

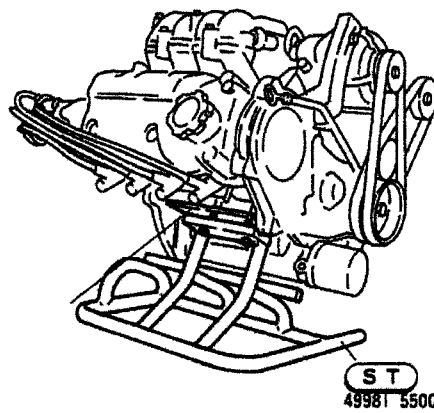
Chapter 10

Engine Overhaul

- 22. Engine Disassembly**
- 23. Block Inspection**
- 24. Cylinder Inspection**
- 25. Piston Inspection Including Oversize Pistons**
- 26. Block Deck-Journal and Bore Sizes**
- 27. Piston Rings and Installation Positioning**
- 28. Connecting Rods**
- 29. Crankshaft & Journals**
- 30. Journal Details and Clearances**
- 31. Crankshaft Oil Seals**
- 32. Block Assembly**
- 33. Piston Installation**
- 34. Oil Pump**
- 35. Cylinder Head and Timing Belt System**
- 36. Valve Rocker Assembly**
- 37. Camshaft Specifications and Clearances**
- 38. Camshaft Installation & Oil Seal**
- 39. Cylinder Head – Valve Springs- Valves**
- 40. Valve Guides- Valve Details**
- 41. Oil Pump Overhaul**
- 42. Oil Pressure Switch**

Engine Overhaul

Note: Use ST 499815500 Engine Stand



**Note: Before Disassembly Steam Clean or Power Wash Unit
Make Sure All Electrical Components Have Been
Removed First**

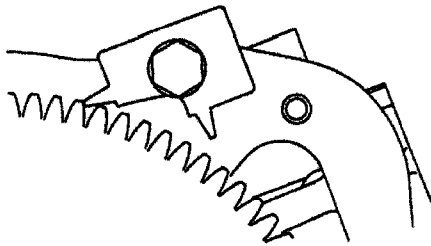
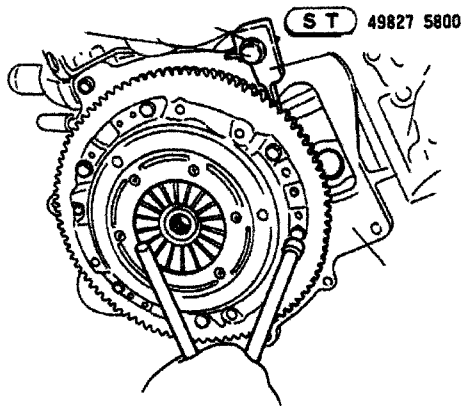
Engine Overhaul

Engine Disassembly

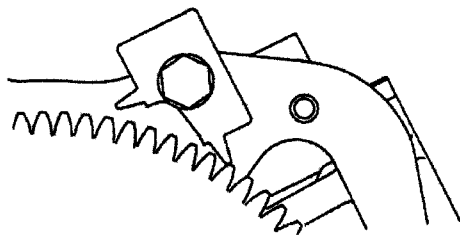
1. Remove All Electrical Accessories
2. Remove Crank Pulley, Clutch, Flywheel

Note: Use Flywheel Holding Tool
Below ST 49827-5800

3. Remove Cylinder Head and Components

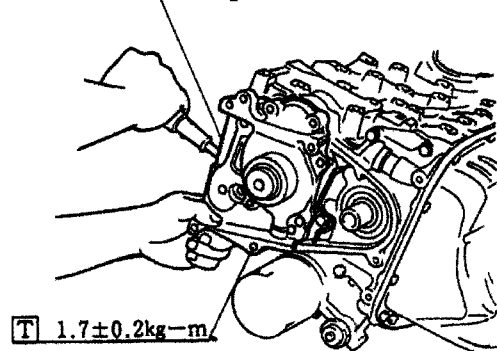


Two-Way Tool (Loose-Tight)



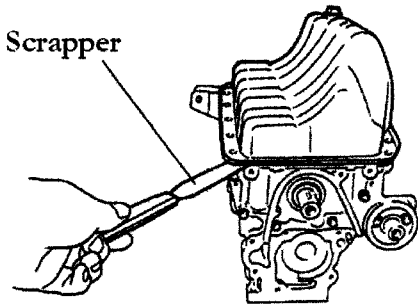
4. Strip Front of Engine Including Water Pump
5. Remove Oil Filter and Oil Cooler (SC Vehicle)

