

FOREWORD

This workshop manual has been prepared to provide information covering general service repairs for the N04C–TF engine equipped on the HINO DUTRO.

Applicable models: XZU305, 345 series

Please note that the publications below have also been prepared as relevant service manuals for the components and systems in this vehicles.

Manual Name	Pub. No.
• DUTRO Chassis Workshop Manual Supplement	S1–YXZE10A

All information in this manual is based on the latest product information at the time of publication. However, specifications and procedures are subject to change without notice.

If you find any failures in this manual, you are kindly requested to inform us by using the report form on the next page.

Workshop Manual Quality Report

Att.) Service Manager,
Your Distributor

Pub. No.		Issue Date	
Name of Dealer		Name of Reporter	
Subject			
Problem Description			
Correction Proposal			

CAUTION

This manual does not include all the necessary items about repair and service. This manual is made for the purpose of the use for the persons who have special techniques and certifications. In the cases that non-specialized or uncertified technicians perform repair or service only using this manual or without proper equipment or tool, that may cause severe injury to you or other people around and also cause damage to your customer's vehicle.

In order to prevent dangerous operation and damages to your customer's vehicle, be sure to follow the instruction shown below.

- Must read this manual thoroughly. It is especially important to have a good understanding of all the contents written in the PRECAUTION of "IN" section.
- The service method written in this manual is very effective to perform repair and service. When performing the operations following the procedures using this manual, be sure to use tools specified and recommended. If using non-specified or recommended tools and service method, be sure to confirm safety of the technicians and any possibility of causing personal injury or damage to the customer's vehicle before starting the operation.
- If part replacement is necessary, must replace the part with the same part number or equivalent part. Do not replace it with inferior quality.
- It is important to note that this manual contains various "Cautions" and "Notices" that must be carefully observed in order to reduce the risk of personal injury during service or repair, or the possibility that improper service or repair may damage the vehicle or render it unsafe. It is also important to understand that these "Cautions" and "Notices" are not exhaustive, because it is important to warn of all the possible hazardous consequences that might result from failure to follow these instructions.

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INTRODUCTION

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HOW TO USE THIS ENGINE WORKSHOP MANUAL

010VQ-01

GENERAL INFORMATION

1. GENERAL DESCRIPTION

- (a) This manual is written in accordance with SAE J2008.
- (b) Repair operations can be separated in 3 main processes:
 1. Diagnosis
 2. Removing and Installing, Replacing, Disassembling, Installing and Checking, Adjusting
 3. Final Inspection
- (c) This manual explains "Removing and Installing, Replacing, Disassembling, Installing and Checking, Adjusting". "Diagnosis" and "Final Inspection" is omitted.
- (d) The following essential operations are not written in this manual. However, these operations must be performed in actual situation.
 - (1) Operation with a jack or lift
 - (2) Cleaning of a removed part when necessary
 - (3) Visual check

2. INDEX

- (a) An alphabetical INDEX section is provided at the end of the book as a reference to help you find the item to be repaired.

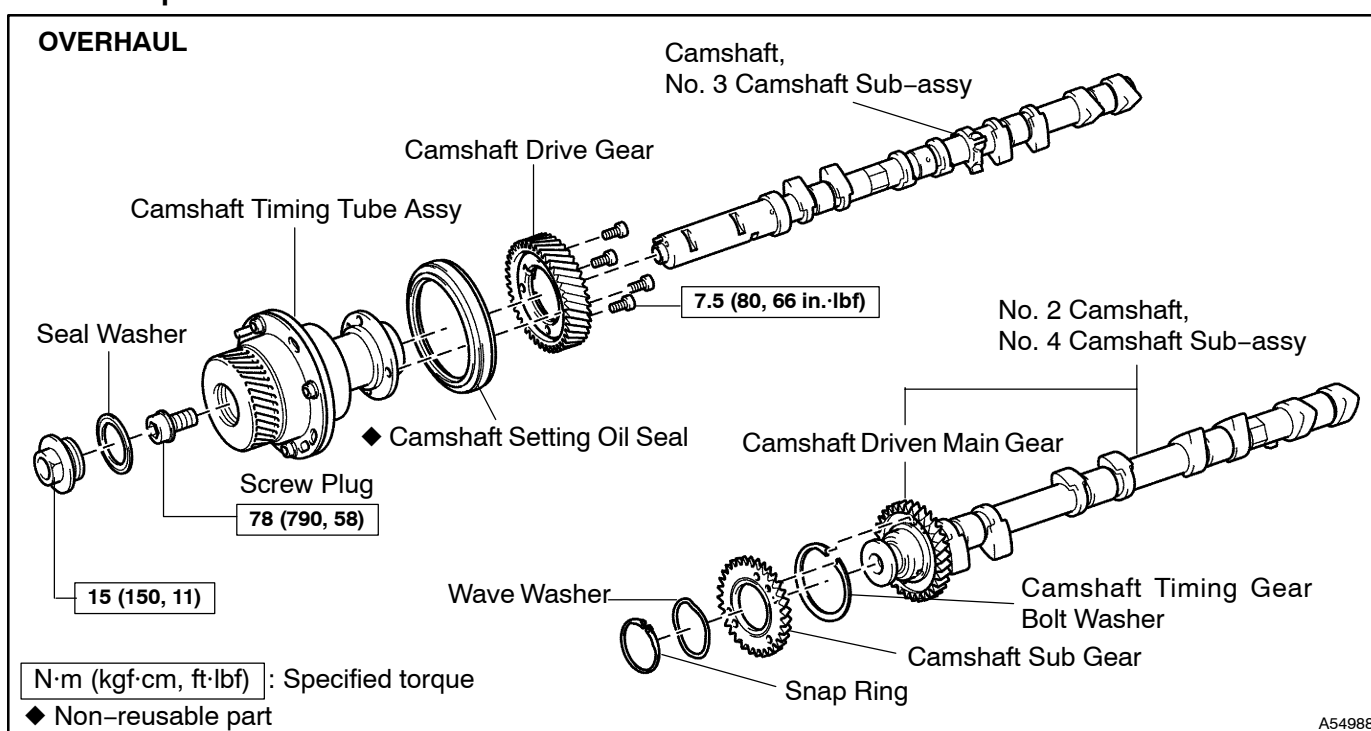
3. PREPARATION

- (a) Use of Special Service Tools (SST) and Special Service Materials (SSM) may be required, depending on the repair situation. Be sure to use SST and SSM when they are required and follow the working procedure properly. A list of SST and SSM is in the Preparation section of this manual.

4. REPAIR PROCEDURES

- (a) A component illustration is placed under the title when necessary.
- (b) Illustrations of the parts catalog are placed as the "disassembled parts drawing" so that it enables you to understand the fitting condition of the components.
- (c) Non-reusable parts, grease application areas, precoated parts and torque specifications are noted in the components illustrations.

Example:



- (d) Torque specifications, grease application areas, and non-reusable parts are emphasized in the procedure.

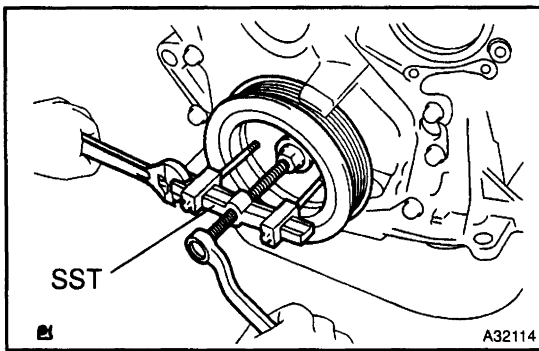
NOTICE:

There are cases where such information can only be explained by using an illustration. In these cases, all the information such as torque, oil, etc. are described in the illustration.

- (e) The installation procedures are the removal procedures in reverse order. However, only installation procedures requiring additional information are included.
- (f) Only items with key points are described in the text. What to do and other details are placed in the illustrations next to the text. Both the text and illustrations are accompanied by standard values and notices.
- (g) Illustrations of similar vehicle models are sometimes used. In those cases, specific details may be different from the actual vehicle.
- (h) Procedures are presented in a step-by-step format:
 - (1) The illustration shows what to do and where to do it.
 - (2) The task heading tells what to do.
 - (3) The explained text tells how to perform the task. It has also information such as specifications and warnings.

Example:

*Illustration:
what to do and where*



Task heading: what to do

5. REMOVE CRANKSHAFT PULLEY

- (a) Using SST, remove the crankshaft pulley.
SST 09950-50012 (09951-05010, 09952-05010, 09953-05020, 09954-05020, 09957-04010)
 - Set part No.* (points to 09950-50012)
 - Component part No.* (points to 09951-05010, 09952-05010, 09953-05020, 09954-05020, 09957-04010)
 - Detailed text: how to do task* (points to the entire instruction)

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HINT:

This format provides an experienced technician with a FAST TRACK to the necessary information. The task headings are easy to read and the text below the task heading provides detailed information. Important specifications and warnings always written in bold type.

5. SERVICE SPECIFICATIONS

- (a) **SPECIFICATIONS** are presented in bold-faced text throughout the manual. The specifications are also found in the Service Specifications section for quick reference.

6. TERMS DEFINITION


CAUTION	Possibility of injury to you or other people.
NOTICE	Possibility of damage to the components being repaired.
HINT	Provide additional information to help you perform repairs.

7. SI UNIT

- (a) The units used in this manual comply with the SI UNIT (International System of Units) standard, Units from the metric system and the English system are also provided.

Example:

Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)



REPAIR INSTRUCTION FOR ENGINE WORKSHOP MANUAL

010VR-01

PRECAUTION

1. TO PREVENT FROM ENTERING FOREIGN SUBSTANCES

(a) When foreign substances such as dust, grain of sand or metallic dust enter inside of the engine, it may causes malfunction of the engine.

- (1) Precaution before disassembly.
 - Remove adequately all sand and mud adhere outside of the engine.
- (2) Precaution at reassembly.
 - Protect disassembled parts from dust by using vinyl sheet to cover.

2. TO PREVENT SCRATCHES ON THE PARTS

(a) Scratches on the contact and revolving surfaces may cause oil leaks and seizures.

- (1) Precautions at disassembly and reassembly.
 - When disassembling the contact surface of the parts, use a plastic hammer striking lightly (Do not pry out by a screwdriver).
 - When fixing the parts to the vise, do not directly catch it in the vise. Fix the parts through aluminum bar.

3. TO CLEAN AND WASH THE PARTS

(a) Each parts must be thoroughly cleaned, washed, and dried by air, and apply specified oil before reassembly.

- (1) Cleaning and washing by alkaline solvent is prohibited:
 - Parts made of aluminum and rubber (ex. cylinder head cover gasket, etc.).
- (2) Cleaning and washing by flushing oil (ex. kerosene, white gasoline, etc.) is prohibited:
 - Parts made of rubber (ex. cylinder head cover gasket, etc.).

4. POSITION AND DIRECTION OF EACH PARTS

(a) Each parts must be reassembled as the same position and direction as it disassembled.

- (1) Precautions at disassembly and reassembly.
 - Follow the directions when the manual designates to mark the matchmark and/or direction mark.
 - Disassembled parts must be stored so that they return to original positions when reassembling.
 - Follow the directions when the manual instructs the position and direction.

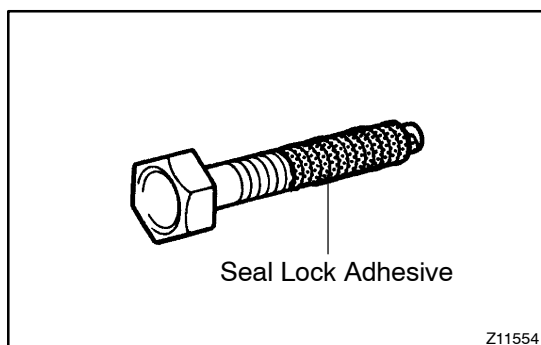
5. INSTALL ENGINE ASSEMBLY TO OVERHAUL STAND WHEN OVERHAUL THE ENGINE

6. PUT THE DISASSEMBLED PARTS IN ORDER AS THEY DISASSEMBLED

7. APPLY ENGINE OIL TO THE SLIDING AND ROTATING SURFACES

8. NON-REUSABLE PARTS SUCH AS GASKET AND SEAL NEEDS TO BE CHANGED TO THE NEW PARTS

9. BASIC REPAIR HINT



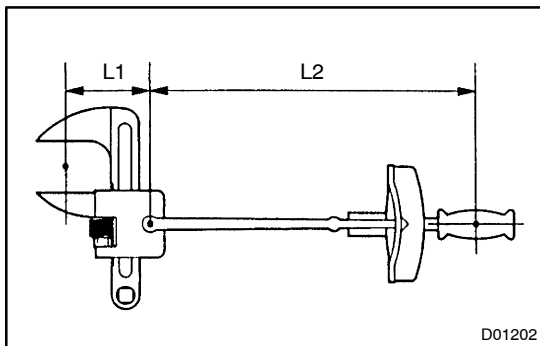
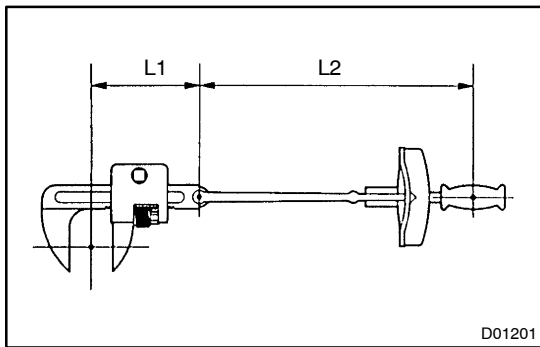
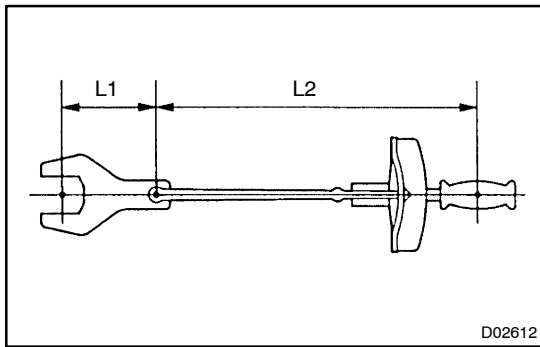
(a) Precoated Parts:

- (1) Precoated parts are bolts and nuts that are coated with a seal lock adhesive at the factory.
- (2) If a precoated part is retightened, loosened or moves in anyway, it must be recoated with the specified adhesive.
- (3) When reusing precoated parts, clean off the old adhesive and dry the parts with compressed air. Then apply new seal lock adhesive appropriate to the bolts and nuts.

NOTICE:

Perform the torque with the lower limit value of the torque tolerance.

- (4) Some seal lock agents harden slowly. You may have to wait for the seal lock agent to harden.
- (b) Gaskets:
When necessary, use a sealer on gaskets to prevent leaks.
- (c) Bolts, Nuts and Screws:
Carefully follow all specifications for bolt tightening torques. Always use a torque wrench.



(d) Torque When Using Extension Tool with Torque Wrench:

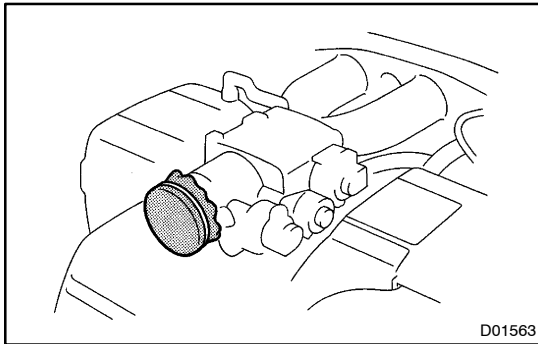
- (1) If SST or an extension tool is combined with the torque wrench to extend its length, do not tighten the torque wrench to the specified torque values in this manual. The actual torque will be excessive.
- (2) Use the formula below to calculate special torque values for situations where SST or extension tool is combined with the torque wrench.
- (3) Formula $T' = T \times L2 / (L1 + L2)$

T'	Reading of torque wrench {N·m (kgf·cm, ft·lbf)}
T	Torque {N·m (kgf·cm, ft·lbf)}
L1	Length of SST or extension tool (cm)
L2	Length of torque wrench (cm)

10. REMOVAL AND INSTALLATION OF FUEL CONTROL PARTS

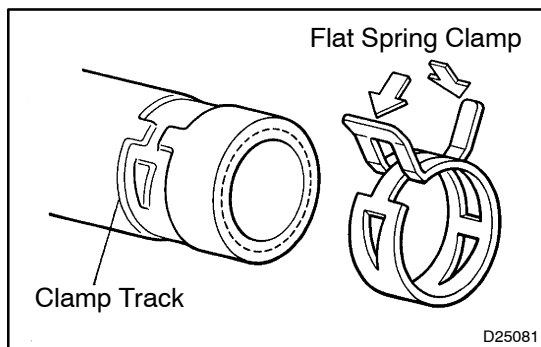
- (a) Place for Removing and Installing Fuel System Parts:
 - (1) Work in a place with good air ventilation that does not have welders, grinders, drills, electric motors, stoves, or any other ignition sources.
 - (2) Never work in a pit or near a pit as vaporized fuel will collect in those places.
- (b) Removing and Installing of Fuel System Parts:
 - (1) Prepare a fire extinguisher before starting operation.
 - (2) To prevent static electricity, install a ground on the fuel changer, vehicle and fuel tank, and do not spray the area with water. The work surface will become slippery. Do not clean up spills with water as this will spread fuel and create a fire hazard.

- (3) Avoid using electric motors, working lights and other electric equipment that can cause sparks or high temperatures.
- (4) Avoid using iron hammers as they may create sparks.
- (5) Dispose of the fuel-contaminated shop rags separately using a fire resistant container.



11. REMOVAL AND INSTALLATION OF ENGINE INTAKE PARTS

- (a) If any metal particles enter the inlet pass, this may damage the engine.
- (b) When removing and installing the inlet system parts, cover the openings of the removed parts and engine openings. Use clean shop rags, gummed tape, or other suitable materials.
- (c) When installing the inlet system parts, check that no metal particles have entered the engine or the installed part.



12. HANDLING OF HOSE CLAMPS

- (a) Before removing the hose, check the clamp position so that it can be reinstalled in the same position.
- (b) Replace deformed or dented clamps with a new one.
- (c) When reusing a hose, attach the clamp on the clamp track portion of the hose.
- (d) For a spring type clamp, you may want to spread the tabs slightly after installation by pushing in the direction of the arrow marks as shown in the illustration.

TERMS FOR ENGINE WORKSHOP MANUAL

ABBREVIATIONS USED IN THIS MANUAL

010VS-01

Abbreviations	Meaning
ABS	Anti-Lock Brake System
A/C	Air Conditioner
AC	Alternating Current
ACC	Accessory
ACIS	Acoustic Control Induction System
ACSD	Automatic Cold Start Device
A.D.D.	Automatic Disconnecting Differential
A/F	Air-Fuel Ratio
AHC	Active Height Control Suspension
ALR	Automatic Locking Retractor
ALT	Alternator
AMP	Amplifier
ANT	Antenna
APPROX.	Approximately
ASSY	Assembly
A/T	Automatic Transmission (Transaxle)
ATF	Automatic Transmission Fluid
AUTO	Automatic
AUX	Auxiliary
AVG	Average
AVS	Adaptive Variable Suspension
B+	Battery Voltage
BACS	Boost Altitude Compensation System
BAT	Battery
BDC	Bottom Dead Center
B/L	Bi-Level
B/S	Bore-Stroke Ratio
BTDC	Before Top Dead Center
BVSV	Bimetallic Vacuum Switching Valve
CB	Circuit Breaker
CCo	Catalytic Converter For Oxidation
CD	Compact Disc
CF	Cornering Force
CG	Center Of Gravity
CH	Channel
CKD	Complete Knock Down
COMB.	Combination
CPE	Coupe
CPS	Combustion Pressure Sensor
CPU	Central Processing Unit
CRS	Child Restraint System
CTR	Center
C/V	Check Valve
CV	Control Valve
CW	Curb Weight
DC	Direct Current
DEF	Defogger
DFL	Deflector

Abbreviations	Meaning
DIFF.	Differential
DIFF. LOCK	Differential Lock
D/INJ	Direct Injection
DLC	Data Link Connector
DLI	Distributorless Ignition
DOHC	Double Overhead Camshaft
DP	Dash Pot
DS	Dead Soak
DSP	Digital Signal Processor
DTC	Diagnostic Trouble Code
ECAM	Engine Control And Measurement System
ECD	Electronic Controlled Diesel
ECDY	Eddy Current Dynamometer
ECT	Electronic Control Transmission
ECU	Electronic Control Unit
ED	Electro-Deposited Coating
EDU	Electronic Driving Unit
EDIC	Electric Diesel Injection Control
EFI	Electronic Fuel Injection
E/G	Engine
EGR	Exhaust Gas Recirculation
EGR-VM	EGR-Vacuum Modulator
ELR	Emergency Locking Retractor
ENG	Engine
ESA	Electronic Spark Advance
ETCS	Electronic Throttle Control System
EVAP	Evaporative Emission Control
EVP	Evaporator
E-VRV	Electric Vacuum Regulating Valve
EX	Exhaust
FE	Fuel Economy
FF	Front-Engine Front-Wheel-Drive
F/G	Fuel Gauge
FIPG	Formed In Place Gasket
FL	Fusible Link
F/P	Fuel Pump
FPU	Fuel Pressure Up
FR	Front
F/W	Flywheel
FW/D	Flywheel Damper
FWD	Front-Wheel-Drive
GAS	Gasoline
GND	Ground
HAC	High Altitude Compensator
H/B	Hatchback
H-FUSE	High Current Fuse
HI	High
HID	High Intensity Discharge (Head Lamp)
HSG	Housing
HT	Hard Top
HWS	Heated Windshield System

INTRODUCTION - TERMS FOR ENGINE WORKSHOP MANUAL

Abbreviations	Meaning
IC	Integrated Circuit
IDI	Indirect Diesel Injection
IFS	Independent Front Suspension
IG	Ignition
IIA	Integrated Ignition Assembly
IN	Intake (Manifold, Valve)
INT	Intermittent
I/P	Instrument Panel
IRS	Independent Rear Suspension
ISC	Idle Speed Control
J/B	Junction Block
J/C	Junction Connector
KD	Kick-Down
LAN	Local Area Network
LB	Liftback
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LH	Left-Hand
LHD	Left-Hand Drive
L/H/W	Length, Height, Width
LLC	Long-Life Coolant
LNG	Liquified Natural Gas
LO	Low
LPG	Liquified Petroleum Gas
LSD	Limited Slip Differential
LSP & PV	Load Sensing Proportioning And Bypass Valve
LSPV	Load Sensing Proportioning Valve
MAP	Manifold Absolute Pressure
MAX.	Maximum
MIC	Microphone
MIL	Malfunction Indicator Lamp
MIN.	Minimum
MP	Multipurpose
MPI	Multipoint Electronic Injection
MPX	Multiplex Communication System
M/T	Manual Transmission (Transaxle)
MT	Mount
MTG	Mounting
N	Neutral
NA	Natural Aspiration
NO.	Number
O2S	Oxygen Sensor
O/D	Overdrive
OEM	Original Equipment Manufacturing
OHC	Overhead Camshaft
OHV	Overhead Valve
OPT	Option
O/S	Oversize
P & BV	Proportioning And Bypass Valve
PCS	Power Control System
PCV	Positive Crankcase Ventilation

Abbreviations	Meaning
PKB	Parking Brake
PPS	Progressive Power Steering
PS	Power Steering
PTO	Power Take-Off
P/W	Power Window
R & P	Rack And Pinion
R/B	Relay Block
RBS	Recirculating Ball Type Steering
R/F	Reinforcement
RFS	Rigid Front Suspension
RRS	Rigid Rear Suspension
RH	Right-Hand
RHD	Right-Hand Drive
RLY	Relay
ROM	Read Only Memory
RR	Rear
RRS	Rear-Wheel Drive
RWD	Rear-Wheel Drive
SDN	Sedan
SEN	Sensor
SICS	Starting Injection Control System
SOC	State Of Charge
SOHC	Single Overhead Camshaft
SPEC	Specification
SPI	Single Point Injection
SRS	Supplemental Restraint System
SSM	Special Service Materials
SST	Special Service Tools
STD	Standard
STJ	Cold-Start Fuel Injection
SW	Switch
SYS	System
T/A	Transaxle
TACH	Tachometer
TBI	Throttle Body Electronic Fuel Injection
TC	Turbocharger
TCCS	Computer-Controlled System
TCV	Timing Control Valve
TDC	Top Dead Center
TEMP.	Temperature
TIS	Total Information System For Vehicle Development
T/M	Transmission
TRC	Traction Control System
TURBO	Turbocharge
TWC	Three-Way Catalyst
U/D	Underdrive
U/S	Undersize
VCV	Vacuum Control Valve
VENT	Ventilator
VIN	Vehicle Identification Number
VPS	Variable Power Steering

INTRODUCTION - TERMS FOR ENGINE WORKSHOP MANUAL

Abbreviations	Meaning
VSC	Vehicle Skid Control
VSV	Vacuum Switching Valve
VTV	Vacuum Transmitting Valve
VVT-i	Variable Valve Timing-intelligent
W/	With
WGN	Wagon
W/H	Wire Harness
W/O	Without
1ST	First
2ND	Second
2WD	Two Wheel Drive Vehicle (4 x 2)
3RD	Third
4TH	Fourth
4WD	Four Wheel Drive Vehicle (4 x 4)
4WS	Four Wheel Steering System
5TH	Fifth

GLOSSARY OF SAE AND HINO TERMS

This glossary lists all SAE-J1930 terms and abbreviations used in this manual in compliance with SAE recommendations, as well as their HINO equivalents.

SAE ABBREVIATIONS	SAE TERMS	HINO TERMS ()--ABBREVIATIONS
A/C	Air Conditioning	Air Conditioner
ACL	Air Cleaner	Air Cleaner, A/CL
AIR	Secondary Air Injection	Air Injection (AI)
AP	Accelerator Pedal	-
B+	Battery Positive Voltage	+B, Battery Voltage
BARO	Barometric Pressure	HAC
CAC	Charge Air Cooler	Intercooler
CARB	Carburettor	Carburettor
CFI	Continuous Fuel Injection	-
CKP	Crankshaft Position	Crank Angle
CL	Closed Loop	Closed Loop
CMP	Camshaft Position	Cam Angle
CPP	Clutch Pedal Position	-
CTOX	Continuous Trap Oxidizer	-
CTP	Closed Throttle Position	LL ON, Idle ON
DFI	Direct Fuel Injection (Diesel)	Direct Injection (DI)
DI	Distributor Ignition	-
DLC1 DLC2 DLC3	Data Link Connector 1 Data Link Connector 2 Data Link Connector 3	1: Check Connector 2: Total Diagnosis Communication Link (TDCL) 3: OBD II Diagnostic Connector
DTC	Diagnostic Trouble Code	Diagnostic Trouble Code
DTM	Diagnostic Test Mode	-
ECL	Engine Control Level	-
ECM	Engine Control Module	Engine ECU (Electronic Control Unit)
ECT	Engine Coolant Temperature	Coolant Temperature, Water Temperature (THW)
EEPROM	Electrically Erasable Programmable Read Only Memory	Electrically Erasable Programmable Read Only Memory (EEPROM), Erasable Programmable Read Only Memory (EPROM)
EFE	Early Fuel Evaporation	Cold Mixture Heater (CMH), Heat Control Valve (HCV)
EGR	Exhaust Gas Recirculation	Exhaust Gas Recirculation (EGR)
EI	Electronic Ignition	Distributorless Ignition (TDI)
EM	Engine Modification	Engine Modification (EM)
EPROM	Erasable Programmable Read Only Memory	Programmable Read Only Memory (PROM)
EVAP	Evaporative Emission	Evaporative Emission Control (EVAP)
FC	Fan Control	-
FEEPROM	Flash Electrically Erasable Programmable Read Only Memory	-
FEPROM	Flash Erasable Programmable Read Only Memory	-
FF	Flexible Fuel	-
FP	Fuel Pump	Fuel Pump
GEN	Generator	Alternator
GND	Ground	Ground (GND)

INTRODUCTION - TERMS FOR ENGINE WORKSHOP MANUAL

HO2S	Heated Oxygen Sensor	Heated Oxygen Sensor (HO ₂ S)
IAC	Idle Air Control	Idle Speed Control (ISC)
IAT	Intake Air Temperature	Intake or Inlet Air Temperature
ICM	Ignition Control Module	-
IFI	Indirect Fuel Injection	Indirect Injection (IDL)
IFS	Inertia Fuel-Shutoff	-
ISC	Idle Speed Control	-
KS	Knock Sensor	Knock Sensor
MAF	Mass Air Flow	Air Flow Meter
MAP	Manifold Absolute Pressure	Manifold Pressure Intake Vacuum
MC	Mixture Control	Electric Bleed Air Control Valve (EBCV) Mixture Control Valve (MCV) Electric Air Control Valve (EACV)
MDP	Manifold Differential Pressure	-
MFI	Multiport Fuel Injection	Electronic Fuel Injection (EFI)
MIL	Malfunction Indicator Lamp	Check Engine Warning Lamp
MST	Manifold Surface Temperature	-
MVZ	Manifold Vacuum Zone	-
NVRAM	Non-Volatile Random Access Memory	-
O2S	Oxygen Sensor	Oxygen Sensor, O ₂ Sensor (O ₂ S)
OBD	On-Board Diagnostic	On-Board Diagnostic System (OBD)
OC	Oxidation Catalytic Converter	Oxidation Catalyst Convert (OC), CCo
OP	Open Loop	Open Loop
PAIR	Pulsed Secondary Air Injection	Air Suction (AS)
PCM	Powertrain Control Module	-
PNP	Park/Neutral Position	-
PROM	Programmable Read Only Memory	-
PSP	Power Steering Pressure	-
PTOX	Periodic Trap Oxidizer	Diesel Particulate Filter (DPF) Diesel Particulate Trap (DPT)
RAM	Random Access Memory	Random Access Memory (RAM)
RM	Relay Module	-
ROM	Read Only Memory	Read Only Memory (ROM)
RPM	Engine Speed	Engine Speed
SC	Supercharger	Supercharger
SCB	Supercharger Bypass	E-ABV
SFI	Sequential Multiport Fuel Injection	Electronic Fuel Injection (EFI), Sequential Injection
SPL	Smoke Puff Limiter	-
SRI	Service Reminder Indicator	-
SRT	System Readiness Test	-
ST	Scan Tool	-
TB	Throttle Body	Throttle Body
TBI	Throttle Body Fuel Injection	Single Point Injection Central Fuel Injection (Ci)
TC	Turbocharger	Turbocharger
TCC	Torque Converter Clutch	Torque Converter

TCM	Transmission Control Module	Transmission ECU, ECT ECU
TP	Throttle Position	Throttle Position
TR	Transmission Range	-
TVV	Thermal Vacuum Valve	Bimetallic Vacuum Switching Valve (BVSV) Thermostatic Vacuum Switching Valve (TVSV)
TWC	Three-Way Catalytic Converter	Three-Way Catalytic (TWC) Manifold Converter CC _{RO}
TWC+OC	Three-Way + Oxidation Catalytic Converter	CC _R + CCo
VAF	Volume Air Flow	Air Flow Meter
VR	Voltage Regulator	Voltage Regulator
VSS	Vehicle Speed Sensor	Vehicle Speed Sensor
WOT	Wide Open Throttle	Full Throttle
WU-OC	Warm Up Oxidation Catalytic Converter	-
WU-TWC	Warm Up Three-Way Catalytic Converter	-
3GR	Third Gear	-
4GR	Fourth Gear	-

PREPARATION


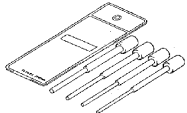
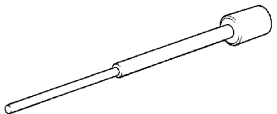

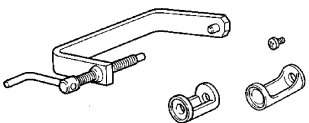
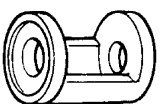
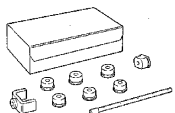
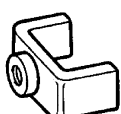

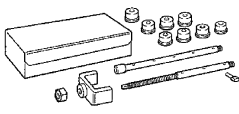
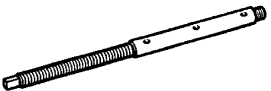

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PREPARATION	02-8

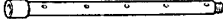

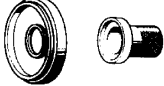
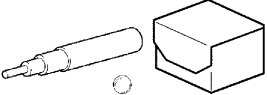
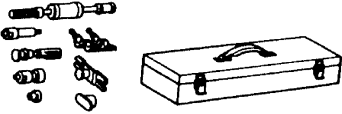

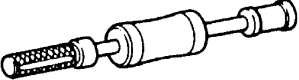
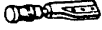

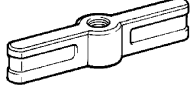
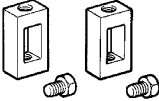
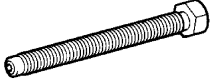
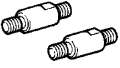
ENGINE MECHANICAL

PREPARATION

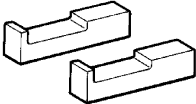
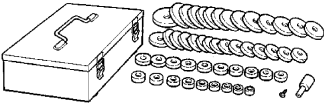


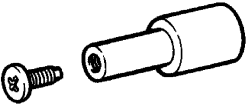
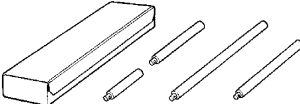

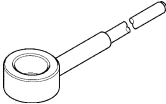
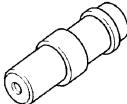
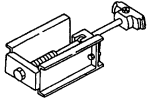
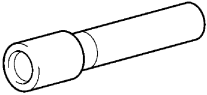


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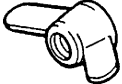
SST

	09032-00100	Oil Pan Seal Cutter	PARTIAL ENGINE ASSY(N04C-TF)
	09201-10000	Valve Guide Bushing Remover & Replacer Set	CYLINDER HEAD ASSY(N04C-TF)
	(09201-01050)	Valve Guide Bushing Remover & Replacer 5	CYLINDER HEAD ASSY(N04C-TF)
	(09201-01070)	Valve Guide Bushing Remover & Replacer 7	CYLINDER HEAD ASSY(N04C-TF)
	09202-70020	Valve Spring Compressor	CYLINDER HEAD ASSY(N04C-TF)
	(09202-00030)	Attachment	CYLINDER HEAD ASSY(N04C-TF)
	09215-00013	Crankshaft Bearing Remover & Replacer Set B	CYLINDER BLOCK ASSY(N04C-TF)
	(09215-00021)	Gate "B"	CYLINDER BLOCK ASSY(N04C-TF)
	(09215-00461)	Camshaft Bearing Remover & Replacer	CYLINDER BLOCK ASSY(N04C-TF)
	09215-00101	Camshaft Bearing Remover & Replacer Set A	CYLINDER BLOCK ASSY(N04C-TF)
	(09215-00130)	Bolt	CYLINDER BLOCK ASSY(N04C-TF)
	(09215-00141)	Nut	CYLINDER BLOCK ASSY(N04C-TF)


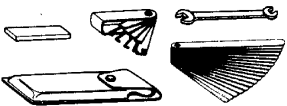
	(09215-00150) Shaft A	CYLINDER BLOCK ASSY(N04C-TF)
	(09215-00161) Pin	CYLINDER BLOCK ASSY(N04C-TF)
	09223-78010 Crankshaft Oil Seal Replacer	PARTIAL ENGINE ASSY(N04C-TF)
	09260-69015 Injection Nozzle Seat Tool Set	CYLINDER HEAD ASSY(N04C-TF)
	09910-00015 Puller Set	PARTIAL ENGINE ASSY(N04C-TF)
	(09911-00011) Puller Clamp	PARTIAL ENGINE ASSY(N04C-TF)
	(09912-00010) Puller Slide Hammer	PARTIAL ENGINE ASSY(N04C-TF)
	(09913-00010) Main Drive Gear Puller Attachment (J)	PARTIAL ENGINE ASSY(N04C-TF)
	09950-40011 Puller B Set	PARTIAL ENGINE ASSY(N04C-TF)
	(09951-04010) Hanger 150	PARTIAL ENGINE ASSY(N04C-TF)
	(09952-04010) Slide Arm	PARTIAL ENGINE ASSY(N04C-TF)
	(09953-04020) Center Bolt 150	PARTIAL ENGINE ASSY(N04C-TF)
	(09954-04010) Arm 25	PARTIAL ENGINE ASSY(N04C-TF)

PREPARATION - ENGINE MECHANICAL

	(09955-04051) Claw No.5	PARTIAL ENGINE ASSY(N04C-TF)
	09950-60010 Replacer Set	CYLINDER HEAD ASSY(N04C-TF)
	(09951-00300) Replacer 30	CYLINDER HEAD ASSY(N04C-TF)
	(09951-00360) Replacer 36	CYLINDER HEAD ASSY(N04C-TF)
	(09952-06010) Adapter	CYLINDER HEAD ASSY(N04C-TF)
	09950-70010 Handle Set	CYLINDER HEAD ASSY(N04C-TF)
	(09951-07100) Handle 100	CYLINDER HEAD ASSY(N04C-TF)
	0940-21450 Press Sub-Assembly	CYLINDER BLOCK ASSY(N04C-TF)
	0940-21470 Spindle	CYLINDER BLOCK ASSY(N04C-TF)
	0942-01460 Cylinder Liner Puller	CYLINDER BLOCK ASSY(N04C-TF)
	0947-22210 Bar	CYLINDER HEAD ASSY(N04C-TF)
	0948-11130 Guide	CYLINDER BLOCK ASSY(N04C-TF)
	0948-11140 Guide	CYLINDER BLOCK ASSY(N04C-TF)

	9191-08252 Bolt	CYLINDER BLOCK ASSY(N04C-TF)
	9233-10360 Wing Nut	CYLINDER BLOCK ASSY(N04C-TF)

Recommended Tools

	09090-04020 Engine Sling Device	PARTIAL ENGINE ASSY(N04C-TF)
	09200-00010 Engine Adjust Kit	PARTIAL ENGINE ASSY(N04C-TF)

Equipment

Abrasive compound	Valve
Air gun	
Brush	Piston
Caliper gauge	
Carbide cutter (30°)	Valve seat
Carbide cutter (45°)	Valve seat
Cylinder gauge	
Dial indicator	
Heater	
Magnetic finger	
Micrometer	
Piston ring compressor	
Piston ring expander	
Precision straight edge	
Press	
Snap ring pliers	Piston pin
Soft brush	Cylinder head Cylinder block
Spring tester	Valve spring
Steel square	Valve spring
Torch	
Torque wrench	
Vernier caliper	
Valve seat cutter	
Valve guide bushing brush	
V-block	
Wire	
Wooden block	

SSM

08826-00080 Seal Packing Black or equivalent (FIPG)	PARTIAL ENGINE ASSY(N04C-TF) CYLINDER HEAD ASSY(N04C-TF)
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COOLING

PREPARATION

023W1-01

Equipment

Heater	
Thermometer	

LUBRICATION

PREPARATION

023W2-01



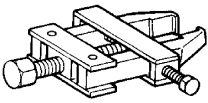

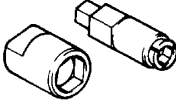

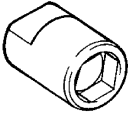
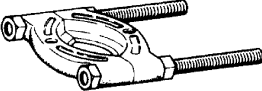
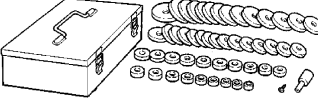



Equipment

Dial gauge	
Micrometer	
Vernier caliper	
Vise	





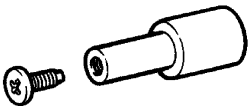
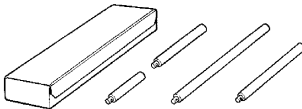

STARTING & CHARGING**PREPARATION**

023VW-01


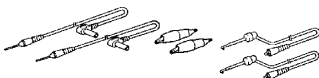
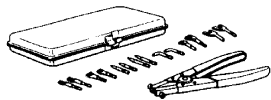

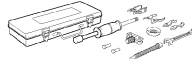
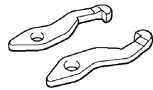
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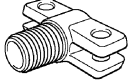
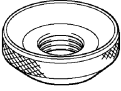

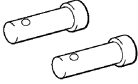
	09285-76010	Injection Pump Camshaft Bearing Cone Replacer	CHARGING SYSTEM(N04C-TF)
	09710-02021	Handle	STARTER ASSY(N04C-TF)
	09820-00021	Alternator Rear Bearing Puller	CHARGING SYSTEM(N04C-TF)
	09820-00031	Alternator Rotor Rear Bearing Replacer	CHARGING SYSTEM(N04C-TF)
	09820-63010	Alternator Pulley Set Nut Wrench Set	CHARGING SYSTEM(N04C-TF)
	(09820-06010)	Alternator Rotor Shaft Wrench	CHARGING SYSTEM(N04C-TF)
	(09820-06020)	Alternator Pulley Set Nut 22 mm Wrench	CHARGING SYSTEM(N04C-TF)
	09950-00020	Bearing Remover	STARTER ASSY(N04C-TF)
	09950-60010	Replacer Set	STARTER ASSY(N04C-TF) CHARGING SYSTEM(N04C-TF)
	(09951-00250)	Replacer 25	STARTER ASSY(N04C-TF)
	(09951-00260)	Replacer 26	STARTER ASSY(N04C-TF)
	(09951-00270)	Replacer 27	CHARGING SYSTEM(N04C-TF)

PREPARATION - STARTING & CHARGING

	(09951-00280) Replacer 28	STARTER ASSY(N04C-TF)
	(09951-00300) Replacer 30	STARTER ASSY(N04C-TF)
	(09951-00310) Replacer 31	STARTER ASSY(N04C-TF)
	(09951-00500) Replacer 50	CHARGING SYSTEM(N04C-TF)
	(09952-06010) Adapter	STARTER ASSY(N04C-TF)
	09950-70010 Handle Set	STARTER ASSY(N04C-TF) CHARGING SYSTEM(N04C-TF)
	(09951-07100) Handle 100	STARTER ASSY(N04C-TF) CHARGING SYSTEM(N04C-TF)

Recommended Tools

	09082-00040 Electrical Tester	STARTER ASSY(N04C-TF) CHARGING SYSTEM(N04C-TF)
	(09083-00150) Test Lead Set	STARTER ASSY(N04C-TF) CHARGING SYSTEM(N04C-TF)
	09904-00010 Expander Set	STARTER ASSY(N04C-TF)
	(09904-00050) No. 4 Claw	STARTER ASSY(N04C-TF)
	95720-00051 Berling Pullar set	CHARGING SYSTEM(N04C-TF)
	(95720-10030) Crow A	CHARGING SYSTEM(N04C-TF)

	(95720-10050) Hanger	CHARGING SYSTEM(N04C-TF)
	(95720-10060) Lock nut	CHARGING SYSTEM(N04C-TF)
	(95720-10070) Bushing bolt	CHARGING SYSTEM(N04C-TF)
	(95720-10080) Pin	CHARGING SYSTEM(N04C-TF)

Equipment

Dial indicator	
Ohmmeter	
Press	
Pull scale	Brush spring
Sandpaper (#400)	Commutator
Soldering iron	
Torque wrench	
Vernier caliper	
Vise	


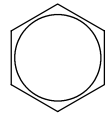
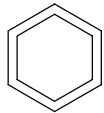
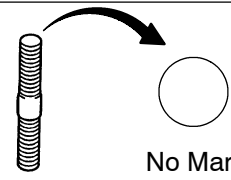
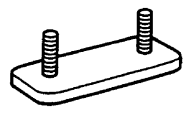

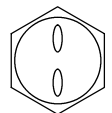
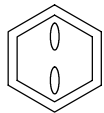

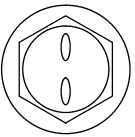
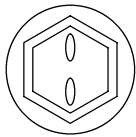










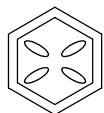
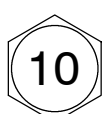

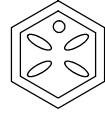


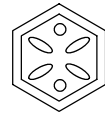
SERVICE SPECIFICATIONS

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STANDARD BOLT

HOW TO DETERMINE BOLT STRENGTH

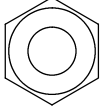
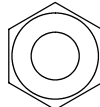
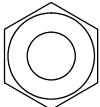
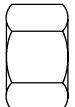

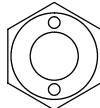
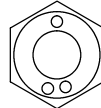
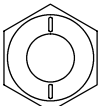
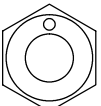
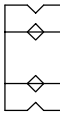
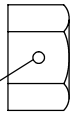

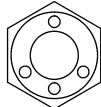

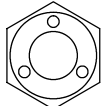
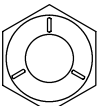
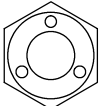
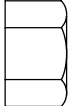

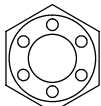

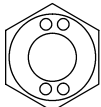
03250-01

Bolt Type				Class
Hexagon Head Bolt		Stud Bolt	Weld Bolt	
Normal Recess Bolt	Deep Recess Bolt			
  No Mark	 No Mark	 No Mark		4T
 				5T
  w/Washer	 w/Washer			6T
 	 			7T
		 		8T
				9T
	 			10T
	 			11T

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N·m	kgf·cm	ft·lbf	N·m	kgf·cm	ft·lbf
4T	6	1	5	55	48 in.·lbf	6	60	52 in.·lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	-	-	-
5T	6	1	6.5	65	56 in.·lbf	7.5	75	65 in.·lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	-	-	-
6T	6	1	8	80	69 in.·lbf	9	90	78 in.·lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	-	-	-
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	-	-	-
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
10T	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

HOW TO DETERMINE NUT STRENGTH

Nut Type		Class	
Present Standard Hexagon Nut	Old Standard Hexagon Nut		
	Cold Forging Nut		Cutting Processed Nut
 No Mark			4N
 No Mark (w/Washer)	 No Mark (w/Washer)	 No Mark	5N (4T)
  			6N
	 	  *	7N (5T)
 			8N
 	 	 No Mark	10N (7T)
 			11N
 			12N

*: Nut with 1 or more marks on one side surface of the nut.

HINT:

Use the nut with the same number of the nut strength classification or the greater than the bolt strength classification number when tightening parts with a bolt and nut.

Example: Bolt = 4T

Nut = 4N or more

ENGINE MECHANICAL

SERVICE DATA

0325R-01

Valve rocker arm and shaft			
Valve rocker arm bush inside diameter	STD	22.023 to 22.052 mm (0.8670 to 0.8681 in.)	
	Maximum	22.08 mm (0.8692 in.)	
Valve rocker shaft diameter	STD	21.959 to 21.980 mm (0.8645 to 0.8653 in.)	
	Maximum	21.92 mm (0.8630 in.)	
Oil clearance	STD	0.043 to 0.093 mm (0.0017 to 0.0036 in.)	
	Maximum	0.15 mm (0.6059 in.)	
Valve push rod			
Circle runout	Maximum	0.30 mm (0.0118 in.)	
Cylinder head bolt			
Length (A)	Bolt No. position 1 to 18	129 mm (5.07 in.)	
Idle gear No. 2 and shaft			
Idle gear No. 2 thrust clearance	STD	0.103 to 0.164 mm (0.0040 to 0.0064 in.)	
	Maximum	0.30 mm (0.0118 in.)	
Idle gear No. 2 backlash	STD	0.036 to 0.227 mm (0.0014 to 0.0089 in.)	
	Maximum	0.30 mm (0.0118 in.)	
Idle gear inside diameter	STD	50.000 to 50.025 mm (1.9685 to 1.9695 in.)	
	Maximum	50.05 mm (1.9704 in.)	
Idle gear shaft diameter	STD	49.950 to 49.975 mm (1.9665 to 1.9675 in.)	
	Minimum	49.95 mm (1.9665 in.)	
Oil clearance	STD	0.0125 to 0.0375 mm (0.0005 to 0.0014 in.)	
	Maximum	0.10 mm (0.0039 in.)	
Camshaft timing gear			
Gear backlash	STD	0.069 to 0.203 mm (0.0027 to 0.0079 in.)	
	Maximum	0.30 mm (0.0118 in.)	
Oil pump gear			
Gear backlash	STD	0.065 to 0.215 mm (0.0025 to 0.0084 in.)	
	Maximum	0.30 mm (0.0118 in.)	
Idle gear No. 1			
Idle gear No. 1 thrust clearance	STD	0.103 to 0.164 mm (0.0040 to 0.0064 in.)	
	Maximum	0.30 mm (0.0118 in.)	
Idle gear No. 1			
Idle gear No. 1 backlash	STD	0.035 to 0.193 mm (0.0014 to 0.0075 in.)	
	Maximum	0.30 mm (0.0118 in.)	
Idle gear No. 1 and shaft			
Idle gear No. 1 inside diameter	STD	50.000 to 50.025 mm (1.9685 to 1.9695 in.)	
	Maximum	50.05 mm (1.9704 in.)	
Idle gear shaft diameter	STD	49.950 to 49.975 mm (1.9665 to 1.9675 in.)	
	Minimum	49.95 mm (1.9665 in.)	
Oil clearance	STD	0.0125 to 0.0370 mm (0.0005 to 0.0014 in.)	
	Maximum	0.10 mm (0.0039 in.)	
Valve clearance (cold)			
	Intake	0.30 mm (0.012 in.)	
	Exhaust	0.45 mm (0.018 in.)	
Cylinder head			
Maximum warpage	Cylinder block side	2.0 mm (0.079 in.)	
	Intake manifold side	2.0 mm (0.079 in.)	
	Exhaust manifold side	2.0 mm (0.079 in.)	
Valve seat			
Refacing angle	Intake	30°, 45°	
	Exhaust	30°, 45°	
Cylinder head dimension			
	Intake (A)	36.000 to 36.015 mm (1.4173 to 1.4179 in.)	
	Intake (B)	8.400 to 8.600 mm (0.3307 to 0.3385 in.)	
	Exhaust (A)	32.000 to 32.016 mm (1.2598 to 1.2604 in.)	
	Exhaust (B)	7.600 to 7.800 mm (0.2992 to 0.3070 in.)	
Contacting width			
	Intake	0.8 to 1.0 mm (0.031 to 0.039 in.)	
	Exhaust	1.8 to 2.0 mm (0.070 to 0.078 in.)	

