

HOW TO USE THIS MANUAL

GENERAL INFORMATION

0106E-06

1. GENERAL DESCRIPTION

- (a) This manual is made in accordance with SAE J2008.
- (b) Generally repair operations can be separated in the following 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", but "Final Inspection" is omitted.
- (d) The following essential operations are not written in this manual, however these operations must be done in the practical 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 is provided as a section on the end of the book to guide you to the item to be repaired.

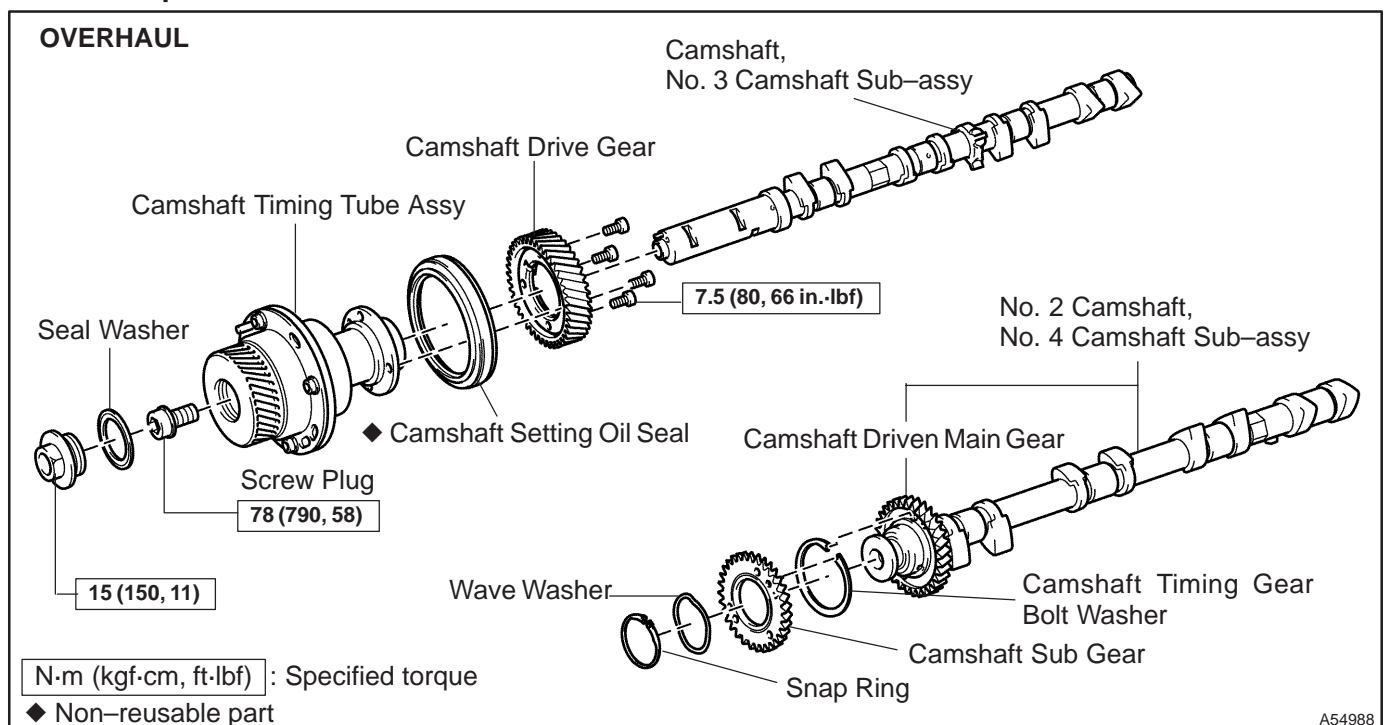
3. PREPARATION

- (a) Use of special service tools (SST) and special service materials (SSM) may be required, depending on the repairing condition. 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) Component drawing is placed as the section or 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 applied parts, precoated parts and tightening torque are specified in the components drawing.

Example:



- (d) Tightening torque, oil applying position, and non-reusable parts are described as important points in the procedure.

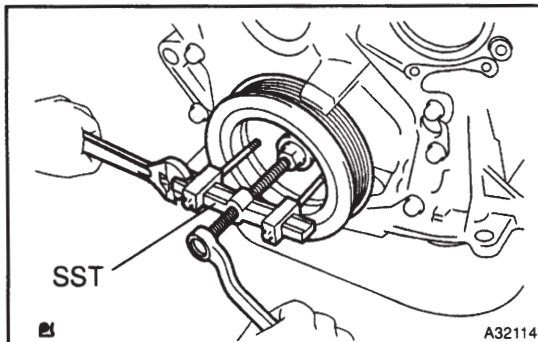
NOTICE:

There are cases where such information can only be indicated by an illustration. In that case, all the information such as torque, oil, etc. are described in the illustration.

- (e) Installing procedure of operation items is performed in the reverse order of the removing, and only the important points are described.
- (f) Only items with points are described in the procedure, and the operational portion and content are placed using an illustration. In the explanations, details of the operational method, standard value and notice are placed.
- (g) There may be a case where the illustrations of similar models are used. In that case the details may be different from the actual vehicle.
- (h) The 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 detailed text tells how to perform the task and gives other 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. Component part No. Detailed text:
how to do task*

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HINT:

This format provides an experienced technician with a FAST TRACK to the necessary information. The task heading can be read at a glance when necessary, and the text below provides detailed information. Important specifications and warnings always stand out in bold type.

5. SERVICE SPECIFICATIONS

- (a) Specifications are presented in bold type throughout the manual. You never have to leave the procedure to look up your specifications. The specifications are also found in the Service Specifications section for a quick reference.

6. TERMS DEFINITION

CAUTION	Indicate the possibility of injury to you or other people.
NOTICE	Indicate the possibility of damage to the components being repaired.
HINT	Provide additional information to help you perform the repair efficiently.

7. SI UNIT

- (a) The UNITS given in this manual are primarily expressed according to the SI UNIT (International System of Unit), and alternately expressed in the metric system and in the English System.

Example:

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

REPAIR INSTRUCTION

010BM-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 engine, it often causes functional failure of the engine.
- (1) Precaution before disassembly.
 - Remove adequately all sand and mud adhere to the outside of engine .
 - (2) Precaution at reassembly.
 - Protect disassembled parts from dust by using vinyl sheet to cover.

2. TO PREVENT SCRATCHES ON THE PARTS.

- (a) The existence of scratches on the contact and revolving surfaces often causes oil leak and seizure.
- (1) Precautions at disassembly and reassembly.
 - When disassemble the contact surface of the parts, use plastic hammer striking lightly. (Do not pry out by screwdriver).
 - When fix 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 needs to be well 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 needs to 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 needs to be put in order as disassembled, not to change position and/or direction.
 - Follow the directions when the manual instructs the position and direction.

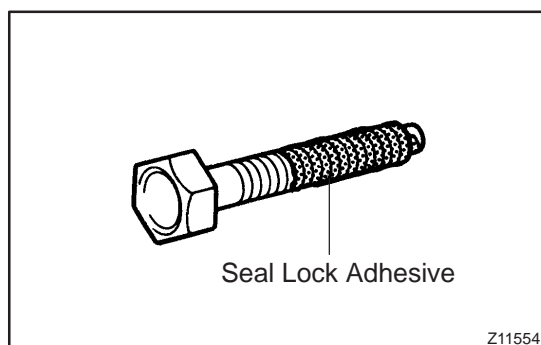
5. INSTALL ENGINE ASSEMBLY TO OVERHAUL STAND WHEN OVERHAUL THE ENGINE.

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

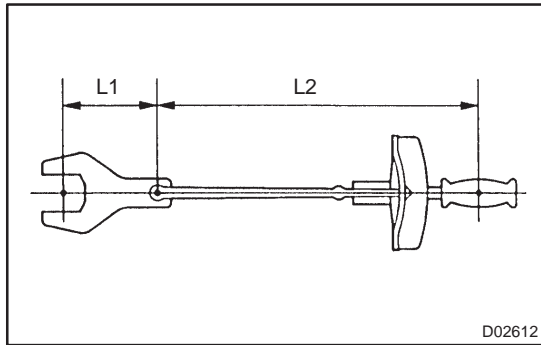


(a) Precoated Parts:

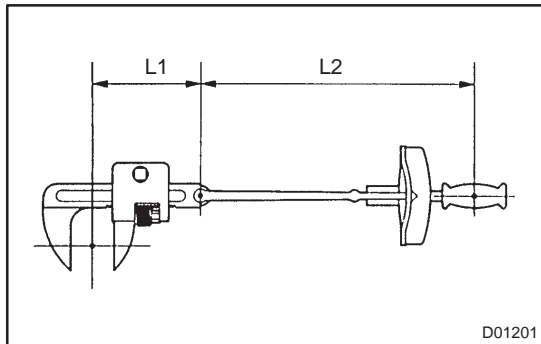
- (1) Precoated parts are bolts, nuts, etc. that are coated with a seal lock adhesive at the factory.
- (2) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.
- (3) When reusing precoated parts, clean off the old adhesive and dry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

NOTICE:**Do the torque checking with the lower limit value of the torque tolerance.**

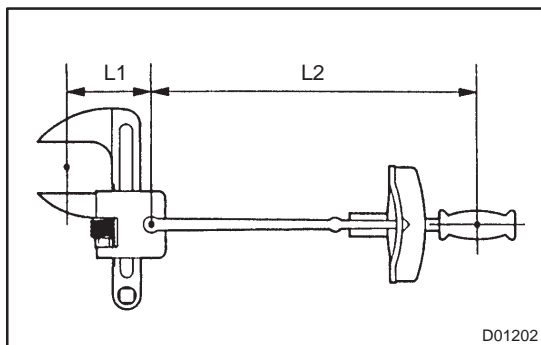
- (4) Depending on the seal lock agent to apply, there may be a case where it is necessary to leave it for a specified time until it hardens.
- (b) Gaskets:
When necessary, use a sealer on gaskets to prevent leaks.
- (c) Bolts, Nuts and Screws:
Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.



- (d) Torque When Using Extension Tool with Torque Wrench:
- (1) In case of tightening by extending the entire length of the torque wrench combined with SST or tool, if you tighten until the reading of the torque wrench reached the specified torque value, the actual torque becomes excessive.
 - (2) In this text, only the specified torque is described. In case of using SST or extension tool, find the reading of the torque wrench by the formula.
 - (3) Formula $T' = T \times L2 / (L1 + L2)$

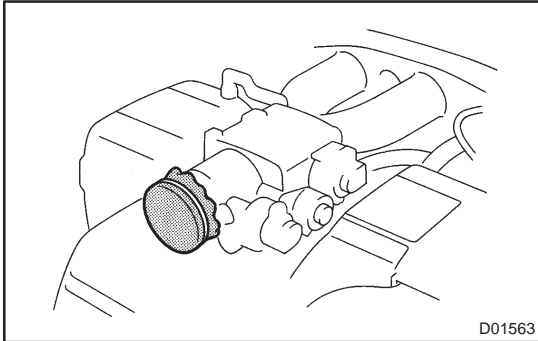


T'	Reading of torque wrench {N·m (kgf·cm, ft·lbf)}
T	Torque {N·m (kgf·cm, ft·lbf)}
L1	Length of SST or tool (cm)
L2	Length of torque wrench (cm)

**10. REMOVAL AND INSTALLATION OF FUEL CONTROL PARTS**

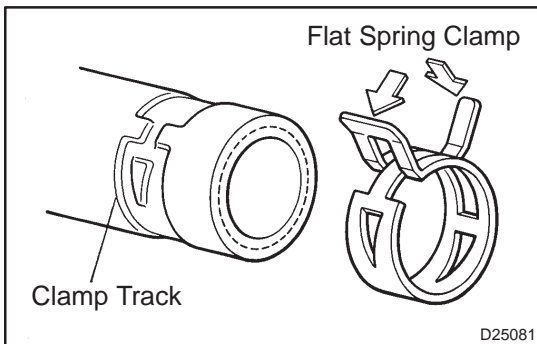
- (a) Place for Removing and Installing Fuel System Parts:
- (1) Place with good air ventilation and without anything flammable such as welder, grinder, drill, electric motor or stove in the surroundings.
 - (2) Never work in a place like a pit or nearby pit as there is a possibility that vaporized fuel fills those places.
- (b) Removing and Installing of Fuel System Parts:
- (1) Prepare a fire extinguisher before starting the operation.
 - (2) For prevention of the static electricity, install a ground on the fuel changer, vehicle and fuel tank, and do not spray much water so as to prevent slipping.

- (3) Never use any electric equipment like an electric motor or a working light as they may cause spark or high temperature.
- (4) Never use an iron hammer as it may cause spark.
- (5) Dispose the shop rag separately from any fuel deposit.



11. REMOVAL AND INSTALLATION OF ENGINE INTAKE PARTS

- (a) If any metal tip is mixed in the inlet pass, that may give a bad effect to the engine and turbo charger.
- (b) When removing and installing of the inlet system parts, close the opening of the removed inlet system parts and the engine with a clean shop rag or gum tape.
- (c) When installing the inlet system parts, check that there is no mixing of a metal tip.



12. HANDLING OF HOSE CLAMPS

- (a) Before removing the hose, check the depth of inserting portion and the clamp position to restore it surely.
- (b) Change a deformed or dented into a new one.
- (c) In case of reusing the hose, install the clamp on the hose where it has a clamp track.
- (d) For a flat spring type clamp, make it adjust by adding force to the arrow mark direction after the installation.

TERMS

ABBREVIATIONS USED IN THIS MANUAL

010B9-02

Abbreviations	Meaning
ABS	Anti-Lock Brake System
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, ATM	Automatic Transmission (Transaxle)
ATF	Automatic Transmission Fluid
AUTO	Automatic
AUX	Auxiliary
AVG	Average
AVS	Adaptive Variable Suspension
B+	Battery Voltage
BA	Brake Assist
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
Calif.	California
CB	Circuit Breaker
CCo	Catalytic Converter For Oxidation
CD	Compact Disc
CF	Cornering Force
CG	Center Of Gravity
CH	Channel
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 Cam
DP	Dash Pot
DS	Dead Soak
DSP	Digital Signal Processor
DTC	Diagnostic Trouble Code
DVD	Digital Versatile Disc
EBD	Electric Brake force Distribution
ECAM	Engine Control And Measurement System
ECD	Electronic Controlled Diesel
ECDY	Eddy Current Dynamometer
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
EMPS	Electric Motor Power Steering
ENG	Engine
ESA	Electronic Spark Advance
ETCS-i	Electronic Throttle Control System-intelligent
EVAP	Evaporative Emission Control
EVP	Evaporator
E-VRV	Electric Vacuum Regulating Valve
EX, EXH	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
FR	Front-Engine Rear-Wheel-Drive
F/W	Flywheel
FW/D	Flywheel Damper
FWD	Front-Wheel-Drive
GAS	Gasoline
GND	Ground
GPS	Global Positioning System
HAC	High Altitude Compensator
H/B	Hatchback
H-FUSE	High Current Fuse
HI	High

INTRODUCTION - TERMS

Abbreviations	Meaning
HID	High Intensity Discharge (Head Lamp)
HPU	Hydraulic Power Unit
HSG	Housing
HT	Hard Top
HWS	Heated Windshield System
IAC	Idel Air Control
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
M-FUSE	Mediam Current Fuse
MIC	Microphone
MIL	Malfunction Indicator Lamp
MIN.	Minimum
MG1	Motor Generator No.1
MG2	Motor Generator No.2
MP	Multipurpose
MPI	Multipoint Electronic Injection
MPX	Multiplex Communication System
M/T, MTM	Manual Transmission
MT	Mount
MTG	Mounting
N	Neutral
NA	Natural Aspiration
No.	Number
O/D	Overdrive

Abbreviations	Meaning
OEM	Original Equipment Manufacturing
OHC	Overhead Camshaft
OHV	Overhead Valve
OPT	Option
ORVR	On-board Refilling Vapor Recovery
O/S	Oversize
P & BV	Proportioning And Bypass Valve
PCS	Power Control System
PCV	Positive Crankcase Ventilation
PKB	Parking Brake
PPS	Progressive Power Steering
PS	Power Steering
PTO	Power Take-Off
P/W	Power Window
R & P	Rack And Pinion
RAM	Random Access Memory
R/B	Relay Block
RBS	Recirculating Ball Type Steering
R/F	Reinforcement
RFS	Rigid Front Suspension
RH	Right-Hand
RHD	Right-Hand Drive
RLY	Relay
ROM	Read Only Memory
Rr	Rear
RR	Rear-Engine Rear-Wheel-Drive
RRS	Rigid Front Suspension
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	TOYOTA Computer-Controlled System
TCV	Timing Control Valve
TDC	Top Dead Center
TEMP.	Temperature
TEMS	TOYOTA Electronic Modulated Suspension

INTRODUCTION – TERMS

Abbreviations	Meaning
TFT	Toyota Free-Tronic
TIS	Total Information System For Vehicle Development
T/M	Transmission
TMC	TOYOTA Motor Corporation
TMMK	TOYOTA Motor Manufacturing Kentucky, Inc.
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
VSC	Vehicle Stability 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
WU-TWC	Warm Up Three-way Catalytic Converter
WU-OC	Warm Up Oxidation Catalytic Converter
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 TOYOTA TERMS

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

SAE ABBREVIATIONS	SAE TERMS	TOYOTA 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	Carburetor	Carburetor
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 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	TOYOTA 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

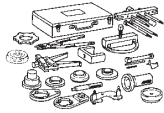
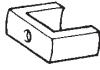
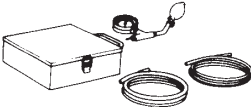

HO2S	Heated Oxygen Sensor	Heated Oxygen Sensor (HO ₂ S)
IAC	Idle Air Control	Idle Speed Control (ISC)
IAT	Intake Air Temperature	Intake or Inlet Air Temperature
ICM	Ignition Control Module	–
IFI	Indirect Fuel Injection	Indirect Injection (IDL)
IFS	InertiaFuel–Shutoff	–
ISC	Idle Speed Control	–
KS	Knock 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 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	-

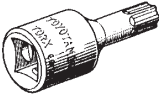
INTAKE PREPARATION

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SST

	09350-32014	TOYOTA Automatic Transmission Tool Set	TURBOCHARGER ASSEMBLY(1CD-FTV)
	(09351-32070)	No.2 Piston Spring Compressor	TURBOCHARGER ASSEMBLY(1CD-FTV)
	09992-00242	Turbocharger Pressure Gauge	TURBOCHARGER ASSEMBLY(1CD-FTV)
	09992-00600	Crank Type Spindle	TURBOCHARGER ASSEMBLY(1CD-FTV)

Recommended Tools

	09042-00010	Torx Socket T30	TURBOCHARGER ASSEMBLY(1CD-FTV)
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SSM

	08826-00080	Seal Packing Black or equivalent (FIPG)	TURBOCHARGER ASSEMBLY(1CD-FTV)
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Equipment

Dial indicator	
Torque wrench	
Protractor	
Steel square	


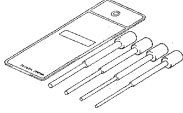
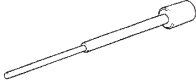
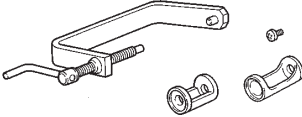
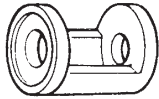


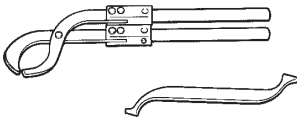
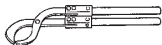

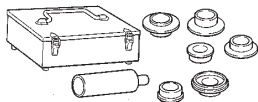

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ENGINE MECHANICAL


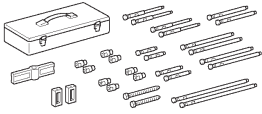
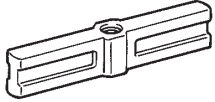
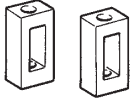
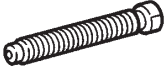
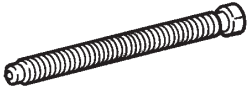

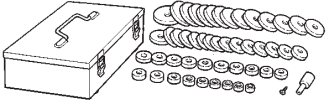


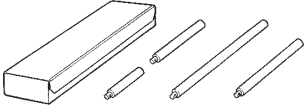

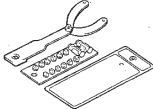
PREPARATION


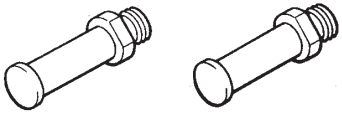
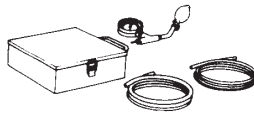
0214S-01

SST

	09032-00100	Oil Pan Seal Cutter	PARTIAL ENGINE ASSY(1CD-FTV)
	09201-10000	Valve Guide Bushing Remover & Replacer Set	CYLINDER HEAD ASSY(1CD-FTV)
	(09201-01060)	Valve Guide Bushing Remover & Replacer 6	CYLINDER HEAD ASSY(1CD-FTV)
	09202-70020	Valve Spring Compressor	CYLINDER HEAD ASSY(1CD-FTV)
	(09202-00010)	Attachment	CYLINDER HEAD ASSY(1CD-FTV)
	09223-15030	Oil Seal & Bearing Replacer	PARTIAL ENGINE ASSY(1CD-FTV)
	09223-46011	Crankshaft Front Oil Seal Replacer	PARTIAL ENGINE ASSY(1CD-FTV)
	09248-55050	Valve Clearance Adjust Tool Set	PARTIAL ENGINE ASSY(1CD-FTV)
	(09248-05510)	Valve Lifter Press	PARTIAL ENGINE ASSY(1CD-FTV)
	(09248-05520)	Valve Lifter Stopper	PARTIAL ENGINE ASSY(1CD-FTV)
	09316-60011	Transmission & Transfer Bearing Replacer	PARTIAL ENGINE ASSY(1CD-FTV)
	(09316-00011)	Replacer Pipe	PARTIAL ENGINE ASSY(1CD-FTV)

PREPARATION - ENGINE MECHANICAL

	(09316-00021) Replacer "A"	PARTIAL ENGINE ASSY(1CD-FTV)
	09950-50013 Puller C Set	PARTIAL ENGINE ASSY(1CD-FTV)
	(09951-05010) Hanger 150	PARTIAL ENGINE ASSY(1CD-FTV)
	(09952-05010) Slide Arm	PARTIAL ENGINE ASSY(1CD-FTV)
	(09953-05010) Center Bolt 100	PARTIAL ENGINE ASSY(1CD-FTV)
	(09953-05020) Center Bolt 150	PARTIAL ENGINE ASSY(1CD-FTV)
	(09954-05021) Claw No.2	PARTIAL ENGINE ASSY(1CD-FTV)
	09950-60010 Replacer Set	CYLINDER HEAD ASSY(1CD-FTV) CYLINDER BLOCK(1CD-FTV)
	(09951-00210) Replacer 21	CYLINDER HEAD ASSY(1CD-FTV)
	(09951-00350) Replacer 35	CYLINDER BLOCK(1CD-FTV)
	09950-70010 Handle Set	CYLINDER HEAD ASSY(1CD-FTV) CYLINDER BLOCK(1CD-FTV) PARTIAL ENGINE ASSY(1CD-FTV)
	(09951-07100) Handle 100	CYLINDER HEAD ASSY(1CD-FTV) CYLINDER BLOCK(1CD-FTV) PARTIAL ENGINE ASSY(1CD-FTV)
	09960-10010 Variable Pin Wrench Set	PARTIAL ENGINE ASSY(1CD-FTV)

	(09962-01000) Variable Pin Wrench Arm Assy	PARTIAL ENGINE ASSY(1CD-FTV)
	(09963-01000) Pin 10	PARTIAL ENGINE ASSY(1CD-FTV)
	09992-00242 Turbocharger Pressure Gauge	PARTIAL ENGINE ASSY(1CD-FTV)

SSM

	08826-00080 Seal Packing Black or equivalent (FIPG)	CYLINDER HEAD ASSY(1CD-FTV) PARTIAL ENGINE ASSY(1CD-FTV)
	08826-00100 "Seal Packing 1282B," THREE BOND 1282B or equivalent (FIPG)	PARTIAL ENGINE ASSY(1CD-FTV)
	08833-00070 "Adhesive 1324," THREE BOND 1324 or equivalent	CYLINDER HEAD ASSY(1CD-FTV) CYLINDER BLOCK(1CD-FTV)

Equipment

V-block	
Piston ring compressor	
Piston ring expander	
Valve seat cutter	
Hexagon wrench (6 mm)	
Hexagon wrench (8 mm)	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	
Feeler gauge	
Micrometer	
Precision straight edge	
Steel square	
Torque wrench	
Vernier calipers	
Dial indicator with magnetic base	
Slide calipers	
Wooden block	
Spring tester	
Plastigage	
Heater	

LUBRICATION PREPARATION

0214T-01

Equipment

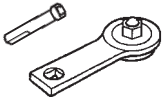

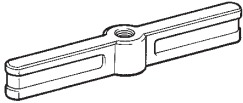
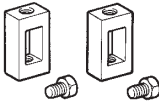
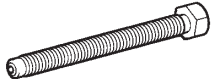
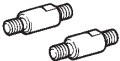
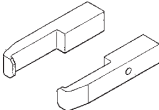
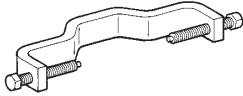
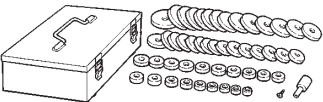

Feeler gauge	
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STARTING & CHARGING


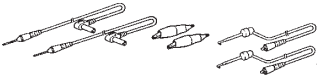
PREPARATION


0214U-01

SST

	09820-63020	Alternator Pulley Wrench Set	GENERATOR ASSY(130A)(1CD-FTV)
	09950-40011	Puller B Set	GENERATOR ASSY(130A)(1CD-FTV)
	(09951-04020)	Hanger 200	GENERATOR ASSY(130A)(1CD-FTV)
	(09952-04010)	Slide Arm	GENERATOR ASSY(130A)(1CD-FTV)
	(09953-04020)	Center Bolt 150	GENERATOR ASSY(130A)(1CD-FTV)
	(09954-04010)	Arm 25	GENERATOR ASSY(130A)(1CD-FTV)
	(09955-04071)	Claw No.7	GENERATOR ASSY(130A)(1CD-FTV)
	(09958-04011)	Holder	GENERATOR ASSY(130A)(1CD-FTV)
	09950-60010	Replacer Set	STARTER ASSY(2.0KW)(1CD-FTV)
	(09951-00340)	Replacer 34	STARTER ASSY(2.0KW)(1CD-FTV)

Recommended Tools

	09082-00040	TOYOTA Electrical Tester	STARTER ASSY(1.4KW)(1CD-FTV) STARTER ASSY(2.2KW)(1CD-FTV) GENERATOR ASSY(130A)(1CD-FTV)
	(09083-00150)	Test Lead Set	STARTER ASSY(1.4KW)(1CD-FTV) STARTER ASSY(2.2KW)(1CD-FTV) GENERATOR ASSY(90A)(1CD-FTV) GENERATOR ASSY(130A)(1CD-FTV)

	(09083-00350) AC/DC 400 A Probe	STARTER ASSY(2.2KW)(1CD-FTV)
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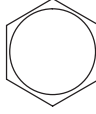
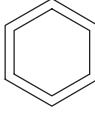
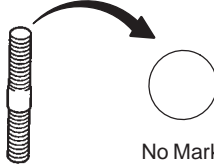
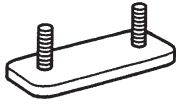




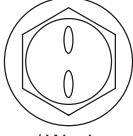
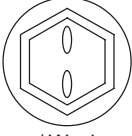
















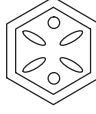
Equipment

V-block	
Feeler gauge	
Ohmmeter	
Torque wrench	
Vernier calipers	
Dial indicator with magnetic base	

STANDARD BOLT

HOW TO DETERMINE BOLT STRENGTH

030KP-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

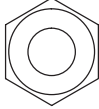
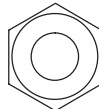
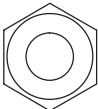


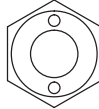

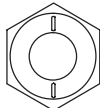
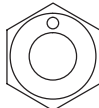
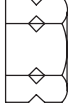
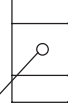

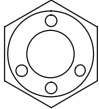

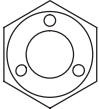
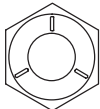
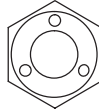


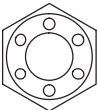

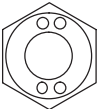
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B06431

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

Present Standard Hexagon Nut	Nut Type		Class
	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

INTAKE

030KS-01

SERVICE DATA

Turbocharger	Actuator pressure		129 – 140 kPa (1.32 – 1.43 kgf/cm ² , 18.7 – 20.3 psi)
	Turbine wheel axial play	Maximum	0.09 mm (0.0035 in.) or less
	Turbine wheel radial play	Maximum	0.16 mm (0.0063 in.) or less

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
V Band	8.3	85	74 in.·lbf
Compressor housing x Bearing housing	4.7	48	42 in.·lbf
Turbocharger actuator x Compressor housing	7.8	80	69 in.·lbf
Compressor inlet elbow x Compressor housing	23	235	17

ENGINE MECHANICAL

SERVICE DATA

03000-05

Cylinder head Warpage	Cylinder brock side Intake manifold side Exhaust manifold side	0.08 mm (0.0031 in.) 0.20 mm (0.0079 in.) 0.20 mm (0.0079 in.)
Intake valve Overall length	Standard Minimum	102.53 mm (4.0366 in.) 102.10 mm (4.0197 in.)
Valve stem diameter Margin thickness	Standard Minimum	5.970 – 5.985 mm (0.2350 – 0.2356 in.) 0.9 (0.035 in.) 0.6 mm (0.0247 in.)
Exhaust valve Overall length	Standard Minimum	101.97 mm (4.0146 in.) 101.55 mm (3.9980 in.)
Valve stem diameter Margin thickness	Standard Minimum	5.960 – 5.975 mm (0.2346 – 0.2352 in.) 0.9 mm (0.035 in.) 0.6 mm (0.024 in.)
Inner compression spring Free length Deviation Installed tension	Maximum at 31.1 mm (1.224 in.)	40.45 mm (1.5925 in.) 2.0 mm (0.079 in.) 177–195 N (18.0 – 19.9 kgf, 39.7 – 44.1 lbf)
Intake Valve guide bush Bushing inside diameter Oil clearance	Standard Maximum	6.010 – 6.030 mm (0.2366 – 0.2374 in.) 0.025 – 0.060 mm (0.0010 – 0.0024 in.) 0.08 mm (0.0031 in.)
Diameter Protrusion height		10.985 – 11.006 mm (0.4325 – 0.4333 in.) 10.05 – 10.45 mm (0.3957 – 0.4114 in.)
Exhaust valve guide bush Bushing inside diameter Oil clearance	Standard Maximum	6.010 – 6.030 mm (0.2366 – 0.2374 in.) 0.035 – 0.070 mm (0.0014 – 0.0028 in.) 0.10 mm (0.0039 in.)
Diameter Protrusion height		10.985 – 11.006 mm (0.4325 – 0.4333 in.) 9.65 – 10.05 mm (0.3799 – 0.3957 in.)
Valve lifter Lifter diameter Lifter bore diameter Oil clearance	Standard Maximum	27.975 – 27.985 mm (1.1014 – 1.1018 in.) 28.010 – 28.031 mm (1.1028 – 1.1036 in.) 0.025 – 0.056 mm (0.0010 – 0.0022 in.) 0.08 mm (0.0031 in.)
Camshaft Circle runout Cam lobe height (No.1)	Maximum Standard Minimum	0.06 mm (0.0024 in.) 46.57 – 46.67 mm (1.8335 – 1.8374 in.) 46.10 mm (1.8150 in.)
Cam lobe height (No.2)	Standard Minimum	47.52 – 47.62 mm (1.8709 – 1.8748 in.) 47.05 mm (1.8524 in.)
Journal diameter Thrust clearance Oil clearance		26.969 – 26.985 mm (1.0618 – 1.0624 in.) 0.035 – 0.11 mm (0.0014 – 0.0043 in.) 0.025 – 0.062 mm (0.0010 – 0.0024 in.)
Gear backlash	Standard Maximum	0.08 mm (0.0031 in.) 0.014 – 0.070 mm (0.0006 – 0.0028 in.) 0.17 mm (0.0067 in.)
Connecting rod Thrust clearance Oil clearance	Standard Maximum Standard Maximum	0.08 – 0.30 mm (0.0031 – 0.0118 in.) 0.40 mm (0.0157 in.) 0.038 – 0.056 mm (0.0015 – 0.0022 in.) 0.10 mm (0.0039 in.)

SERVICE SPECIFICATIONS – ENGINE MECHANICAL

Cylinder block Warpage Bore diameter	Maximum Standard Maximum	0.05 mm (0.0020 in.) 82.200 – 82.213 mm (3.2362 – 3.2367 in.) 82.400 mm (3.2441 in.)
Piston Piston diameter Piston oil clearance Bushing inside diameter	Standard Maximum	82.118 – 82.132 mm (3.2330 – 3.2335 in.) 0.068 – 0.095 mm (0.0027 – 0.0037 in.) 0.14 mm (0.0055 in.) 31.015 – 31.027 mm (1.2211 – 1.2215 in.)
Piston pin Piston pin diameter Oil clearance	Standard Maximum	31.000 – 31.012 mm (1.2205 – 1.2209 in.) 0.030 – 0.027 mm (0.0001 – 0.0011 in.) 0.025 mm (0.0010 in.)
Cylinder head set bolt Out side diameter	Standard Minimum	10.75 – 11.00 mm (0.4234 – 0.4331 in.) 10.40 mm (0.4904 in.)
Connecting rod bolt Diameter	Standard Minimum	8.2 – 8.3 mm (0.323 – 0.327 in.) 8.0 mm (0.315 in.)
Connecting rod Out-of-alignment Rod twist	Maximum per 100 mm (3.94 in.) Maximum per 100 mm (3.94 in.)	0.05 mm (0.0020 in.) 0.15 mm (0.0059 in.)
Crankshaft Thrust clearance Circle runout Crank pin taper and out- of -round Crank pin diameter Main journal diameter Oil clearance	Standard Maximum Maximum Maximum Standard Maximum	0.040 – 0.240 mm (0.0016 – 0.0094 in.) 0.30 mm (0.0118 in.) 0.025 mm (0.0010 in.) 0.01 mm (0.0004 in.) 50.482 – 50.500 mm (1.9875 – 1.9882 in.) 56.992 – 57.010 mm (2.2438 – 2.2445 in.) 0.032 – 0.050 mm (0.0013 – 0.0020 in.) 0.10 mm (0.0039 in.)

TORQUE SPECIFICATION

Part Tightened		N-m	kgf-cm	ft-lbf
Cylinder block water drain cock x Cylinder block		29	291	21
Oil check valve x Cylinder block		30	310	22
Oil pump x Cylinder block		31	320	23
Oil pan x Cylinder block	For 10 mm head bolt and nut	11	112	8.0
	For 12 mm head bolt	21	210	15
	For 14 mm head bolt	42	429	31
Oil strainer x Cylinder block	For bolt	21	210	15
	For nut	13	135	10
Oil pan No.2 x Cylinder block		12	120	9.0
Cylinder head x Cylinder block	1st	45	460	33
	2nd	Turn 90°	Turn 90°	Turn 90°
	3rd	Turn 90°	Turn 90°	Turn 90°
	4th	Turn 90°	Turn 90°	Turn 90°
Camshaft bearing cap x Cylinder head		20	204	15
Water pump x Cylinder block		31	320	23
Camshaft oil seal retainer x Cylinder head		8.8	90	78 in. lbf
Timing belt idler Sub assy No.2 x Oil pump		47	475	34
Timing belt idler No. 1 x Cylinder head		35	350	25
Camshaft timing pulley x Camshaft		88	899	65
Nozzle holder clamp x Cylinder head		27	275	20
Nozzle leakage pipe x Cylinder head	Hollow screw	18	184	13
	Union bolt	22	224	16
Over flow screw x Plug		9.8	100	7.0
Check valve x Cylinder head		21	214	15
Cylinder head cover x Cylinder head		13	135	10
Taper screw plug No.1 x Cylinder head		25	255	18
Cylinder head stud bolt (See Page 14-23)	Bolt A	8.8	90	78 in. lbf
	Bolt B	12	120	9.0
	Bolt C	8.8	90	78 in. lbf
Connecting rod cap x Connecting rod	1st	30	306	22
	2nd	Turn 90°	Turn 90°	Turn 90°
Crankshaft bearing cap x Cylinder block		115	1,173	85
Cylinder block oil orifice x Cylinder block		9.0	92	78 in. lbf
Oil nozzle No.1 x Cylinder block		7.4	76	67 in. lbf

LUBRICATION

SERVICE DATA

0300L-04

Oil pump		
Tip clearance	Standard	0.080-0.160 mm (0.0031 - 0.0063 in.)
	Maximum	0.2 mm (0.0079 in.)
Body clearance	Standard	0.100-0.170 mm (0.0039 - 0.0067 in.)
	Maximum	0.2 mm (0.0079 in.)

STARTING & CHARGING

SERVICE DATA

0300Q-04

Starter assy (1.4kw)		
Circle runout	Maximum	0.05 mm(0.0020 in.)
Diameter	Standard	30 mm (1.18 in.)
	Minimum	29 mm (1.14 in.)
Undercut depth	Standard	0.6 mm (0.024 in.)
	Minimum	0.2 mm (0.008 in.)
Brush length	Standard	15.5 mm (0.61 in.)
	Minimum	8.5 mm (0.3346 in.)
Starter assy (2.0kw)		
Circle runout	Maximum	0.03 mm (0.0012 in.)
Diameter	Standard	32.3 mm (1.272 in.)
	Minimum	30.5 mm (1.201 in.)
Undercut depth	Standard	0.9 mm (0.035 in.)
	Minimum	0.3 mm (0.012 in.)
Brush length	Standard	14.5 mm (0.571 in.)
	Minimum	9.0 mm (0.354 in.)
Starter assy (2.2kw)		
Circle runout	Maximum	0.05 mm(0.0020 in.)
Diameter	Standard	35 mm (1.378 in.)
	Minimum	34 mm (1.3386 in.)
Undercut depth	Standard	0.7 mm (0.0276 in.)
	Minimum	0.2 mm (0.079 in.)
Brush length	Standard	16.5 mm (0.6496 in.)
	Minimum	9.0 mm (0.3543 in.)
Generator assy (90A)		
Rotor coil resistance	at 20°C (68°F)	2.7 – 3.1 Ω
Slip ring diameter	Standard	14.2 – 14.4 mm (0.559 – 0.567 in.)
	Minimum	12.8 mm (0.504 in.)
Brush exposed length	Standard	9.5 – 11.5 mm (0.374 – 0.453 in.)
	Minimum	1.5 mm (0.059 in.)
Generator assy (130A)		
Rotor coil resistance	at 20°C (68°F)	2.3 – 2.7 Ω
Slip ring diameter	Standard	14.2 – 14.4 mm (0.559 – 0.567 in.)
	Minimum	14 mm (0.551 in.)
Brush exposed length	Standard	10.5 mm (0.4134 in.)
	Minimum	4.5 mm (0.177 in.)

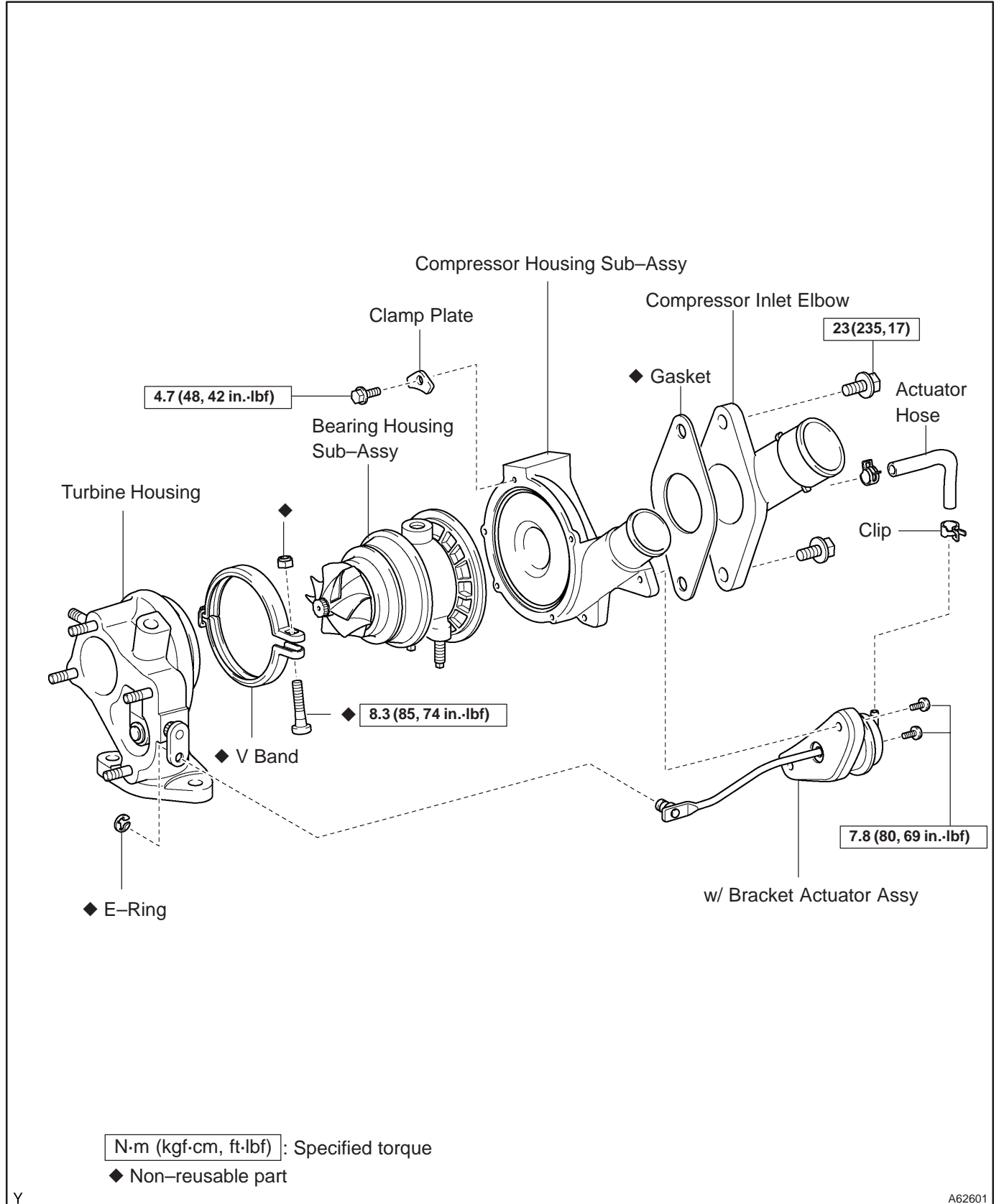
TORQUE SPECIFICATION

Part Tightened	N-m	kgf-cm	ft-lbf	
Starter Assy (1.4kw)				
Commutator end frame Assy x Starter yoke	1.5	15	13 in.·lbf	
Starter housing x Magnetic switch	5.9	60	52 in.·lbf	
Filed frame x Armature assembly	5.9	60	52 in.·lbf	
Lead wire x Terminal C of starter	5.9	60	52 in.·lbf	
Starter Assy (2.0kw)				
Commutator end frame Assy x Starter housing	6.5	66	58 in.·lbf	
Commutator end frame cover x Commutator end frame Assy	1.7	17	15 in.·lbf	
Starter housing x Magnet Starter Switch	5.0	51	44 in.·lbf	
Lead wire x Terminal C of starter	8.0	82	71 in.·lbf	
Starter Assy (2.2kw)				
Starter housing x Magnetic switch	9.3	95	82 in.·lbf	
Filed frame x Armature assembly	12.7	130	9.0	
Lead wire x Terminal C of starter	5.9	60	52 in.·lbf	
Generator (90A)				
Rectifire end frame x Drive end frame				
	Nut A	4.5	46	39 in.·lbf
	Nut B	5.4	55	47 in.·lbf
Rectifire holder x Rectifire end frame		2.9	30	26 in.·lbf
Voltage regulator x Rectifire holder		3.9	40	35 in.·lbf
Brush holder x Rectifier holder		2.0	20	18 in.·lbf
Rear end cover x Rectifier end frame		4.4	45	39 in.·lbf
	Nut			
	Bolt	3.9	39	35 in.·lbf
Generator pulley x Rotor		111	1,133	82
Generator Assy (130 A)				
Rectifire end frame x Drive end frame		5.8	59	51 in.·lbf
Generator pulley x Rotor		111	1,133	82
Brush holder x Rectifire end frame		1.8	18	16 in.·lbf
Rear end cover x Rectifire holder		4.6	47	41 in.·lbf

TURBOCHARGER ASSEMBLY (1CD-FTV) COMPONENTS

13034-01

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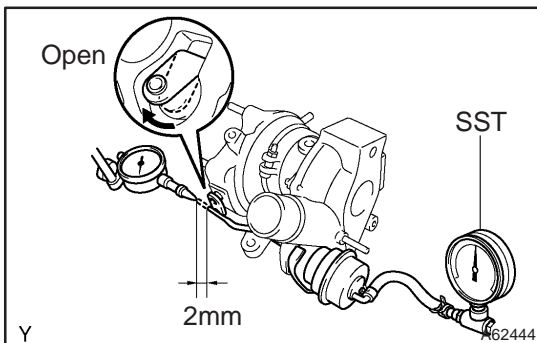
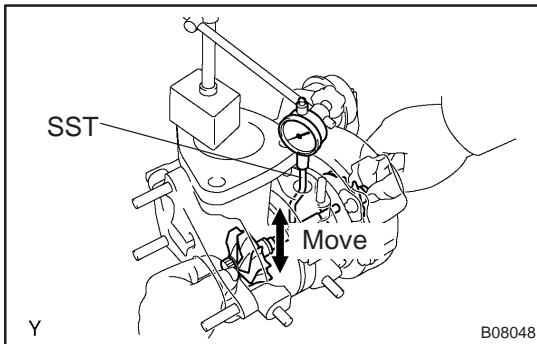
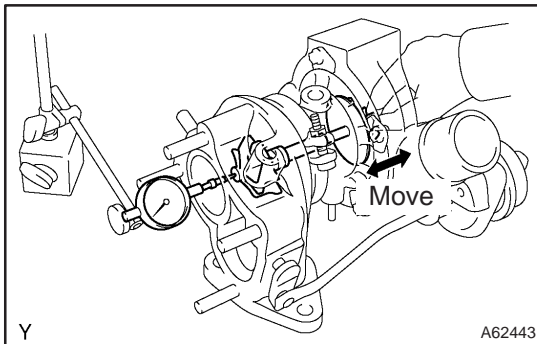
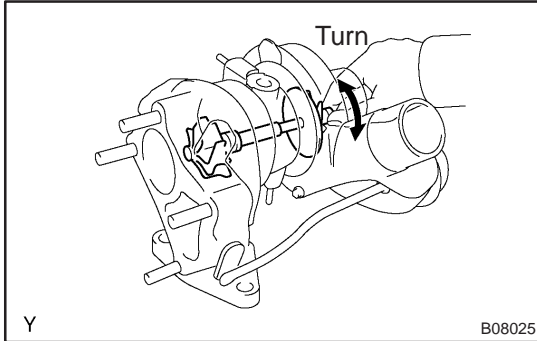
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A62601

OVERHAUL

1. REMOVE COMPRESSOR INLET ELBOW

- (a) Remove 2 bolts and the compressor inlet elbow.