Water Pump Removal



6. Place Block Up-Side Down on Clean Piece of Wood or Plastic

Scraper

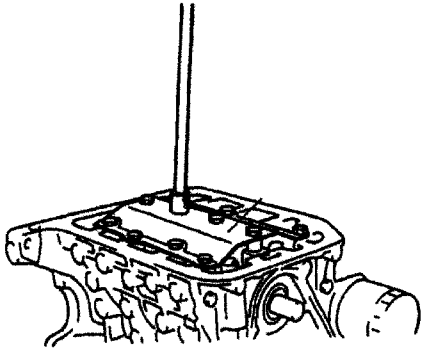


7. Remove Oil Pan Bolts and Use Gasket Scraper to Separate Gasket From Pan. Lift Up Pan.

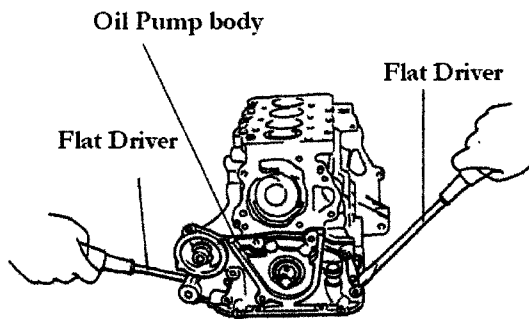
Engine Overhaul

Engine Disassembly

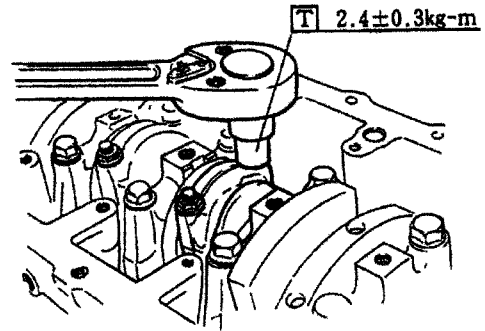
8. Remove Block Stiffener Plate



9. Remove Oil Pump Body



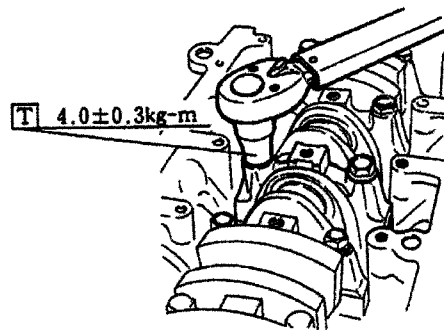
Note: Use Caution Not To Brake Casing



10. Remove Rod End Caps (Mark Cap Cylinder #)

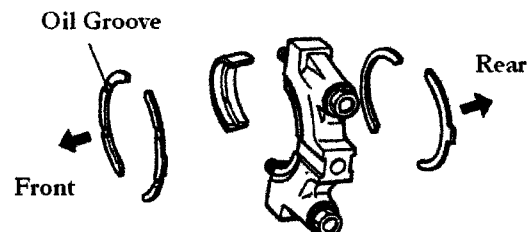
11. Remove Crankshaft End Caps (Mark Cap)

12. Remove Crankshaft



13. Remove Crankshaft Oil Seal

14. Remove Thrust Bearings

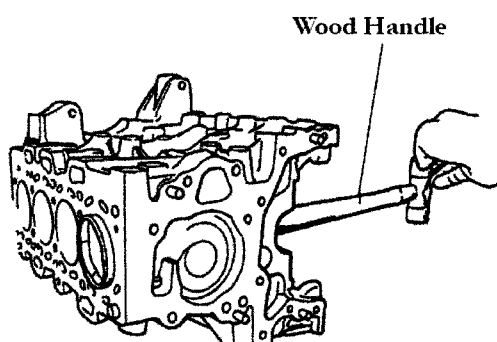


Engine Overhaul

Disassembly and Block Inspection

15. Remove Pistons From Block

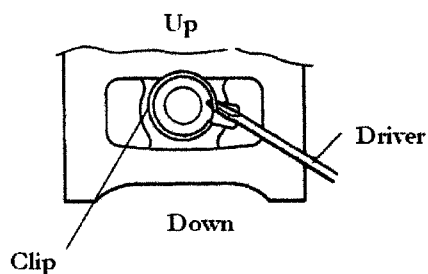
Note: Use Wood Handle to Push Out the Pistons



Note: Have Block Cleaned

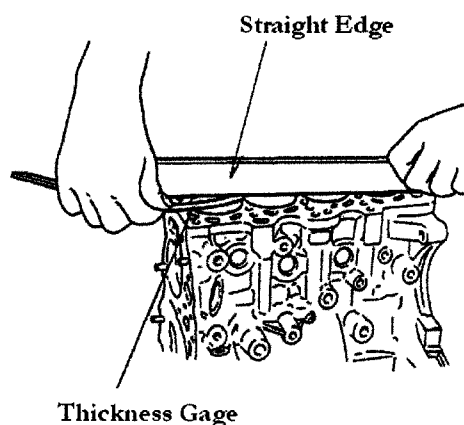
Piston and Connecting Rod

1. Remove Circle Clip
2. Separate Piston from Connecting Rod



Note: Circle Clips Can Not Be Re-Used

1. Use a Straight Edge (Not Ruler) and A Thickness Gage to Check Block] Deck For Straightness



Normal	0.05mm
Limit	0.15mm

Note: Over 0.16mm Block Must be Milled

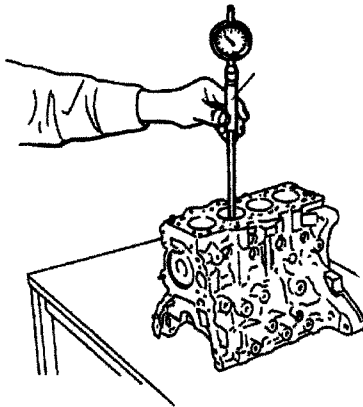
Note: If Block is Out of Specifications The Cylinder Head May Also be Affected. Check Cylinder Head Carefully.

Engine Overhaul

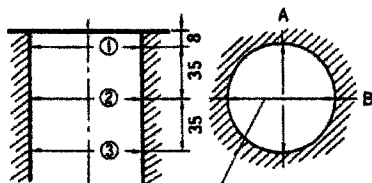
Block and Piston Inspection

Cylinder Inspection

Note: Check Cylinder Bores Visually for Any Visable Damage or Cracks. If Crack is Located Discard Block



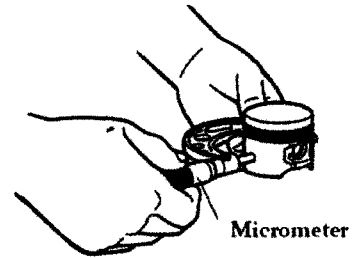
Measurement Points 1-2-3



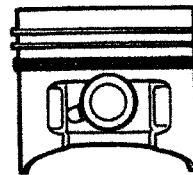
Crankshaft Direction

Cylinder Inside Dia	56.0~56.02mm
Circum Limit	0.05mm
Taper	0.05mm
Cylinder Dai Limit	Below 56.5mm