SERVICE SPECIFICATIONS - ENGINE MECHANICAL

Valve spring		
Maximum deviation		2.0 mm (0.079 in.)
Standard free length		85.1 mm (3.350 in.)
Maximum free length		82.1 mm (3.232 in.)
Valve guide bush and Valve stem diameter	Intake	6.957 to 6.972 mm (0.2738 to 0.2744 in.)
	Exhaust	6.932 to 6.947 mm (0.2729 to 0.2735 in.)
Bush inside diameter (w/ Valve guide bush)	Intake	7.000 to 7.015 mm (0.2755 to 0.2761 in.)
	Exhaust	7.000 to 7.015 mm (0.2755 to 0.2761 in.)
Standard oil clearance	Intake	0.023 to 0.058 mm (0.0009 to 0.0022 in.)
	Exhaust	0.050 to 0.083 mm (0.0020 to 0.0032 in.)
Maximum oil clearance	Intake	0.12 mm (0.0047 in.)
	Exhaust	0.15 mm (0.0059 in.)
Bush inside diameter (w/o Valve guide bush)		13.000 to 13.018 mm (0.5118 to 0.5125 in.)
Protrusion height		26.4 to 26.8 mm (1.039 to 1.055 in.)
Valve sink		
Standard sink	Intake	0.8 to 1.0 mm (0.031 to 0.039 in.)
	Exhaust	1.8 to 2.0 mm (0.070 to 0.078 in.)
Maximum sink	Intake	1.1 mm (0.043 in.)
	Exhaust	2.1 mm (0.082 in.)
Injection nozzle seat		
Protrusion	STD	2.45 to 2.95 mm (0.0964 to 0.1161 in.)
	Minimum	2.95 mm (0.1161 in.)
Valve stem oil seal		
Standard height (A)		29.0 to 29.5 mm (1.141 to 1.161 in.)
Connecting rod bolt		
Bolt length	STD	59.00 mm (2.3228 in.)
	Minimum	61.5 mm (2.421 in.)
Connecting rod		
Connecting rod thrust clearance	STD	0.200 to 0.520 mm (0.0079 to 0.0204 in.)
	Maximum	0.60 mm (0.0236 in.)
Connecting rod bearing		
Big end inside diameter	STD	61.991 to 62.022 mm (2.446 to 2.4418 in.)
	Maximum	62.06 mm (2.4433 in.)
Oil clearance	STD	0.031 to 0.082 mm (0.0012 to 0.0032 in.)
	Maximum	0.20 mm (2.4433 in.)
	STD	61.94 to 61.96 mm (2.4385 to 2.4393 in.)
	U/S 0.25	61.69 to 61.71 mm (2.4287 to 2.4295 in.)
	U/S 0.50	61.44 to 61.46 mm (2.4188 to 2.4196 in.)
	U/S 0.75	61.19 to 61.21 mm (2.4090 to 2.4098 in.)
	U/S 1.00	60.94 to 60.96 mm (2.3992 to 2.3999 in.)
Crankshaft pin		3.50 to 4.00 mm (0.1378 to 0.1575 in.)
Cylinder liner		
Cylinder liner inside diameter	STD (A)	106.982 to 106.989 mm (4.2118 to 4.2121 in.)
	(B)	106.990 to 106.995 mm (4.2121 to 4.2123 in.)
	(C)	106.996 to 107.004 mm (4.2124 to 4.2127 in.)
Cylinder liner outside diameter	STD (A)	107.000 to 107.008 mm (4.2125 to 4.2129 in.)
	(B)	107.008 to 107.014 mm (4.2129 to 4.2131 in.)
	(C)	107.014 to 107.022 mm (4.2131 to 4.2134 in.)
Cylinder bore inside diameter	STD	104.012 to 104.036 mm (4.0950 to 4.0959 in.)
	Maximum	104.15 mm (4.1004 in.)
Oil clearance	STD	0.084 to 0.124 mm (0.0033 to 0.0048 in.)
Protrusion	STD	0.01 to 0.08 mm (0.0004 to 0.0031 in.)
	Maximum	0.08 mm (0.0031 in.)

Piston		
Piston diameter	STD	103.912 to 103.928 mm (4.0910 to 4.0916 in.)
Oil clearance	STD	0.084 to 0.124 mm (0.0033 to 0.0048 in.)
Piston ring groove clearance	STD 1st	0.11 to 0.15 mm (0.0043 to 0.0059 in.)
	2nd	0.07 to 0.11 mm (0.0028 to 0.0043 in.)
	Oil	0.02 to 0.06 mm (0.0008 to 0.0024 in.)
	Maximum	0.30 mm (0.0118 in.)
Piston ring groove width	STD 1st	2.58 to 2.60 mm (0.1016 to 0.1024 in.)
	2nd	2.06 to 2.08 mm (0.0811 to 0.0819 in.)
	Oil	4.01 to 4.03 mm (0.1579 to 0.1578 in.)
	Maximum 1st	3.10 mm (0.1220 in.)
	2nd	2.20 mm (0.0866 in.)
Piston ring groove width	Oil	4.08 mm (1.1606 in.)
	STD 1st	2.47 to 2.49 mm (0.0972 to 0.0980 in.)
	2nd	1.97 to 1.99 mm (0.0776 to 0.0783 in.)
	Oil	4.97 to 4.99 mm (0.1957 to 0.1965 in.)
Piston pin	Maximum 1st	2.32 mm (0.0913 in.)
	2nd	1.82 mm (0.0717 in.)
	Oil	4.95 mm (1.1949 in.)
Piston pin diameter	STD	36.989 to 37.000 mm (1.4563 to 1.4567 in.)
Bush inside diameter	Minimum	36.96 mm (1.4551 in.)
	STD	37.035 to 37.045 mm (1.4581 to 1.4585 in.)
Oil clearance	Maximum	37.10 mm (1.4606 in.)
	STD	0.035 to 0.056 mm (0.0014 to 0.0022 in.)
Piston pin boss inside diameter	Maximum	0.08 mm (0.0031 in.)
	STD	36.987 to 37.003 mm (1.4562 to 1.4568 in.)
Oil clearance	Maximum	37.05 mm (1.4587 in.)
	STD	0.013 to 0.014 mm (0.0051 to 0.0055 in.)
	Maximum	0.05 mm (0.0020 in.)
Crankshaft		
Crankshaft thrust clearance	STD	0.050 to 0.220 mm (0.0019 to 0.0086 in.)
	Maximum	0.40 mm (0.0157 in.)
Maximum bend		0.04 mm (0.0016 in.)
Crankshaft main journal diameter	STD	72.94 to 72.96 mm (2.8716 to 2.8724 in.)
	Minimum (New)	72.74 mm (2.8638 in.)
	(Old)	71.76 mm (2.8252 in.)
	Maximum taper and out-of-round	0.01 mm (0.0003 in.)
Crankshaft main journal diameter	STD	61.94 to 61.96 mm (2.4385 to 2.4393 in.)
	Minimum (New)	61.74 mm (2.4307 in.)
	(Old)	60.76 mm (2.3921 in.)
	Maximum taper and out-of-round	0.01 mm (0.0003 in.)
Crankshaft No. 4 journal dimension	STD	34.00 to 34.08 mm (1.33858 to 1.3417 in.)
	Maximum	34.48 mm (1.3574 in.)
Cylinder block		
Maximum warpage		0.10 mm (0.0039 in.)
Crankshaft bearing cap bolt		
Bolt length (A)	STD	92.80 to 93.80 mm (3.6535 to 3.6929 in.)
	Maximum	95.00 mm (3.7401 in.)

SERVICE SPECIFICATIONS - ENGINE MECHANICAL

Crankshaft bearing cap		
Crankshaft bearing cap inside diameter	STD	77.985 to 78.00 mm (3.0703 to 3.0709 in.)
	Maximum	78.20 mm (3.0787 in.)
Crankshaft bearing inside diameter	STD	73.01 to 73.04 mm (2.8744 to 2.8756 in.)
	Maximum	73.30 mm (2.8858 in.)
Oil clearance	STD	0.051 to 0.102 mm (0.0020 to 0.0004 in.)
	Maximum	0.20 mm (0.0078 in.)
	STD	72.94 to 72.96 mm (2.8716 to 2.8724 in.)
	U/S 0.25	72.69 to 72.71 mm (2.8618 to 2.8625 in.)
	U/S 0.50	72.44 to 72.46 mm (2.8519 to 2.8527 in.)
	U/S 0.75	72.19 to 72.21 mm (2.8421 to 2.8429 in.)
	U/S 1.00	71.94 to 71.96 mm (2.8322 to 2.8330 in.)
Main crankshaft journal		3.00 to 3.50 mm (0.1181 to 0.1378 in.)
Camshaft		
Maximum circle runout		0.06 mm (0.0023 in.)
Cam lobe height	STD Intake	50.6576 to 50.8596 mm (1.9943 to 2.0023 in.)
	Exhaust	49.3561 to 49.5581 mm (1.9431 to 1.9511 in.)
	Minimum Intake	50.20 mm (1.9763 in.)
	Exhaust	48.95 mm (1.9271 in.)
Journal outside diameter	No. 1	56.95 to 56.97 mm (2.2421 to 2.2429 in.)
	No. 2	56.75 to 56.77 mm (2.2342 to 2.2350 in.)
	No. 3	56.95 to 56.97 mm (2.2421 to 2.2429 in.)
Journal inside diameter	No. 1	57.035 to 57.135 mm (2.2454 to 2.2494 in.)
	No. 2	56.835 to 56.935 mm (2.2375 to 2.415 in.)
	No. 3	56.635 to 56.735 mm (2.2297 to 2.2336 in.)
Oil clearance	STD	0.030 to 0.120 mm (0.0011 to 0.0047 in.)
	Maximum	0.15 mm (0.0059 in.)
Camshaft bearing		
Bearing inside diameter	No. 1	57.0 mm (2.2440 in.)
	No. 2	56.8 mm (2.2362 in.)
	No. 3	56.6 mm (2.2283 in.)
Bearing outside diameter	No. 1	60.0 mm (2.3622 in.)
	No. 2	59.8 mm (2.3543 in.)
	No. 3	59.6 mm (2.3646 in.)

TORQUE SPECIFICATION

Part Tightened		N·m	kgf·cm	ft·lbf
Cylinder head cover No. 2 x Cylinder head cover sub-assy		28.5	291	21
Cylinder head cover sub-assy x Cylinder head		28.5	291	21
Engine mounting bracket FR No. 1 RH x Cylinder block		69	704	51
Engine mounting bracket FR No. 1 LH x Cylinder block		69	704	51
Flywheel housing stay RH x Cylinder block		97	989	72
Flywheel housing stay RH x Flywheel housing		132	1,346	97
Flywheel housing stay LH x Cylinder block		97	989	72
Flywheel housing stay LH x Flywheel housing		132	1,346	97
Flywheel housing x Cylinder block	for bolt (M14)	132	1,346	97
	for bolt (M8)	28.5	291	21
Flywheel sub-assy x Crankshaft		190	1,938	140
Oil strainer sub-assy x Cylinder head		28.5	291	21
Drain plug x Oil pan sub-assy		41	418	30
Crankshaft pulley x Crankshaft		519	5,294	383
Oil check valve x Cylinder head		68.5	699	51
Cylinder head x Cylinder block (1 to 18 head bolt)	1st	60	612	44
	2nd	Turn 90°	Turn 90°	Turn 90°
Cylinder head x Cylinder block (19 to 22 head bolt)		55	561	41
Valve rocker shaft sub-assy No. 1 x Cylinder head		69	704	51
Camshaft x Cylinder block		28.5	291	21
Oil Pump assy x Cylinder block		28.5	291	21
Lock plate x Front end plate		28.5	291	21
Water outlet pipe No. 1 x Cylinder block		55	561	41
Idle gear shaft No. 1 x Cylinder block		127	1,397	101
Idle gear shaft No. 2 x Lock plate		55	561	41
Timing chain or belt cover sub-assy x Front end plate		28.5	291	21
Adjusting screw lock nut		29.5	300	22
Crankshaft bearing cap x Cylinder block (see page 14-33)	1st	58.8	600	43
	2nd	Turn 60°	Turn 60°	Turn 60°
Connecting rod bearing cap x Connecting rod sub-assy (see page 14-33)	1st	29.5	301	22
	2nd	Turn 60°	Turn 60°	Turn 60°
Sub-assy oil nozzle No. 1 x Cylinder block		28.5	291	21

COOLING

SERVICE DATA

03252-01

Thermostat		
Valve opening temperature		80 to 84°C (176 to 183°F)
Valve lift	at 95°C (203°F)	10 mm (0.394 in.) or more

LUBRICATION

SERVICE DATA

03253-01

Oil pump		
Driven gear length	STD	27.02 to 27.04 mm (1.0638 to 1.0645 in.)
Cylinder block depth	STD	27.03 to 27.07 mm (1.0642 to 1.0657 in.)
Driven gear and cylinder block clearance	STD	0.05 to 0.13 mm (0.0019 to 0.0051 in.)
	Maximum	0.17 mm (0.0066 in.)
Drive gear and driven gear backlash	STD	0.091 to 0.217 mm (0.0036 to 0.0085 in.)
	Maximum	0.25 mm (0.0098 in.)
Drive gear shaft		
Shaft diameter	STD	18.088 to 18.106 mm (0.7121 to 0.7128 in.)
	Minimum	18.062 mm (0.7111 in.)
Drive gear bush		
Bush inside diameter	STD	18.146 to 18.173 mm (0.7144 to 0.7155 in.)
	Maximum	18.20 mm (0.7165 in.)
Bush and shaft clearance	STD	0.040 to 0.085 mm (0.0016 to 0.0033 in.)
	Maximum	0.10 mm (0.0039 in.)
Driven gear shaft		
Shaft diameter	STD	17.979 to 17.997 mm (0.7078 to 0.7085 in.)
	Minimum	17.97 mm (0.7075 in.)
Driven gear bush		
Bush inside diameter	STD	18.037 to 18.054 mm (0.7101 to 0.7108 in.)
	Minimum	18.07 mm (0.7114 in.)
Bush and shaft clearance	STD	0.040 to 0.075 mm (0.0016 to 0.0030 in.)
	Maximum	0.10 mm (0.0039 in.)
Oil cooler		
Test pressure		196 kPa (2.0 kgf/cm ² , 28.4 psi)
Test time		1 min

STARTING & CHARGING

SERVICE DATA

0325H-01

Starter assy

Starter armature assy	Commutator diameter	STD	36 mm (1.417 in.)
		Minimum	34 mm (1.339 in.)
	Commutator undercut depth	STD	0.5 to 0.8 mm (0.020 to 0.032 in.)
		Minimum	0.2 mm (0.008 in.)
Starter brush	Brush length	STD	18.0 mm (0.709 in.)
		Minimum	13.0 mm (0.512 in.)
Starter brush holder assy	Brush spring installed load	STD	18 N (1.8 kgf, 4.0 lbf)
		Minimum	13 N (1.3 kgf, 2.9 lbf)
Starter commutator end frame assy	Inside diameter	STD	28.0 mm (1.102 in.)
		Maximum	28.1 mm (1.106 in.)
Planet carrier shaft sub-assy	Outside diameter (See page 19-3)	A: STD	26.0 mm (1.024 in.)
		Minimum	25.9 mm (1.020 in.)
		B: STD	12.1 mm (0.476 in.)
		Minimum	12.04 mm (0.474 in.)
	Inside diameter	STD	9.0 mm (0.354 in.)
		Maximum	9.2 mm (0.362 in.)
Starter motor housing	Pull-in coil resistance (between terminal C and M)	STD	0.12 to 0.14 Ω
	Hold-in coil resistance (between terminal C and switch body)	STD	1.13 to 1.25 Ω
	Inside diameter	Maximum	29.033 mm (1.143 in.)
Starter housing bush	Inside diameter	STD	25.0 mm (0.984 in.)
		Maximum	25.2 mm (0.992 in.)
Starter drive housing	Inside diameter	Maximum	30.033 mm (1.1824 in.)
Starter center bearing bush	Inside diameter	STD	26.0 mm (1.024 in.)
		Maximum	26.2 mm (1.031 in.)
Starter clutch sub-assy	Outside diameter	STD	25.0 mm (0.984 in.)
		Minimum	24.9 mm (0.980 in.)

Generator assy

Generator rotor assy	Coil resistance at 20°C (68°F)	STD	11.6 to 12.4 Ω
		STD	14.2 to 14.4 mm (0.559 to 0.567 in.)
		Minimum	12.8 mm (0.504 in.)
Brush holder assembly	Brush exposed length	STD	9.5 to 11.5 mm (0.374 to 0.453 in.)
		Minimum	1.5 mm (0.059 in.)

TORQUE SPECIFICATION

Starter assy

Part tightened	N·m	kgf·cm	ft·lbf
Starter drive housing x Starter motor housing	4.3	44	38 in·lbf
Starter commutator end frame assy x Starter drive housing assy	15	152	11
Starter cover assy x Starter motor housing	4.3	44	38 in·lbf
Starter commutator end frame assy x Starter brush holder assy	4.3	44	38 in·lbf
Lead wire x Terminal M	13.5	138	10

Generator assy

Part tightened	N·m	kgf·cm	ft·lbf
Stud bolt x Drive end frame	9.8	100	7.2
Bearing retainer x Drive end frame	2.9	30	26 in·lbf
Rubber insulator x Drive end frame	2.9	30	26 in·lbf
Rectifier end frame x Drive end frame	4.5	46	40 in·lbf
Cord clip x Rectifier end frame	5.4	55	48 in·lbf
Generator pulley x Generator rotor assy	111	1,131	82
Voltage regulator x Rectifier end frame	2.0	20	18 in·lbf
Generator brush holder assy x Voltage regulator	2.0	20	18 in·lbf
Rear end cover No. 2 x Rectifier end frame	4.4	45	38 in·lbf
Terminal plate x Rear end cover	bolt	3.9	35 in·lbf
	nut	4.4	38 in·lbf
Terminal insulator x Generator holder w/ regulator	3.6	37	32 in·lbf

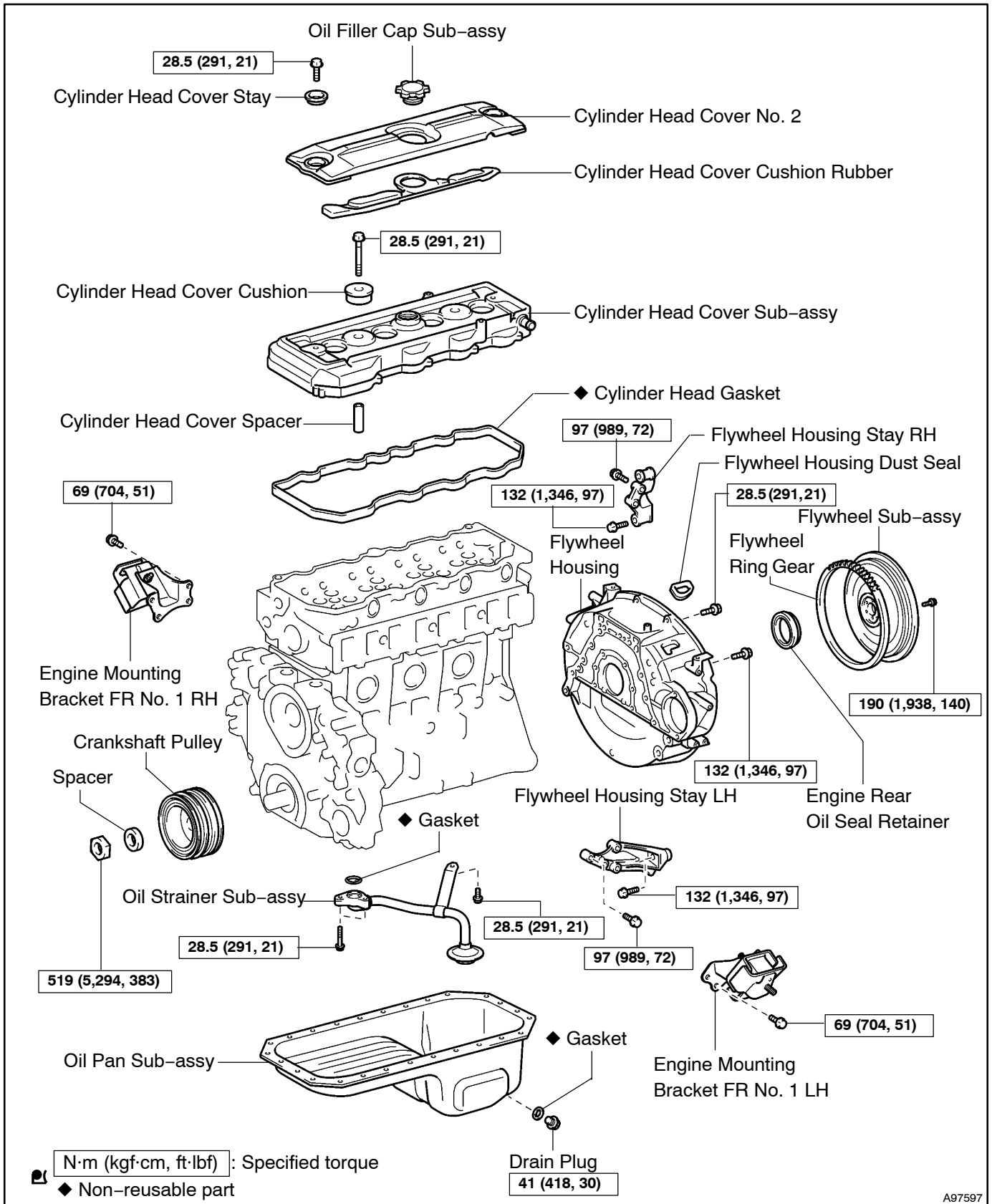
ENGINE MECHANICAL

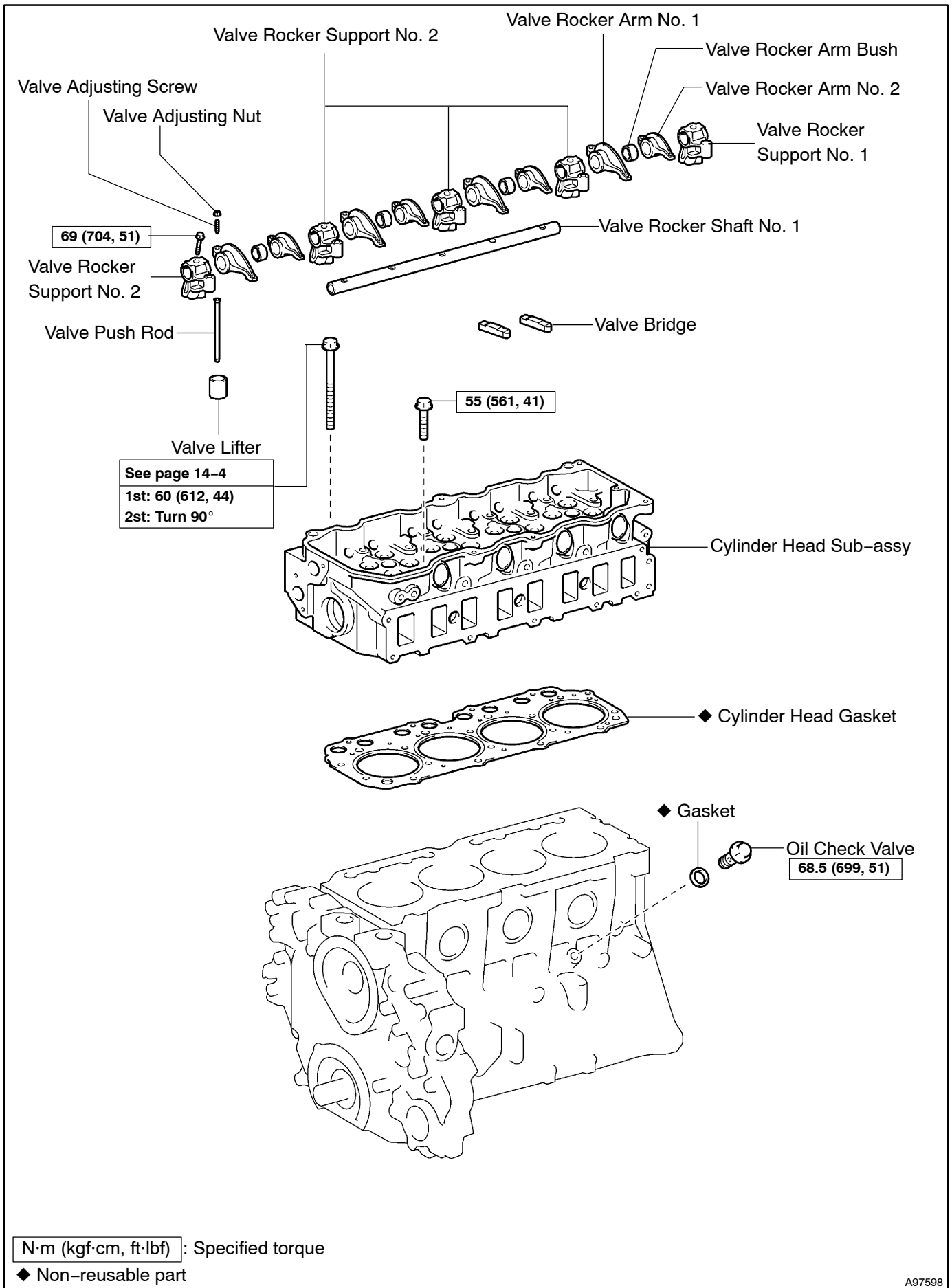
PARTIAL ENGINE ASSY (N04C-TF)	14-1
COMPONENTS	14-1
OVERHAUL	14-4
CYLINDER HEAD ASSY (N04C-TF)	14-22
COMPONENTS	14-22
OVERHAUL	14-23
CYLINDER BLOCK ASSY (N04C-TF)	14-32
COMPONENTS	14-32
OVERHAUL	14-33

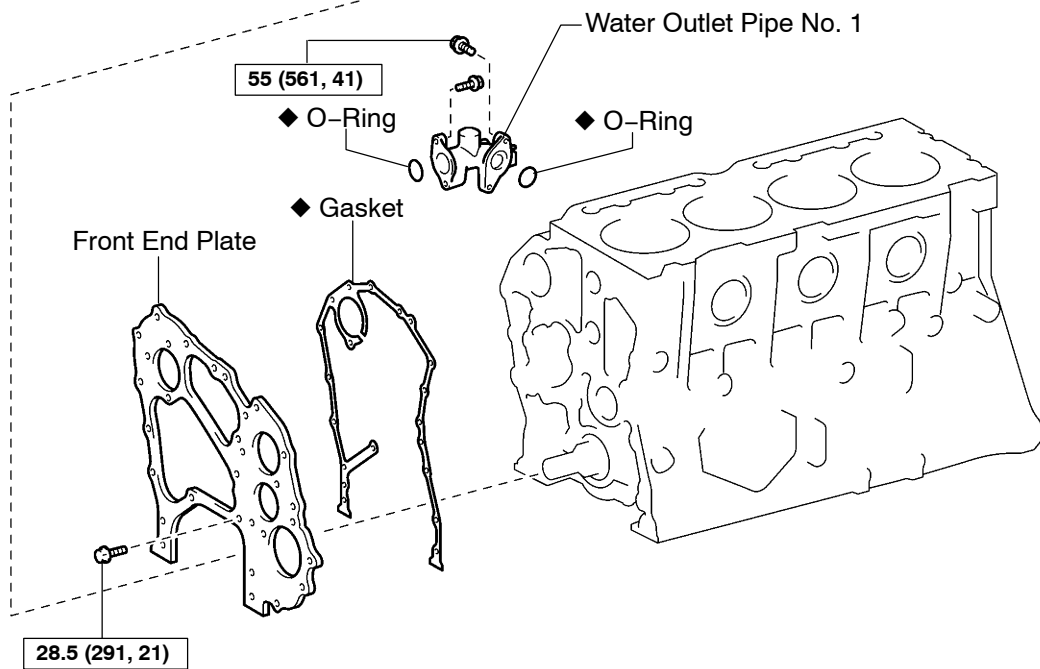
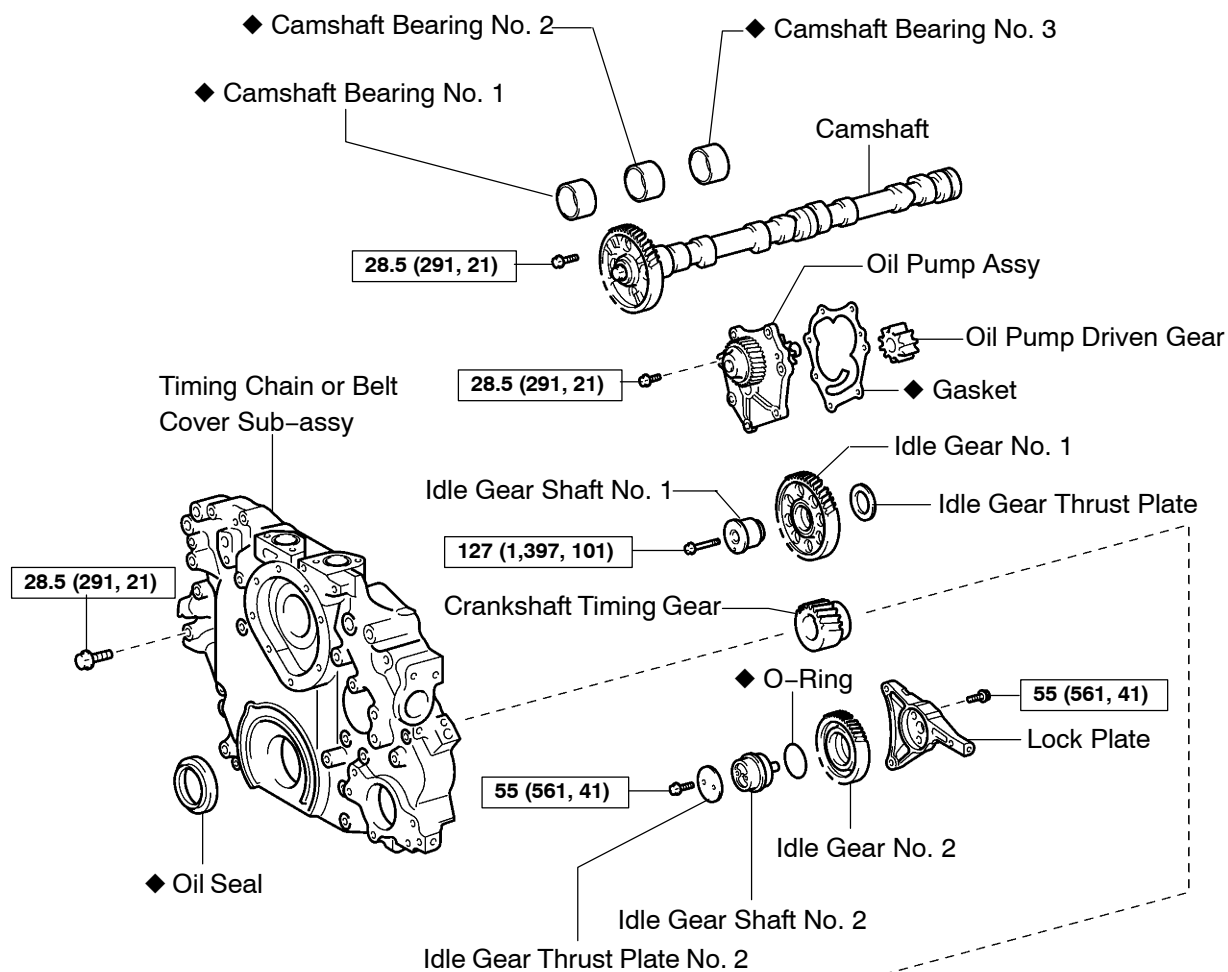
PARTIAL ENGINE ASSY (N04C-TF)


COMPONENTS

141UR-01







 N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

OVERHAUL

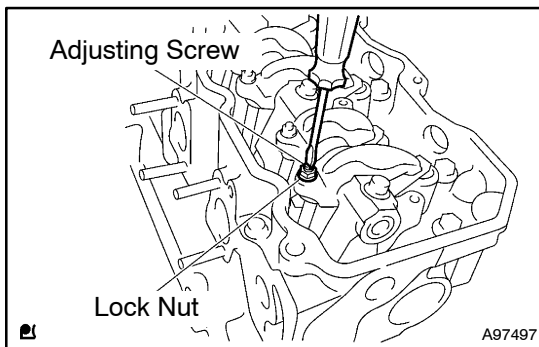
1. REMOVE OIL FILLER CAP SUB-ASSY

2. REMOVE CYLINDER HEAD COVER NO. 2

- Remove the 2 bolts and cover.
- Remove the cylinder head cover cushion rubber and 2 cylinder head cover stays from the cover.

3. REMOVE CYLINDER HEAD COVER SUB-ASSY

- Remove the 2 bolts and cover.
- Remove the 2 cylinder head cover spacers, 2 cylinder head cover cushions and cylinder head gasket from the cover.

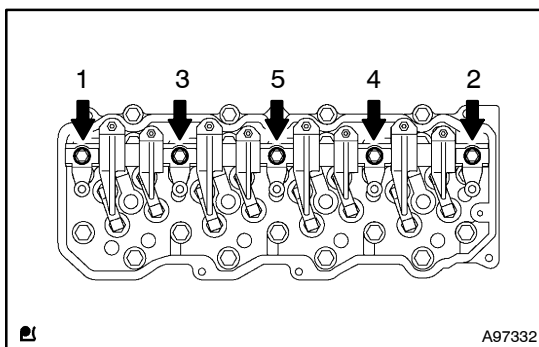


4. REMOVE VALVE ROCKER SHAFT SUB-ASSY NO.1

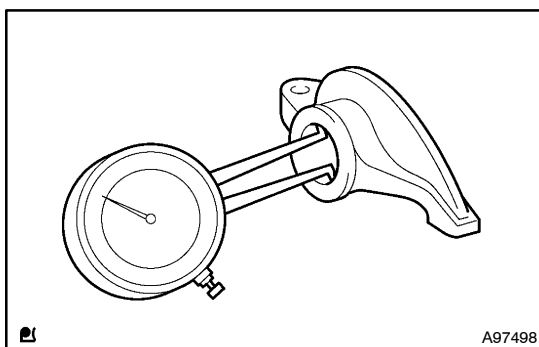
- Loosen the lock nut at the top of the rocker arms, then wind up the adjusting screws completely.

NOTICE:

If the adjusting screws are left unwound, the rocker shaft may bend when the rocker arm support bolts are loosened.



- Loosen the rocker arm support bolts in the order as shown in the illustration.



5. INSPECT VALVE ROCKER ARM OIL CLEARANCE

- Using a caliper gauge, measure the inside diameter of the rocker arm bush.

Standard bush inside diameter:

22.023 to 22.052 mm (0.8670 to 0.8681 in.)

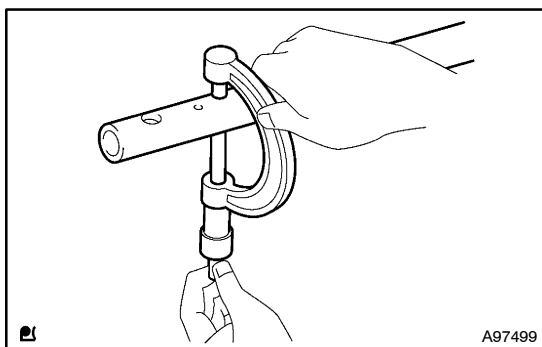
Maximum bush inside diameter:

22.08 mm (0.8692 in.)

If the inside diameter is greater than the maximum, replace the bush.

HINT:

When installing a bush into the rocker arm, align the bush with the 2 oil holes of the rocker arm.



- (b) Using a micrometer, measure the outside diameter of the rocker arm shaft.

Standard shaft diameter:

21.959 to 21.980 mm (0.8645 to 0.8653 in.)

Maximum shaft diameter:

21.92 mm (0.8630 in.)

If the outside diameter is less than the minimum, replace the rocker arm shaft and rocker arm.

- (c) Subtract the valve rocker arm inside diameter measurement from the valve rocker shaft outside diameter measurement.

Standard oil clearance:

0.043 to 0.093 mm (0.0017 to 0.0036 in.)

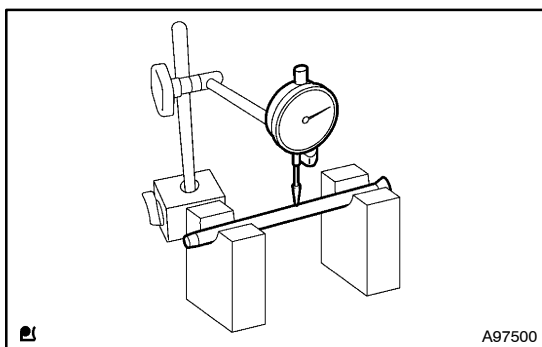
Maximum oil clearance: 0.15 mm (0.6059 in.)

If the oil clearance is greater than the maximum, replace the rocker arm shaft and rocker arm bush.

6. REMOVE VALVE PUSH ROD

NOTICE:

Organize the parts so that each parts location can be remembered for reassembly.



7. INSPECT VALVE PUSH ROD

- (a) Place the push rod on V-blocks.
 (b) Using a dial indicator, measure the circle runout at the center of the push rod.

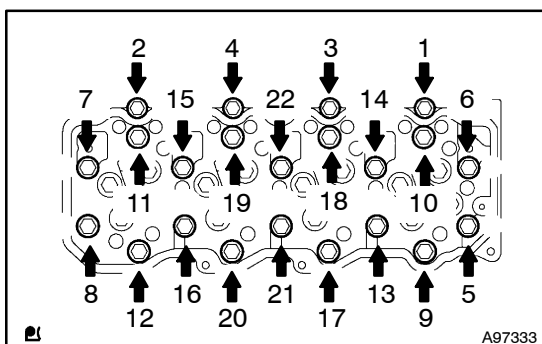
Maximum circle runout: 0.30 mm (0.0118 in.)

If the circle runout is greater than the maximum, replace the push rod.

8. REMOVE VALVE BRIDGE

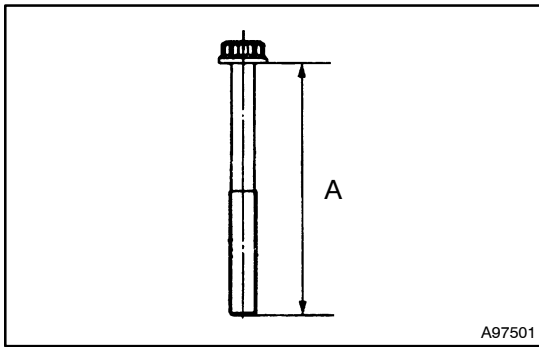
NOTICE:

Organize the parts so that each parts location can be remembered for reassembly.



9. REMOVE CYLINDER HEAD SUB-ASSY

- (a) Remove the cylinder head bolts in the order as shown in the illustration.
 (b) Lift and remove the cylinder head from the cylinder block.

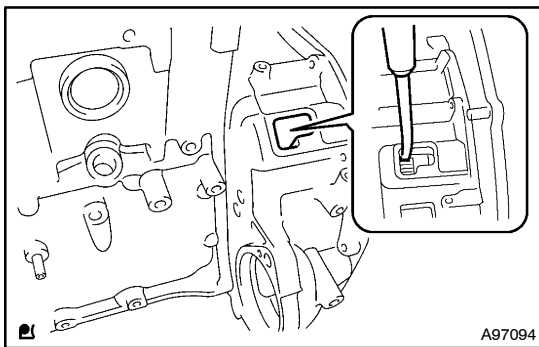
**10. INSPECT CYLINDER HEAD BOLT**

- (a) Measure the length of the M12 head bolts No. 1 to No. 18.
Maximum length (A): 129 mm (5.07 in.)

If the length is greater than the maximum, replace the bolts with new bolts.

11. REMOVE VALVE LIFTER**NOTICE:**

Organize the parts so that each parts location can be remembered for reassembly.

**12. REMOVE CRANKSHAFT PULLEY**

- (a) Using a 46 mm socket wrench, remove the nut, spacer and pulley.

HINT:

Insert a screwdriver through the inspection hole of the flywheel housing into the ring gear of the flywheel to keep it from turning together with the crankshaft.

13. REMOVE FLYWHEEL HOUSING STAY RH

- (a) Remove the 4 bolts and stay.

14. REMOVE FLYWHEEL HOUSING STAY LH

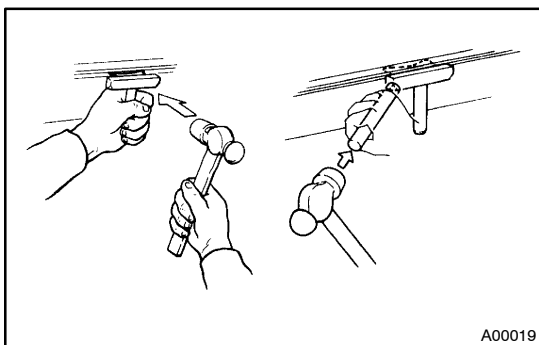
- (a) Remove the 4 bolts and stay.

15. REMOVE ENGINE MOUNTING BRACKET FR NO. 1 RH

- (a) Remove the 4 bolts and bracket.

16. REMOVE ENGINE MOUNTING BRACKET FR NO. 1 LH

- (a) Remove the 4 bolts and bracket.

**17. REMOVE OIL PAN SUB-ASSY**

- (a) Remove the 26 bolts from the oil pan.
 (b) Insert the blade of SST between the crankcase and oil pan. Cut through the applied sealer and remove the oil pan.

SST 09032-00100

NOTICE:

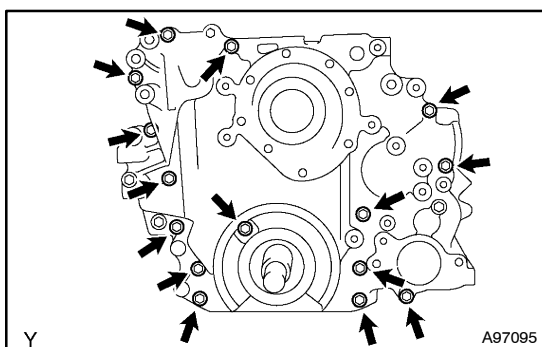
Do not damage the contact surface of the cylinder block and oil pan.

18. REMOVE OIL STRAINER SUB-ASSY

- (a) Remove the 3 bolts and strainer.
 (b) Remove the O-ring.

19. REMOVE WATER OUTLET PIPE NO. 1

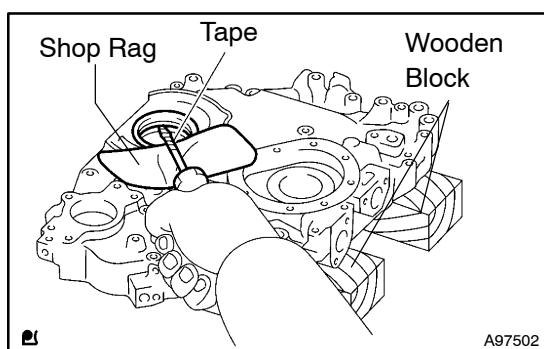
- (a) Remove the 4 bolts and outlet pipe from the timing chain or belt cover.
- (b) Remove the 2 O-rings.

**20. REMOVE TIMING CHAIN OR BELT COVER SUB-ASSY**

- (a) Remove the 15 bolts.
- (b) Using a screwdriver, pry out the cover.

NOTICE:

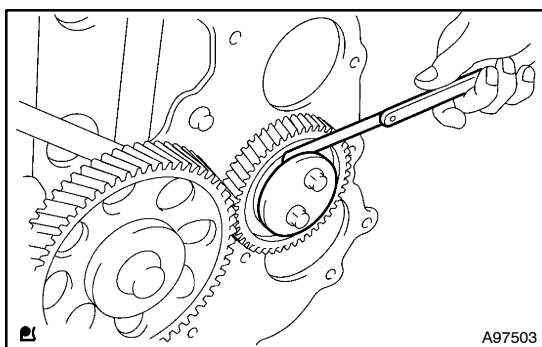
Do not damage the contact surfaces of the timing chain or belt cover, cylinder block and cylinder head.

**21. REMOVE OIL SEAL**

- (a) Using a screwdriver, pry out the oil seal.

HINT:

- Tape the screwdriver tip before use.
- Use wooden blocks and shop rag to prevent the timing chain or belt cover sub-assy.

**22. INSPECT IDLE GEAR NO. 2 THRUST CLEARANCE**

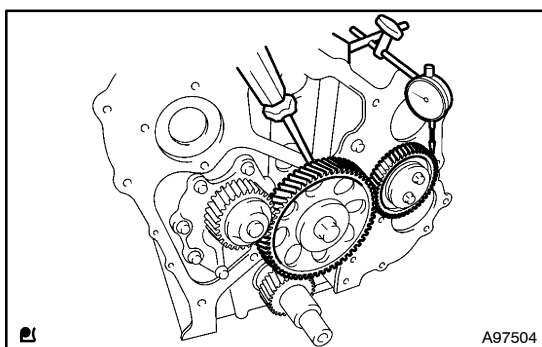
- (a) Using a feeler gauge, measure the thrust clearance between the idle gear thrust plate No. 2 and idle gear No. 2.

Standard thrust clearance:

0.103 to 0.164 mm (0.0040 to 0.0064 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

If the thrust clearance is greater than the maximum, replace the idle gear thrust plate No. 2 and idle gear No. 2.

**23. INSPECT IDLE GEAR NO. 2 BACKLASH**

- (a) Using a dial indicator, measure the backlash between the idle gear No. 1 and No. 2.

Standard backlash:

0.036 to 0.227 mm (0.0014 to 0.0089 in.)

Maximum backlash: 0.30 mm (0.0118 in.)

If the backlash is greater than the maximum, replace the idle gear No. 1 and No. 2.

24. REMOVE IDLE GEAR THRUST PLATE NO. 2

- (a) Remove the 2 bolts and thrust plate.

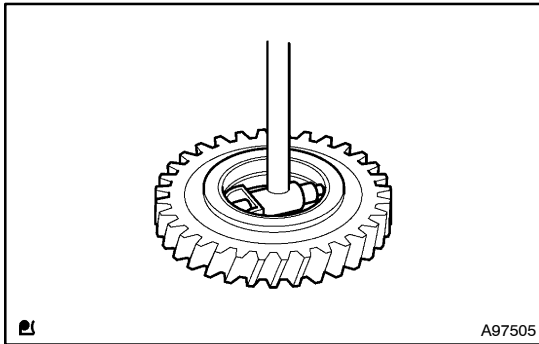
25. REMOVE IDLE GEAR NO. 2

26. REMOVE IDLE GEAR SHAFT NO. 2

- (a) Remove the 3 bolts and shaft.
- (b) Remove the O-ring.

27. REMOVE LOCK PLATE

- (a) Remove the 3 bolts and plate from the end plate.

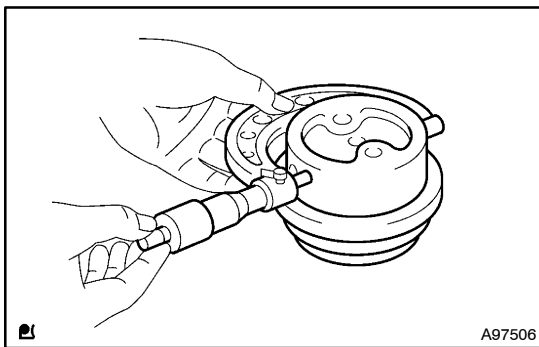
**28. INSPECT IDLE GEAR NO. 2 OIL CLEARANCE**

- (a) Using a cylinder gauge, measure the inside diameter of the idle gear.

Standard idle gear inside diameter:
50.000 to 50.025 mm (1.9685 to 1.9695 in.)

Maximum idle gear inside diameter:
50.05 mm (1.9704 in.)

If the diameter is greater than the maximum, replace the idle gear No. 2.