2. INSPECT TURBOCHARGER SUB-ASSY

- (a) Inspect turbine shaft rotation
- (1) Grasp the edge of the turbine shaft, and turn it.
 - (2) Check that the turbine shaft turns smoothly.

If the turbine shaft turns remarkably heavily or stuck, replace the bearing housing. At that time, check also the interference with the turbine housing and compressor housing.

- (b) Inspect axial play of turbine shaft
- (1) Using a dial indicator, insert the needle of the dial indicator into the exhaust side.
 - (2) Move the turbine shaft in an axial direction, measure the axial play of the turbine shaft.

Maximum oil clearance: 0.09 mm (0.0035 in.) or less

If the axial play is greater than maximum, replace the bearing housing. At that time, check also the interference with the turbine housing and compressor housing.

- (c) Inspect radial play of turbine shaft
- (1) Using SST and a dial indicator, insert the needle of the dial indicator into the oil outlet hole, and set it in the center of the turbine shaft.

SST 09992-00600

- (2) Move the turbine shaft in a radial direction, measure the radial play of the turbine shaft.

Maximum oil clearance: 0.16 mm (0.0063 in.) or less

If the radial play is greater than maximum, replace the bearing housing. At that time, check also the interference with the turbine housing and compressor housing.

- (d) Inspect actuator and waste gate valve operation.
- (1) Disconnect the actuator hose from the compressor housing.
 - (2) Using SST and a dial indicator, read the graduation of SST when the actuator push rod moved 2 mm (0.079 in.).

SST 09992-00242

Standard pressure:

129 - 140 kPa (1.32 - 1.43 kgf/cm², 18.7 - 20.3 psi)

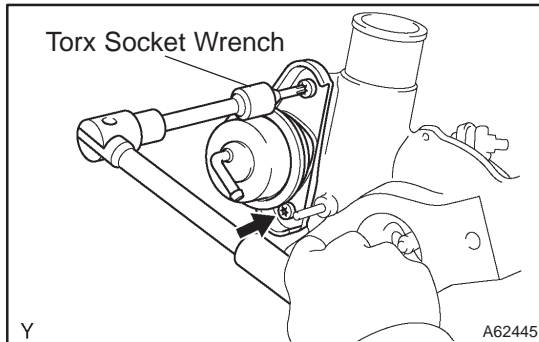
- (e) Move the actuator push rod, and check that the waste gate valve is open.

If operation is not as specified, replace the actuator and/or turbine housing.

NOTICE:

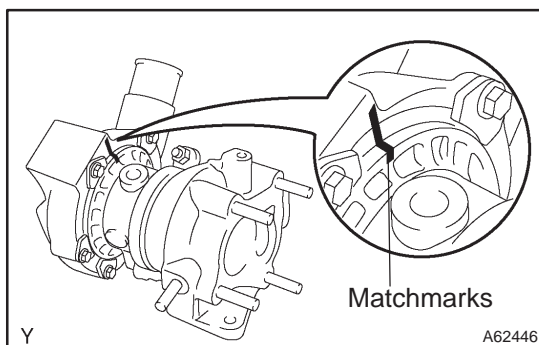
Never apply more than 161 kPa (1.64 kgf/cm², 28.5 psi) of pressure on the actuator.

- (f) Reconnect the actuator hose to the compressor housing.



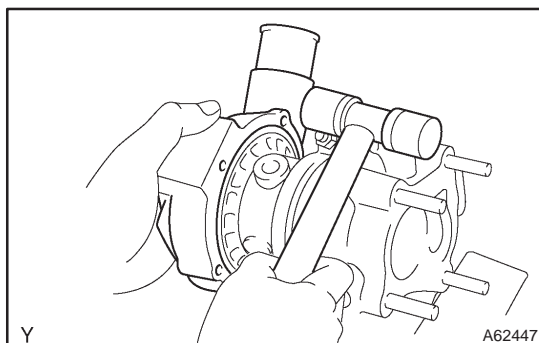
3. REMOVE W/BRACKET ACTUATOR ASSY

- (a) Remove the actuator hose.
 (b) Using a torx socket wrench (T30), remove the 2 screws holding the actuator to the compressor housing.
 (c) Remove the E-ring holding the actuator push rod to the waste gate valve link, and remove the actuator w/ bracket.



4. REMOVE COMPRESSOR HOUSING SUB-ASSY

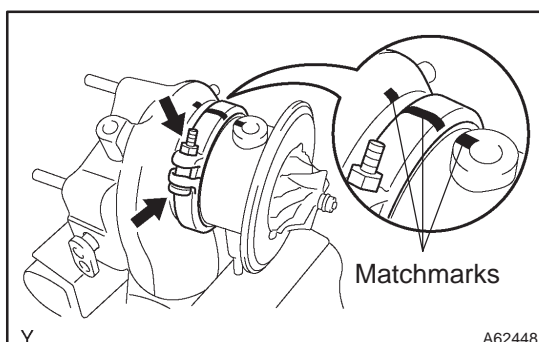
- (a) Place the matchmarks on the compressor housing and the bearing housing.
 (b) Remove the 5 bolts and 5 clamp plates.



- (c) Using a plastic-faced hammer, tap out the compressor housing.

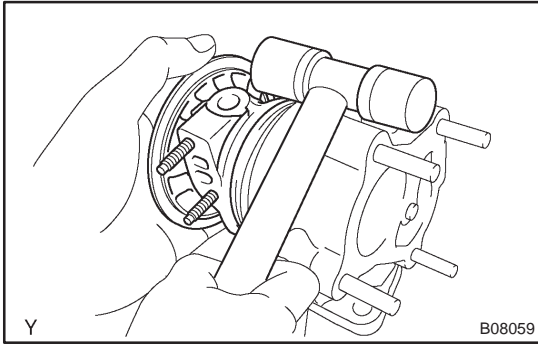
NOTICE:

Remove the compressor housing as straight as possible and do not make the impeller wheel interfere with the compressor housing.



5. REMOVE BEARING HOUSING SUB-ASSY

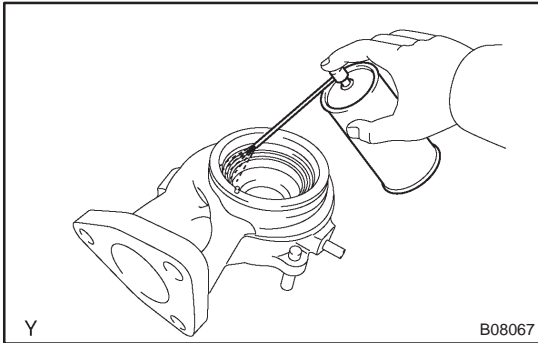
- (a) Place the matchmarks on the V band, turbine housing and bearing housing.
 (b) Remove the flat head square neck bolt, nut and V band.



- (c) Using a plastic-faced hammer, tap out the bearing housing.

NOTICE:

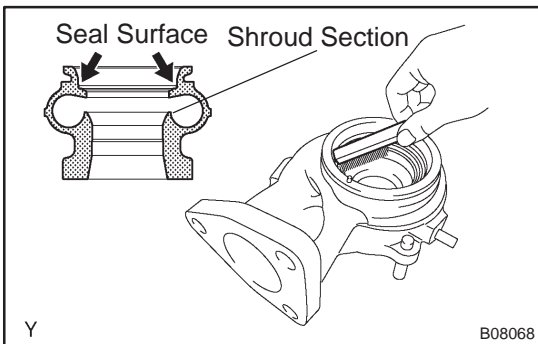
Remove the bearing housing as straight as possible and do not make the turbine wheel interfere with the turbine housing.

**6. CLEAN TURBINE HOUSING**

- (a) Spray the engine conditioner to the section where the carbon dirt is adhered.

NOTICE:

Be careful not to erase the matchmark of the turbine housing.



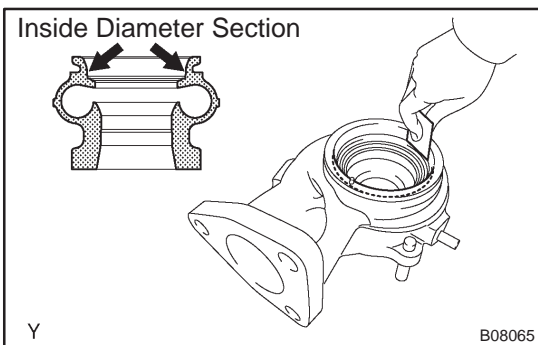
- (b) Using a wire brush, remove all the carbon dirt inside the turbine housing.

NOTICE:

Clean the seal surface and shroud section shown in the illustration sufficiently. And clean the waste gate valve seat sufficiently, too.

HINT:

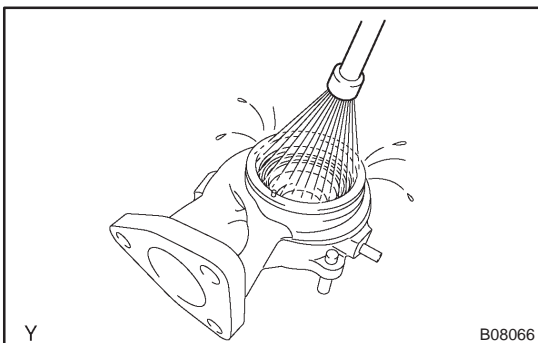
When the carbon dirt is heavily adhered, remove it using the screwdriver and the like.



- (c) Clean the inside diameter section with a sandpaper (No. 100) until the metal surface can be seen.

NOTICE:

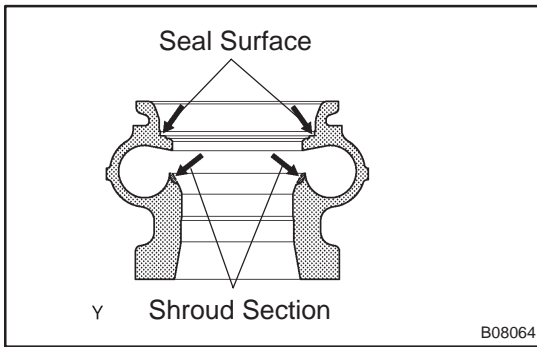
If the cleaning is not enough, installation of the bearing housing becomes harder, so clean it sufficiently.



- (d) Wash with compressed air or a steam cleaner.

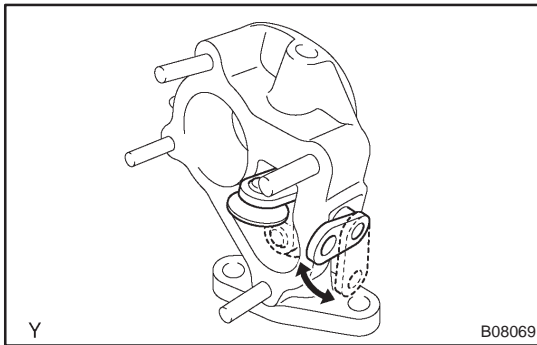
NOTICE:

Wash sufficiently without leaving any irregular objects.



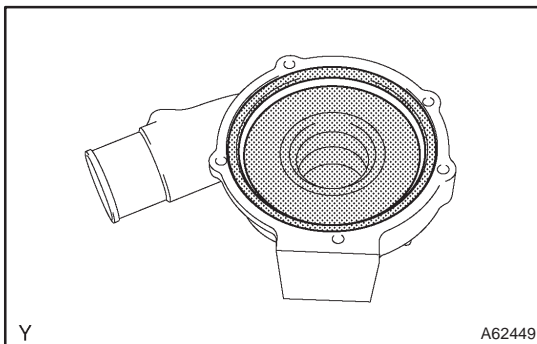
- (e) Check that there is no severe damage on the seal surface with the bearing housing.
- (f) Check that there is no bore made by the interference with the turbine wheel in the shroud section.

If the turbine housing is having remarkable damage or bore, replace the turbine housing and bearing housing.



- (g) Move the waste gate valve link and check that it runs smoothly without sticking.

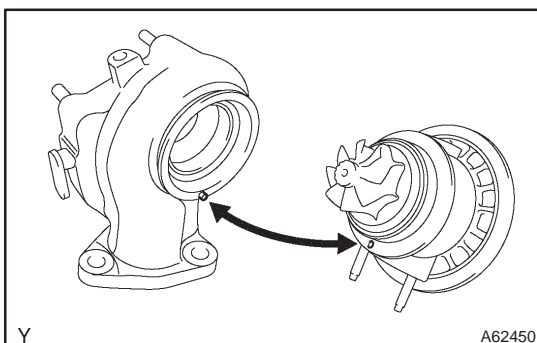
If the link is bad running, clean again. If it is bad running, even after cleaning, replace the turbine housing.



7. CLEAN COMPRESSOR HOUSING SUB-ASSY

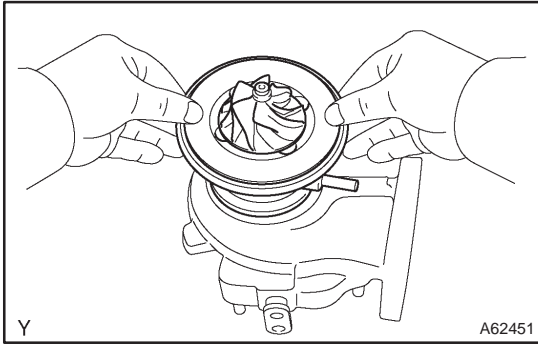
- (a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the compressor housing and bearing housing.
 - (1) Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces.
 - (2) Thoroughly clean all components to remove all the loose material.
 - (3) Using a non-residue solvent, clean both sealing surfaces.
- (b) Wipe off the dirt from the inside of the housing with a shop rag.
- (c) Check that there is no severe interference with the impeller wheel.

If it is having bur made by a slight interference damage, remove it with a sandpaper (No. 400) and blow with compressed air.



8. INSTALL BEARING HOUSING SUB-ASSY

- (a) Align the pin of the turbine housing with the pin hole of the bearing housing.



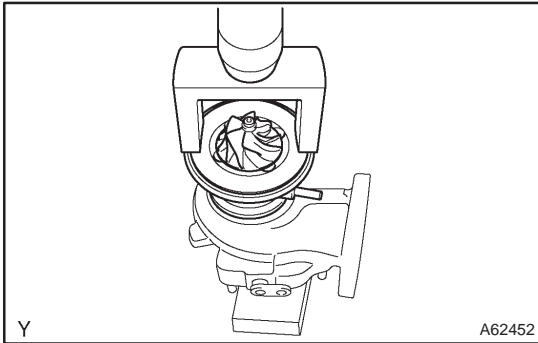
(b) Install the bearing housing to the turbine housing.

NOTICE:

- Install the bearing housing straight, and be careful not to damage the turbine wheel.
- In case of having difficulty of pressing in the bearing housing to install with a hand due to hard engagement, apply the procedure (c).

HINT:

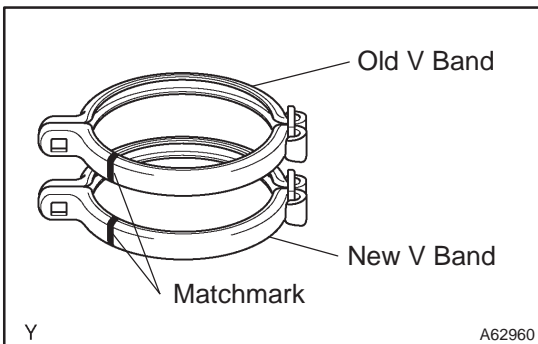
Apply a little penetrate rust prevention lubricant onto the engagement section to make installation easier.



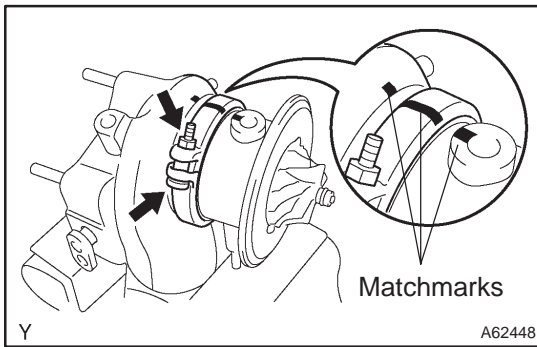
(c) In case that the engagement of the bearing housing is hard, using SST and a press, install the bearing housing while checking the smooth rotation of the impeller wheel. SST 09350-32014 (09351-32070)

NOTICE:

- Do not hold the turbine housing with the stud bolts.
- Be sure to install the bearing housing straight without tilting as the shaft may bent and cause the irregular noise.
- Press in the bearing housing slowly. When the rotation of the impeller wheel becomes heavy, return the press immediately and do the operation again.
- After installation, check that the turbine shaft turns smoothly.



(d) Place a new and old (used) V bands in line, then reprint the matchmark position on the old V band to the new one.

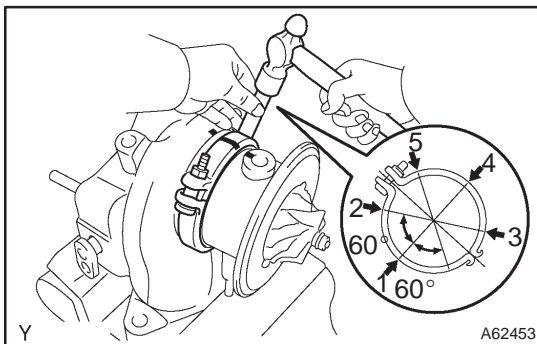
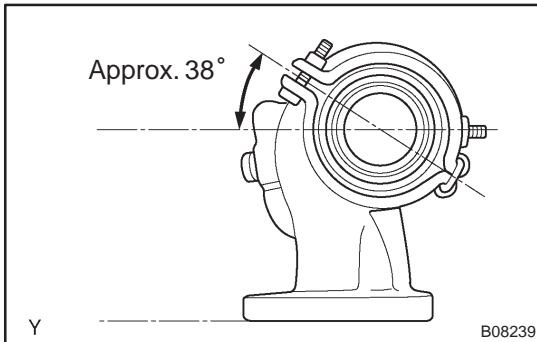


- (e) Align the matchmarks on the new V band, turbine housing and bearing housing, and temporarily torque with a new bolt and nut.

Torque: 8.3 N·m (85 kgf·cm, 74 in·lbf)

HINT:

When the marks are erased, make the matching openings meet at the position shown in the illustration.



- (f) Using a brass bar and hammer, hit 2 or 3 times lightly at each place in order of 1 through 5.

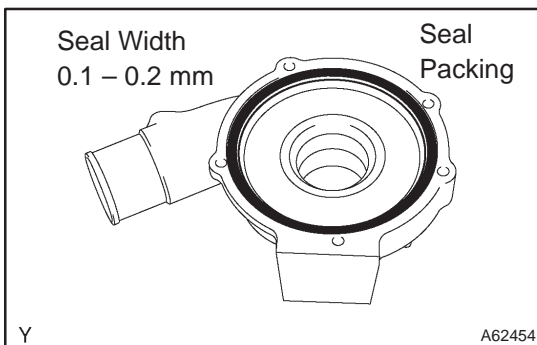
- (g) Torque the bolt and nut more.

Torque: 8.3 N·m (85 kgf·cm, 74 in·lbf)

- (h) Using a brass bar and hammer, hit 2 or 3 times lightly at each place of 1 and 4.

- (i) Torque the bolt and nut completely.

Torque: 8.3 N·m (85 kgf·cm, 74 in·lbf)



9. INSTALL COMPRESSOR HOUSING SUB-ASSY

- (a) In case of reusing the compressor housing and bearing housing:

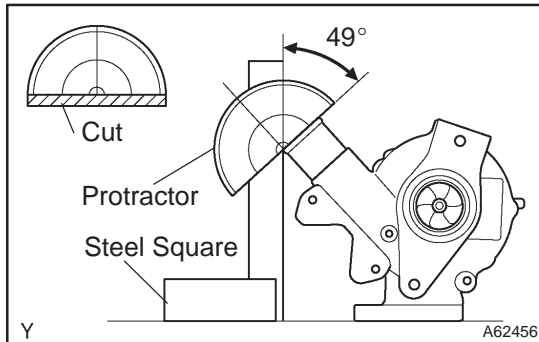
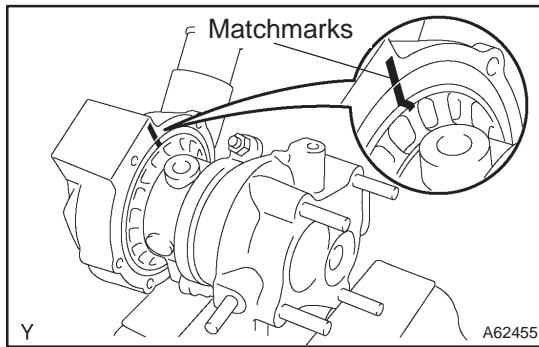
- (1) Apply seal packing to the compressor housing as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

Avoid applying an excessive amount to the surface.

- Install a nozzle that has been cut to a 0.1 – 0.2 mm (0.004 – 0.008 in.) opening.
- Parts must be assembled within 7 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall the cap.



- (2) Align the matchmarks on the compressor housing and bearing housing, and install them.

NOTICE:

- Do not make the impeller wheel interfere with the compressor housing.
- Check that the turbine shaft turns smoothly.

- (3) Using a steel square and protractor, check the installation angle of the outlet port of the compressor housing shown in the illustration.

- (4) Install the 5 clamp plates and bolts.

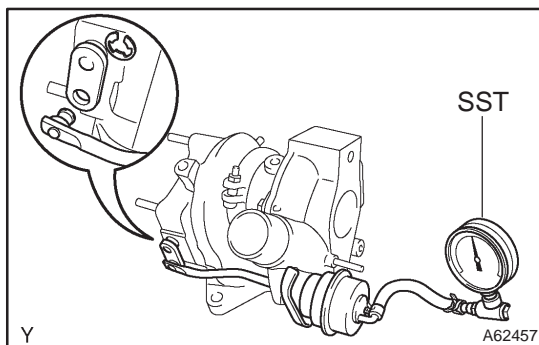
Torque: 4.7 N·m (48 kgf·cm, 42 in·lbf)

- (b) In case of using a new compressor housing and/or bearing housing :

- (1) Temporarily install the compressor housing on the bearing housing, make the installation angle of the outlet port of the compressor housing meet at the position shown in the illustration, and place the matchmarks.

- (2) Remove the compressor housing.

- (3) The following procedure is the same as that of reusing the compressor housing and/or bearing housing.

**10. INSTALL W/BRACKET ACTUATOR ASSY**

- (a) Using a torx wrench (T30), install the actuator w/ bracket to the compressor housing with the 2 screws.

Torque: 7.8 N·m (80 kgf·cm, 69 in·lbf)

- (b) Using SST, move the actuator push rod.

SST 09992-00242

NOTICE:

Never apply more than 197 kPa (2.01 kgf/cm², 28.5 psi) of pressure on the actuator.

- (c) Connect the actuator push rod to the waste gate valve link with a new E-ring.

NOTICE:

Do not use a hammer, etc. to force the actuator push rod onto the waste gate valve link.

- (d) Remove the SST.

- (e) Connect the actuator hose.

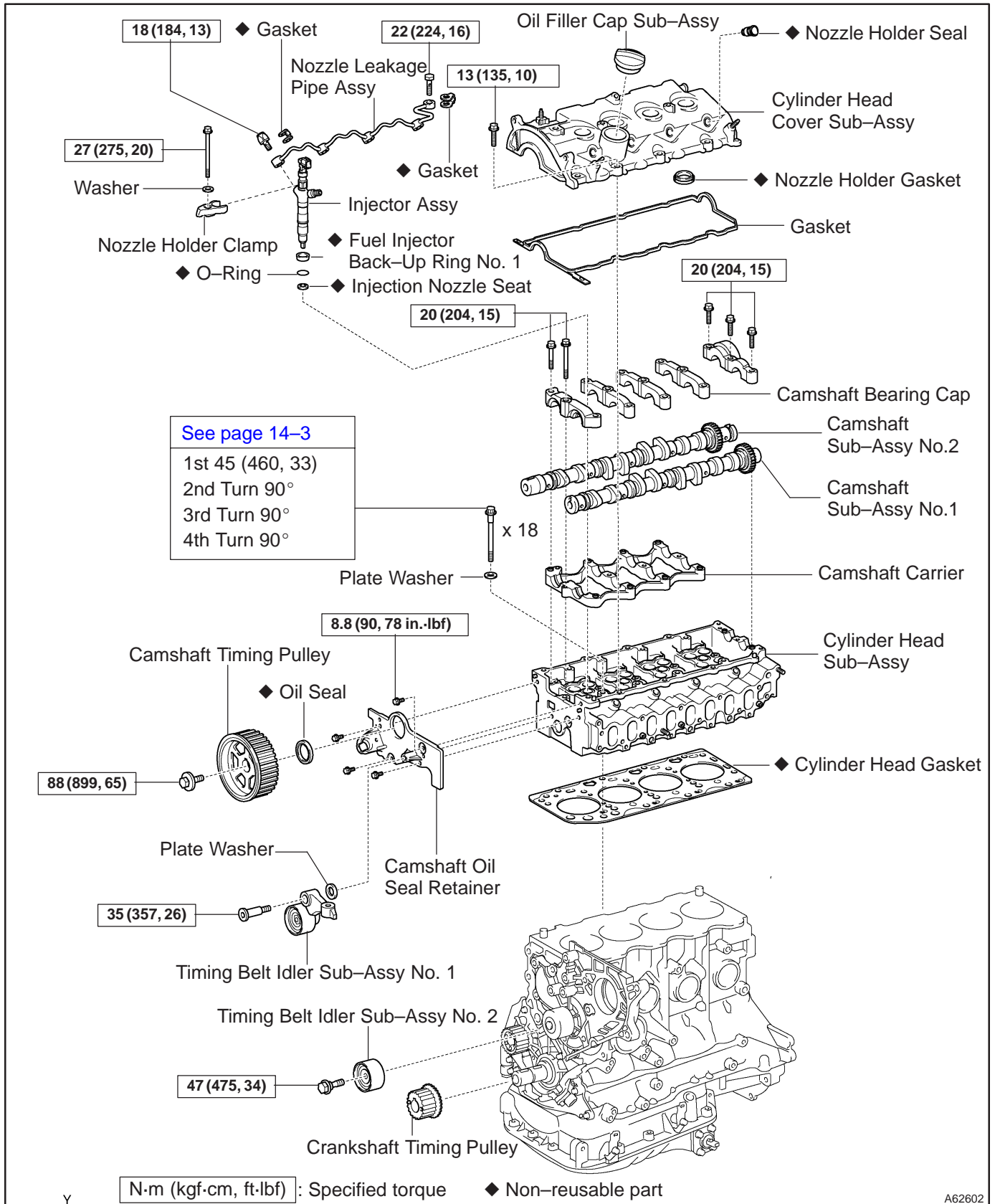
11. INSTALL COMPRESSOR INLET ELBOW

Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)

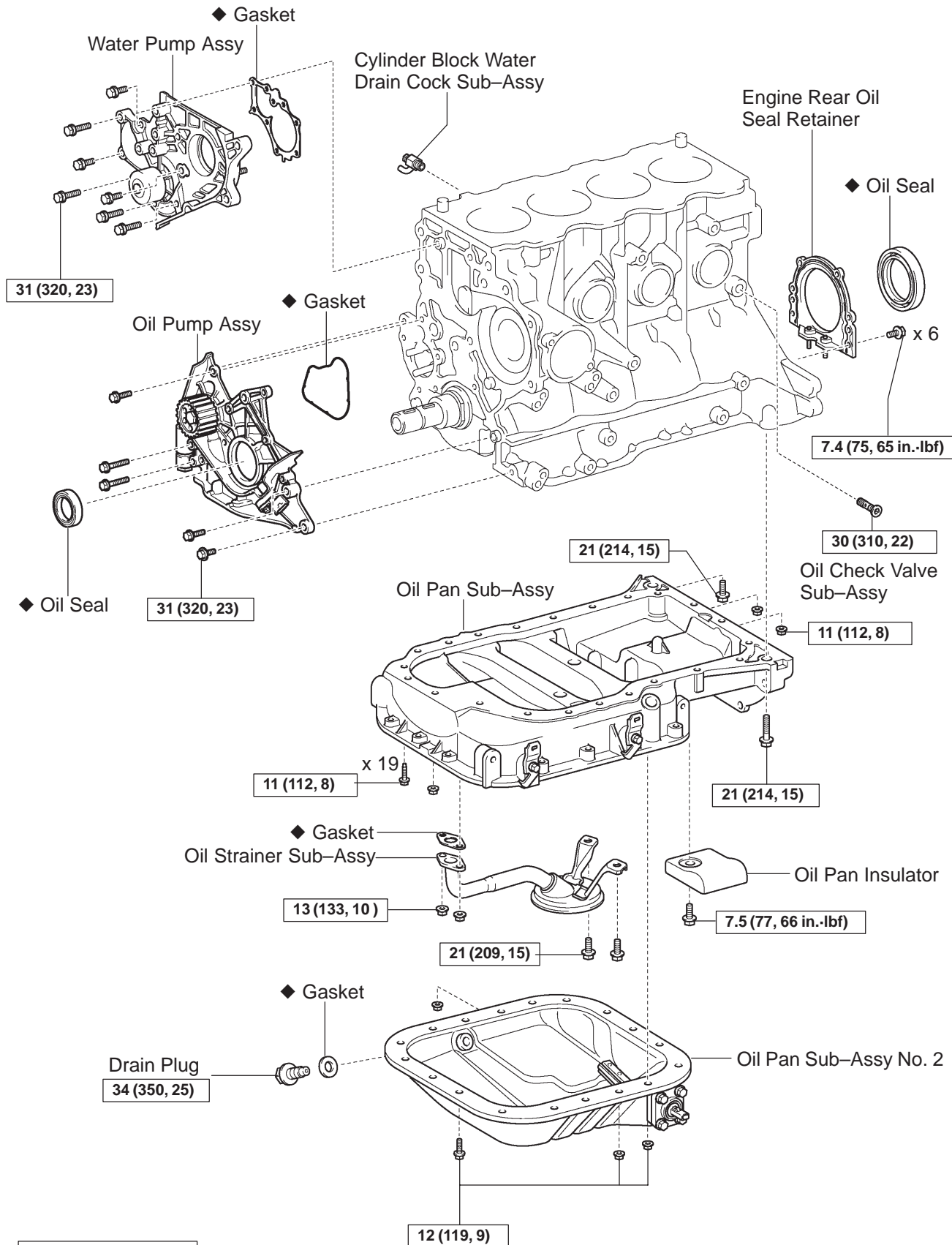
PARTIAL ENGINE ASSY (1CD-FTV) COMPONENTS

140L3-01

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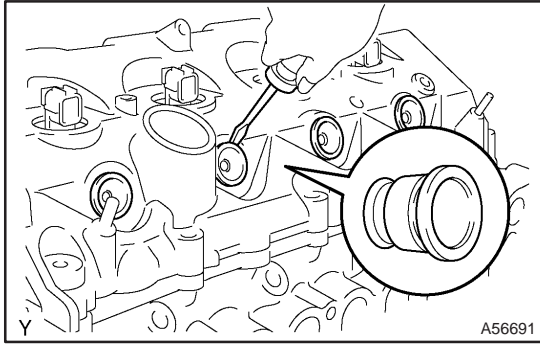
A62602



N·m (kgf·cm, ft·lbf) : Specified torque
 ◆ Non-reusable part

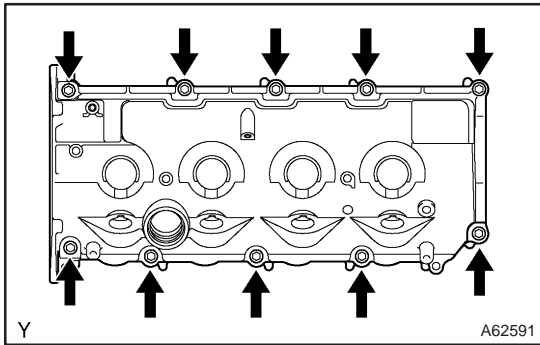
OVERHAUL

1. REMOVE OIL FILLER CAP SUB-ASSY



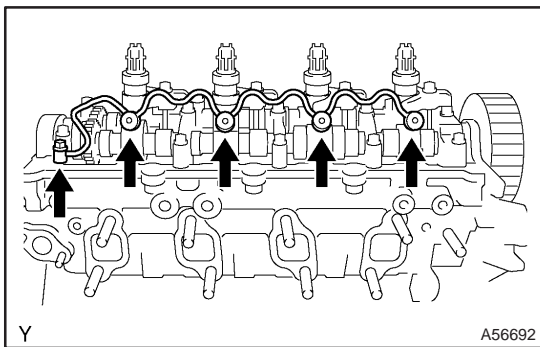
2. REMOVE NOZZLE HOLDER SEAL

- (a) Using a screwdriver, pry out the 4 nozzle holder seals.



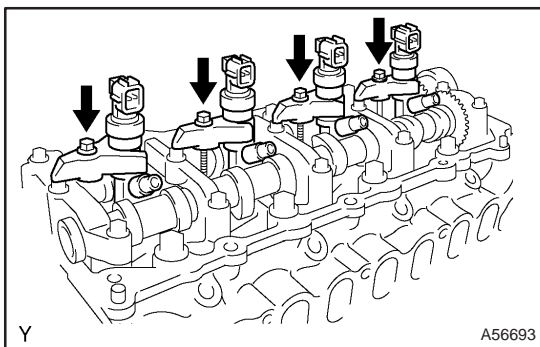
3. REMOVE CYLINDER HEAD COVER SUB-ASSY

- (a) Remove the 10 bolts, cylinder head cover and gasket.



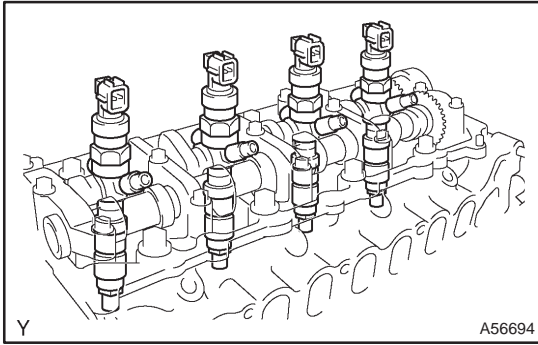
4. REMOVE NOZZLE LEAKAGE PIPE ASSY

- (a) Using a hexagon wrench (6mm), remove 4 hollow screws.
- (b) Remove the union bolt, nozzle leakage pipe and 5 gaskets from the cylinder head and injector.



5. REMOVE NOZZLE HOLDER CLAMP

- (a) Remove the 4 bolts, 4 washers and 4 nozzle holder clamps.

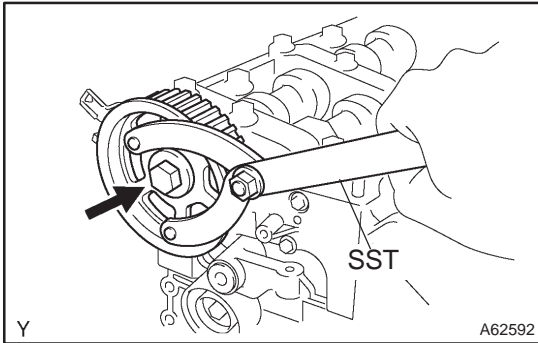


6. REMOVE INJECTOR ASSY

- (a) Remove the 4 injectors from the cylinder head.

HINT:

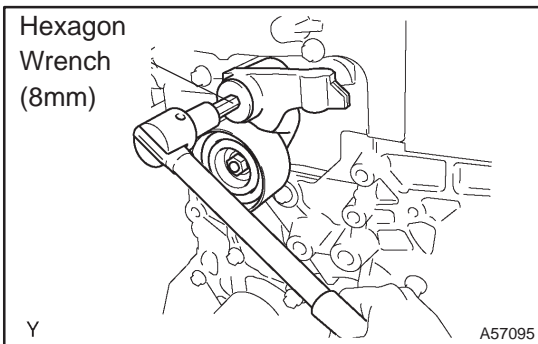
Arrange the injectors in correct order.



7. REMOVE CAMSHAFT TIMING PULLEY

- (a) Using SST, remove the pulley bolt.

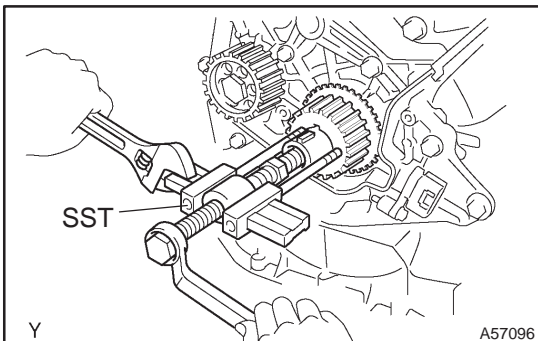
SST 09960-10010 (09962-01000, 09963-01000)



8. REMOVE TIMING BELT IDLER SUB-ASSY NO.1

- (a) Using hexagon wrench (8mm), remove the idler pulley shaft, idler pulley and plate washer.

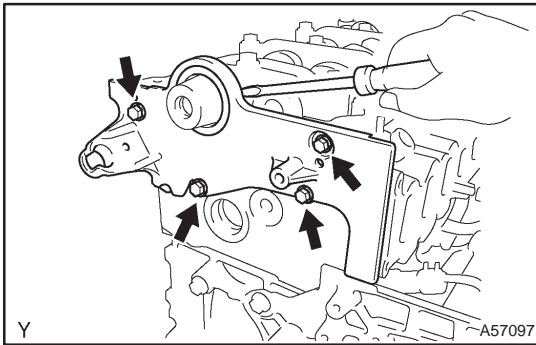
9. REMOVE TIMING BELT IDLER SUB-ASSY NO.2



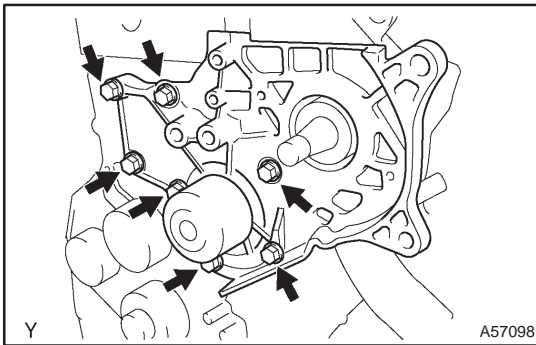
10. REMOVE CRANKSHAFT TIMING PULLEY

- (a) If the pulley cannot be removed by hand, use SST to remove the timing pulley.

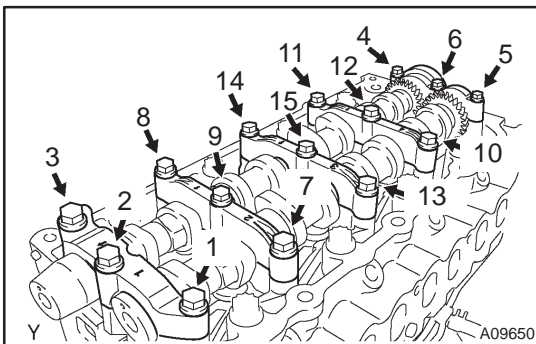
SST 09950-50013 (09951-05010, 09952-05010, 09953-05010, 09953-05020, 09954-05021)

**11. REMOVE CAMSHAFT OIL SEAL RETAINER**

- (a) Remove the 4 bolts.
- (b) Using a screwdriver, remove the oil seal retainer by prying the portions between the oil seal retainer and camshaft bearing cap.

**12. REMOVE WATER PUMP ASSY**

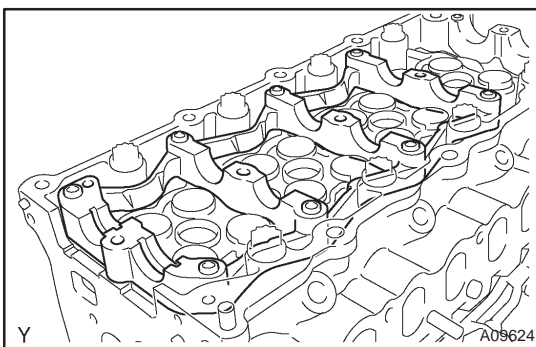
- (a) Remove the 7 bolts, water pump and gasket.

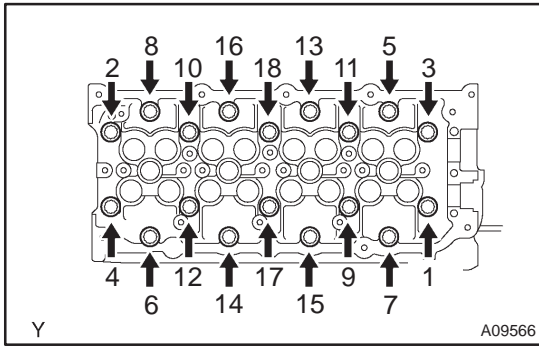
**13. REMOVE CAMSHAFT SUB-ASSY, NO.2**

- (a) Uniformly loosen and remove the 15 bearing cap bolts in several passes in the sequence shown.
- (b) Remove the 5 bearing caps.
- (c) Remove the camshaft No. 2.

14. REMOVE CAMSHAFT SUB-ASSY, NO.1

- (a) Remove the camshaft from the cylinder head.
- (b) Remove the camshaft carrier from the cylinder head.



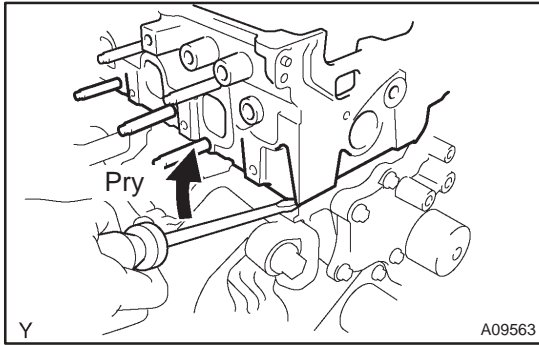


15. REMOVE CYLINDER HEAD SUB-ASSY

- (a) Uniformly loosen the 18 cylinder head bolts in several passes in the sequence shown. Remove the 18 cylinder head bolts and plate washers.

NOTICE:

Cylinder head warpage or cracking could result from removing bolts in incorrect order.



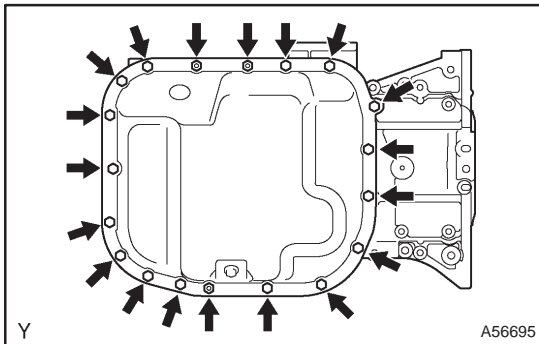
- (b) Lift the cylinder head from the dowels on the cylinder block, and place the cylinder head on wooden blocks on a bench.

HINT:

If the cylinder head is lift off, pry between the cylinder head and cylinder block with a screwdriver.

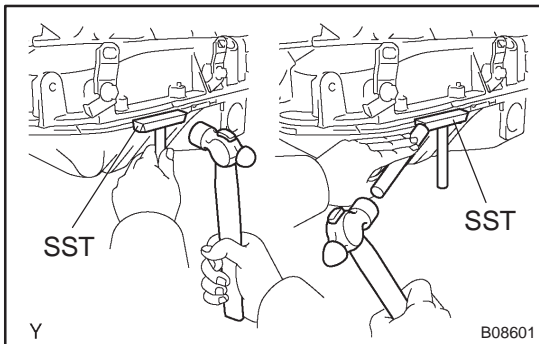
NOTICE:

Be careful not to damage the contact surfaces of the cylinder head and cylinder block.



16. REMOVE OIL PAN SUB-ASSY NO.2

- (a) Remove the 16 bolts and 3 nuts.