Piston Inspection



Micrometer



A
NA: 10mm
SC: 8.7mm

Piston Measurement 20 Degrees C

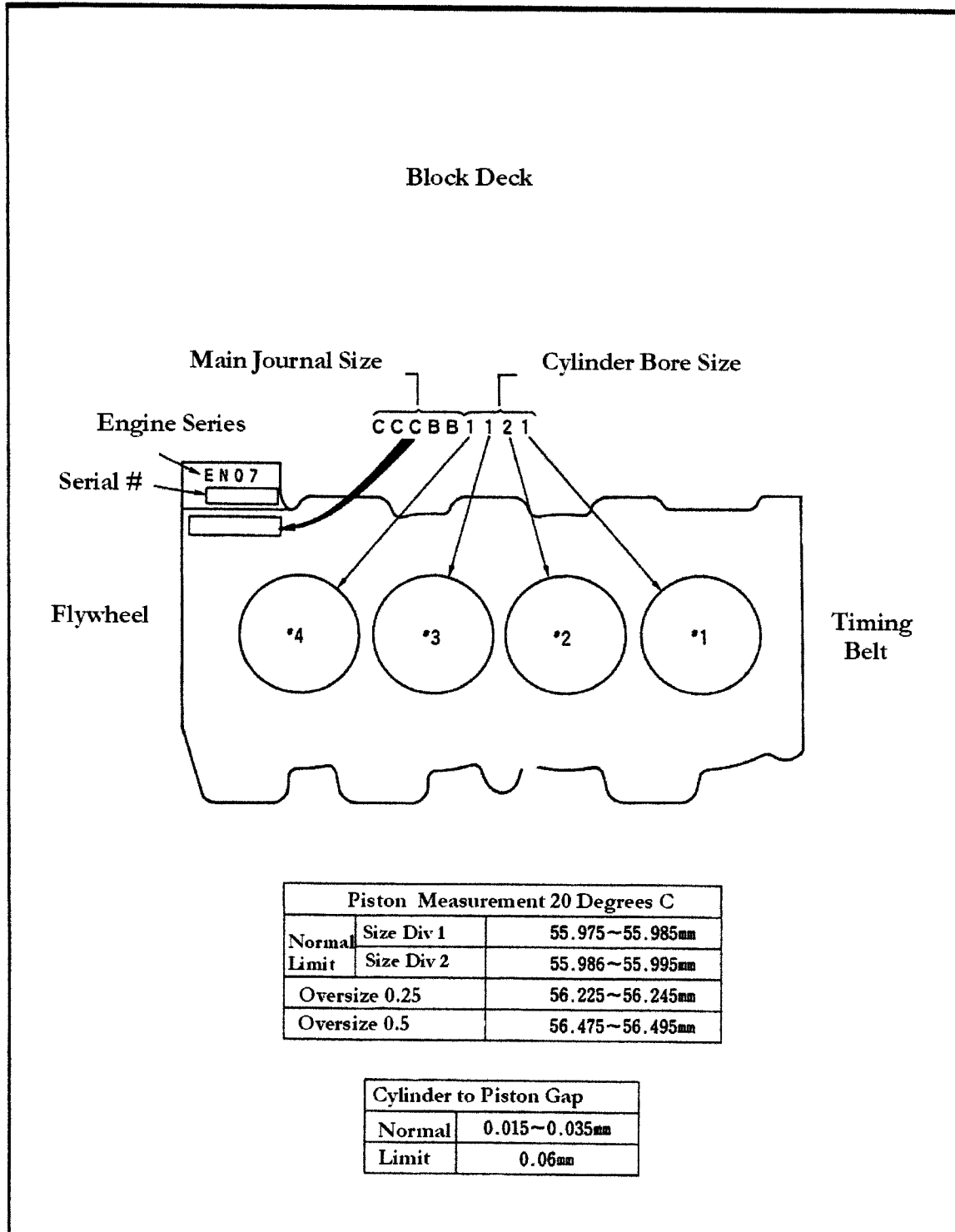
Normal Limit	Size Div 1	55.975~55.985mm
	Size Div 2	55.986~55.995mm
Oversize 0.25		56.225~56.245mm
Oversize 0.5		56.475~56.495mm

Cylinder to Piston Gap

Normal	0.015~0.035mm
Limit	0.06mm

Engine Overhaul

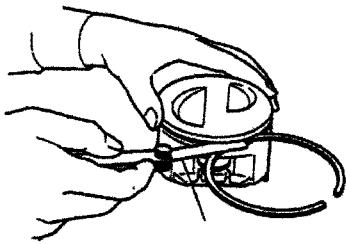
Cylinder Bore & Piston Clearance



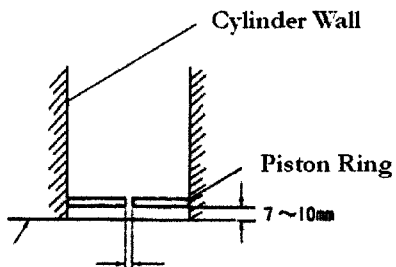
Engine Overhaul

Piston Rings and Piston Angle

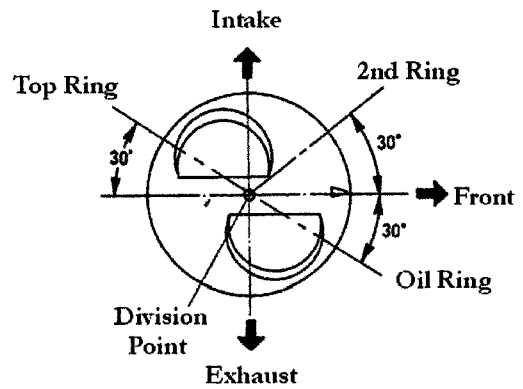
Piston Ring Inspection



	Normal	Limit
Top Ring	0.035~0.075mm	0.15mm
Secondary	0.025~0.065mm	0.15mm
Oil Ring	0	—



Piston Ring Position

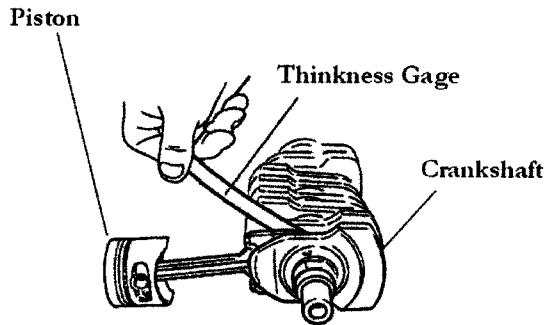


		Normal	Limit
Top Ring	NA	0.15~0.3mm	0.8mm
	SC	0.15~0.25mm	0.7mm
Secondary		0.15~0.3mm	0.8mm
Oil Ring		0.1~0.6mm	0.8mm

Engine Overhaul

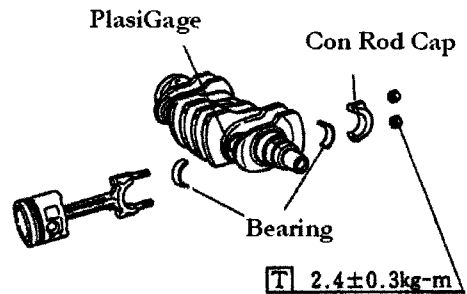
Connecting Rod Inspection

Side Clearance



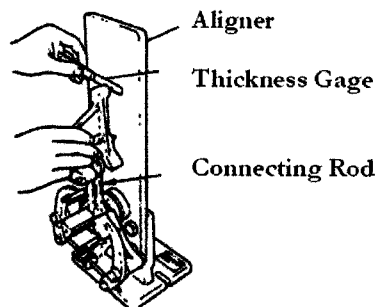
Side Clearance	Limit
0.07~0.33mm	0.4mm

Expoded Parts Diagram



Note: See Next Page for Details

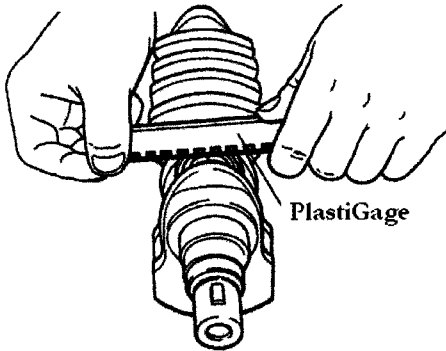
Connecting Rod Alignment Board



Alignment Limit	0.1mm
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Engine Overhaul