- (b) Using a micrometer, measure the diameter of the idle gear shaft.

Standard shaft diameter:
49.950 to 49.975 mm (1.9665 to 1.9675 in.)

Minimum idle gear shaft diameter:
49.95 mm (1.9665 in.)

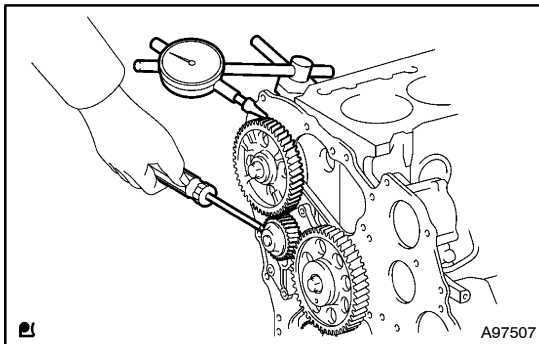
If the diameter is less than the minimum, replace the idle gear No. 2 shaft.

- (c) Subtract the idle gear No. 2 inside diameter measurement from the idle gear shaft No. 2 diameter measurement.

Standard oil clearance:
0.0125 to 0.0375 mm (0.0005 to 0.0014 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the clearance is greater than the maximum, replace the idle gear No. 2 and idle gear No. 2 shaft.

**29. INSPECT CAMSHAFT TIMING GEAR BACKLASH**

- (a) Using a dial indicator, measure the backlash between the camshaft timing gear and idle gear No. 1.

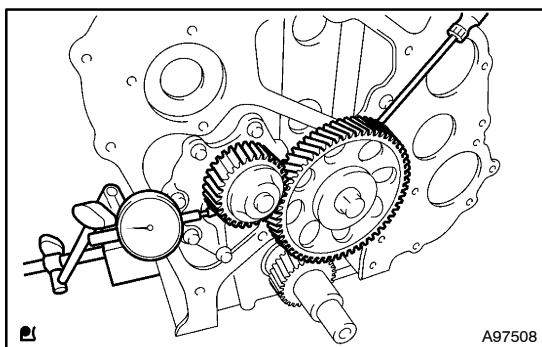
Standard backlash:
0.069 to 0.203 mm (0.0027 to 0.0079 in.)

Maximum backlash: 0.30 mm (0.0118 in.)

If the backlash is greater than the maximum, replace the camshaft timing gear and idle gear No. 1.

30. REMOVE CAMSHAFT

- (a) Remove the 2 bolts, thrust plate and camshaft.

**31. INSPECT OIL PUMP GEAR BACKLASH**

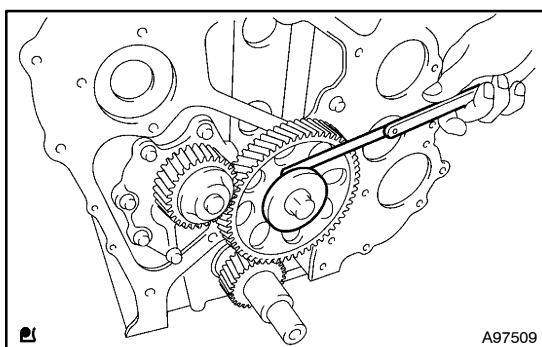
- (a) Using a dial indicator, measure the backlash between the oil pump gear and idle gear No. 1.

Standard backlash:

0.065 to 0.215 mm (0.0025 to 0.0084 in.)

Maximum backlash: 0.30 mm (0.0118 in.)

If the backlash is greater than the maximum, replace the oil pump assy and idle gear No. 1.

**32. INSPECT IDLE GEAR NO. 1 THRUST CLEARANCE**

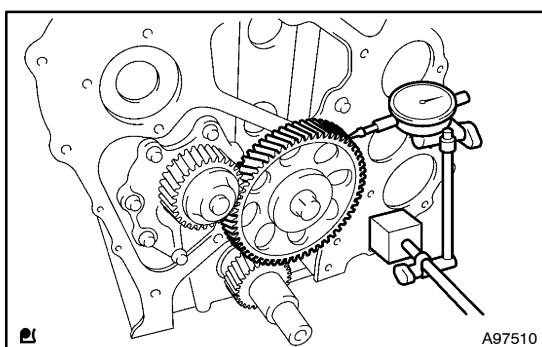
- (a) Using a feeler gauge, measure the thrust clearance between the idle gear thrust plate No. 1 and idle gear No. 1.

Standard thrust clearance:

0.103 to 0.164 mm (0.0040 to 0.0064 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

If the thrust clearance is greater than the maximum, replace the idle gear thrust plate No. 1 and idle gear No. 1.

**33. INSPECT IDLE GEAR NO. 1 BACKLASH**

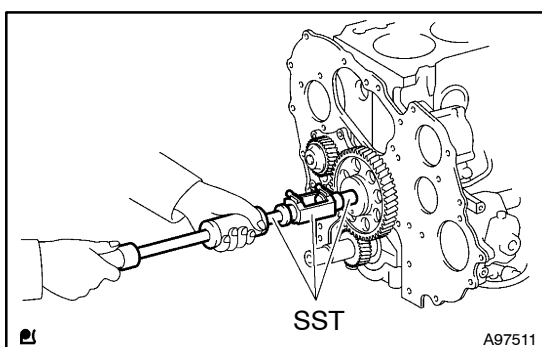
- (a) Using a dial indicator, measure the backlash between the crankshaft timing gear and idle gear No. 1.

Standard backlash:

0.035 to 0.193 mm (0.0014 to 0.0075 in.)

Maximum backlash: 0.30 mm (0.0118 in.)

If the backlash is greater than the maximum, replace the crankshaft timing gear and idle gear No. 1.

**34. REMOVE IDLE GEAR NO.1**

- (a) Remove the bolt.
 (b) Using SST, remove the idle gear shaft.
 SST 09910-00015 (09911-00011, 09912-00010, 09913-00010)

NOTICE:

When removing the gear shaft, hold the gear by a hand to prevent the gear and thrust plate from being fallen.

- (c) Remove the idle gear.
 (d) Remove the idle gear thrust plate.

35. INSPECT IDLE GEAR NO. 1 OIL CLEARANCE

- (a) Using a cylinder gauge, measure the inside diameter of the idle gear.

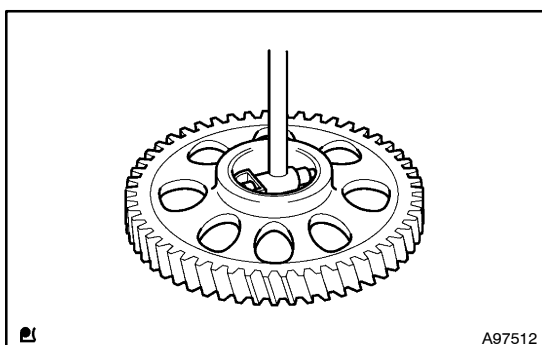
Standard idle gear inside diameter:

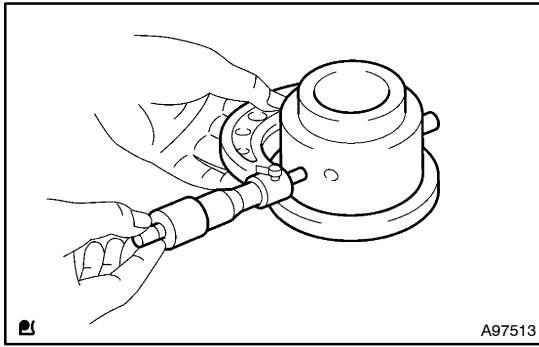
50.000 to 50.025 mm (1.9685 to 1.9695 in.)

Maximum idle gear inside diameter:

50.05 mm (1.9704 in.)

If the diameter is greater than the maximum, replace the idle gear No. 1.





- (b) Using a micrometer, measure the diameter of the idle gear shaft.

Standard idle gear shaft diameter:

49.950 to 49.975 mm (1.9665 to 1.9675 in.)

Minimum idle gear shaft diameter:

49.95 mm (1.9665 in.)

If the diameter is less than the minimum, replace the idle gear shaft No. 1.

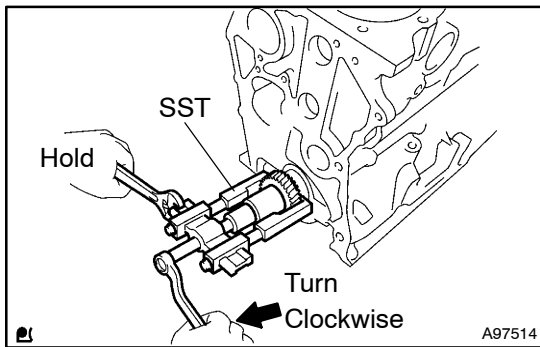
- (c) Subtract the idle gear No. 1 inside diameter measurement from the idle gear shaft No. 1 outside diameter measurement.

Standard oil clearance:

0.0125 to 0.0370 mm (0.0005 to 0.0014 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the clearance is greater than the maximum, replace the idle gear No. 1 and idle gear shaft No. 1.



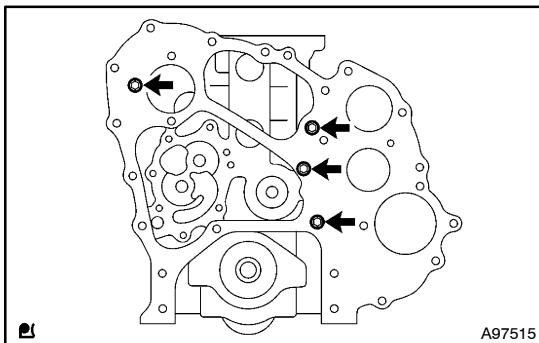
36. REMOVE CRANKSHAFT TIMING GEAR OR SPROCKET

- (a) Using SST, remove the timing gear.

SST 09950-40011 (09951-04010, 09952-04010, 09953-04020, 09954-04010, 09955-04051)

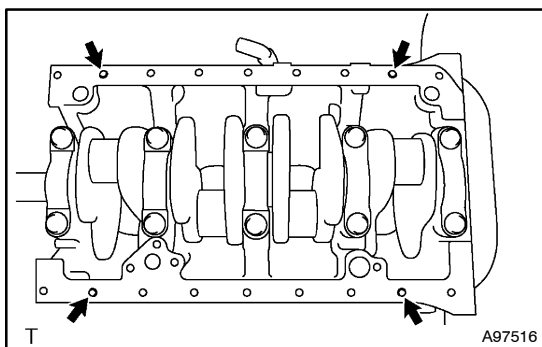
37. REMOVE OIL PUMP ASSY

- (a) Remove the 7 bolts and pump.
(b) Remove the gasket from the pump.



38. REMOVE FRONT END PLATE

- (a) Remove the 4 bolts and end plate.
(b) Remove the gasket from the end plate.

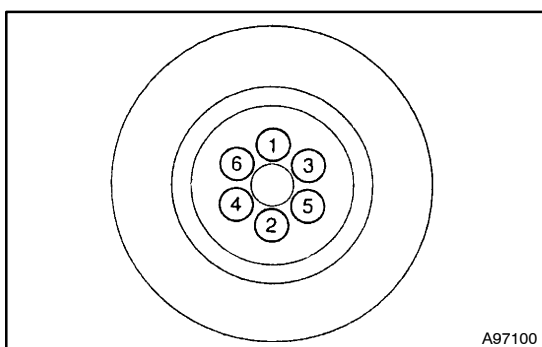
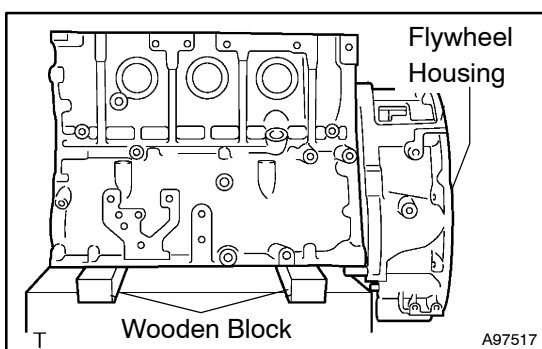
**39. REMOVE FLYWHEEL SUB-ASSY**

- (a) Temporarily install the 4 bolts to the portions of the cylinder block in the illustration to prevent the wires from being misaligned.
- (b) Hook the 2 wires on the cylinder block.

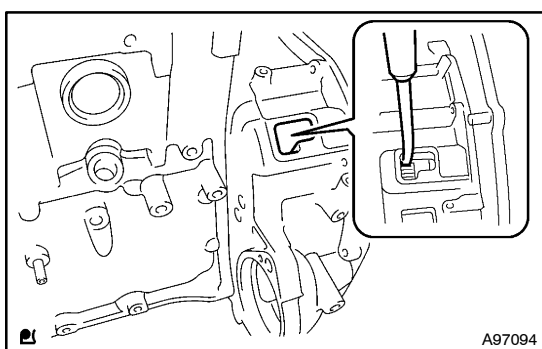
HINT:

The wires must be hooked outside the installed bolts.

- (c) Using a chain block and an engine sliding device, hang the cylinder block from the engine stand.
- (d) Place the cylinder block on wooden blocks on a table.
- (e) Remove the 4 bolts from the cylinder block.



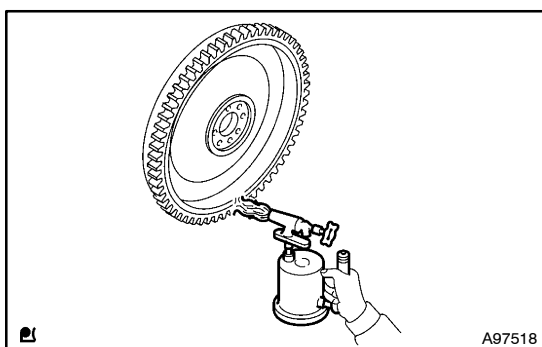
- (f) Uniformly loosen and remove the 6 bolts in the order shown in the illustration.
- (g) Remove the flywheel.

**HINT:**

Insert a screwdriver through the inspection hole of the flywheel housing into the ring gear of the flywheel to keep it from turning together with the crankshaft.

NOTICE:

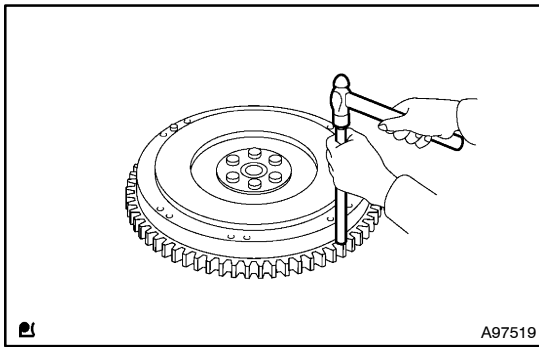
The flywheel is heavy. When removing, be careful not to drop it on your feet.

**40. REMOVE FLYWHEEL RING GEAR**

- (a) Using a torch, heat the ring gear evenly to approximately 200°C (392°F).

NOTICE:

Be careful not to overheat the ring gear.



- (b) Using a brass bar and hammer, uniformly strike all around the ring gear and remove the gear.

CAUTION:

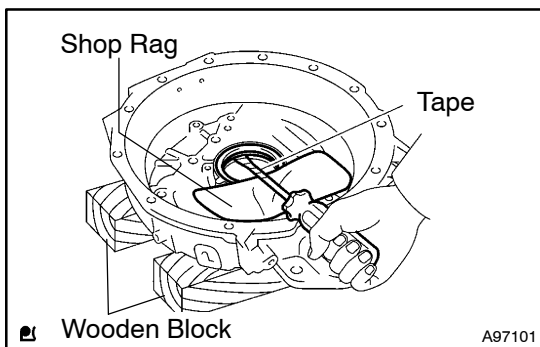
After removing, allow the ring gear to become cold to prevent your hands from burning.

41. REMOVE FLYWHEEL HOUSING

- (a) Remove the 14 bolts from the cylinder block.
 (b) Using a screwdriver, pry out the housing.

HINT:

Tape the screwdriver tip before use.

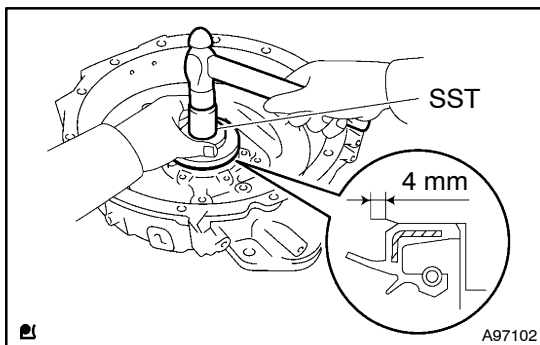


42. REMOVE ENGINE REAR OIL SEAL RETAINER

- (a) Using a screwdriver, pry out the retainer.

HINT:

- Tape the screwdriver tip before use.
- Use wooden blocks and shop rag to prevent the timing chain or belt cover sub-assy.



43. INSTALL ENGINE REAR OIL SEAL RETAINER

- (a) Using SST and a hammer, tap in a new retainer until it lower by 4 mm (0.16 in.) from the upper edge of the flywheel housing.

SST 09223-78010

NOTICE:

- **Be careful not to tap the oil seal retainer at an angle.**
- **Keep the gap between the rear oil seal retainer edge and the oil seal free of foreign matter.**

- (b) Apply MP grease to the oil seal lip.

44. INSTALL FLYWHEEL HOUSING

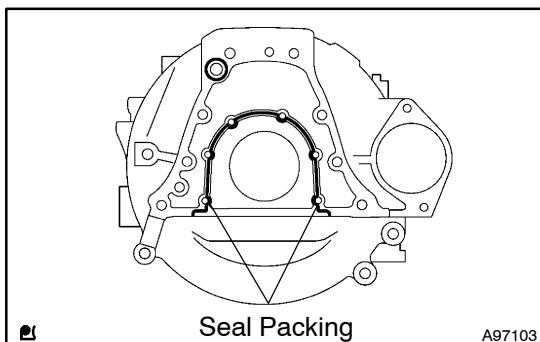
- (a) Remove any oil packing material from the contact surface.

- (b) Apply a continuous bead of seal packing (diameter: 1.5 to 2.5 mm (0.06 to 0.10 in.)) as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

- **Remove any oil from the contact surface.**
- **Install the belt cover within 3 minutes after applying seal packing.**
- **Do not expose the seal packing engine oil for at least 2 hours after installing.**

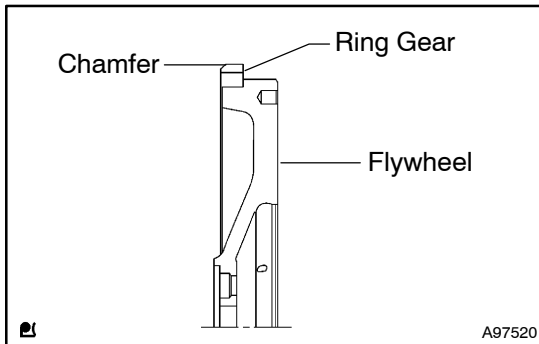


- (c) Install the flywheel housing with the 14 bolts.

Torque:

132 N·m (1,346 kgf·cm, 97 ft·lbf) for bolt (M14)

28.5 N·m (291 kgf·cm, 21 ft·lbf) for bolt (M8)



45. INSTALL FLYWHEEL RING GEAR

- (a) Using a torch, heat the ring gear evenly to approximately 200°C (392°F).

NOTICE:

Be careful not to overheat the ring gear.

- (b) Using a brass bar, strike the ring gear onto the flywheel with its chamfered gear teeth facing the block.

CAUTION:

After installing, allow the ring gear to become cold to prevent your hands from burning.

46. INSTALL FLYWHEEL SUB-ASSY

- (a) Insert the flywheel slowly until it contacts the collar knock in order to prevent impact on the guide bar. Adjust the position, then insert it completely.

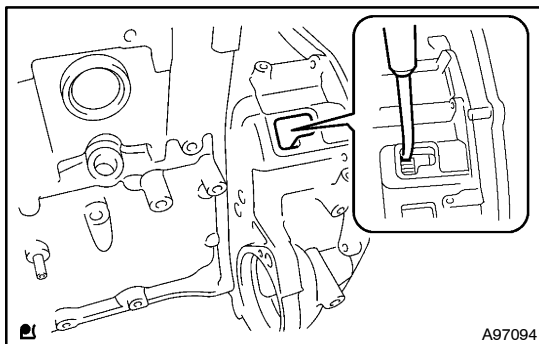
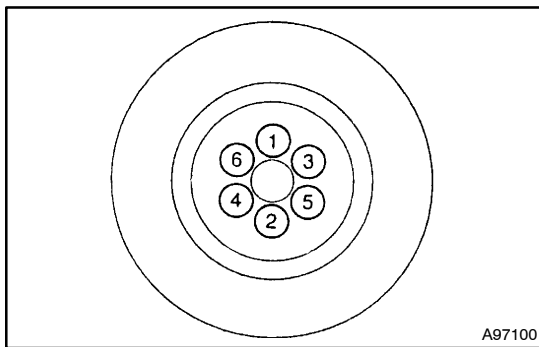
NOTICE:

The flywheel is heavy. When removing, be careful not to drop it on your feet.

- (b) Apply clean engine oil to the threads of the flywheel bolt and the flywheel bolt seat.

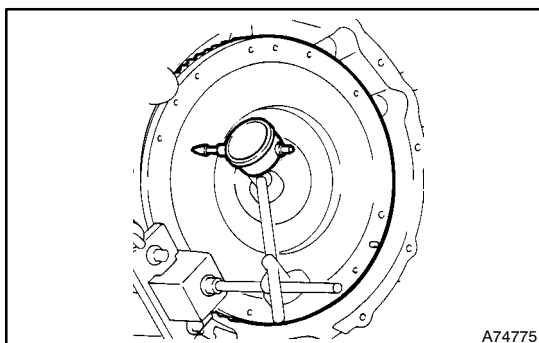
- (c) Tighten the flywheel bolts in the order shown in the illustration.

Torque: 190 N·m (1,938 kgf·cm, 140 ft·lbf)



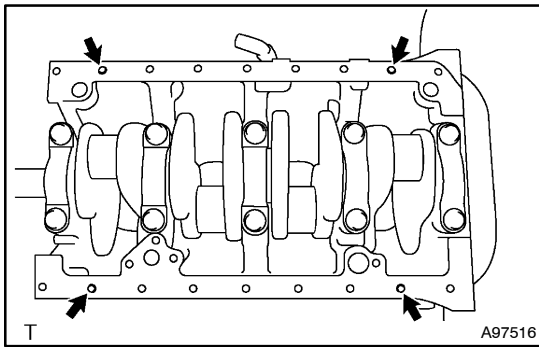
HINT:

Insert a screwdriver through the inspection hole of the flywheel housing into the ring gear of the flywheel to keep it from turning together with the crankshaft.



- (d) Using a dial indicator, measure the runout of the flywheel.
Maximum runout: 0.15 mm (0.0059 in.)

If the runout is greater than the maximum, resurface the sliding surface.



(e) Temporarily install the 4 bolts to the portions of the cylinder block in the illustration to prevent the wires from being misaligned.

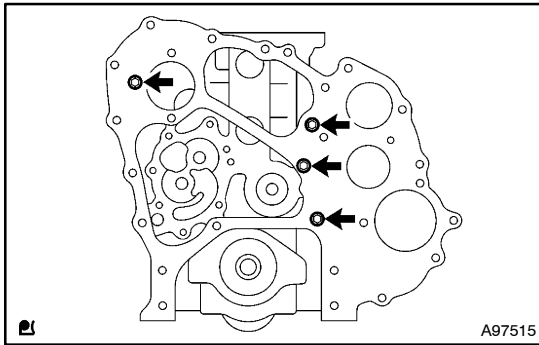
(f) Hook the 2 wires on the cylinder block.

HINT:

The wires must be hooked outside the installed bolts.

(g) Using a chain block and an engine sliding device, install the cylinder block to the engine stand.

(h) Remove the 4 bolts from the cylinder block.

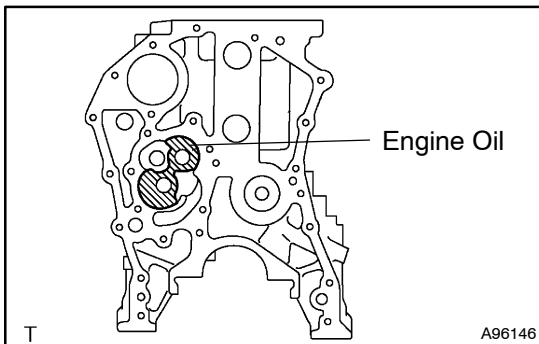


47. INSTALL FRONT END PLATE

(a) Install the end plate with a new gasket and 4 bolts.

Torque: 28.5 N·m (291 kgf·cm, 21 ft·lbf)

(b) Using a cutter, cut the gasket so that it is flush with the lower surface of the cylinder block.



48. INSTALL OIL PUMP ASSY

(a) Apply engine oil to the pump case of the cylinder block and bearing.

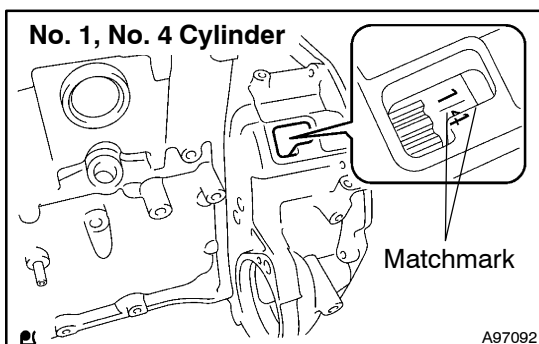
NOTICE:

If engine oil is not applied, an oil suction malfunction will occur when starting the engine. The malfunction causes seizure and abnormal wear to the engine.

(b) Install a new gasket and pump with the 7 bolts.

Torque: 28.5 N·m (291 kgf·cm, 21 ft·lbf)

(c) Check that the oil pump rotates smoothly by hand after the installation.

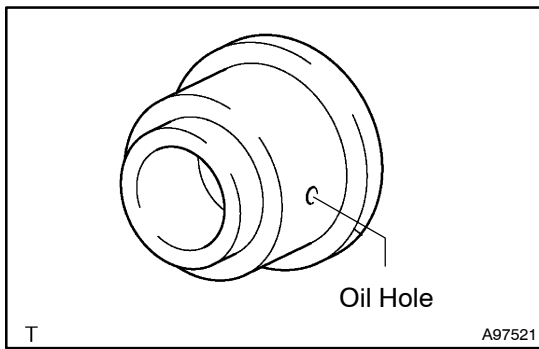


49. INSTALL CRANKSHAFT TIMING GEAR OR SPROCKET

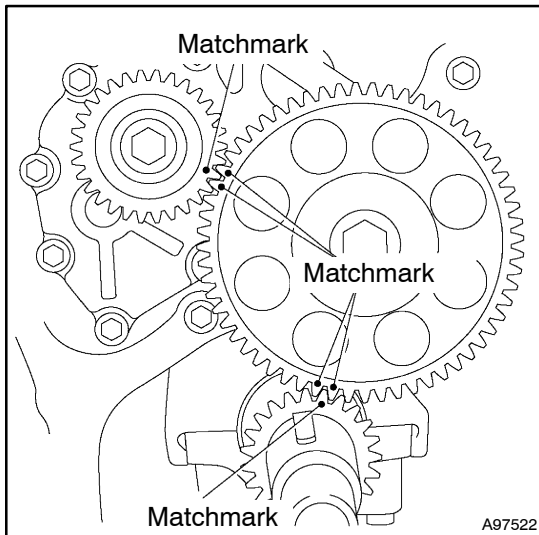
(a) Turn the crankshaft clockwise, and align the matchmarks of the flywheel and flywheel housing to set the No. 1 cylinder to TDC.

(b) Align the set key on the crankshaft with the key groove of the crankshaft timing gear.

(c) Using a hammer, tap in the timing gear.

**50. INSTALL IDLE GEAR NO.1**

- (a) Install the idle gear and idle gear thrust plate to the idle gear shaft.



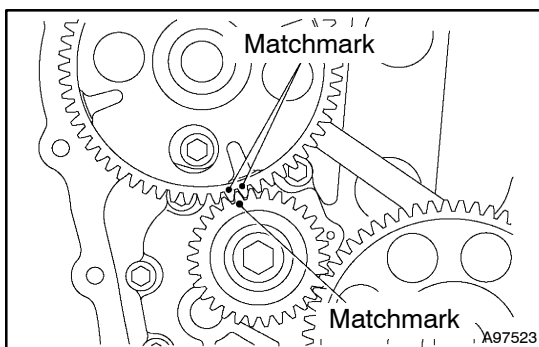
- (b) With the idle gear shaft oil hole facing down, match the matchmarks for each gear, and insert the shaft positively into the cylinder block.

NOTICE:

If the oil hole is not facing down, it causes burnt or abnormal wear.

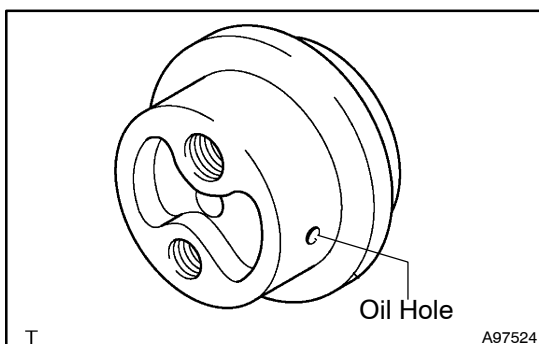
- (c) Install the bolt.

Torque: 137 N·m (1,397 kgf·cm, 101 ft·lbf)

**51. INSTALL CAMSHAFT**

- (a) Apply engine oil to the camshaft journal and bearing.
 (b) Match the matchmarks of the camshaft timing gear and oil pump gear and install the camshaft.
 (c) Install the thrust plate with the 2 bolts.

Torque: 28.5 N·m (291 kgf·cm, 21 ft·lbf)

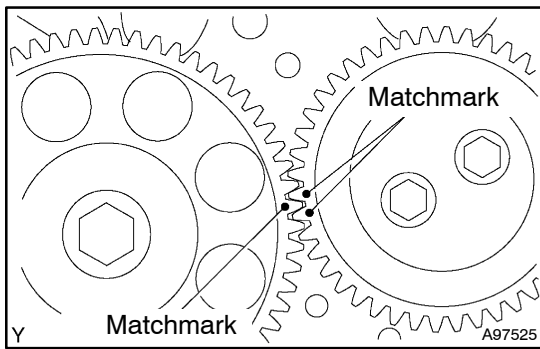
**52. INSTALL IDLE GEAR SHAFT NO. 2**

- (a) Install the lock plate to the end plate with the 3 bolts.
Torque: 55 N·m (561 kgf·cm, 41 ft·lbf)
 (b) Install a new O-ring to the idle gear shaft.
 (c) With the idle gear shaft oil hole facing down, install the gear shaft to the lock plate with the 2 bolts.

Torque: 55 N·m (561 kgf·cm, 41 ft·lbf)

NOTICE:

If the oil hole is not facing down, it causes burnt or abnormal wear.

**53. INSTALL IDLE GEAR NO. 2**

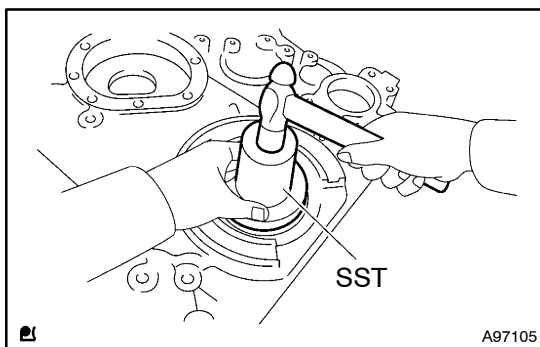
- (a) Match the matchmarks of the idle gears No. 1 and No. 2 and install the idle gear No. 2.

Torque: 55 N·m (561 kgf·cm, 41 ft·lbf)

54. INSTALL IDLE GEAR THRUST PLATE NO. 2

- (a) Install the thrust plate with the 2 bolts.

Torque: 55 N·m (560 kgf·cm, 40 ft·lbf)

**55. INSTALL OIL SEAL**

- (a) Using SST and a hammer, tap in the oil seal to the timing gear case so that oil seal is flush with the timing gear edge.

SST 09223-78010

NOTICE:

- **Be careful not to tap the oil seal at an angle.**
- **Keep the gap between the gear case edge and the oil seal free of foreign matter.**

- (b) Apply MP grease to the oil seal lip.

56. INSTALL TIMING CHAIN OR BELT COVER SUB-ASSY

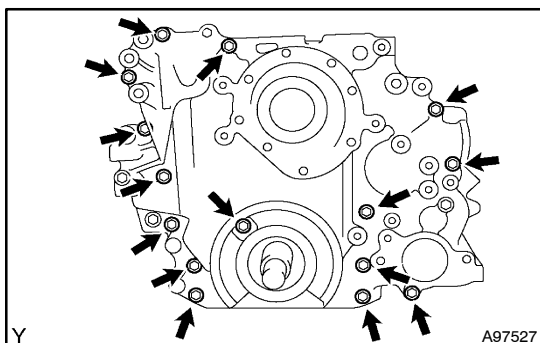
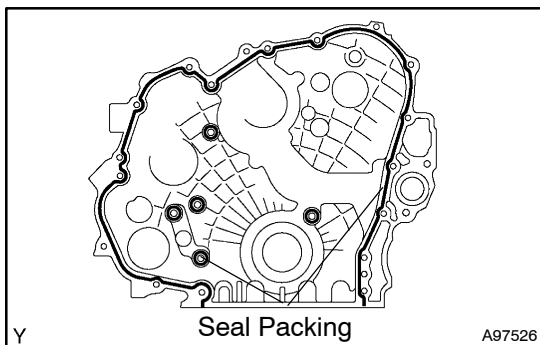
- (a) Remove any oil packing material from the contact surface.

- (b) Apply a continuous bead of seal packing (diameter: 3 to 4 mm (0.11 to 0.15 in.)) as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

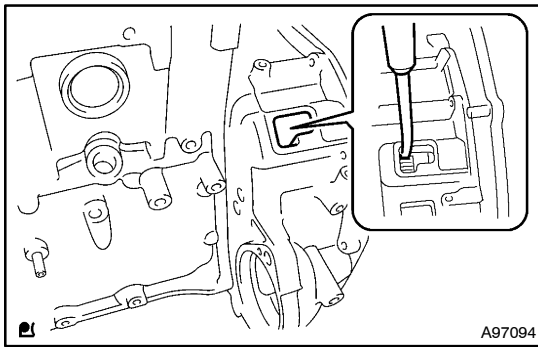
NOTICE:

- **Remove any oil from the contact surface.**
- **Install the belt cover within 3 minutes after applying seal packing.**
- **Do not expose the seal packing engine oil for at least 2 hours after installing.**



- (c) Install the timing gear case with the 15 bolts.

Torque: 28.5 N·m (291 kgf·cm, 21 ft·lbf)

**57. INSTALL CRANKSHAFT PULLEY**

(a) Install the pulley and spacer to the crankshaft.

HINT:

Align the pulley set key with the key groove of the pulley.

(b) Using a 46 mm socket wrench, tighten the nut.

Torque: 519 N·m (5,294 kgf·cm, 383 ft·lbf)

HINT:

Insert a screwdriver through the inspection hole of the flywheel housing into the ring gear of the flywheel to keep it from turning together with the crankshaft.

58. INSTALL WATER OUTLET PIPE NO. 1

(a) Install 2 new O-rings to the timing chain or belt cover.

(b) Install the outlet pipe with the 4 bolts.

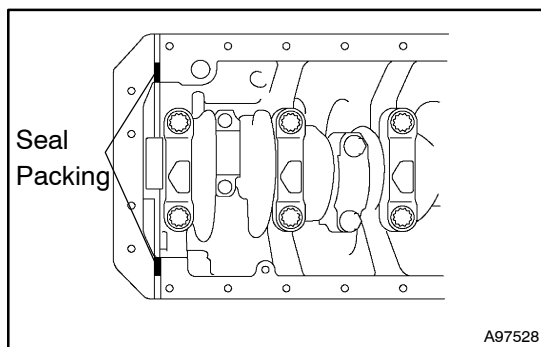
Torque: 55 N·m (561 kgf·cm, 41 ft·lbf)

59. INSTALL OIL STRAINER SUB-ASSY

(a) Install a new O-ring to the cylinder block.

(b) Install the strainer with the 3 bolts.

Torque: 28.5 N·m (291 kgf·cm, 21 ft·lbf)

**60. INSTALL OIL PAN SUB-ASSY**

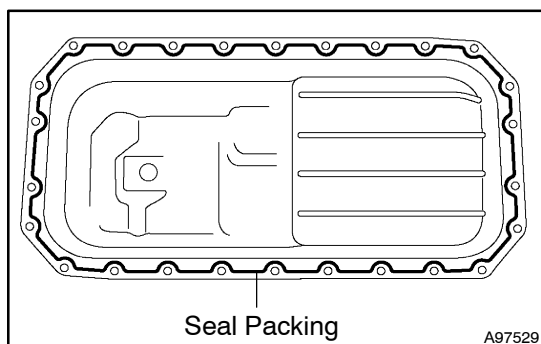
(a) Remove any oil packing material from the contact surface.

(b) Apply a continuous bead of seal packing (diameter: 3 to 4 mm (0.11 to 0.15 in.)) as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

- Remove any oil from the contact surface.
- Install the belt cover within 3 minutes after applying seal packing.
- Do not expose the seal packing engine oil for at least 2 hours after installing.



(c) Install the oil pan with the 26 bolts.

Torque: 28.5 N·m (291 kgf·cm, 21 ft·lbf)

61. INSTALL FLYWHEEL HOUSING STAY RH

(a) Install the stay with the 4 bolts.

Torque:

132 N·m (1,346 kgf·cm, 97 ft·lbf) for bolt (M14)

97 N·m (989 kgf·cm, 72 ft·lbf) for bolt (M12)

62. INSTALL FLYWHEEL HOUSING STAY LH

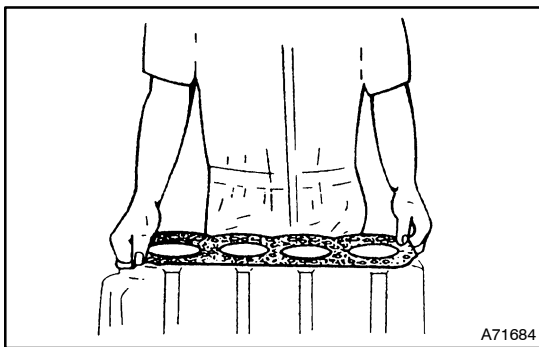
- (a) Install the stay with the 4 bolts.

Torque:**132 N·m (1,346 kgf·cm, 97 ft·lbf) for bolt (M14)****97 N·m (989 kgf·cm, 72 ft·lbf) for bolt (M12)****63. INSTALL ENGINE MOUNTING BRACKET FR NO. 1 RH**

- (a) Install the bracket with the 4 bolts.

Torque: 69 N·m (704 kgf·cm, 51 ft·lbf)**64. INSTALL ENGINE MOUNTING BRACKET FR NO. 1 LH**

- (a) Install the bracket with the 4 bolts.

Torque: 69 N·m (704 kgf·cm, 51 ft·lbf)**65. INSTALL VALVE LIFTER****NOTICE:****Be sure to install the push rod to its original position.**

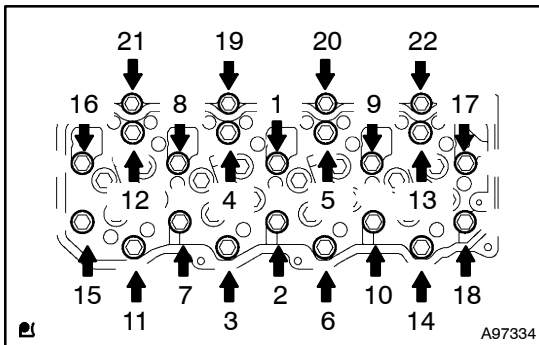
A71684

66. INSTALL CYLINDER HEAD SUB-ASSY

- (a) Install a new cylinder head gasket.

NOTICE:**Always use a new cylinder head gasket after cleaning the surface of the cylinder head, cylinder block and head gasket and keep them free of all dirt, water and grease.**

- (b) Install the cylinder head over the dowels on the cylinder block.

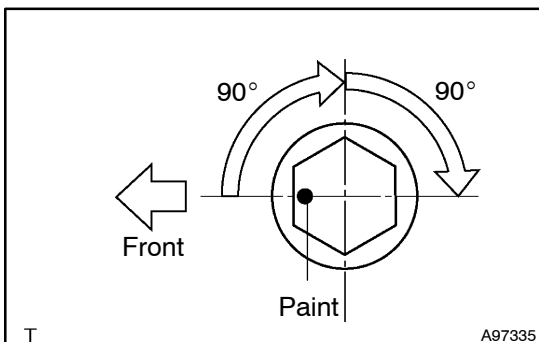


A97334

HINT:

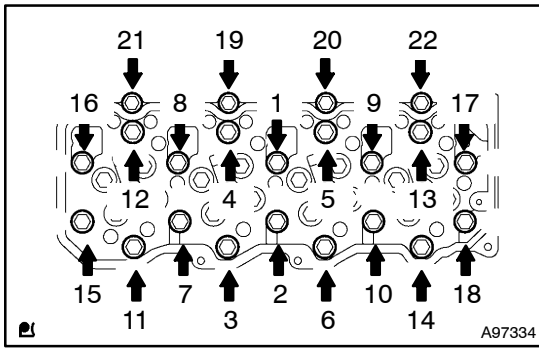
Since the cylinder head bolts are unique to this engine, do not substitute them with ordinary bolts for them.

- (c) Uniformly install and tighten the 1 to 18 cylinder head bolts in the order shown in the illustration.

Torque: 60 N·m (612 kgf·cm, 44 ft·lbf)

A97335

- (d) Mark the front side of each cylinder head bolt head with paint as shown in the illustration.
- (e) Retighten the cylinder head bolts by 90° in the same order as step (c).
- (f) Perform step (e) again.
- (g) Check that each painted mark is now at a 180° angle to the front.



- (h) Uniformly install and tighten the 19 to 22 cylinder head bolts in the order shown in the illustration.
Torque: 55 N·m (561 kgf·cm, 41 ft·lbf)

67. INSTALL VALVE BRIDGE

NOTICE:

Be sure to install the bridge to its original location.

68. INSTALL VALVE PUSH ROD

NOTICE:

Be sure to install the push rod to its original location.

69. INSTALL VALVE ROCKER SHAFT SUB-ASSY NO.1

- (a) Lubricate the rocker arm shaft and bush.

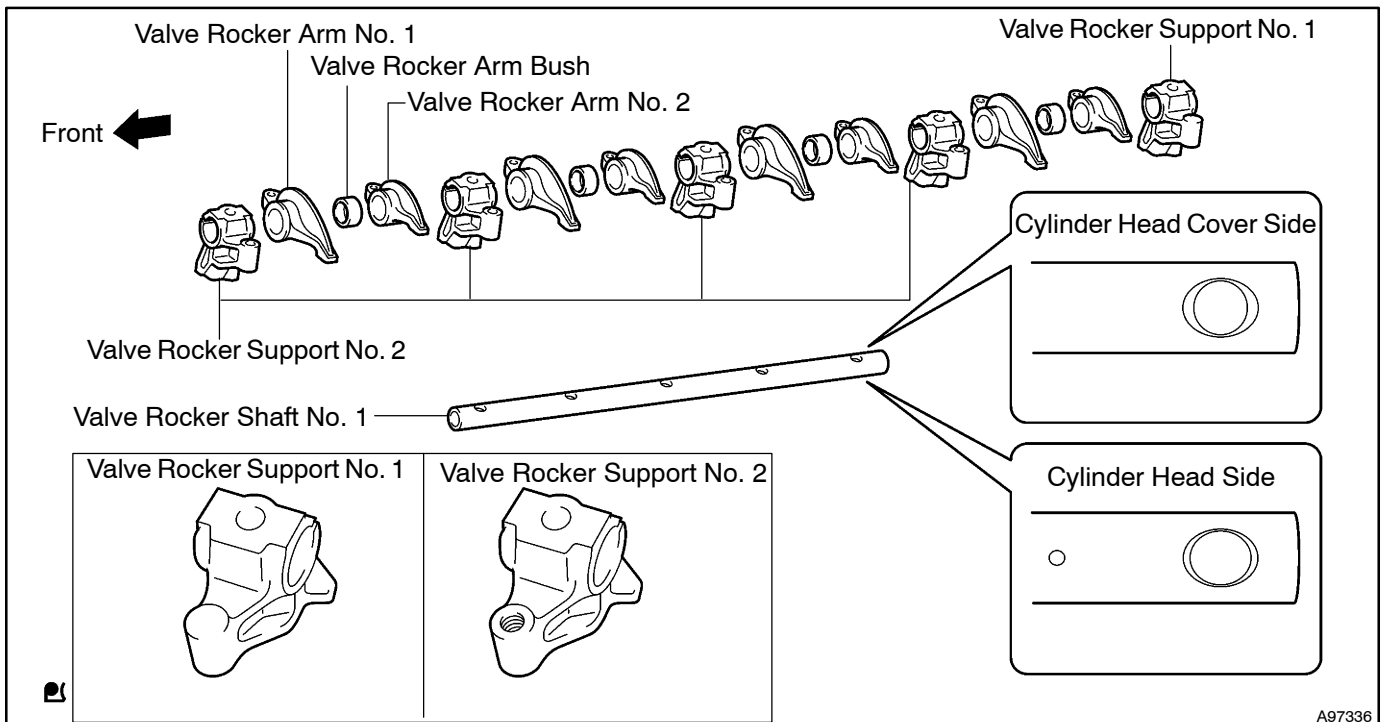
NOTICE:

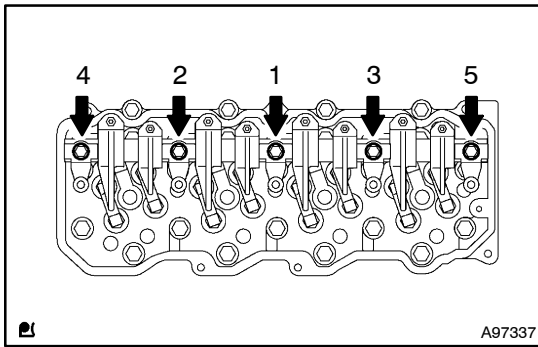
Confirm that oil hole of the rocker arm No. 1 support aligns with the shaft oil hole. Improper installation will result in burning of the entire valve.

- (b) Install the rocker arm No. 1 and No. 2, the rocker support No.1 and No. 2 and the rocker arm bush to the rocker shaft No. 1.

NOTICE:

When the installing, face the hole on the cylinder head side of the rocker shaft No. 1 as shown in the illustration.



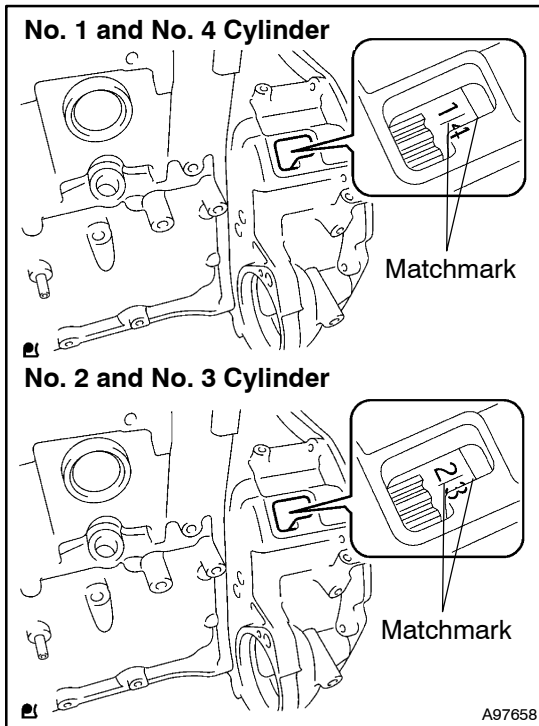


- (c) Install the rocker shaft to the cylinder head.
- (d) Apply engine oil to the rocker arm and push rod.
- (e) Install the bolts in the order shown in the illustration.

Torque: 69 N·m (704 kgf·cm, 51 ft·lbf)

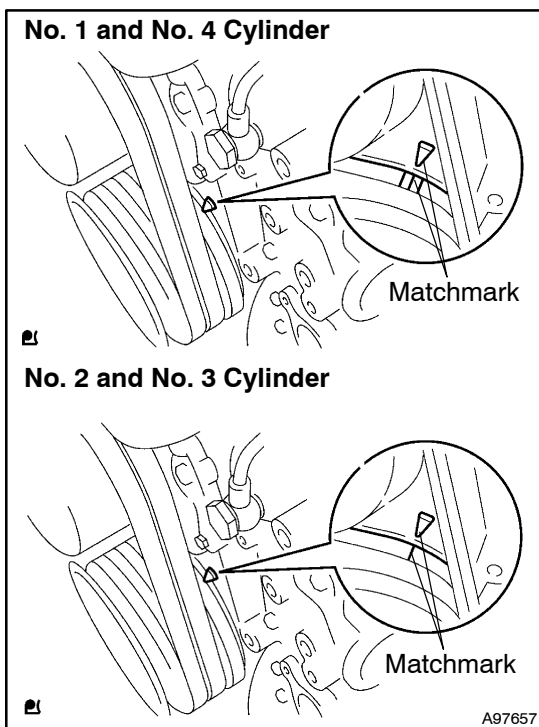
NOTICE:

Be careful not to interfere the push rod with the adjusting screw.



