engine Coolant		Air Intake		Exhaust Temperature Rise	Corrective Action	Reference Page
	Engine Does Not Start.	Engine Starts But Stops Soon.		Exhaust Color			During Work		High Knocking Sound During Combustion		During Idling	During Work Operation				Excessive Oil Consumption	Dilution by Diesel Fuel	Oil with Water	Low Oil Pressure		Overheat	Low Water Temperature	Pressure Drop	Pressure Rise			
		Exhaust Smoke																									
		None	Little	Much	Ordinary	White	Black	White	Black																			
Engine System																											
Improper Intake / Exhaust Valve Clearance	O	O			O					O															O	Adjust the Valve Clearance.	*See Measuring and Adjusting Valve Clearance on page 104.*
Compression Leakage from Valve Seat					O		O	O		O				O						O					O	Lap the Valve Seat.	*See Valve Face and Valve Seat on page 96 for 2 valve head or Valve Face and Valve Seat on page 96 for 4 valve head.*
Intake / Exhaust Valve Seizure	O		O	O	O		O			O		O	O				O			O						Correct or Replace Intake / Exhaust Valve.	*See Removal of Intake / Exhaust Valves on page 91.*
Cylinder Head Gasket Blowout					O												O									Replace the Gasket.	*See Removal of Cylinder Head on page 91.*
Seized or Broken Piston Ring	O			O		O		O		O			O				O		O	O					O	Replace the Piston Ring.	*See Reassembly of Pistons on page 127.*
Worn Piston Ring, Piston or Cylinder	O			O		O		O								O	O									Perform Honing and Use Oversize Parts.	*See Honing and Boring on page 126.*
Seized Crankpin Metal or Bearing	O	O								O		O	O							O						Repair or Replace.	*See Inspection of Crankshaft on page 124.*
Improper Arrangement of Piston Ring Joints		O				O										O				O						Correct the Ring Joint Positions.	*See Reassembly of Pistons on page 127.*
Reverse Assembly of Piston Rings						O		O								O				O						Reassemble Correctly.	*See Reassembly of Pistons on page 127.*
Worn Crankpin and Journal Bearing					O					O		O	O					O								Measure and Replace.	*See Inspection of Crankshaft on page 124.*
Loose Connecting Rod Bolt										O			O					O								Tighten to the Specified Torque.	*See Torque for Bolts and Nuts on page 73.*
Foreign Matter Trapped in Combustion Chamber	O									O						O				O						Disassemble and Repair.	*See Disassembly of Engine on page 111.*
Excessive Gear Backlash										O																Adjust Gear Meshing.	*See Checking Timing Gear Backlash on page 112.*
Worn Intake / Exhaust Valve Guide						O										O				O						Measure and Replace.	*See Inspection of Valve Guides on page 94.*
Governor Adjusted Incorrectly		O										O	O	O												Make Adjustment.	*See Check and Adjust the Governor Lever and Engine Speed Control on page 52.*
Improper Open / Close Timing of Intake / Exhaust Valves	O					O	O	O		O																Adjust the Valve Clearance.	*See Measuring and Adjusting Valve Clearance on page 104.*

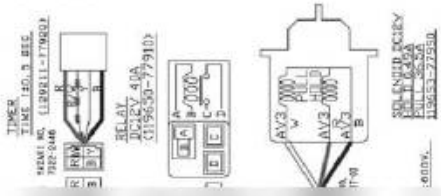
PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Wiring Diagram

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.

4TNV98 Engine



PREVIEW - YOUFIXTHIS.COM

Blurred on purpose. The manual you buy has this page in full quality.

Download full manual at youfixthis.com

Section 1. GENERAL SERVICE INFORMATION

Component Identification 7
Location of Labels 8
Engine Nameplate (Typical) 8
Emission Control Regulations 8
EPA / ARB Regulations - USA Only 8
Emission Control Labels 9
The 97/68/EC Directive Certified Engines 9
Engine Family 9
Function of Major Engine Components 10
Function of Cooling System Components 11
Diesel Fuel 12
Diesel Fuel Specifications 12
Filling The Fuel Tank 13
Priming the Fuel System 15
Engine Oil 16
Engine Oil Specifications 16
Engine Oil Viscosity 16
Checking Engine Oil 17
Adding Engine Oil 17
Engine Oil Capacity (Typical) 17
Engine Coolant 18
Engine Coolant Specifications 19
Filling Radiator with Engine Coolant 19
Engine Coolant Capacity (Typical) 20
Specifications 20
Description of Model Number 20
Engine General Specifications 21
Principal Engine Specifications 22
4TNV98 EPA Tier 2 22
4TNE98 EPA Tier 3 23
Engine Service Standards 24
Tightening Torques for Standard Bolts and Nuts 25
Abbreviations and Symbols 27
Abbreviations. 27
Symbols 27
Unit Conversions 28
Unit Prefixes 28
Units of Length 28
Units of Volume 28
Units of Mass 28
Units of Force 28
Units of Torque 28
Units of Pressure 28
Units of Power 28
Units of Temperature 28