Crankshaft Inspection

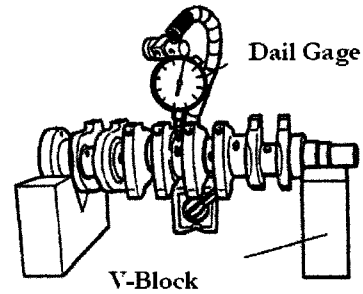


Normal	0.025~0.060mm
Limit	0.065 mm

Bearing Size	Bearing Thickness	Crank Pin Outer Dia
Normal	1.488~1.498	30.989~31.000
0.03 Undersize	1.506~1.510	30.959~30.970
0.05 Undersize	1.516~1.520	30.939~30.950
0.25 Undersize	1.616~1.620	30.739~30.750

Con Rod to Piston Pin	0.007~0.029mm
Limit	0.035mm

Crankshaft Journal Round-Out



Limit	0.03 mm
-------	---------

Note: Undersize Bearings

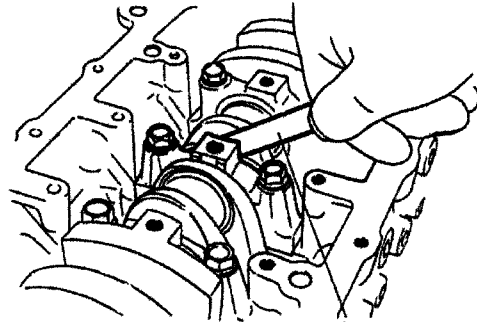
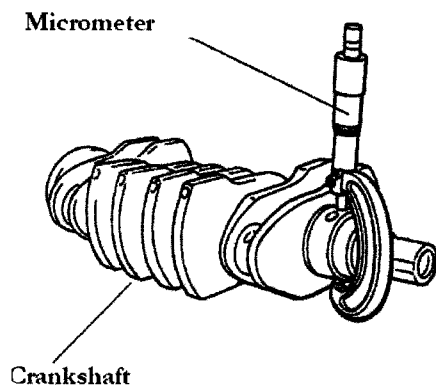
Degree	0.03mm
Taper	0.02mm

Availability: 0.03, 0.05, 0.25 (3 Types)
Check Parts Department for Stock or
Special Order

Engine Overhaul

Clearances

Journal Measurement



Thickness Gage

Side Clearance	Normal	Limit
	0.05~0.222	0.30

Torque Setting

Bearing Cap	4.0±0.3kg-m
-------------	-------------

Oil Clearance

		Normal	Limit
Normal Size	#1, #2, #4, #5 Journal	0.021~0.039	0.055
	#3 Journal	0.027~0.045	0.060
Under-Size	0.03 Under	Same	Same
	0.05 Under		
	0.25 Under		

Journal - Crankshaft - Bearing

Size Division		Crank Journal		Crank Pin
		#1, #2, #4, #5 Journal	#3 Journal	
Normal	Diameter	41.973~41.991	41.967~41.985	30.989~31.000
	Thickness	1.494~1.512	←	1.488~1.498
0.03 Undersize	Diameter	41.943 ~41.963	41.937~41.955	30.959~30.970
	Thickness	1.515~1.518	←	1.515~1.518
0.05 Undersize	Diameter	41.923~41.941	41.917~41.935	30.939~30.950
	Thickness	1.525~1.528	←	1.525~1.528
0.25 Undersize	Diameter	41.723~41.741	41.717~41.735	30.739~30.750
	Thickness	1.625~1.628	←	1.625~1.628

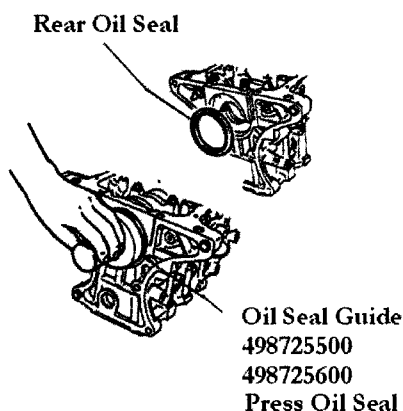
www.yokohamamotors.com [English]

Engine Overhaul

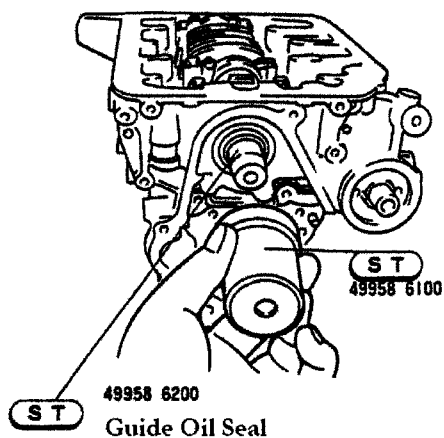
Crankshaft Oil Seal

Note: Oil Seals Can Not be Re-Used

Coat all Seals With 30W Engine Oil

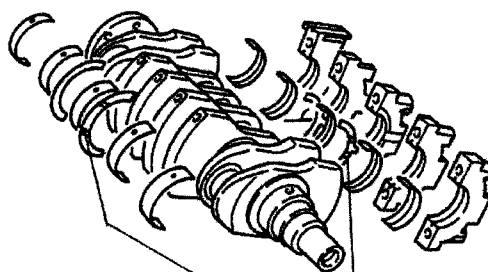


Front Oil Seal Installation



Engine Block Assembly

Note: Before Assembly Make Sure All Parts Are Clean and Plenty of Engine Oil For Coating Rotating Parts



Preparation

1. Gather All Related Parts
2. Coat All Moving Parts Heavily With 30W Engine Oil
3. Oil Seals Will Require a Coating of Light Grease or Assembly Grease if Available