70. ADJUST VALVE CLEARANCE

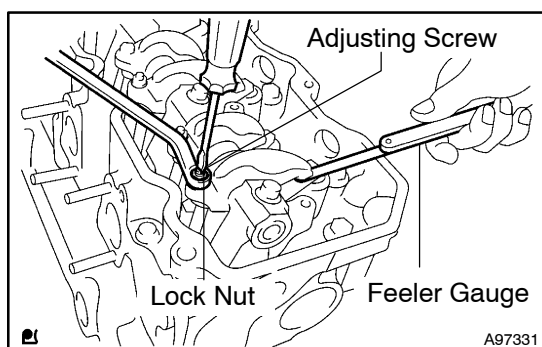
- (a) Flyheel housing side:
Turn the crankshaft clockwise to align the matchmark on the flywheel the line between the 2 numbers with the edge on the flywheel housing.



- (b) Crankshaft pulley side:
Turn the crankshaft clockwise to align the matchmark on the crankshaft pulley with the pointer on the Timing chain or belt cover.

HINT:

If not, turn the crankshaft 1 revolution (360°) to align the matchmark.



- (c) With the No. 1 piston positioned at TDC on the compression stroke, using a feeler gauge, adjust the each valve clearance.

Valve clearance (Cold):

Intake	0.30 mm (0.0118 in.)
Exhaust	0.45 mm (0.0177 in.)

HINT:

The feeler gauge should move with a very slight pull.

- (d) Loosen the lock nut on the valve rocker arm and loosen the adjusting screw.
- (e) Insert a 0.30 mm (0.012 in.) feeler gauge for the intake or a 0.45 mm (0.018 in.) feeler gauge for the exhaust between the adjusting screw on the valve rocker arm and the valve bridge.
- (f) Turn the adjusting screw on the valve rocker arm until the feeler gauge slides with a very slight drag, and lock the adjusting screw with the lock nut.

Torque: 29.5 N·m (300 kgf·cm, 22 ft·lbf)

- (g) Recheck the clearance.
- (h) Adjust the other valves.
- (1) Turn the crankshaft 1 revolution (360°) clockwise.
- (2) Adjust the valve clearance for each cylinder in the firing order.

Firing order: 1 - 3 - 4 - 2

(A number of a cylinder is counted from the timing gear side)

71. INSTALL CYLINDER HEAD COVER SUB-ASSY

- (a) Install a new cylinder head cover gasket to the head cover.
- (b) Install the 2 cylinder head cover spacers and 2 cylinder head cover cushions to the cover.
- (c) Install the cover with the 2 bolts.

Torque: 28.5 N·m (291 kgf·cm, 21 ft·lbf)

72. INSTALL CYLINDER HEAD COVER NO. 2

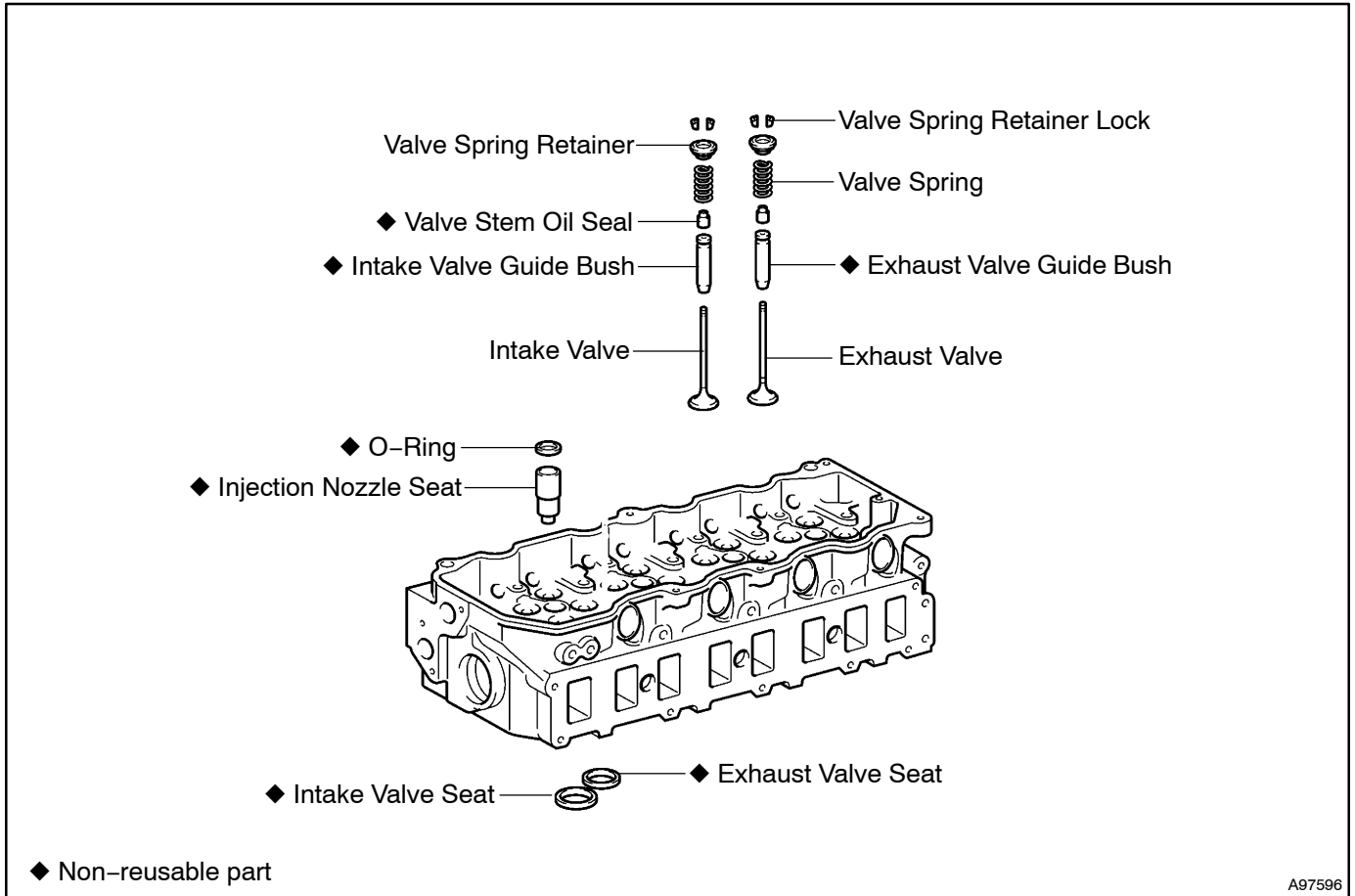
- (a) Install the 2 cylinder head cover stays and cylinder head cover cushion rubber to the cover.
- (b) Install the cover with the 2 bolts.

Torque: 28.5 N·m (291 kgf·cm, 21 ft·lbf)

73. INSTALL OIL FILLER CAP SUB-ASSY

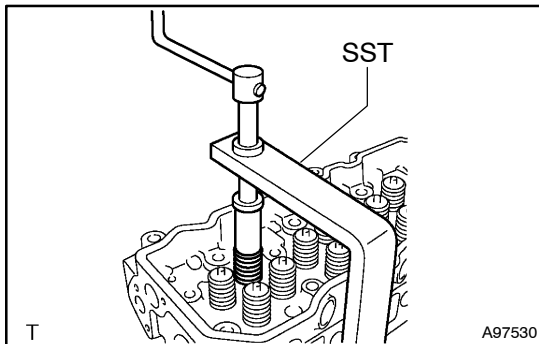
CYLINDER HEAD ASSY (N04C-TF) COMPONENTS

141UP-01



A97596

OVERHAUL



1. REMOVE VALVE SPRING RETAINER LOCK

- (a) Using SST, compress the valve spring and remove the retainer lock.

SST 09202-70020 (09202-00030)

2. REMOVE VALVE SPRING RETAINER

NOTICE:

Organize the parts so that each parts location can be remembered for reassembly.

3. REMOVE VALVE SPRING

NOTICE:

Organize the parts so that each parts location can be remembered for reassembly.

4. REMOVE INTAKE VALVE

NOTICE:

Organize the parts so that each parts location can be remembered for reassembly.

5. REMOVE EXHAUST VALVE

NOTICE:

Organize the parts so that each parts location can be remembered for reassembly.

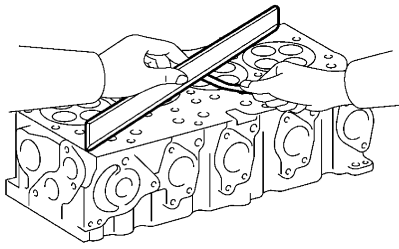
6. REMOVE VALVE STEM OIL SEAL

- (a) Using a needle nose pliers, remove the oil seal.

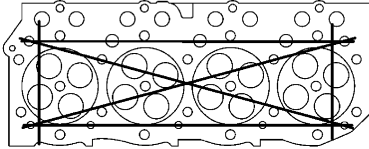
NOTICE:

Organize the parts so that each parts location can be remembered for reassembly.

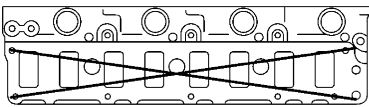
7. REMOVE STUD BOLT



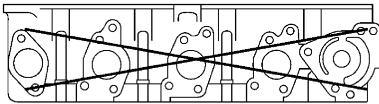
Cylinder Block Side



Intake Manifold Side



Exhaust Manifold Side



A97531

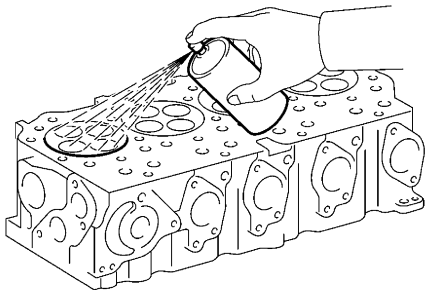
8. INSPECT CYLINDER HEAD SUB-ASSY

(a) Inspect the flatness.

- (1) Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block and the manifolds for warpage.

Maximum warpage: 2.0 mm (0.079 in.)

If the warpage is greater than the maximum, replace the cylinder head.

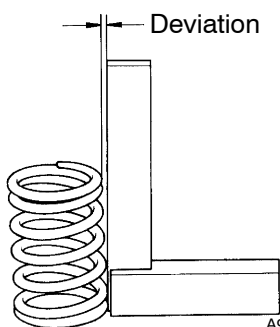


A97532

(b) Inspect for cracks.

- (1) Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.

If cracked, replace the cylinder head.



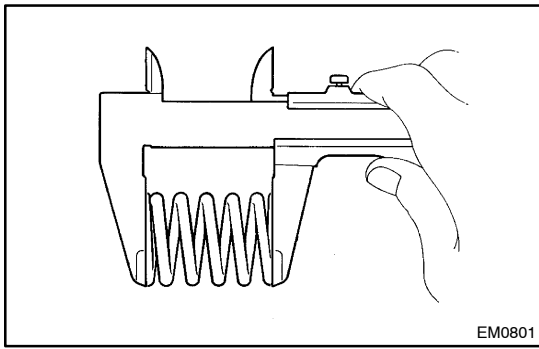
A97533

9. INSPECT VALVE SPRING

(a) Using a steel square, measure the deviation of the spring.

Maximum deviation: 2.0 mm (0.079 in.)

If the deviation is greater than the maximum, replace the spring.

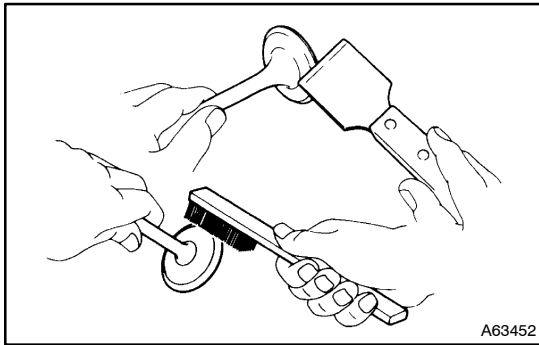


- (b) Using a vernier caliper, measure the free length of the spring.

Standard free length: 85.1 mm (3.350 in.)

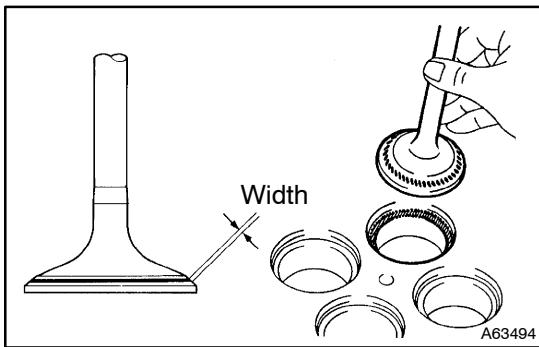
Minimum free length: 82.1 mm (3.232 in.)

If the free length is less than the minimum, replace the spring.



10. CLEAN VALVE

- (a) Using a gasket scraper, chip off any carbons from the valve head.
- (b) Using a wire brush, thoroughly clean the valve.



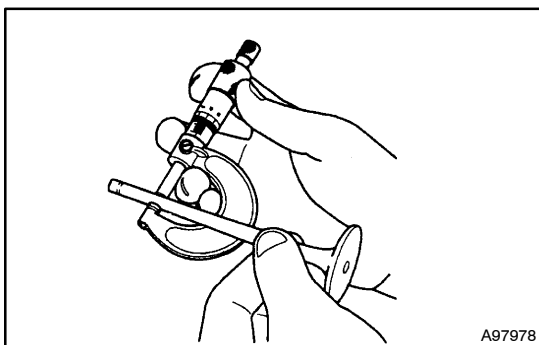
11. INSPECT INTAKE AND EXHAUST VALVE

- (a) Visually check the valves for damage, burns, carbons or warpage, and check the valve heads, valve stems and valve stem grooves for cracks.

If wear, burns, warpage or cracks are excessive, replace the valves.

- (b) Check the valve seating condition.
- (1) Lightly apply red lead marking compound to the valve face.
 - (2) Tapping and rotating the valve against the seat, check the seating condition.

If the red lead mark is not concentric or the compound is scattered all around the valve face or seat, correct the valve face or the valve seat.



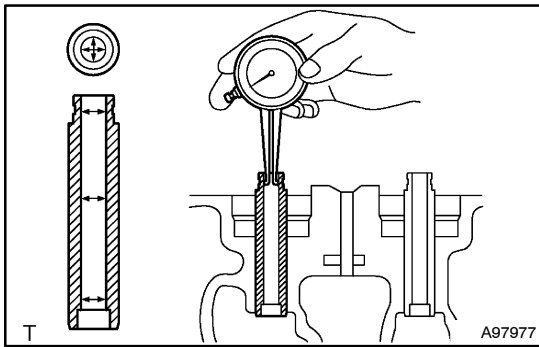
12. INSPECT VALVE GUIDE BUSH OIL CLEARANCE

- (a) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

Intake	6.957 to 6.972 mm (0.2738 to 0.2744 in.)
Exhaust	6.932 to 6.947 mm (0.2729 to 0.2735 in.)

If the stem diameter is less than the minimum, replace the valve.



- (b) Using a caliper gauge, measure the inside diameter of the guide bush.

Bush inside diameter:

Intake	7.000 to 7.015 mm (0.2755 to 0.2761 in.)
Exhaust	7.000 to 7.015 mm (0.2755 to 0.2761 in.)

If the diameter is greater than the maximum, replace the valve guide bush.

- (c) Subtract the valve stem diameter measurement from the guide bush inside diameter measurement.

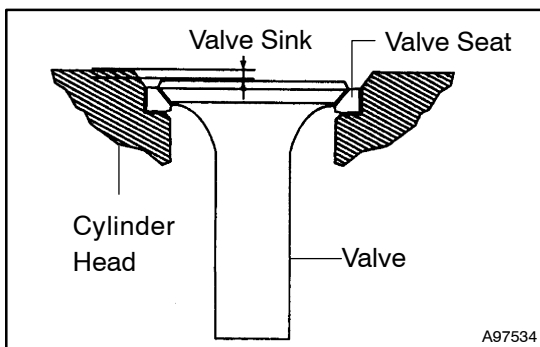
Standard oil clearance:

Intake	0.023 to 0.058 mm (0.0009 to 0.0022 in.)
Exhaust	0.050 to 0.083 mm (0.0020 to 0.0032 in.)

Maximum oil clearance:

Intake	0.12 mm (0.0047 in.)
Exhaust	0.15 mm (0.0059 in.)

If the clearance is greater than the maximum, replace the valve and guide bush (see steps 16 and 17).



13. INSPECT VALVE SINK

- (a) Using a vernier caliper, measure the valve sink.

Standard:

Intake	0.8 to 1.0 mm (0.031 to 0.039 in.)
Exhaust	1.8 to 2.0 mm (0.070 to 0.078 in.)

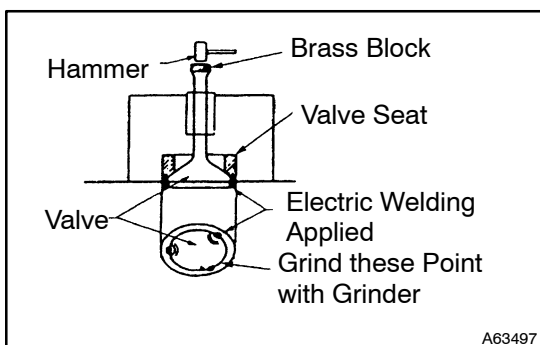
Maximum:

Intake	1.1 mm (0.043 in.)
Exhaust	2.1 mm (0.082 in.)

If the sink is greater than the maximum, replace the valve and valve seat.

NOTICE:

- If the valve heads are protruding from the cylinder head surface, the valve heads may hit against the pistons while the engine is running.
- When replacing the valve and valve seat, always re-check the seating condition.



14. REMOVE VALVE SEATS

- (a) Grind the 3 places on the circumference of an unwanted valve and weld it to the valve seat.

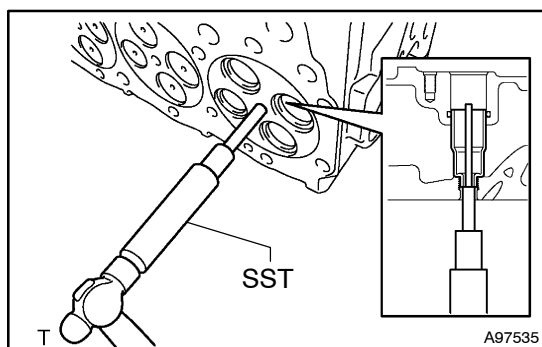
NOTICE:

To protect the lower surface of the cylinder head from welding spatters, be sure to apply grease before welding.

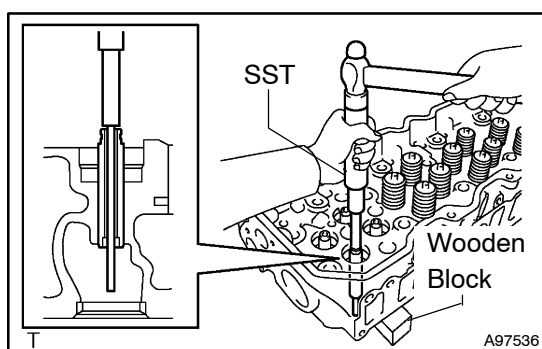
- (b) Place a brass block on the top of the valve stem and strike it with a hammer to remove the valve seat.

CAUTION:

When striking, a metal tip may fly off on impact. Wear safety glasses to protect your eyes.

**15. REMOVE INJECTION NOZZLE SEAT**

- (a) Using SST, remove the nozzle seat.
SST 09201-10000 (09201-01050), 09950-70010 (09951-07100)
- (b) Remove the O-ring from the cylinder head.

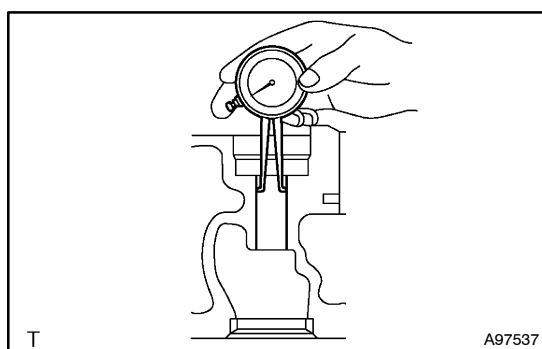
**16. REMOVE INTAKE AND EXHAUST VALVE GUIDE BUSH**

- (a) Heat the cylinder head to 80 to 100°C (176 to 212°F) with hot water.
- (b) Using SST and a hammer, tap out the valve guide bush.
SST 09201-10000 (09201-01070), 09950-70010 (09951-07100)

17. INSPECT CYLINDER HEAD COOLANT GALLERY FOR LEAKS

- (a) Close all coolant holes and apply air pressure of about 245 kPa (2.5 kgf·cm², 36 psi) from one of the coolant holes. Immerse the cylinder head into water, then check for air leakage.

If any leakage is found, replace the cylinder head.

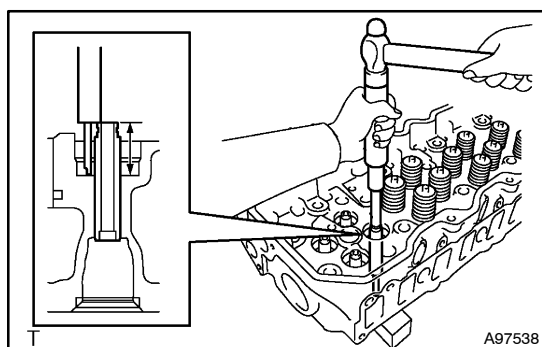
**18. INSTALL INTAKE AND EXHAUST VALVE GUIDE BUSH**

- (a) Using a caliper gauge, measure the inside diameter of the guide bush.

Bush inside diameter:

13.000 to 13.018 mm (0.5118 to 0.5125 in.)

If the bush bore diameter of the cylinder head is greater than 13.018 mm (0.5125 in.), replace the cylinder head.



- (b) Heat the cylinder head to 80 to 100°C (176 to 212°F) with hot water.

- (c) Using SST and a hammer, tap in a new guide bush to the specified protrusion height.

SST 09201-10000 (09201-01070), 09950-70010 (09951-07100)

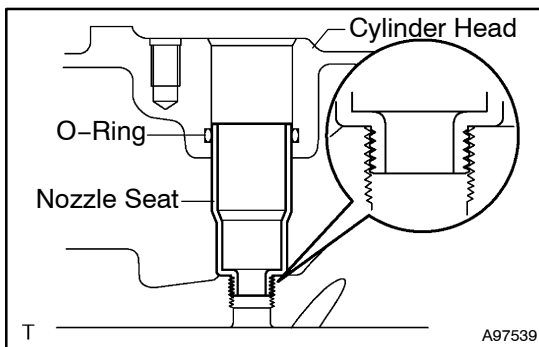
Protrusion height:

26.4 to 26.8 mm (1.039 to 1.055 in.)

NOTICE:

Do not tap in the guide bush too much.

- (d) Using a reamer, ream the guide bush to obtain the standard clearance (see step 12) between the guide bush and valve stem.

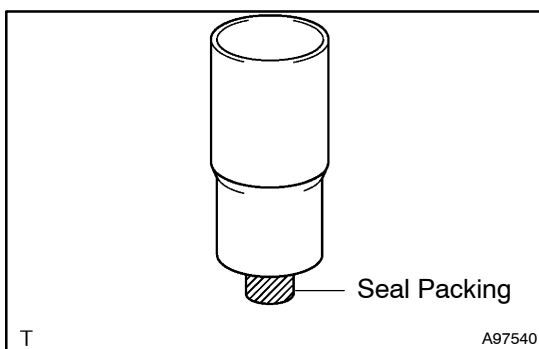


19. INSTALL INJECTION NOZZLE SEAT

- (a) Apply a light coat of engine oil to a new O-ring, and install it to the cylinder head.

NOTICE:

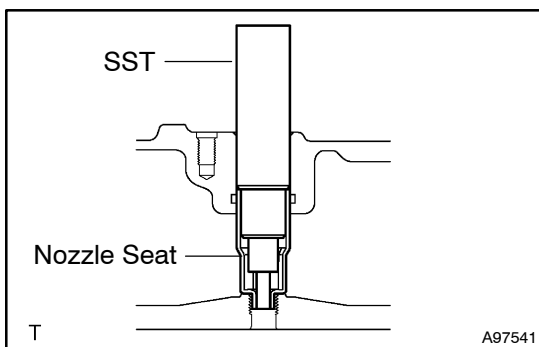
Be sure to install a new O-ring. Reused O-rings may cause water or gas leakage and lead to overheating or cracked heads.



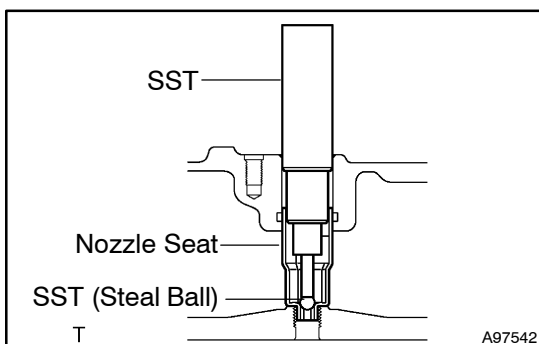
- (b) Apply seal packing to a new nozzle seat.
Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

- Remove any oil from the installation surface of the cylinder head and nozzle seat.
- Be sure to install a new nozzle seat. Reused nozzle seats may cause water or gas leakage and lead to overheating or cracked heads.



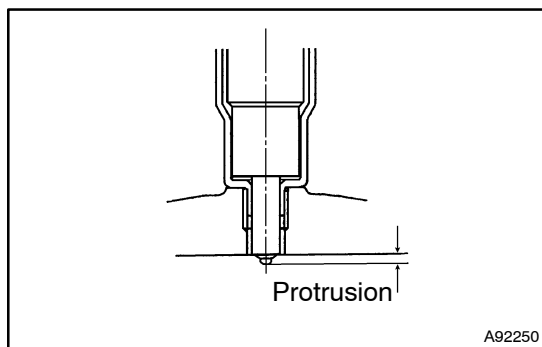
- (c) Using SST, install the nozzle seat to the cylinder head.
 SST 09260-69015



- (d) Using SST, caulk the nozzle seat.
 SST 09260-69015

HINT:

Put a container under the cylinder head to prevent the steal ball from being lost.



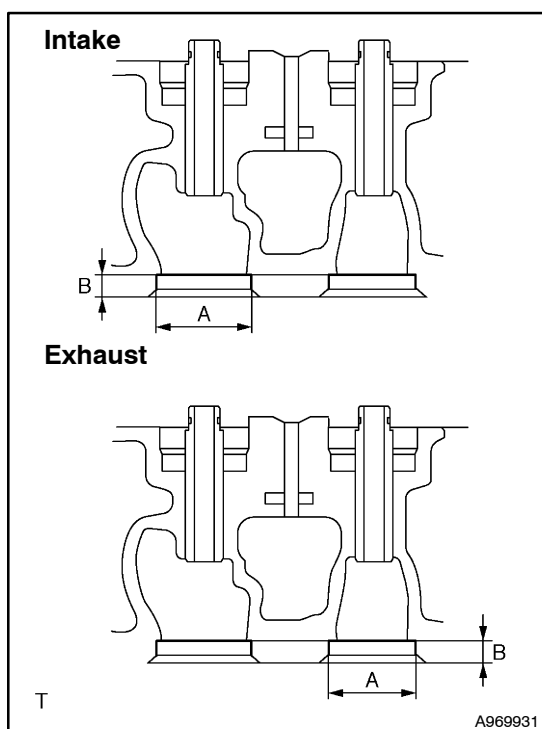
- (e) Install the injector to the cylinder head. Using a vernier caliper, measure the protrusion of the injection from the lower surface of the cylinder head.

Protrusion:

Standard: 2.45 to 2.95 mm (0.0964 to 0.1161 in.)

Minimum: 2.95 mm (0.1161 in.)

If the protrusion is greater than the maximum, replace the injection nozzle seat.



20. INSTALL VALVE SEATS

- (a) Using a caliper gauge and vernier caliper, measure the dimensions of the valve seat installation hole.

Cylinder head dimension:

Intake	A	36.000 to 36.015 mm (1.4173 to 1.4179 in.)
	B	8.400 to 8.600 mm (0.3307 to 0.3385 in.)
Exhaust	A	32.000 to 32.016 mm (1.2598 to 1.2604 in.)
	B	7.600 to 7.800 mm (0.2992 to 0.3070 in.)

If the result is not as specified, replace the cylinder head.

- (b) Heat the cylinder head between 80 to 100°C (176 to 212°F) with hot water. Cool the valve seat with dry ice for approximately 30 minutes.
- (c) Using SST and a hammer, lightly tap in the valve seat to the cylinder head.
SST 09950-60010 (09951-00300, 09951-00360, 09952-06010), 09950-70010 (09951-07100)
- (d) Using SST and a hammer, completely tap in the valve seat.
SST 09950-60010 (09951-00360), 09950-70010 (09951-07100)

21. REPAIR VALVE SEATS

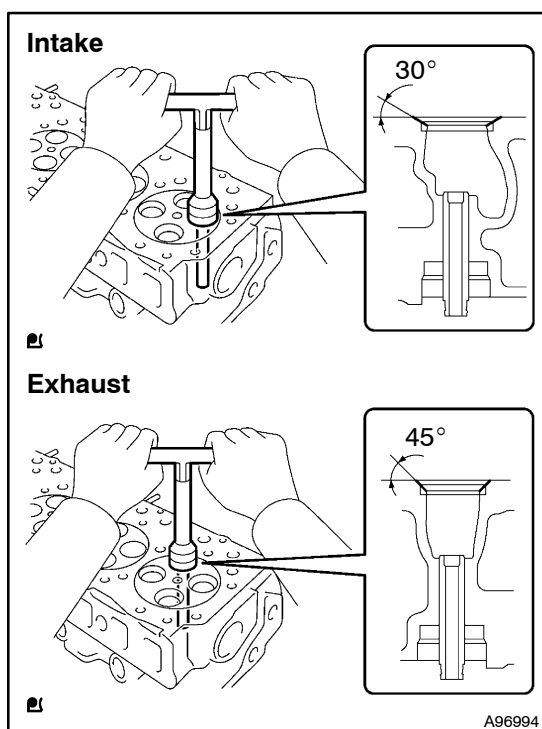
- (a) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

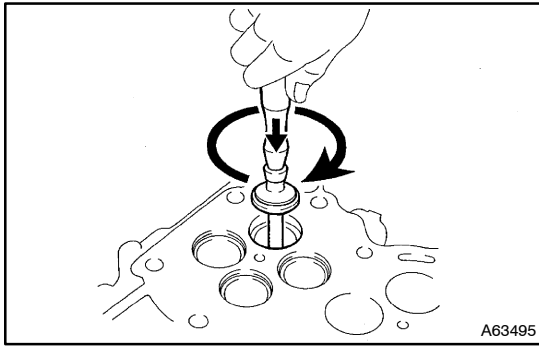
Standard:

Intake	0.8 to 1.0 mm (0.031 to 0.039 in.)
Exhaust	1.8 to 2.0 mm (0.070 to 0.078 in.)

CAUTION:

When grinding, a metal tip may fly off on impact. Wear safety glasses to protect your eyes.





- (b) Hand-lap the valve and valve seat.
- (1) Lightly apply lapping compound to the valve face. Then, tap and rotate the valve against the seat.

HINT:

- After hand-lapping, clean off any lapping compound on the valves and valve seats.
- When hand-lapping, always recheck the seating condition (see step 11).

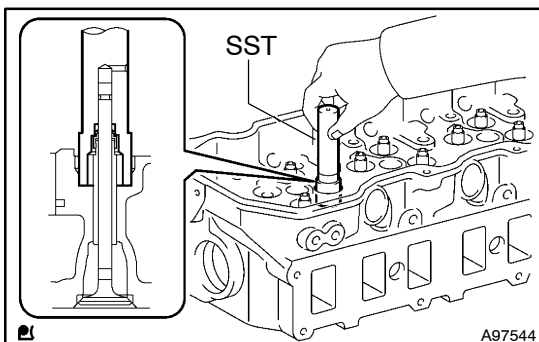
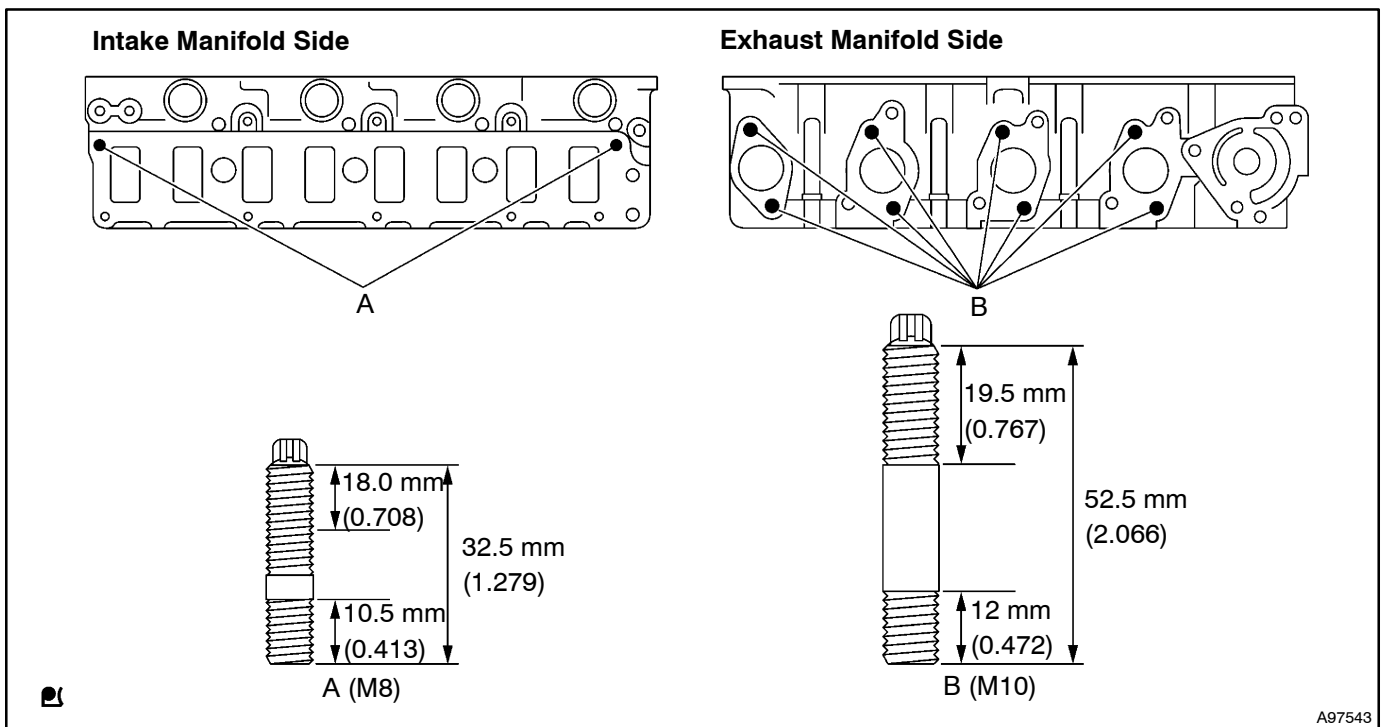
22. INSTALL STUD BOLT

- (a) Using a torx socket wrench, install the stud bolts labeled A and B.

Torque:

25 N·m (255 kgf·cm, 18 ft·lbf) for bolt A

51 N·m (520 kgf·cm, 38 ft·lbf) for bolt B



23. INSTALL VALVE STEM OIL SEAL

- (a) First, install the lower spring seat and valve to the cylinder head (for guide of SST), then apply engine oil to the lip of the stem seal and drive the guide with SST.

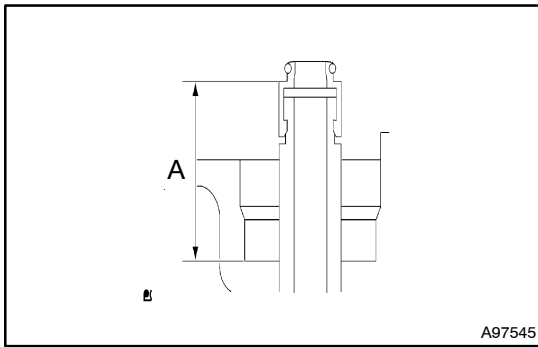
SST 0947-22210

CAUTION:

When striking, a metal tip may fly off impact. Wear safety glasses to protect your eyes.

NOTICE:

- Do not use the SST if its surface contacting the valve spring lower seat is deformed.
- Check that the seal has not been deformed, sloped or cracked after the installation.



- (b) After installing the valve stem oil seal, check the height (A) using a vernier caliper.

Standard height (A):

29.0 to 29.5 mm (1.141 to 1.161 in.)

- If the result is greater than specified, adjust the height.
If the result is less than specified, replace the oil seal.

24. INSTALL INTAKE VALVE

- (a) Apply engine oil to the valve stem.
(b) Install the valve to the cylinder head.

NOTICE:

Be sure to install the bridge to its original location.

25. INSTALL EXHAUST VALVE

- (a) Apply engine oil to the valve stem.
(b) Install the valve to the cylinder head.

NOTICE:

Be sure to install the bridge to its original location.

26. INSTALL VALVE SPRING

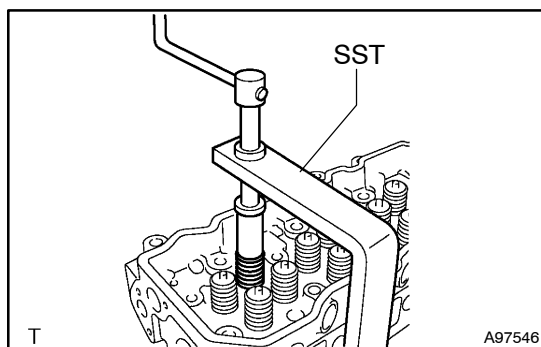
NOTICE:

Be sure to install the valve spring to its original location.

27. INSTALL VALVE SPRING RETAINER

NOTICE:

Be sure to install the retainer to its original location.



28. INSTALL VALVE SPRING RETAINER LOCK

- (a) Using SST, compress the valve spring and install the retainer lock.

SST 09202-70020 (09202-00030)

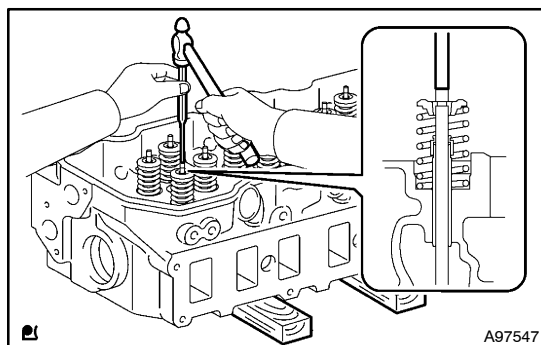
NOTICE:

- **Be sure to apply engine oil to the contact surface of the parts before the assembly.**
- **Be sure to install the retainer its to original location.**
- **When the valve spring is compressed, be careful that the upper seat will not damage the stem seal.**

- (b) Using a 5 mm (0.19 in.) pin punch, tap in the valve tip to settle the spring.

NOTICE:

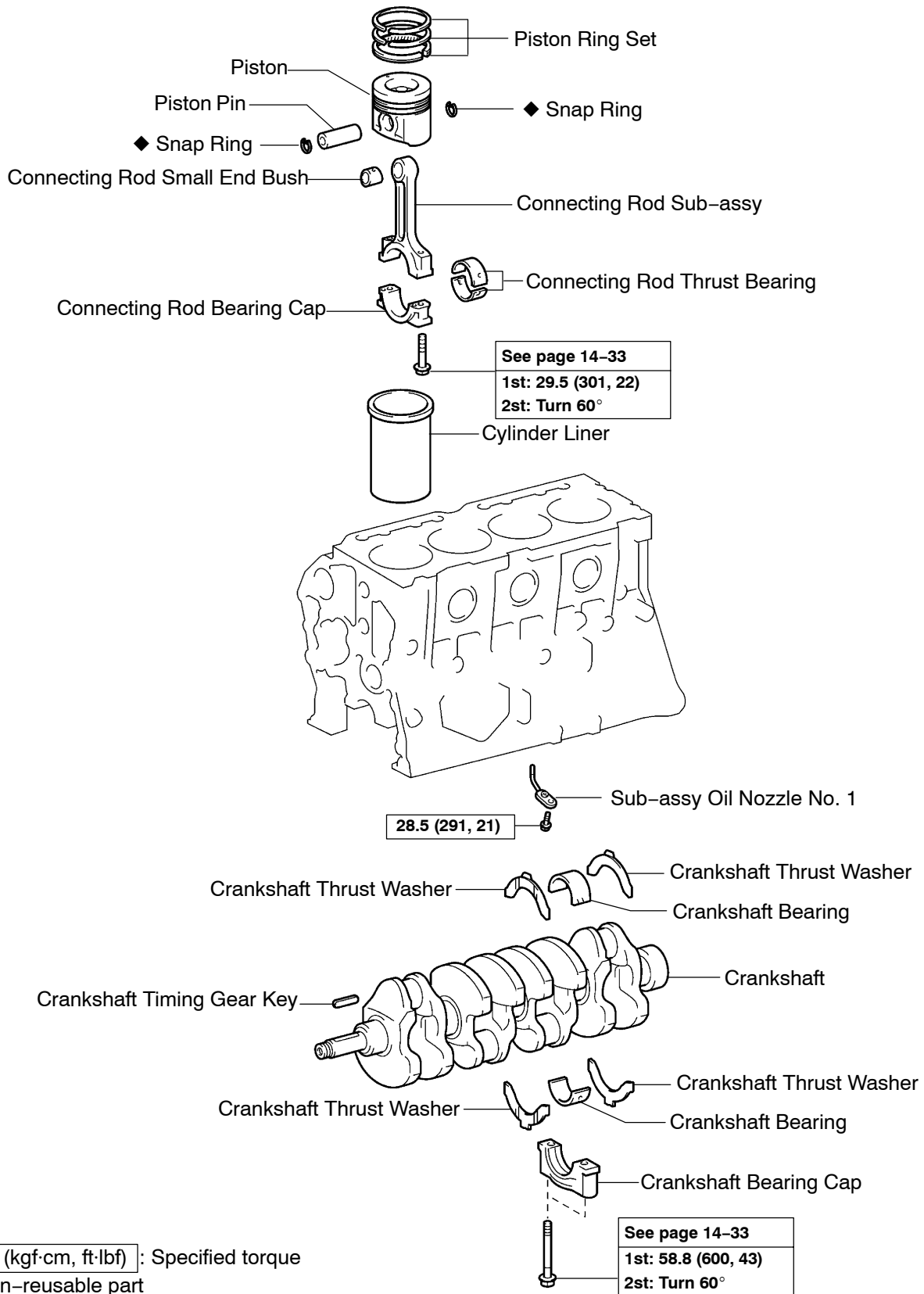
- **Do not tap the retainer.**
- **Be careful not to damage the valve stem.**



CYLINDER BLOCK ASSY (N04C-TF)

COMPONENTS

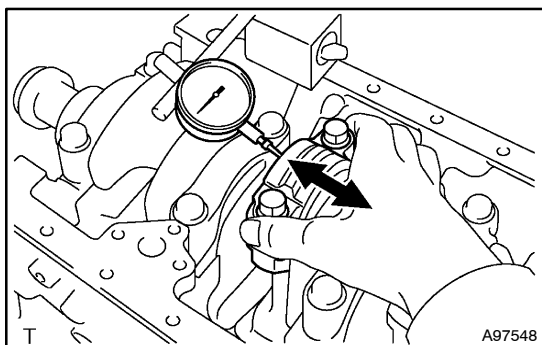
141UN-01



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

OVERHAUL



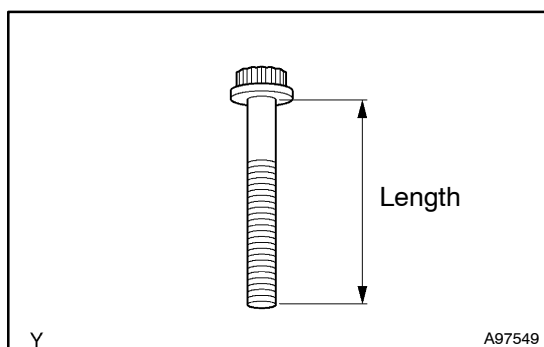
1. **INSPECT CONNECTING ROD THRUST CLEARANCE**
 - (a) Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:
0.200 to 0.520 mm (0.0079 to 0.0204 in.)

Maximum thrust clearance: 0.60 mm (0.0236 in.)

If the thrust clearance is greater than the maximum, replace the connecting rod assy. If necessary, replace the crankshaft.

2. **REMOVE PISTON W/CONNECTING ROD**
 - (a) Remove the piston from the cylinder block.
3. **REMOVE CONNECTING ROD BEARING**

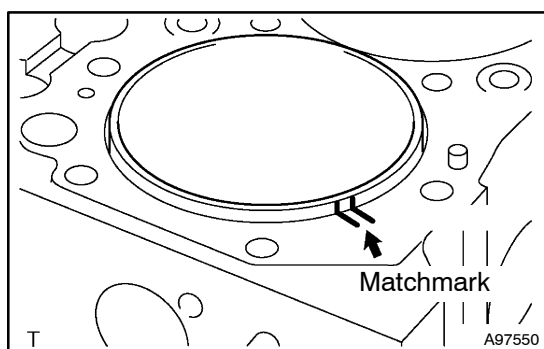


4. **INSPECT CONNECTING ROD BOLT**
 - (a) Using a vernier caliper, measure the length of the connecting rod bolt.

Standard bolt length: 59.00 mm (2.3228 in.)

Maximum bolt length: 61.5 mm (2.421 in.)

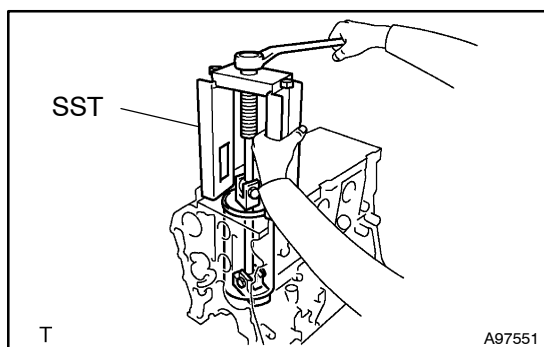
If the diameter is less than the minimum, replace the bolt.



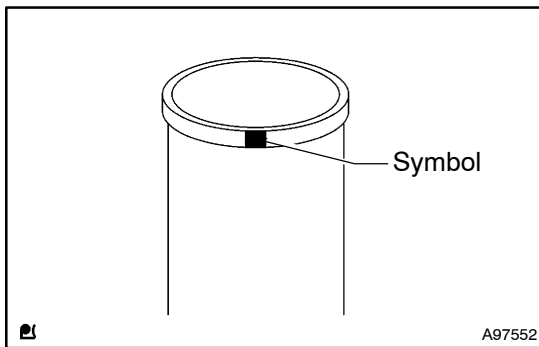
5. **REMOVE CYLINDER LINER**

HINT:
Before removing the cylinder liner, put matchmarks on the cylinder liner and cylinder is bent by "run-in".

NOTICE:
When reusing the cylinder liner, misalignment with the cylinder block may concentrate stress on the thin part of the cylinder liner and it may be broken.



- (a) Using SST, remove the cylinder liner.
SST 0942-01460
- NOTICE:**
Organize the parts so that each parts location can be remembered for reassembly.



6. INSPECT CYLINDER LINER

- (a) Using a micrometer, measure the outside diameter of the cylinder liner.

Standard:

Symbols	Outside Diameter
A	106.982 to 106.989 mm (4.2118 to 4.2121 in.)
B	106.990 to 106.995 mm (4.2121 to 4.2123 in.)
C	106.996 to 107.004 mm (4.2124 to 4.2127 in.)