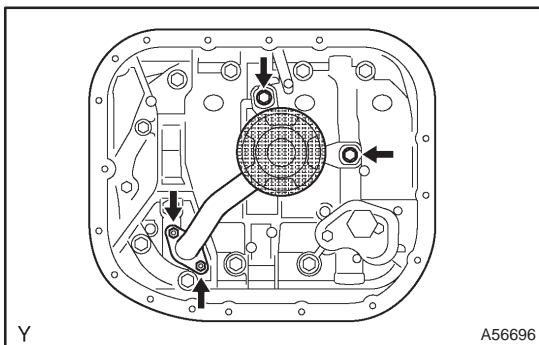


- (b) Insert the blade of SST between the No. 1 and No. 2 oil pans, and cut off the applied seal and remove the No. 2 oil pan.

SST 09032-00100

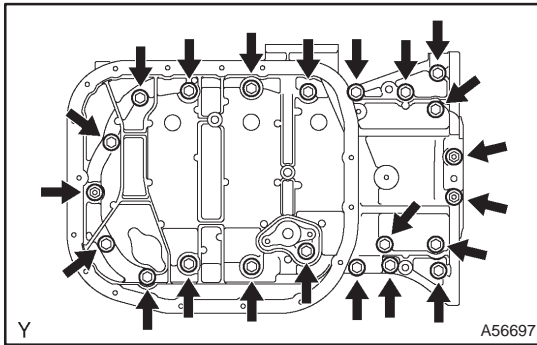
NOTICE:

Be careful not to damage the contact surfaces of the No. 1 and No. 2 oil pans.

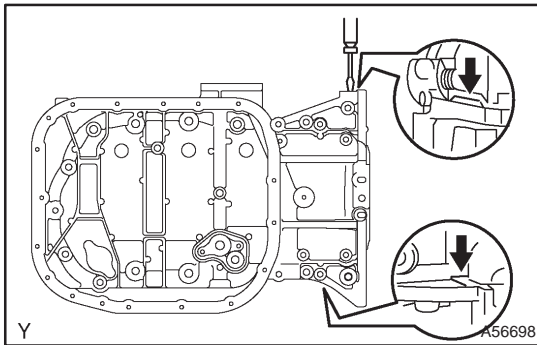


17. REMOVE OIL STRAINER SUB-ASSY

- (a) Remove the 2 bolts, 2 nuts, oil strainer and gasket.

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

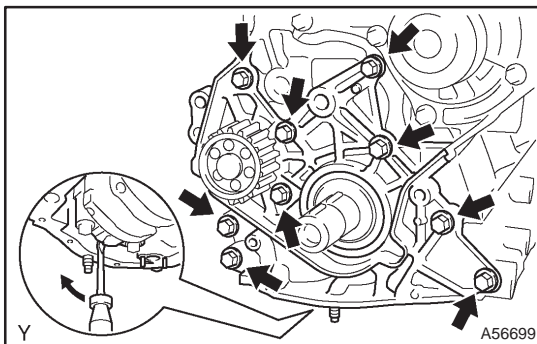
- (a) Remove the 19 bolts and 3 nuts.



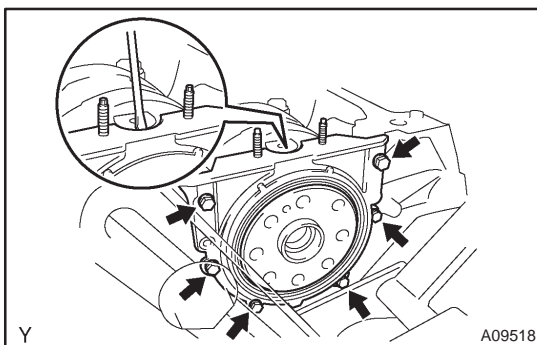
- (b) Using a screwdriver, remove the oil pan by prying the portions between the cylinder block and No. 1 oil pan.

NOTICE:

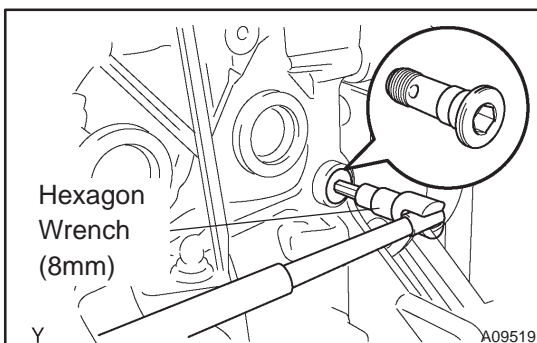
Be careful not to damage the contact surfaces of the cylinder block and No. 1 oil pan.

**19. REMOVE OIL PUMP ASSY**

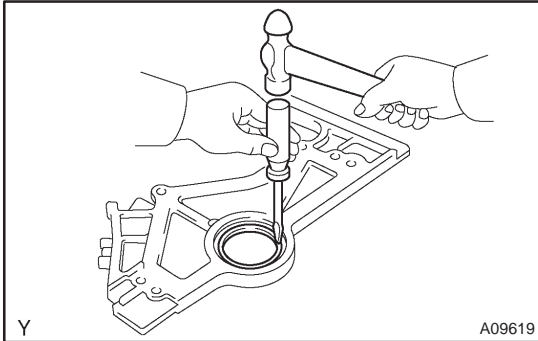
- (a) Remove the 9 bolts.
 (b) Remove the oil pump by prying a screwdriver between the oil pump and main bearing cap.
 (c) Remove the gasket.

**20. REMOVE ENGINE REAR OIL SEAL RETAINER**

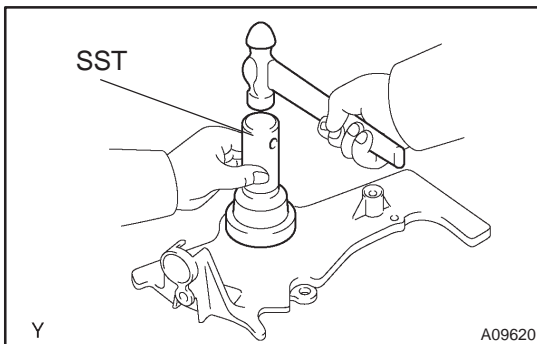
- (a) Remove the 6 bolts.
 (b) Using a screwdriver, remove the oil seal retainer by prying the portions between the oil seal retainer and main bearing cap.

**21. REMOVE OIL CHECK VALVE SUB-ASSY**

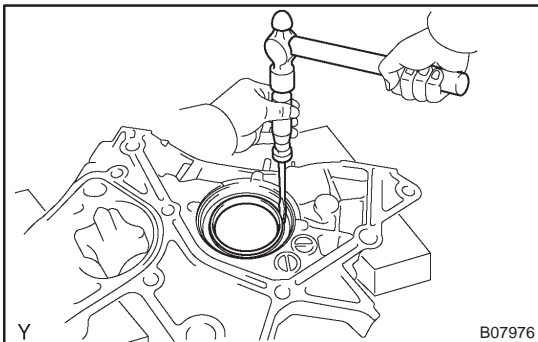
- (a) Using hexagon wrench (8mm), remove the pressure valve and gasket.

22. REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSY**23. REMOVE CAMSHAFT OIL SEAL**

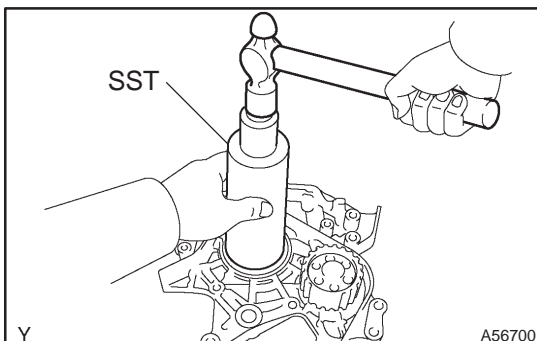
- (a) Using a screwdriver and a hammer, tap out the oil seal.

**24. INSTALL CAMSHAFT OIL SEAL**

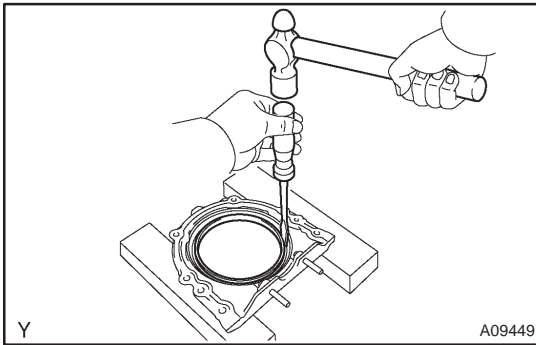
- (a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the camshaft oil seal retainer edge.
SST 09223-46011

**25. REMOVE CRANKSHAFT SEAL**

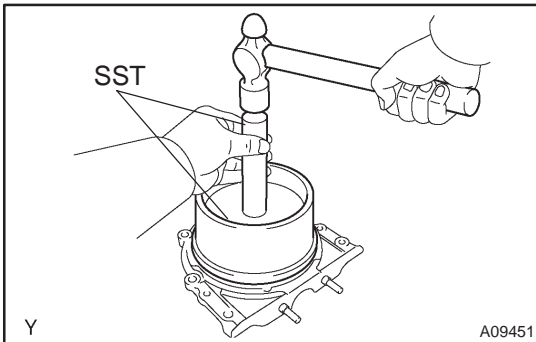
- (a) Using a screwdriver and a hammer, tap out the oil seal.

**26. INSTALL CRANKSHAFT SEAL**

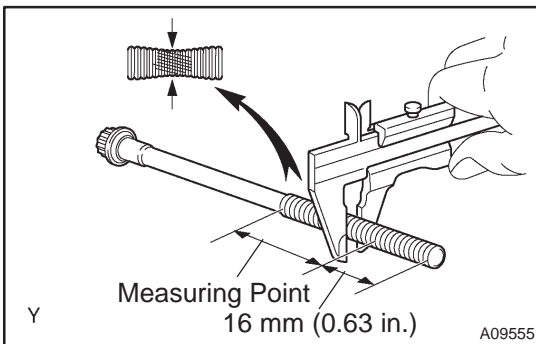
- (a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump edge.
SST 09316-60011 (09316-00011, 09316-00021)

**27. REMOVE ENGINE REAR OIL SEAL**

- (a) Using a screwdriver and a hammer, tap out the oil seal.

**28. INSTALL ENGINE REAR OIL SEAL**

- (a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223-15030, 09950-70010 (09951-07100)

**29. INSPECT CYLINDER HEAD SET BOLT**

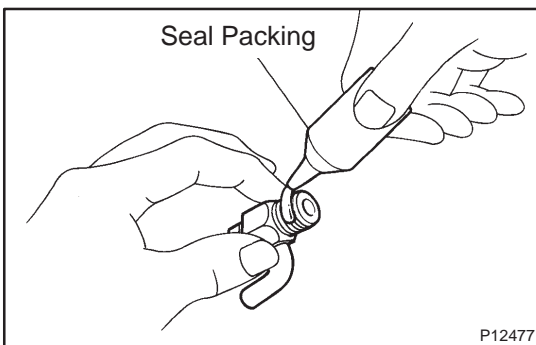
- (a) Using vernier calipers, measure the tension portion diameter of the bolt.

Standard outside diameter:

10.75 – 11.00 mm (0.4232 – 0.4331 in.)

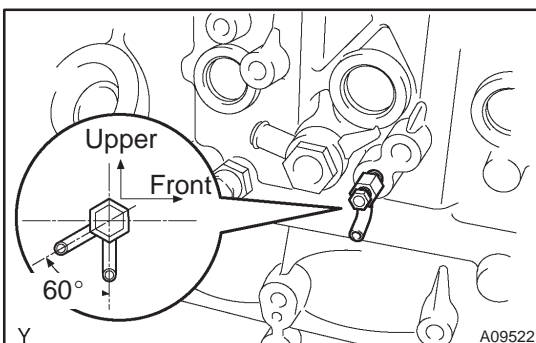
Minimum outside diameter: 10.40 mm (0.4094 in.)

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

**30. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB-ASSY**

- (a) Apply seal packing 2 or 3 threads.

Seal packing: Part No. 08826-00100 or equivalent

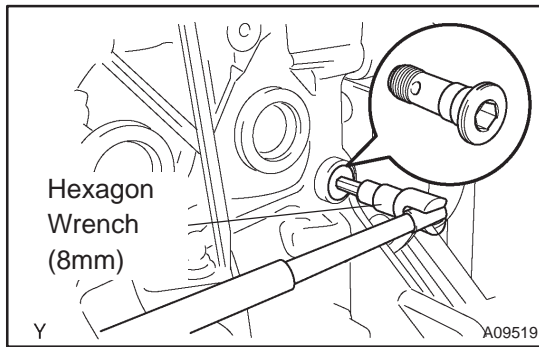


- (b) Install the drain union.

Torque: 29 N·m (291 kgf·cm, 21 ft·lbf)

HINT:

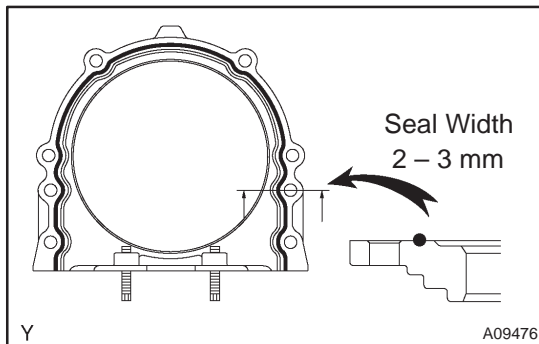
After applying the specified torque, if the drain pipe of the drain union is not at the position shown in the illustration, rotate the drain union further clockwise and make the drain pipe face downward.



31. INSTALL OIL CHECK VALVE SUB-ASSY

- (a) Using hexagon wrench (8mm), install a new gasket and the pressure valve.

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



32. INSTALL ENGINE REAR OIL SEAL RETAINER

- (a) Apply seal packing to the oil seal retainer as shown in the illustration.

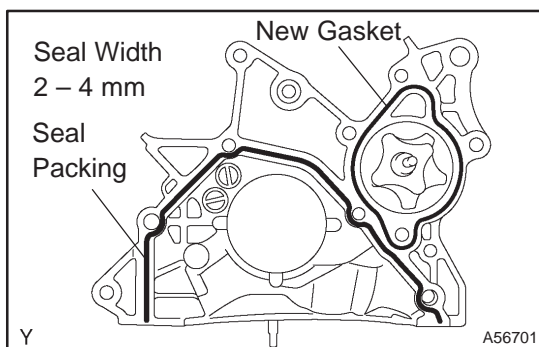
Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

- Install a nozzle that has been cut to a 2 - 3 mm (0.08 - 0.12 in.) opening.
- Parts must be assembled within 15 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall the cap.

- (b) Install the oil seal retainer with 6 bolts. Uniformly tighten the bolt in several passes.

Torque: 7.4 N·m (75 kgf·cm, 65 in·lbf)



33. INSTALL OIL PUMP ASSY

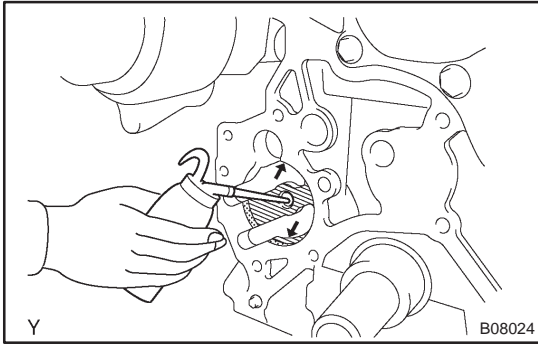
- (a) Apply seal packing to the oil pump as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

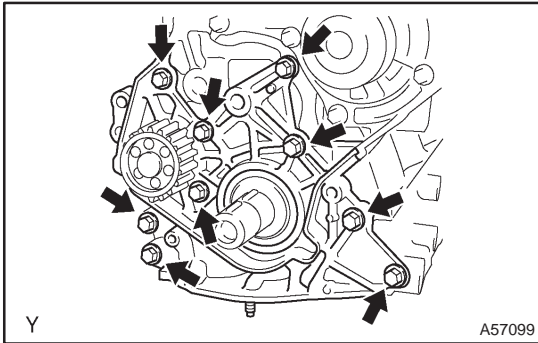
NOTICE:

- Avoid applying an excessive amount to the surface.
- Install a nozzle that has been cut to a 2 - 4 mm (0.08 - 0.16 in.) opening
- Parts must be assembled within 15 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall the cap.

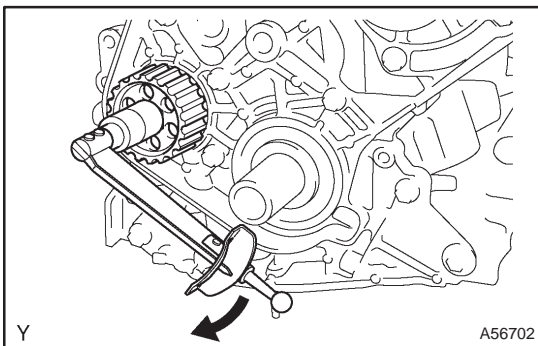
- (b) Install a new gasket to the oil pump.



- (c) Pour in 0.5 cm³ (0.03 cu in.) or more of engine oil into the bushing of the cylinder block.
- (d) Apply engine oil to the cylinder block side where it contacts with the oil pump driven rotor.

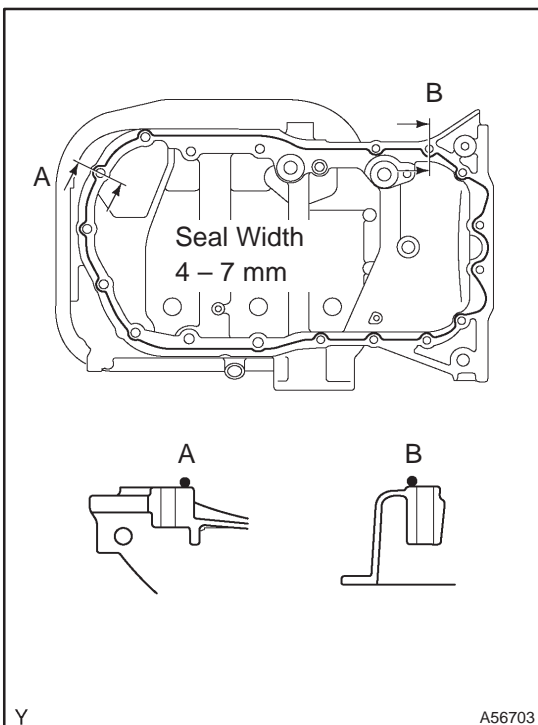


- (e) Install the oil pump with the 9 bolts.
Torque: 31 N·m (320 kgf·cm, 23 ft·lbf)



- (f) Measure the oil pump rotating torque
- (1) Check that the pump rotates smoothly without abnormal noise.
 - (2) Using a torque wrench, check the pump rotating torque.

Rotating torque: 3.0 N·m (30 kgf·cm, 26 in·lbf) or less



34. INSTALL OIL PAN SUB-ASSY

- (a) Apply seal packing to the No. 1 oil pan as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

- Install a nozzle that has been cut to a 4 - 7 mm (0.16 - 0.28 in.) opening.
- Parts must be assembled within 15 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall the cap.

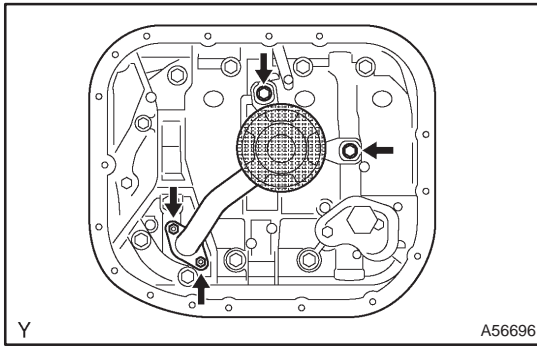
- (b) Install the oil pan with 19 bolts and 3 nuts.

Torque:

11 N·m (112 kgf·cm, 8 ft·lbf) for 10 mm head bolt and nut

21 N·m (210 kgf·cm, 15 ft·lbf) for 12 mm head bolt

42 N·m (429 kgf·cm, 31 ft·lbf) for 14 mm head bolt



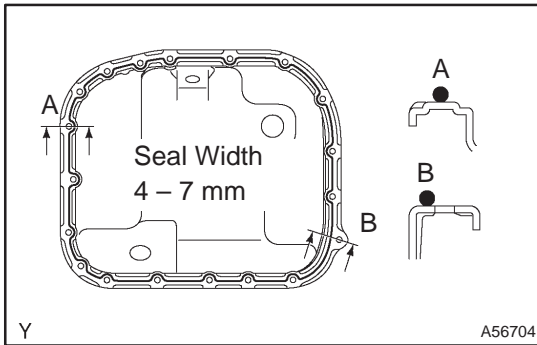
35. INSTALL OIL STRAINER SUB-ASSY

- (a) Install a new gasket and the oil strainer with the 2 bolts and 2 nuts.

Torque:

21 N·m (210 kgf·cm, 15 ft·lbf) for bolt

13 N·m (135 kgf·cm, 10 ft·lbf) for nut



36. INSTALL OIL PAN SUB-ASSY NO.2

- (a) Apply a seal packing to the oil pan as shown in the illustration.

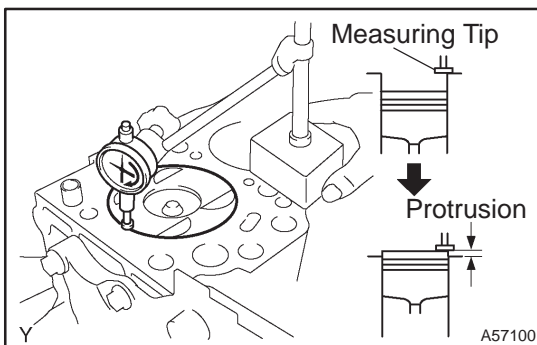
Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

- Install a nozzle that has been cut to a 4 – 7 mm (0.16 – 0.28 in.) opening.
- Parts must be assembled within 15 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall the cap.

- (b) Install the oil pan with 16 bolts and 3 nuts. Uniformly tighten the bolts and nuts in several passes.

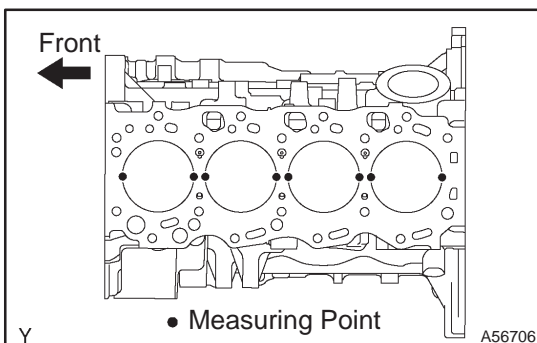
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

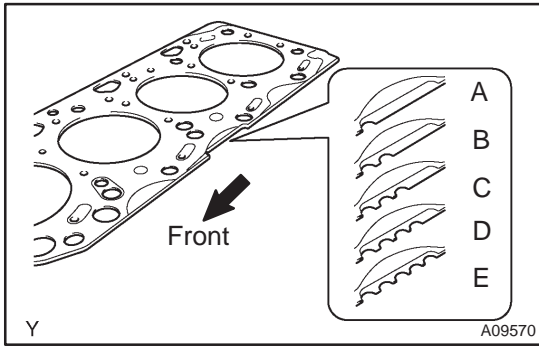


37. INSTALL CYLINDER HEAD SUB-ASSY

- (a) Check piston protrusions for each cylinder.
- (1) Find where the piston head protrudes most by slowly turning the crankshaft clockwise and counter-clockwise.
 - (2) Measure each cylinder at 2 places as shown in the illustration, marking a total of 8 measurements.
 - (3) For the piston protrusion valve of each cylinder, use the average of the 2 measurements of each cylinder.

Protrusion: 0.165 – 0.425 mm (0.0065 – 0.0168 in.)





(b) Select a new cylinder head gasket.

HINT:

There are 5 sizes of new cylinder head gaskets, marked "A", "B", "C", "D", or "E" according.

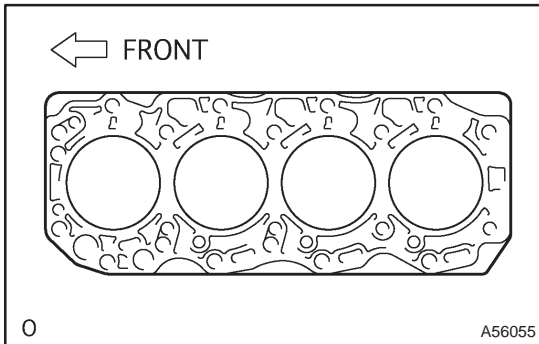
New installed cylinder head gasket thickness:

A	0.85 – 0.95 mm (0.0335 – 0.0374 in.)
B	0.90 – 1.00 mm (0.0354 – 0.0394 in.)
C	0.95 – 1.05 mm (0.0374 – 0.0413 in.)
D	1.00 – 1.10 mm (0.0394 – 0.0433 in.)
E	1.05 – 1.15 mm (0.0413 – 0.0453 in.)

(1) Select the largest piston protrusion value from the measurements made, then select a new appropriate gasket according to the table below.

Piston protrusion mm (in.)	Gasket size
0.165 – 0.220 (0.0065 – 0.0087)	Use A
0.220 – 0.270 (0.0087 – 0.0106)	Use B
0.270 – 0.320 (0.0106 – 0.0126)	Use C
0.320 – 0.370 (0.0126 – 0.0146)	Use D
0.370 – 0.425 (0.0146 – 0.0167)	Use E

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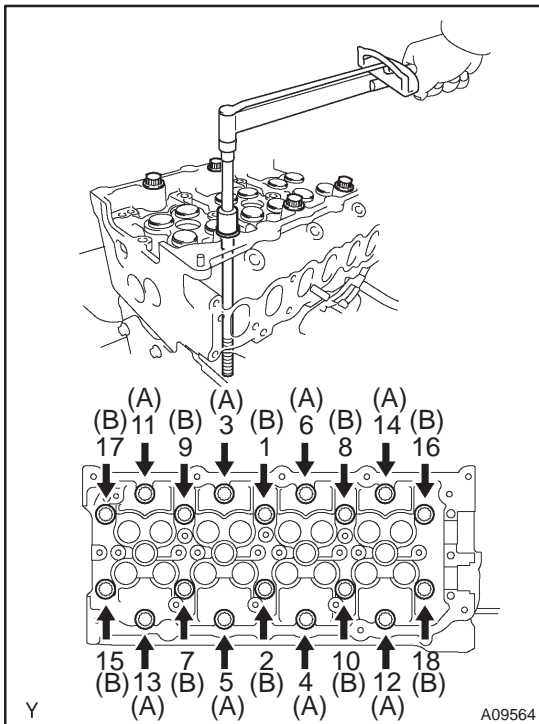


(c) Place a new cylinder head gasket in position on the cylinder block.

NOTICE:

Be careful of the installation direction.

(d) Place the cylinder head in position on the cylinder head gasket.



(e) Install the cylinder head bolts.

HINT:

The cylinder head bolts are tightened in 4 progressive steps (steps (3), (5), (6) and (7)).

- (1) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts and plate washers.
- (2) Install the plate washer to the cylinder head bolt.
- (3) Install and uniformly tighten the 18 cylinder head bolts and plate washers in several passes in the sequence shown.

Torque: 45 N·m (460 kgf·cm, 33 ft·lbf)

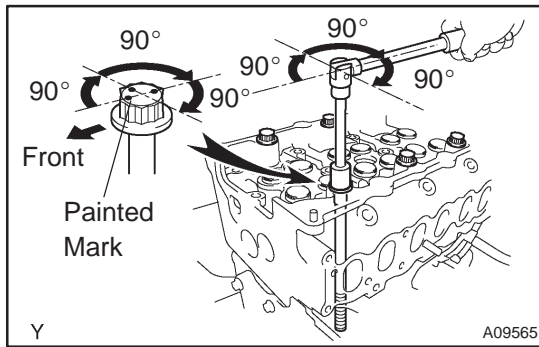
HINT:

Each bolt length is indicated in the illustration.

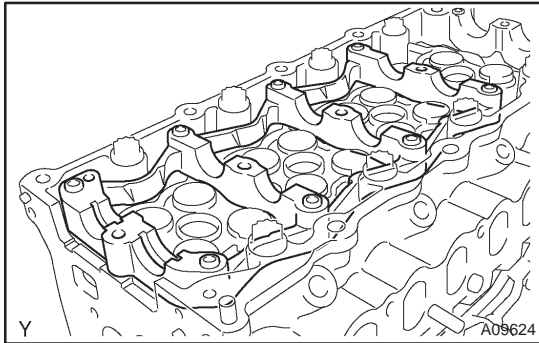
Bolt length:

(A)	160 mm (6.30 in.)
(B)	104 mm (4.09 in.)

If any of the cylinder head bolt does not meet the torque specification, replace the cylinder head bolts.

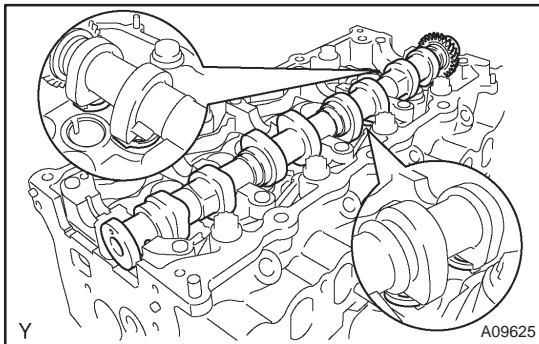


- (4) Mark the front of the cylinder head bolt with paint.
- (5) Retighten the cylinder head bolts additional 90° in the numerical order shown.
- (6) Retighten the cylinder head bolts additional 90° in the numerical order shown.
- (7) Retighten the cylinder head bolts additional 90° in the numerical order shown.
- (8) Check that the painted mark is at the intake manifold side now.

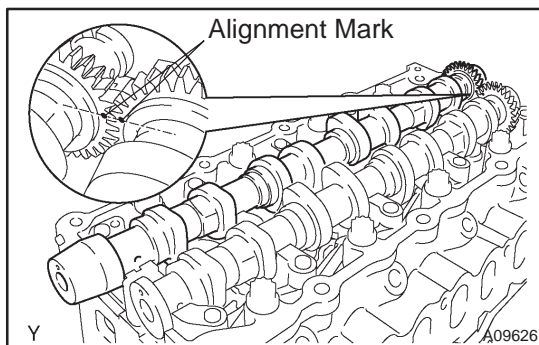


38. INSTALL CAMSHAFT SUB-ASSY, NO.1

- (a) Place the camshaft carrier in position on the cylinder head.

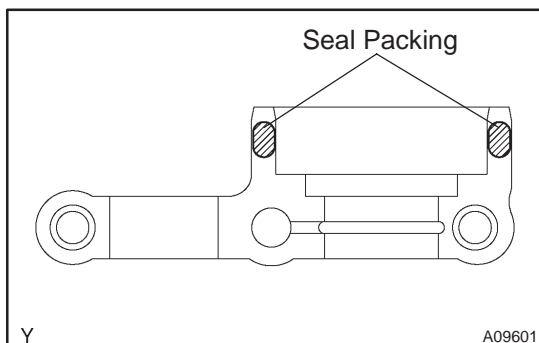


- (b) Apply engine oil to the cam and gear of the camshaft, and the journal of the camshaft carrier.
- (c) Place the intake camshaft on top of the camshaft carrier as shown in the illustration so that the No. 3 and No. 4 of cylinder cam lobes face downward.



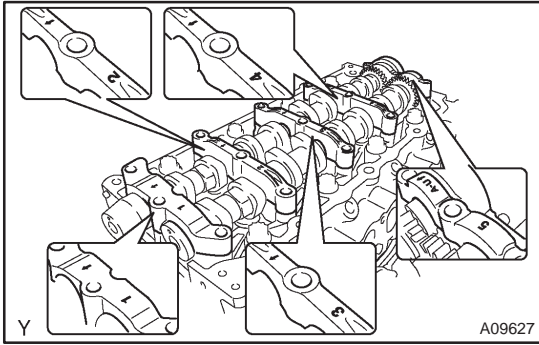
39. INSTALL CAMSHAFT SUB-ASSY, NO.2

- (a) Apply engine oil to the cam and gear of the camshaft, and the journal of the camshaft carrier.
- (b) Engage the exhaust camshaft gear to the intake camshaft gear by matching the alignment marks on each gear.
- (c) Roll down the exhaust camshaft onto the bearing journals while engaging gears with each other.

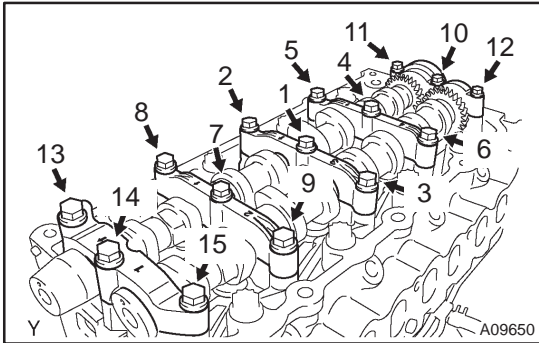


- (d) Install the camshaft bearing caps.
 - (1) Remove any old packing (FIPG) material from the No.5 camshaft bearing cap.
 - (2) Apply seal packing to the No. 5 camshaft bearing cap as shown in the illustration.

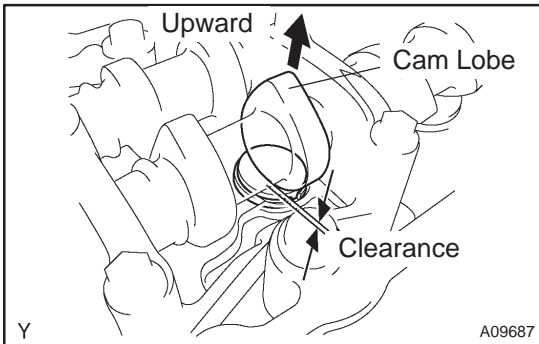
Seal packing: Part No. 08826-00080 or equivalent



(3) Place the 5 bearing caps in their proper locations.



(4) Install and uniformly tighten the 15 bearing cap bolts in several passes and in the sequence shown.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

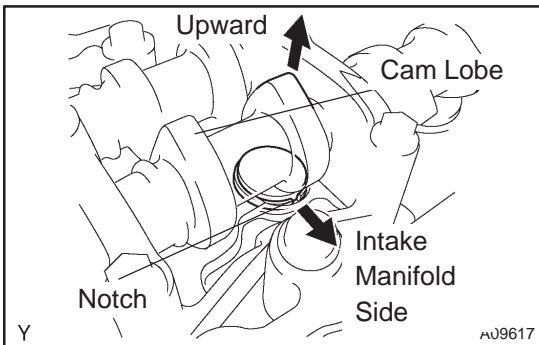


40. INSPECT VALVE CLEARANCE

- (a) Turn the crankshaft so that the cam lobe of the camshaft on the inspecting valve points upward.
- (b) Using a feeler gauge, measure the clearance between the valve lifter and the camshaft.
- (c) Measure the clearance at 16 places.
- (d) Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

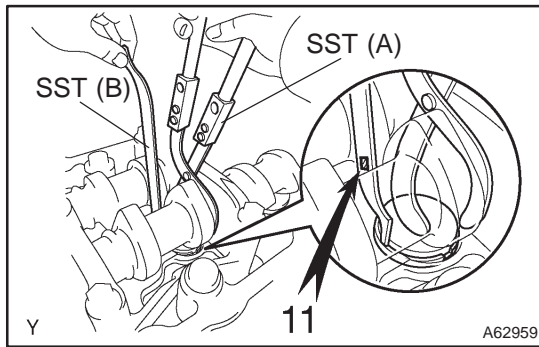
Valve clearance (Cold) :

Intake	0.20 – 0.30 mm (0.008 – 0.012 in.)
Exhaust	0.35 – 0.45 mm (0.014 – 0.018 in.)



41. ADJUST VALVE CLEARANCE

- (a) Remove the adjusting shim.
 - (1) Turn the crankshaft so that the cam lobe of the camshaft on the adjusting valve points upward.
 - (2) Position the notch of the valve lifter facing the intake manifold side.

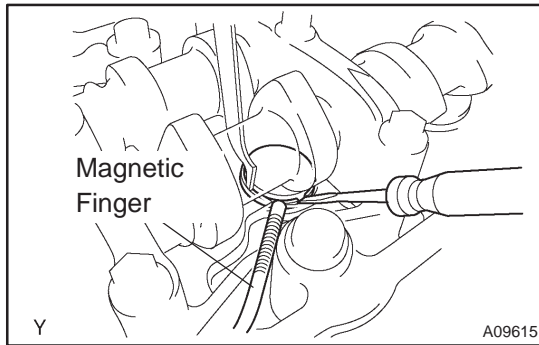


- (3) Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

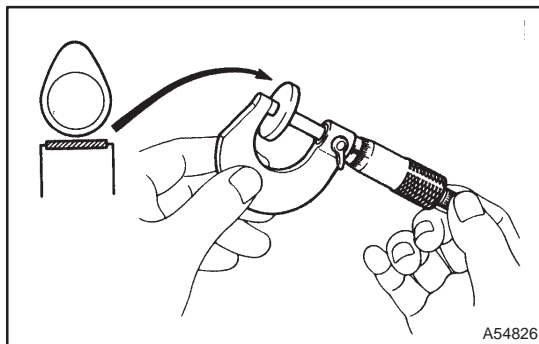
SST 09248-55050 (09248-05510, 09248-05520)

HINT:

Apply SST (B) on the side marked with "11".



- (4) Remove the adjusting shim with a small screwdriver and magnetic finger.



- (b) Determine the replacement adjusting shim size by following the formula:

- (1) Using a micrometer, measure the thickness of the removed shim.
- (2) Calculate the thickness of a new shim so that the valve clearance comes within specified value.

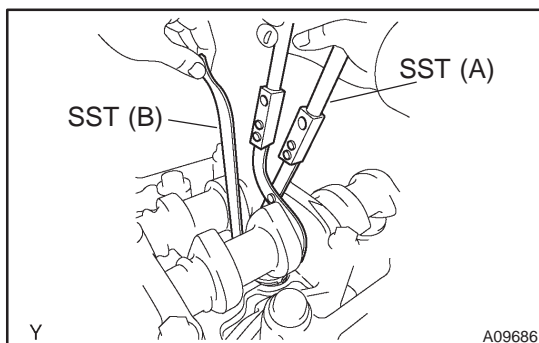
HINT:

- T Thickness of removed adjusting shim
- A Measured valve clearance
- N Thickness of new adjusting shim
- Intake: $N = T + (A - 0.25 \text{ mm (0.010 in.)})$
- Exhaust: $N = T + (A - 0.40 \text{ mm (0.016 in.)})$

- (3) Select a new shim with a thickness as close as possible to the calculated value.

HINT:

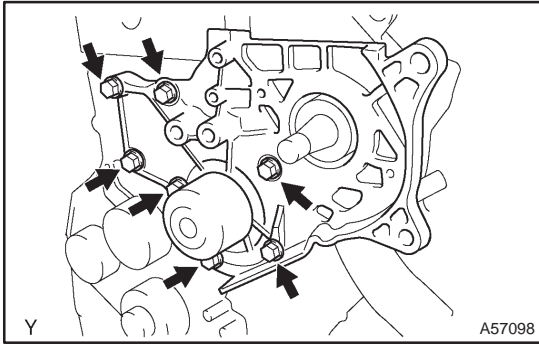
Shims are available in 17 sizes in increments of 0.05 mm (0.0020 in.), from 2.50 mm (0.0984 in.) to 3.30 mm (0.1299 in.).



- (c) Install a new adjusting shim.
- (1) Place a new adjusting shim on the valve lifter.
 - (2) Using SST (A), press down the valve lifter and remove SST (B).

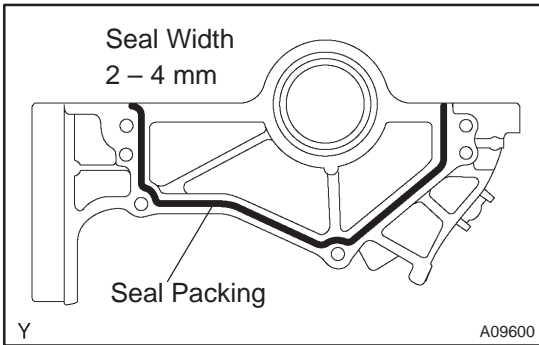
SST 09248-55050 (09248-05510, 09248-05520)

- (d) Recheck the valve clearance.



42. INSTALL WATER PUMP ASSY

- (a) Install a new gasket and the water pump with the 7bolts.
Torque: 31 N·m (320 kgf·cm, 23 ft·lbf)



43. INSTALL CAMSHAFT OIL SEAL RETAINER

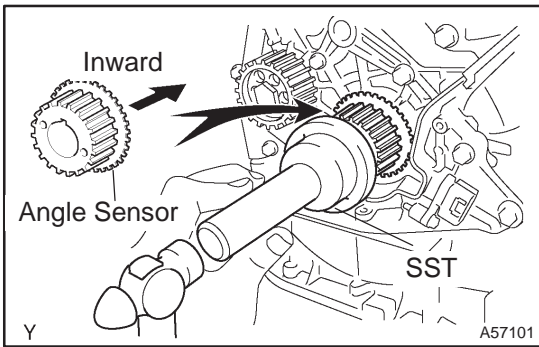
- (a) Apply seal packing to the oil seal retainer as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

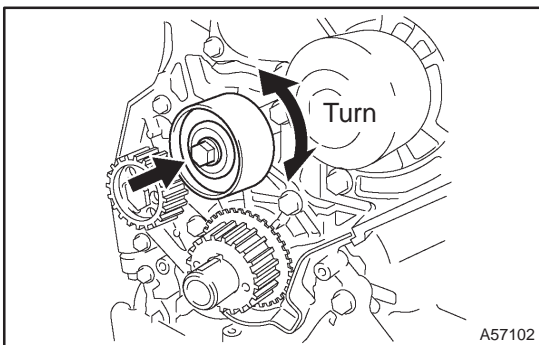
- Install a nozzle that has been cut to a 2 – 4 mm (0.08 – 0.16 in.) opening.
 - Parts must be assembled within 15 minutes of application. Otherwise the material must be removed and reapplied.
 - Immediately remove nozzle from the tube and reinstall the cap.
- (b) Install the oil seal retainer with 4 bolts. Uniformly tighten the 4 bolts in several passes.
Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)

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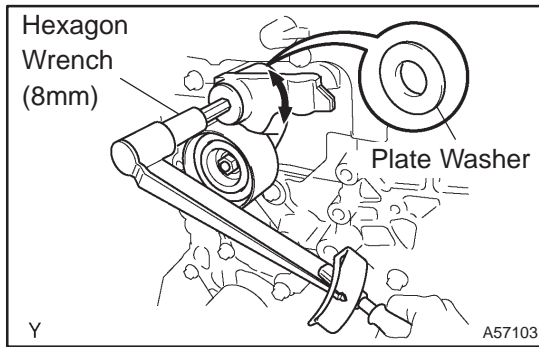
44. INSTALL CRANKSHAFT TIMING PULLEY

- (a) Align the pulley set key with the key groove of the timing pulley.
- (b) Using SST and a hammer, tap in the timing pulley, facing the angle sensor inward.
SST 09223-46011

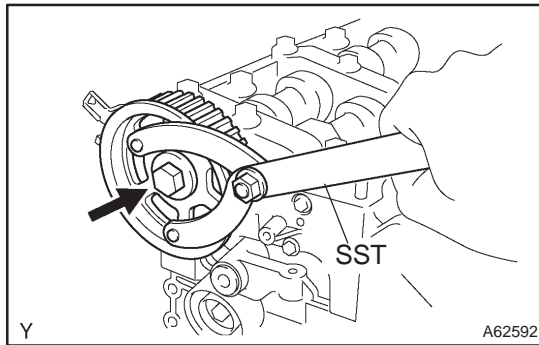


45. INSTALL TIMING BELT IDLER SUB-ASSY NO.2

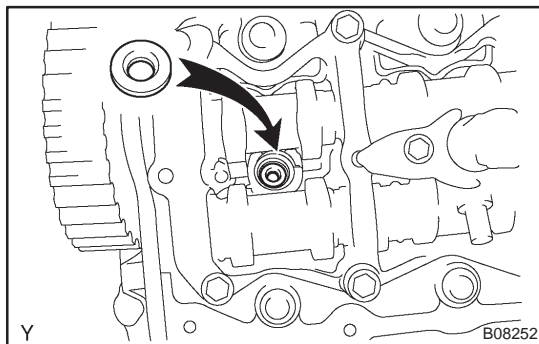
- (a) Install the idler pulley with the bolt.
Torque: 47 N·m (475 kgf·cm, 34 ft·lbf)
- (b) Check that the idler pulley moves smoothly.

**46. INSTALL TIMING BELT IDLER SUB-ASSY NO.1**

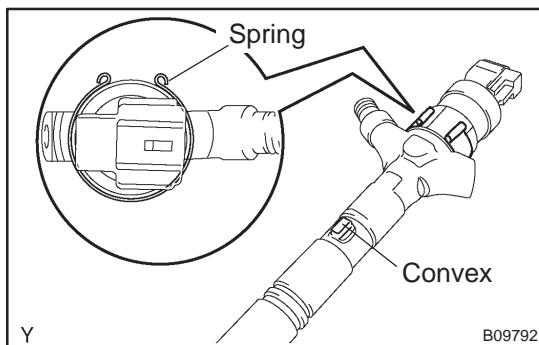
- (a) Using an hexagon wrench (8mm), install the plate washer and idler pulley with the idler pulley shaft.
Torque: 35 N·m (350 kgf·cm, 25 ft·lbf)
- (b) Check that the pulley bracket moves smoothly.