Assembly

1. Install Crankshaft into Block
2. Attach Main Bearing Caps
Torque: 4.0+-0.3Kg-m

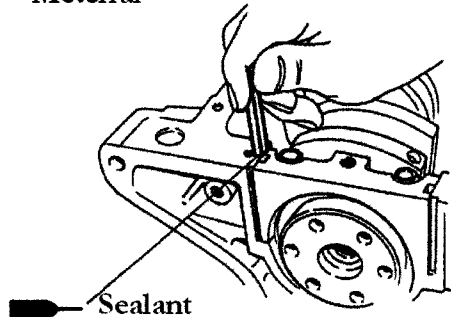
Rotate Assembly And Check for Any Friction Points. If Binding is Detected Disassemble and Locate Problem

No Issues: Re-Torque Caps

Engine Overhaul

Block Assembly

3. Coat Bearing Cap Seal With 1/3 Bead of 3Bond or Equivalent Bonding Material

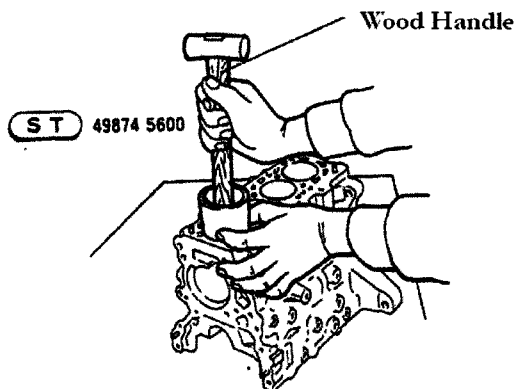


4. Assemble Pistons and Connecting Rods for Installation.

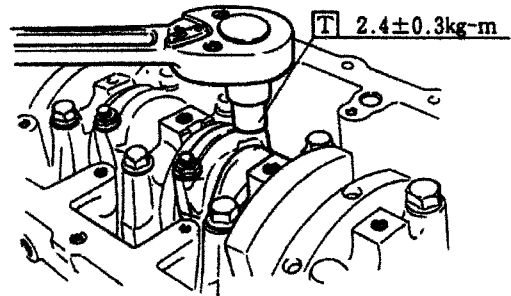
Note: Use the Chart in This Chapter of The Book For Ring Configuration

5. Use a Spring Compressor to Install Pistons into Their Respective Bores

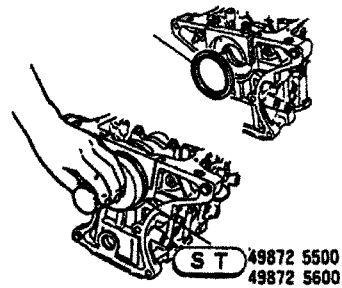
Note: Use a Vacuum Hose and Cover Rod End Bolts to Prevent Crank Damage



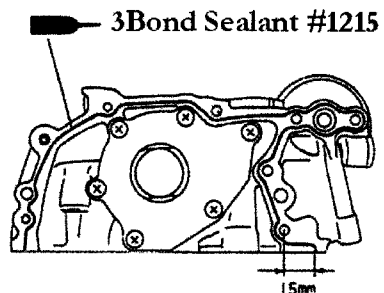
6. Attach Bearings and Caps
Torque to Specifications Below



7. Attach Rear Oil Seal



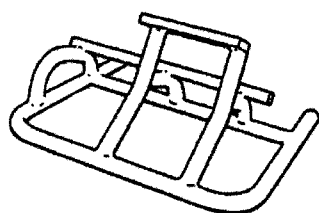
8. Attach Oil Pump



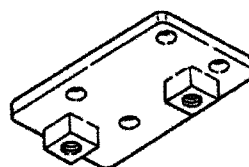
Engine Overhaul

Special Tools

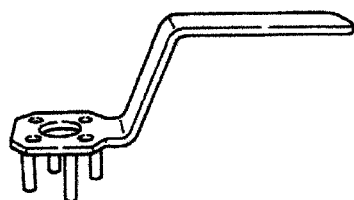
Engine Stand



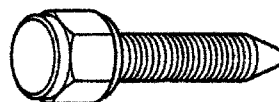
Engine Stand Adapter



Crankshaft pulley Wrench



Bolt (Puller)



Engine Overhaul

Timing Belt

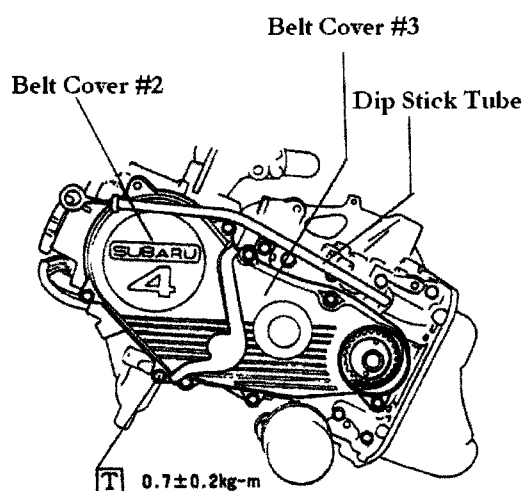
Note: Set Engine to TDC Compression Stroke

Preparation

1. Remove Engine Cover
2. Jack Up Vehicle and Remove Rear Right Tire
3. Remove Rear RH Wheel Housing Inside Engine Cover.

Removal

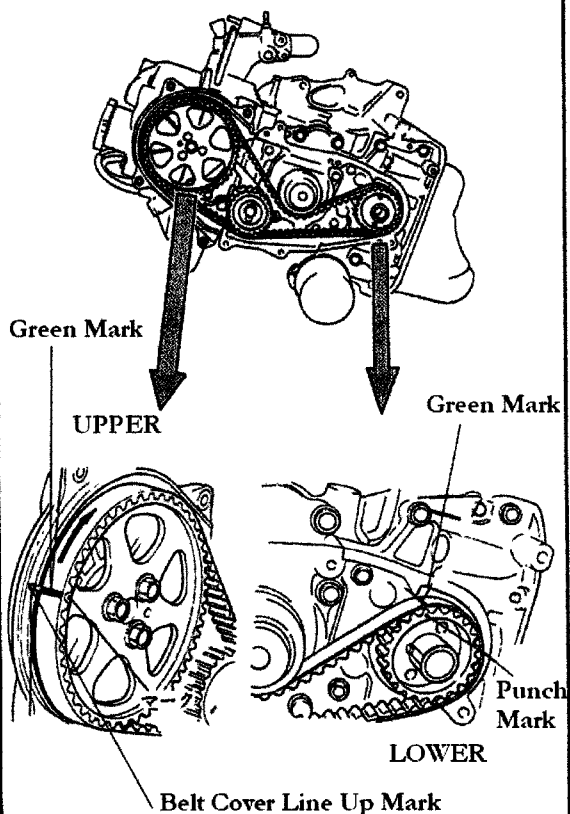
1. Remove Accessories: Alternator Etc V-Belts
2. SC Vehicle: Remove Supercharger Belt
3. Use ST Crankshaft Pulley Remover and Remove Crankshaft Pulley
4. Remove Timing Belt Cover
5. Remove Oil Dip Stick Tube Unit
6. Remove Timing Belt Cover #2, #3