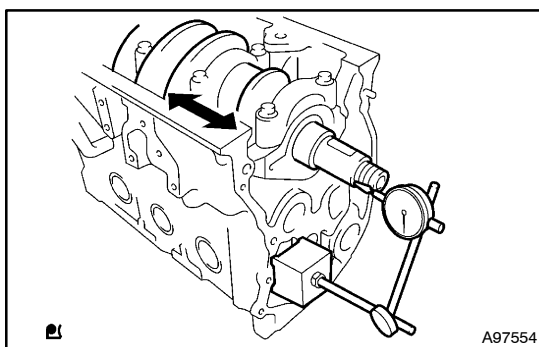
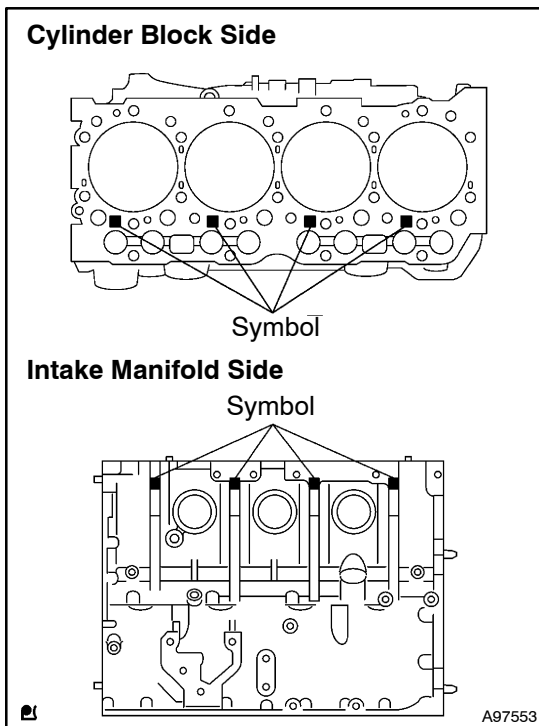
If the diameter is greater than the minimum, replace the cylinder liner.

- (b) Using a cylinder gauge, measure the inside diameter of the cylinder block.

Standard:

Symbols	Outside Diameter
A	107.000 to 107.008 mm (4.2125 to 4.2129 in.)
B	107.008 to 107.014 mm (4.2129 to 4.2131 in.)
C	107.014 to 107.022 mm (4.2131 to 4.2134 in.)

If the diameter is greater than the maximum, replace the cylinder block.



7. INSPECT CRANKSHAFT THRUST CLEARANCE

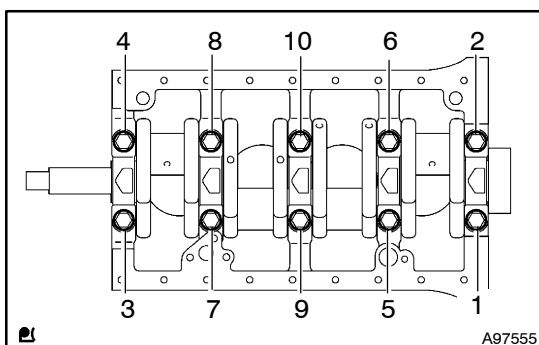
- (a) Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:

0.050 to 0.220 mm (0.0019 to 0.0086 in.)

Maximum thrust clearance: 0.40 mm (0.0157 in.)

If the thrust clearance is greater than the maximum, replace the crankshaft or thrust washers as a set.



8. REMOVE CRANKSHAFT

- (a) Remove the 10 bearing cap bolts in the order as shown in the illustration.
- (b) Using a plastic-faced hammer, tap the bearing caps to remove them.

NOTICE:

Be careful not to damage the thrust washer and bearing.

- (c) Remove the crankshaft.

9. REMOVE CRANKSHAFT THRUST WASHER SET**NOTICE:**

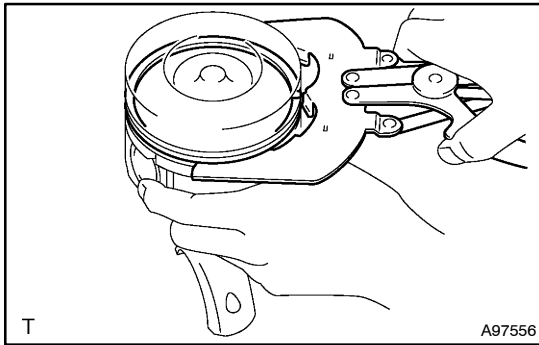
Organize the parts so that each parts location can be remembered for reassembly.

10. REMOVE CRANKSHAFT BEARING**NOTICE:**

Organize the parts so that each parts location can be remembered for reassembly.

11. REMOVE SUB-ASSY OIL NOZZLE NO.1

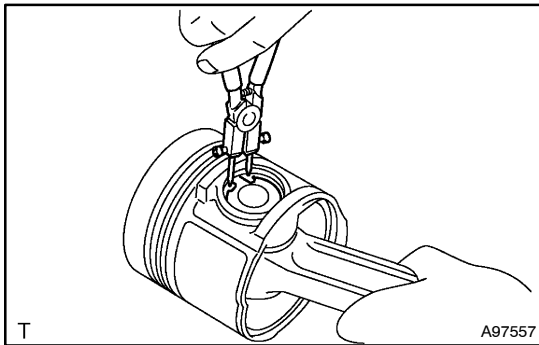
- (a) Remove the bolt and nozzle.

**12. REMOVE PISTON RING SET**

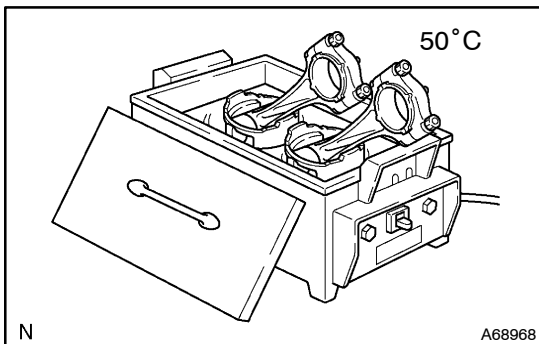
- (a) Using a piston ring expander, remove the piston rings.

HINT:

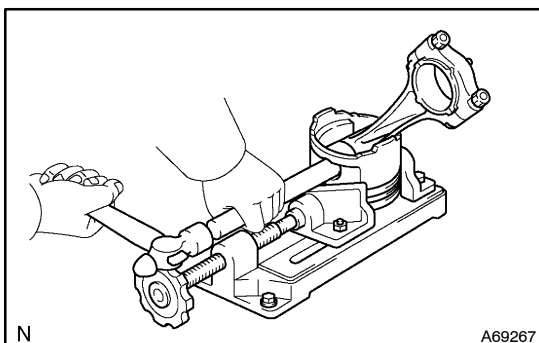
Arrange the piston rings in the correct order.

**13. REMOVE PISTON PIN**

- (a) Using snap ring pliers, remove the snap rings.



- (b) Gradually heat the piston to approximately 50°C (122°F).

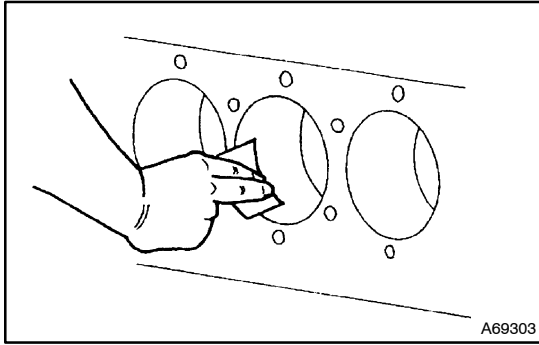


- (c) Using a plastic-faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

HINT:

- The piston and pin are a set.
- Arrange the pistons, pins, rings, connecting rods and bearings in the correct order.

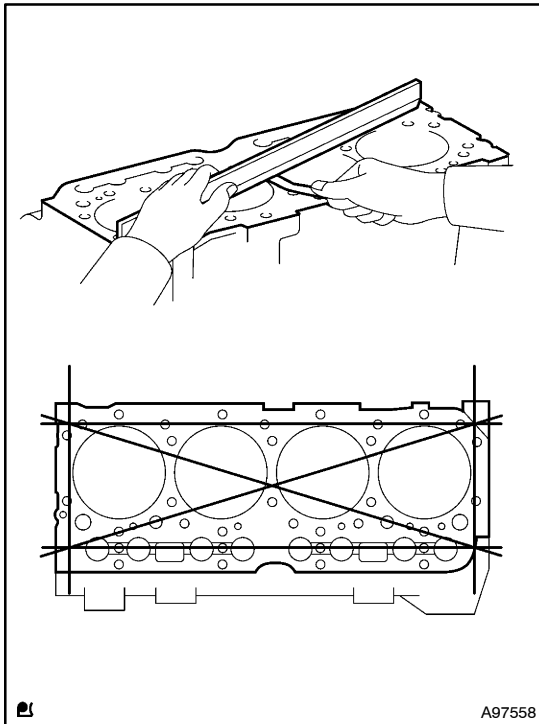
14. REMOVE STUD BOLT



15. INSPECT CYLINDER BLOCK FOR FLATNESS

HINT:

Before the measurement, remove carbon deposits from the upper end inside the cylinder liner with a scraper or an emery paper (recommended: No. 150), working in a circular direction. Make sure that there is no scratches inside the cylinder liner.



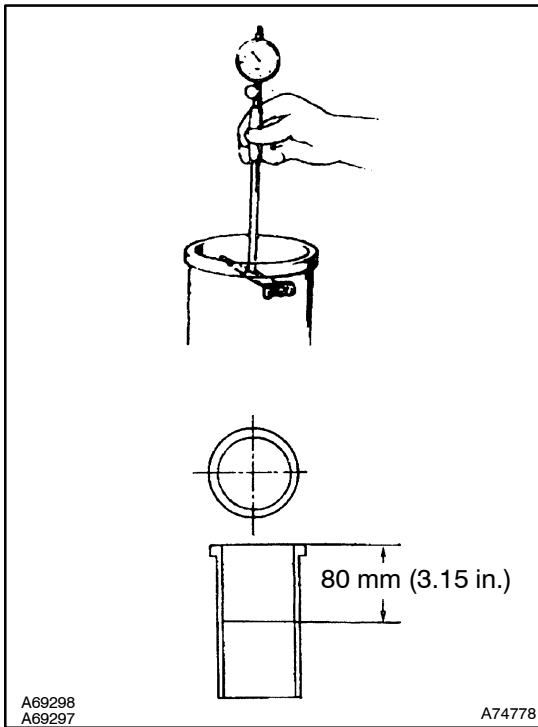
- (a) Using a precision straight edge and feeler gauge, measure the warpage of the surface contacting the cylinder head cap.

Maximum warpage: 0.10 mm (0.0039 in.)

If the warpage is greater than the maximum, replace the cylinder block.

- (b) Visually check the cylinders for vertical scratches.

If deep scratches are found, rebore all the 4 cylinders. If necessary, replace the cylinder block.

**16. INSPECT CYLINDER BORE**

- (a) Using a cylinder gauge, measure the cylinder liner inside diameter at the 4 points in the piston boss and thrust direction, as shown in the illustration.

Standard inside diameter:

104.012 to 104.036 mm (4.0950 to 4.0959 in.)

Maximum inside diameter: 104.15 mm (4.1004 in.)

If the inside diameter is greater than the maximum, replace the cylinder liner with a new one.

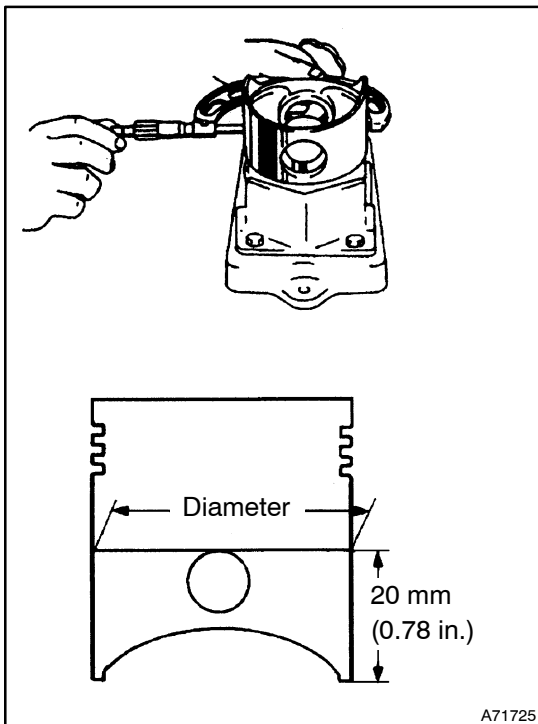
HINT:

- Apply the value measured at the most worn point to the cylinder liner inside diameter.
- If the cylinder liner is heavily worn or if only the piston ring must be replaced, correct the corrugation in the top of the cylinder liner.

Standard oil clearance:

0.084 to 0.124 mm (0.0033 to 0.0048 in.)

If the clearance is greater than the standard, replace the cylinder liner and/or piston with a new one.

**17. INSPECT PISTON**

- (a) Using a micrometer, measure the piston diameter at the points in the illustration.

Standard piston diameter:

103.912 to 103.928 mm (4.0910 to 4.0916 in.)

If the piston diameter is less than the minimum, replace the piston with a new one.

18. INSPECT PISTON OIL CLEARANCE

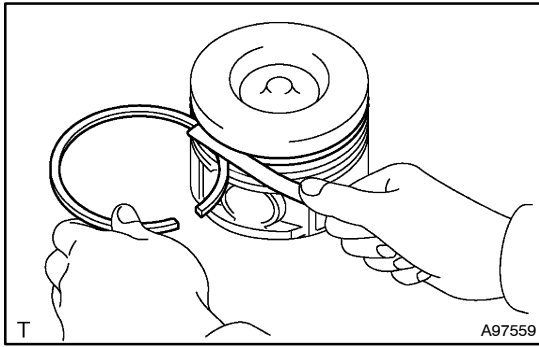
- (a) Subtract the piston diameter measurement from the cylinder liner inside diameter measurement.

Standard oil clearance: 0.084 to 0.124 mm (0.0033 to 0.0048 in.)

If the clearance is greater than the standard, replace the cylinder liner and/or piston with a new one.

HINT:

Apply the value measured at the most worn point to the cylinder liner inside diameter.



19. INSPECT RING GROOVE CLEARANCE

- (a) Insert the piston ring into the piston ring groove.
- (b) Using a feeler gauge, measure the clearance between the piston ring and piston ring groove.

Standard groove clearance:

1st	0.11 to 0.15 mm (0.0043 to 0.0059 in.)
2nd	0.07 to 0.11 mm (0.0028 to 0.0043 in.)
Oil	0.02 to 0.06 mm (0.0008 to 0.0024 in.)

Maximum groove clearance: 0.30 mm (0.0118 in.)

If the clearance is greater than the maximum, measure the width of the piston ring and piston ring groove individually and replace any parts that do not meet the limit with new ones.

- (c) Using a feeler gauge, measure the dimension each groove.

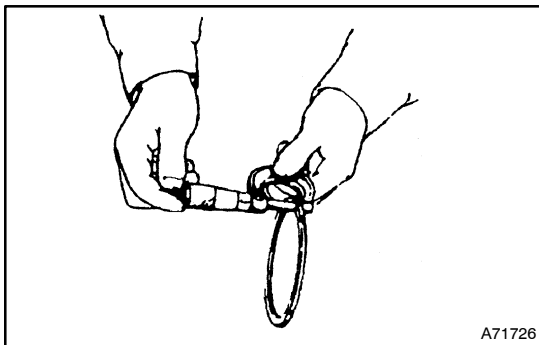
Standard groove width:

1st	2.58 to 2.60 mm (0.1016 to 0.1024 in.)
2nd	2.06 to 2.08 mm (0.0811 to 0.0819 in.)
Oil	4.01 to 4.03 mm (0.1579 to 0.1587 in.)

Maximum groove width:

1st	3.10 mm (0.1220 in.)
2nd	2.20 mm (0.0866 in.)
Oil	4.08 mm (0.1606 in.)

If the dimension is greater than the maximum, replace the piston and piston ring as a set.



- (d) Using a micrometer, measure the piston ring thickness.

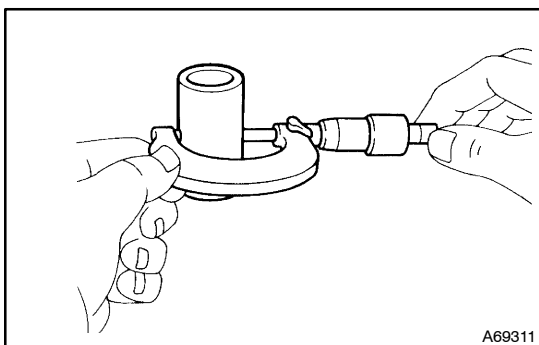
Standard ring thickness:

1st	2.47 to 2.49 mm (0.0972 to 0.0980 in.)
2nd	1.97 to 1.99 mm (0.0776 to 0.0783 in.)
Oil	4.97 to 4.99 mm (0.1957 to 0.1965 in.)

Minimum ring thickness:

1st	2.32 mm (0.0913 in.)
2nd	1.82 mm (0.0717 in.)
Oil	4.95 mm (0.1949 in.)

If the thickness is less than the minimum, replace the piston ring.



20. INSPECT PISTON PIN OIL CLEARANCE

- (a) Using a micrometer, measure the piston pin diameter.

Standard piston pin diameter:

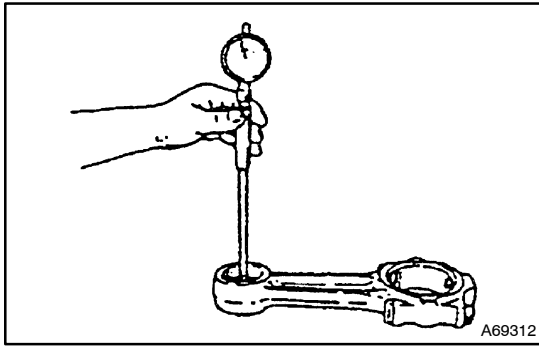
36.989 to 37.000 mm (1.4563 to 1.4567 in.)

Minimum piston pin diameter: 36.96 mm (1.4551 in.)

If the diameter is less than the minimum, replace the piston pin with a new one.

HINT:

Never grind the piston pin, because the surface is coated with a special material.



- (b) Using a cylinder gauge, measure the connecting rod bush inside diameter.

Standard bush inside diameter:

37.035 to 37.045 mm (1.4581 to 1.4585 in.)

Maximum bush inside diameter: 37.10 mm (1.4606 in.)

If the inside diameter is greater than the maximum, replace the connecting rod bush with a new one.

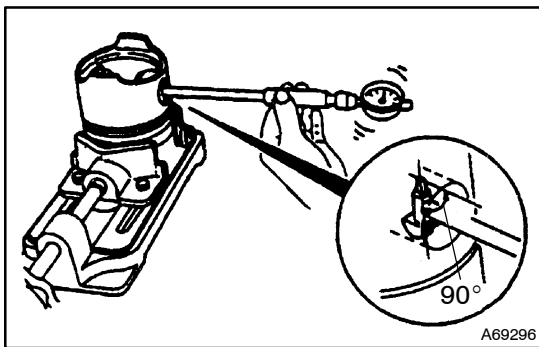
- (c) Subtract the diameter measurement of the piston pin from the inside diameter measurement of the connecting rod bush.

Standard oil clearance:

0.035 to 0.056 mm (0.0014 to 0.0022 in.)

Maximum oil clearance: 0.08 mm (0.0031 in.)

If the oil clearance is greater than the maximum, replace the piston with a new one.



- (d) Using a cylinder gauge, measure the piston pin boss inside diameter while turning the gauge by 90°.

Standard piston pin boss inside diameter:

36.987 to 37.003 mm (1.4562 to 1.4568 in.)

Maximum piston pin boss inside diameter:

37.05 mm (1.4587 in.)

If the piston pin boss inside diameter is greater than the maximum, replace the piston with a new one.

- (e) Subtract the diameter measurement of the piston pin from the inside diameter measurement of the piston pin boss.

Standard oil clearance:

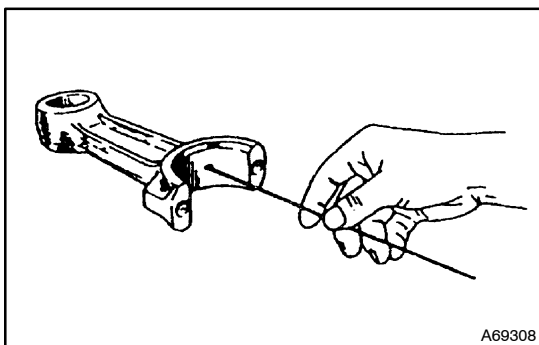
0.013 to 0.014 mm (0.0051 to 0.0055 in.)

Maximum oil clearance: 0.05 mm (0.0020 in.)

HINT:

T = tightening allowance, L = clearance

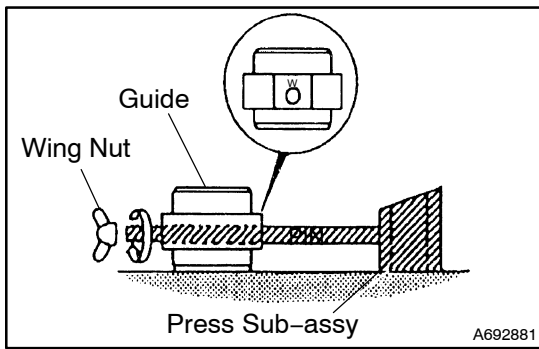
If the clearance is greater than the maximum, replace the piston or piston pin.



21. INSPECT CONNECTING ROD SUB-ASSY

- (a) Check that there is no clogging in the lubrication passage to the connecting rod small end.

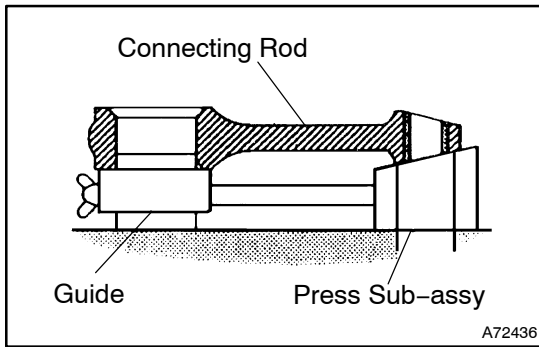
If there is any clogging, blow air through the lubrication passage using an air gun, or clean by inserting a wire.

**22. REMOVE CONNECTING ROD SMALL END BUSH**

(a) Prepare SST.

SST 0940-21450, 0948-11130, 9233-10360

- (1) Assemble the guide and press sub-assy by inserting its pin into the guide, then secure them with the wing nut.

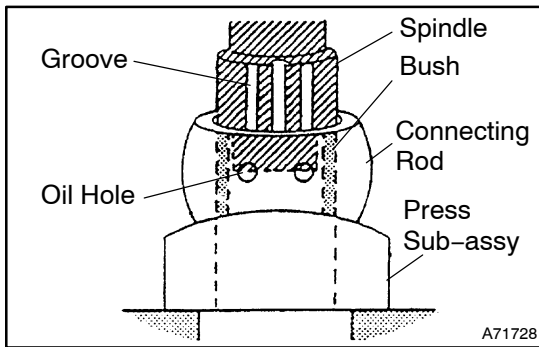


HINT:

- Bring the lever W punched on the guide above the pin.
- Make sure to align both supporting surfaces of the guide and press sub-assy flatly on a plane.

(b) Using the SST, remove the bush.

- (1) Set the connecting rod assembled without crankshaft pin bore bearing on the guide and press sub-assembly.

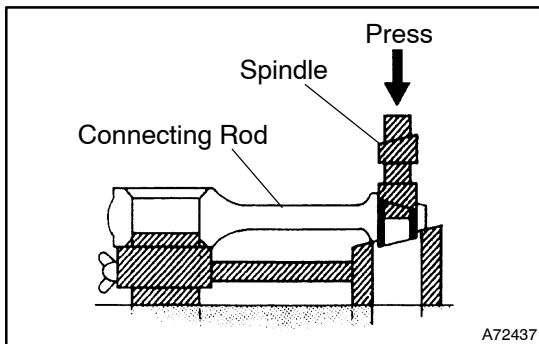


- (2) Using SST, install the spindle into the bush.

SST 0940-21470

HINT:

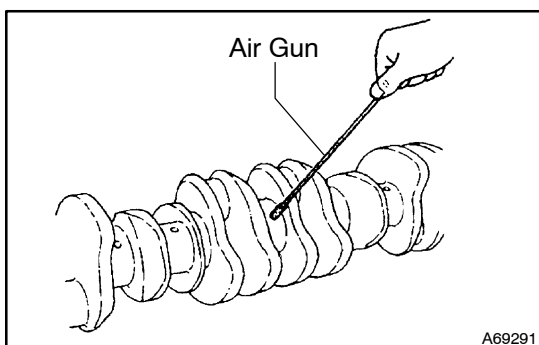
Align the groove of the spindle with the oil hole of the bush.



- (3) Using a press, remove the bush.

HINT:

Always operate the press slowly and smoothly.

**23. INSPECT CRANKSHAFT**

HINT:

Before the inspection, clean the crankshaft with a commercial cleaning agent and clean the lubrication passage using an air gun.

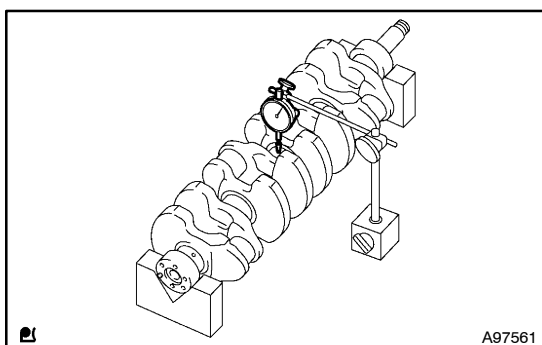
- (a) Performing the dye penetrant test, check the crankshaft for cracks.

HINT:

Pay special attention to the finished R section and oil hole of the crankshaft journal and crankshaft pin.

- (b) Visually check the condition of the crankshaft journal and pin for damage or wear.

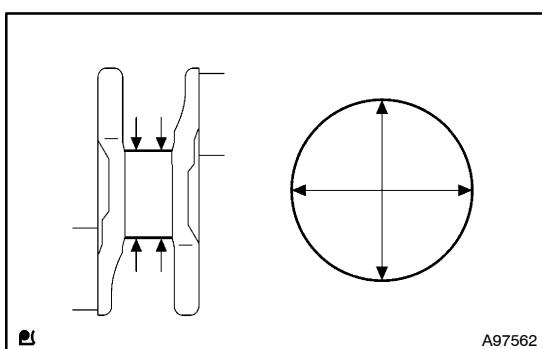
If any damages are found, replace the crankshaft with a new one.



- (c) Inspect for bend.
- (1) Place the crankshaft on V-blocks.
 - (2) Using a dial gauge, measure the bend of the crankshaft at the center journal.

Maximum bend: 0.04 mm (0.0016 in.)

If the bend is greater than the maximum, replace the crankshaft with a new one.



- (d) Using a micrometer, measure the main journal outside diameter.

Standard journal diameter:

72.94 to 72.96 mm (2.8716 to 2.8724 in.)

Minimum journal diameter:

New	72.74 mm (2.8638 in.)
Old	71.76 mm (2.8252 in.)

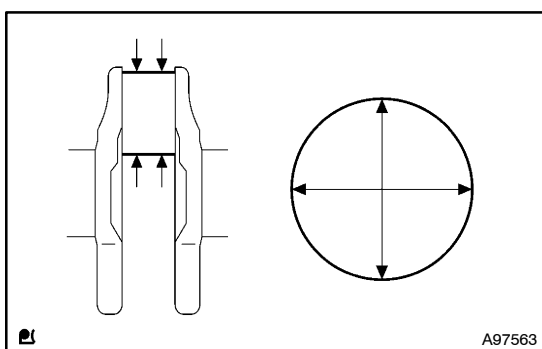
If the diameter is less than the minimum for use, replace the crankshaft with a new one.

- (e) Check each main journal for taper and out-of-round.

Maximum taper and out-of-round:

0.01 mm (0.0003 in.)

If the taper and out-of-round is greater than maximum, replace the crankshaft.



- (f) Using a micrometer, measure the main journal outside diameter.

Standard journal diameter:

61.94 to 61.96 mm (2.4385 to 2.4393 in.)

Minimum journal diameter:

New	61.74 mm (2.4307 in.)
Old	60.76 mm (2.3921 in.)

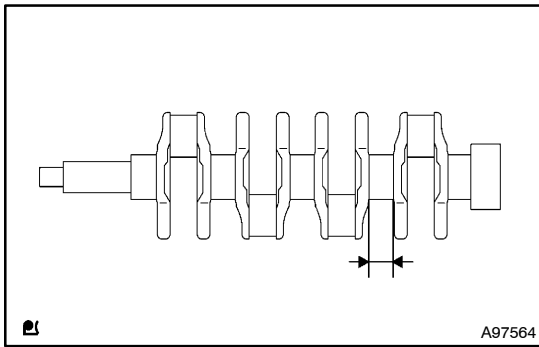
If the diameter is less than the minimum for use, replace the crankshaft with a new one.

- (g) Check each crankshaft pin for taper and out-of-round.

Maximum taper and out-of-round:

0.01 mm (0.0003 in.)

If the taper and out-of-round is greater than maximum, replace the crankshaft.



- (h) Using a vernier caliper, measure the dimension of the crankshaft No. 4 journal.

Standard journal dimension:

34.00 to 34.08 mm (1.3386 to 1.3417 in.)

Maximum journal dimension: 34.48 mm (1.3574 in.)

If the dimension is greater than the maximum, replace the crankshaft.

- (i) Visually check if there are any cracks on the crankshaft.
 (j) Check if the oil hole of the crankshaft is choked.

If any defect is found, replace the crankshaft.

24. INSPECT CRANKSHAFT BEARING CAP BOLT

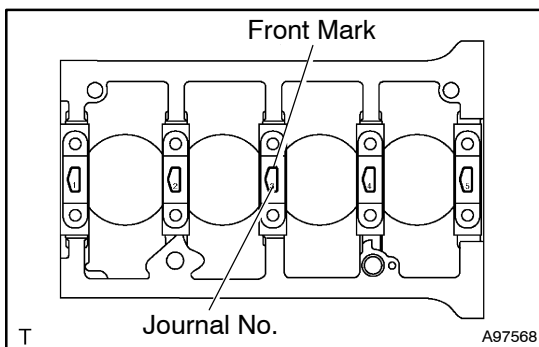
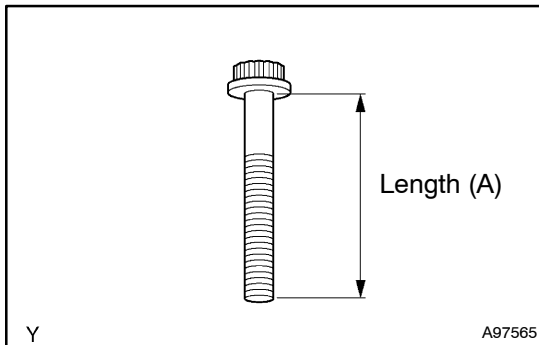
- (a) Using a vernier caliper, measure the bearing cap bolt length (A).

Standard bolt length (A):

92.80 to 93.80 mm (3.6535 to 3.6929 in.)

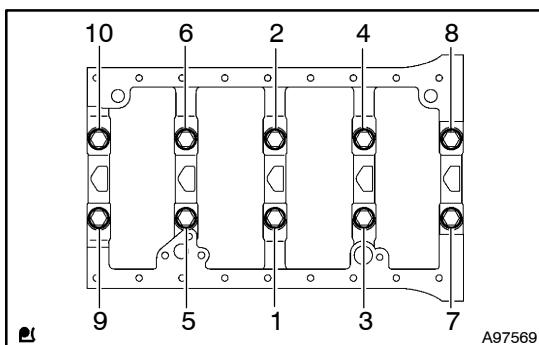
Maximum bolt length (A): 95.00 mm (3.7401 in.)

If the length is longer than the maximum, replace the bolt.



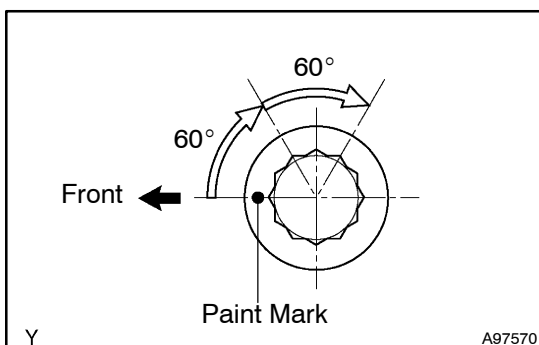
25. INSPECT CRANKSHAFT BEARING CAP

- (a) Install the bearing cap to the cylinder block.
 (b) Apply a light coat of engine oil on the threads of the bearing cap bolt.

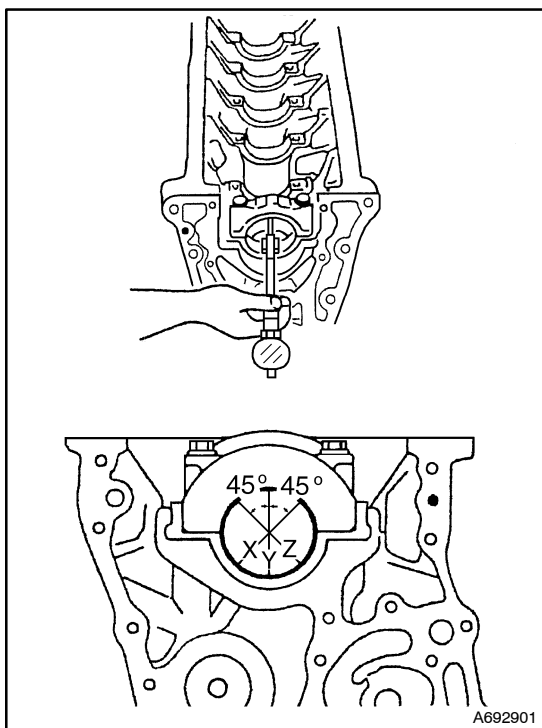


- (c) Uniformly tighten the 10 bolts in the order shown in the illustration.

Torque: 58.8 N·m (600 kgf·cm, 43 ft·lbf)



- (d) Mark the front side of the bolts with paint.
 (e) Retighten the bolts by 60° in the same order as step (c).
 (f) Perform step (e) again.
 (g) Check that each painted mark is now at a 120° angle to the front.

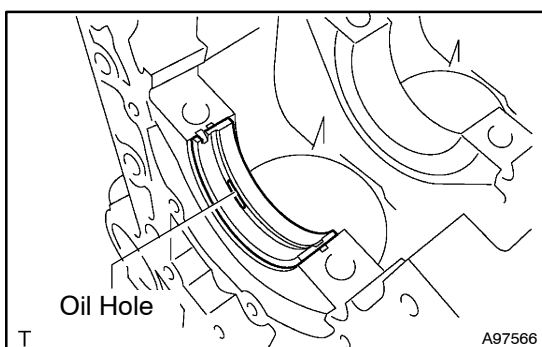


- (h) Using a cylinder gauge, measure the crankshaft bearing cap inside diameter at 3 point (X, Y, Z in the illustration).
Standard crankshaft bearing cap inside diameter:
77.985 to 78.00 mm (3.0703 to 3.0709 in.)
Maximum crankshaft bearing cap inside diameter:
78.20 mm (3.0787 in.)

If the inside diameter is greater than the maximum, carry out boring after overlay welding or replace the cylinder block with a new one.

HINT:

When installing the main bearing caps, make sure to return them to their original locations according to the number stamped on the caps. The main bearing caps together with the cylinder block are round.



26. INSPECT CRANKSHAFT OIL CLEARANCE

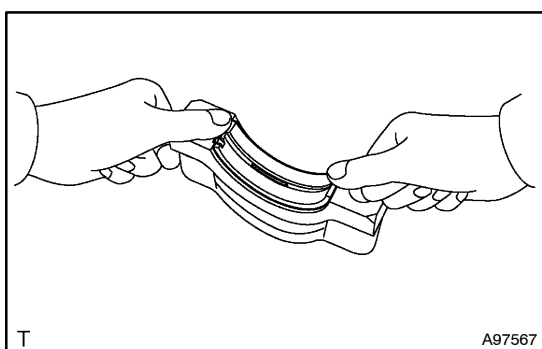
HINT:

The upper bearings have an oil groove and oil hole, however, the lower bearings do not.

- (a) Align the key of the bearing with the keyway of the cylinder block, and push in the upper bearing.

NOTICE:

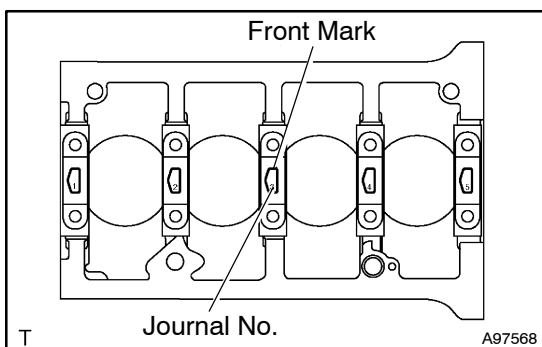
Do not apply engine oil to the bearing and its contact surface.



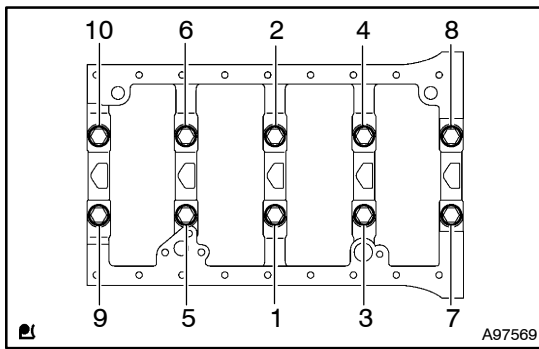
- (b) Align the key of the bearing with the keyway of the main bearing cap, and push in the lower bearing.

NOTICE:

Do not apply engine oil to the bearing and its contact surface.



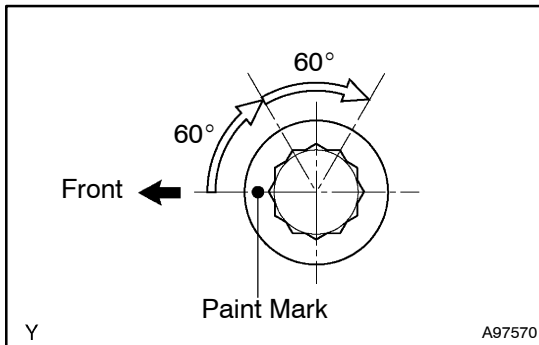
- (c) Install the bearing cap to the cylinder block.
 (d) Apply a light coat of engine oil on the threads of the bearing cap bolt.



- (e) Uniformly tighten the 10 bolts in the order shown in the illustration.

Torque: 58.8 N·m (600 kgf·cm, 43 ft·lbf)

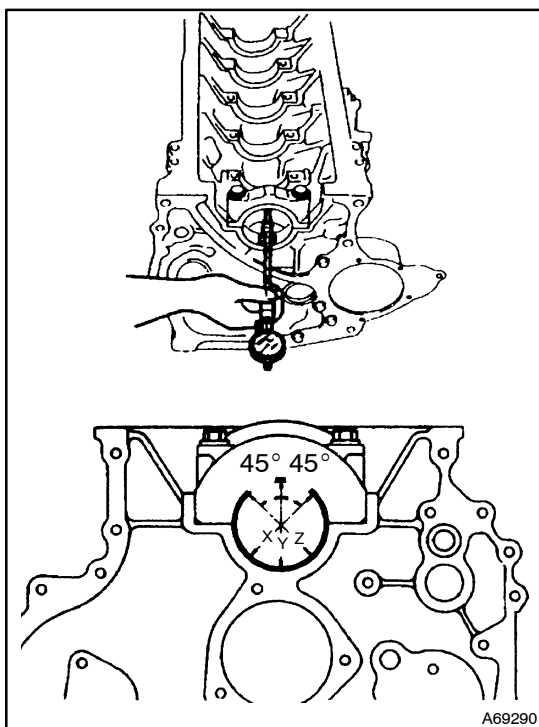
- (f) Mark the front side of the bolts with paint.



- (g) Retighten the bolts by 60° in the same order as step (e).

- (h) Perform step (g) again.

- (i) Check that each painted mark is now at a 120° angle to the front.



- (j) Using a cylinder gauge, measure the crankshaft bearing inside diameter at 3 point (X, Y, Z in the illustration).

Standard crankshaft bearing inside diameter:

73.01 to 73.04 mm (2.8744 to 2.8756 in.)

Maximum crankshaft bearing inside diameter:

73.30 mm (2.8858 in.)

NOTICE:

Do not damage the crankshaft bearing.

If the inside diameter is greater than maximum, replace the bearing with a new one.

HINT:

When installing the bearing caps, make sure to return them to their original locations according to the number stamped on the caps. The bearing caps together with the cylinder block are round.

- (k) Subtract the crankshaft journal diameter measurement from the bearing inside diameter measurement.

Standard oil clearance:

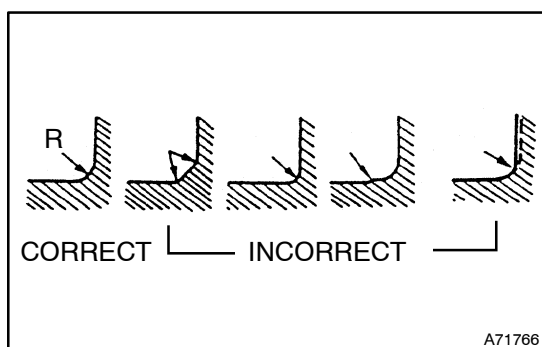
0.051 to 0.102 mm (0.0020 to 0.004 in.)

Maximum oil clearance: 0.20 mm (0.0078 in.)

If the result is greater than the maximum, use an undersize bearing and correct or grind crankshaft so that the oil clearance becomes 0.20 mm (0.0078 in.) or less.

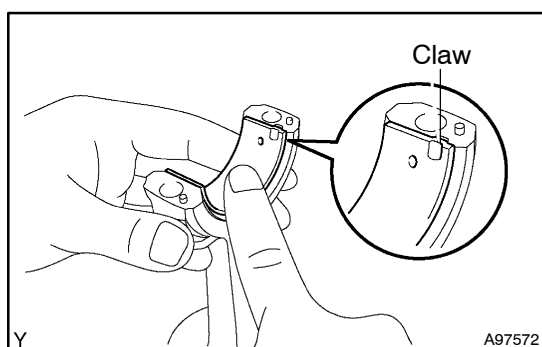
Under size bearing diameter:

STD	72.94 to 72.96 mm (2.8716 to 2.8724 in.)
U/S 0.25	72.69 to 72.71 mm (2.8618 to 2.8625 in.)
U/S 0.50	72.44 to 72.46 mm (2.8519 to 2.8527 in.)
U/S 0.75	72.19 to 72.21 mm (2.8421 to 2.8429 in.)
U/S 1.00	71.94 to 71.96 mm (2.8322 to 2.8330 in.)



HINT:

- Make sure to replace the upper and lower main bearings as one set. The upper and lower main bearings must be round.
- Machined dimension of file R
Main crankshaft journal:
3.00 to 3.50 mm (0.1181 to 0.1378 in.)



27. INSPECT CONNECTING ROD BEARING OIL CLEARANCE

- (a) Align the claw of the bearing with the claw grooves of the connecting rod and connecting cap.

NOTICE:

Clean the backside of the bearing and the bearing surface of the connecting rod. The surface should be free of dust and oils.

- (b) Tighten the connecting rod bolts.
 (1) Install the bearing cap.

NOTICE:

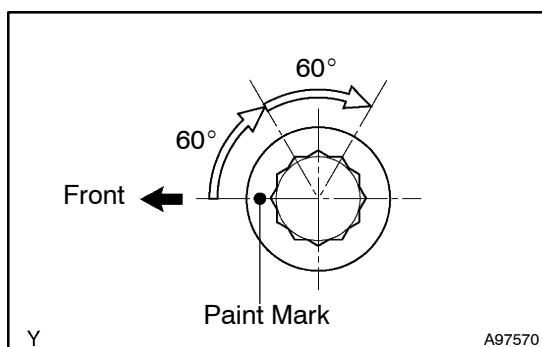
Be careful of the installation direction of the bearing cap.

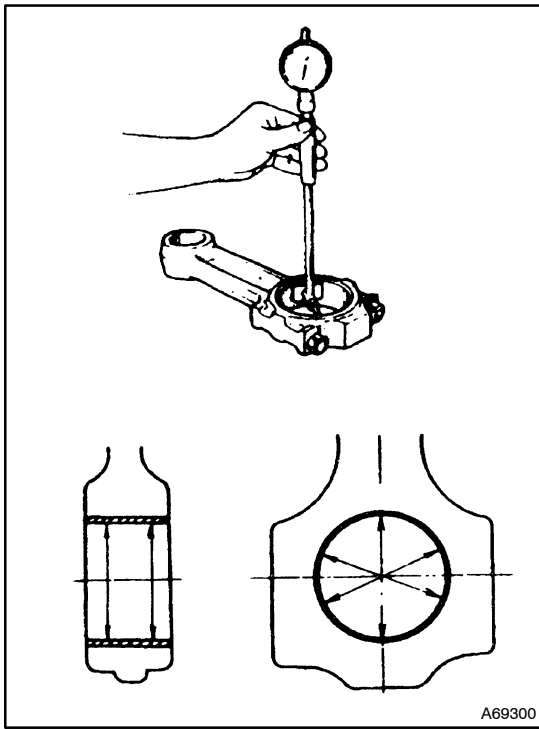
- (2) Uniformly tighten the bolts several time.
 (3) Retighten the connecting rod bolts.

Torque: 29.5 N·m (301 kgf·cm, 22 ft·lbf)

- (4) Mark the front side of the bolts with paint.

- (c) Retighten the bolts by 60° in the same order as step (b-2).
 (d) Perform step (c) again.





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(e) Using a cylinder gauge, measure the connecting rod big end inside diameter.

Standard big end inside diameter (w/ bearing):

61.991 to 62.022 mm (2.446 to 2.4418 in.)

Maximum big end inside diameter (w/ bearing):

62.06 mm (2.4433 in.)

If the result is greater than the maximum, replace the connecting rod bearing.

(f) Subtract the inside diameter measurement of the connecting rod from the diameter measurement of the crankshaft pin.

Standard clearance:

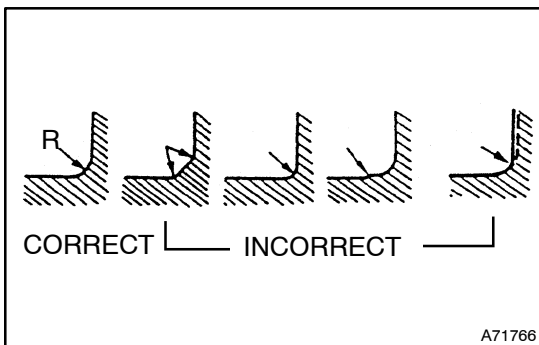
0.031 to 0.082 mm (0.0012 to 0.0032 in.)

Maximum oil clearance: 0.20 mm (0.0078 in.)

If the result is greater than the maximum, use an undersize bearing and correct or regrind crankshaft so that the oil clearance becomes 0.2 mm (0.0078 in.) or less.

Under size bearing diameter:

STD	61.94 to 61.96 mm (2.4385 to 2.4393 in.)
U/S 0.25	61.69 to 61.71 mm (2.4287 to 2.4295 in.)
U/S 0.50	61.44 to 61.46 mm (2.4188 to 2.4196 in.)
U/S 0.75	61.19 to 61.21 mm (2.4090 to 2.4098 in.)
U/S 1.00	60.94 to 60.96 mm (2.3992 to 2.3999 in.)

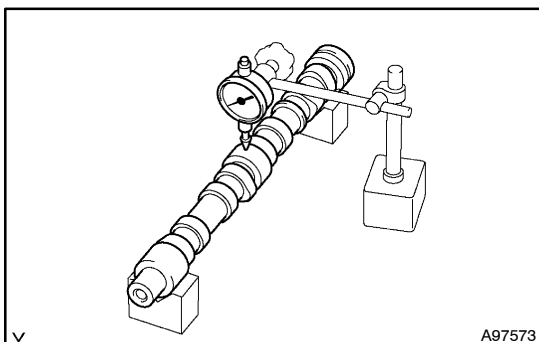


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HINT:

Machined dimension of file R

Crankshaft pin: 3.50 to 4.00 mm (0.1378 to 0.1575 in.)



Y

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28. INSPECT CAMSHAFT

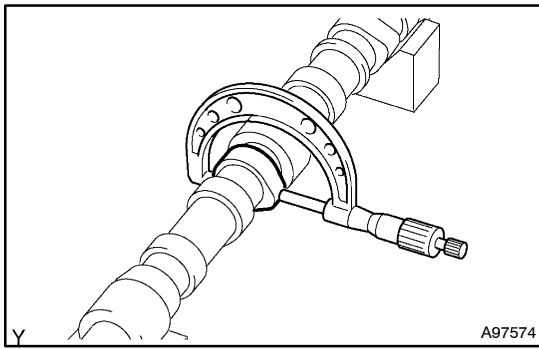
(a) Inspect the camshaft for circle runout.

(1) Place the camshaft on V-blocks.

(2) Using a dial gauge, measure the circle runout at the center journal.

Maximum circle runout: 0.06 mm (0.0023 in.)

If the circle runout is greater than the maximum, replace the camshaft.



(b) Using a micrometer, measure the cam lobe height.