**47. INSTALL CAMSHAFT TIMING PULLEY**

- (a) Install the pulley set key to the key groove of the camshaft.
- (b) Align the pulley set key with the key groove of the timing pulley, and slide on the timing pulley.
- (c) Using SST, install the pulley bolt.
SST 09960-10010 (09962-01000, 09963-01000)
Torque: 88 N·m (899 kgf·cm, 65 ft·lbf)

**48. INSTALL INJECTOR ASSY**

- (a) Install 4 new nozzle seats to the cylinder head.

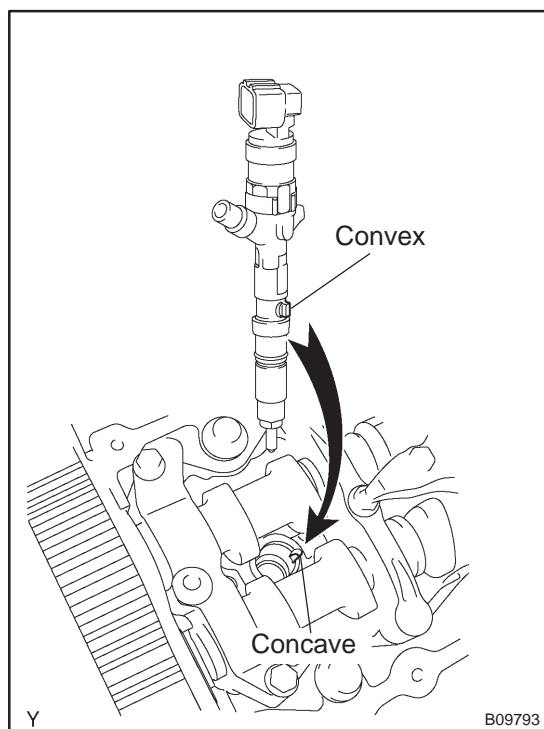


- (b) Set the spring to each injector.

NOTICE:

Be sure to make the opening direction of the spring and the direction of the injector positioning convex meet.

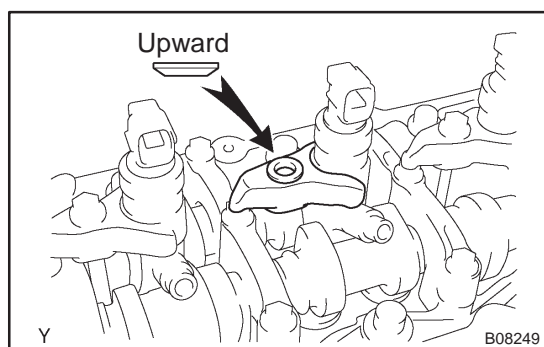
- (c) Install a new back-up ring and O-ring to each injector.
- (d) Apply a light coat of oil onto O-ring for each injector.



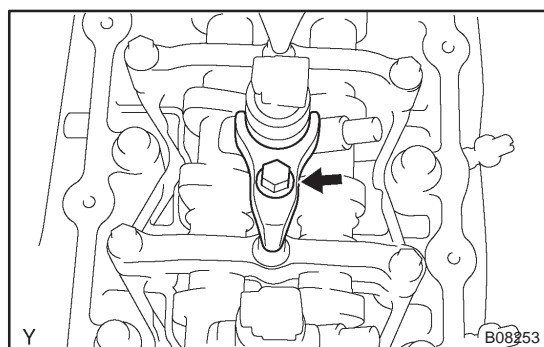
- (e) Meet the injector positioning convex to the positioning concave at the cylinder head side and install the injector to the cylinder head.

NOTICE:

- At this time, insert the injector until it touches the nozzle sheet surface.
 - When installing the injector to the cylinder head and in case that the injector comes to float up with the reaction of O-ring, pull out the injector once, install it again.
 - During the time after equipping the head cover and before installing the injection pipe, install the irregular object prevention cover.
 - Do not exchange the injector cylinder.
- (f) Place the 4 nozzle holder clamps to each injector.

**49. INSTALL NOZZLE HOLDER CLAMP**

- (a) Set the washer on the nozzle holder clamp as shown in the illustration.



- (b) Tighten the bolts.

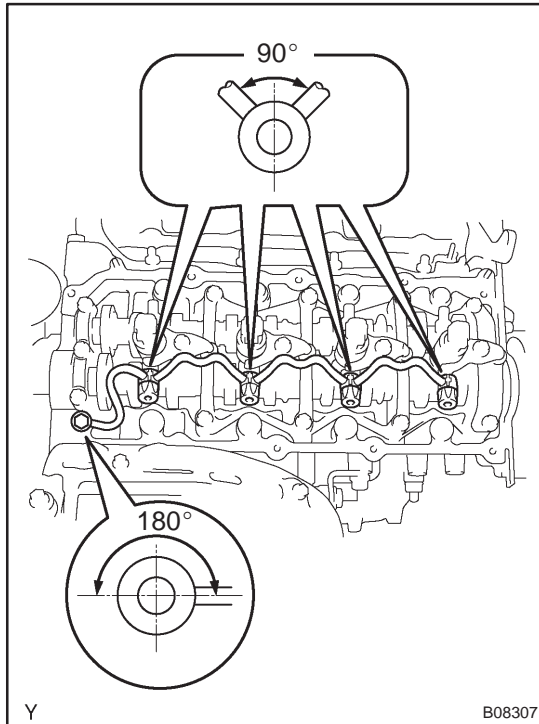
HINT:

Apply a light coat of engine oil on the threads and under the heads of the nozzle holder clamp bolts.

Torque: 27 N·m (275 kgf·cm, 20 ft·lbf)

NOTICE:

At this time, the clamp has its cam cap bolt as a fulcrum and clip the injector at the fork portion.



50. INSTALL NOZZLE LEAKAGE PIPE ASSY

- (a) Place the leakage pipe and 5 new gaskets.

NOTICE:

Do the installation of the gasket crew within the angle range shown in the illustration.

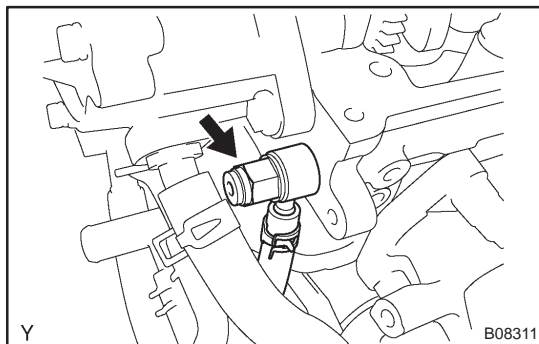
- (b) Apply a light coat of oil onto 4 hollow screws and union bolt.
 (c) Tighten the 4 hollow screws and union bolt by hand.
 (d) Tighten the 4 hollow screws and union bolt.

Torque:

Hollow screw 18 N·m (184 kgf·cm, 13 ft·lbf)

Union bolt 22 N·m (224 kgf·cm, 16 ft·lbf)

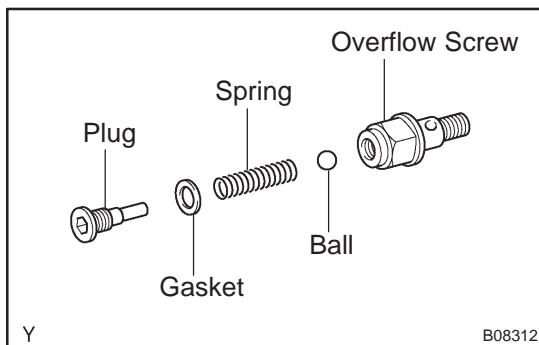
- (e) Check that there is no leak from nozzle leakage pipe connection.



- (1) Disconnect the fuel hose, and remove the check valve, No. 2 nozzle leakage pipe and gasket.
 (2) Purchase a new check valve.

HINT:

Part No. 23122-27010



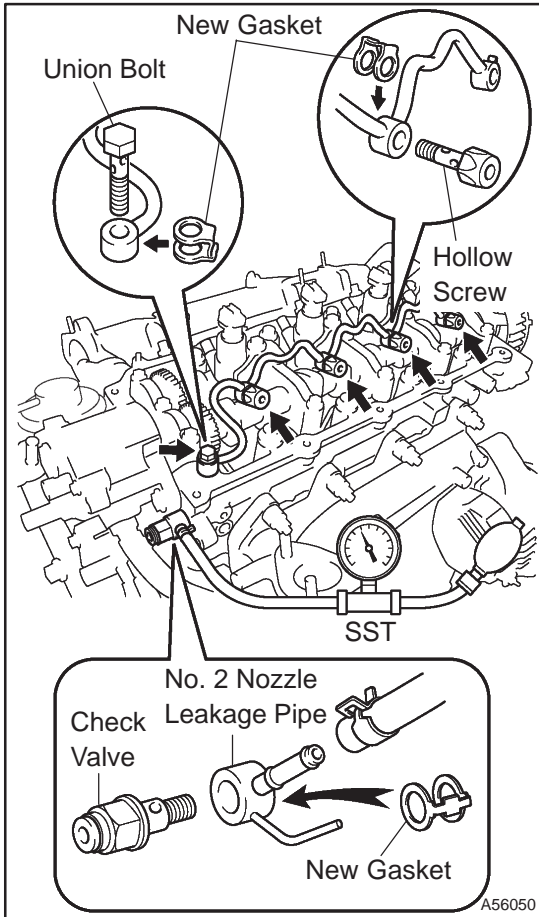
- (3) Remove the plug, gasket, spring and ball.
 (4) Install the plug with the gasket to the overflow screw.

Torque: 9.8 N·m (100 kgf·cm, 7 ft·lbf)

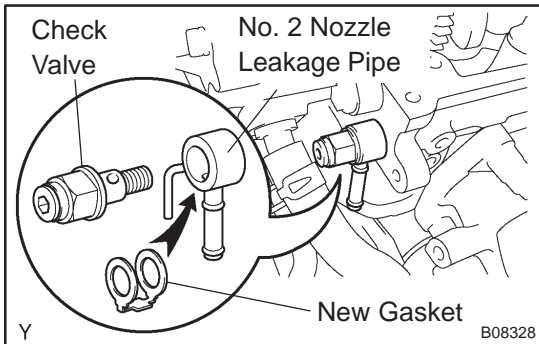
- (5) Install the No. 2 nozzle leakage pipe and gasket with the check valve to the cylinder head.

Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)

- (6) Apply a light coat of soapy water (any fluid to detect fuel leakage) on the nozzle leakage pipe connection.



- (7) Using SST (turbocharger pressure gauge), apply the SST to the fuel return side of the No. 2 nozzle leakage pipe, and maintain 100 kPa (1 kgf/cm², 14.5 psi) of pressure for 600 seconds to check that there are no bubbles from the soap-applied places.
SST 09992-00242
- (8) After checking fuel leaks, wipe off soapy water from nozzle leakage pipe connection.
- (9) Remove SST, check valve, No. 2 nozzle leakage pipe and gasket.

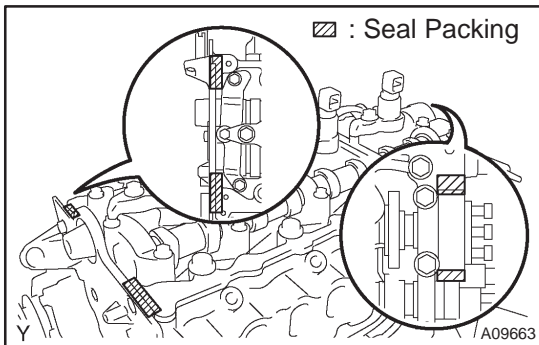


- (10) Reinstall the No. 2 nozzle leakage pipe and a new gasket with the check valve.

Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)

HINT:

- Never reinstall the disassembled check valve on the engine.
- (11) Reconnect the fuel hose to the No. 2 nozzle leakage pipe.



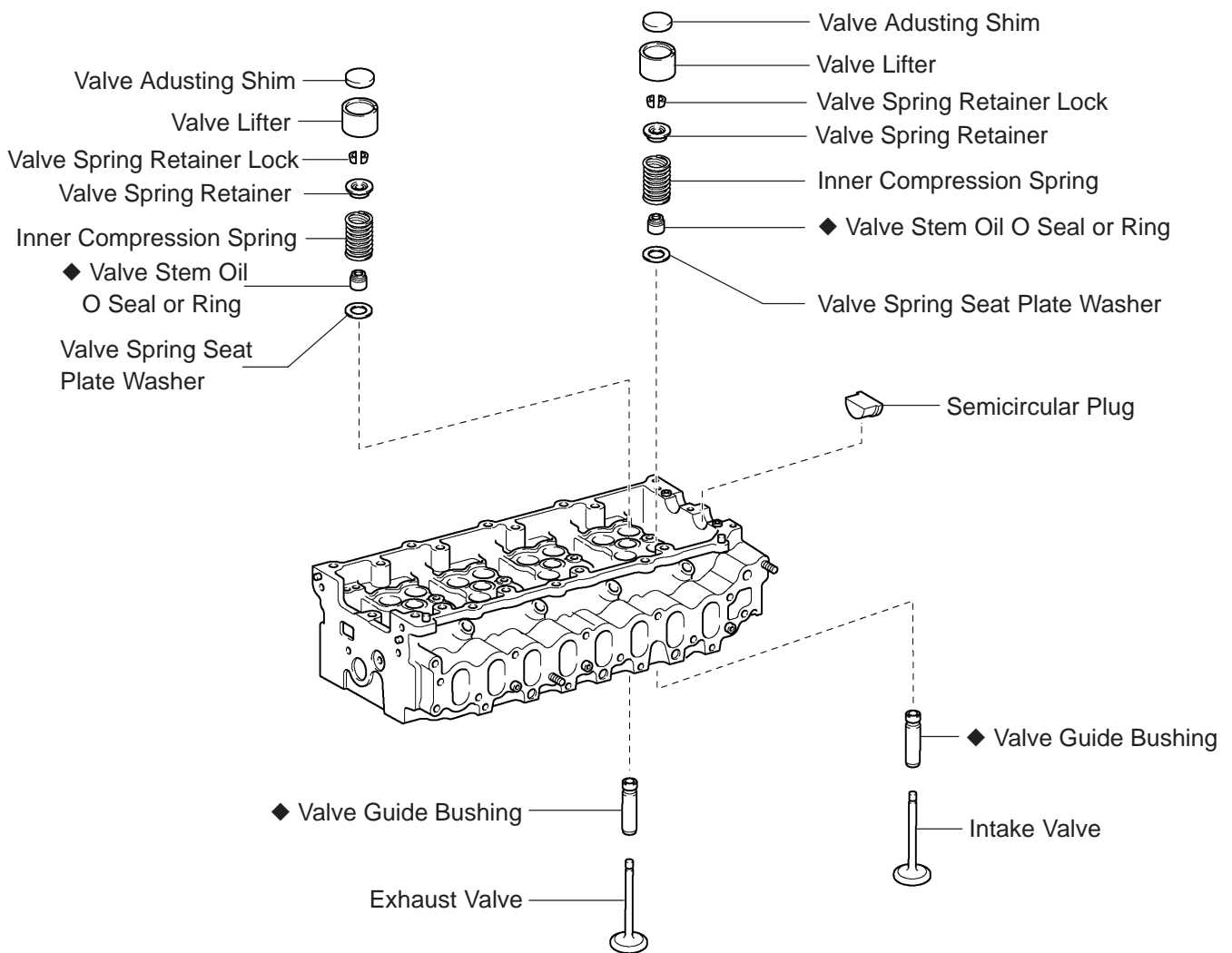
51. INSTALL CYLINDER HEAD COVER SUB-ASSY

- (a) Remove any old packing (FIPG) material.
- (b) Apply seal packing to the cylinder head.
Seal packing: Part No. 08826-00080 or equivalent
- (c) Install the gasket to the head cover.
- (d) Install the cylinder head cover with 10 bolts.
Torque: 13 N·m (135 kgf·cm, 10 ft·lbf)
- (e) Install 4 new nozzle holder seals.

CYLINDER HEAD ASSY (1CD-FTV) COMPONENTS

140L5-01

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◆ Non-reusable part

Y

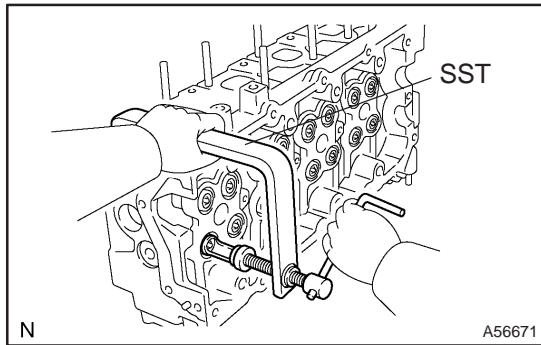
A62604

OVERHAUL

1. REMOVE VALVE LIFTER

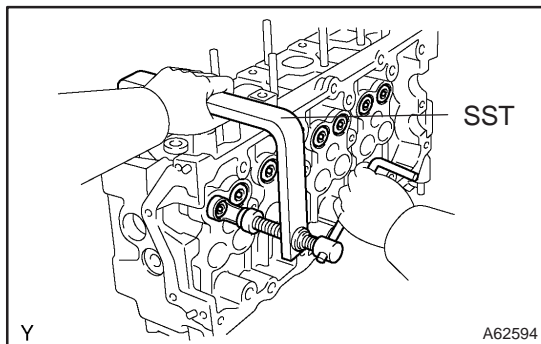
HINT:

Arrange the valve lifters in the correct order.



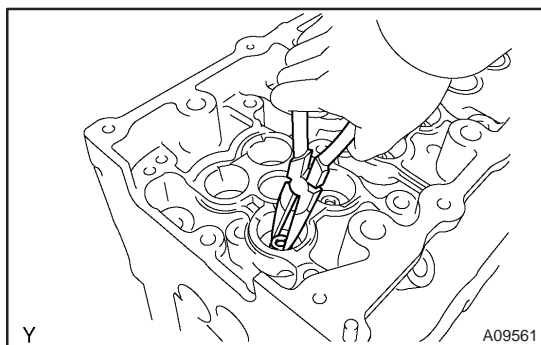
2. REMOVE INTAKE VALVE

- (a) Using SST, compress the valve spring and remove the 2 keepers.
SST 09202-70020 (09202-00010)
- (b) Remove the spring retainer, valve spring and valve.



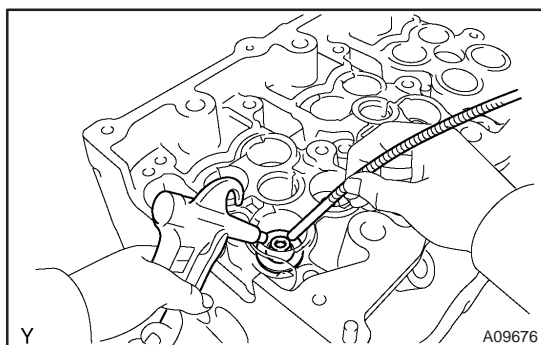
3. REMOVE EXHAUST VALVE

- (a) Using SST, compress the valve spring and remove the 2 keepers.
SST 09202-70020 (09202-00010)
- (b) Remove the spring retainer, valve spring and valve.



4. REMOVE VALVE STEM OIL O SEAL OR RING

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

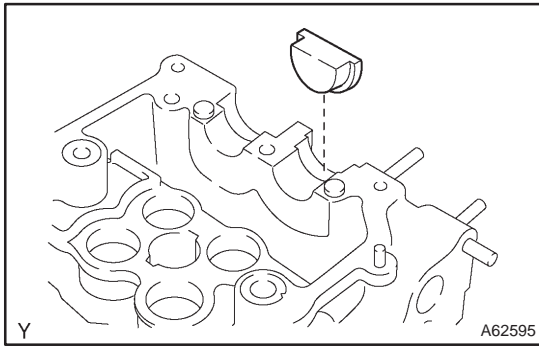


5. REMOVE VALVE SPRING SEAT PLATE WASHER

- (a) Using compressed air and a magnetic finger, remove the spring seat by blowing air.

HINT:

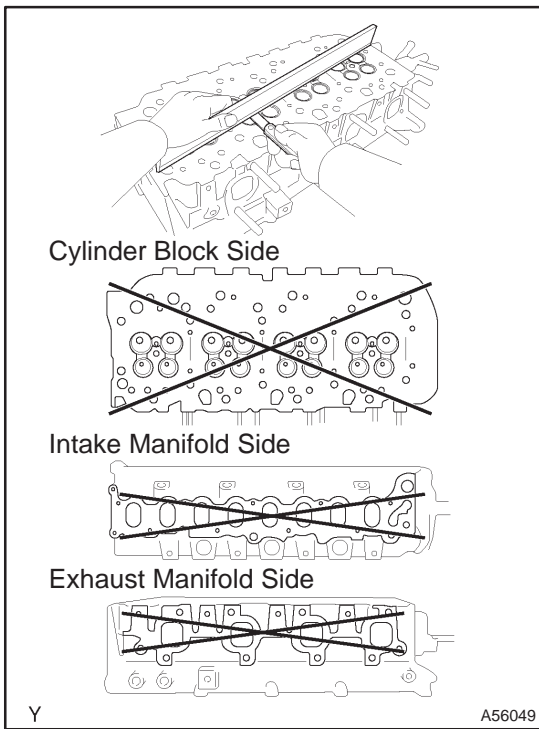
Arrange the valves, valve springs, spring seats and spring retainers in the correct order.



6. REMOVE SEMICIRCULAR PLUG

7. REMOVE W/HEAD TAPER SCREW PLUG NO.1

- (a) Using a hexagon wrench (6mm), remove the 3 plugs.
SST 99999-70037

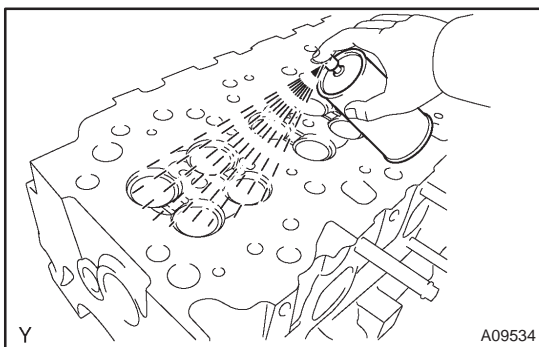


8. INSPECT CYLINDER HEAD FOR FLATNESS

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

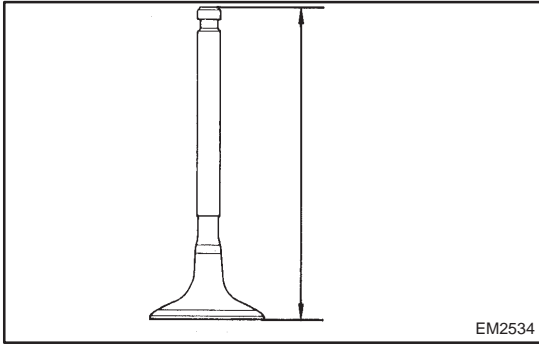
Maximum warpage:

Cylinder block side	0.08mm(0.0031in.)
Intake manifold side	0.20mm(0.0079in.)
Exhaust manifold side	0.20mm(0.0079in.)



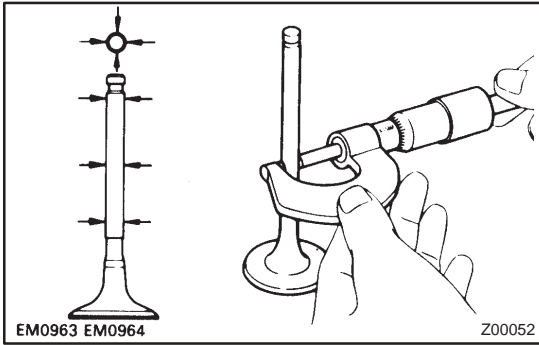
9. INSPECT CYLINDER HEAD FOR CRACKS

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

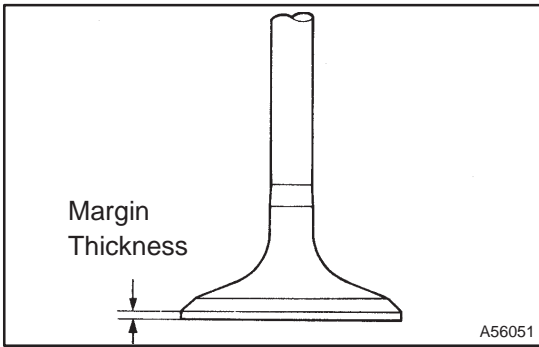


10. INSPECT INTAKE VALVE

- (a) Check the valve overall length.
Standard overall length: 102.53 mm (4.0366 in.)
Minimum overall length: 102.10 mm (4.0197 in.)

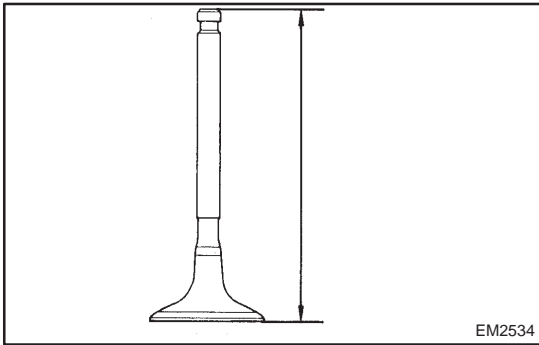


- (b) Using a micrometer, measure the diameter of the valve stem.
Valve stem diameter:
5.970 – 5.985 mm (0.2350 – 0.2356 in.)



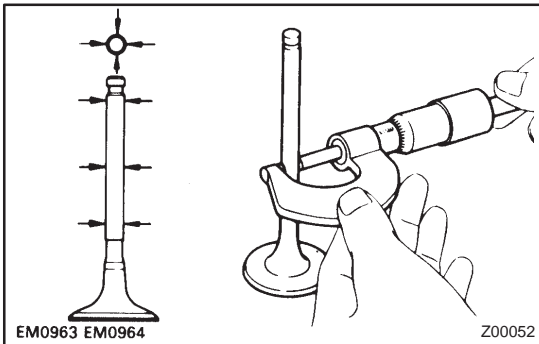
- (c) Check the valve head margin thickness.
Standard margin thickness: 0.9 mm (0.035 in.)
Minimum margin thickness: 0.6 mm (0.0247 in.)

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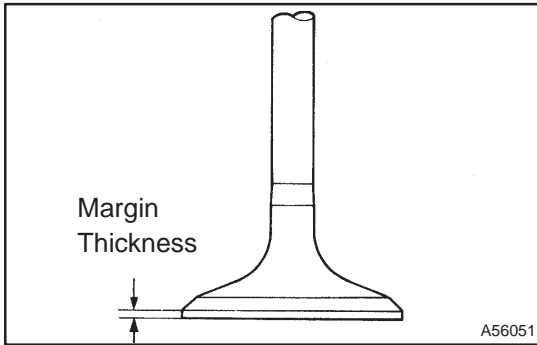


11. INSPECT EXHAUST VALVE

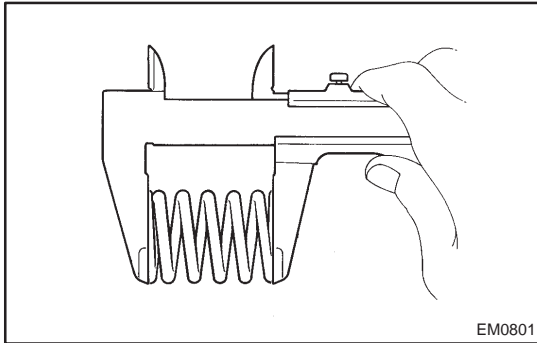
- (a) Check the valve overall length.
Standard overall length: 101.97 mm (4.0146 in.)
Minimum overall length: 101.55 mm (3.9980 in.)



- (b) Using a micrometer, measure the diameter of the valve stem.
Valve stem diameter:
5.960 – 5.975 mm (0.2346 – 0.2352 in.)

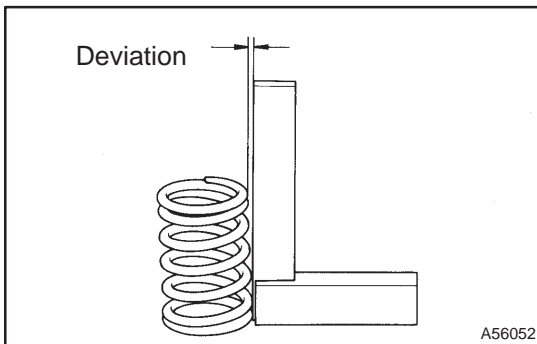


- (c) Check the valve head margin thickness.
Standard margin thickness: 0.9 mm (0.035 in.)
Minimum margin thickness: 0.6 mm (0.024 in.)

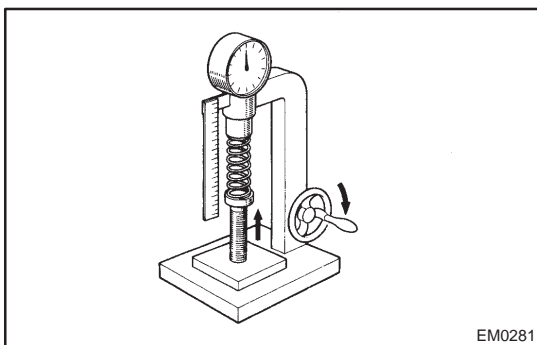


12. INSPECT INNER COMPRESSION SPRING

- (a) Using vernier calipers, measure the free length of the valve spring.
Free length: 40.45 mm (1.5925 in.)

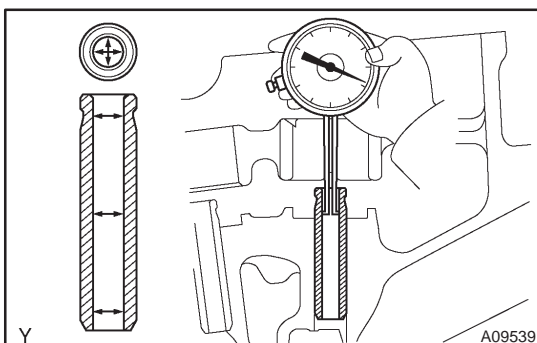


- (b) Using a steel square, measure the deviation of the valve spring.
Maximum deviation: 2.0 mm (0.079 in.)



- (c) Using a spring tester, measure the tension of the valve spring at the specified installed length.
Installed tension:
177 – 195 N (18.0 – 19.9 kgf, 39.7 – 44.1 lbf) at 31.1 mm (1.224 in.)

If the installed tension is not as specified, replace the valve spring.



13. INSPECT VALVE GUIDE BUSHING OIL CLEARANCE

- (a) using a caliper gauge, measure the inside diameter of the guide bushing.
Bushing inside diameter:
6.010 – 6.030 mm (0.2366 – 0.2374 in.)

- (b) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

Standard oil clearance:

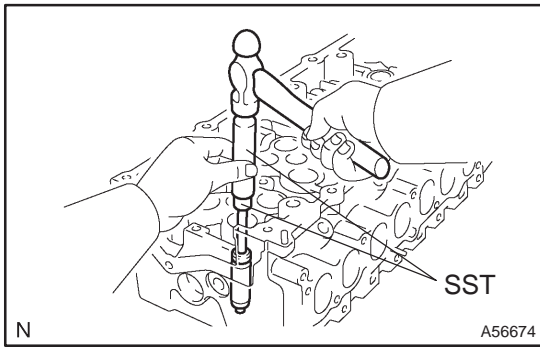
Intake	0.025 – 0.060 mm (0.0010 – 0.0024 in.)
Exhaust	0.035 – 0.070 mm (0.0014 – 0.0028 in.)

Maximum oil clearance:

Intake	0.08 mm (0.0031 in.)
Exhaust	0.10 mm (0.0039 in.)

14. REMOVE INTAKE VALVE GUIDE BUSH

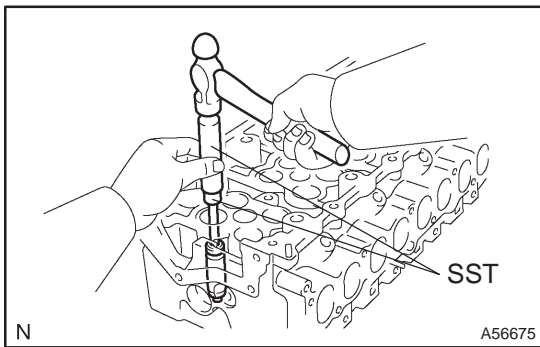
- (a) Heat the cylinder head to 80 – 100°C (176 – 212°F).



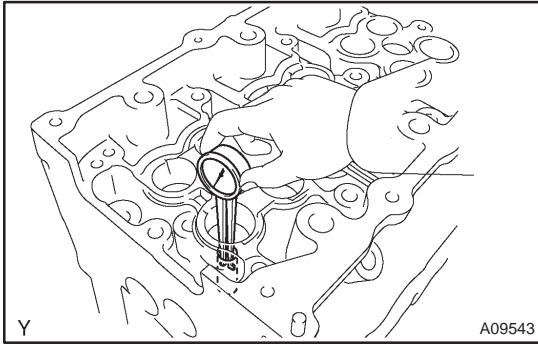
- (b) Using SST and a hammer, tap out the guide bushing.
SST 09201-10000 (09201-01060), 09950-70010 (09951-07100)

15. REMOVE EXHAUST VALVE GUIDE BUSH

- (a) Heat the cylinder head to 80 – 100°C (176 – 212°F).



- (b) Using SST and a hammer, tap out the guide bushing.
SST 09201-10000 (09201-01060), 09950-70010 (09951-07100)



16. INSTALL INTAKE VALVE GUIDE BUSH

- (a) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

Diameter: 10.985 – 11.006 mm (0.4325 – 0.4333 in.)

If the bushing bore diameter of the cylinder head is greater than 11.006 mm (0.4333 in.), machine the bushing bore to the dimension of 11.035 – 11.056 mm (0.4344 – 0.4353 in.).

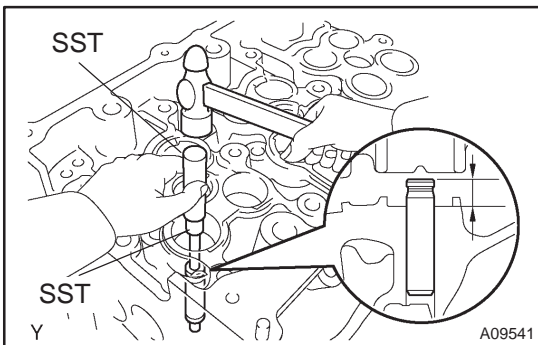
HINT:

Bushing size	Bushing bore diameter mm (in.)
Use STD	10.985 – 11.006 (0.4325 – 0.4333)
Use O/S 0.05	11.035 – 11.056 (0.4344 – 0.4353)

- (b) Heat the cylinder head to 80 – 100°C. (176 – 212°F)
- (c) Using SST and a hammer, top in a new guide bushing to the specified protrusion height.
SST 09201-10000 (09201-01060), 09950-70010 (09951-07100)

Protrusion height:

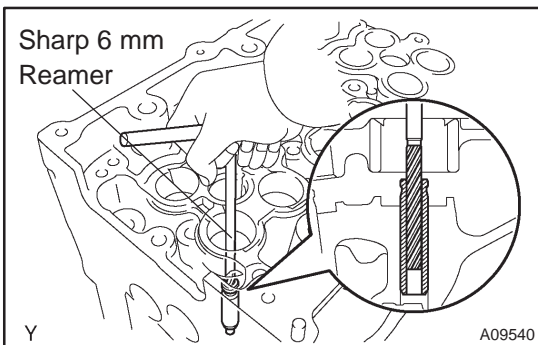
10.05 – 10.45 mm (0.3957 – 0.4114 in.)

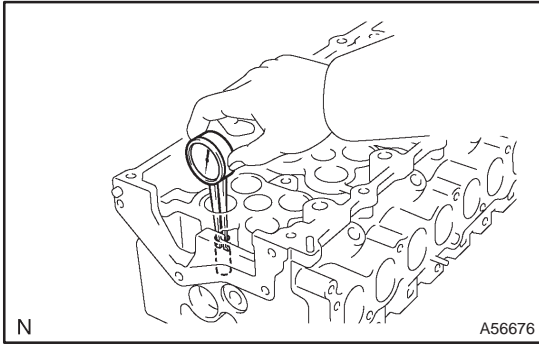


- (d) Using a sharp 6 mm reamer, ream the guide bushing to obtain the standard specified clearance between the guide bushing and valve stem.

Standard oil clearance:

0.025 – 0.060 mm (0.0010 – 0.0024 in.)





17. INSTALL EXHAUST VALVE GUIDE BUSH

- (a) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

Diameter: 10.985 – 11.006 mm (0.4325 – 0.4333 in.)

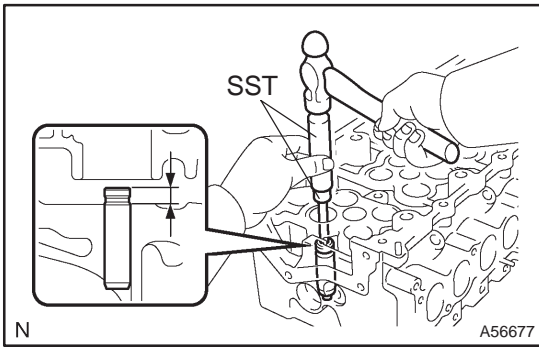
If the bushing bore diameter of the cylinder head is greater than 11.006 mm (0.4333 in.), machine the bushing bore to the dimension of 11.035 – 11.056 mm (0.4344 – 0.4353 in.).

HINT:

Bushing size	Bushing bore diameter mm (in.)
Use STD	10.985 – 11.006 (0.4325 – 0.4333)
Use O/S 0.05	11.035 – 11.056 (0.4344 – 0.4353)

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

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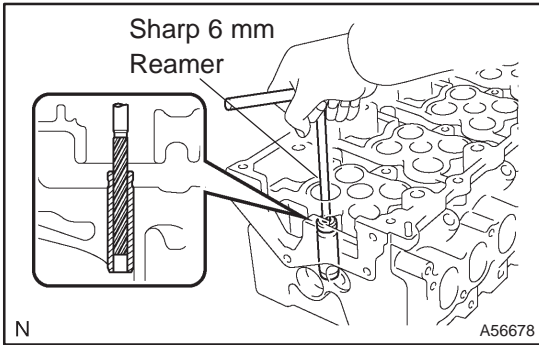


- (c) Using SST and a hammer, tap in a new guide bushing to the specified protrusion height.

SST 09201-10000 (09201-01060), 09950-70010 (09951-07100)

Protrusion height:

9.65 – 10.05 mm (0.3799 – 0.3957 in.)



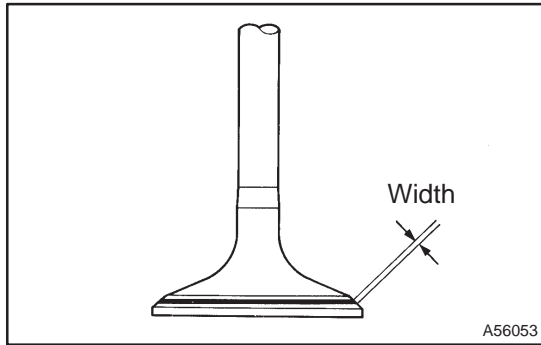
- (d) Using a sharp 6 mm reamer, ream the guide bushing to obtain the standard specified clearance between the guide bushing and valve stem.

Standard oil clearance:

0.035 – 0.070 mm (0.0014 – 0.0028 in.)

18. INSPECT VALVE SEATS

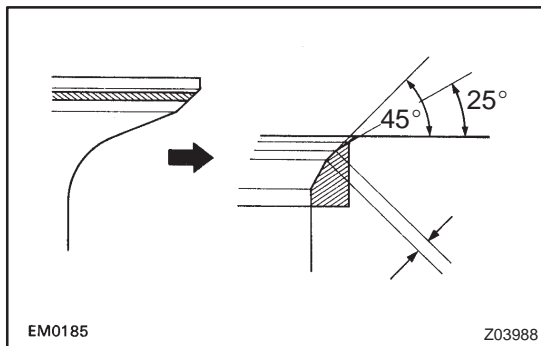
- (a) Apply a light coat of prussian blue (or white lead) to the valve face.
- (b) Lightly press the valve against the seat.



- (c) Check the valve face and seat according to the following procedure.
- (1) If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
 - (2) If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
 - (3) Check that the seat contact is in the middle of the valve face with the following width.

Intake	1.2 – 1.6 mm (0.047 – 0.063 in.)
Exhaust	1.6 – 2.0 mm (0.063 – 0.079 in.)

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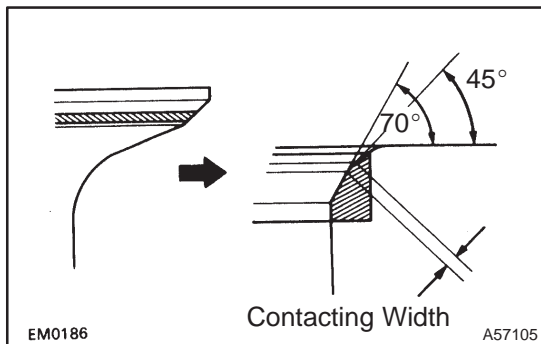


19. REPAIR INTAKE VALVE SEATS

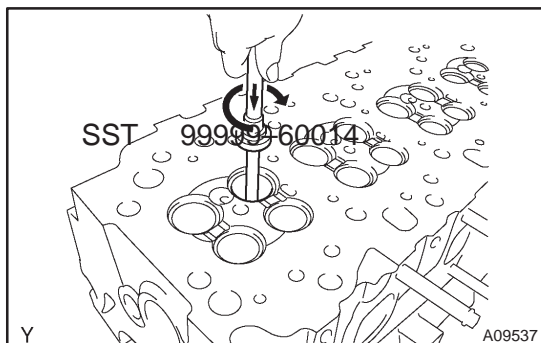
NOTICE:

Take off a cutter gradually to make smooth valve seats.

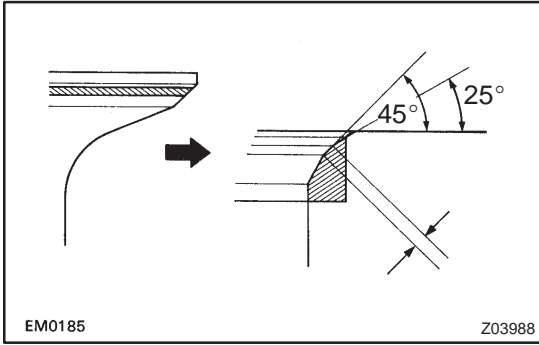
- (a) If the seating is too high on the valve face, use 25° and 45° cutters to correct the seat.



- (b) If the seating is too low on the valve face, use 70° and 45° cutters to correct the seat.



- (c) Hand-lap the valve and valve seat with an abrasive compound.
- (d) Check the valve seating position.

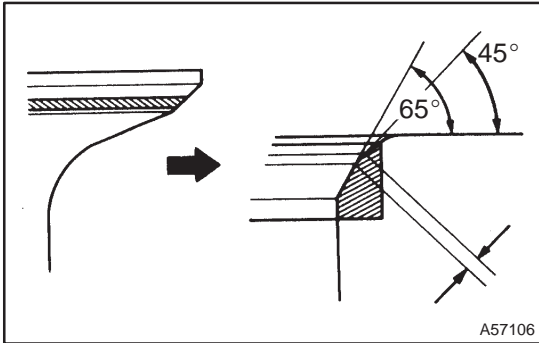


20. REPAIR EXHAUST VALVE SEATS

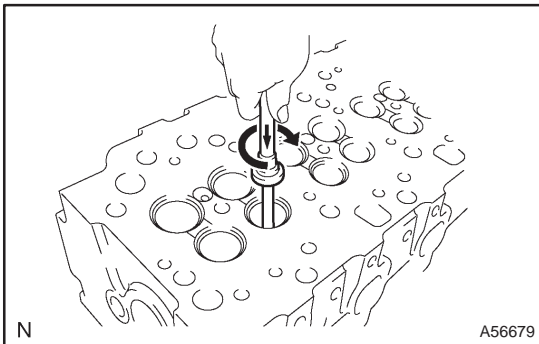
NOTICE:

Take off a cutter gradually to make smooth valve seats.

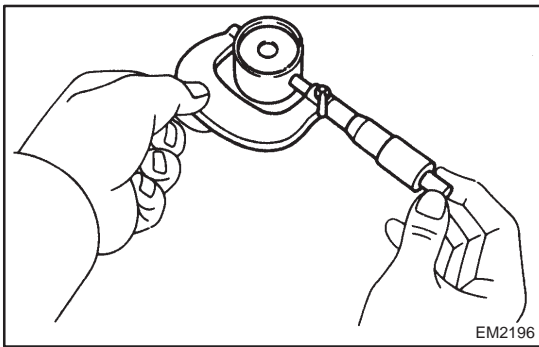
- (a) If the seating is too high on the valve face, use 25° and 45° cutters to correct the seat.



- (b) If the seating is too low on the valve face, use 65° and 45° cutters to correct the seat.



- (c) Hand-lap the valve and valve seat with an abrasive compound.
- (d) Check the valve seating position.

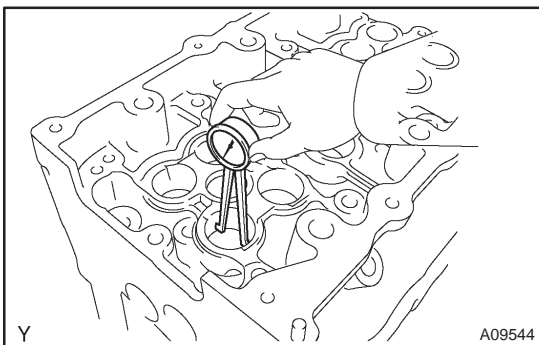


21. INSPECT VALVE LIFTER

- (a) Using a micrometer, measure the lifter diameter.