7. Remove Timing Belt

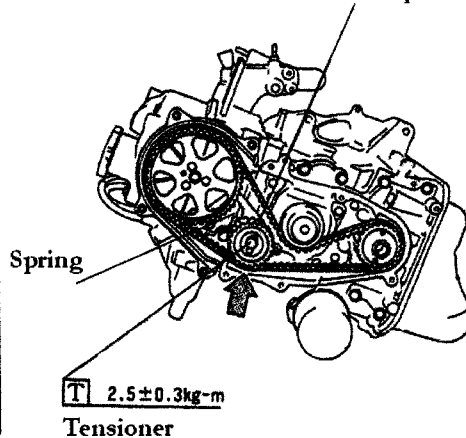
Note: Never Re-Use a Timing Belt

Change: Every 60,000 Kilometers



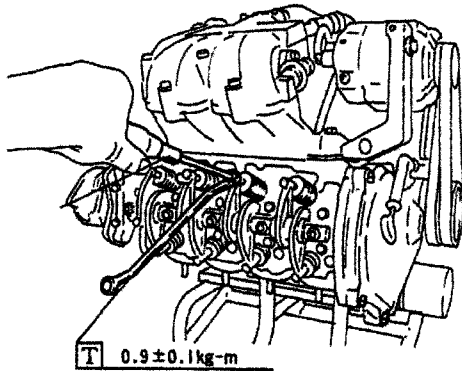
8. Install New Belt and Line Up With GREEN Marks. Set Tensioner and Torque Spec

Caution: Be Careful Of Tensioner Spring
Tensioner Sprocket



Engine Overhaul

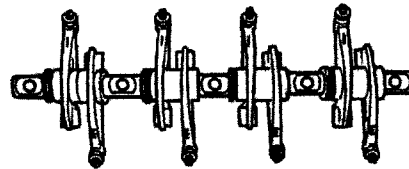
Valve Rocker Assembly



1. Remove Valve Cover
2. Loosen Valve Adjustment Screws
3. Remove (5) Rocker Shaft Attachment Bolts
4. Remove Rocker Arm Assembly

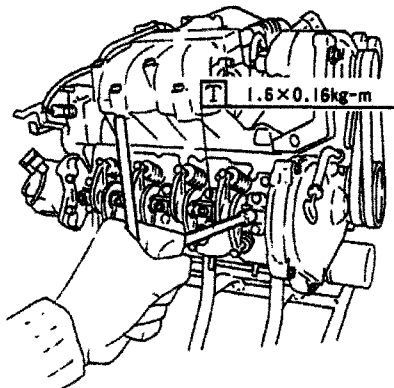
Note: Inspect Arms for Extream Wear or Cracks. If Found Discard Unit and Replace

Inspection



Specification [Rocker Arm+Shaft]

Rocker Arm & Shaft Clearance	Fine	0.016~0.052
	Limit	0.1
Rocker Arm (IN Dia)	Fine	16.0~16.018
Rocker Shaft (Ont Dia)	Fine	15.984~15.966



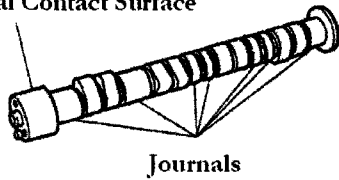
5. Replace Rocker Arm Shaft and Set Torque.
6. Set Valve Adjustment (Begining of this book).
7. Check Timing

Engine Overhaul

Camshaft Specifications

Camshaft Journal Measurement

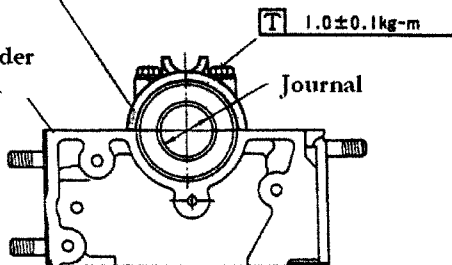
Oil Seal Contact Surface



Journal		26.0~26.021mm
Camshaft Journal(Outer)		25.939~25.955mm
Journal	Ok	0.045~0.082mm
Opening	Out	0.1mm

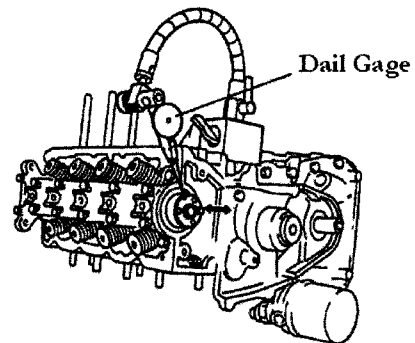
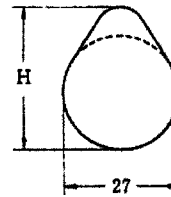
Camshaft Cap

Cylinder Head



Camshaft Lobe Measurement

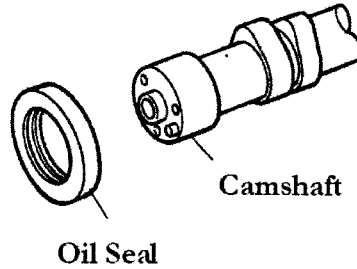
Cam "H" Limit	31.42~31.52mm
Replace	31.20mm



Side Clearance	0.02~0.22mm
Over Limit	0.5mm

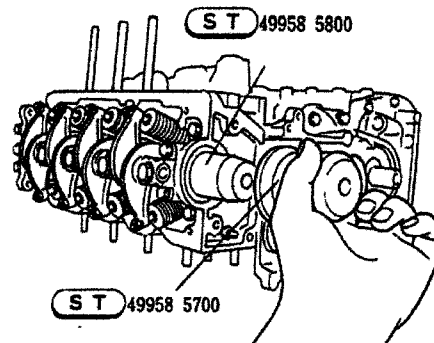
Engine Overhaul

Camshaft Oil Seal



Note: Never Re-Use Oil Seals, Replace With New Parts

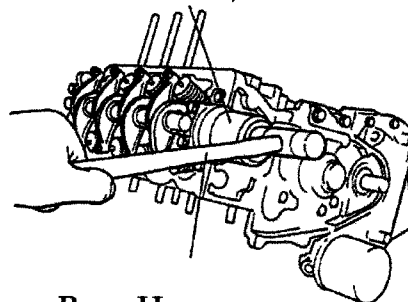
Use: Oil Seal Guide Tools for Proper Installation