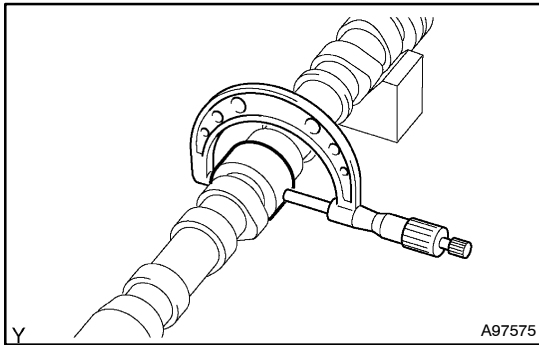
Standard cam lobe height:

Intake	50.6576 to 50.8596 mm (1.9943 to 2.0023 in.)
Exhaust	49.3561 to 49.5581 mm (1.9431 to 1.9511 in.)

Minimum cam lobe height:

Intake	50.20 mm (1.9763 in.)
Exhaust	48.95 mm (1.9271 in.)

If the lobe height is less than the minimum, replace the camshaft.



29. INSPECT CAMSHAFT OIL CLEARANCE

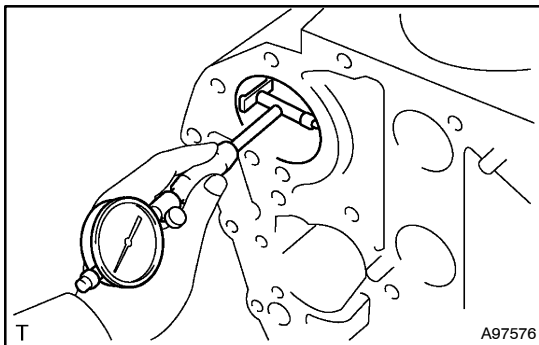
(a) Measure the oil clearance of the camshaft journal.

(1) Using a micrometer, measure the camshaft journal outside diameter.

Journal outside diameter:

No. 1	56.95 to 56.97 mm (2.2421 to 2.2429 in.)
No. 2	56.75 to 56.77 mm (2.2342 to 2.2350 in.)
No. 3	56.55 to 56.57 mm (2.2263 to 2.2271 in.)

If the outside diameter is greater than the maximum, replace the camshaft.



(2) Using a cylinder gauge, measure the camshaft bearing inside diameter.

Inside diameter:

No. 1	57.035 to 57.135 mm (2.2454 to 2.2494 in.)
No. 2	56.835 to 56.935 mm (2.2375 to 2.2415 in.)
No. 3	56.635 to 56.735 mm (2.2297 to 2.2336 in.)

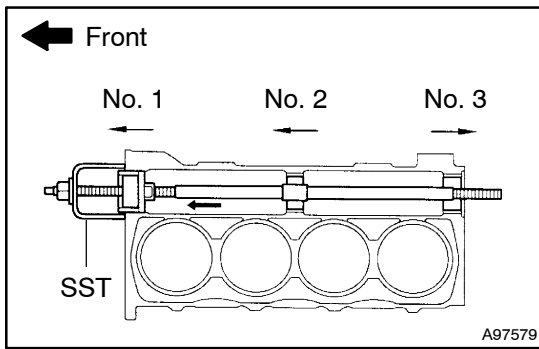
If the inside diameter is greater than the maximum, replace the camshaft.

(3) Subtract the outside diameter measurement of the camshaft journal from the inside diameter measurement of the camshaft bearing.

Oil clearance:

Standard	0.030 to 0.120 mm (0.0011 to 0.0047 in.)
Maximum	0.15 mm (0.0059 in.)

If the oil clearance is greater than the maximum, replace the camshaft or camshaft bearing.

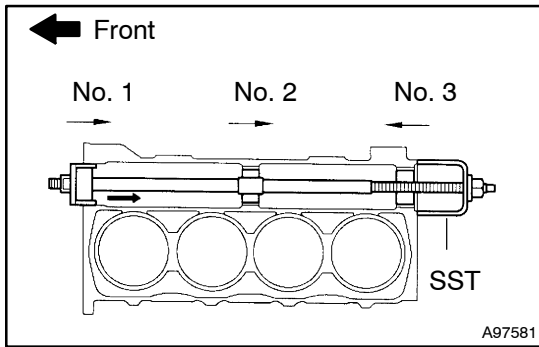
**30. REMOVE CAMSHAFT BEARING SET**

- (a) Using SST, remove the camshaft bearings in the directions indicated by the arrow marks in the illustration.

SST 09215-00101 (09215-00130, 09215-00141, 09215-00150, 09215-00161), 09215-00013 (09215-00021, 09215-00461)

NOTICE:

Remove the bearings No. 1, No. 2 and No. 3 in order.

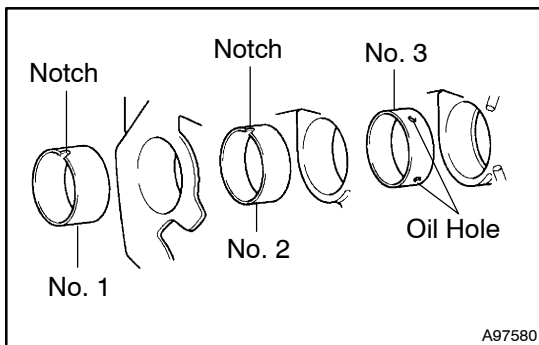
**31. INSTALL CAMSHAFT BEARING SET**

- (a) Using SST, install new camshaft bearings in the direction indicated by the arrow marks in the illustration.

SST 09215-00101 (09215-00130, 09215-00141, 09215-00150, 09215-00161), 09215-00013 (09215-00021, 09215-00461)

Journal bearing diameter:

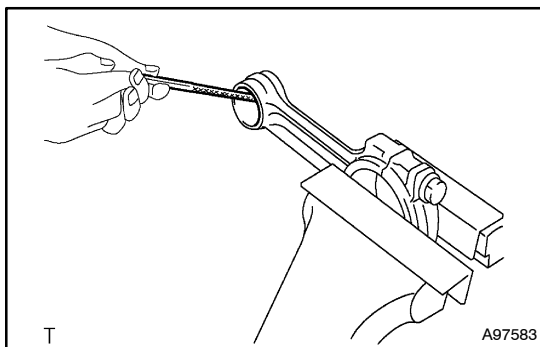
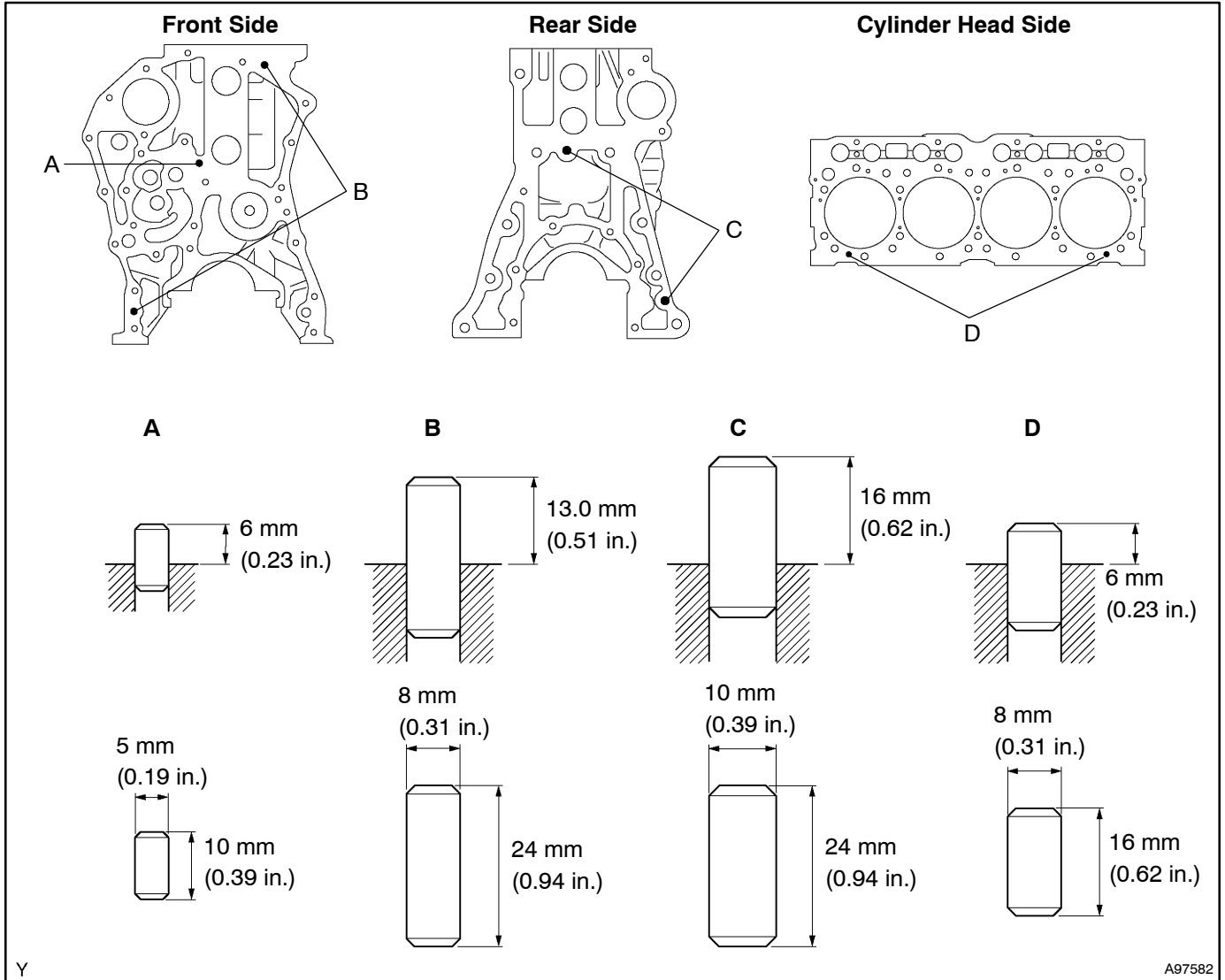
Journal No.	Inside diameter	Outside diameter
No. 1	57.0 mm (2.2440 in.)	60.0 mm (2.3622 in.)
No. 2	56.8 mm (2.2362 in.)	59.8 mm (2.3543 in.)
No. 3	56.6 mm (2.2283 in.)	59.6 mm (2.3464 in.)

**NOTICE:**

- **Be sure to face the notches of the bearing No. 1 and No. 2 and oil holes of the No. 3 to the correct direction.**
- **Install the bearings No. 2, No. 1 and No. 3 in order.**

32. INSTALL STRAIGHT PIN

(a) Using a plastic hammer, tap in the straight pin.

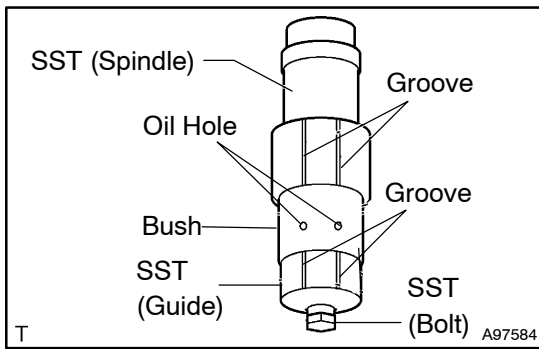


33. INSTALL CONNECTING ROD SMALL END BUSH

(a) Uniformly chamfer one edge of the bush hole at the small end of the connecting rod.

HINT:

- Irregular chamfering can cause out-of-roundness of the pressed bush, which may result in jamming during the insertion.
- Remove dust from the inner surface of the smaller hole.



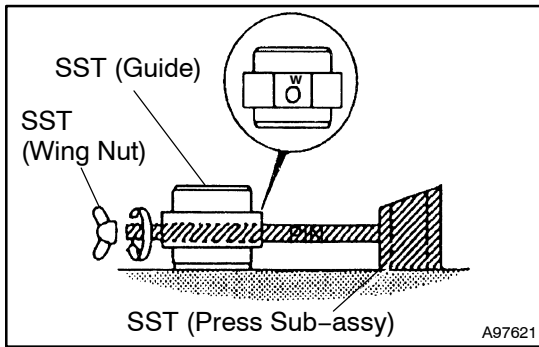
- (b) Mount the bush on the spindle.
SST 0940-21470, 0948-11140, 9191-08252,
0940-21450, 0948-11130, 9233-10360

Torque: 6.0 N·m (61 kgf·cm, 53 in.·lbf)

HINT:

Align oil hole in the bush with both groove or the spindle and guide, and make sure that oil hole will meet with oil path in the connecting rod led from the big end bore in the rod.

- (1) Apply fresh engine oil around the bush and guide.



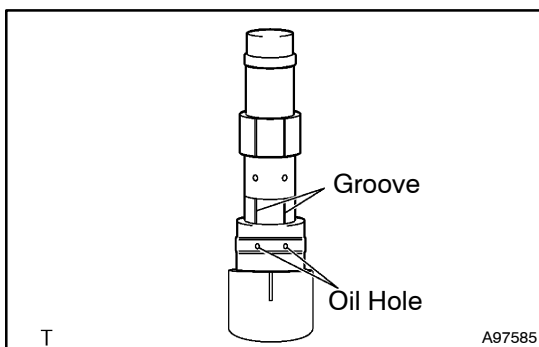
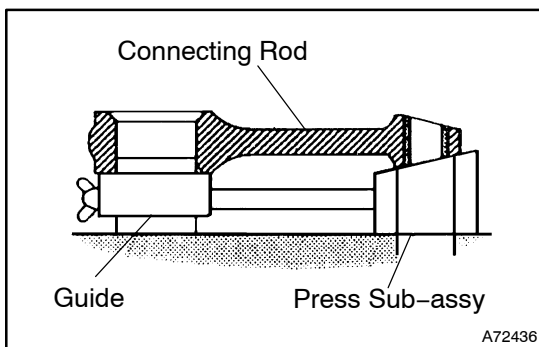
- (c) Prepare SST.

SST 0940-21470, 0948-11140, 9191-08252,
0940-21450, 0948-11130, 9233-10360

- (1) Assemble the guide and press sub-assy by inserting its pin into the guide, then secure them with the wing nut.

HINT:

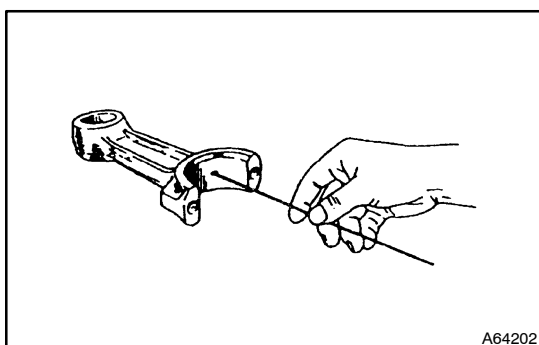
- Bring the lever W punched on the guide above the pin.
- Make sure to align both supporting surfaces of the guide and press sub-assy flatly on a plane.



- (d) Install the bush in the connecting rod. Position the bush tool assembly so that the oil hole aligns with the oil path through the connecting rod.

HINT:

Before installing, fully coat the bore in the connecting rod with fresh engine oil.



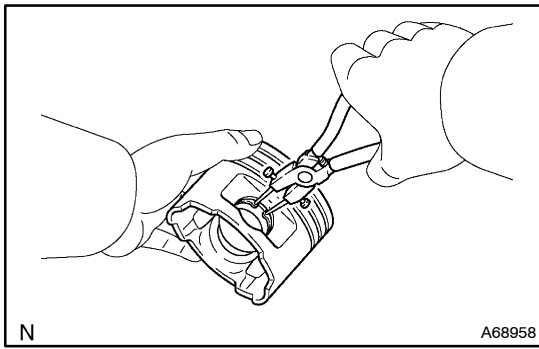
- (e) Inspect the bush position after the installation.

- (1) Make sure that the oil hole of the bush and the oil path of the connecting rod are suitably aligned allowing a 6 mm (0.23 in.) diameter rod to penetrate.

HINT:

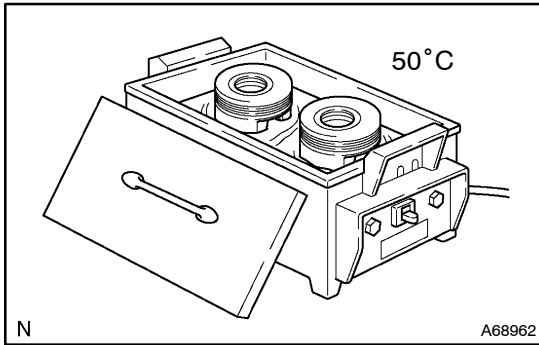
Misalignment can lead to insufficient lubrication, which may result in seizure.

- (2) With a new piston pin inserted in the piston, make sure that the bush can be rotated by hand without rattling.

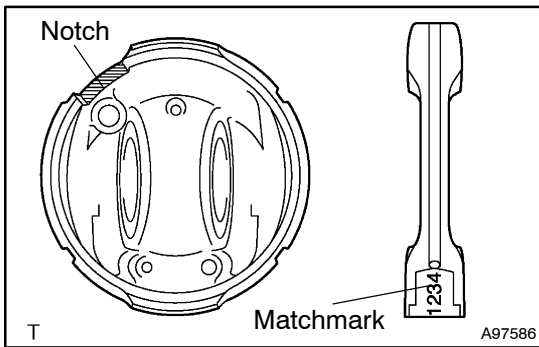
**34. INSTALL PISTON PIN**

(a) Assemble the piston and connecting rod.

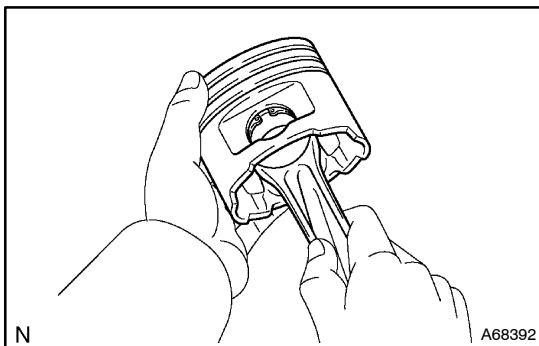
- (1) Using snap ring pliers, install a new snap ring on one side of the piston hole.



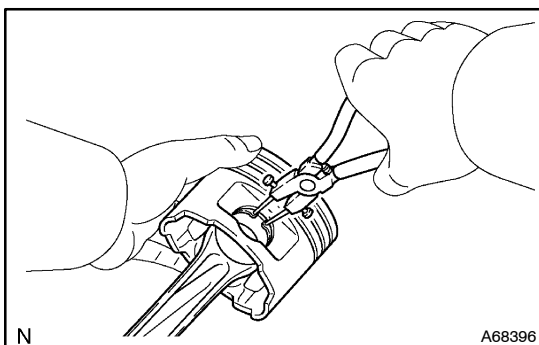
- (2) Gradually heat the piston to approximately 50°C (122°F).



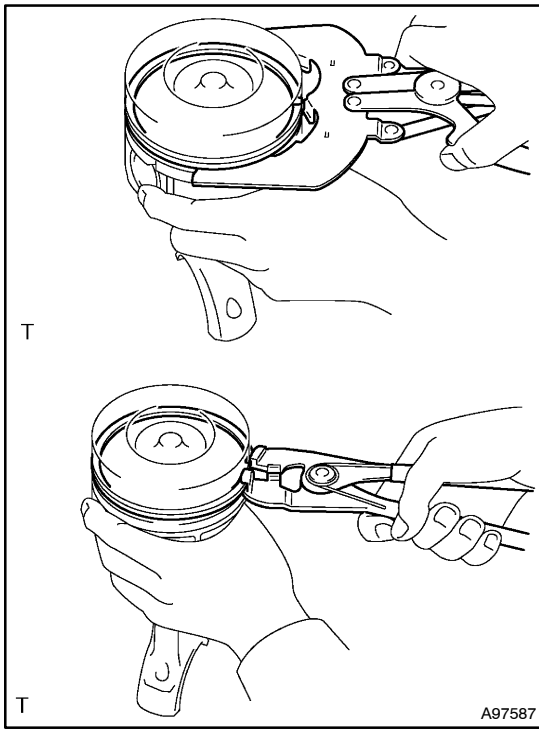
- (3) Coat the piston pin with engine oil.
 (4) Install the piston to the connecting rod with the notch of the piston faced in the opposite direction to the matchmark of the rod. Then, secure them with the piston pin.



- (5) Check that the piston and piston pin fit.
 • Try to move the piston back and forth.



- (6) Using snap ring pliers, install a new snap ring on the other side of the piston pin hole.

**35. INSTALL PISTON RING SET**

- (a) Facing the identification marks on the piston ring upper surface, using a piston ring expander, install them in the order of the oil ring, 2nd ring and 1st ring.

HINT:

- Never change the combination of the coil and oil ring.
- Connect the joint of the coil expander for the oil ring and install it inside the piston ring. Assemble the ring with the joint 180° opposite to the matching point of the ring.

CAUTION:

Never touch the piston with your bare hands while it is hot.

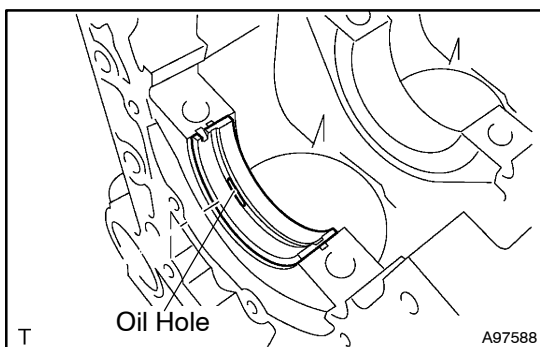
36. INSTALL SUB-ASSY OIL NOZZLE NO.1

- (a) Install the nozzle with the bolt.

Torque: 28.5 N·m (291 kgf·cm, 21 ft·lbf)

NOTICE:

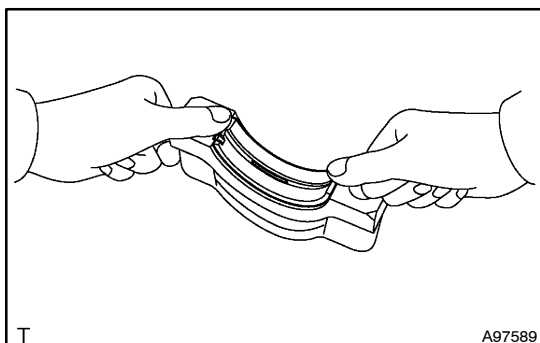
- If the oil nozzle has been dropped or impact is applied to a nozzle, replace the nozzle with a new one.
- Replace the deformed nozzle with a new one.

**37. INSTALL CRANKSHAFT BEARING SET**

- (a) Align the oil groove of the bearing with the oil hole of the cylinder block, and push in the 5 upper bearings.

NOTICE:

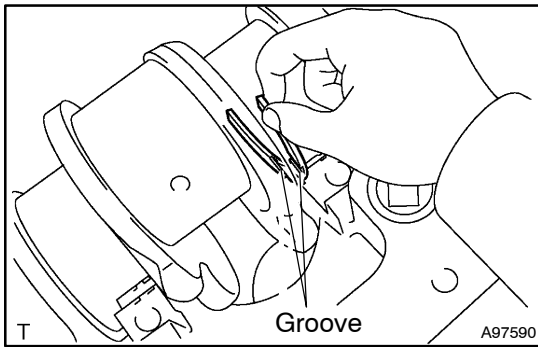
Clean the backside of the bearing and the bearing surface of the bearing cap and do not let the oil and fats stick.



- (b) Align the bearing with the crankshaft bearing cap, and push in the 5 lower bearings.

NOTICE:

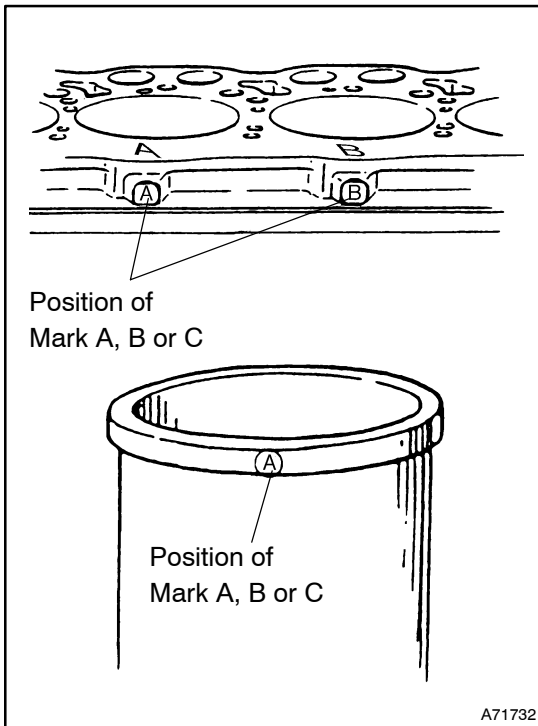
Clean the backside of the bearing and the bearing surface of the bearing cap and do not let the oil and fats stick.



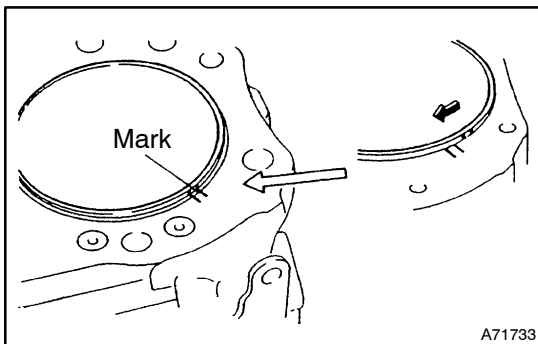
- (c) Insert the thrust washer into the clearance between the cylinder block and crankshaft with the oil groove facing outward.
- (d) Install the main bearing cap to the cylinder block.
- (e) Apply a light coat of engine oil to the threads and under the cap bolt.

NOTICE:

Be sure to install the thrust washer to its original position.

**38. INSTALL CYLINDER LINER****HINT:**

- When assembling the cylinder liner with the cylinder block, clearance can be set to 3 levels.
- The upper surface and side surface of the cylinder block are stamped A, B or C. When using a new cylinder liner, insert a matching cylinder liner having the same symbol.

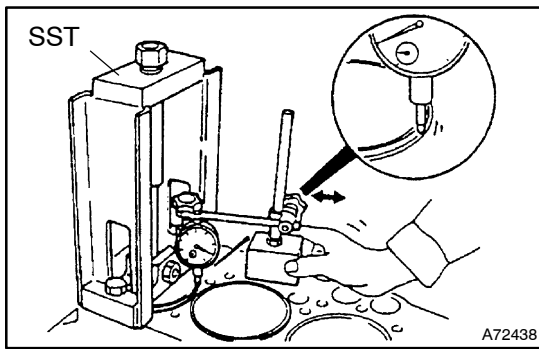


- When reusing a cylinder liner, install it according to the marks made during the removal. When reusing the cylinder liner, misalignment with the cylinder block may concentrate stress on the thin part of the cylinder liner and it may be broken.

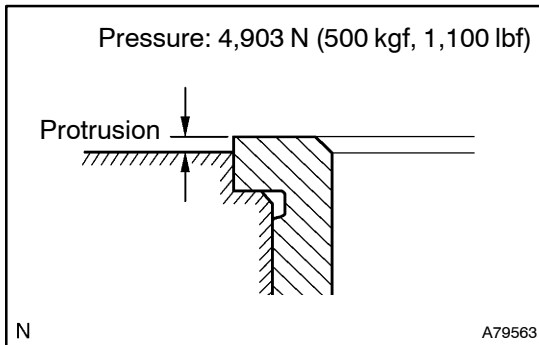
- (a) Apply engine oil to the cylinder block inside bore.
- (b) Align the marks of the cylinder liner and cylinder block.
- (c) Install the cylinder liner.

NOTICE:

Make sure to install the cylinder liner to its original location as the reused liner is bent by "run-in"

**39. INSPECT PROTRUSION OF CYLINDER LINER**

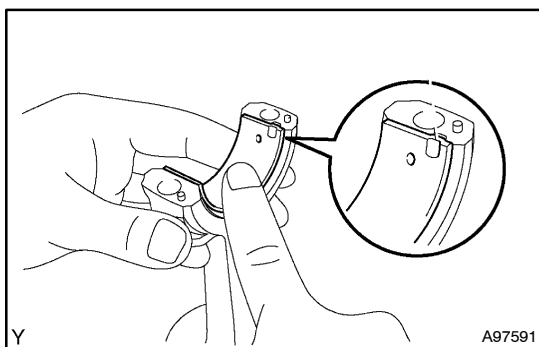
- (a) Install SST onto the cylinder block.
SST 0942-01460
- (b) Tighten the center bolt to the specified torque below to set the cylinder liner in the normal installation condition.
Torque: 9.8 N·m (100 kgf·cm, 87 in·lbf)



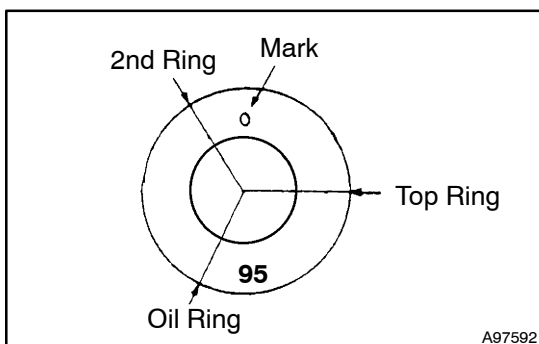
- (c) Using a dial gauge, measure the protrusion of the cylinder liner.

Standard protrusion:**0.01 to 0.08 mm (0.0004 to 0.0031 in.)****Maximum protrusion: 0.08 mm (0.0031 in.)**

If the protrusion is greater than the maximum, replace the cylinder liner.

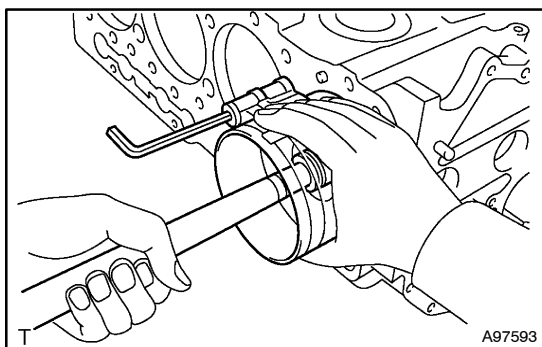
**40. INSTALL CONNECTING ROD BEARING****NOTICE:**

- When reusing the bearing, make sure to reassemble the removed bearing as it was originally installed.
- Install the bearing with the oil hole on the connecting rod side and install the bearing without the oil hole on the cap side.
- Match the bearing protrusion with the notch of the connecting rod or cap.
- Clean the backside of the bearing and the bearing surface of the bearing cap and do not let the oil and fats stick.

**41. INSTALL PISTON W/CONNECTING ROD****HINT:**

- Position the matching points of the piston ring at an even distance. Be careful not to position at the piston boss.
- Before assembling the piston with the connecting rod, check whether the piston is specified for this engine. Check should be performed using the engine compatible identification code on the top of the piston.

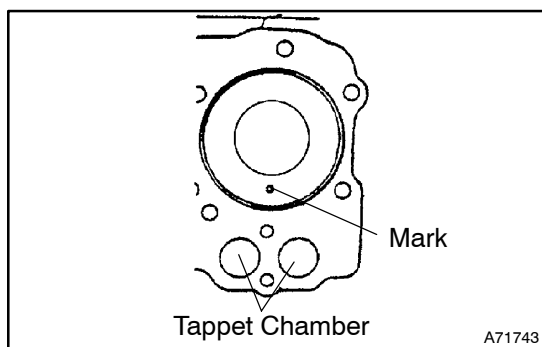
Engine compatible identification: 95



- (a) Using a piston ring compressor and a hammer handle, insert the piston through the connecting rod assembly into the cylinder block.

HINT:

- Before the installation, apply engine oil to the piston pin, piston ring, cylinder liner and connecting rod bearing.
- Recheck the matching point of each piston ring.

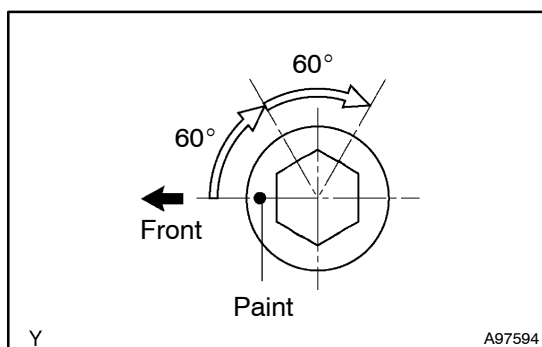


- Make sure that the mark on the piston is at the tappet chamber side.
- Do not damage the inside of the liner.

- (b) Install the bearing cap to the connecting rod with the front mark facing to the correct direction.

- (c) Uniformly install and tighten the bolts several times. Then, retighten the bolts.

Torque: 29.5 N·m (301 kgf·cm, 22 ft·lbf)



- (d) Mark the front side of the bolt head with paint as shown in the illustration.

- (e) Retighten the bolts by 60° in the same order as step (c).

- (f) Perform step (e) again.

- (g) Check that each painted mark is now at a 120° angle to the front.

COOLING

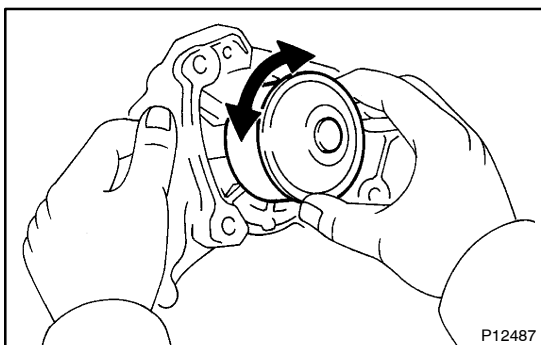
WATER PUMP ASSY (N04C-TF)	16-1
INSPECTION	16-1
THERMOSTAT (N04C-TF)	16-2
INSPECTION	16-2



WATER PUMP ASSY (N04C-TF)

INSPECTION

160WU-01



1. INSPECT WATER PUMP ASSY

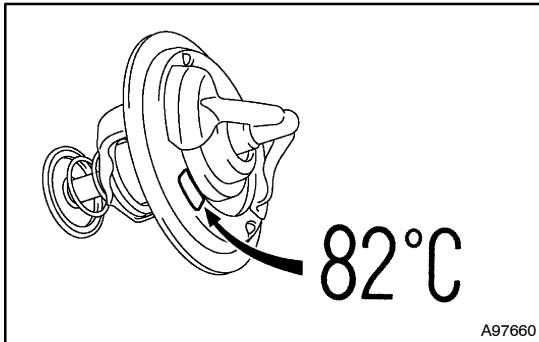
- (a) Visually check the drain hole for coolant leakage.
- (b) Turn the pulley, and check that the water pump bearing moves smoothly and noiselessly.

If the bearing moves roughly or noisily, replace the water pump.

THERMOSTAT (N04C-TF)

INSPECTION

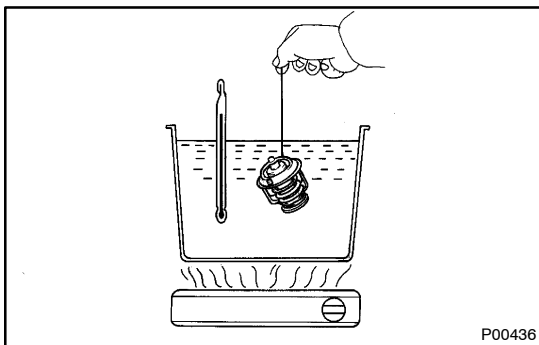
160VV-01



1. INSPECT THERMOSTAT

HINT:

The thermostat is stamped with the valve opening temperature.



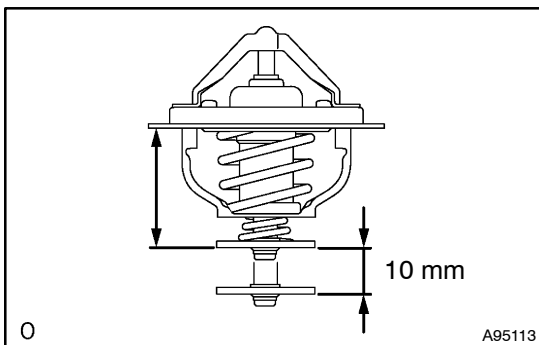
(a) Immerse the thermostat in water and gradually heat the water.

(b) Measure the valve opening temperature.

Valve opening temperature:

80 to 84°C (176 to 183°F)

If the valve opening temperature is not as specified, replace the thermostat.



(c) Measure the valve lift.

Valve lift: 10 mm (0.394 in.) or more at 95°C (203°F)

If the valve lift is not as specified, replace the thermostat.

(d) Check that the valve is fully closed when the thermostat is at low temperatures (below 40°C (104°F)).

If not closed, replace the thermostat.

LUBRICATION

OIL PUMP ASSY (N04C-TF)	17-1
OVERHAUL	17-1
OIL COOLER ASSY (N04C-TF)	17-4
OVERHAUL	17-4

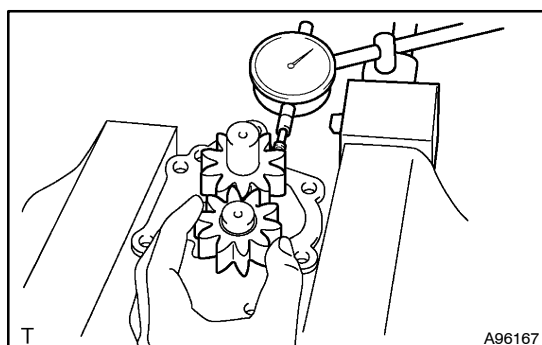
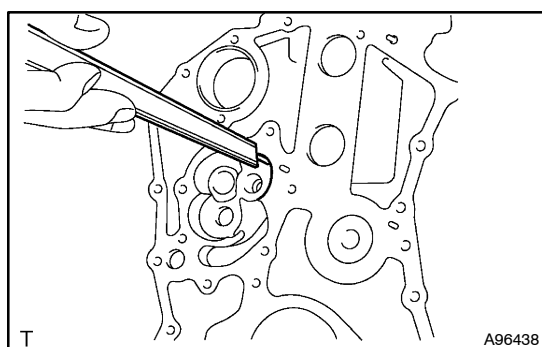
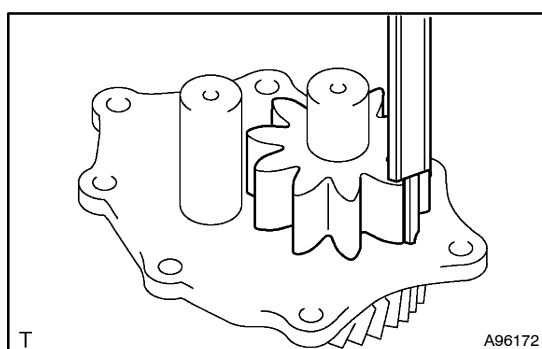
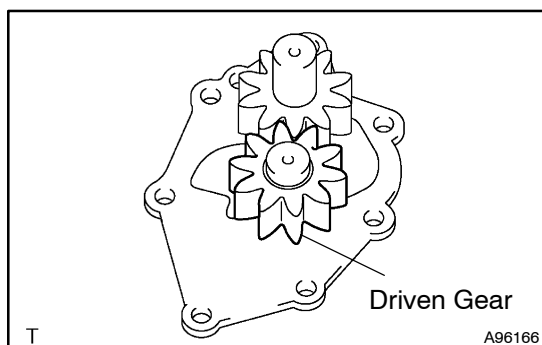


OIL PUMP ASSY (N04C-TF)

OVERHAUL

170L7-01

1. REMOVE OIL PUMP ASSY



2. REMOVE OIL PUMP DRIVEN GEAR

- (a) Remove the driven gear from the oil pump.

NOTICE:

Since the driven gear is a press-fit type, it cannot be disassembled.

3. INSPECT OIL PUMP ASSY

- (a) Visually check each part of the oil pump for damage or wear.

If damage or wear is excessive, replace the oil pump assy with a new one.

- (b) Inspect the clearance between the driven gear and cylinder block.

- (1) Using a vernier caliper, measure the length of the driven gear.

Standard:

27.02 to 27.04 mm (1.0638 to 1.0645 in.)

- (2) Using a vernier caliper, measure the depth of the cylinder block.

Standard:

27.03 to 27.07 mm (1.0642 to 1.0657 in.)

- (3) Add the measurement of the cylinder block to the thickness of the gasket. From this total, subtract the measurement of the driven gear.

Standard:

0.05 to 0.13 mm (0.0019 to 0.0051 in.)

Maximum: 0.17 mm (0.0066 in.)

If the clearance is greater than the maximum, replace the oil pump assy or cylinder block.

- (c) Inspect the backlash between the drive gear and driven gear.

- (1) Using a vise, fix the oil pump.

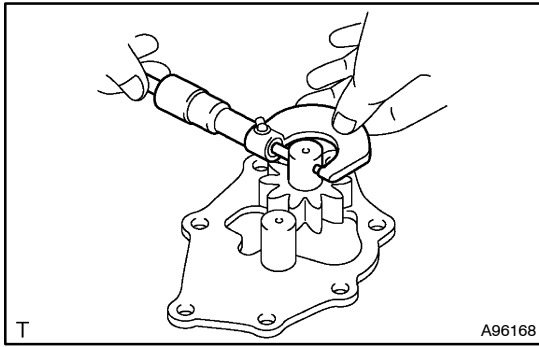
- (2) Using a dial gauge, measure the backlash between the drive gear and driven gear.

Standard backlash:

0.091 to 0.217 mm (0.0036 to 0.0085 in.)

Maximum backlash: 0.25 mm (0.0098 in.)

If the backlash is greater than the maximum, replace the oil pump assy with a new one.



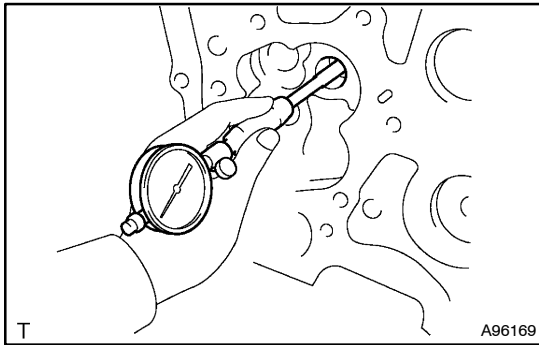
- (d) Inspect the clearance between the drive gear shaft and drive gear bush.

(1) Using a micrometer, measure the diameter of the drive gear shaft.

Standard shaft diameter:

18.088 to 18.106 mm (0.7121 to 0.7128 in.)

Minimum shaft diameter: 18.062 mm (0.7111 in.)



(2) Using a dial gauge, measure the inside diameter of the drive gear bush.

Standard bush inside diameter:

18.146 to 18.173 mm (0.7144 to 0.7155 in.)

Maximum bush inside diameter: 18.20 mm (0.7165 in.)

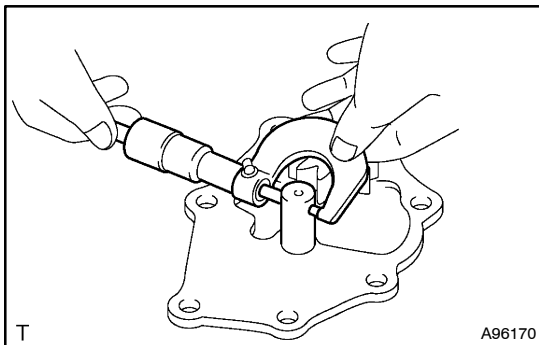
(3) Subtract the diameter measurement of the drive gear shaft from the inside diameter measurement of the drive gear bush.

Standard clearance:

0.040 to 0.085 mm (0.0016 to 0.0033 in.)

Maximum clearance: 0.10 mm (0.0039 in.)

If the clearance is greater than the maximum, replace the oil pump assy or drive gear bush.



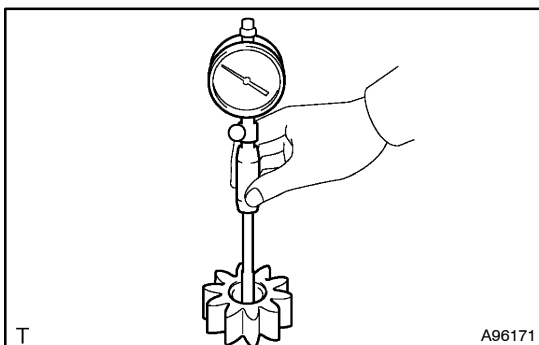
- (e) Inspect the clearance between the driven gear shaft and driven gear bush.

(1) Using a micrometer, measure the diameter of the driven gear shaft.

Standard shaft diameter:

17.979 to 17.997 mm (0.7078 to 0.7085 in.)

Minimum shaft diameter: 17.97 mm (0.7075 in.)



(2) Using a dial gauge, measure the inside diameter of the driven gear bush.

Standard bush inside diameter:

18.037 to 18.054 mm (0.7101 to 0.7108 in.)

Maximum bush inside diameter: 18.07 mm (0.7114 in.)

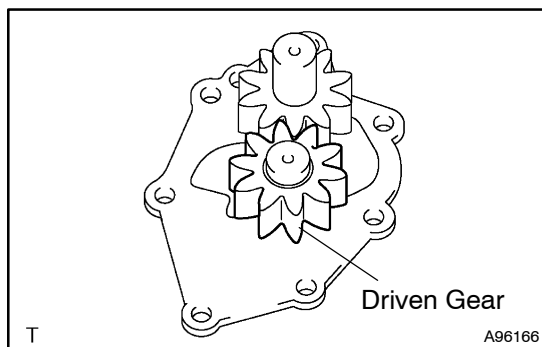
(3) Subtract the diameter measurement of the driven gear shaft from the inside diameter measurement of the driven gear bush.

Standard clearance:

0.040 to 0.075 mm (0.0016 to 0.0030 in.)

Maximum clearance: 0.10 mm (0.0039 in.)

If the clearance is greater than the maximum, replace the driven gear or oil pump assy.



- 4. INSTALL OIL PUMP DRIVEN GEAR**
(a) Install the driven gear to the oil pump.

5. INSTALL OIL PUMP ASSY

OIL COOLER ASSY (N04C-TF)

OVERHAUL

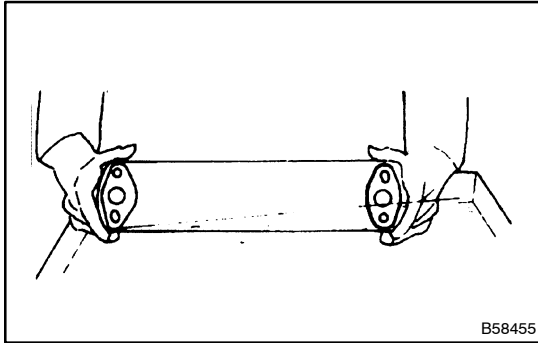
170LB-01

1. INSPECT OIL COOLER ASSY

NOTICE:

Before the inspection, please refer to the following items.

- Be sure to clean the oil cooler element and oil passage using a commercial cleaning agent.
- Clean the metal parts using treated oil.



- (a) Carry out a pneumatic test for the oil cooler element.

Test pressure: 196 kPa (2.0 kgf/cm², 28.4 psi)

Test time: 1 min.

If defective, replace the oil cooler element with a new one.

- (b) Visually check each part for damage or wear.

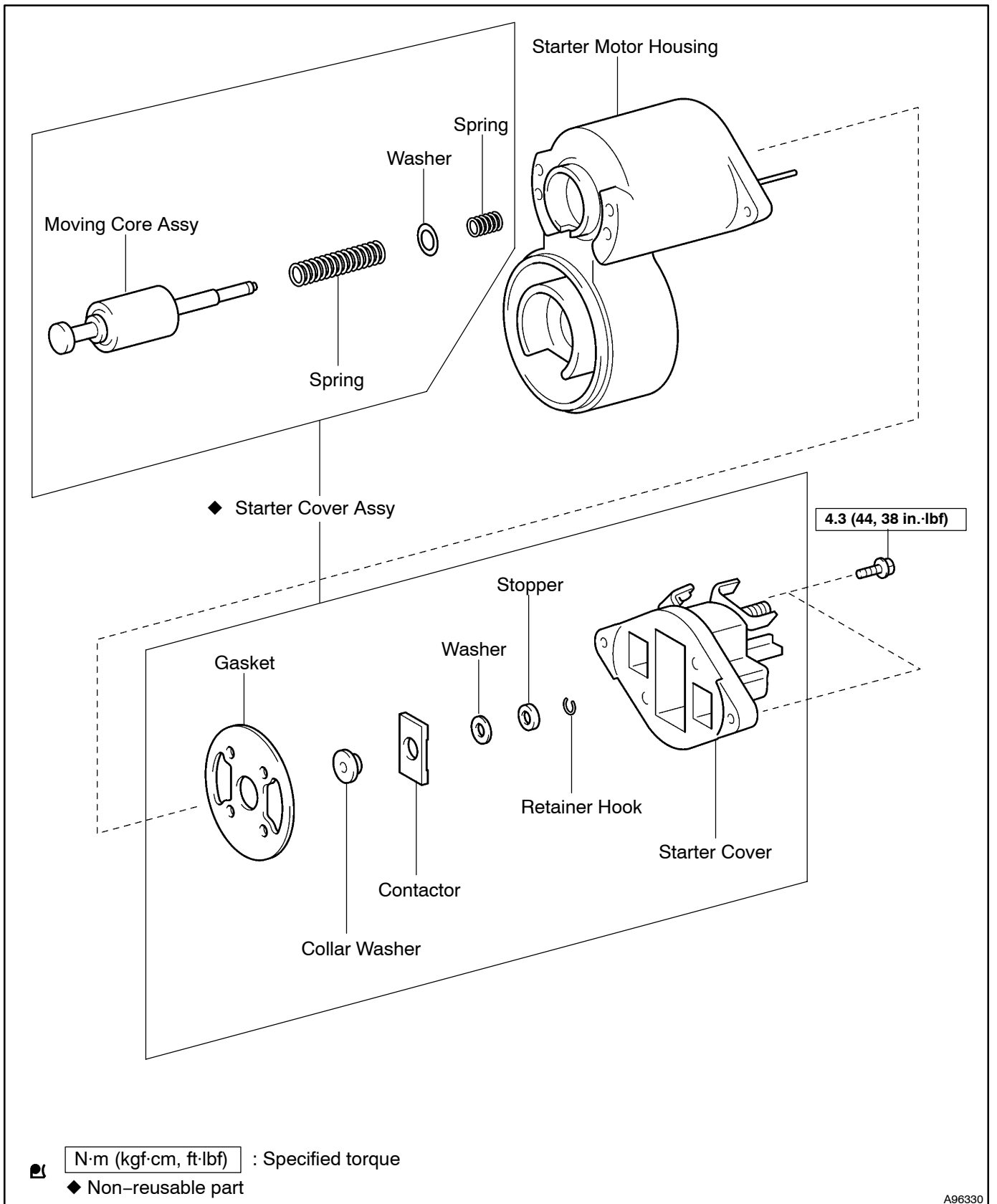
If the damage or wear is excessive, replace the safety valve or oil cooler assy with a new one.