Lifter diameter:

27.975 – 27.985 mm (1.1014 – 1.1018 in.)



22. INSPECT VALVE LIFTER OIL CLEARANCE

- (a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

Lifter diameter:

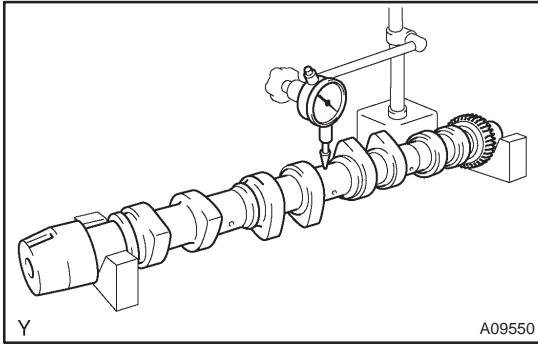
28.010 – 28.031 mm (1.1028 – 1.1036 in.)

- (b) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

Standard oil clearance:

0.025 – 0.056 mm (0.0010 – 0.0022 in.)

Maximum oil clearance: 0.08 mm (0.0031 in.)

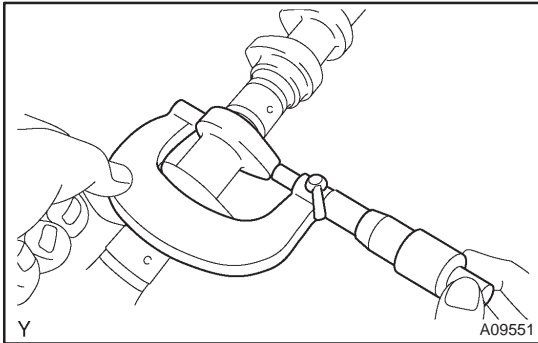


23. INSPECT CAMSHAFT

- (a) Inspect the circle runout.
- (1) Place the camshaft on V-blocks.
 - (2) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.06 mm (0.0024 in.)

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



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

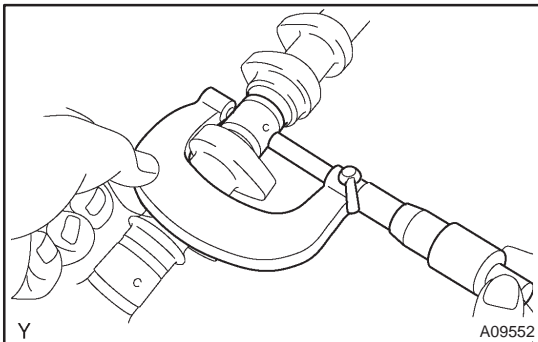
Standard cam lobe height:

Intake	46.57 – 46.67 mm (1.8335 – 1.8374 in.)
Exhaust	47.52 – 47.62 mm (1.8709 – 1.8748 in.)

Minimum cam lobe height:

Intake	46.10 mm (1.8150 in.)
Exhaust	47.05 mm (1.8524 in.)

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

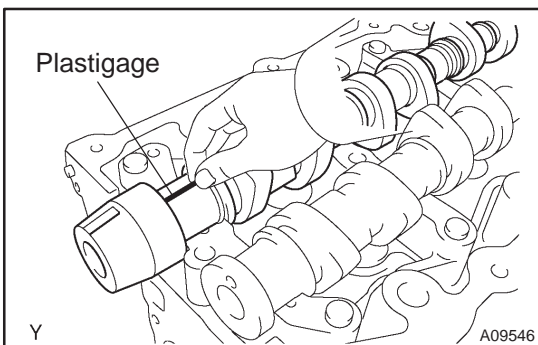


- (c) Using a micrometer, measure the journal diameter.

Journal diameter:

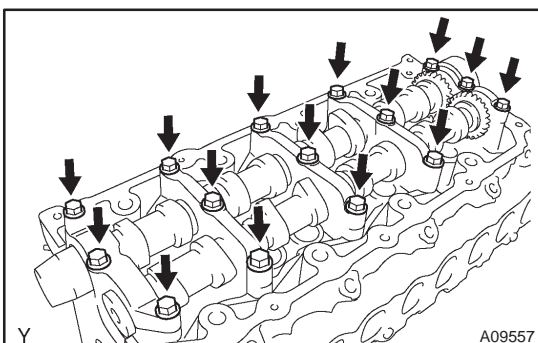
26.969 – 26.985 mm (1.0618 – 1.0624 in.)

If the journal diameter is not as specified, check the oil clearance.



24. INSPECT CAMSHAFT OIL CLEARANCE

- (a) Clean the bearing caps and camshaft carrier.
 - (b) Check the bearings for flaking and scoring.
- If the bearings are damaged, replace the bearing caps, camshaft carrier and cylinder head as a set.
- (c) Place the camshaft carrier and camshafts on the cylinder head.
 - (d) Lay a strip of Plastigage across each of the camshaft journals.



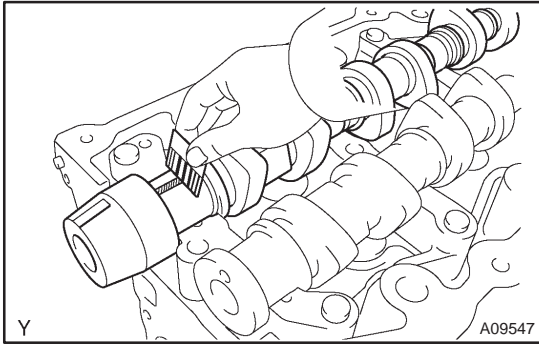
- (e) Install the bearing caps.

Torque: 20 N·m (200 kgf·cm, 15 ft·lbf)

NOTICE:

Do not turn the camshaft.

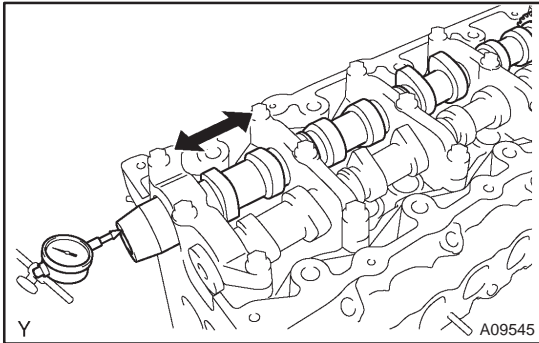
- (f) Remove the bearing caps.



- (g) Measure the Plastigage at its widest point.
Standard oil clearance:
0.025 – 0.062 mm (0.0010 – 0.0024 in.)
Maximum oil clearance: 0.08 mm (0.0031 in.)

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps, camshaft carrier and cylinder head as a set.

- (h) Completely remove the Plastigage.

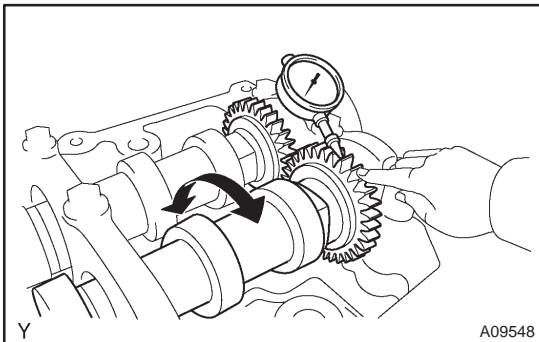


25. INSPECT CAMSHAFT THRUST CLEARANCE

- (a) Install the camshaft.
- (b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance:
0.035 – 0.110 mm (0.0014 – 0.0043 in.)

If the thrust clearance is not as specified, replace the camshaft. If necessary, replace the bearing caps, camshaft carrier and cylinder head as a set.



26. INSPECT CAMSHAFT GEAR BACKLASH

- (a) Install the camshafts.
- (b) Using a dial indicator, measure the backlash.

Standard backlash:
0.014 – 0.070 mm (0.0006 – 0.0028 in.)
Maximum backlash: 0.17 mm (0.0067 in.)

If the backlash is greater than maximum, replace the camshafts.

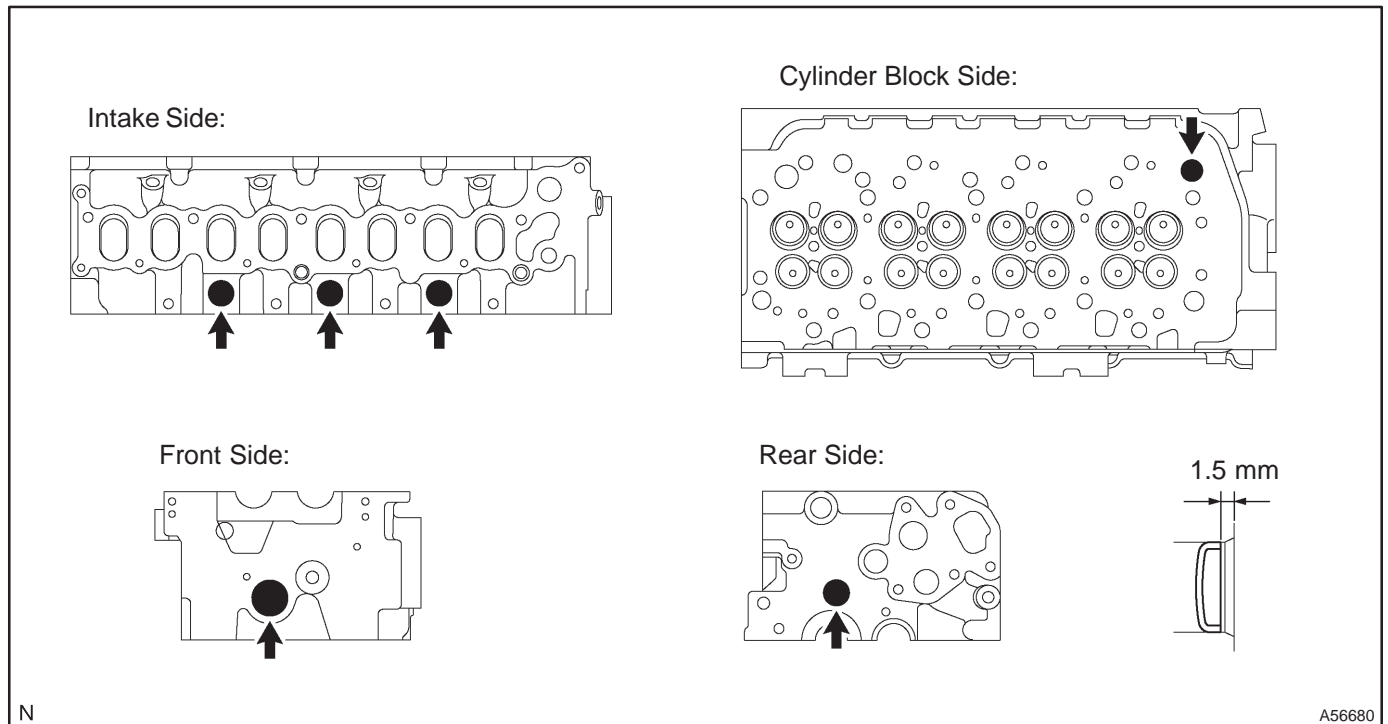
27. INSTALL TIGHT PLUG

- (a) Apply adhesive around tight plugs.

Adhesive: Part No.08833 - 00070, THREE BOND 1324 or equivalent

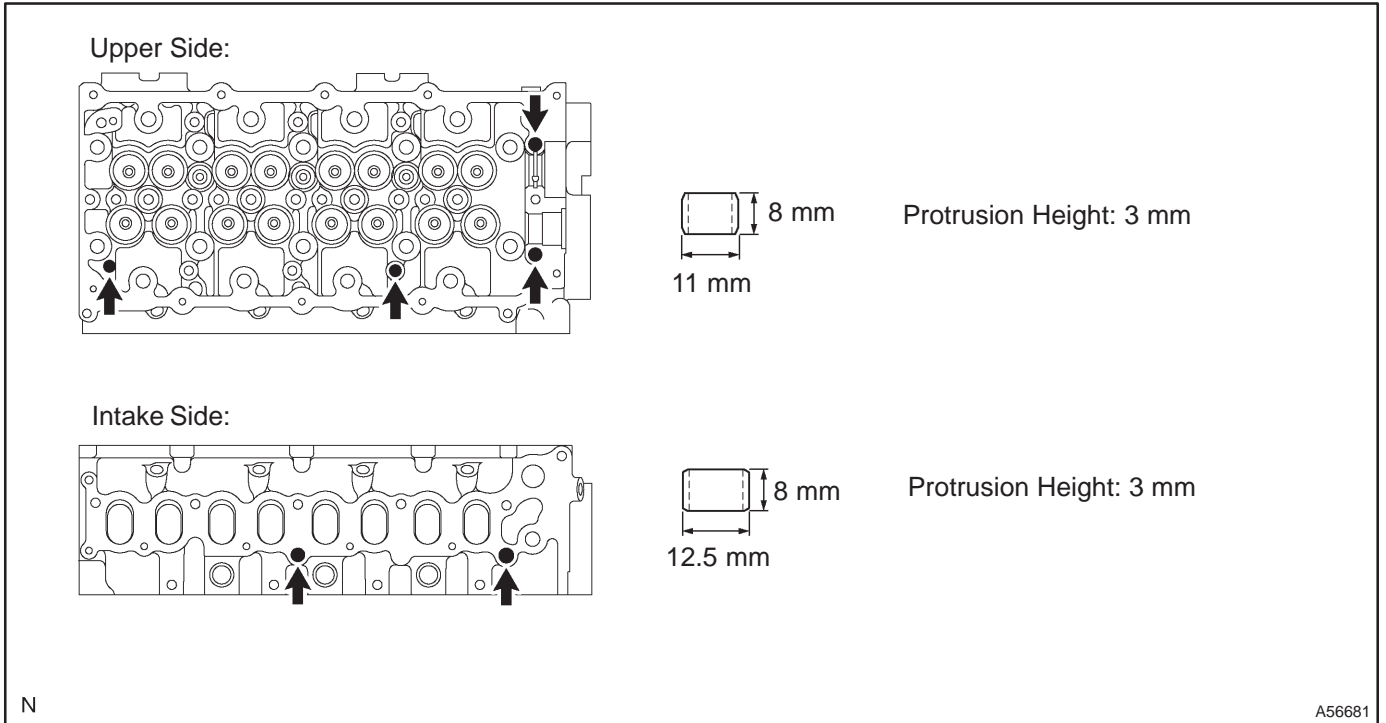
- (b) Using SST, tap in the tight plugs as shown in the illustration.

SST 09950-60010 (09951-00210), 09950-70010 (09951-07100)



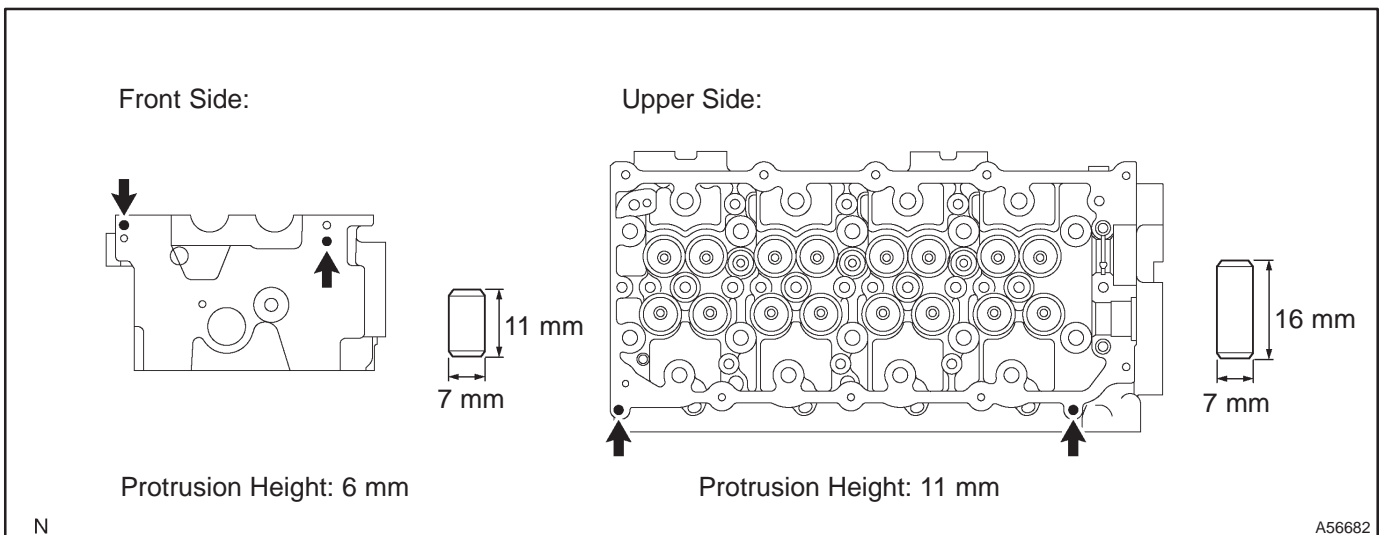
28. INSTALL RING PIN

- (a) Using a plastic-faced hammer, tap in new ring pins to the specified protrusion height.



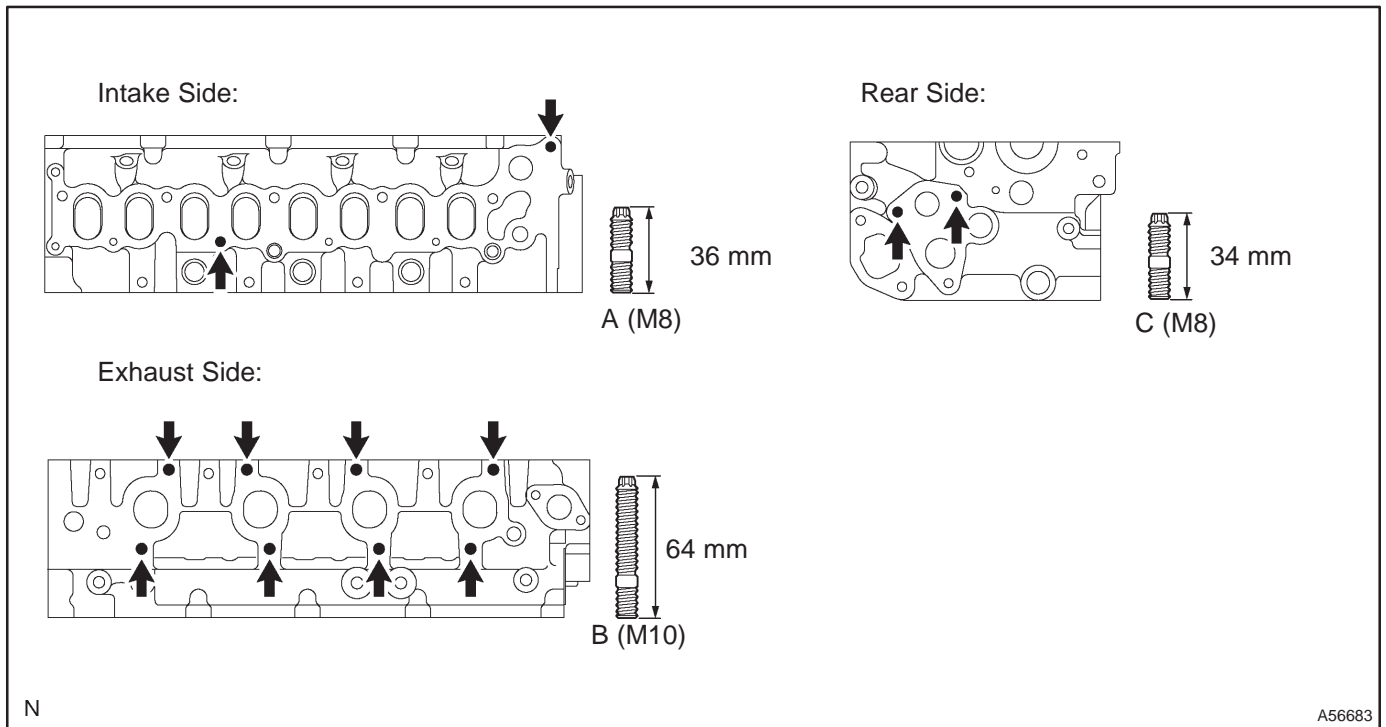
29. INSTALL STRAIGHT PIN

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



30. INSTALL STUD BOLT

- (a) Install the stud bolts as shown in the illustration.

Torque:**Bolt A 8.8N·m (90 kgf·cm, 78 in·lbf)****Bolt B 12N·m (120 kgf·cm, 9 ft·lbf)****Bolt C 8.8N·m (90 kgf·cm, 78 in·lbf)****31. INSTALL W/HEAD TAPER SCREW PLUG NO.1**

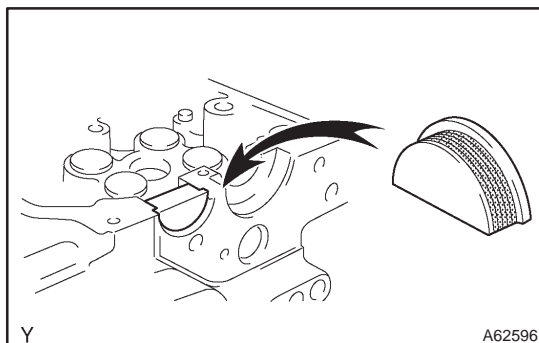
- (a) Apply adhesive to the plugs end.

Adhesive: Part No. 08833 - 00070, THREE BOND 1324 or equivalent

- (b) Using a hexagon wrench (6 mm), install the 3 plugs.

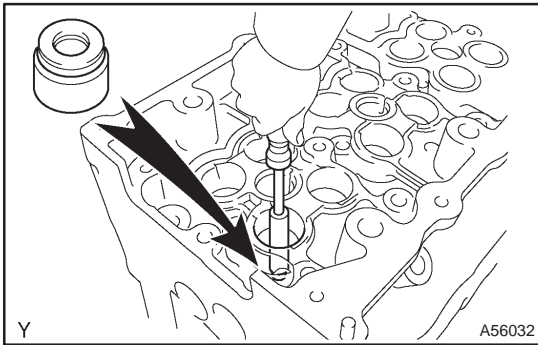
Torque: 25N·m (255 kgf·cm, 18 ft·lbf)

SST 99999-70037

**32. INSTALL SEMICIRCULAR PLUG**

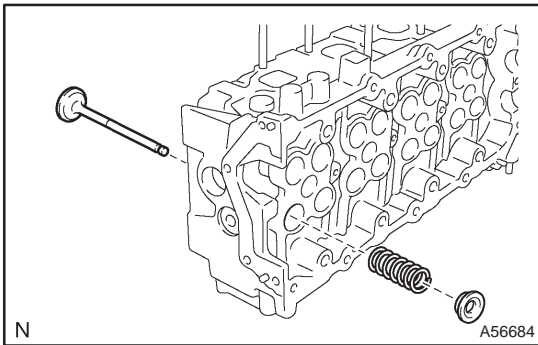
- (a) Apply seal packing to the semi-circular plug grooves.
Seal packing: Part No. 08826 - 00080 or equivalent
- (b) Install the semi-circular plug to the cylinder head.

33. INSTALL VALVE SPRING SEAT PLATE WASHER



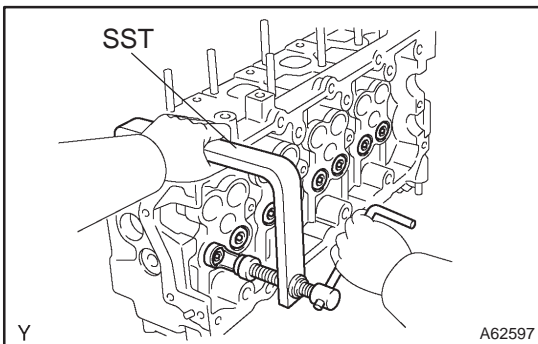
34. INSTALL VALVE STEM OIL O SEAL OR RING

- (a) Apply a light coat of engine oil on the valve stem.
- (b) Install a new oil seal on the valve guide bushing.

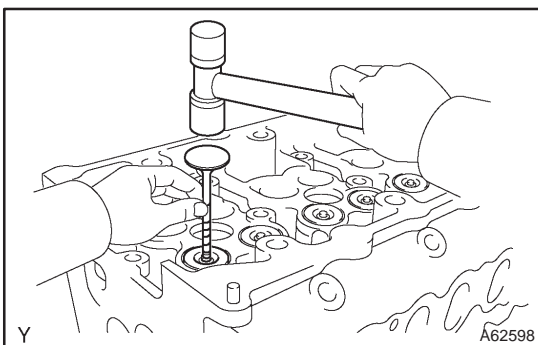


35. INSTALL INTAKE VALVE

- (a) Install the valve, valve spring, and spring retainer.



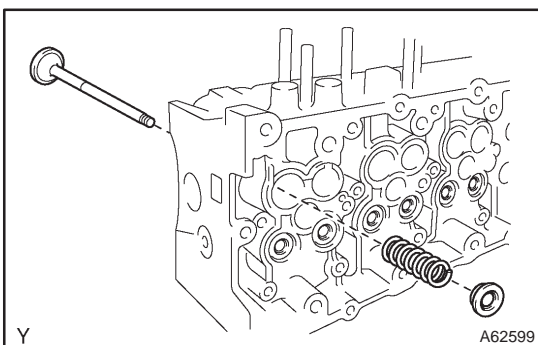
- (b) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202-70020 (09202-00010)



- (c) Using a plastic-faced hammer and the valve stem (not in use) tip wound with vinyl tape, lightly tap the valve stem tip to ensure a proper fit.

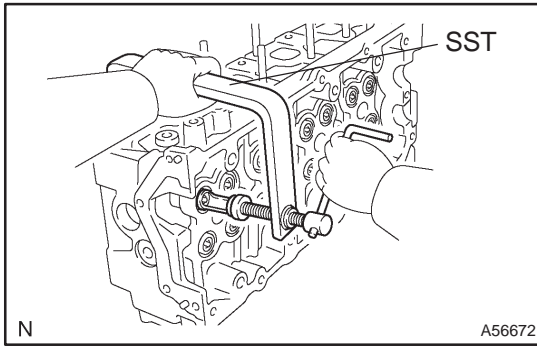
NOTICE:

Be careful not to damage the valve stem tip.

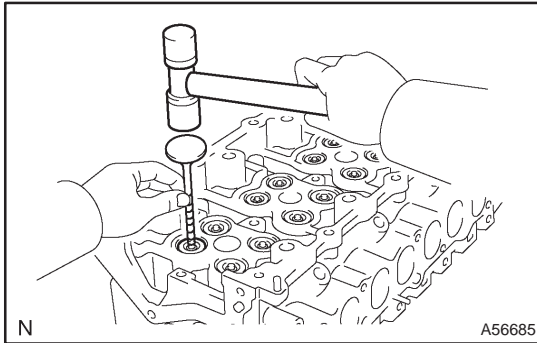


36. INSTALL EXHAUST VALVE

- (a) Install the valve, valve spring, and spring retainer.



- (b) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202-70020 (09202-00010)



- (c) Using a plastic-faced hammer and the valve stem (not in use) tip wound with vinyl tape, lightly tap the valve stem tip to assure proper fit.

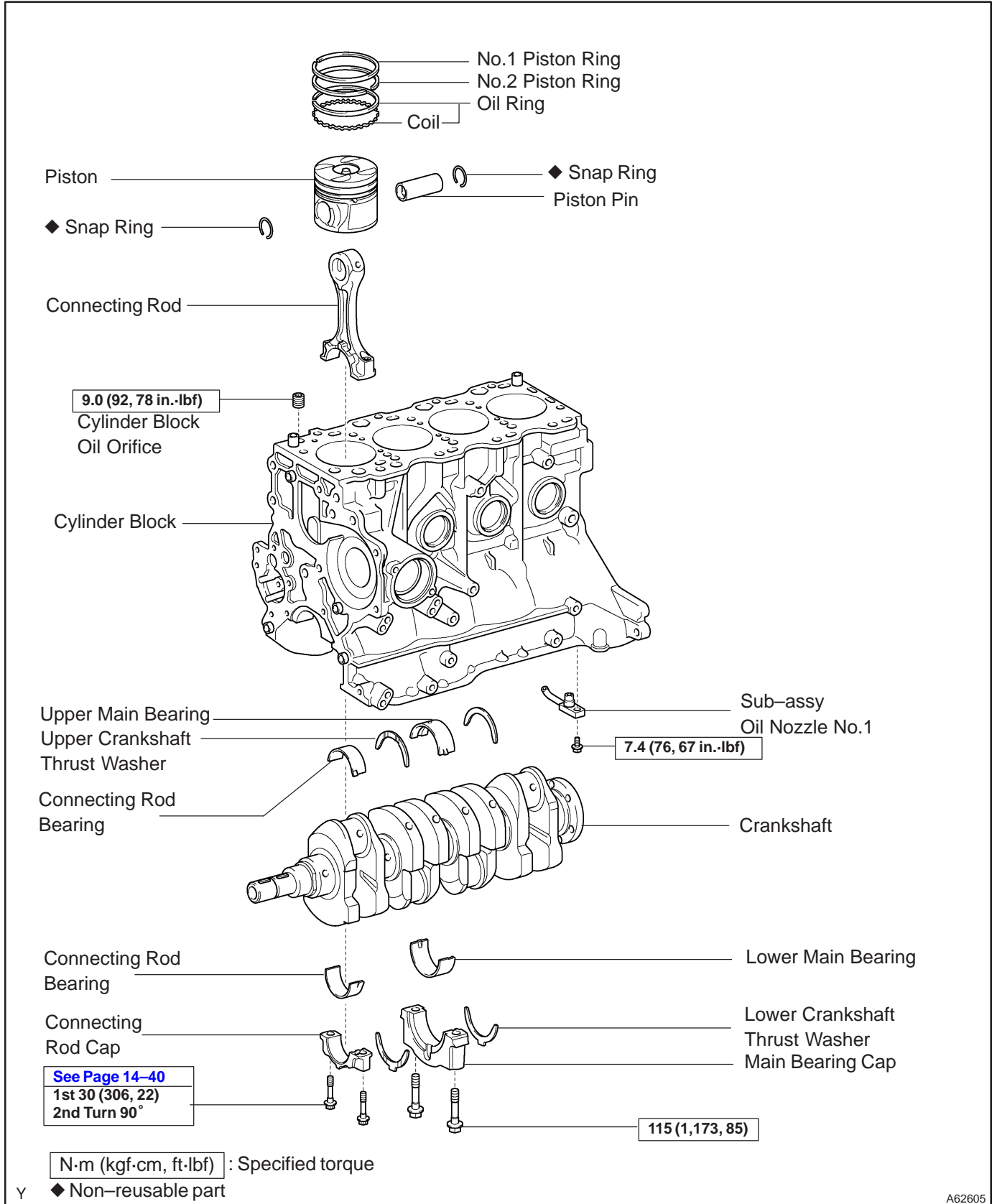
NOTICE:

Be careful not to damage the valve stem tip.

CYLINDER BLOCK (1CD-FTV) COMPONENTS

140L6-01

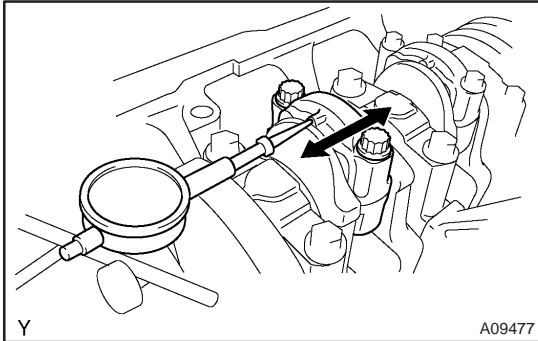
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OVERHAUL



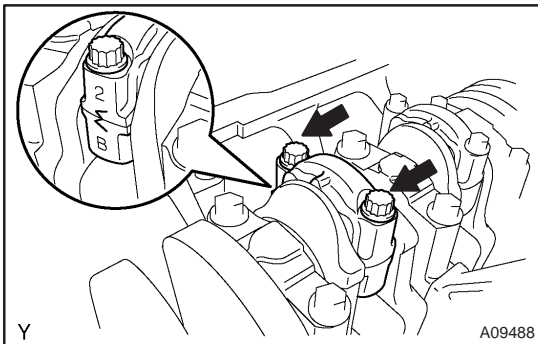
- 1. INSPECT CONNECTING ROD THRUST CLEARANCE**
 (a) Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:

0.08 – 0.30 mm (0.0031 – 0.0118 in.)

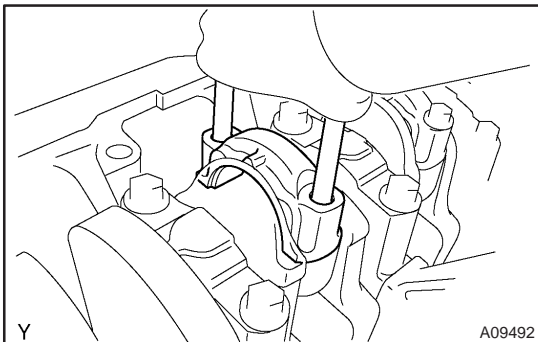
Maximum thrust clearance: 0.40 mm (0.0157 in.)

If the thrust clearance is greater than maximum, replace the connecting rod assembly(s). If necessary, replace the crankshaft.



- 2. INSPECT CONNECTING ROD OIL CLEARANCE**

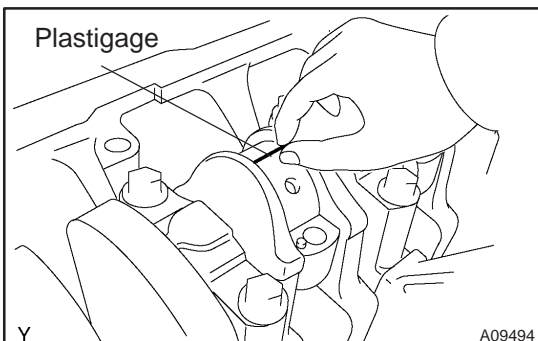
- (a) Check the matchmarks on the connecting rod and cap to ensure correct reassembly.
 (b) Remove the 2 connecting rod cap bolts.



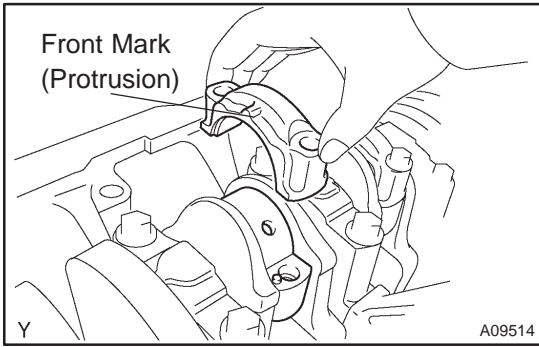
- (c) Using 2 removed connecting rod cap bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.

HINT:

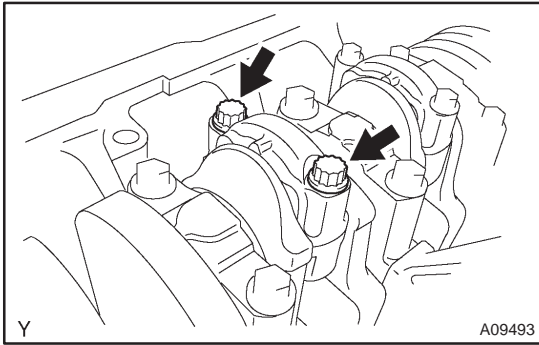
Keep the lower bearing inserted with the connecting rod cap.



- (d) Clean the crank pin and bearing.
 (e) Check the crank pin and bearing for pits and scratches. If the crank pin or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.
 (f) Lay a strip of plastigage across the crank pin.

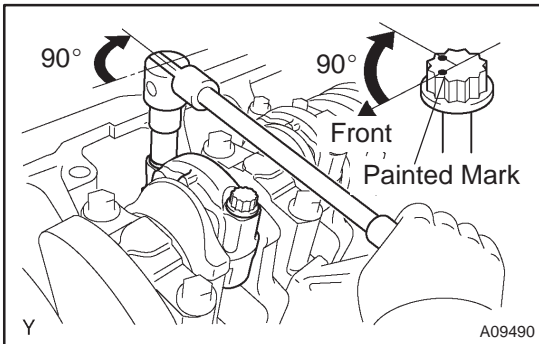


- (g) Match the numbered connecting rod cap with the connecting rod.
- (h) Install the connecting rod cap with the front mark facing forward.
- (i) Apply a light coat of engine oil on the threads and under the heads of the connecting rod cap bolts.



- (j) Install and alternately tighten the 2 cap bolts in several passes.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

If any of the cap bolts does not meet the torque specification, replace the connecting rod cap bolts.

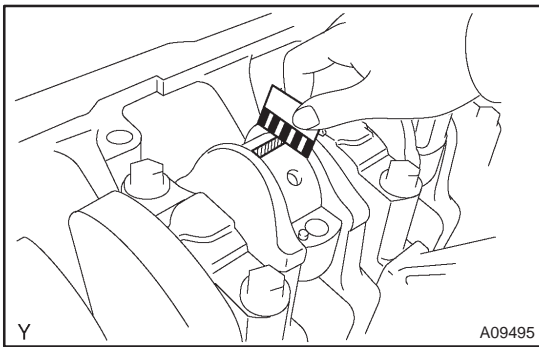


- (k) Mark the front of the cap bolt with the paint.
- (l) Retighten the cap bolts 90° as shown.
- (m) Check that the painted mark is now at a 90° angle to the front.

NOTICE:

Do not turn the crankshaft.

- (n) Remove the 2 bolts, connecting rod cap and lower bearing.



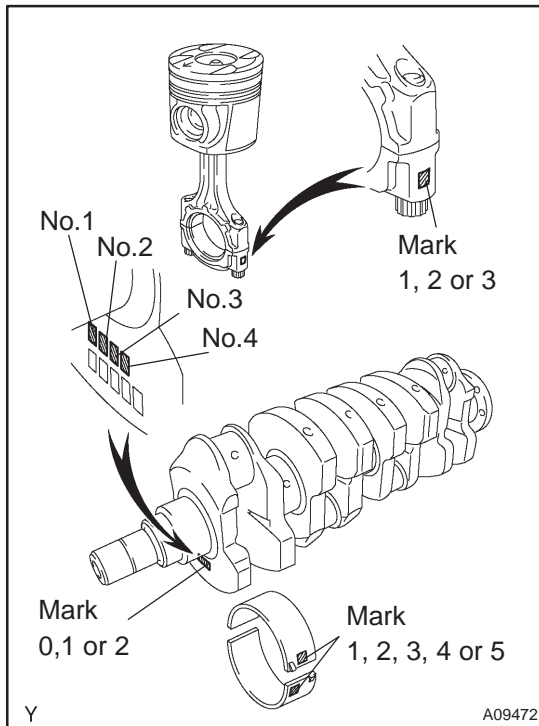
- (o) Measure the Plastigage at its widest point.

Standard oil clearance:

0.038 – 0.056 mm (0.0015 – 0.0022 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, replace the crankshaft.



- (p) If using a standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the crankshaft and connecting rod cap, then select the bearing with the same number as the total. There are 5 sizes of standard bearings, marked "1", "2", "3", "4" and "5" accordingly.

Connecting rod cap	Crankshaft	Use bearing
1	0	1
1	1	2
1	2	3
2	0	2
2	1	3
2	2	4
3	0	3
3	1	4
3	2	5

HINT:

EXAMPLE: Connecting rod cap "2" + Crankshaft "1"
= total number 3 (Use bearing "3")

Connecting rod big end inside diameter:

Mark "1"	53.500 – 53.506 mm (2.1063 – 2.1065 in.)
Mark "2"	53.506 – 53.512 mm (2.1065 – 2.1068 in.)
Mark "3"	53.512 – 53.518 mm (2.1068 – 2.1070 in.)

Crankshaft crank pin diameter:

Mark "0"	50.494 – 50.500 mm (1.9880 – 1.9882 in.)
Mark "1"	50.488 – 50.494 mm (1.9877 – 1.9880 in.)
Mark "2"	50.482 – 50.488 mm (1.9875 – 1.9877 in.)

Standard sized bearing center wall thickness:

Mark "1"	1.478 – 1.481 mm (0.0582 – 0.0583 in.)
Mark "2"	1.481 – 1.484 mm (0.0583 – 0.0584 in.)
Mark "3"	1.484 – 1.487 mm (0.0584 – 0.0585 in.)
Mark "4"	1.487 – 1.490 mm (0.0585 – 0.0587 in.)
Mark "5"	1.490 – 1.493 mm (0.0587 – 0.0588 in.)

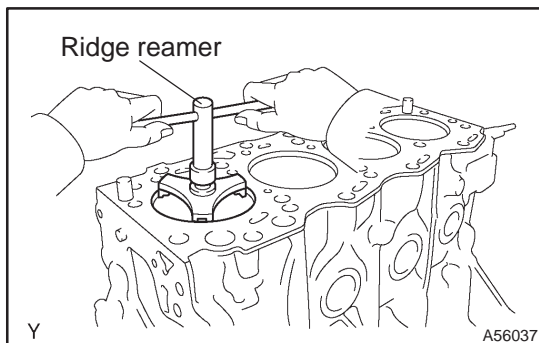
- (q) Completely remove the Plastigage.

3. REMOVE PISTON SUB-ASSY W/CONNECTING ROD

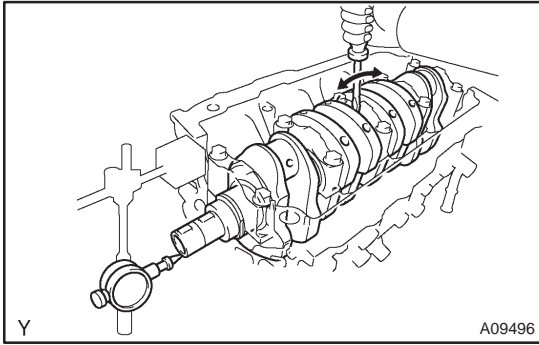
- (a) Using a ridge reamer, remove all the carbon from the top of the cylinder.
 (b) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

HINT:

- Keep the bearing, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in the correct order.



4. REMOVE CONNECTING ROD BEARING



5. 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:

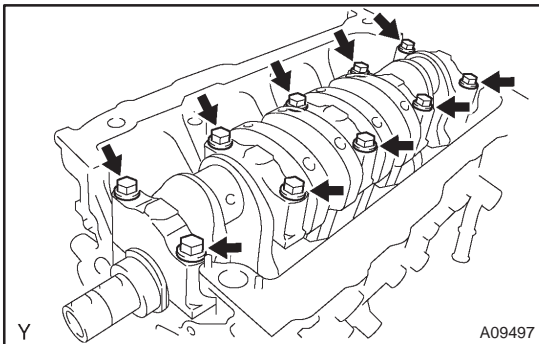
0.040 – 0.240 mm (0.0016 – 0.0009 in.)

Maximum thrust clearance: 0.30 mm(0.0118 in.)

If the thrust clearance is greater than maximum, replace the thrust washer as a set.

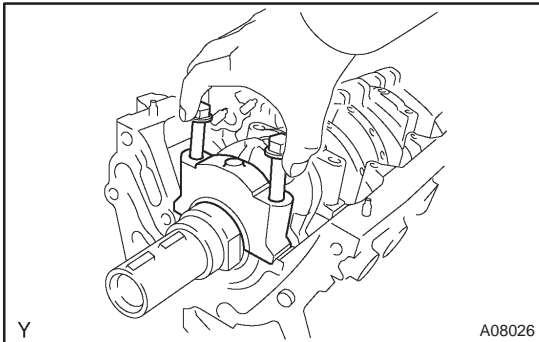
Thrust washer thickness:

STD	2.680 – 2.730 mm (0.1055 – 0.1075 in.)
O/S 0.125	2.743 – 2.793 mm (0.1080 – 0.1100 in.)
O/S 0.250	2.805 – 2.855 mm (0.1104 – 0.1124 in.)



6. REMOVE CRANKSHAFT

- (a) Uniformly loosen and remove the 10 main bearing cap bolts.



- (b) Using the removed main bearing cap bolts, wiggle the cap back and forth, and remove the 5 main bearing caps, 5 lower bearings and 2 lower thrust washers (No. 3 main bearing cap only).

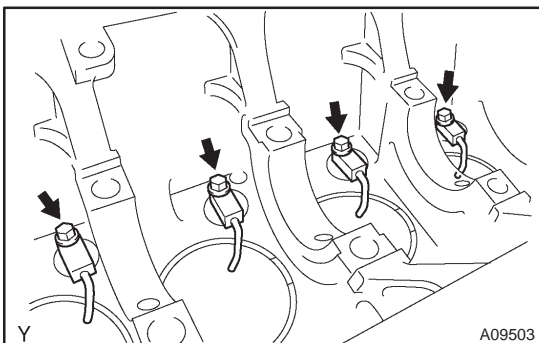
HINT:

- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust washers in the correct order.

- (c) Lift out the crankshaft.

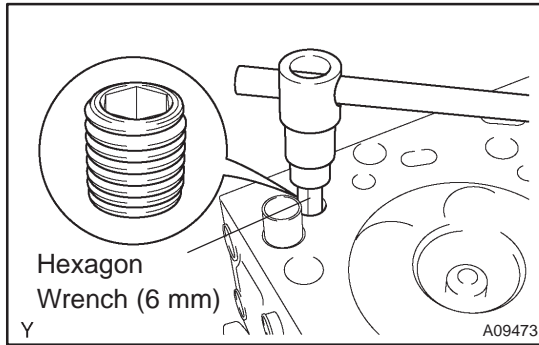
HINT:

Keep the upper bearing and upper thrust washers together with the cylinder block.