Note: Lubricate Seal With Engine Oil Before Installation

Note: Tap Lightly When Installing Oil Seal

Guide Oil Seal (Cover Cup)

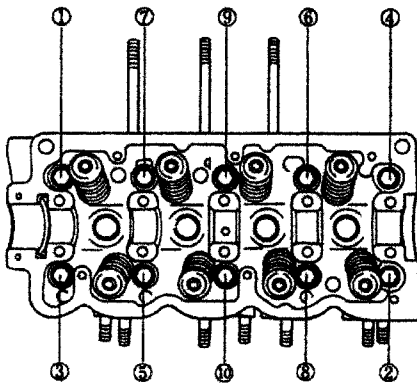


Engine Overhaul

Cylinder Head - Valve Spring - Valve

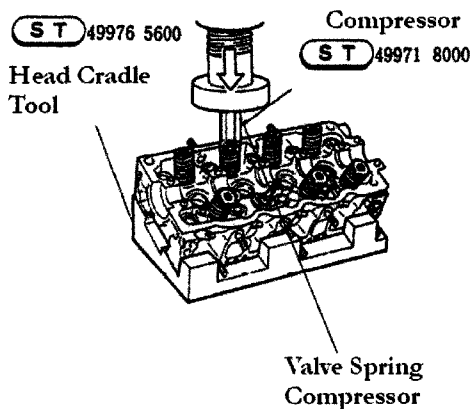
Torque=3.0+-0.3kg-m

Cylinder Head Torque Sequence



Note:

Use Cylinder Head Cradle Holder
Tool ST 49976-5600 To Hold Head
In Place for Spring Removal and
Installation Procedures

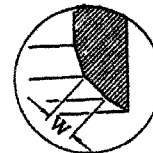
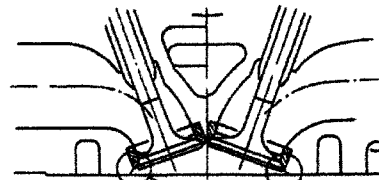


Use Above Combination for Removal and
Installation of Valves and Springs

Valve Spring Specifications

Specifications		IN & EX
Free Length (mm)		43.46
Set	Pressure (kg)	18.2
	Spring Length	36.5
Lift	Pressure (kg)	44.9
	Spring Length	29.0

Valve Seat Specifications

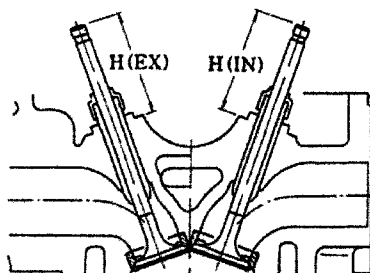


Valve Seat	Intake	Exhaust
"W"	1.3mm	1.2mm

Engine Overhaul

Valve - Valve Spring - Valve Guide

Valve Specifications



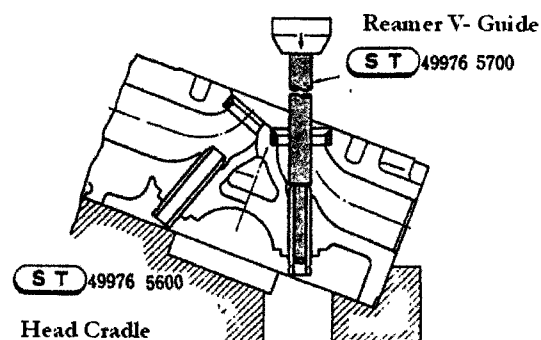
Valve Stem		IN	EX
"H"	Ok	41.3mm	41.4mm
	Fail	41.8mm	41.9mm
Side Clearance Limit		0.5mm	0.5mm

Valve Guide	Intake	Exhaust
Valve Stem (OP)	0.030~0.060	0.040~0.070
Opening Deg	0.130	0.150
V Guide (Out)	5.452~5.470	5.442~5.460
V Guide Limit	5.50 ~5.512	5.50 ~5.512
Head Clearance	0.060~0.027	0.060~0.027

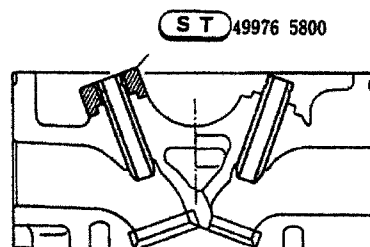
Specialty Tools

Part #	Part Name
49976 5600	Cylinder Head Cradle
49976 5700	Ream Bar Valve Guide
49976 5800	Adjuster Valve Guide
49976 5900	Reamer Valve Guide

Use Service Tools For Guide Replacement

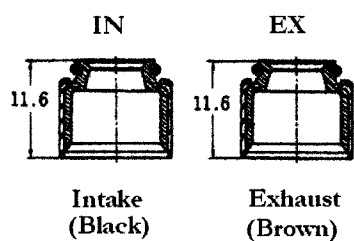


Valve Guide Adjuster Tool



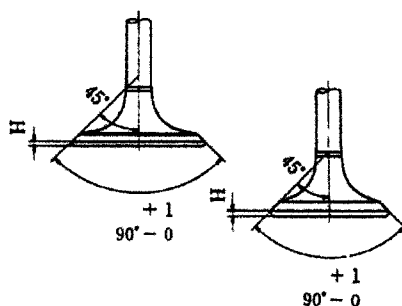
Engine Overhaul

Valve Oil Stem Seal



Note: Replacement Oil Stem Seals are Marked and or Have a Color Code.