If the spring is flattened, replace the safety valve or oil cooler assy with a new one.

STARTING & CHARGING

STARTER ASSY (N04C-TF)	19-1
COMPONENTS	19-1
OVERHAUL	19-3
GENERATOR ASSY (N04C-TF)	19-17
COMPONENTS	19-17
OVERHAUL	19-18



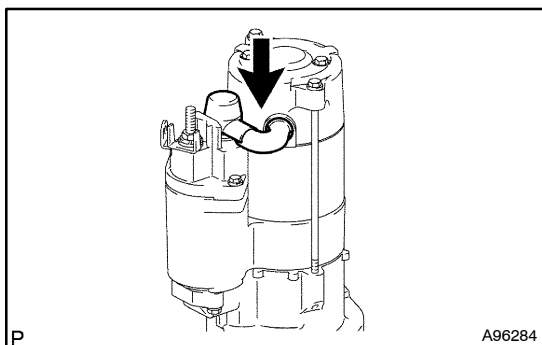


OVERHAUL

HINT:

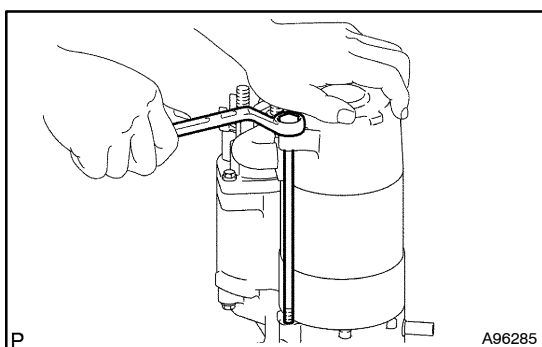
Use high-temperature grease to lubricate the bearings and gears when assembling the starter.

1. REMOVE DUST PROTECTOR CAP



2. REMOVE STARTER YOKE ASSY

- (a) Remove the cap, nut and lead wire.

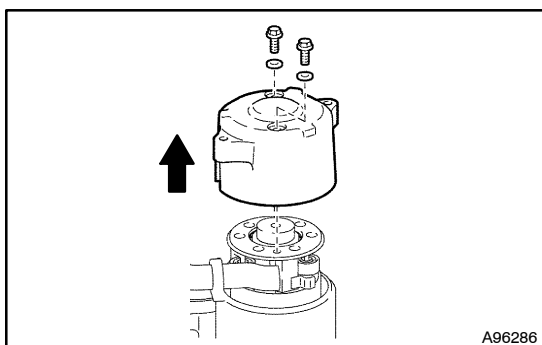


- (b) Remove the 2 through bolts, and pull out the starter yoke together with the armature.

HINT:

Hold the starter with your hand so that it will not fall or drop.

- (c) Remove the rubber seal from the starter motor housing.



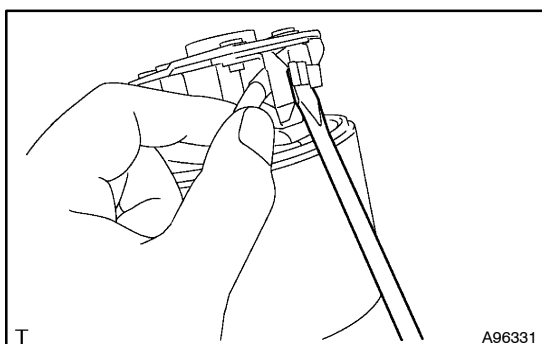
3. REMOVE STARTER COMMUTATOR END FRAME ASSY

- (a) Remove the 2 bolts, 2 rubber seals and end frame.
 (b) Remove the starter plate.

HINT:

If the starter plate cannot be found, it may be stuck to the starter commutator end frame or starter armature bearing.

- (c) Remove the rubber seal from the starter yoke assy.

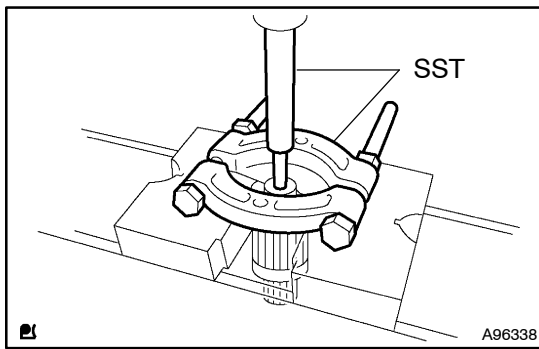


4. REMOVE STARTER BRUSH HOLDER ASSY

- (a) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder.
 (b) Disconnect the 4 brushes and remove the brush holder.

5. REMOVE STARTER ARMATURE ASSY

- (a) Remove the armature from the starter yoke.
 (b) Remove the starter plate from the armature.

**6. REMOVE STARTER ARMATURE BEARING**

- (a) Using SST and a press, press out the bearing from the starter armature.

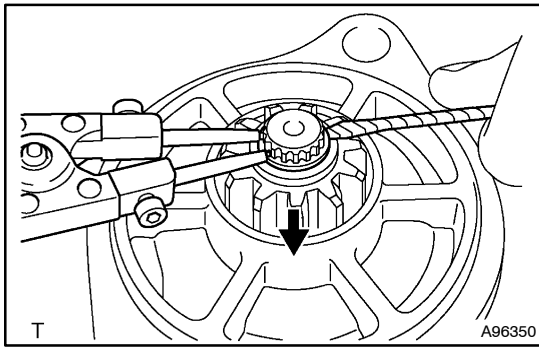
SST 09950-00020, 09710-02021

7. REMOVE STARTER PLATE**8. REMOVE RUBBER CUSHION****9. REMOVE PLANETARY GEAR**

- (a) Remove the 3 planetary gears from the starter motor housing.
 (b) Remove the starter yoke plate from the planet carrier shaft.

10. REMOVE INTERNAL GEAR

- (a) Remove the internal gear from the starter motor housing.

**11. REMOVE STARTER IDLE GEAR PINION**

- (a) Attach a screwdriver to the retainer and push down on the stopper.

HINT:

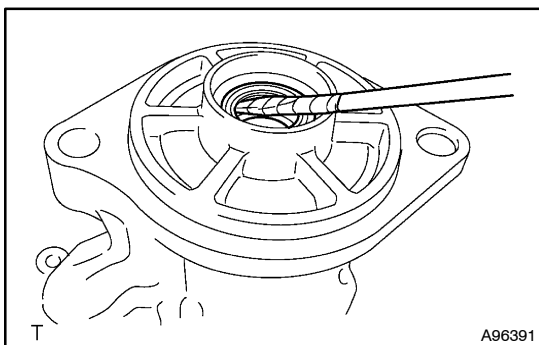
Tape the screwdriver tip before use.

- (b) Using a snap ring expander, remove the retainer with the stopper pushed down.

- (c) Remove the starter idle gear pinion.

12. REMOVE STARTER DRIVE HOUSING ASSY

- (a) Remove the 2 bolts and starter drive housing from the starter motor housing.

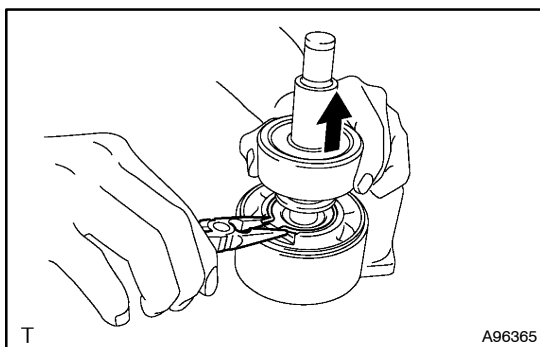
**13. REMOVE DUST STARTER PROTECTOR**

- (a) Remove the protector by prying with a screwdriver.

HINT:

Tape the screwdriver tip before use.

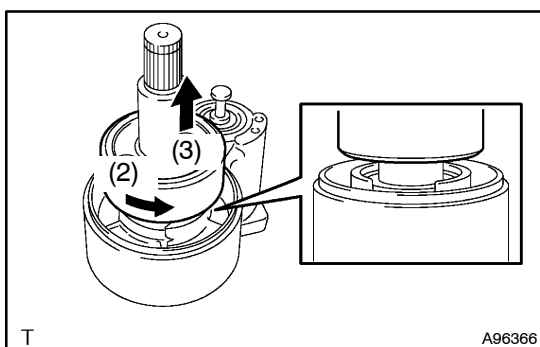
14. REMOVE STARTER PINION DRIVE LEVER**15. REMOVE MAGNET SWITCH COVER GASKET**

**16. REMOVE STARTER ARMATURE PLATE**

- (a) Lift up the starter clutch. Using a needle nose plier, remove the clip.
- (b) Remove the starter armature plate.

17. REMOVE STARTER CLUTCH SUB-ASSY

- (a) Remove the starter clutch from the planet carrier shaft. If unable to remove the starter clutch, go to step (b). Otherwise, go to step (c).



- (b) Perform (1) to (3).
 - (1) Push the starter clutch and planet carrier shaft together. Maintain this position for step (2).
 - (2) Slightly turn the starter clutch as shown in the illustration.
 - (3) Remove the starter clutch from the planet carrier shaft.
- (c) Remove the magnet switch cover gasket.

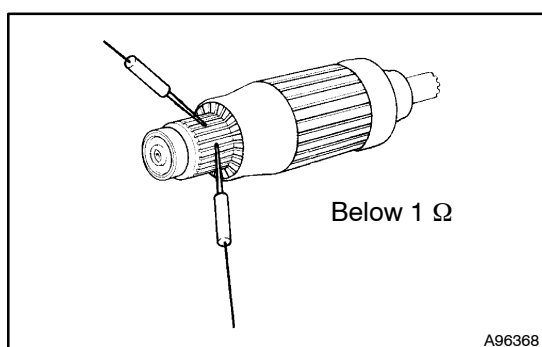
18. REMOVE PLANETARY CARRIER SHAFT SUB-ASSY

- (a) Remove the planet carrier shaft and starter plate from the starter motor housing.

19. INSPECT STARTER ARMATURE ASSY

- (a) Check the commutator for contamination and burns on its surface.

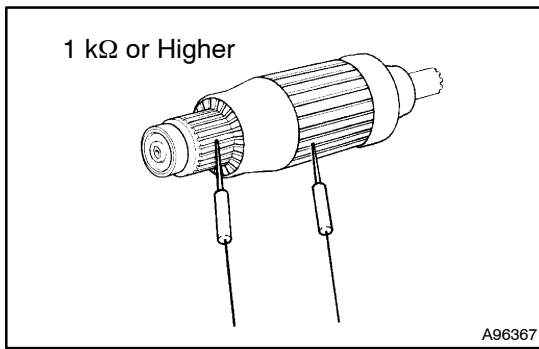
If the surface is dirty or burnt, correct it with sandpaper (No. 400) or a lathe.



- (b) Check if the commutator has an open circuit.
 - (1) Measure the resistance between the segments of the commutator.

Standard: Below 1 Ω

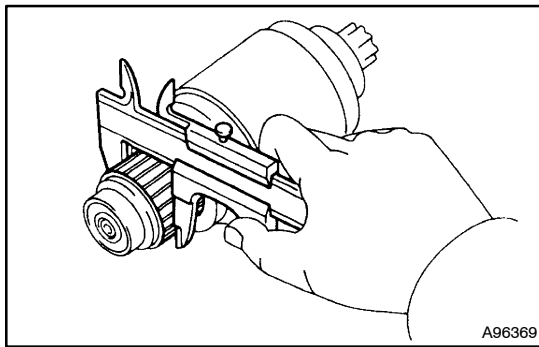
If the result is not as specified, replace the armature assy.



- (c) Check if the commutator is grounded.
 (1) Measure the resistance between the commutator and armature coil core.

Standard: 1 k Ω or higher

If the result is not as specified, replace the armature assy.

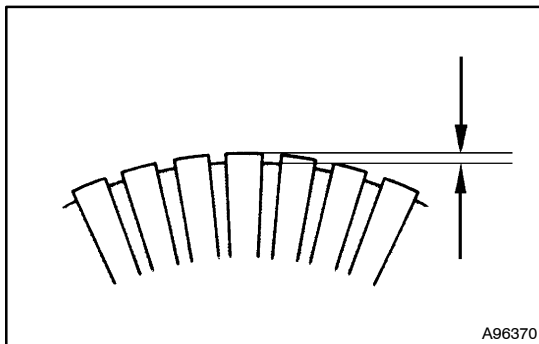


- (d) Using a vernier caliper, measure the commutator diameter.

Diameter:

Standard	Minimum
36.0 mm (1.417 in.)	34.0 mm (1.339 in.)

If the diameter is less than the minimum, replace the armature assy.



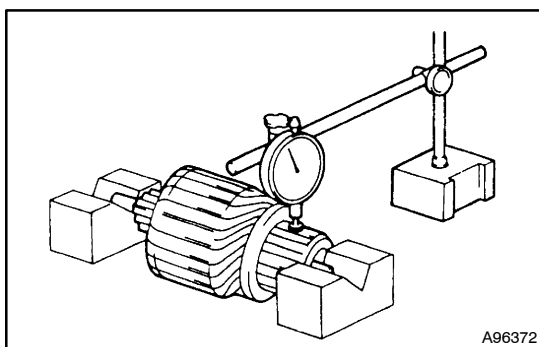
- (e) Check that the undercut depth is clean and free of foreign materials.

- (f) Measure the undercut depth.

Undercut depth:

Standard	Minimum
0.5 to 0.8 mm (0.020 to 0.032 in.)	0.2 mm (0.008 in.)

If the undercut depth is less than the minimum, increase the depth using a hacksaw blade.

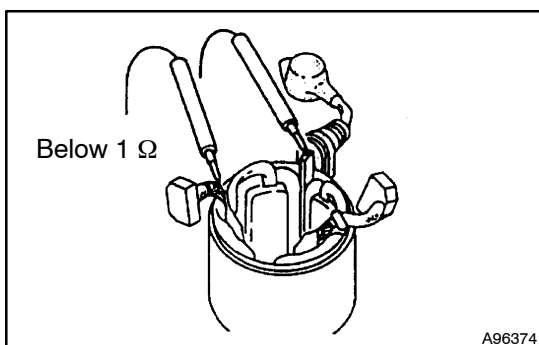


- (g) Check for the commutator circle runout.

- (1) Place the commutator on V-blocks.
 (2) Using a dial indicator, measure the circle runout.

Maximum circle runout: 0.1 mm (0.004 in.)

If the circle runout is greater than the maximum, replace the armature assy.



20. INSPECT STARTER YOKE ASSY

- (a) Check if the starter yoke has an open circuit.

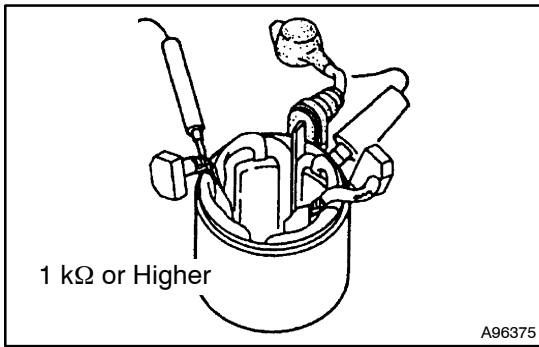
- (1) Measure the resistance between the lead wire and field coil brush lead.

Standard: Below 1 Ω

If the result is not as specified, replace the starter yoke assy.

HINT:

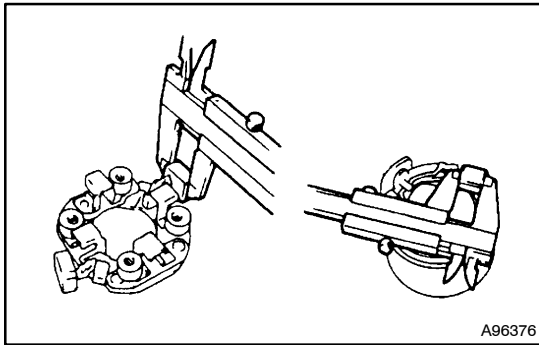
Inspect the brushes on both sides.



- (b) Check if the starter yoke body is grounded.
 (1) Measure the resistance between the field coil brush and starter yoke body.

Standard: 1 kΩ or higher

If the result is not as specified, replace starter yoke assy.



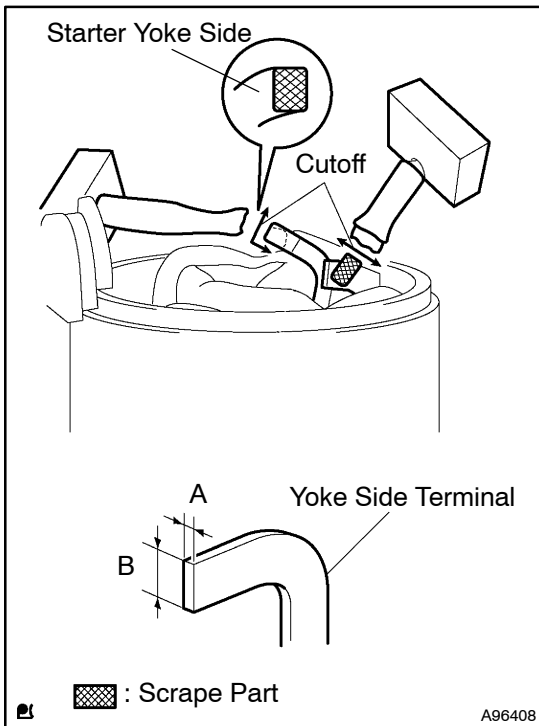
21. INSPECT STARTER BRUSH

- (a) Using a vernier caliper, measure the brush length.

Length:

Standard	Minimum
18.0 mm (0.709 in.)	13.0 mm (0.512 in.)

If the length is less than the minimum, replace the brush holder assy and starter brush.



22. REPLACE STARTER BRUSH

HINT:

- Only the brushes mounted on the starter yoke can be replaced.
- When replacing the brushes mounted on the brush holder, replace the brush and brush holder as a set.

- (a) Remove the clamp.
 (b) When replacing brushes that were supply parts:
 (1) Remove the brushes from the clamps.
 (c) When replacing brushes that were pre-made parts:
 (1) Cut the lead wires at the positions indicated in the illustration.
 (d) File the welded parts of the lead wires on the starter yoke so that dimensions are within the specifications.

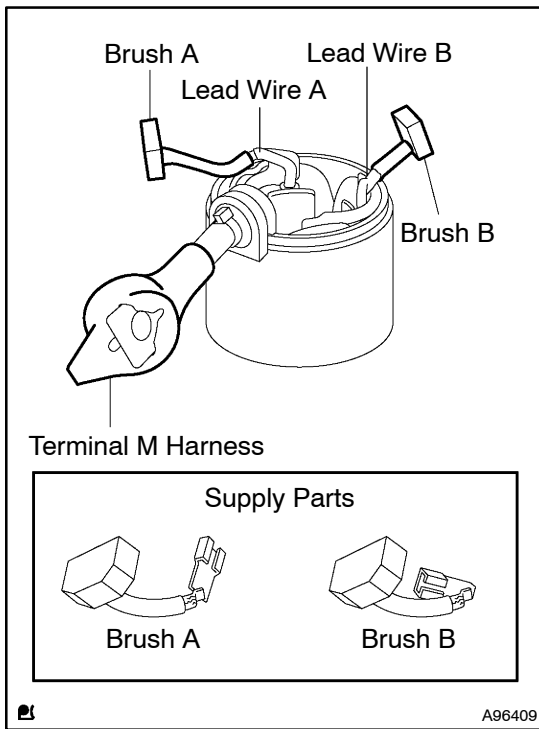
Specification:

A: 1.4 mm (0.055 in.)

B: 6.0 mm (0.236 in.)

NOTICE:

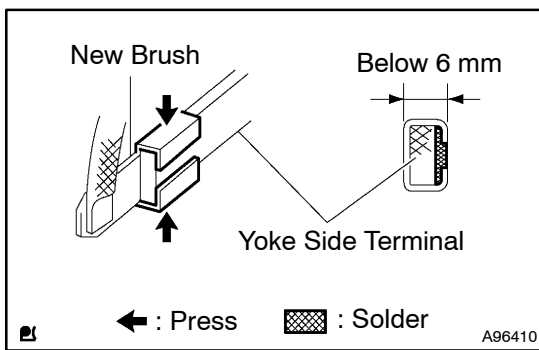
Do not move the lead wires on the starter yoke or the insulation part of the field coil will incur damage.



- (e) Connect brush A to lead wire A and brush B to lead wire B.

NOTICE:

Be sure to connect the brushes to the correct lead wires.



- (f) Match the new brush and yoke side lead wire's tip. Then caulk the clamp of the brush.

- (g) Solder the clamp of the brush.

HINT:

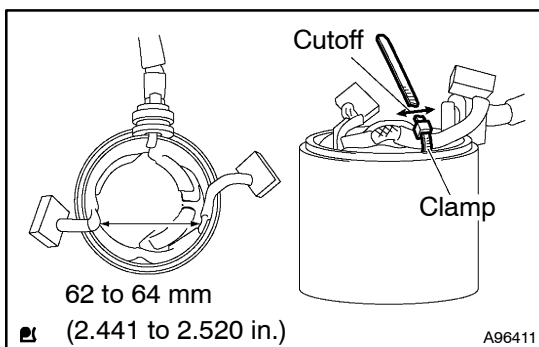
Before soldering, sufficiently heat the part to be soldered.

NOTICE:

Do not allow solder to contact any area that is not specified.

- (h) Check the dimensions of the soldered part.

Standard: Below 6 mm (0.24 in.)



- (i) Measure the internal dimension of the starter yoke shown in the illustration.

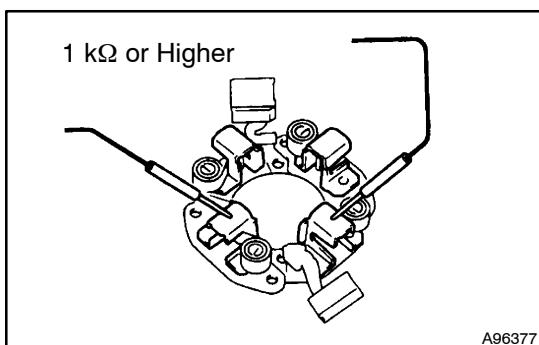
Standard: 62 to 64 mm (2.44 to 2.52 in.)

If the result is not as specified, replace the starter yoke assy.

NOTICE:

When installing the armature, make sure that the inside of the starter yoke does not contact the armature.

- (j) Fix the lead wire with the clamp as shown in the illustration.

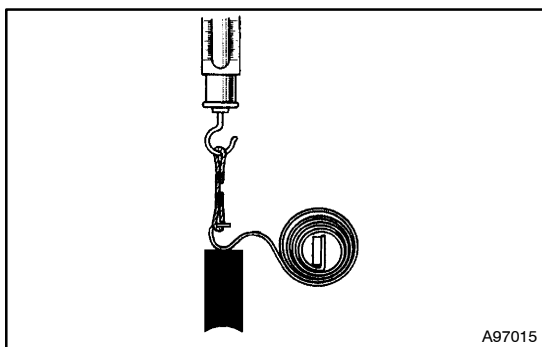


23. INSPECT STARTER BRUSH HOLDER ASSY

- (a) Using an ohmmeter, measure the resistance between the positive (+) and negative (-) brush holders.

Standard: 1 kΩ or higher

If the result is not as specified, replace the brush holder assy.

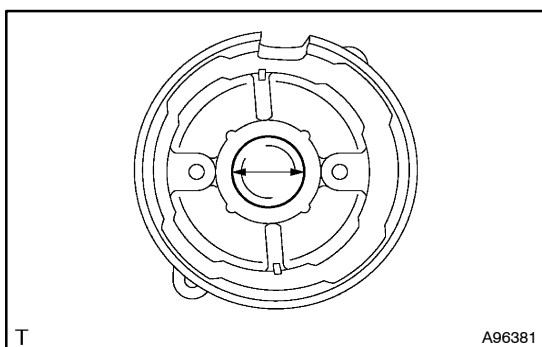


- (b) Inspect the load of the brush spring.
- (1) Using a pull scale, measure the installed load of the spring at the exact moment the spring separates from the brush.

Installed load:

Standard	Minimum
18 N (1.8 kgf, 4.0 lbf)	13 N (1.3 kgf, 2.9 lbf)

If the installed load is less than the minimum, replace the brush spring.

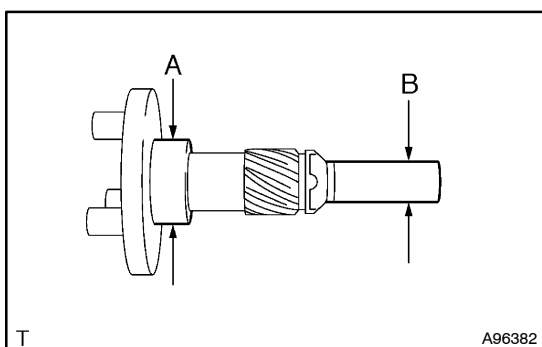
**24. INSPECT STARTER COMMUTATOR END FRAME ASSY**

- (a) Using a cylinder gauge, measure the inside diameter of the end frame.

Inside diameter:

Standard	Maximum
28.0 mm (1.102 in.)	28.1 mm (1.106 in.)

If the inside diameter is greater than the maximum, replace the commutator end frame assy.

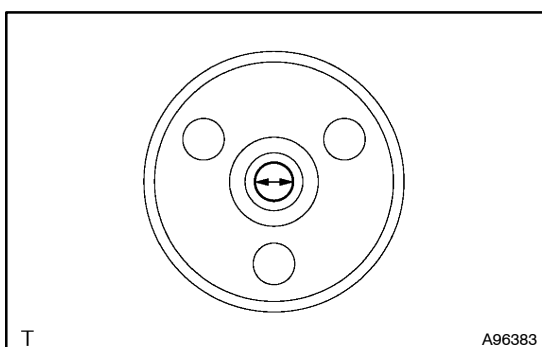
**25. INSPECT PLANET CARRIER SHAFT SUB-ASSY**

- (a) Using a micrometer, measure each outside diameter of the shaft.

Outside diameter:

Standard	Minimum
A: 26.0 mm (1.024 in.) B: 12.1 mm (0.476 in.)	A: 25.9 mm (1.020 in.) B: 12.04 mm (0.474 in.)

If the outside diameter is less than the minimum, replace the shaft sub-assy.

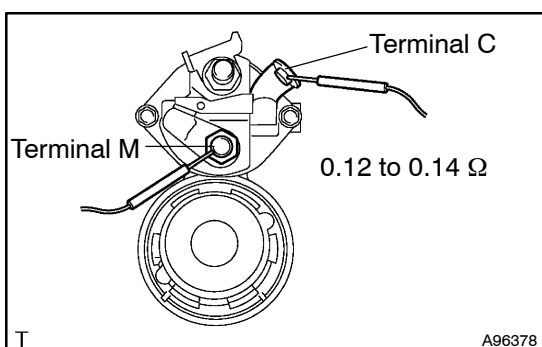


- (b) Using a vernier caliper, measure the inside diameter of the shaft.

Inside diameter:

Standard	Maximum
9.0 mm (0.354 in.)	9.2 mm (0.362 in.)

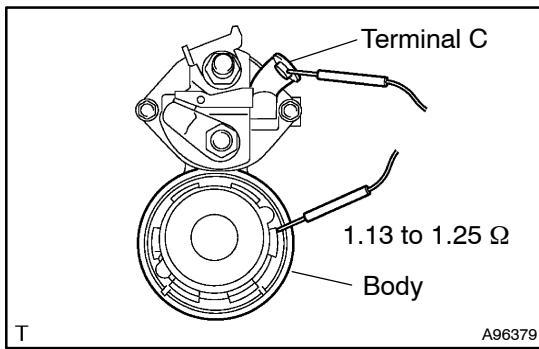
If the inside diameter is greater than the maximum, replace the shaft.

**26. INSPECT STARTER MOTOR HOUSING**

- (a) Check if the pull-in coil has an open circuit.
- (1) Measure the resistance between terminals C and M.

Standard: 0.12 to 0.14 Ω at 20°C (68°F)

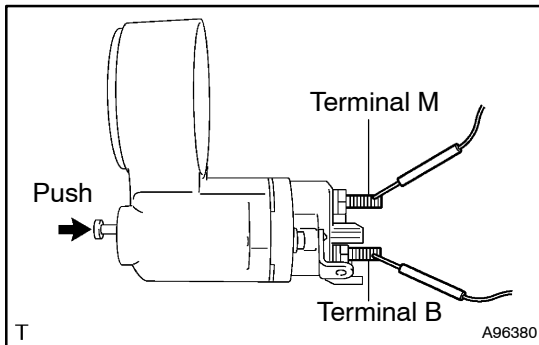
If the result is not as specified, replace the starter cover assy.



- (b) Check if the hold-in coil has an open circuit.
- (1) Measure the resistance between terminal C and the motor housing body.

Standard: 1.13 to 1.25 Ω at 20°C (68°F)

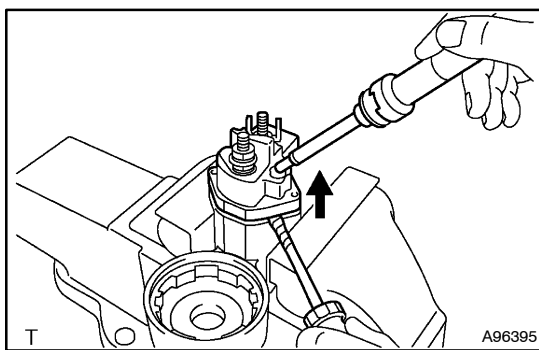
If the result is not as specified, replace the starter cover assy.



- (c) Measure the resistance between terminals B and M.
- Standard:**

Condition	Specified Condition
Not pushed	10 k Ω or higher
Pushed	Below 1 Ω

If the result is not as specified, replace the starter cover assy.



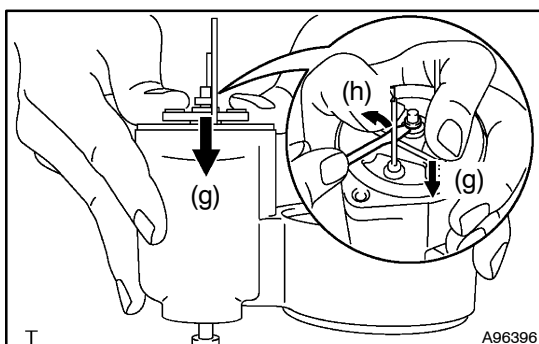
27. REMOVE STARTER COVER ASSY

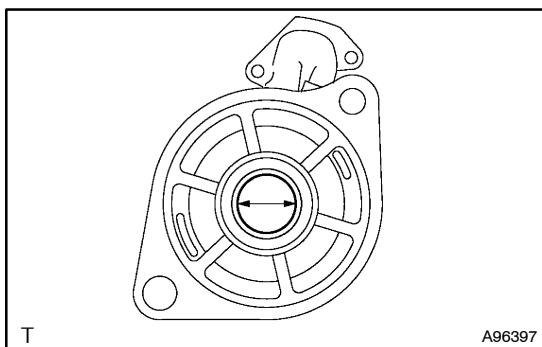
- (a) Using a vise and aluminum protection plates, fix the starter motor housing.
- (b) Using a soldering iron, remove the solder from the soldered parts of the lead wire.
- (c) Heat the soldered part of the lead wire with a soldering iron. Maintain this position for step (d).
- (d) Using a screwdriver, pry up part of the cover.

HINT:

Tape the screwdriver's tip before use.

- (e) Perform steps (c) and (d) on the opposite side. Pry up the other side of the cover.
- (f) Perform steps (c) to (e) several times at both soldered parts until the cover assy is fully removed.
- (g) Place the starter motor housing on a table and push down on the contactor. Maintain this position for step (h).
- (h) Using a screwdriver, remove the retainer hook.
- (i) Remove the stopper, washer, contactor, collar washer and gasket.
- (j) Remove the moving core from the motor housing.



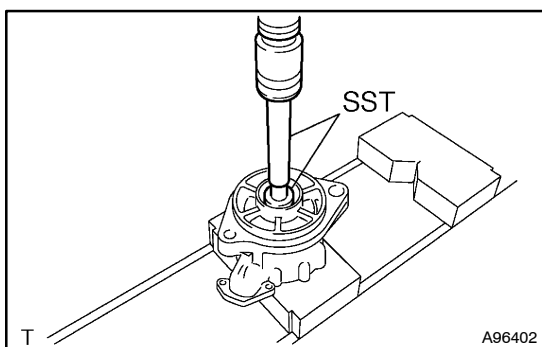
**28. INSPECT STARTER HOUSING BUSH**

- (a) Using a cylinder gauge, measure the inside diameter of the bush.

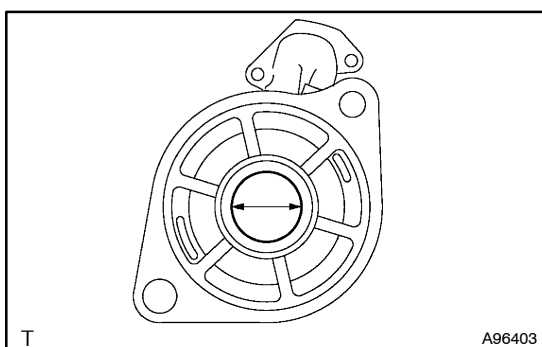
Inside diameter:

Standard	Maximum
25.0 mm (0.984 in.)	25.2 mm (0.992 in.)

If the inside diameter is greater than the maximum, replace the bush.

**29. REMOVE STARTER HOUSING BUSH**

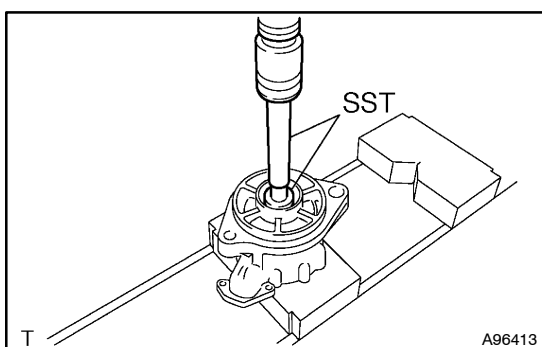
- (a) Using a press and SST, press out the bush.
SST 09950-60010 (09951-00250, 09951-00300, 09952-06010), 09950-70010 (09951-07100)

**30. INSPECT STARTER DRIVE HOUSING ASSY**

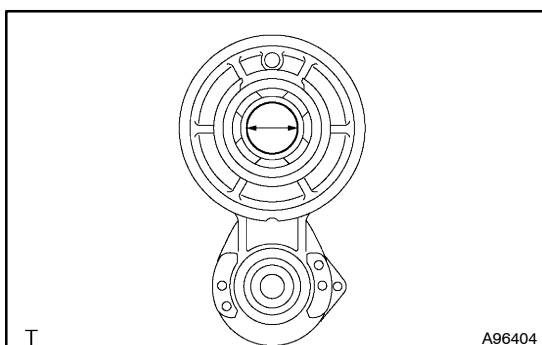
- (a) Using a cylinder gauge, measure the inside diameter of the housing.

Maximum: 30.033 mm (1.1824 in.)

If the inside diameter is greater than the maximum, replace the housing assy.

**31. INSTALL STARTER HOUSING BUSH**

- (a) Apply grease to a new bush.
(b) Using SST and a press, press in the bush.
SST 09950-60010 (09951-00250, 09951-00300, 09952-06010), 09950-70010 (09951-07100)

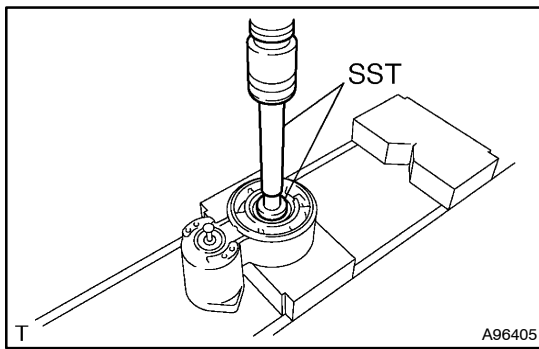
**32. INSPECT STARTER CENTER BEARING BUSH**

- (a) Using a cylinder gauge, measure the inside diameter of the bush.

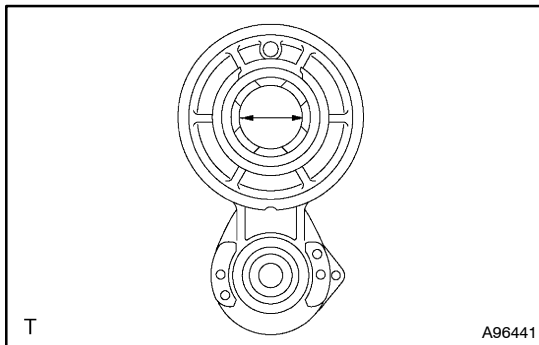
Inside diameter

Standard	Maximum
26.0 mm (1.024 in.)	26.2 mm (1.031 in.)

If the inside diameter is greater than the maximum, replace the bush.

**33. REMOVE STARTER CENTER BEARING BUSH**

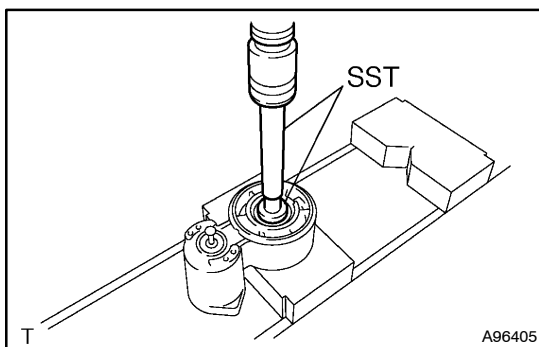
- (a) Using a press and SST, press out the bush.
 SST 09950-60010 (09951-00260, 09951-00310, 09952-06010), 09950-70010 (09951-07100)

**34. INSPECT STARTER MOTOR HOUSING**

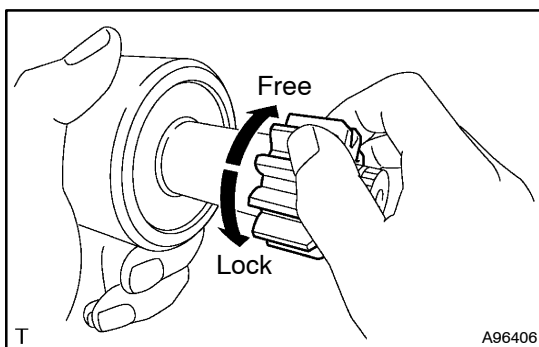
- (a) Using a cylinder gauge, measure the inside diameter of the housing.

Maximum: 29.033 mm (1.143 in.)

If the inside diameter is greater than the maximum, replace the housing.

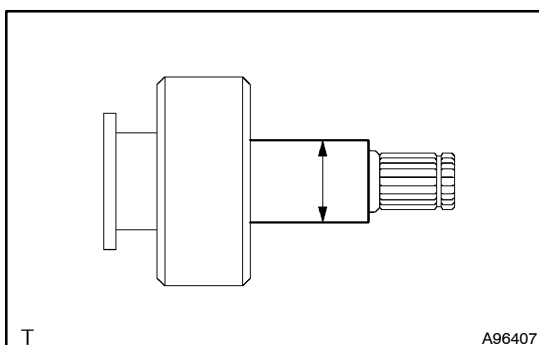
**35. INSTALL STARTER CENTER BEARING BUSH**

- (a) Apply grease to a new bush.
 (b) Using SST and a press, press in the bush.
 SST 09950-60010 (09951-00260, 09951-00310, 09952-06010), 09950-70010 (09951-07100)

**36. INSPECT STARTER CLUTCH SUB-ASSY**

- (a) Grip the clutch in one hand and turn only the inner sleeve with the other hand.
 (b) Check that the inner sleeve turns easily in the "free" direction but cannot turn in the "lock" direction as shown in the illustration.

If the starter clutch does not operate as specified, replace the starter clutch.

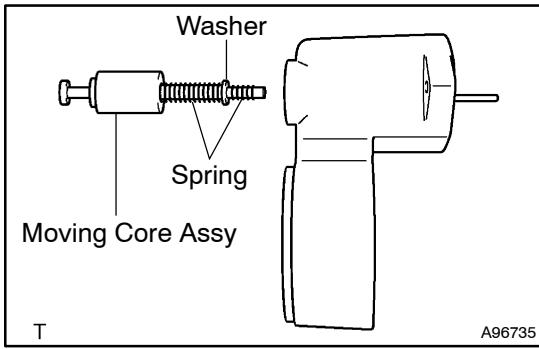


- (c) Using a micrometer, measure the outside diameter of the starter clutch.

Outside diameter:

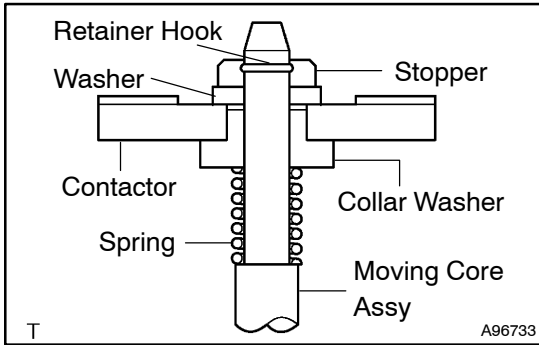
Standard	Minimum
25.0 mm (0.984 in.)	24.9 mm (0.980 in.)

If the outside diameter is less than the minimum, replace the clutch sub-assy.



37. INSTALL STARTER COVER ASSY

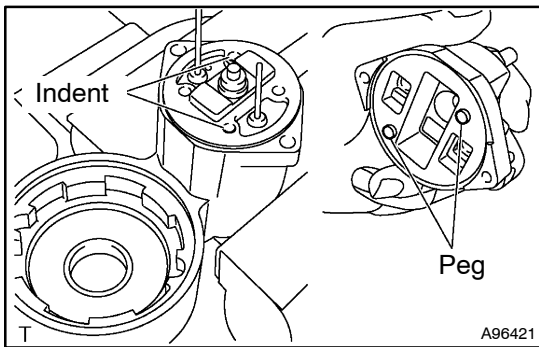
(a) Install 2 new springs and a new washer to a new moving core as shown in the illustration.



- (b) Install the collar washer, contactor, washer and stopper to the moving core.
- (c) Place the starter motor housing on a table and push down the contactor. Maintain this position for step (d).
- (d) Install a new retainer hook.

NOTICE:

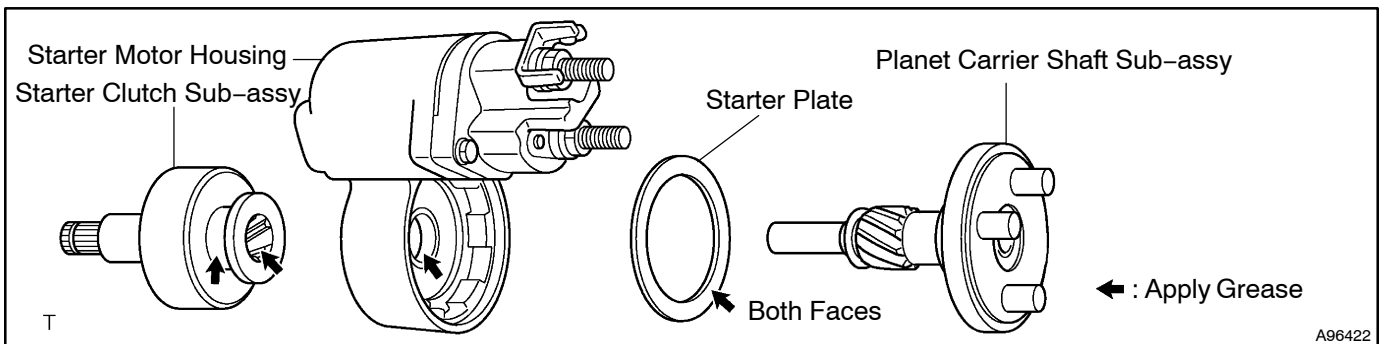
Make sure that the retainer hook is in the groove of the stopper.



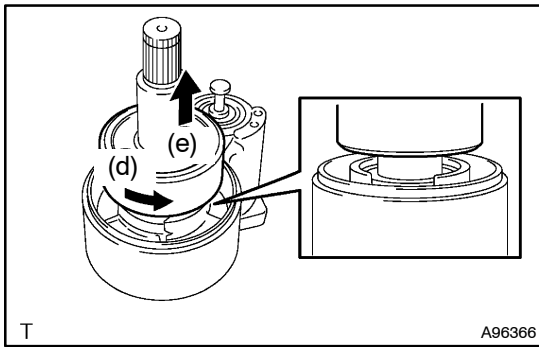
- (e) Using a vise and aluminum protection plates, fix the motor housing.
- (f) Clean the contactor surface.
- (g) Install a new gasket.
- (h) Match the indent of the gasket and peg of the cover. Then install the cover with the 2 bolts.
- (i) Install the 2 bolts.
- Torque: 4.3 N·m (44 kgf·cm, 38 in·lbf)**
- (j) Solder the 2 lead wires to the top of the starter cover.

38. INSTALL STARTER CLUTCH SUB-ASSY

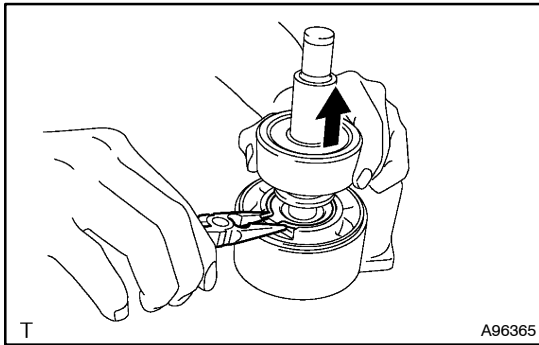
(a) Apply grease to the parts indicated by arrow marks in the illustration.



(b) Install the starter plate and planet carrier shaft to the housing.



- (c) Push together the starter clutch and planet carrier shaft. Maintain this position for step (d).
- (d) Slightly turn the starter clutch in the direction indicated by the arrow mark in the illustration.
- (e) Check that the starter clutch is installed securely to the planet carrier shaft by pulling up the clutch.
- (f) Install the starter armature plate.



- (g) Lift up the starter clutch. Using needle nose pliers, install the clip.

39. INSTALL DUST STARTER PROTECTOR

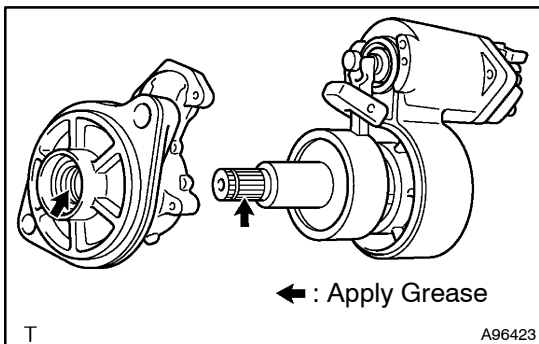
- (a) Install a new dust starter protector to the starter drive housing.

40. INSTALL DUST PROTECTOR CAP

41. INSTALL MAGNET SWITCH COVER GASKET

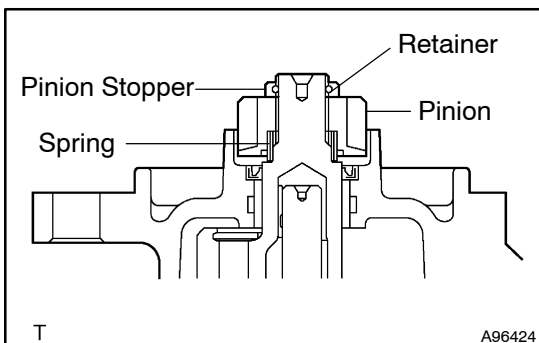
- (a) Install a new magnet switch cover gasket to the starter motor housing.