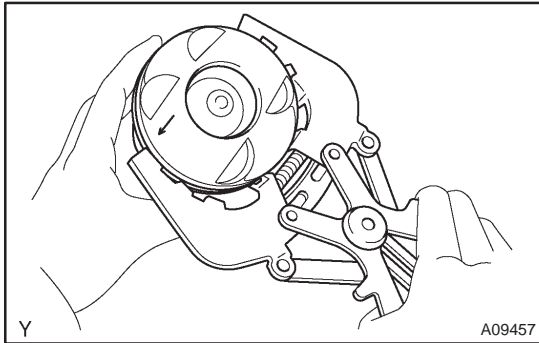
7. REMOVE SUB-ASSY OIL NOZZLE NO.1

- (a) Remove the bolt and 4 oil nozzles.



8. REMOVE CYLINDER BLOCK OIL ORIFICE

- (a) Using a hexagon wrench (6 mm), remove the oil orifice.



9. REMOVE PISTON RING SET

- (a) Using a piston ring expander, remove the No. 1 piston ring, No. 2 piston ring and oil ring.

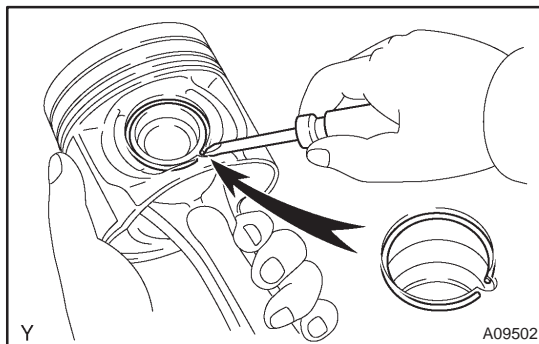
NOTICE:

Make the expansion of the piston ring as small as necessary.

- (b) Remove the coil by hand.

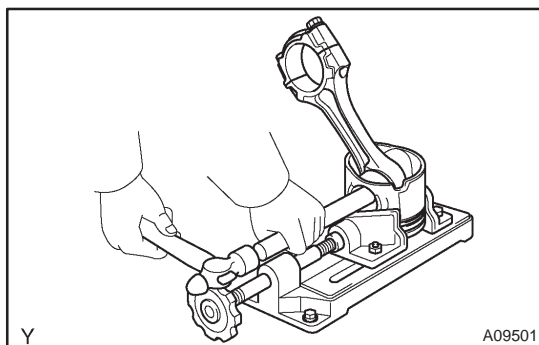
HINT:

Arrange the piston rings in correct order.



10. REMOVE W/PIN PISTON SUB-ASSY

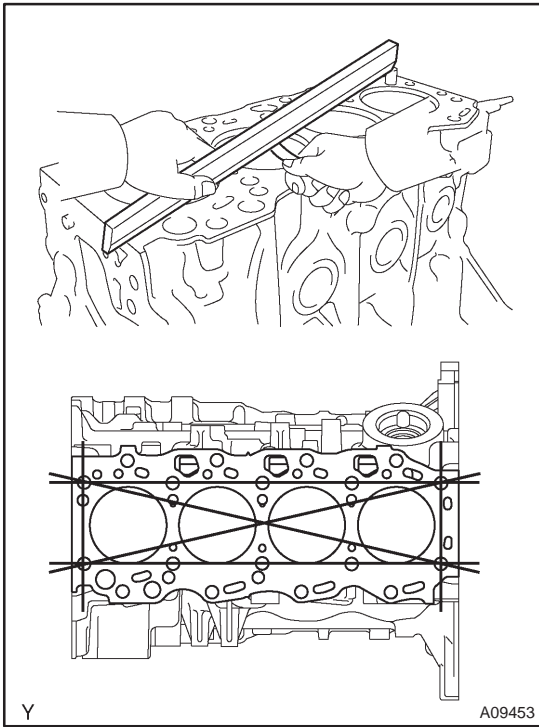
- (a) Using a small screwdriver, pry off the snap rings from the piston.
- (b) Gradually heat the piston to approx. 60°C (140°F).



- (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 matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in the correct order.



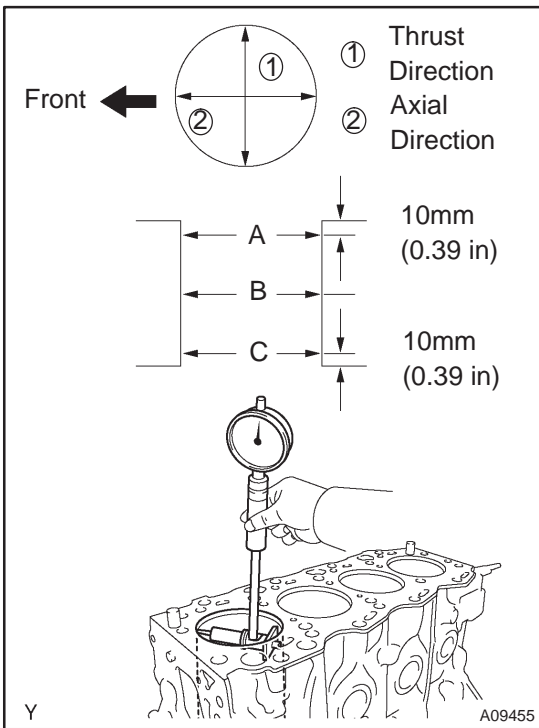
11. INSPECT CYLINDER BLOCK FOR FLATNESS

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

Maximum warpage: 0.05 mm (0.0020 in.)

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

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12. INSPECT CYLINDER BORE

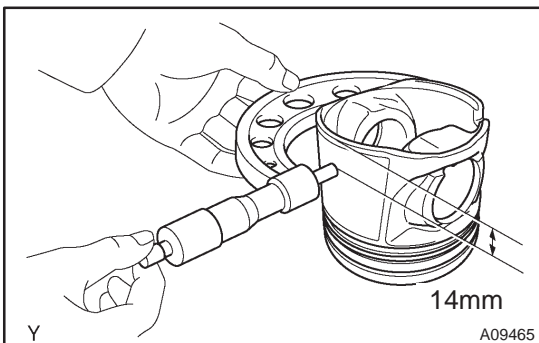
- (a) Using a cylinder gauge, measure the cylinder bore diameter at the positions A, B and C in the thrust and axial directions.

Standard diameter:

82.200 – 82.213 mm (3.2362 – 3.2367 in.)

Maximum diameter: 82.400 mm (3.2441 in.)

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



13. INSPECT W/PIN PISTON SUB-ASSY

- (a) Using a micrometer, measure the piston diameter at a right angles to the piston pin center line, 14 mm (0.55 in.) below the skirt bottom edge.

Piston diameter:

82.118 – 82.132 mm (3.2330 – 3.2335 in.)

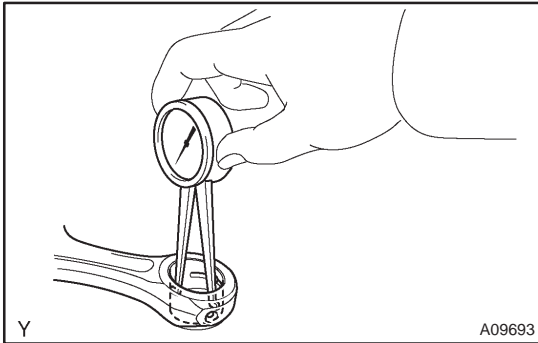
- (b) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

0.068 – 0.095 mm (0.0027 – 0.0037 in.)

Maximum oil clearance: 0.14 mm (0.0055 in.)

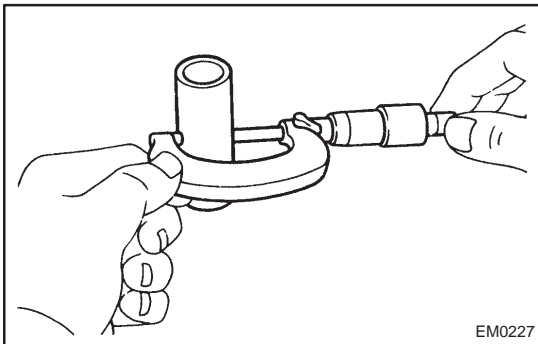
If the oil clearance is greater than maximum, replace all the 4 pistons. If necessary, replace the cylinder block.



- (c) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

Bushing inside diameter:

31.015 – 31.027 mm (1.2211 – 1.2215 in.)



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

Piston pin diameter:

31.000 – 31.012 mm (1.2205 – 1.2209 in.)

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

Standard oil clearance:

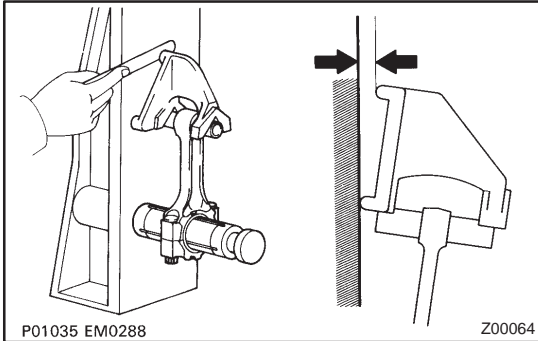
0.003 – 0.027 mm (0.0001 – 0.0011 in.)

Maximum oil clearance: 0.025 mm (0.0010 in.)

If the oil clearance is greater than maximum, replace the connecting rod. If necessary, replace the piston and piston pin as a set.

14. INSPECT CONNECTING ROD SUB-ASSY

- (a) Using a rod aligner and feeler gauge, check the connecting rod alignment.

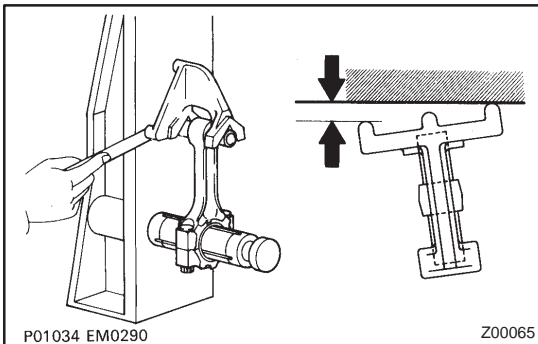


- (1) Check for out-of-alignment.

Maximum out-of alignment:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If out-of alignment is greater than maximum, replace the connecting rod assembly.



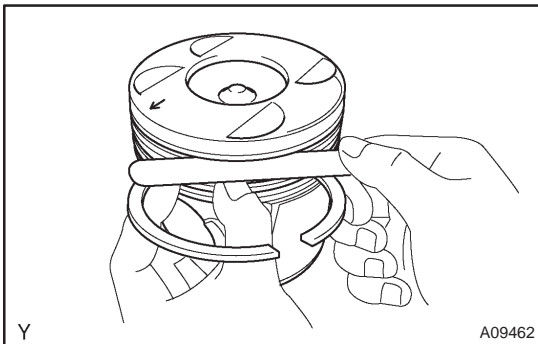
- (2) Check for twist.

Maximum twist:

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

If twist is greater than maximum, replace the connecting rod assembly.

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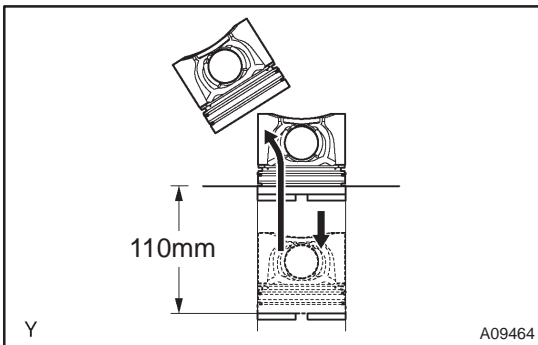
15. INSPECT RING GROOVE CLEARANCE

- (a) Using a feeler gauge, measure the clearance between new piston ring and wall of the ring groove.

Ring groove clearance:

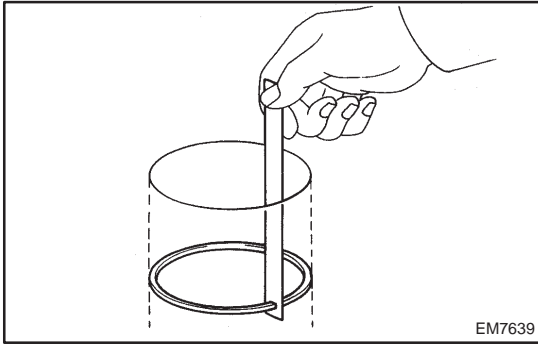
No. 1	0.08 – 0.12 mm (0.0031 – 0.0047 in.)
No. 2	0.05 – 0.09 mm (0.0020 – 0.0035 in.)
Oil	0.03 – 0.07 mm (0.0012 – 0.0028 in.)

If the clearance is not as specified, replace the piston.



16. INSPECT PISTON RING END GAP

- (a) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.



(b) Using a feeler gauge, measure the end gap.

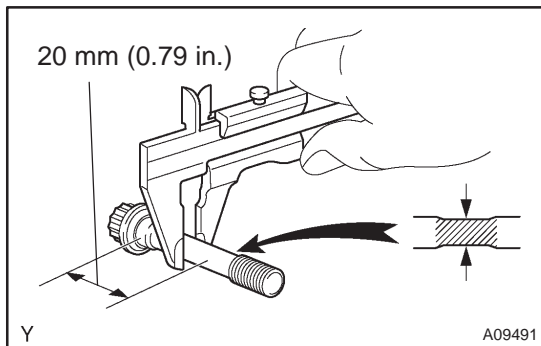
Standard end gap:

No. 1	0.27 – 0.43 mm (0.0106 – 0.0169 in.)
No. 2	0.39 – 0.58 mm (0.0154 – 0.0228 in.)
Oil	0.20 – 0.44 mm (0.0079 – 0.0173 in.)

Maximum end gap:

No. 1	0.82 mm (0.0323 in.)
No. 2	1.00 mm (0.0394 in.)
Oil	0.90 mm (0.0354 in.)

If the end gap is greater than maximum, replace the piston ring.
If the end gap is greater than maximum, even with a new piston ring, replace the cylinder block.



17. INSPECT CONNECTING ROD BOLT

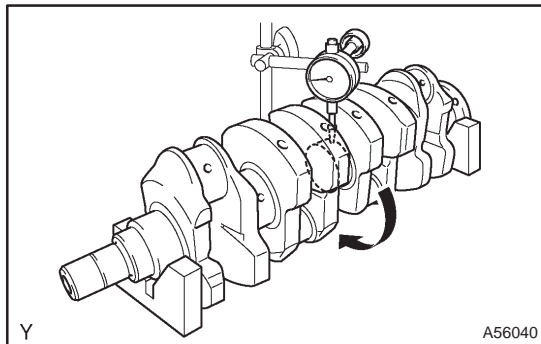
(a) Using vernier calipers, measure the tension portion diameter.

Standard diameter:

8.2 – 8.3 mm (0.323 – 0.327 in.)

Minimum diameter: 8.0 mm (0.315 in.)

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



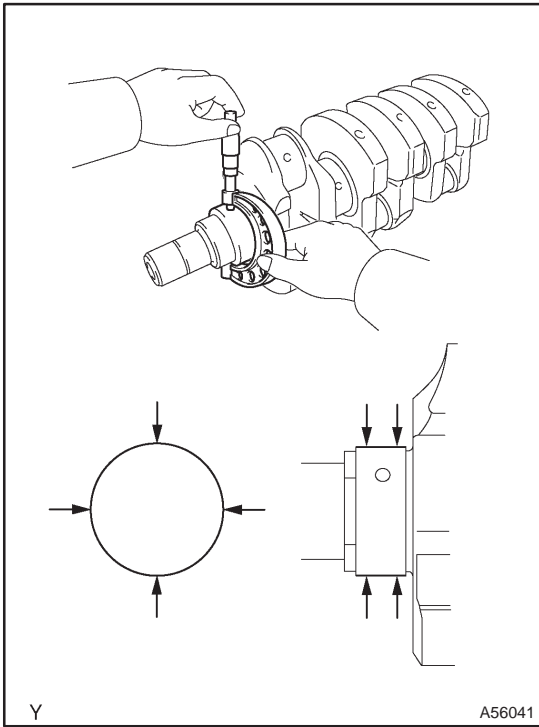
18. INSPECT CRANKSHAFT

(a) Place the crankshaft on V-blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.025 mm (0.0010 in.)

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



(c) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:
56.992 – 57.010 mm (2.2438 – 2.2445 in.)

Crank pin diameter:
50.482 – 50.500 mm (1.9875 – 1.9882 in.)

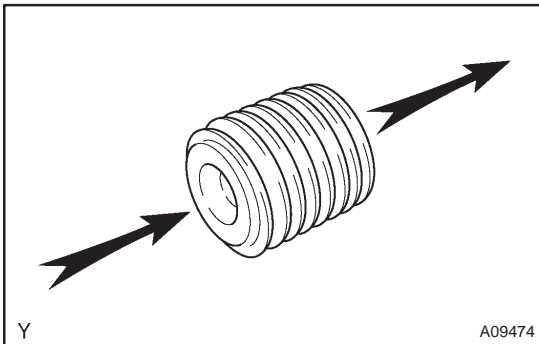
If the diameter is not as specified, replace the crankshaft.

(d) Check each main journal and crank pin for taper and out-of-round as shown.

Maximum taper and out-of-round:
0.01 mm (0.0004 in.)

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

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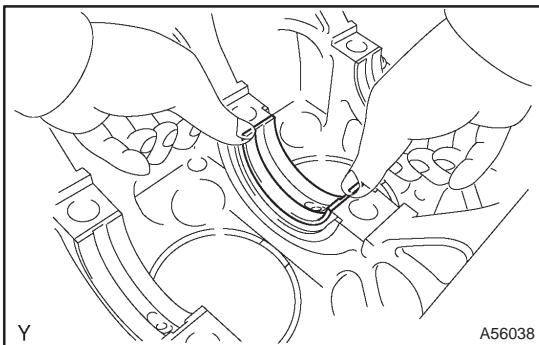


19. INSPECT CYLINDER BLOCK OIL ORIFICE

(a) Check the oil orifice for clogging. If necessary, replace the oil orifice.

20. INSPECT CRANKSHAFT OIL CLEARANCE

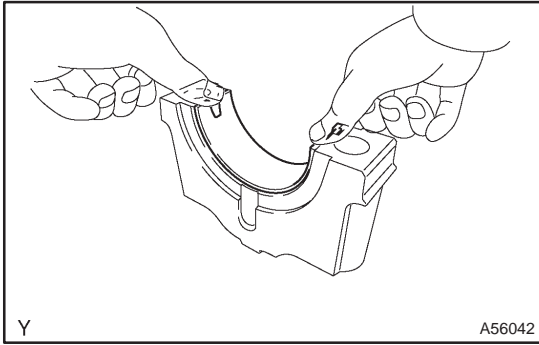
(a) Clean each main journal and bearing.



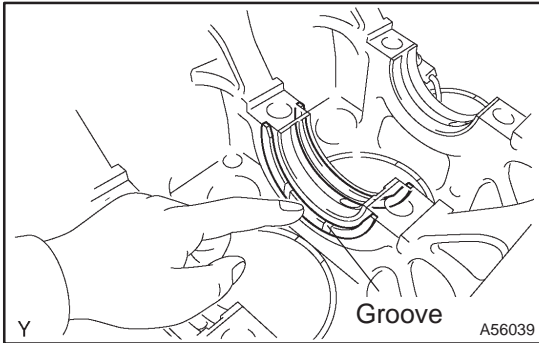
(b) Install the bearing on the cylinder block and bearing cap. **HINT:**

Upper bearings have an oil groove and oil holes; lower bearings do not.

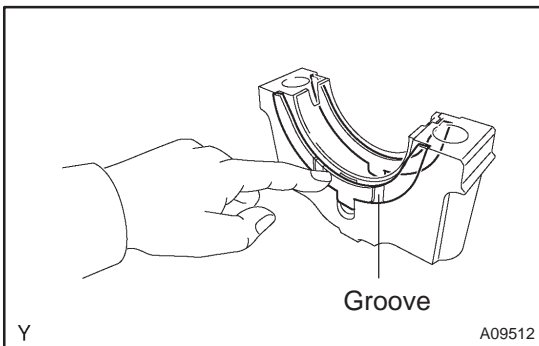
(1) Align the bearing claw with the claw groove of the cylinder block, and push in the 5 upper bearings.



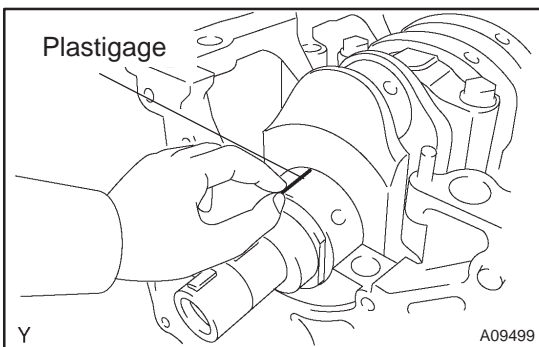
- (2) Align the bearing claw with the claw groove of the main bearing cap, and push in the 5 lower bearings.



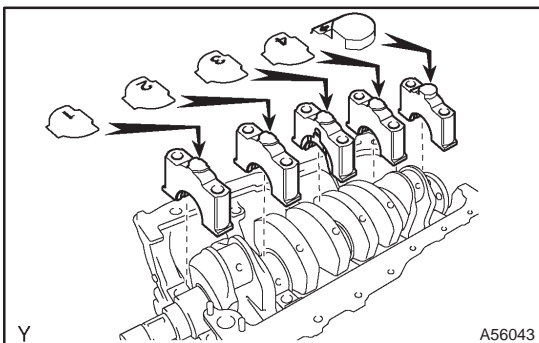
- (c) Install the 2 thrust washers under the No. 3 journal position of the cylinder block with the oil grooves facing outward.



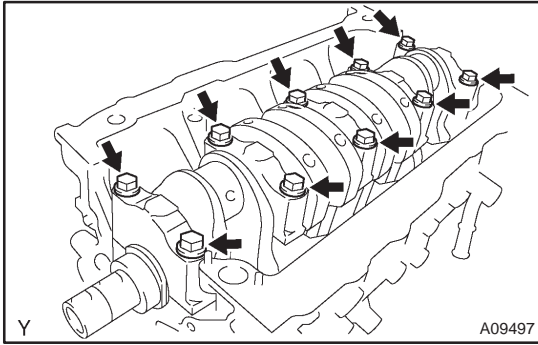
- (d) Install the 2 thrust washers on the No. 3 bearing cap with the oil grooves facing outward.
 (e) Place the crankshaft on the cylinder block.



- (f) Lay a strip of Plastigage across each journal.



- (g) Install the 5 main bearing caps in their proper locations.
 HINT:
 Each bearing cap has a number and a front mark.



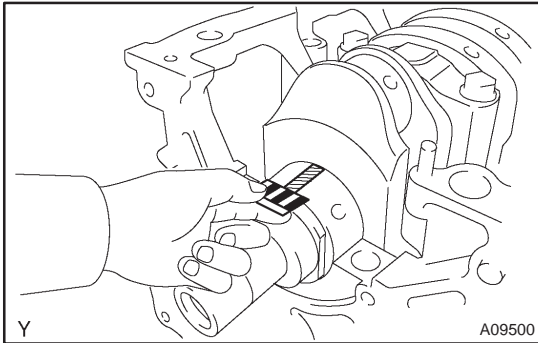
- (h) Apply a light coat of engine oil on the threads and under the heads of the main bearing cap bolts.
- (i) Install and uniformly tighten the 10 bolts of the main bearing cap in several passes.

Torque: 115 N·m (1,173 kgf·cm, 85 ft·lbf)

NOTICE:

Do not turn the crankshaft.

- (j) Remove the bearing cap.



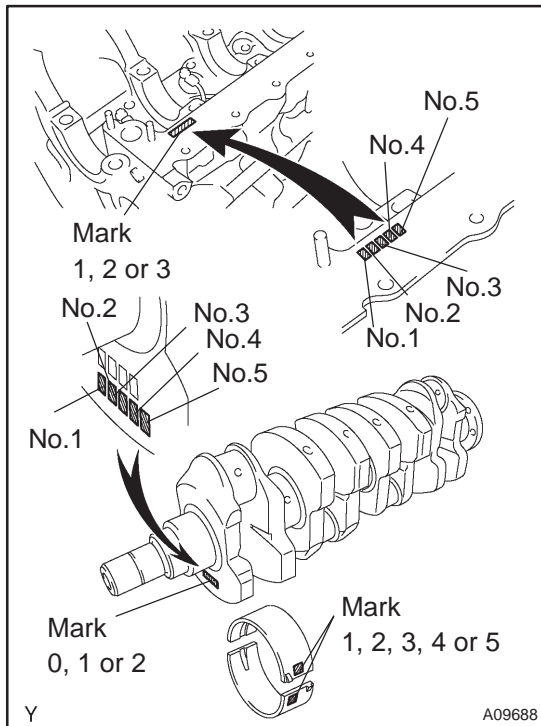
- (k) Measure the Plastigage at its widest point.

Standard oil clearance:

0.026 – 0.044 mm (0.0010 – 0.0017 in.)

Maximum oil Clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, replace the crankshaft.



- (l) If using a standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then select the bearing with the same number as the total. There are 5 sizes of standard bearings, marked "1", "2", "3", "4" and "5" accordingly.

Number Marked

Cylinder block	Crankshaft	Use bearing
1	0	1
1	1	2
1	2	3
2	0	2
2	1	3
2	2	4
3	0	3
3	1	4
3	2	5

HINT:

EXAMPLE

Cylinder block "2" + Crankshaft "1" = Total number 3 (Use bearing "3")

Cylinder block main journal bore diameter:

Mark "1"	61.000 – 61.006 mm (2.4016 – 2.4018 in.)
Mark "2"	61.006 – 61.012 mm (2.4018 – 2.4020 in.)
Mark "3"	61.012 – 61.018 mm (2.4020 – 2.4023 in.)

Crankshaft main journal diameter:

Mark "0"	57.004 – 57.010 mm (2.2442 – 2.2445 in.)
Mark "1"	56.998 – 57.004 mm (2.2440 – 2.2442 in.)
Mark "2"	56.992 – 56.998 mm (2.2438 – 2.2440 in.)

Standard sized bearing center wall thickness:

Mark "1"	1.976 – 1.979 mm (0.0778 – 0.0779 in.)
Mark "2"	1.979 – 1.982 mm (0.0779 – 0.0780 in.)
Mark "3"	1.982 – 1.985 mm (0.0780 – 0.0781 in.)
Mark "4"	1.985 – 1.988 mm (0.0781 – 0.0783 in.)
Mark "5"	1.988 – 1.991 mm (0.0783 – 0.0784 in.)

- (m) Completely remove the Plastigage.

21. INSTALL TIGHT PLUG

- (a) Apply adhesive around tight plugs.
Adhesive: Part No.08833 - 00070, THREE BOND 1324 or equivalent.

- (b) Using SST, tap to the tight plugs as shown in the illustration.

SST 09950-60010 (09951-00350), 09950-70010 (09951-07100)

Standard depth:

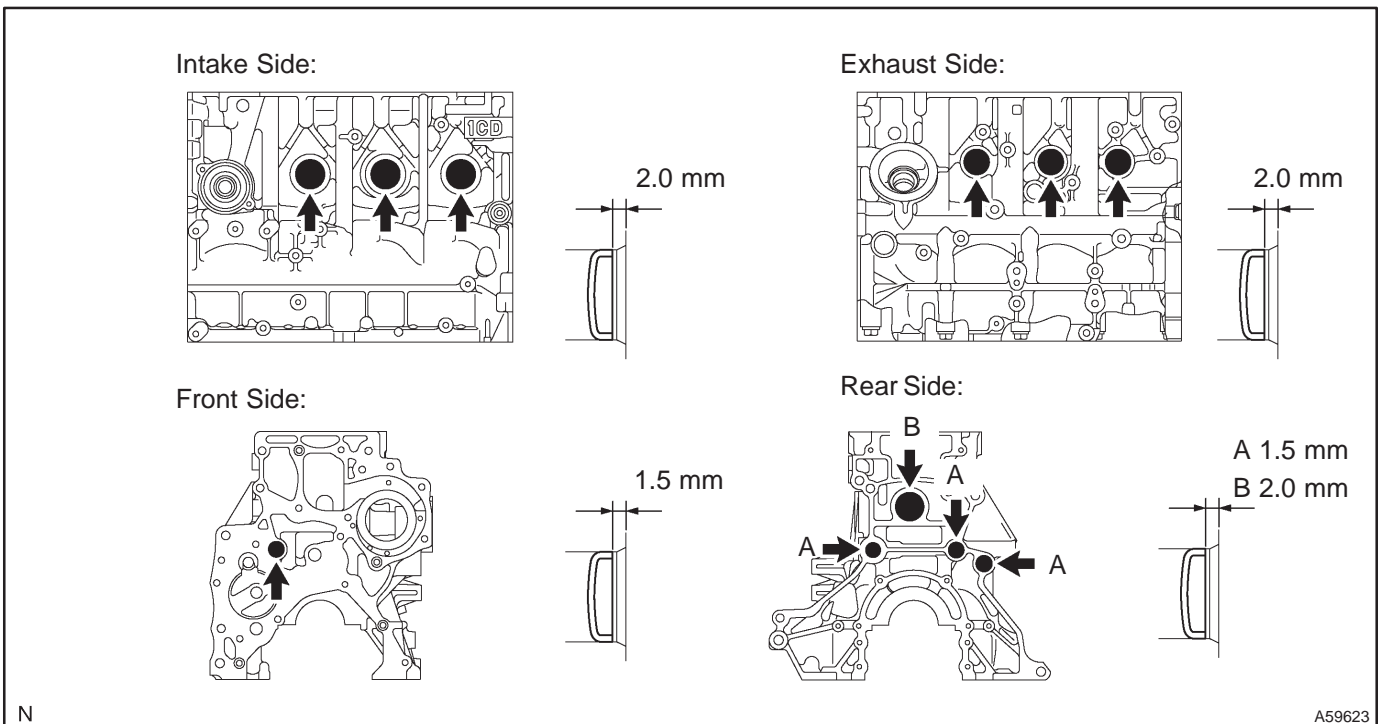
Intake side: 2.0 mm (0.0787 in.)

Exhaust side: 2.0 mm (0.0787 in.)

Front side: 1.5 mm (0.0590 in.)

Rear side A: 1.5 mm (0.0590 in.)

B: 2.0 mm (0.0787 in.)



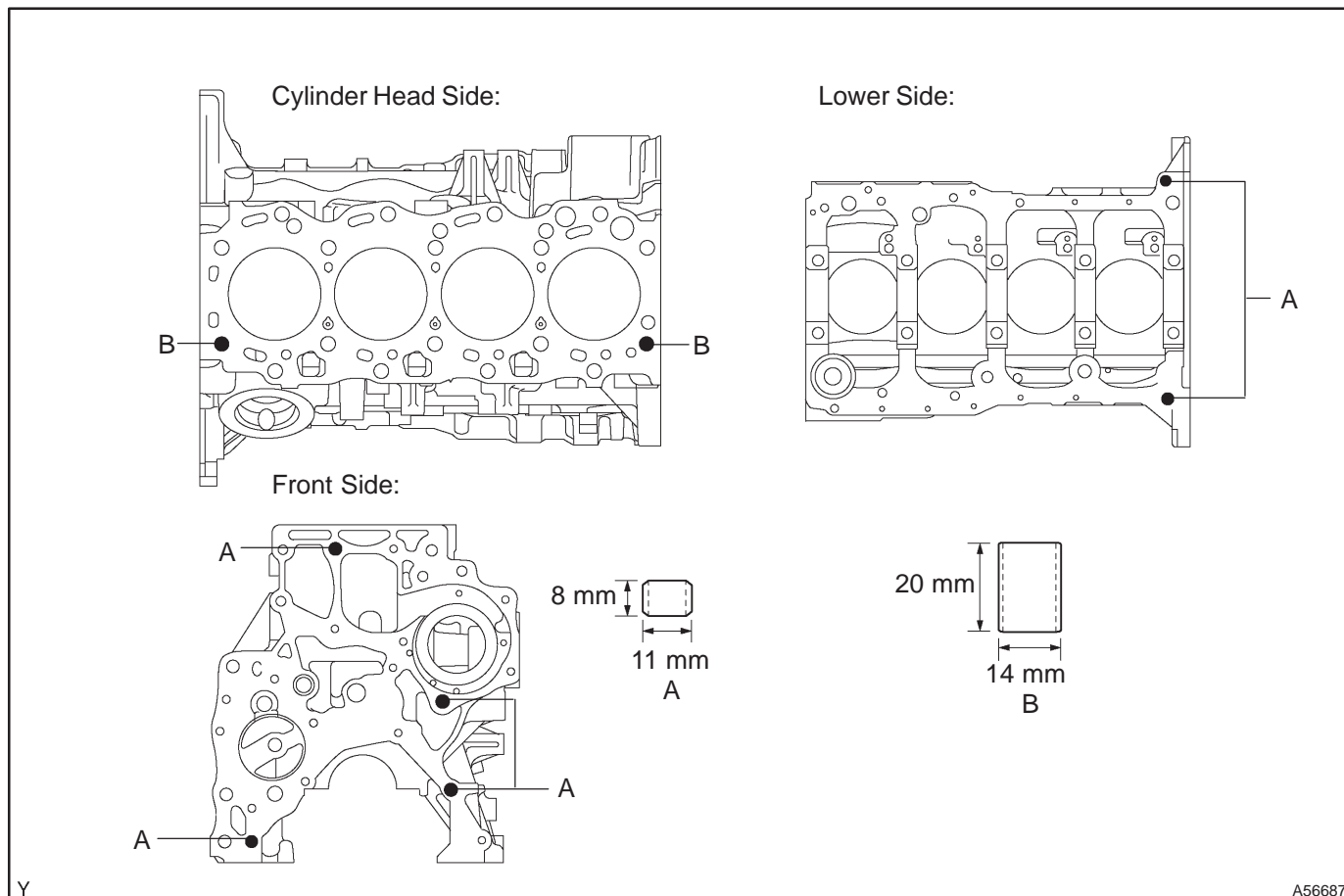
22. INSTALL RING PIN

- (a) Using a plastic-faced hammer, tap in new ring pins to the specified protrusion height.

Protrusion height:

A: 7.0 mm (0.2755 in.)

B: 13 mm (0.5118 in.)



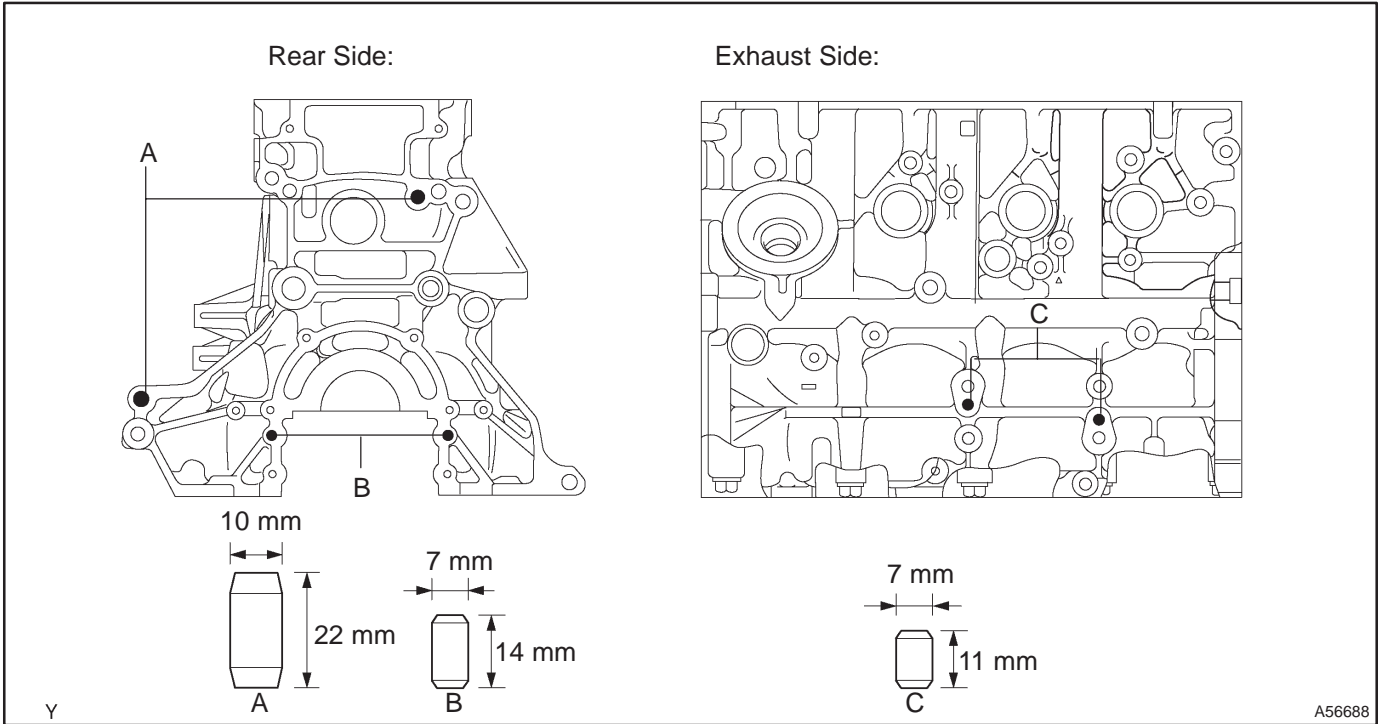
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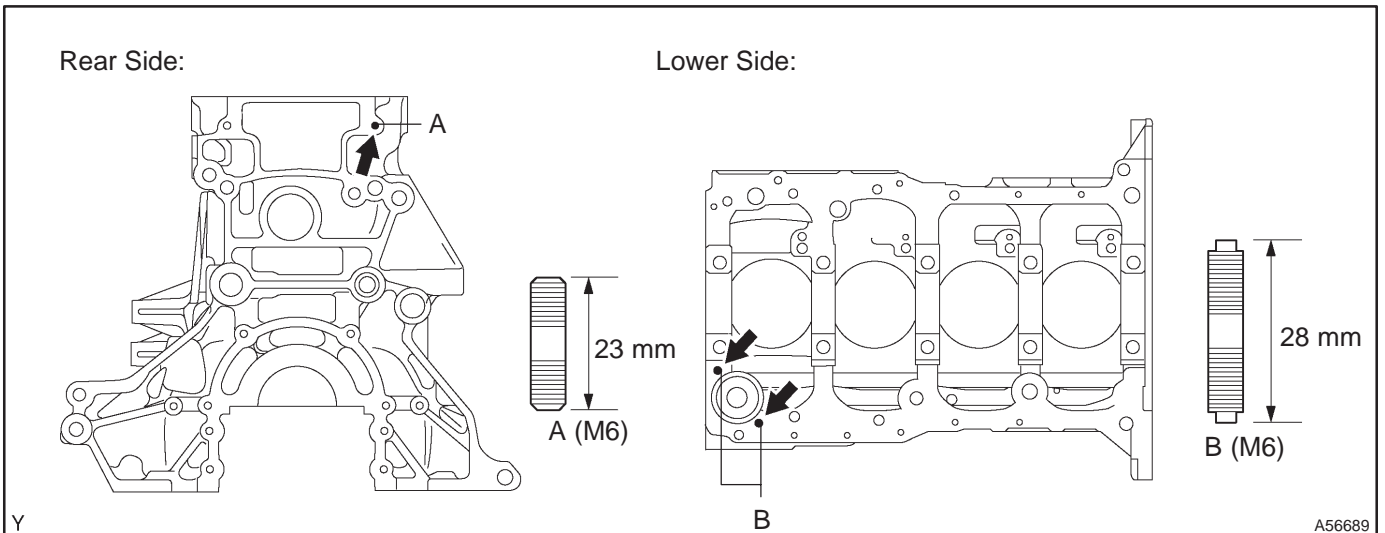
23. INSTALL STRAIGHT PIN

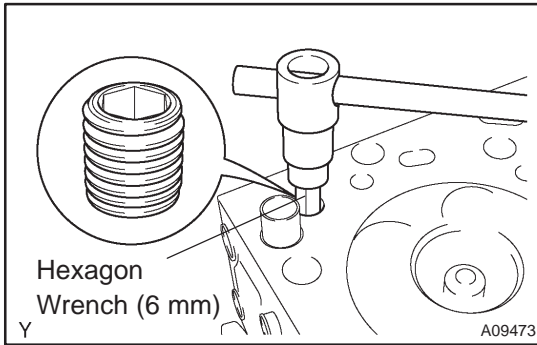
- (a) Using a plastic-faced hammer, tap in the straight pin.
Standard protrusion:
A: 13 mm (0.5118 in.)
B: 7.0 mm (0.2755 in.)
C: 5.0 mm (0.1968 in.)



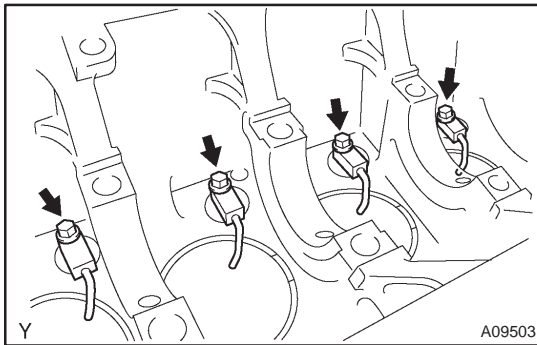
24. INSTALL STUD BOLT

- (a) Install the stud bolts as shown in the illustration.

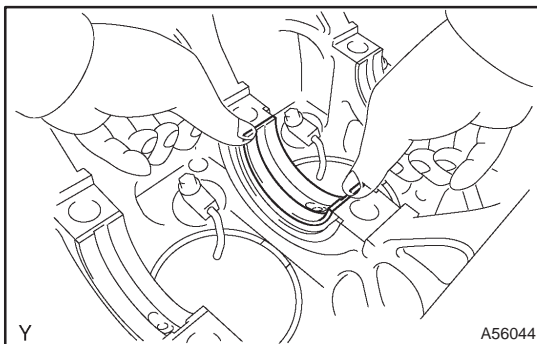


**25. INSTALL CYLINDER BLOCK OIL ORIFICE**

- (a) Using a hexagon wrench (6 mm), install the oil orifice.
Torque: 9.0 N·m (92 kgf·cm, 78 in·lbf)

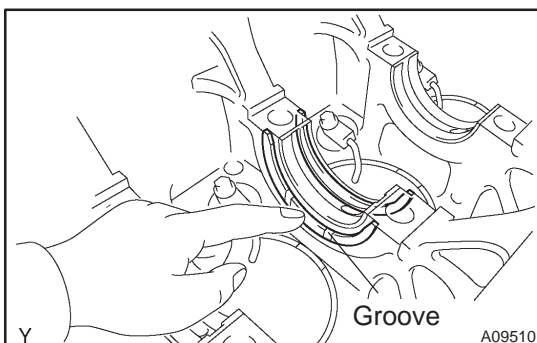
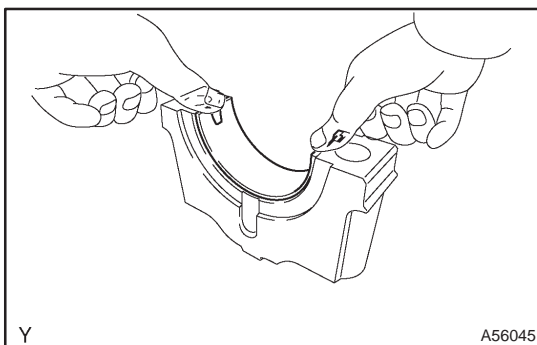
**26. INSTALL SUB-ASSY OIL NOZZLE NO.1**

- (a) Install the oil nozzle with the bolt. Install the 4 oil nozzles.
Torque: 7.4 N·m (76 kgf·cm, 67 in·lbf)

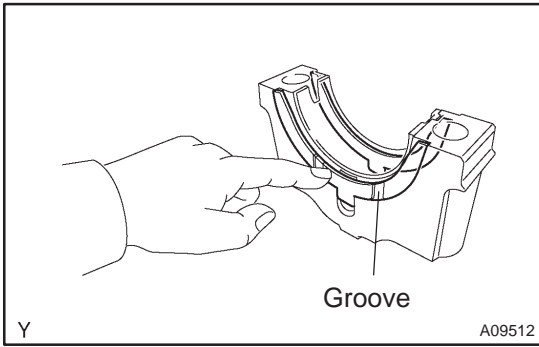
**27. INSTALL CRANKSHAFT**

- (a) Install the bearing on the cylinder block and bearing cap.
HINT:
 Upper bearings have an oil groove and oil holes; lower bearings do not.

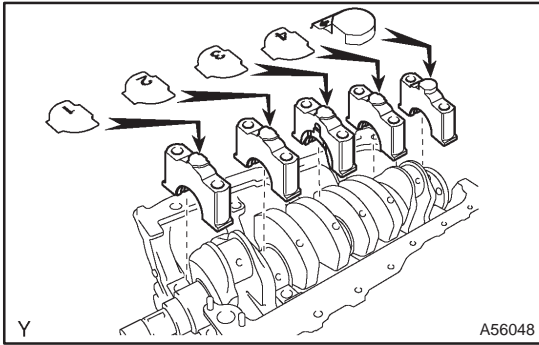
- (1) Align the bearing claw with the claw groove of the cylinder block, and push in the 5 upper bearings.
- (2) Align the bearing claw with the claw groove of the main bearing cap, and push in the 5 lower bearings.



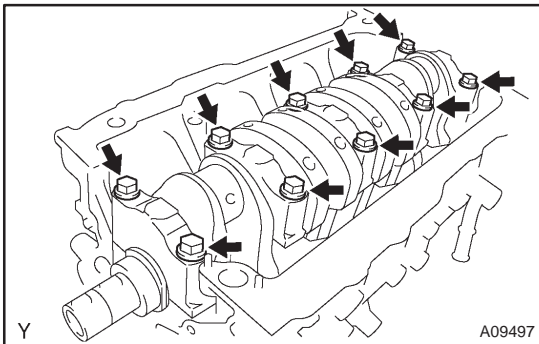
- (b) Install the 2 thrust washers under the No. 3 journal position of the cylinder block with the oil grooves facing outward.