Valve Face Angle

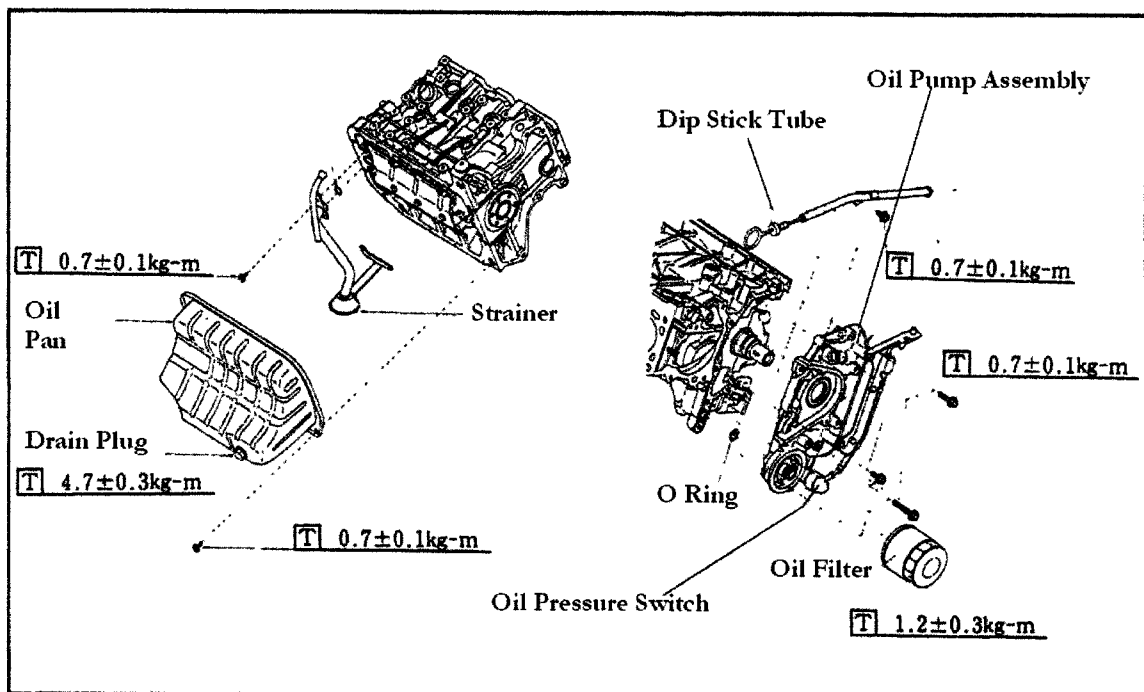


		Intake	Exhaust
Valve Head "H"	Ok	1.0mm	1.0mm
	Limit	0.5mm	0.5mm
Valve Face		φ 26mm	φ 23mm
Valve Length		94.6mm	94.6mm

Engine Overhaul

Oil Pump System

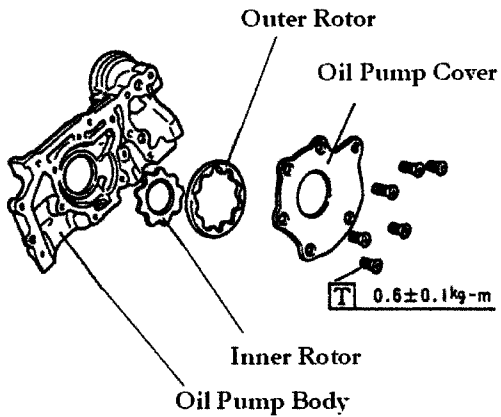
Oiling System Exploded View



Engine Overhaul

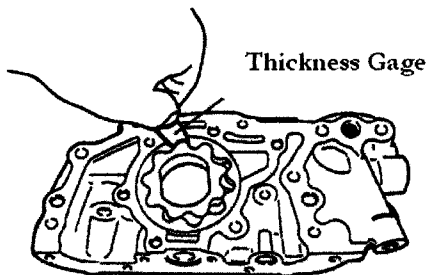
Oil Pump

Brakedown of Parts

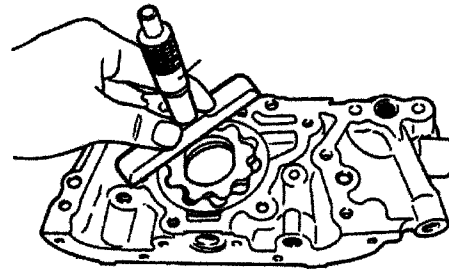


Inner to Outer Clearance

Clearance	Norm	0.05~0.18mm
	Out	0.2mm

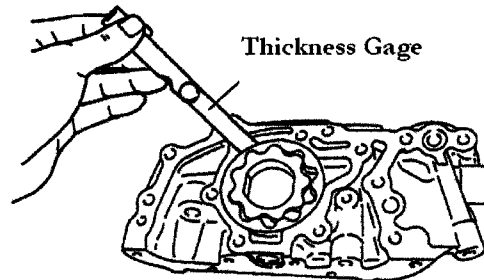


Radial Clearance



Radial Clearance

Radial	Norm	0.12~0.19mm
	Fail	0.25mm



Side Clearance

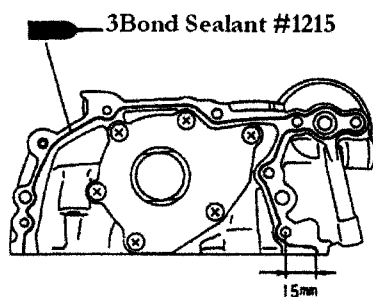
Side Clearance	Norm	0.03~0.07mm
	Out	0.15mm

Out=Replace

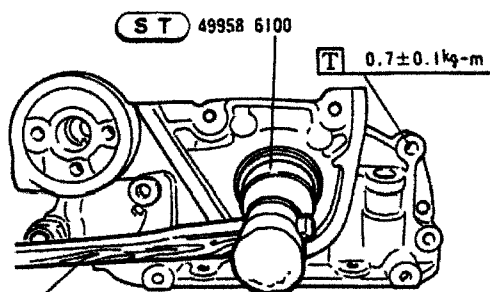
Engine Overhaul

Oil Pump Assembly

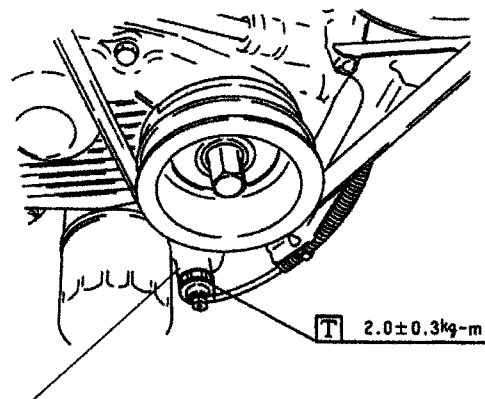
Attach Pump Assembly to Block



Install New Oil Seal



Oil Pressure Switch



Oil Pressure Switch

Note: Oil Pressure Switch Details See in This Book (Electrical Diagrams)

Oil Pressure Switch