42. INSTALL STARTER PINION DRIVE LEVER



43. INSTALL STARTER DRIVE HOUSING ASSY

- (a) Apply grease to the housing.
- (b) Install the starter drive housing with the 2 bolts.
Torque: 4.3 N·m (44 kgf·cm, 38 in.·lbf)



44. INSTALL STARTER IDLE GEAR PINION

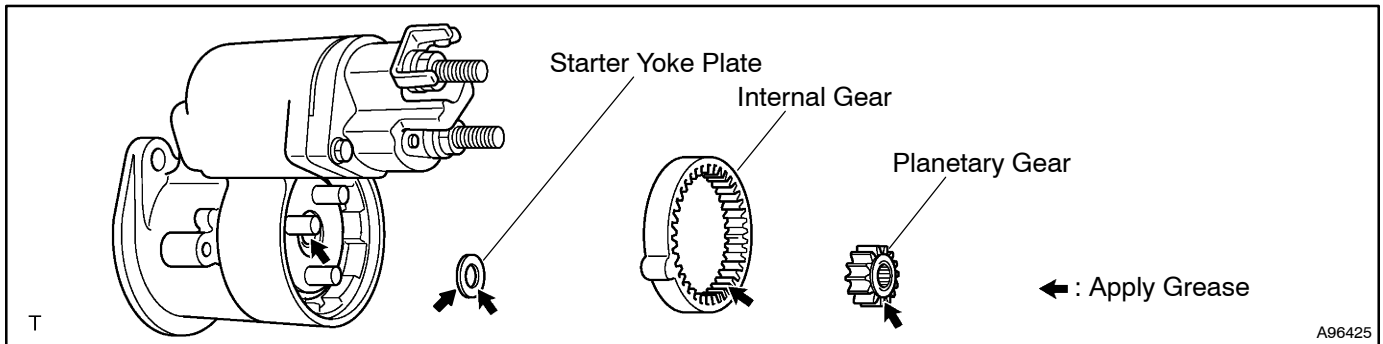
- (a) Install the spring, pinion and pinion stopper.
- (b) Push down the pinion stopper to install a new retainer.

NOTICE:

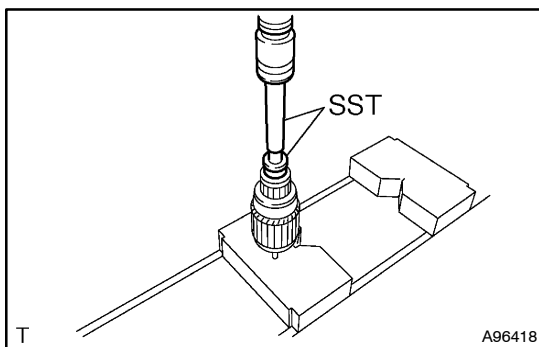
Make sure that the retainer is in the groove of the pinion stopper.

45. INSTALL PLANETARY GEAR

- (a) Apply grease to the parts indicated by the arrow marks in the illustration.
- (b) Install the starter yoke plate, internal gear and 3 planetary gears to the planet carrier shaft.

**46. INSTALL STARTER ARMATURE BEARING**

- (a) Using SST and a press, press in a new bearing.
SST 09950-60010 (09951-00280), 09950-70010 (09951-07100)

**47. INSTALL RUBBER CUSHION**

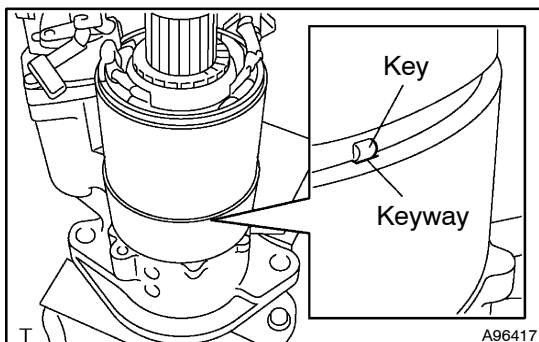
- (a) Install the rubber cushion to the starter motor housing.

48. INSTALL STARTER PLATE

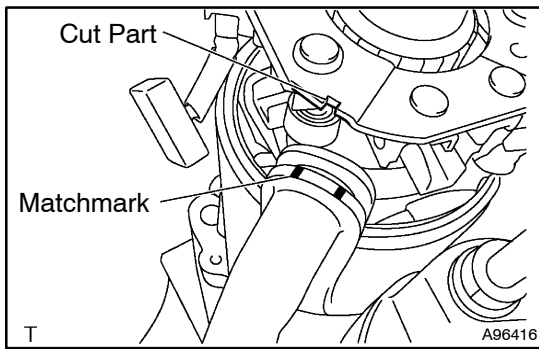
- (a) Install the starter plate to the starter motor housing.

49. INSTALL STARTER ARMATURE ASSY

- (a) Install the armature to the starter motor housing.

**50. INSTALL STARTER YOKE ASSY**

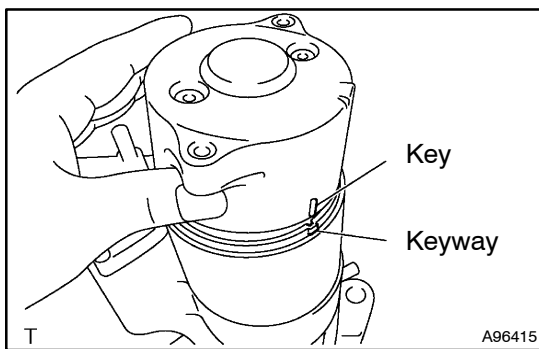
- (a) Install 2 new rubber seals.
- (b) Match the keyway of the starter yoke with the key of the starter motor housing to install the starter yoke assy.

**51. INSTALL STARTER BRUSH HOLDER ASSY**

- (a) Align the cut part of the brush holder with the matchmark on the lead wire.
- (b) Install the brush holder to the armature.

52. INSTALL STARTER BRUSH

- (a) Using a screwdriver, hold the brush spring back and connect the brush to the brush holder.

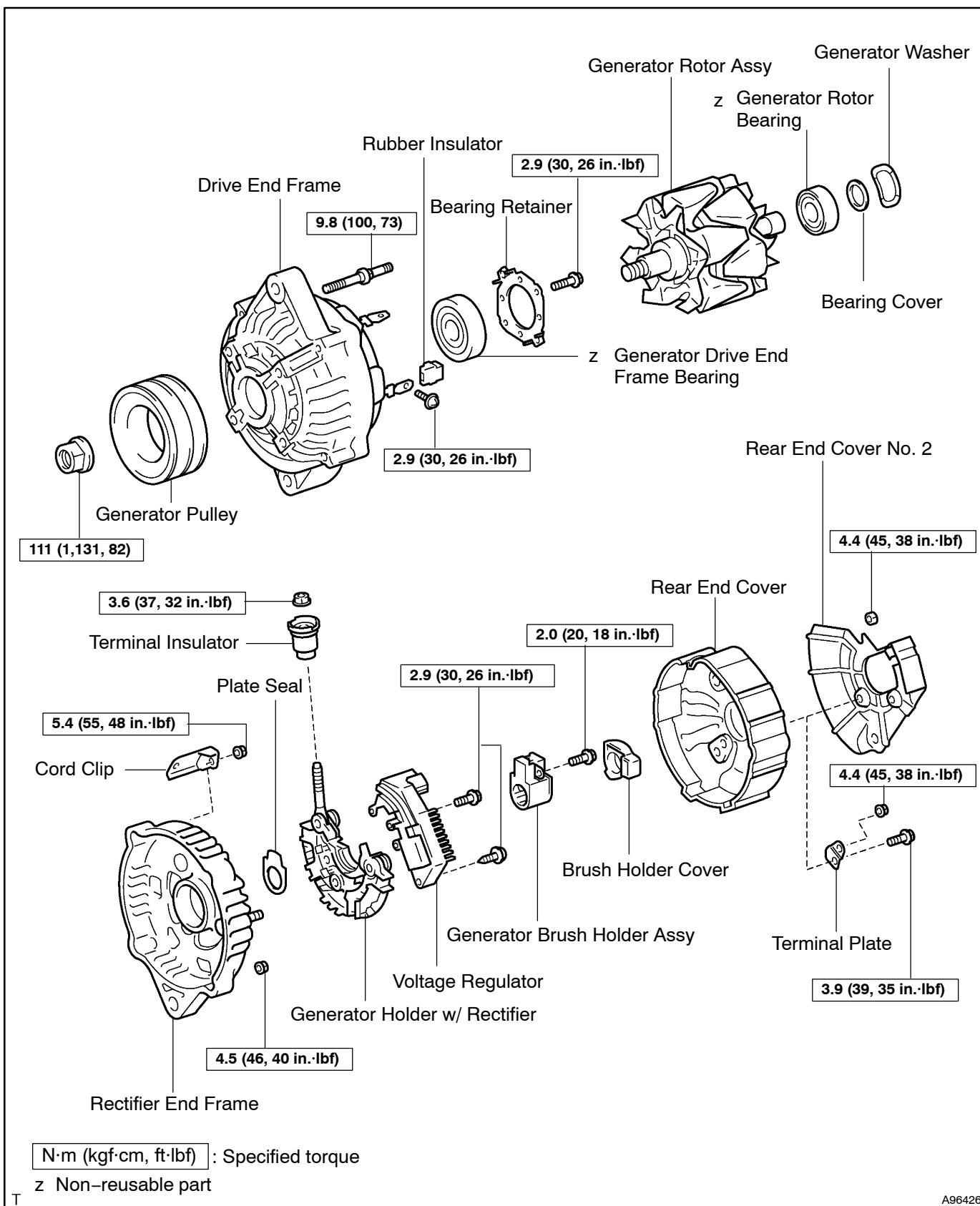
**53. INSTALL STARTER COMMUTATOR END FRAME ASSY**

- (a) Install the starter plate.
- (b) Align the end frame with the keyway located on the yoke.
- (c) Install the commutator end frame with the 2 through bolts.
Torque: 15 N·m (152 kgf·cm, 11 ft·lbf)
- (d) Install the end frame with 2 new rubber seals.
Torque: 4.3 N·m (44 kgf·cm, 38 in·lbf)
- (e) Connect the lead wire to terminal M.
Torque: 13.5 N·m (138 kgf·cm, 10 ft·lbf)

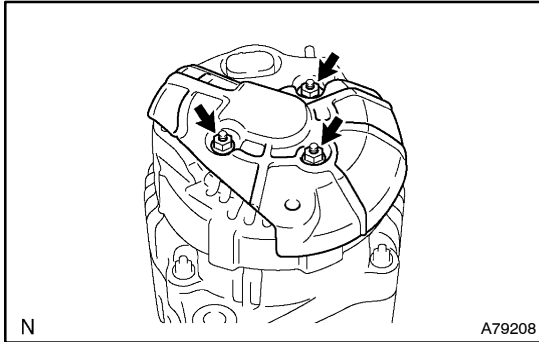
GENERATOR ASSY (N04C-TF)

COMPONENTS

190YT-01

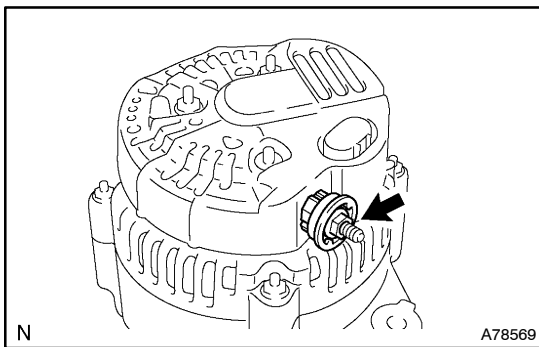


OVERHAUL



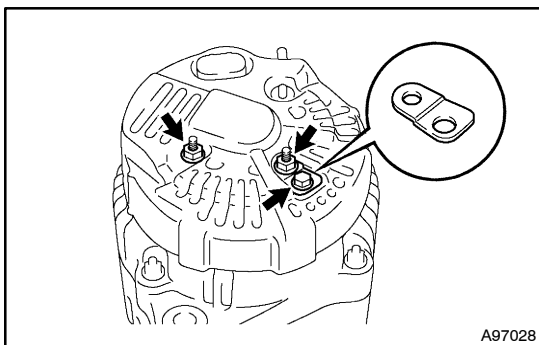
1. REMOVE REAR END COVER NO. 2

- (a) Remove the 3 nuts and end cover.

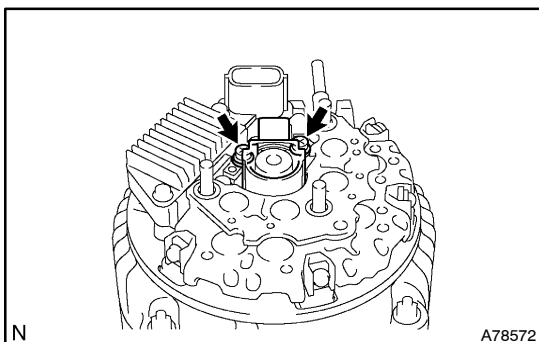


2. REMOVE REAR END COVER

- (a) Remove the nut and terminal insulator.

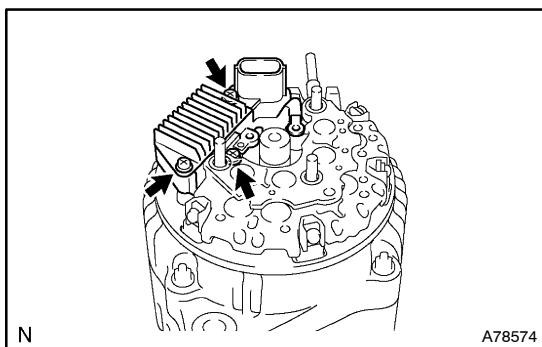


- (b) Remove the bolt, 2 nuts, plate terminal, end cover and brush holder cover.



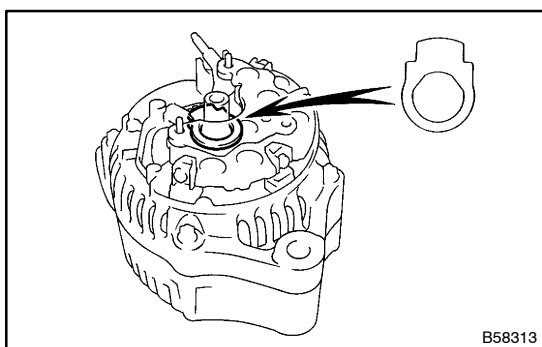
3. REMOVE GENERATOR BRUSH HOLDER ASSY

- (a) Remove the 2 screws and brush holder.

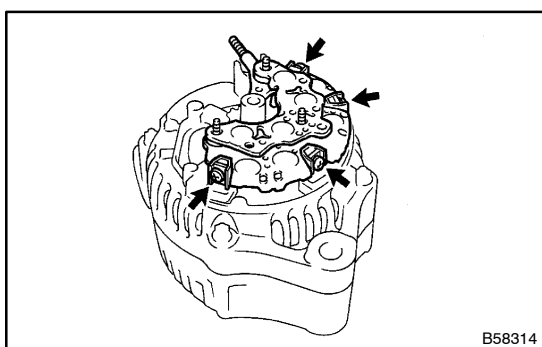


4. REMOVE VOLTAGE REGULATOR

- (a) Remove the 3 screws and voltage regulator.

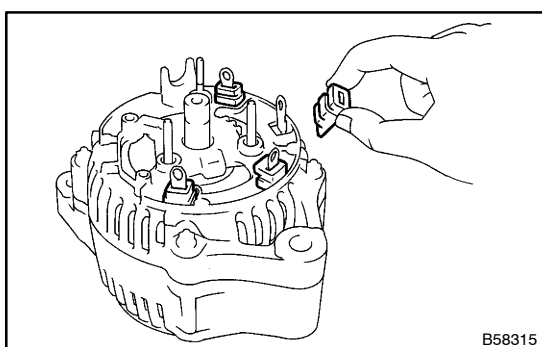


- (b) Remove the plate seal from the rectifier end frame.

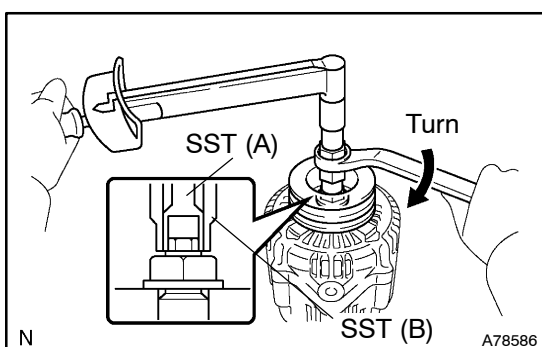


5. REMOVE GENERATOR HOLDER W/ RECTIFIER

- (a) Remove the 4 screws and generator holder.

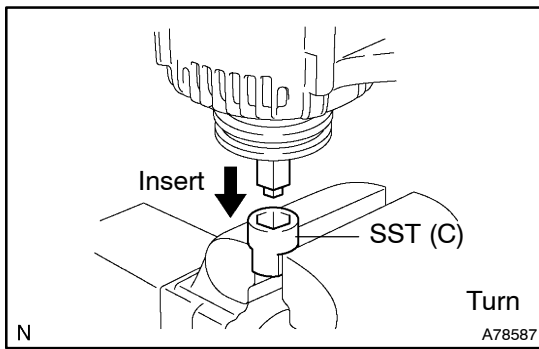


- (b) Remove the 4 rubber insulators.

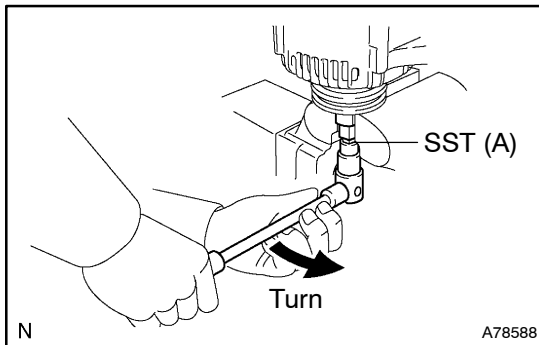


6. REMOVE GENERATOR PULLEY

- (a) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.
- (b) Check that SST (A) is secured to the rotor shaft.
SST 09820-63010 (09820-06010, 09820-06020)



- (c) As shown in the illustration, mount SST (C) in a vise, and attach the pulley nut to SST (C).

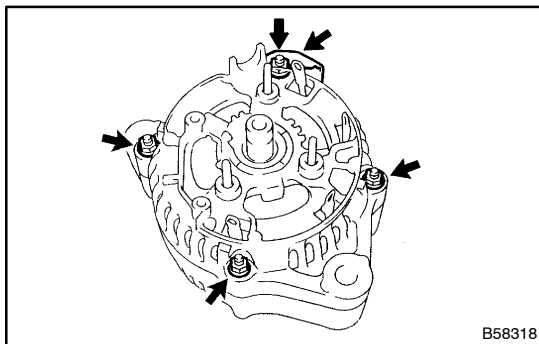


- (d) To loosen the pulley nut, turn SST (A) in the direction shown in the illustration.

NOTICE:

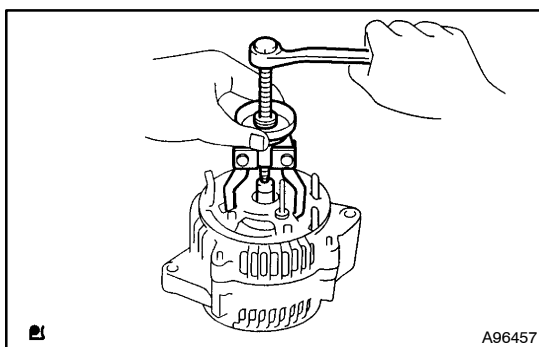
To prevent damage to the rotor shaft, do not loosen the pulley nut more than one-half of a turn.

- (e) Remove the generator from SST (C).
 (f) Turn SST (B), and remove SST (A and B).
 (g) Remove the pulley nut and pulley.

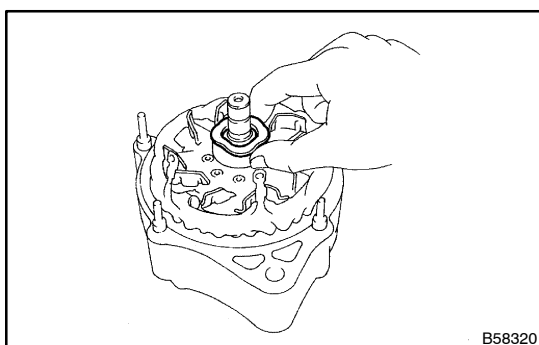


7. REMOVE RECTIFIER END FRAME

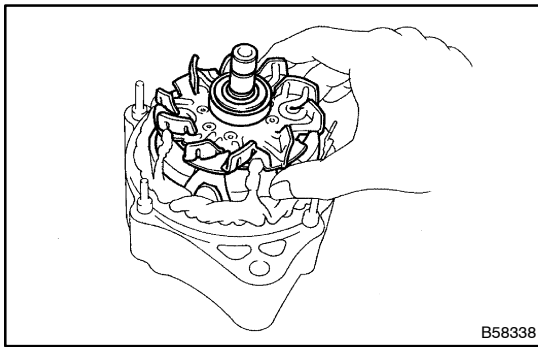
- (a) Remove the 4 nuts and cord clip.



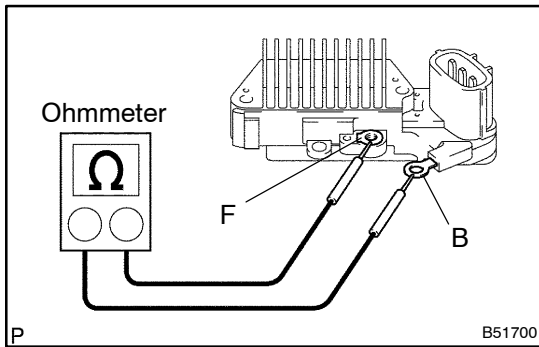
- (b) Using a bearing puller, remove the rectifier end frame.



- (c) Remove the generator washer and bearing cover.



8. REMOVE GENERATOR ROTOR ASSY



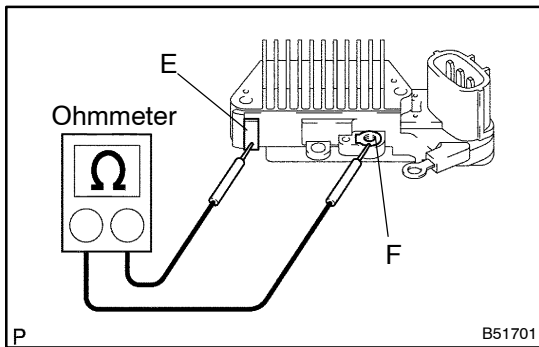
9. INSPECT VOLTAGE REGULATOR

- (a) Measure the resistance between terminals F and B.

Standard:

The resistance between terminals F and B should be below 1 Ω when the probes are connected one way, and 10 k Ω or higher when the probes are reversed.

If the result is not as specified, replace the regulator.

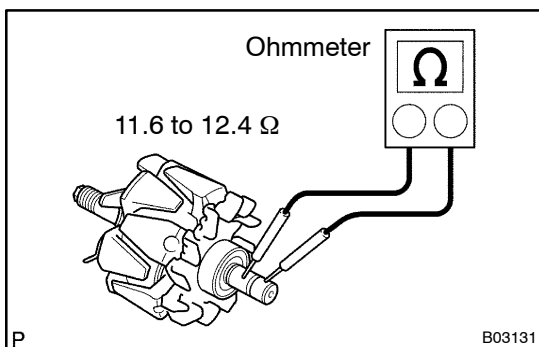


- (b) Measure the resistance between terminals F and E.

Standard:

The resistance between terminals F and E should be below 1 Ω when the probes are connected one way, and 10 k Ω or higher when the probes are reversed.

If the result is not as specified, replace the regulator.



10. INSPECT GENERATOR ROTOR ASSY

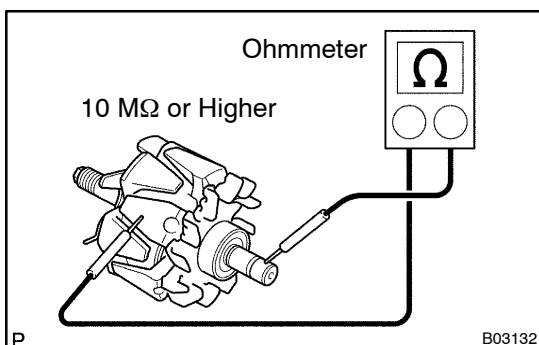
- (a) Check the rotor for an open circuit.

- (1) Measure the resistance between the slip rings.

Standard:

11.6 to 12.4 Ω at 20°C (68°F)

If the result is not as specified, replace the rotor assy.



- (b) Check the rotor for ground.

- (1) Measure the resistance between the slip ring and rotor.

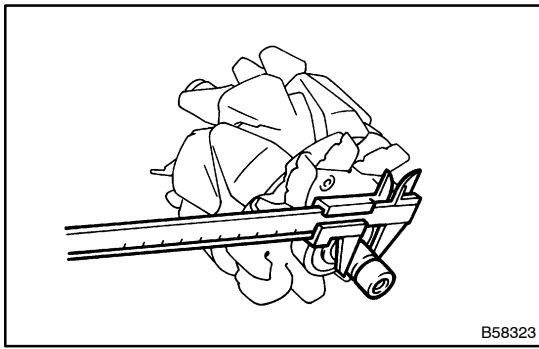
Standard:

10 M Ω or higher at 20°C (68°F)

If the result is not as specified, replace the rotor assy.

- (c) Check that the slip rings are not rough or scored.

If rough or scored, replace the rotor.

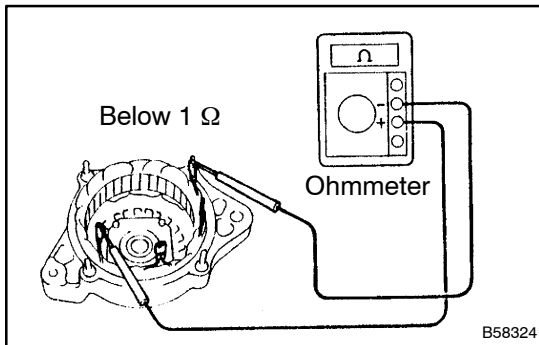


- (d) Using a vernier caliper, measure the slip ring diameter.

Diameter:

Standard	14.2 to 14.4 mm (0.559 to 0.567 in.)
Minimum	12.8 mm (0.504 in.)

If the diameter is less than the minimum, replace the rotor assy.



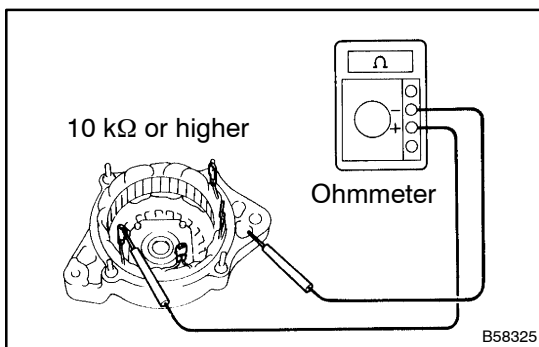
11. INSPECT DRIVE END FRAME

- (a) Check if the drive end frame has an open circuit.

- (1) Using an ohmmeter, measure the resistance between the coil leads.

Standard: Below 1 Ω

If the result is not as specified, replace the drive end frame.

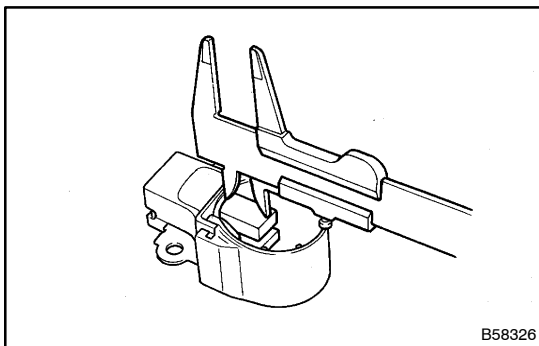


- (b) Check if the drive end frame is grounded.

- (1) Measure the resistance between the coil lead and drive end frame.

Standard: 10 kΩ or higher

If the result is not as specified, replace the drive end frame.



12. INSPECT GENERATOR BRUSH HOLDER ASSY

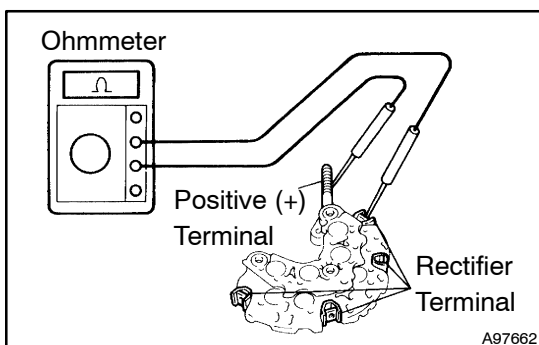
- (a) Using a vernier caliper, measure the exposed brush length.

Standard exposed length:

9.5 to 11.5 mm (0.374 to 0.453 in.)

Minimum exposed length: 1.5 mm (0.059 in.)

If the exposed length is less than the minimum, replace the brush holder assy.



13. INSPECT GENERATOR HOLDER W/ RECTIFIER

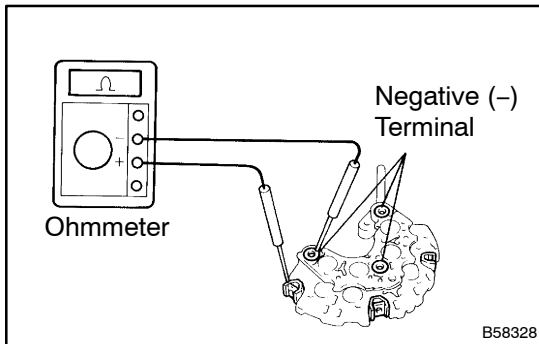
- (a) Check the positive (+) rectifier.

- (1) Connect an ohmmeter probe to the positive (+) terminal and the other probe to a rectifier terminal. Measure the resistance.

- (2) Reverse the tester probes and measure the resistance again.

- (3) The resistance should be below 1 Ω when the probes are connected one way, and 10 kΩ or higher when the probes are reversed.

- (4) Repeat steps (1) to (3) for each rectifier terminal.
If the result is not as specified, replace the rectifier holder.

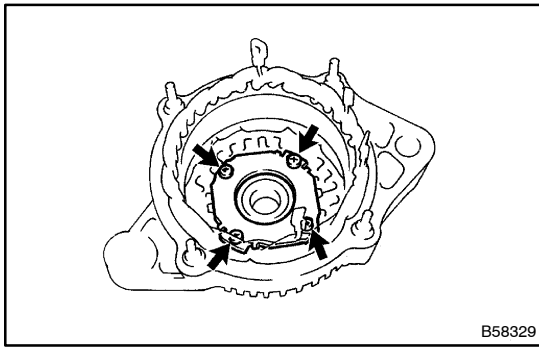


- (b) Check the negative (-) rectifier.
- (1) Connect an ohmmeter probe to the negative (-) terminal and the other probe to a rectifier terminal. Measure the resistance.
 - (2) Reverse the tester probes and measure the resistance again.
 - (3) The resistance should be below 1 Ω when the probes are connected one way, and 10 k Ω or higher when the probes are reversed.

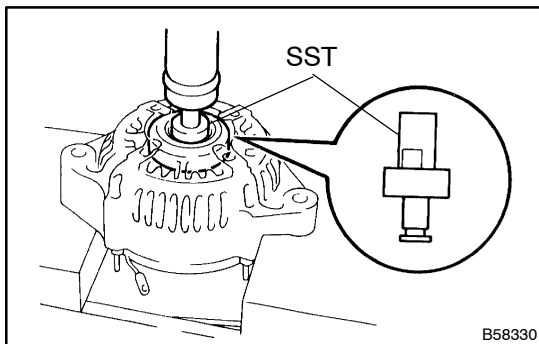
If the result is not as specified, replace the rectifier holder.

14. INSPECT BEARING

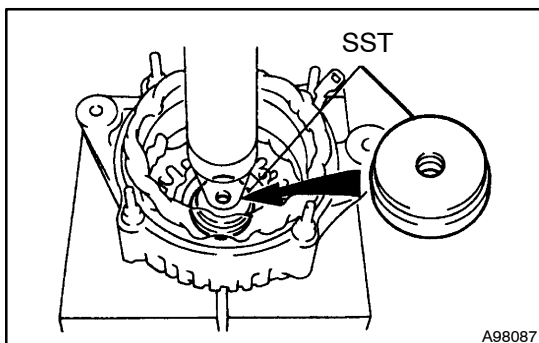
- (a) Check that the bearing is not rough or worn.
If necessary, replace the bearing.



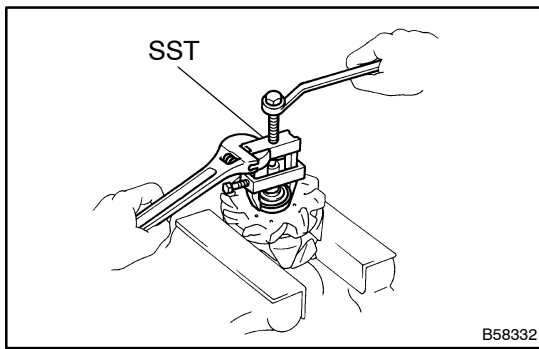
- 15. REMOVE GENERATOR DRIVE END FRAME BEARING**
- (a) Remove the 4 screws and bearing retainer.



- (b) Using SST and a press, press out the bearing.
SST 09950-60010 (09951-00270), 09950-70010 (09951-07100)



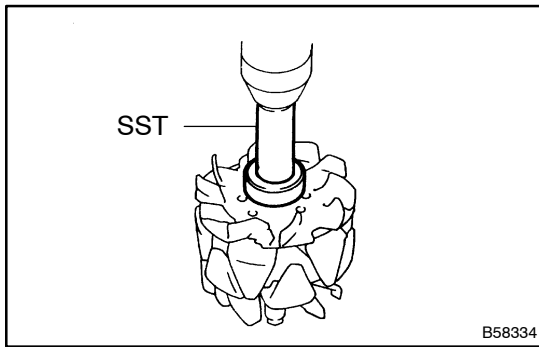
- 16. INSTALL GENERATOR DRIVE END FRAME BEARING**
- (a) Using SST and a press, press in a new bearing.
- (b) Install the bearing retainer with the 4 screws.
Torque: 2.9 N·m (30 kgf·cm, 26 in·lbf)
SST 09950-60010 (09951-00500)

**17. REMOVE GENERATOR ROTOR BEARING**

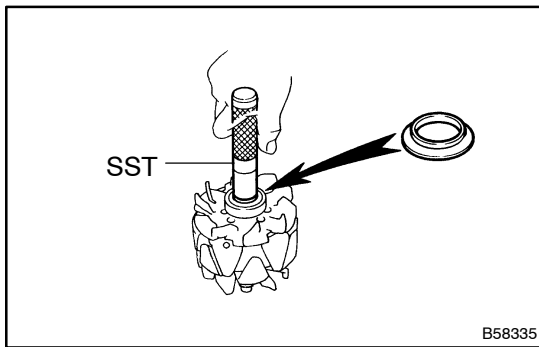
- (a) Using SST, remove the bearing cover and bearing.
SST 09820-00021

NOTICE:

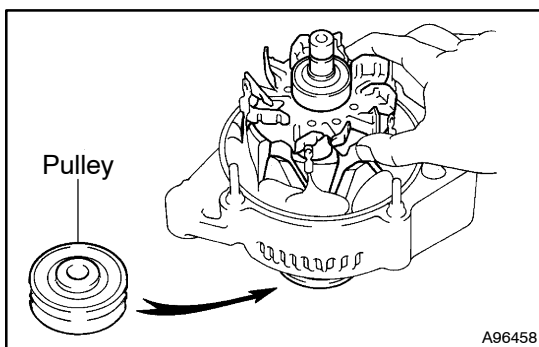
Be careful not to damage the fan.

**18. INSTALL GENERATOR ROTOR BEARING**

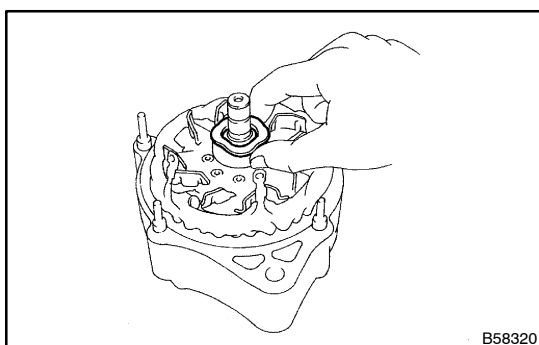
- (a) Using SST and a press, press in a new bearing.
SST 09820-00031



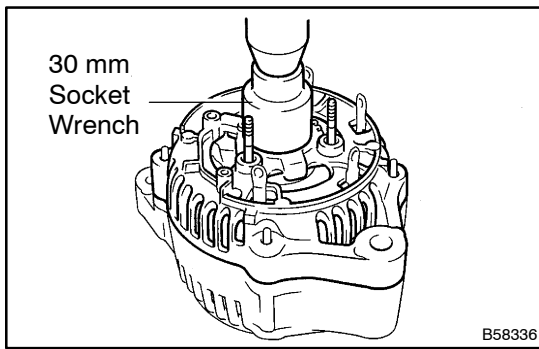
- (b) Using SST, push in the bearing cover.
SST 09285-76010

**19. INSTALL GENERATOR ROTOR ASSY**

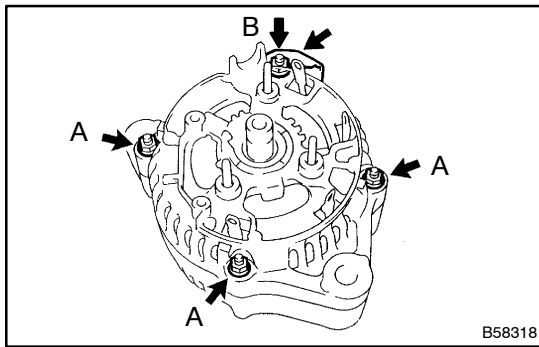
- (a) Place the drive end frame on the pulley.
(b) Install the rotor to the drive end frame.

**20. INSTALL RECTIFIER END FRAME**

- (a) Place the generator washer on the rotor.



- (b) Using a 30 mm socket wrench and press, slowly press in the rectifier end frame.

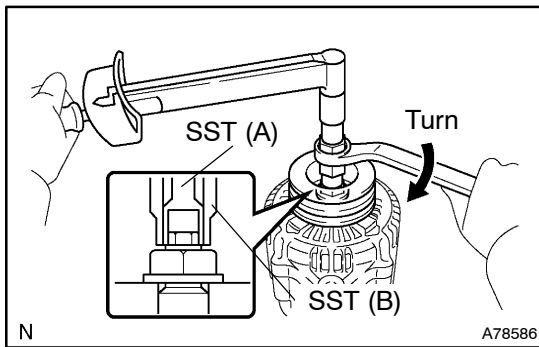


- (c) Install the cord clip and 4 nuts.

Torque:

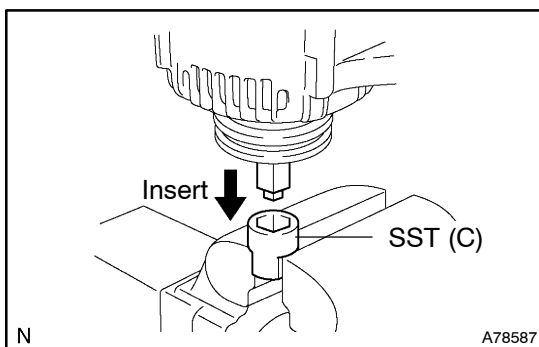
4.5 N·m (46 kgf·cm, 40 in·lbf) for nut A

5.4 N·m (55 kgf·cm, 48 in·lbf) for nut B

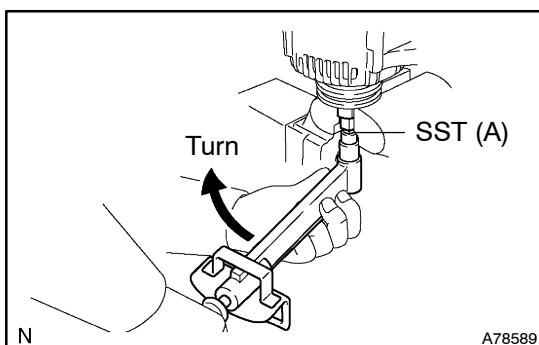


21. INSTALL GENERATOR PULLEY

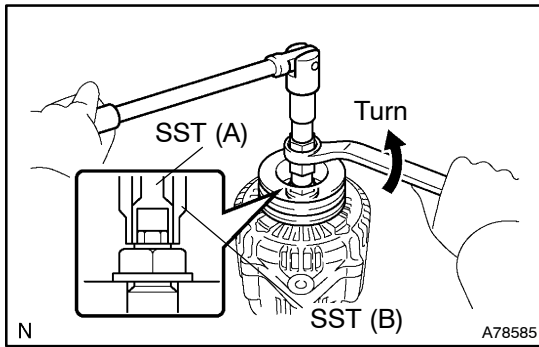
- (a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.
- (b) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.
SST 09820-63010 (09820-06010, 09820-06020)
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
- (c) Check that SST (A) is secured to the pulley shaft.



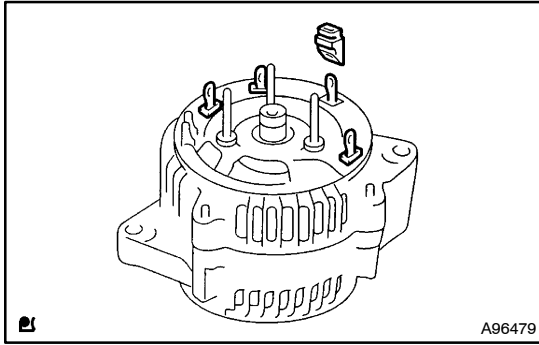
- (d) As shown in the illustration, mount SST (C) in a vise and attach the pulley nut to SST (C).



- (e) To torque the pulley nut, turn SST (A) in the direction shown in the illustration.
Torque: 111 N·m (1,131 kgf·cm, 82 ft·lbf)
- (f) Remove the generator from SST (C).



- (g) Turn SST (B) and remove SST (A and B).

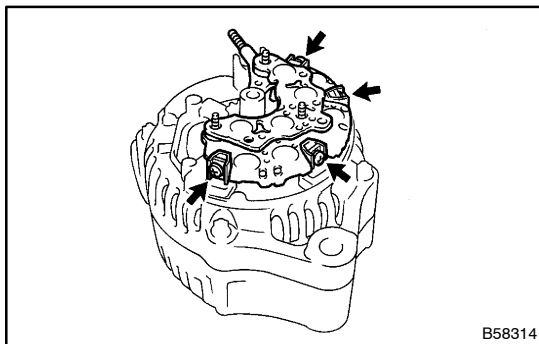


22. INSTALL GENERATOR HOLDER W/ RECTIFIER

- (a) Install the 4 rubber insulators on the lead wires.

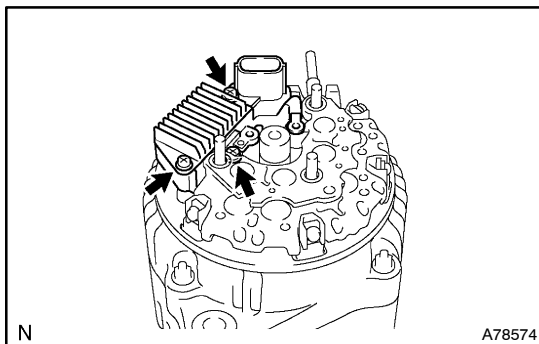
NOTICE:

Make sure each rubber insulator is oriented as shown in the illustration.



- (b) Place the rectifier holder on the rectifier end frame.
 (c) Push the rectifier holder down and install it with the 4 screws.

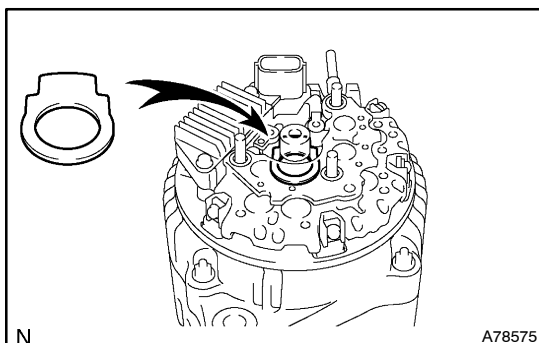
Torque: 2.9 N·m (30 kgf·cm, 26 in.·lbf)



23. INSTALL VOLTAGE REGULATOR

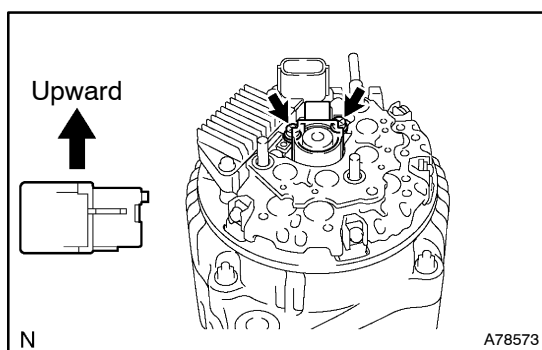
- (a) Install the voltage regulator with the 3 screws.

Torque 2.0 N·m (20 kgf·cm, 18 in.·lbf)



24. INSTALL GENERATOR BRUSH HOLDER ASSY

- (a) Place the plate seal on the rectifier end frame.

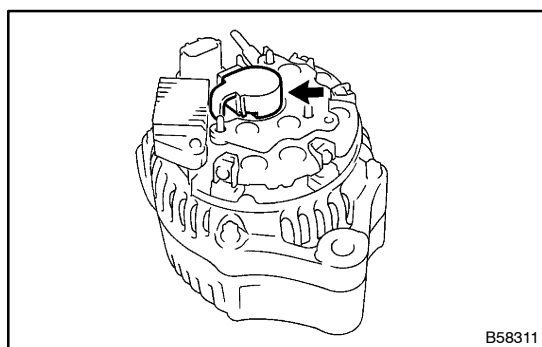


- (b) Install the brush holder with the 2 screws.

Torque: 2.0 N·m (20 kgf·cm, 18 in·lbf)

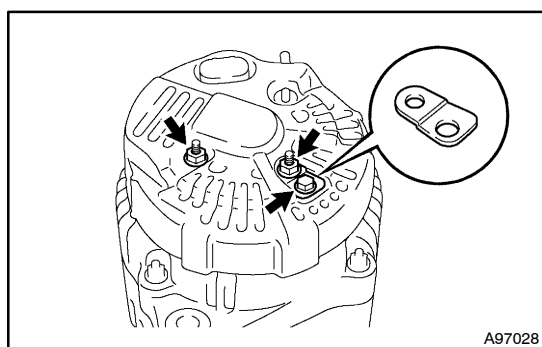
NOTICE:

Be careful of the holder installation direction.



25. INSTALL REAR END COVER

- (a) Place the brush holder cover on the brush holder.

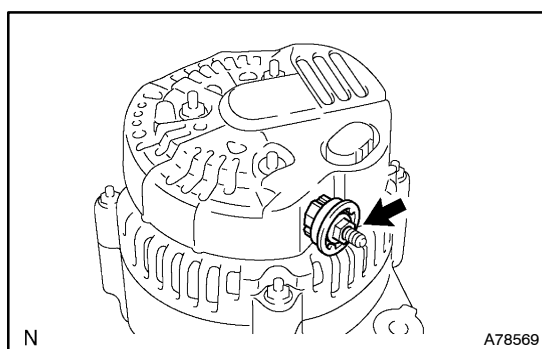


- (b) Install the rear end cover and terminal plate with the 2 nuts and bolt.

Torque:

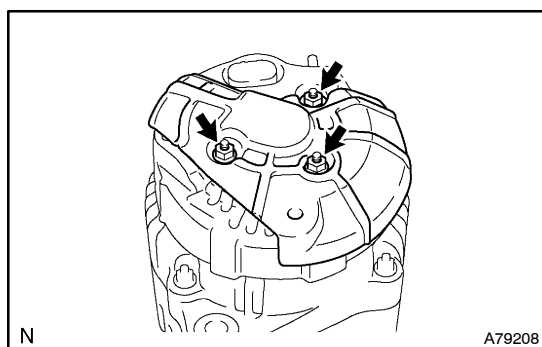
3.9 N·m (39 kgf·cm, 35 in·lbf) for bolt

4.4 N·m (45 kgf·cm, 38 in·lbf) for nut



- (c) Install the terminal insulator with the nut.

Torque: 3.6 N·m (37 kgf·cm, 32 in·lbf)



26. INSTALL REAR END COVER NO. 2

- (a) Install the generator rear end cover with the 3 nuts.

Torque: 4.4 N·m (45 kgf·cm, 38 in·lbf)

- (b) Turn the pulley and check that the pulley moves smoothly.

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