Section 2. PERIODIC MAINTENANCE

Before You Begin Servicing 29
Introduction 40
The Importance of Periodic Maintenance 40
Performing Periodic Maintenance 40
Yanmar Replacement Parts 40
Required EPA / ARB Maintenance-USA Only 40
EPA / ARB Installation Requirements-USA Only 40
Periodic Maintenance Schedule 41
Periodic Maintenance Procedures 43
Drain Fuel Filter / Water Separator 43
4TNE98 For D25S-5 Only 43
Daily 45
After Initial 50 Hours of Operation 45
Every 50 Hours of Operation 48
Every 250 Hours of Operation 51
Every 500 Hours of Operation 54
Every 1000 Hours of Operation 59
Every 1500 Hours of Operation 61
Every 2000 Hours of Operation 62

Section 3. ENGINE

Before You Begin Servicing 63
Introduction 66
Cylinder Head Specifications 66
Adjustment Specifications 66
Cylinder Head 66
Intake / Exhaust Valve and Guide Cont... 67
Push Rod 68
Rocker Arm and Shaft 68
Valve Spring 68
Camshaft and Timing Gear Train Specifications 68
Camshaft 68
Idler Gear Shaft and Bushing 69
Timing Gear Backlash 69
Crankshaft and Piston Specifications 70
Crankshaft 70
Thrust Bearing 70
Piston 71
Connecting Rod 72
Tappet 72
Cylinder Block Specifications 73
Cylinder Block 73
Special Torque Chart 73
Torque for Bolts and Nuts 73
Special Service Tools 75

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Important Safety Information

Most accidents involving product operation, maintenance and repair are caused by failure to observe basic safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards. This person should also have the necessary training, skills and tools to perform these functions properly.

Read and understand all safety precautions and warnings before operating or performing lubrication, maintenance and repair on this product.

Blurred on purpose. The manual you buy has this page in full quality.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Measuring Instruments..... 77
Cylinder Head..... 80
Cylinder Head Components..... 80
Disassembly of 4-Valve Cylinder Head ... 82
4TNE98 Engine..... 87
Disassembly of Cylinder Head..... 89
Cleaning of Cylinder Head Components . 92
Inspection of Cylinder Head Components93
Reassembly of Cylinder Head 98
Measuring and Adjusting Valve Clearance..... 104
4TNE98 Engine..... 105
4TNV98 Engine..... 106
Crankshaft and Camshaft Components..... 109
Disassembly of Engine 111
Disassembly of Camshaft and Timing Components.....111
Disassembly of Crankshaft and Piston Components..... 116
Inspection of Crankshaft and Camshaft Components..... 120
Honing and Boring..... 126
Reassembly of Crankshaft and Piston Components..... 127
Reassembly of Camshaft and Timing Components..... 136
Final Reassembly of Engine 138

Section 4. FUEL SYSTEM

Before You Begin Servicing..... 139
4TNV98 ENGINE..... 141
Introduction 141
Fuel Injection Pump..... 141
Stop Solenoid..... 142
Cold Start Device..... 142
Trochoid Fuel Pump 142
Fuel System Specifications 143
Special Torque Chart 143
Test and Adjustment Specifications..... 144
Special Service Tools 145
Measuring Instruments..... 145
Fuel System Diagram 146
Fuel System Components..... 147
4-Valve Cylinder Head..... 147
Fuel Injection Pump 148
Removal of Fuel Injection Pump 148
Installation of Fuel Injection Pump 152
Checking and Adjusting Fuel Injection Timing.... 157
Determining the Fuel Injection Timing Specification..... 157
Checking Fuel Injection Timing..... 158
Adjusting Fuel Injection Timing..... 161
Fuel Injectors..... 163
Removal of Fuel Injectors..... 163
Testing of Fuel Injectors 164
Disassembly and Inspection of Fuel Injectors..... 165
Adjusting Fuel Injector Pressure..... 166
Reassembly of Fuel Injectors 167
Installation of the Fuel Injectors..... 167
4TNE98 ENGINE..... 168
Fuel System Special Torque Chart..... 168
Measuring Instruments..... 168
Fuel System Components 169
Fuel System Components 170
Structure And Operation Of Fuel Injection Pump..... 171
Overview..... 172
Plunger Operation..... 175
Process..... 176
Reverse Rotation Prevention Mechanism 178
Fuel Injection Volume Adjustment Mechanism 178
Delivery Valve Assembly 179
Delivery Valve Holder with Damping Valve 179
All - Speed Governor 180
At Start of Engine..... 182
During Idling..... 183
At Full-Load Maximum Speed Control .. 184
At No-Load Maximum Speed Control ... 185
Full-Load Position Adjustment Mechanism 186
Structure And Operation Of Timer 187
Standard Type Automatic Timer..... 187
Magnetic Valve (Stop Solenoid)..... 188
Removal Of Fuel Injection Pump..... 189
Installation Of The Fuel Injection Pump..... 192
Checking / Adjustment Of Fuel Injection Timing. 194
Servicing The Fuel Injectors..... 196
Removal of the Fuel Injectors..... 196
Inspection and Testing of the Fuel Injectors 197
Judgement Criteria on Atomization Condition 199
Installation of Fuel Injectors..... 200