- (c) Install the 2 thrust washers on the No. 3 bearing cap with the oil grooves facing outward.

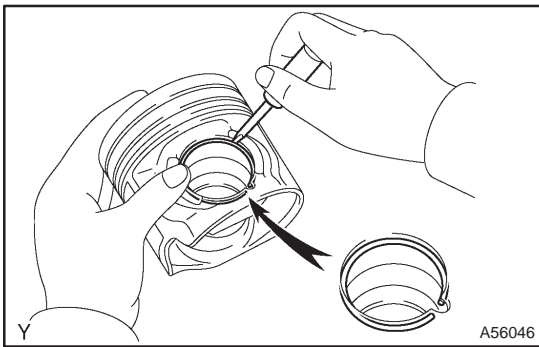


- (d) Install the 5 main bearing caps in their proper locations.
HINT:
Each bearing cap has a number and a font mark.



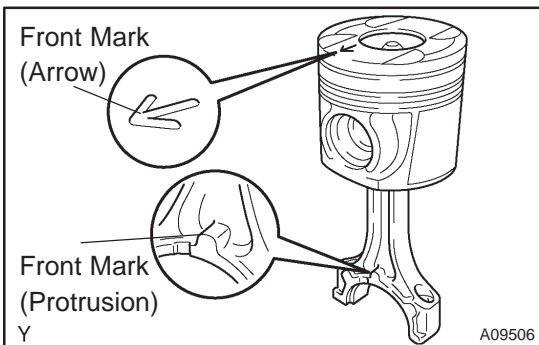
- (e) Apply a light coat of engine oil on the threads and under the heads of the main bearing cap bolts.
- (f) Install and uniformly tighten the 10 bolts of the main bearing cap in several passes.
Torque: 115 N·m (1,173 kgf·cm, 85 ft·lbf)
- (g) Check that the crankshaft turns smoothly.

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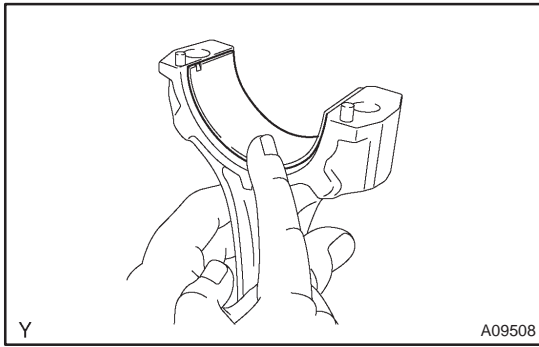


28. INSTALL W/PIN PISTON SUB-ASSY

- (a) Install a new snap ring on one side of the piston pin hole.
- (b) Gradually heat the piston to 60°C (140°F).
- (c) Coat the piston pin and piston hole of the piston with engine oil.



- (d) Align the front marks of the piston and connecting rod, and push in the piston pin by hand.
- (e) Install a new snap ring on the other side of the piston pin hole.

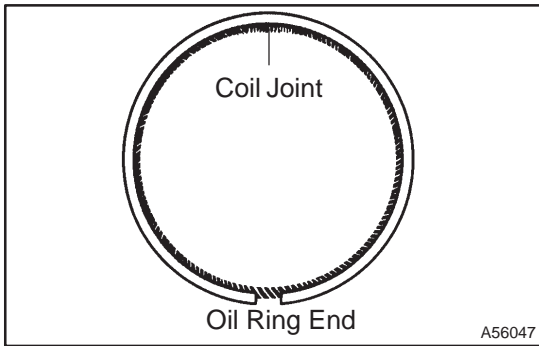


29. INSTALL CONNECTING ROD BEARING

- (a) Align the bearing claw with the groove of the connecting rod or connecting cap.
- (b) Install the bearings in the connecting rod and connecting rod cap.

30. INSTALL PISTON RING SET

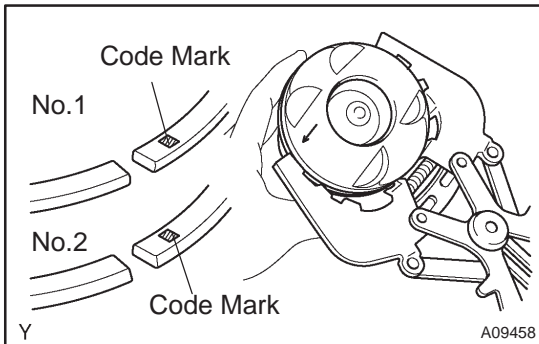
- (a) Install the coil by hand.



- (b) Using a piston ring expander, install the oil ring.

HINT:

Face the end gap of the oil ring in the opposite direction coil joint.



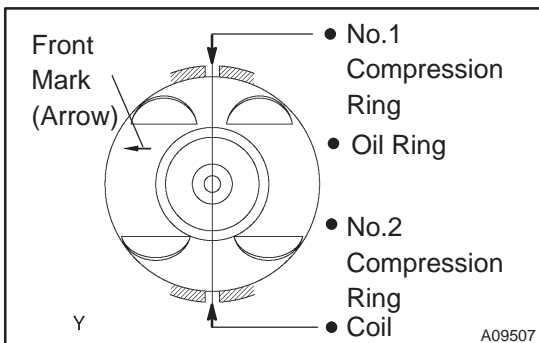
- (c) Using a piston ring expander, install the No. 2 and No. 1 piston rings with the code mark facing upward.

Code mark:

No.1	1T
No.2	2T

NOTICE:

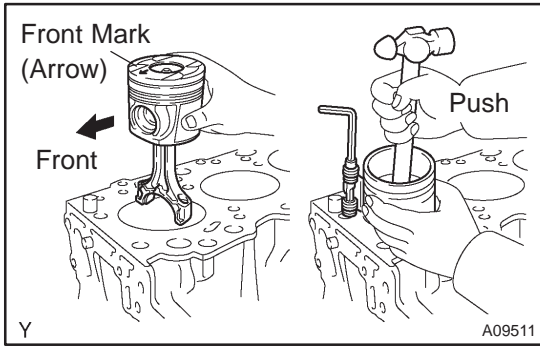
Make the expansion of the piston ring as small as necessary.



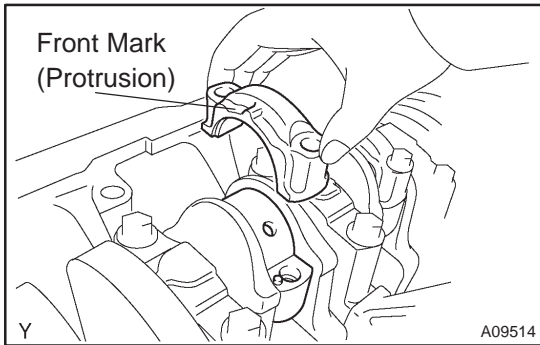
- (d) Position the piston rings so that the ring ends are as shown.

31. INSTALL PISTON SUB-ASSY W/CONNECTING ROD

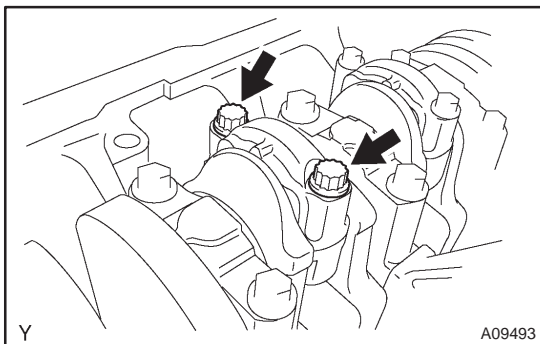
- (a) Apply engine oil to the cylinder walls, pistons, and surfaces of connecting rod bearings.
- (b) Check the position of the piston ring ends.



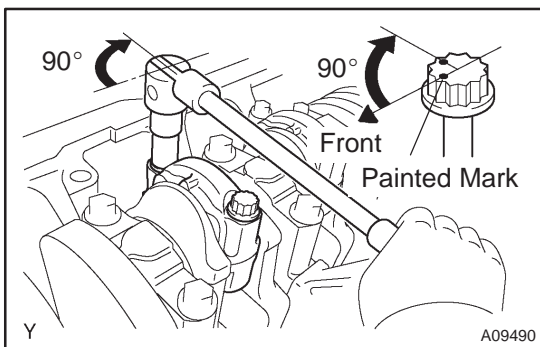
(c) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.



(d) Match the numbered connecting rod cap with the connecting rod.
 (e) Install the connecting rod cap with the front mark facing forward.
 (f) Apply a light coat of engine oil on the threads and under the heads of the connecting rod cap bolts.



(g) Install and alternately tighten the 2 cap bolts in several passes.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)
 If any of the cap bolts does not meet the torque specification, replace the connecting rod cap bolts.



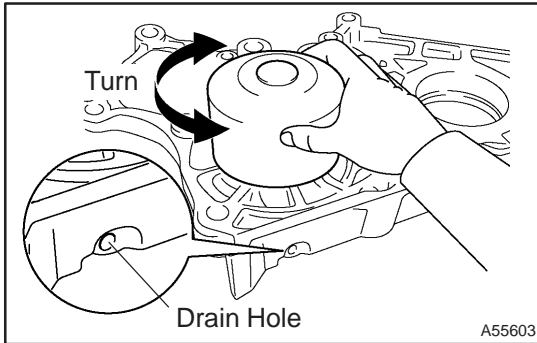
(h) Mark the front of the cap bolt with the paint.
 (i) Retighten the cap bolts 90° as shown.
 (j) Check that the painted mark is now at a 90° angle to the front.
 (k) Check that the crankshaft turns smoothly.

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WATER PUMP ASSY (1CD-FTV)

INSPECTION

1606V-02



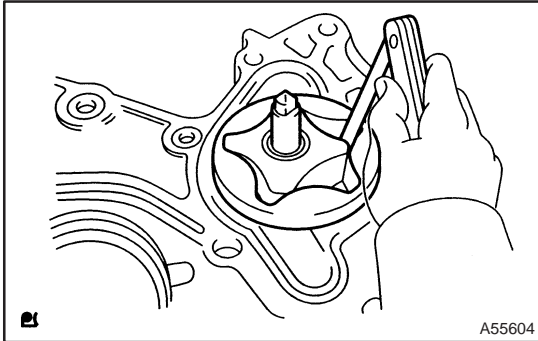
1. INSPECT WATER PUMP ASSY

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

OIL PUMP ASSY (1CD-FTV)

INSPECTION

1704C-02



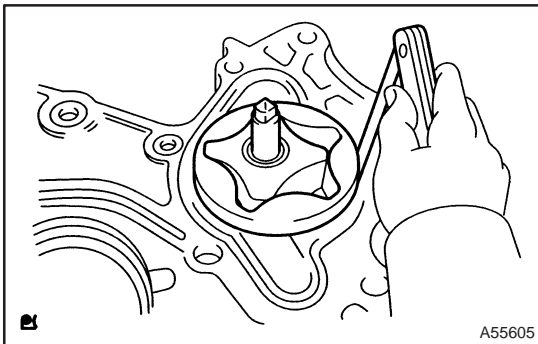
1. INSPECT OIL PUMP ASSY

- (a) Inspect the rotors for tip clearance.
 (1) Using a feeler gauge, measure the clearance between the drive and driven rotor tips.

Standard tip clearance:

0.08 – 0.16 mm (0.0031 – 0.0063 in.)

Maximum tip clearance: 0.2 mm (0.0079 in.)



- (b) Inspect the rotors for body clearance.
 (1) Using a feeler gauge, measure the clearance between the driven rotor and body.

Standard body clearance:

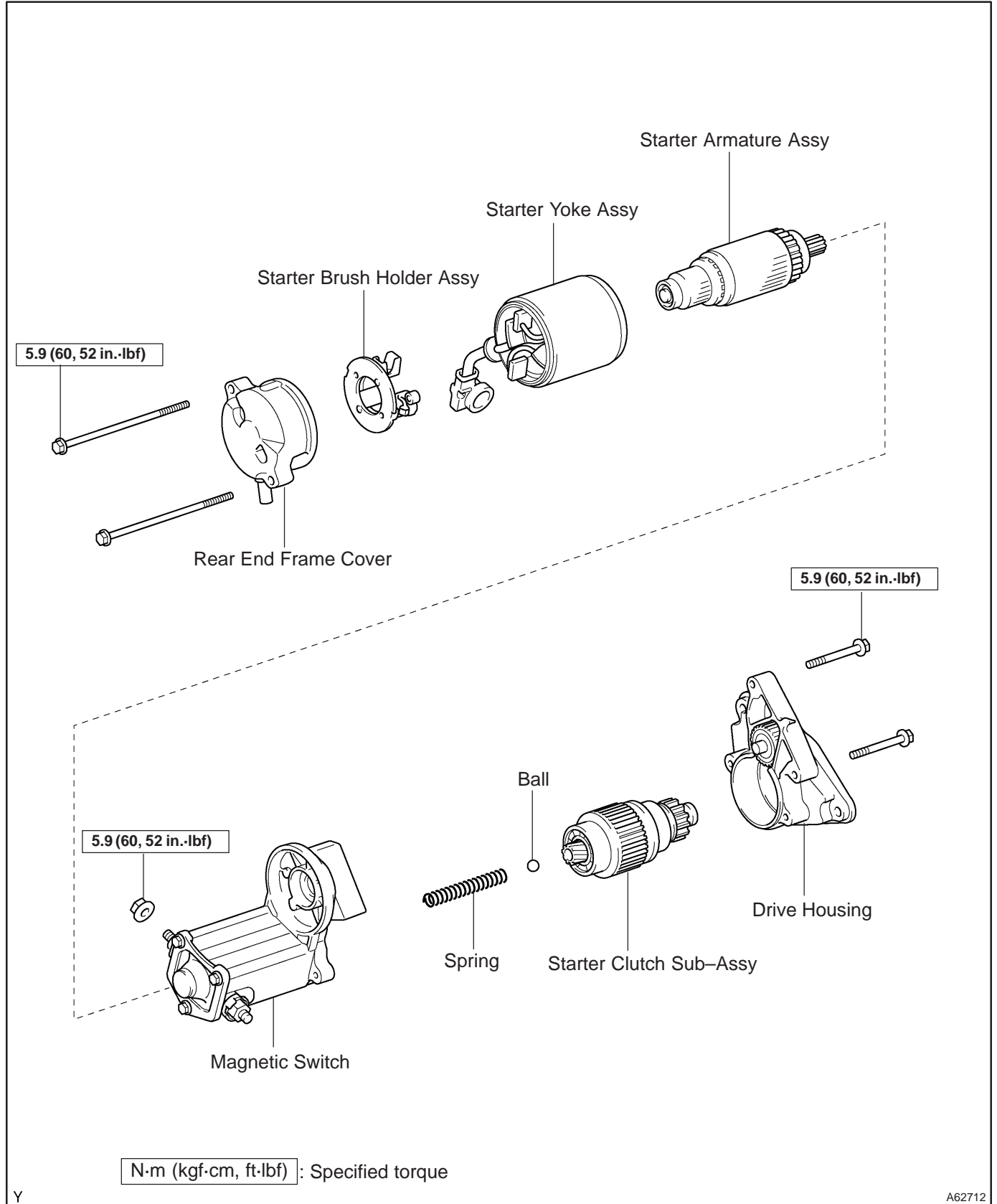
0.1 – 0.17 mm (0.0039 – 0.0067 in.)

Maximum body clearance: 0.2 mm (0.0079 in.)

STARTER ASSY(1.4KW) (1CD-FTV) COMPONENTS

190AE-01

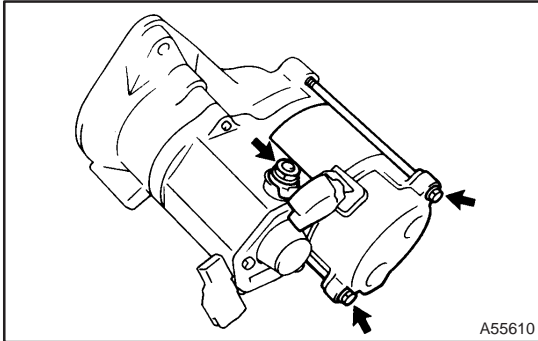
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Y

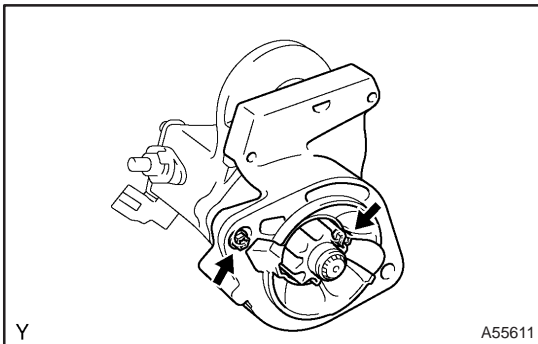
A62712

OVERHAUL



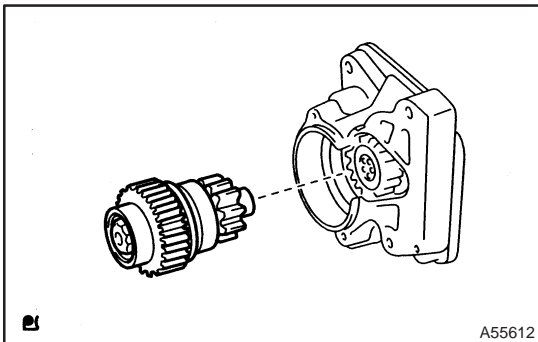
1. REMOVE STARTER YOKE ASSY

- (a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.
- (b) Remove the 2 through bolts.
- (c) Pull out the yoke together with the armature from the magnetic switch.

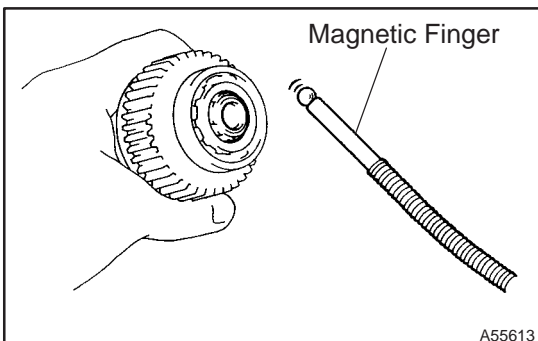


2. REMOVE STARTER CLUTCH SUB-ASSY

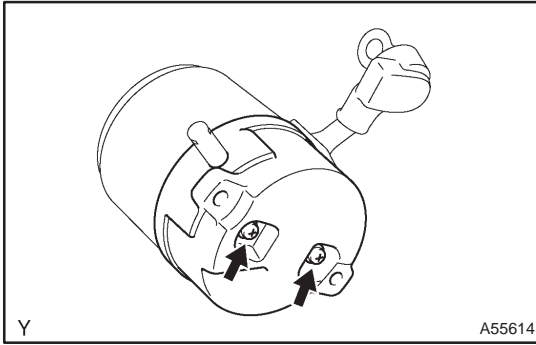
- (a) Remove the 2 bolts and drive housing.



- (b) Remove the clutch from the drive housing.

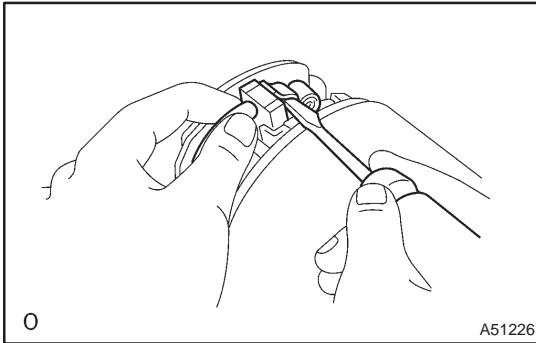


- (c) Using a magnetic finger, remove the ball from the clutch shaft hole.



3. REMOVE STARTER BRUSH HOLDER ASSY

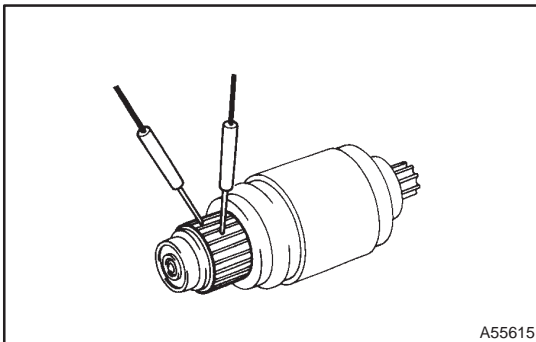
- (a) Remove the 2 screws and end frame from the yoke.



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

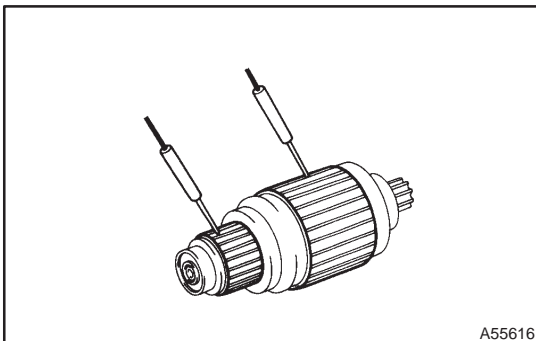
4. REMOVE STARTER ARMATURE ASSY

- (a) Remove the armature from the yoke.

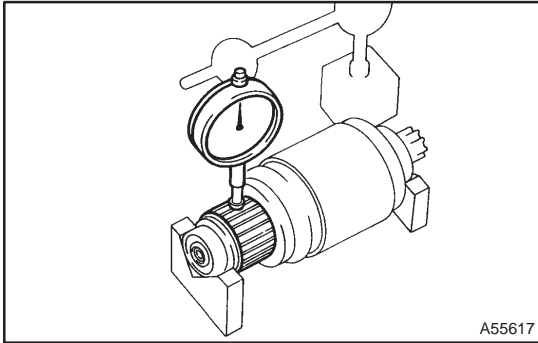


5. INSPECT STARTER ARMATURE ASSY

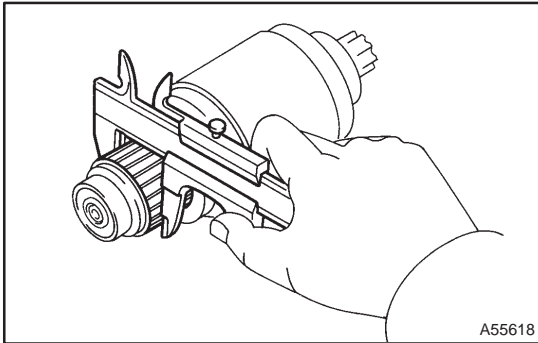
- (a) Using an ohmmeter, check that there is continuity between the segments of the commutator.



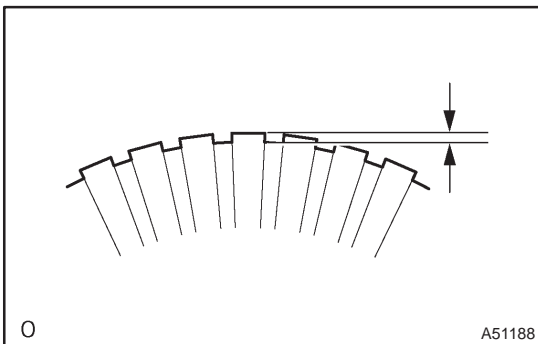
- (b) Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.



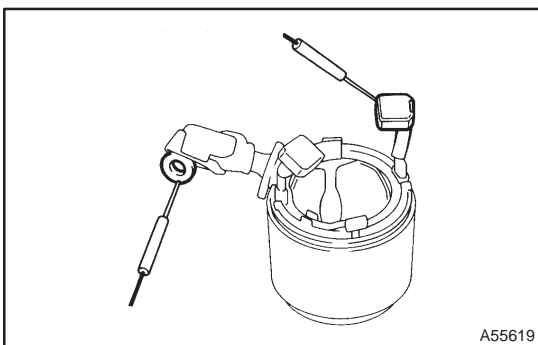
- (c) Place the commutator on V-blocks.
 (d) Using a dial gauge, measure the circle runout.
Maximum circle runout: 0.05 mm (0.002 in.)



- (e) Using vernier calipers, measure the commutator diameter.
Standard diameter: 30 mm (1.1811 in.)
Minimum diameter: 29 mm (1.1417 in.)

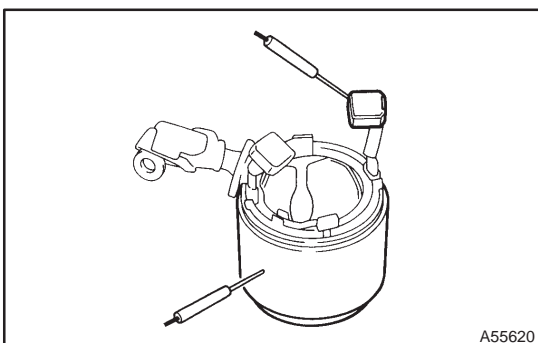


- (f) Check that the undercut depth is clean and free of foreign materials. Smooth out the edge.
Standard undercut depth: 0.6 mm (0.024 in.)
Minimum undercut depth: 0.2 mm (0.008 in.)

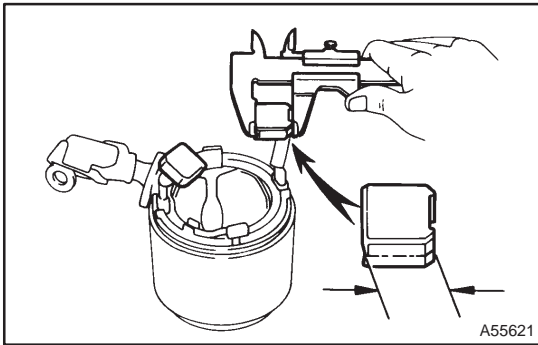


6. INSPECT STARTER YOKE ASSY

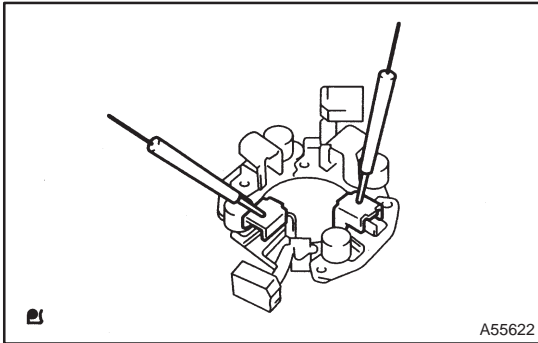
- (a) Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.



- (b) Using an ohmmeter, check that there is no continuity between the field coil brush lead and yoke.

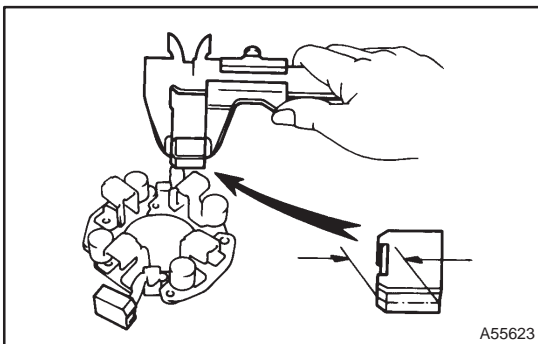


- (c) Using vernier calipers, measure the brush length.
Standard length: 15.5 mm (0.6102 in.)
Minimum length: 8.5 mm (0.3346 in.)

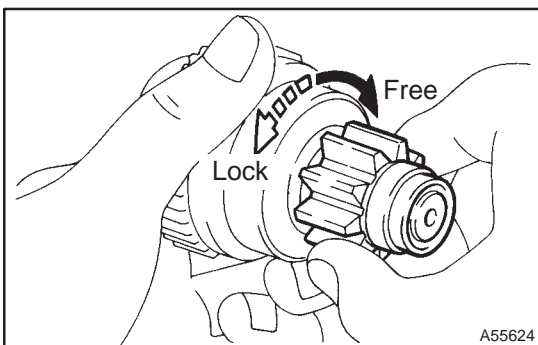


7. INSPECT STARTER BRUSH HOLDER ASSY

- (a) Using an ohmmeter, check that there is no continuity between the positive (+) and negative (-) brush holders.

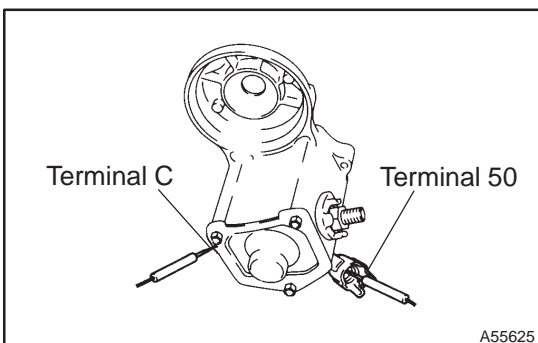


- (b) Using vernier calipers, measure the brush length.
Standard length: 15.5 mm (0.6102 in.)
Minimum length: 8.5 mm (0.3346 in.)



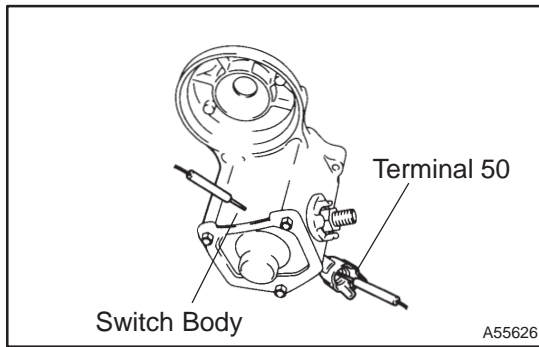
8. INSPECT STARTER CLUTCH SUB-ASSY

- (a) Rotate the pinion gear clockwise, and check that it turns freely. Try to rotate the pinion gear counterclockwise and check that it locks.



9. INSPECT MAGNET STARTER SWITCH ASSY

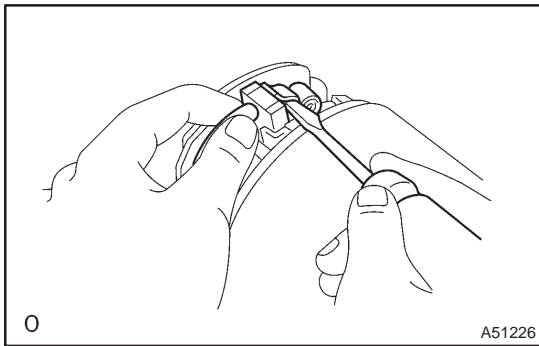
- (a) Using an ohmmeter, check that there is continuity between terminal 50 and C.



- (b) Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.

10. INSTALL STARTER ARMATURE ASSY

- (a) Apply grease to the armature bearings and insert the armature into the yoke.

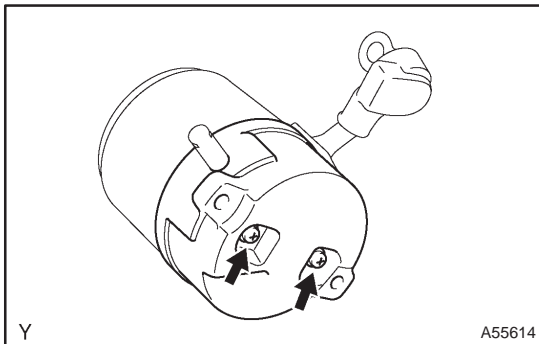


11. INSTALL STARTER BRUSH HOLDER ASSY

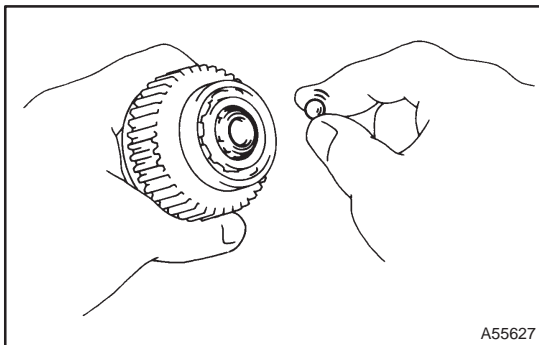
- (a) Place the brush holder on the armature.
 (b) Using a screwdriver, hold the brush spring back and connect the brush into the brush holder. Connect the 4 brushes.

NOTICE:

Check that the positive (+) lead wires are not grounded.

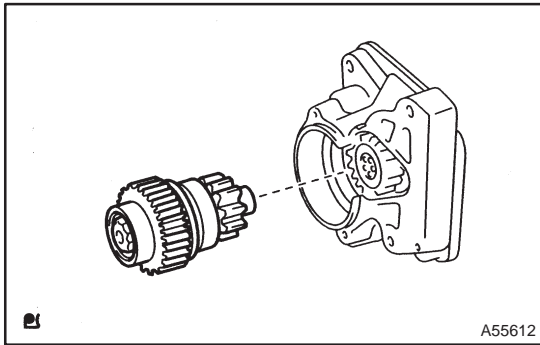


- (c) Install the end frame to the yoke with the 2 screws.
Torque: 1.5 N·m (15 kgf·cm, 13 in·lbf)

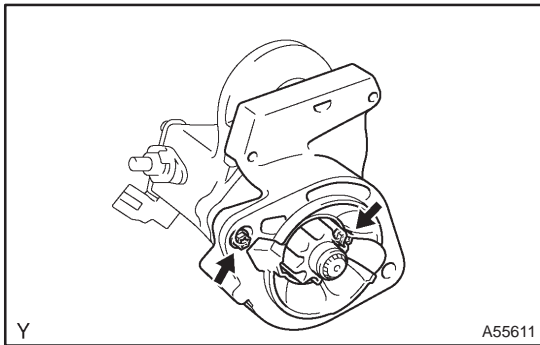


12. INSTALL STARTER CLUTCH SUB-ASSY

- (a) Apply grease to the ball.
 (b) Insert the ball into the clutch shaft hole.

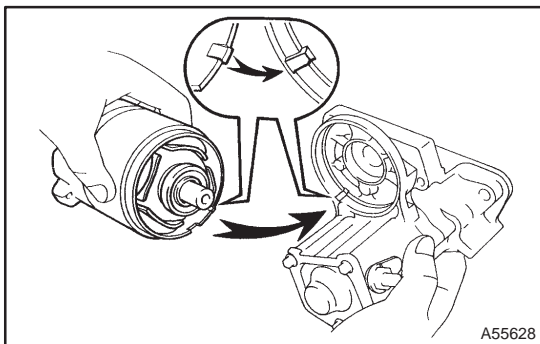


(c) Place the clutch on the drive housing.



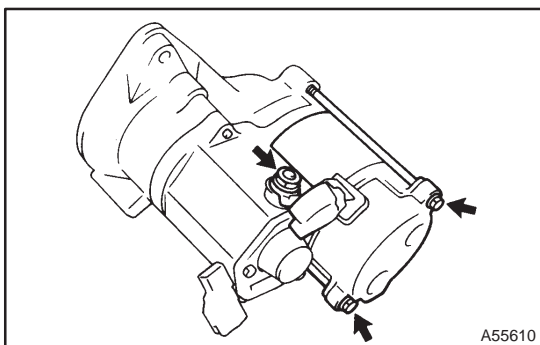
(d) Install the drive housing to the magnetic switch with the 2 bolts.

Torque: 5.9 N·m (60 kgf·cm, 52 in·lbf)



13. INSTALL STARTER YOKE ASSY

(a) Align the protrusion of the yoke with the cutout of the magnetic switch.



(b) Install the yoke and armature with the 2 through bolts.

Torque: 5.9 N·m (60 kgf·cm, 52 in·lbf)

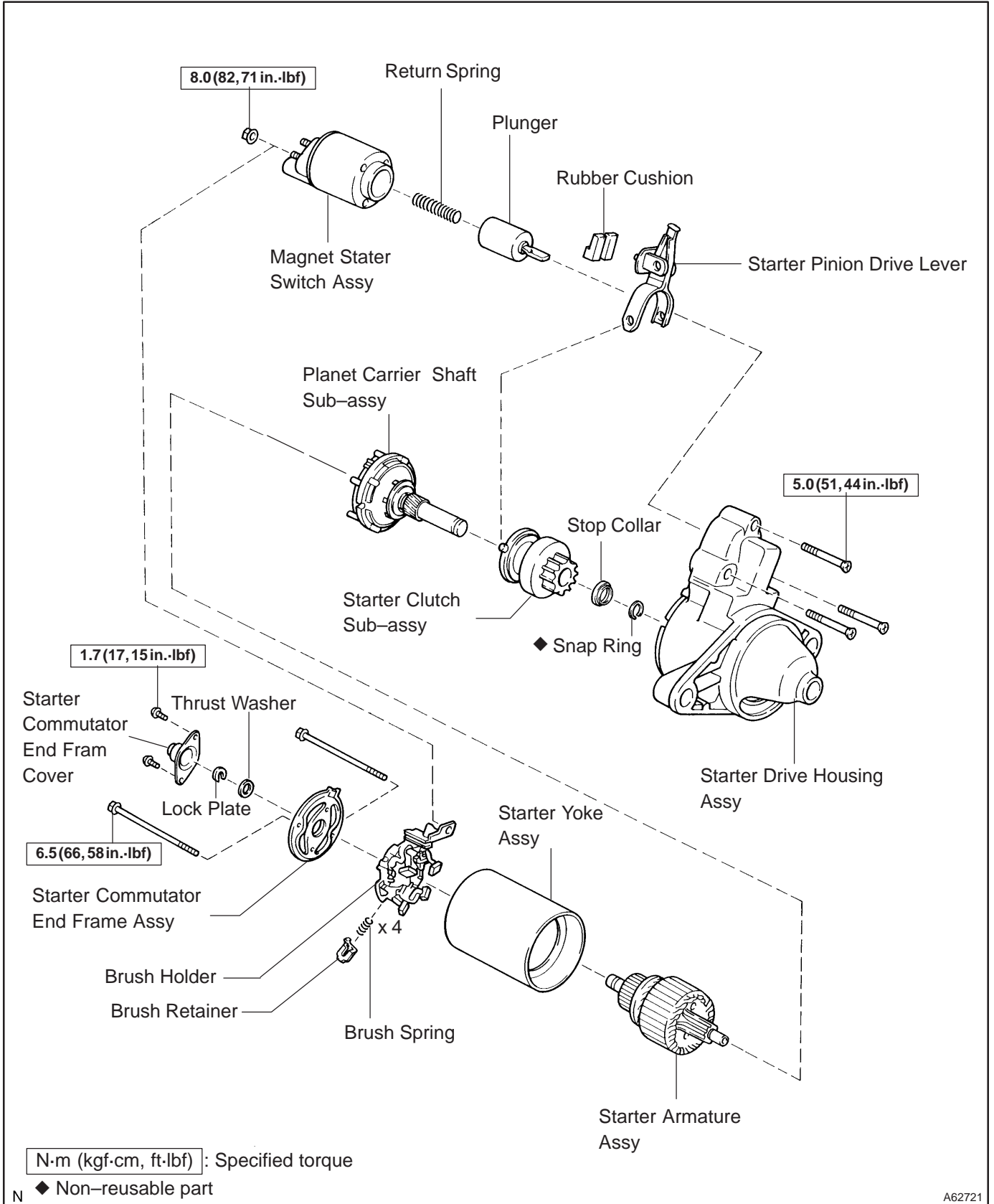
(c) Connect the lead wire to terminal C with the nut.

Torque: 5.9 N·m (60 kgf·cm, 52 in·lbf)

STARTER ASSY(2.0KW) (1CD-FTV) COMPONENTS

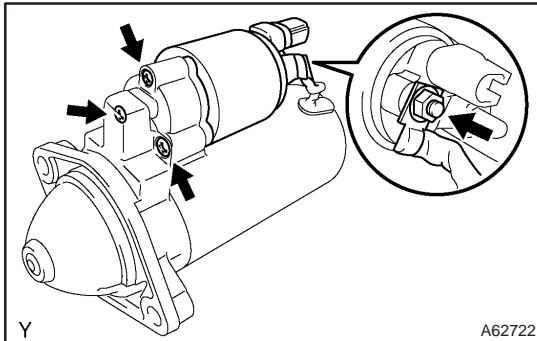
190AF-01

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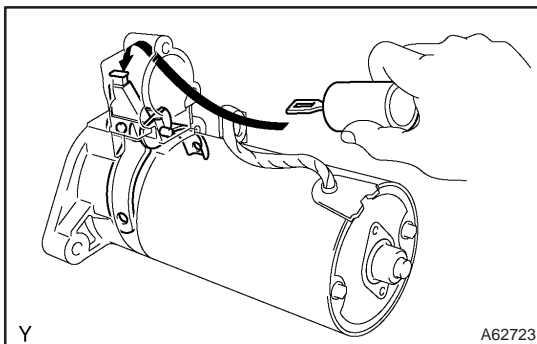
A62721

OVERHAUL

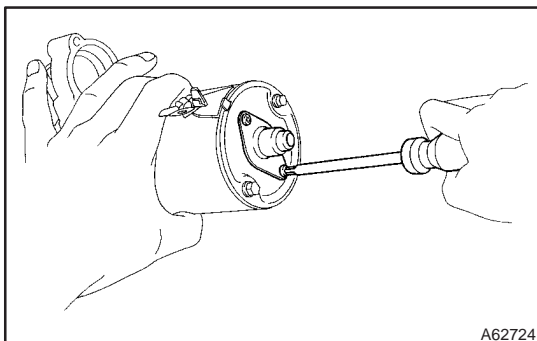


1. REMOVE MAGNET STARTER SWITCH ASSY

- (a) Remove the nut, and disconnect lead wire from the magnet starter switch terminal.
- (b) Remove the 3 screws, magnet starter switch and return spring.

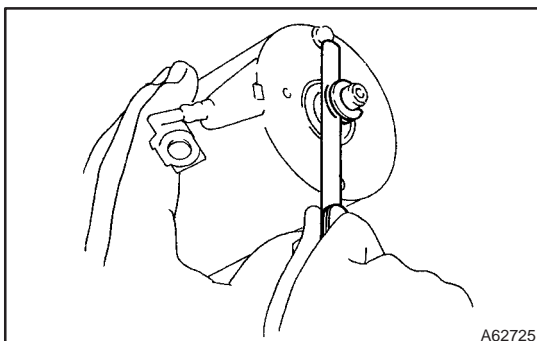


- (c) Pull the plunger, and disconnect the plunger hook from the upper side of the drive lever.



2. REMOVE STARTER COMMUTATOR END FRAM COVER

- (a) Remove the 2 screws and end fram cover.



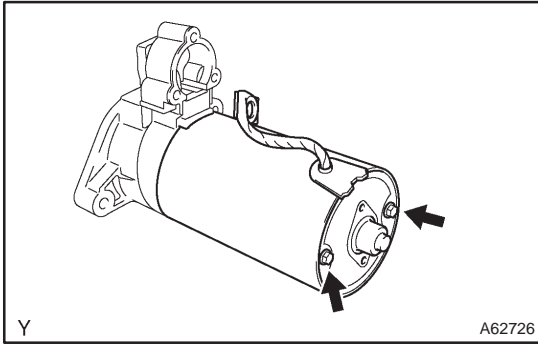
- (b) Using a feeler gauge, measure the armature thrust clearance between the lock plate and end frame.

Standard thrust clearance: 0.3 mm (0.012 in.)

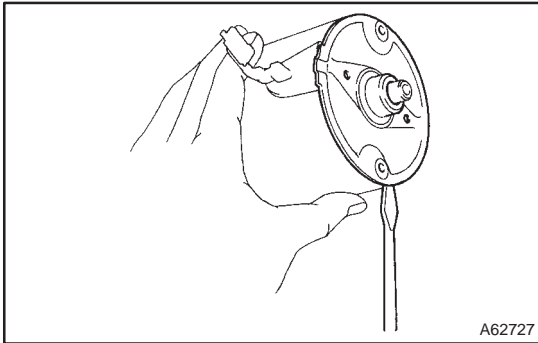
Maximum thrust clearance: 0.6 mm (0.024 in.)

If the thrust clearance is greater than maximum, replace the thrust washer.

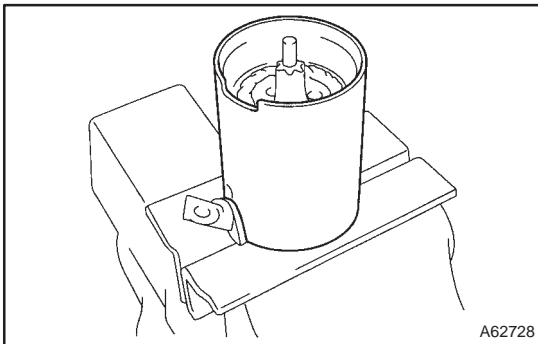
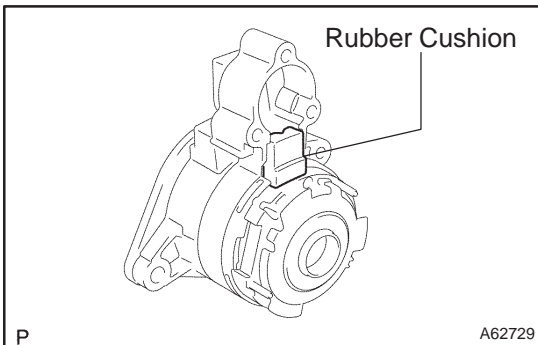
- (c) Remove the lock plate and thrust washer.