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

2. Apply a continuous bead of ThreeBond Liquid Gasket No. 1212 to the outside diameter of a new oil seal **(Figure 6-108, (2))**, and install in the gear case cover. Apply lithium grease to the lip of the seal.

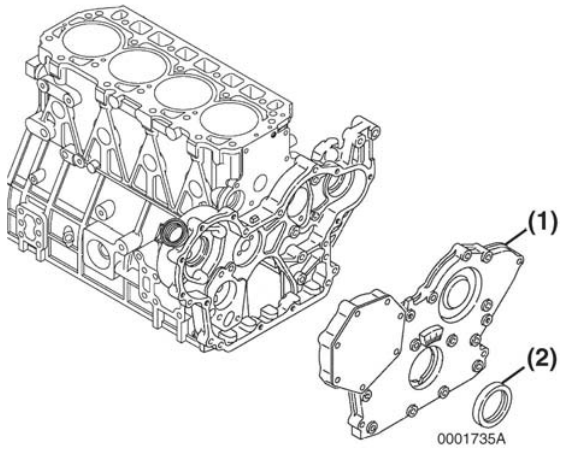


Figure 6-108

3. Remove the rear oil seal **(Figure 6-109, (3))** from the seal housing **(Figure 6-109, (2))**.

4. Apply a continuous bead of ThreeBond Liquid Gasket No. 1212 to the outside diameter of a new oil seal **(Figure 6-109, (2))**, and install in the housing. Apply lithium grease to the lip of the seal.

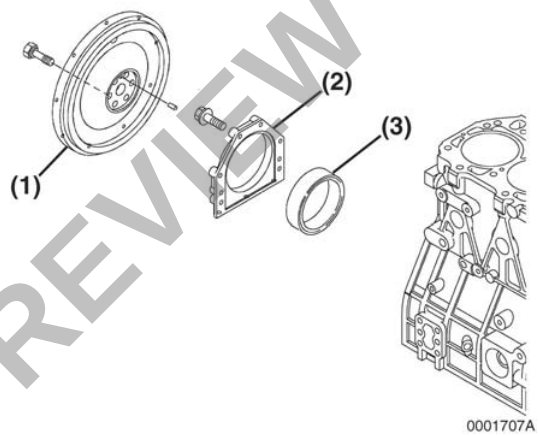


Figure 6-109

Measure Crankshaft Bearing Oil Clearance

Oil clearance should be checked during disassembly to determine the extent of wear, and during assembly to ensure long engine life. The same procedure is done for both connecting rods and main bearings.

Inspection of Cylinder Block

1. Ensure that oil passages are clear and unobstructed.

2. Check for discoloration or evidence of cracks. If a fracture is suspected, use the color check method or the Magnaflux method to determine if the cylinder block is fractured.

3. Inspect cylinders for roundness, taper, or evidence of scoring. Collect and record the measurements. Consider honing, reboring or replacing the cylinder block if the measurements are not within specification.

- Take measurements at three places **(Figure 6-110)** (a, b, c), and in two directions (d and e) in each cylinder.

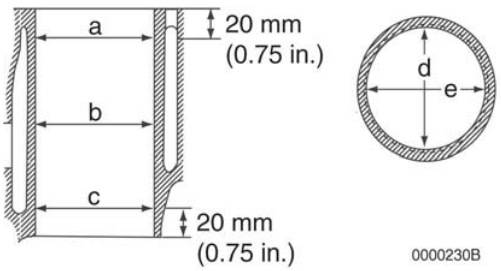


Figure 6-110

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

PREVIEW ONLY

You're viewing 12 of 246 pages

The full manual includes:

- All 246 pages, complete
- Searchable PDF (find any keyword)
- No watermarks
- Instant download
- Print-ready quality

GET FULL MANUAL NOW

Yanmar 4TNV98, 4TNE98 Service Manual

Scan or click anywhere
youfixthis.com

Click anywhere on this page to get the full manual