**3. REMOVE STARTER YOKE ASSY**

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

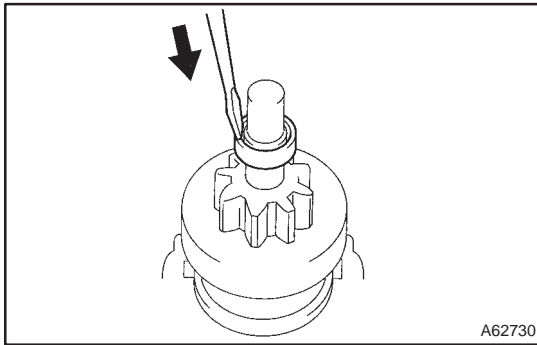
**4. REMOVE STARTER COMMUTATOR END FRAM ASSY**

- (a) Using a screwdriver, pry out the commutator end frame.

**5. REMOVE STARTER ARMATURE ASSY****6. REMOVE STARTER BRUSH HOLDER ASSY****7. REMOVE PLANET CARRIER SHAFT SUB-ASSY**

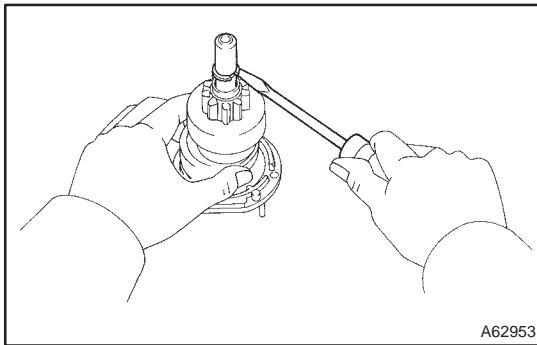
- (a) Remove the rubber cushion.
 (b) Remove the planet carrier shaft and starter clutch assembly.

8. REMOVE STARTER PINION DRIVE LEVER

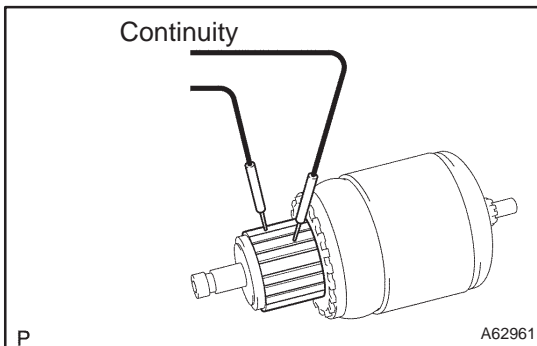


9. REMOVE STARTER CLUTCH SUB-ASSY

- (a) Using a screwdriver, tap in the stop collar towards the starter clutch.



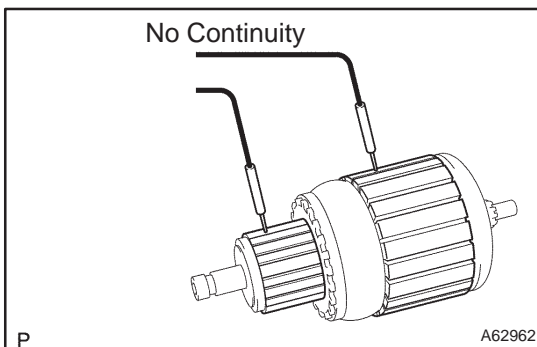
- (b) Using a screwdriver, pry out the snap ring.
 (c) Remove the stop collar from the shaft.



10. INSPECT STARTER ARMATURE ASSY

- (a) Using an ohmmeter, check that there is continuity between the segments of the commutator.

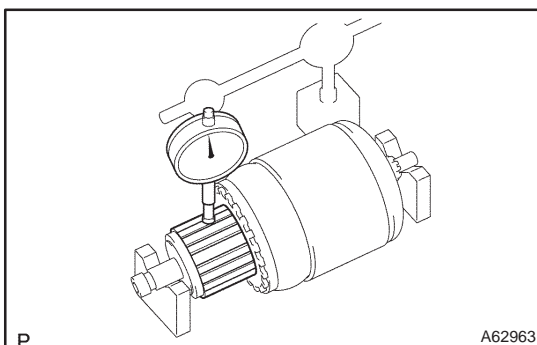
If there is no continuity between any segments, replace the armature.



- (b) Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

If there is continuity, replace the armature.

- (c) Check the commutator for the dirty and burnt surface. If the surface is dirty or burnt, correct with sandpaper (No.400) or a lathe.

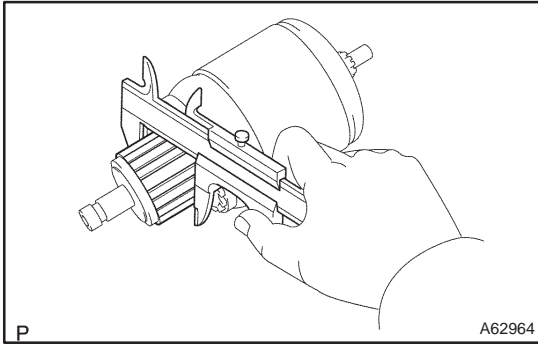


- (d) Place the commutator on V-blocks.

- (e) Using a dial indicator, measure the circle runout.

Maximum circle runout: 0.03 mm (0.0012 in.)

If the circle runout is greater than maximum, correct it on a lathe.

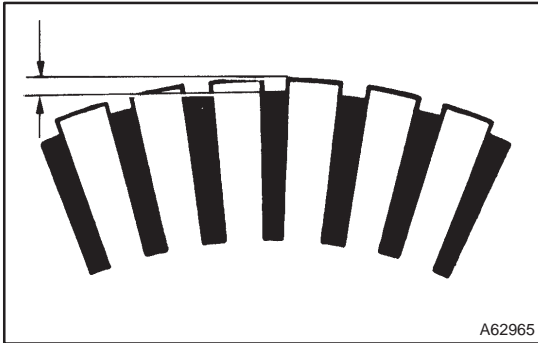


- (f) Using vernier calipers, measure the commutator diameter.

Standard diameter: 32.3 mm (1.272 in.)

Minimum diameter: 30.5 mm (1.201 in.)

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

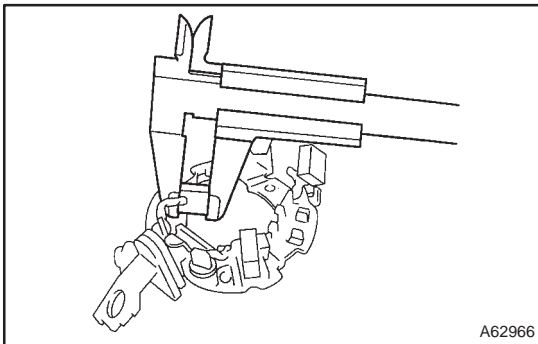


- (g) Check that the undercut depth is clean and free of foreign materials. Smooth out the edge.

Standard undercut depth: 0.9 mm (0.035 in.)

Minimum undercut depth: 0.3 mm (0.012 in.)

If the undercut depth is less than minimum, correct it with a hacksaw blade.



11. INSPECT STARTER BRUSH HOLDER ASSY

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

Standard length: 14.5 mm (0.571 in.)

Minimum length: 9.0 mm (0.354 in.)

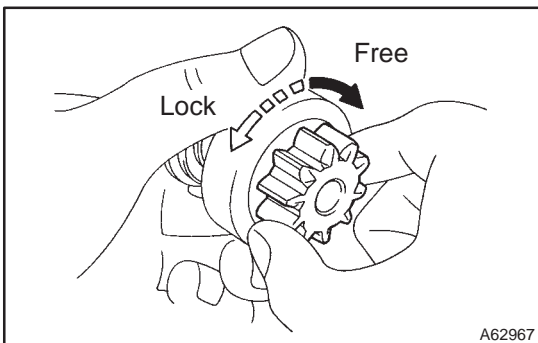
If the length is less than minimum, replace the brush holder.

12. INSPECT STARTER CLUTCH SUB-ASSY

- (a) Check the gear teeth on the starter clutch for wear or damage.

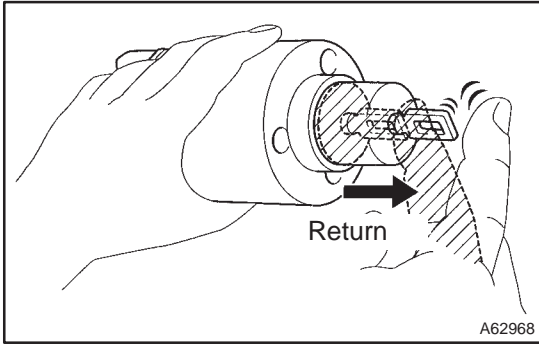
If the gear is damaged, replace it.

If damaged, replace the clutch assembly. If damaged, also check the drive plate ring gear for wear or damage.



- (b) Rotate the clutch pinion gear clockwise and check that it turns freely. Try to rotate the clutch pinion gear counter-clockwise and check that it locks.

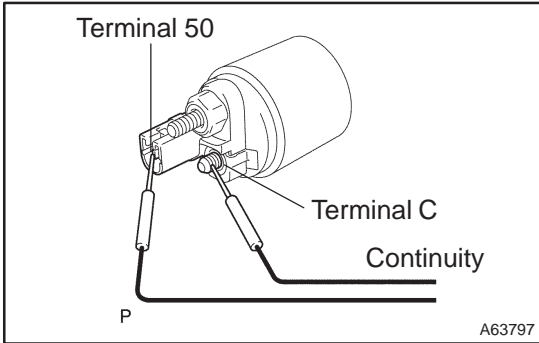
If necessary, replace the starter clutch.



13. INSPECT MAGNET STARTER SWITCH ASSY

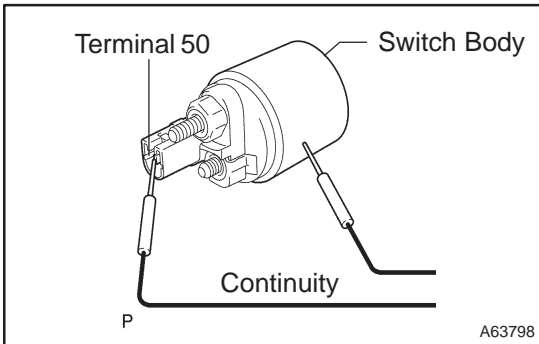
- (a) Push in the plunger and check that it returns quickly to its original position.

If necessary, replace the magnetic switch.



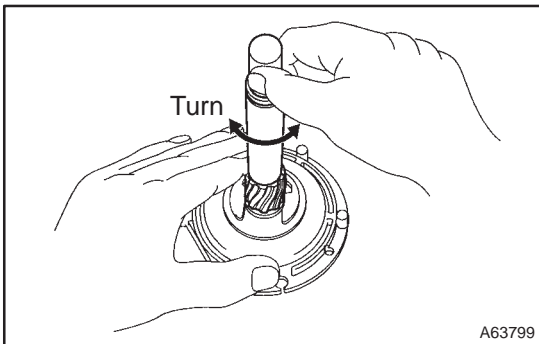
- (b) Using an ohmmeter, check that there is continuity between terminals 50 and C.

If there is no continuity, replace the magnetic switch.



- (c) Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.

If there is no continuity, replace the magnet starter switch.



14. INSPECT PLANET CARRIER SHAFT SUB-ASSY

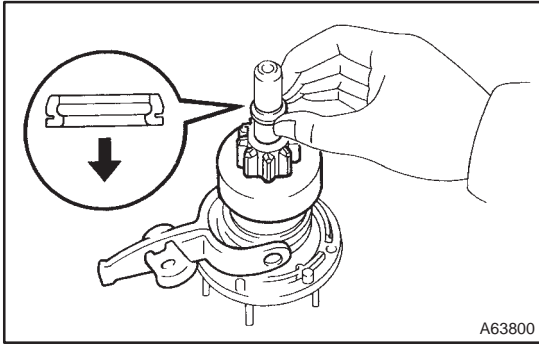
- (a) Turn the shaft, and check that it is not rough or worn.

If it feels rough or worn, replace the planet carrier shaft.

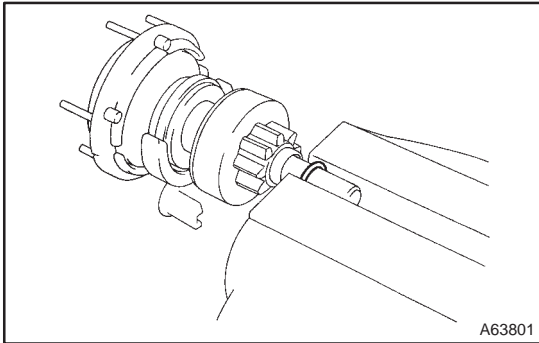
15. INSTALL STARTER PINION DRIVE LEVER

16. INSTALL STARTER CLUTCH SUB-ASSY

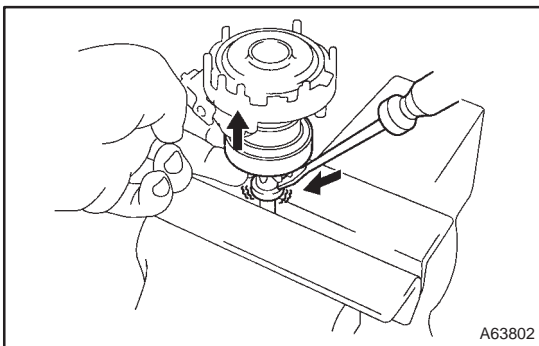
- (a) Apply grease to the bushing and spline of the starter clutch and planet carrier shaft.



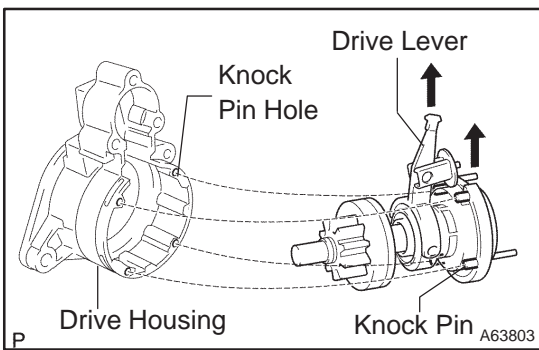
- (b) Place the starter clutch and stop collar on the planet carrier shaft as shown in the illustration.



- (c) Install a new snap ring to the planet carrier shaft groove.
- (d) Using a vise, compress the snap ring.
- (e) Check that the snap ring fits correctly.

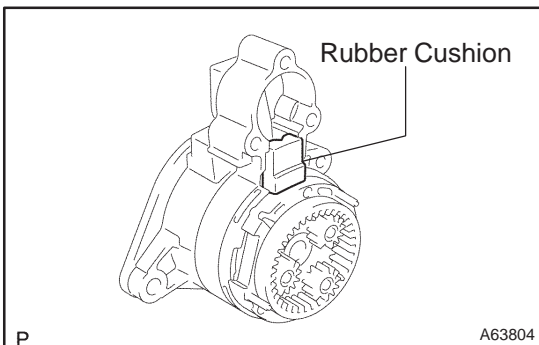


- (f) Using a screwdriver, tap the stop collar to slide it onto the snap ring.

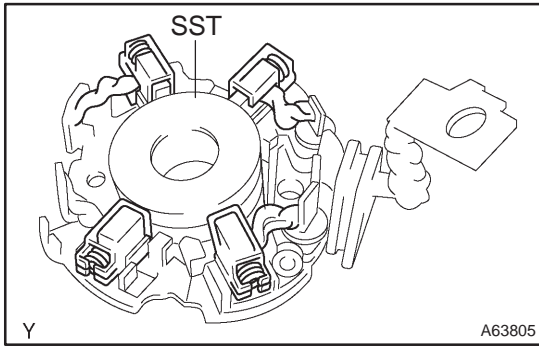


17. INSTALL PLANET CARRIER SHAFT SUB-ASSY

- (a) Set the planet carrier shaft and drive lever in position as shown in the illustration.
- (b) Align the holes of the drive housing with the knock pins.
- (c) Install the planet carrier shaft and starter clutch to the drive housing.

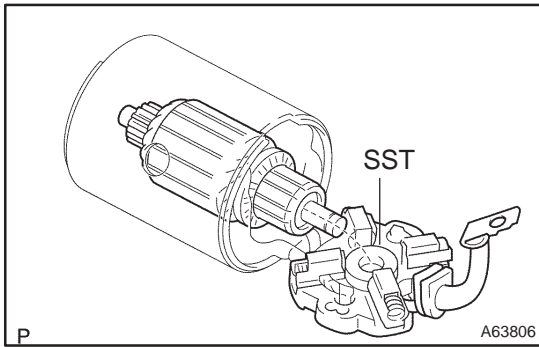


- (d) Install the rubber cushion.

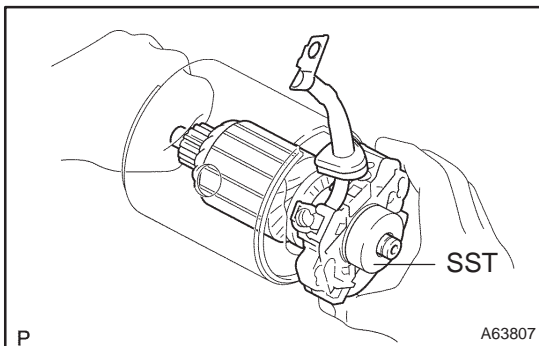


18. INSTALL STARTER BRUSH HOLDER ASSY

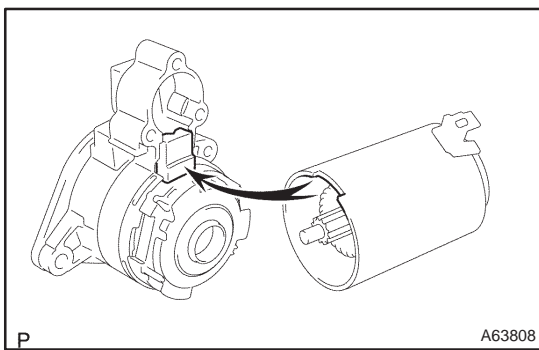
- (a) Install the 4 brush retainers and 4 brush springs to the brush holder.
- (b) Using SST, install the 4 brushes to the brush holder.
SST 09950-60010 (09951-00340)



- (c) Attach the brush holder to the armature.

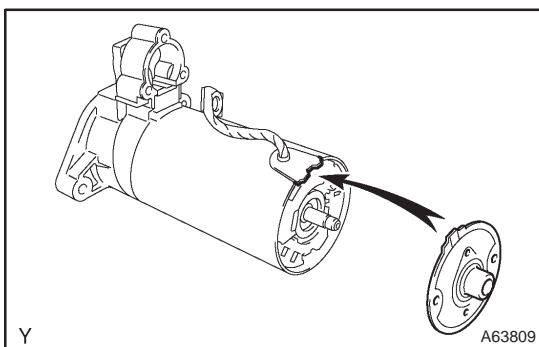


- (d) Push the armature, and remove the SST.

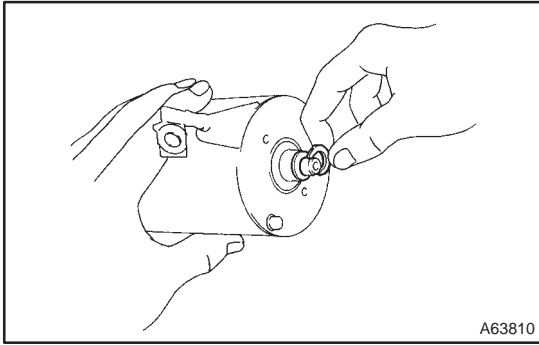


19. INSTALL STARTER YOKE ASSY

- (a) Align the cushion rubber on the starter drive housing with the cutout of the starter yoke.
- (b) Install the starter yoke and armature assembly.

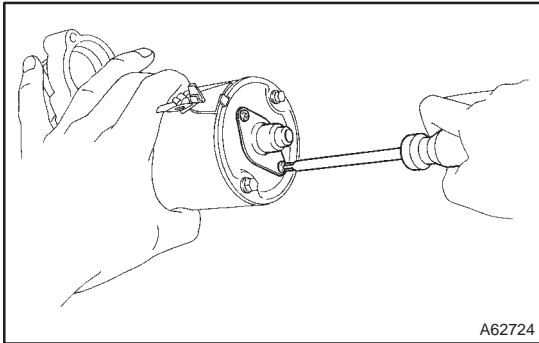


- (c) Align the commutator end frame with the brush holder rubber part as shown in the illustration.
- (d) Install the commutator end frame with the 2 through bolts.
6.5 N-m (66 kgf-cm, 58 in.-lbf)

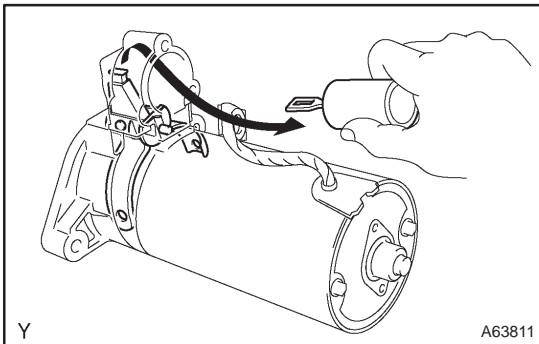


20. INSTALL STARTER COMMUTATOR END FRAM COVER

- (a) Install the thrust washer and lock plate.
- (b) Check the armature thrust clearance between the lock plate and the end frame cover. (See page 19-9)

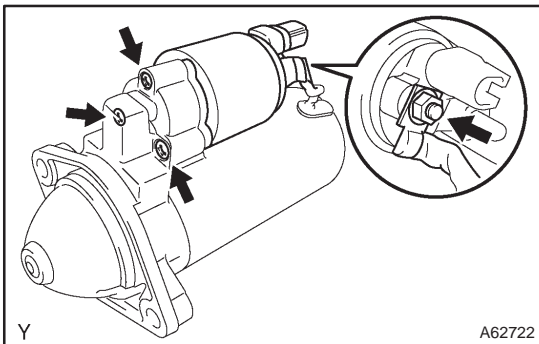


- (c) Pack grease to the commutator end cover.
- (d) Install the commutator end frame cover with the 2 screws.
1.7 N-m (17 kgf-cm, 15 in.-lbf)



21. INSTALL MAGNET STARTER SWITCH ASSY

- (a) Hang the plunger hook to the upper side of the drive lever.
- (b) Install the return spring into the plunger.

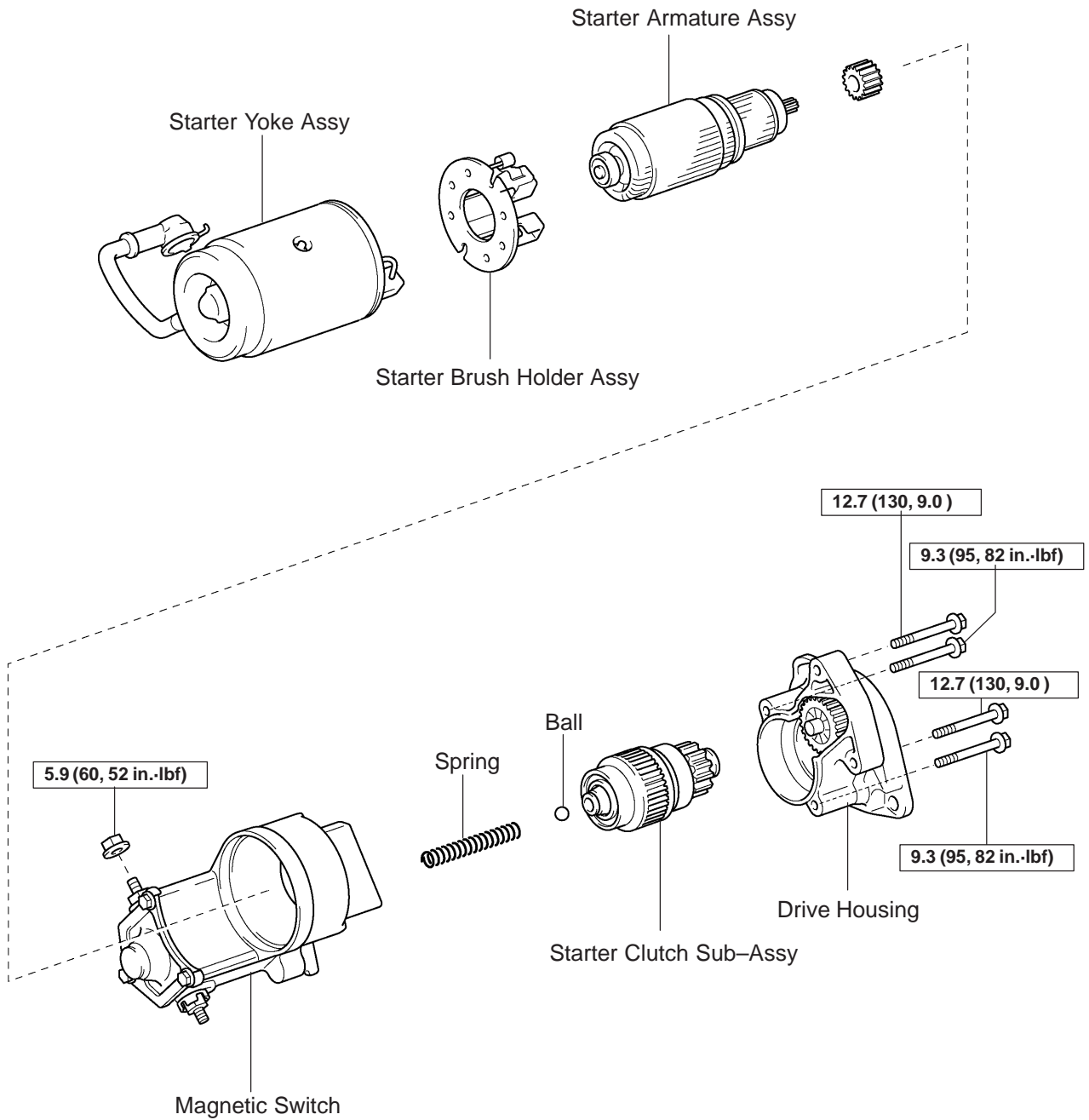


- (c) Install the return spring and magnet starter switch with the 3 screws.
5.0 N-m (51 kgf-cm, 44 in.-lbf)
- (d) Connect the lead wire to the magnet starter switch terminal with the nut.
8.0 N-m (82 kgf-cm, 71 in.-lbf)

STARTER ASSY(2.2KW) (1CD-FTV) COMPONENTS

190AH-01

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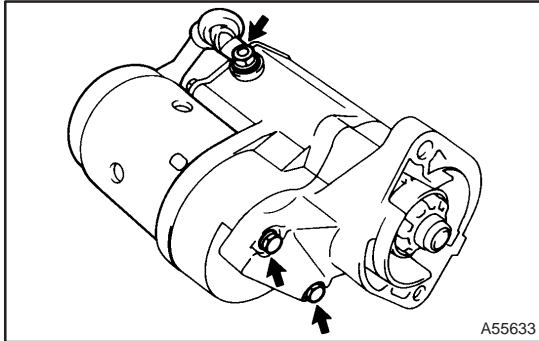


N·m (kgf·cm, ft·lbf) : Specified torque

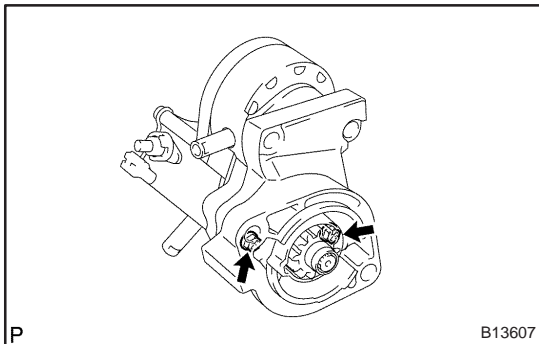
Y

A62713

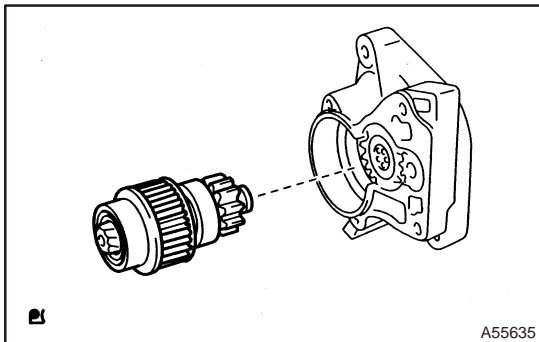
OVERHAUL

**1. REMOVE STARTER YOKE ASSY**

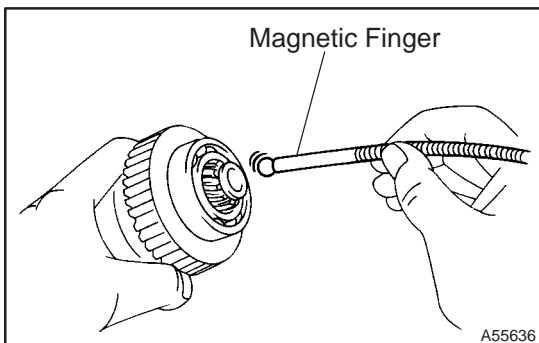
- (a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.
- (b) Remove the 2 through bolts.
- (c) Pull out the yoke together with the armature from the magnetic switch.

**2. REMOVE STARTER CLUTCH SUB-ASSY**

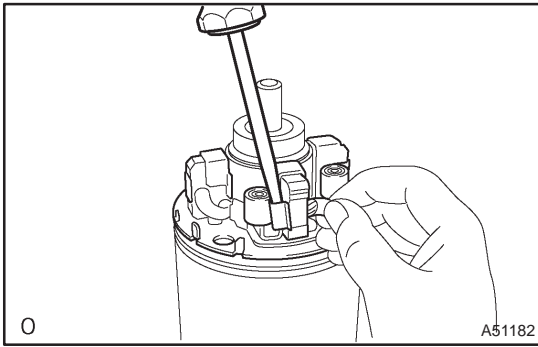
- (a) Remove the 2 bolts and drive housing.



- (b) Remove the clutch from the drive housing

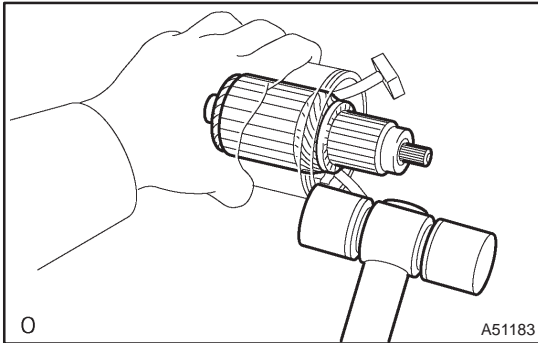


- (c) Using a magnetic finger, remove the ball from the clutch shaft hole.



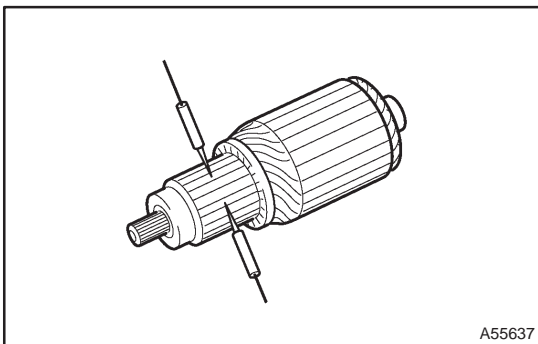
3. REMOVE STARTER BRUSH HOLDER ASSY

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



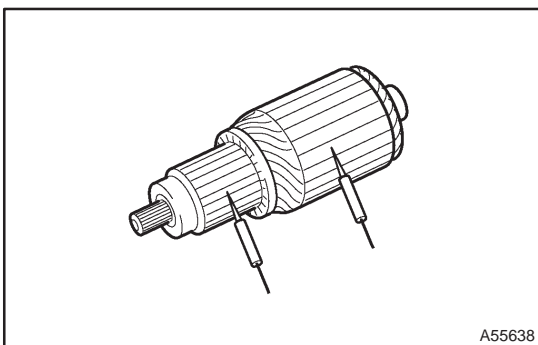
4. REMOVE STARTER ARMATURE ASSY

- (a) Using a plastic-faced hammer, tap the yoke and remove the armature.

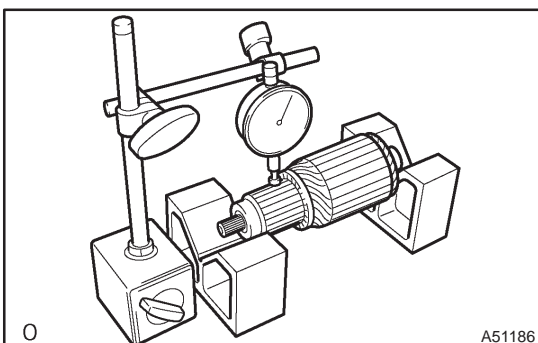


5. INSPECT STARTER ARMATURE ASSY

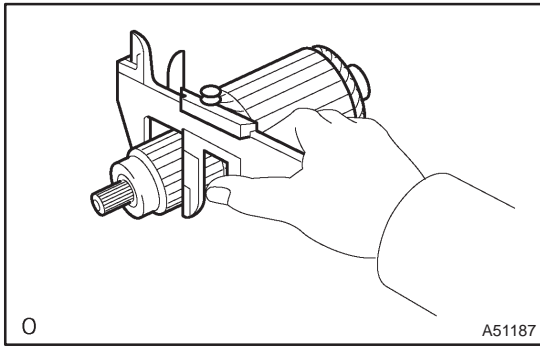
- (a) Using an ohmmeter, check that there is continuity between the segments of the commutator.



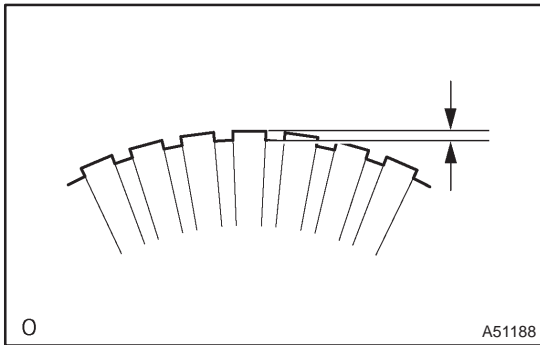
- (b) Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.



- (c) Place the commutator on V-blocks.
 (d) Using a dial gauge, measure the circle runout.
Maximum circle runout: 0.05 mm (0.002 in.)

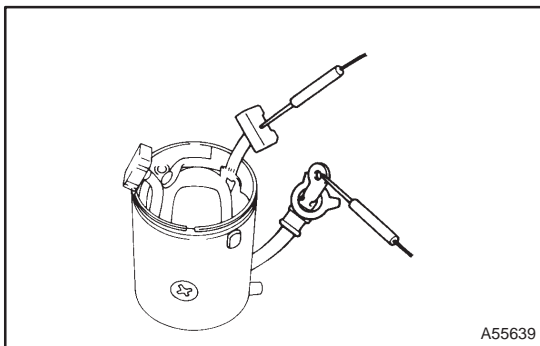


- (e) Using vernier calipers, measure the commutator diameter.
Standard diameter: 35 mm (1.378 in.)
Minimum diameter: 34 mm (1.3386 in.)



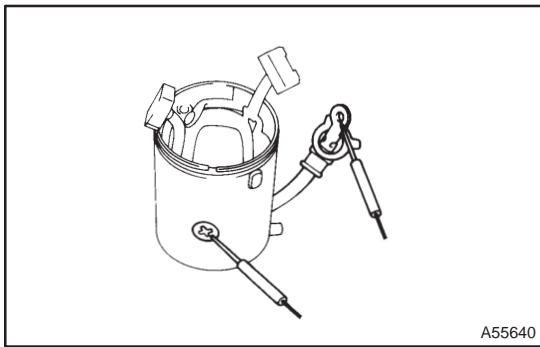
- (f) Check that the undercut depth is clean and free of foreign materials. Smooth out the edge.
Standard undercut depth: 0.7 mm (0.0276 in.)
Minimum undercut depth: 0.2 mm (0.079 in.)

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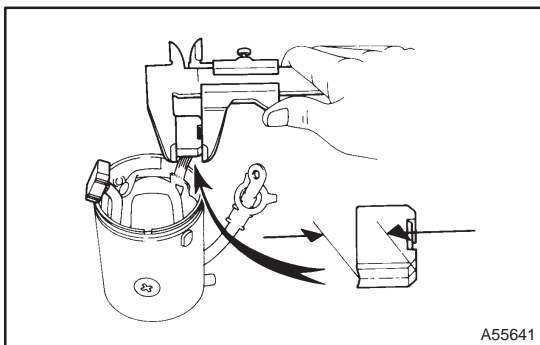


6. INSPECT STARTER YOKE ASSY

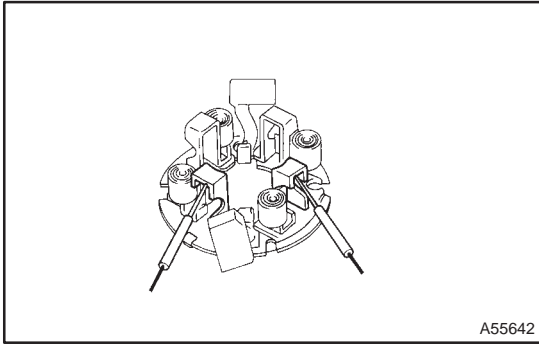
- (a) Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.



- (b) Using an ohmmeter, check that there is no continuity between the field coil brush lead and yoke.

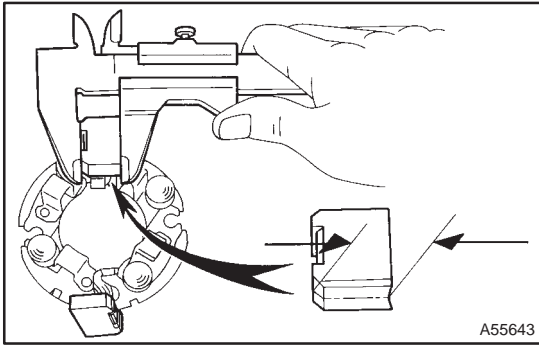


- (c) Using vernier calipers, measure the brush length.
Standard length: 16.5 mm (0.6496 in.)
Minimum length: 9 mm (0.3543 in.)



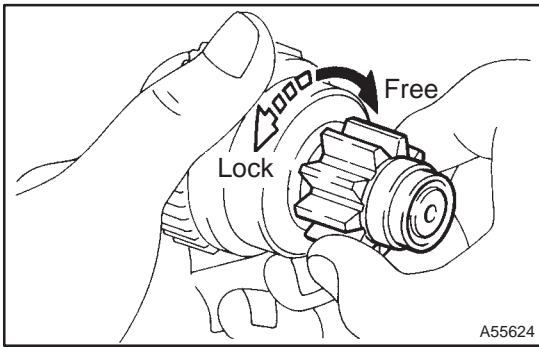
7. INSPECT STARTER BRUSH HOLDER ASSY

(a) Using an ohmmeter, check that there is no continuity between the positive (+) and negative (-) brush holders.



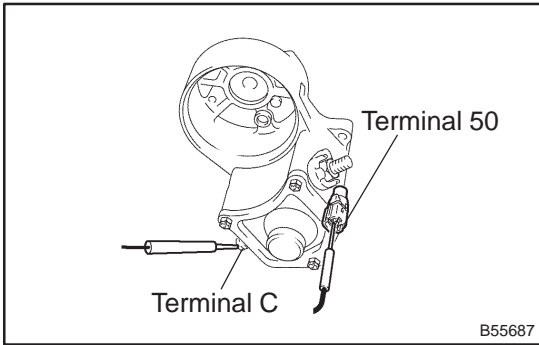
(b) Using vernier calipers, measure the brush length.
Standard length: 16.5 mm (0.6496 in.)
Minimum length: 9 mm (0.3543 in.)

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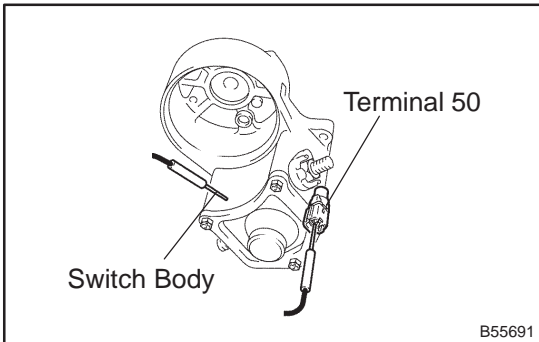
8. INSPECT STARTER CLUTCH SUB-ASSY

(a) Rotate the pinion gear clockwise, and check that it turns freely. Try to rotate the pinion gear counterclockwise and check that it locks.

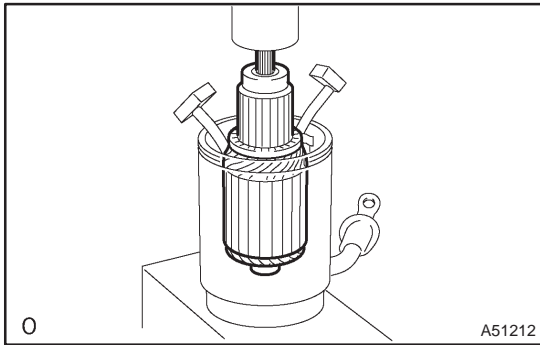


9. INSPECT MAGNET STARTER SWITCH ASSY

(a) Using an ohmmeter, check that there is continuity between terminals 50 and C.

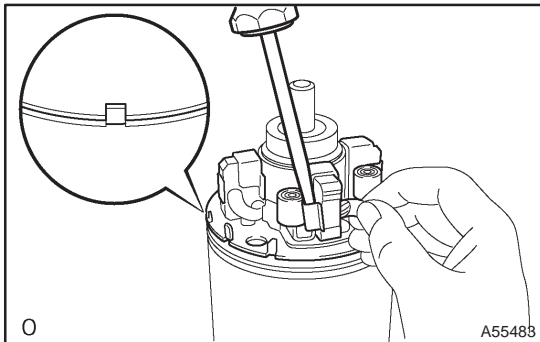


(b) Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.



10. INSTALL STARTER ARMATURE ASSY

- (a) Apply grease to the armature bearings.
- (b) Using a press, press in armature.



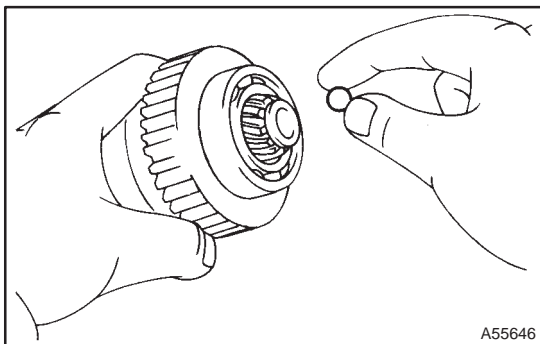
11. INSTALL STARTER BRUSH HOLDER ASSY

- (a) Align the claw of the brush holder with the claw groove of the yoke.
- (b) Place the brush on the yoke.
- (c) Using a screwdriver, hold the brush spring back and connect the brush into the brush holder. Connect the 4 brushes.

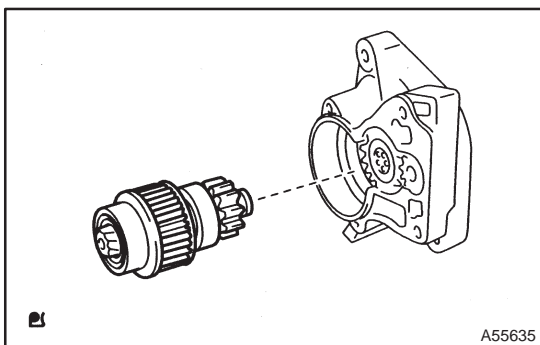
NOTICE:

Check that the positive (+) lead wires are not grounded.

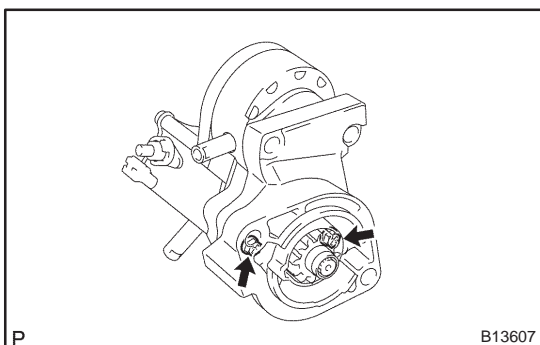
12. INSTALL STARTER CLUTCH SUB-ASSY



- (a) Apply grease to the ball.
- (b) Insert the ball into the clutch shaft hole.

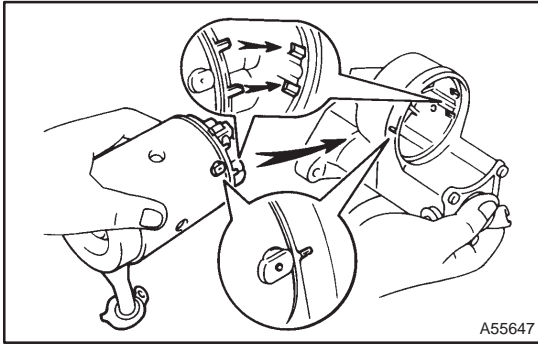


- (c) Place the clutch on the drive housing.



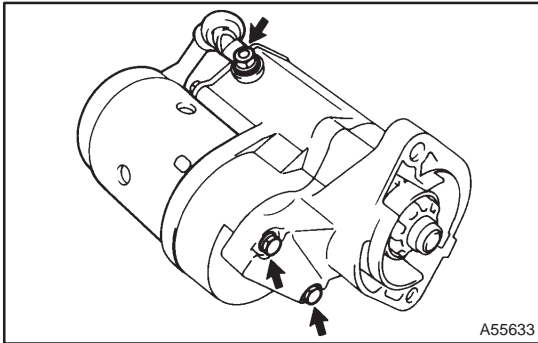
- (d) Install the drive housing to the magnetic switch with the 2 bolts.

Torque: 9.3 N·m (95 kgf·cm, 82 in·lbf)



13. INSTALL STARTER YOKE ASSY

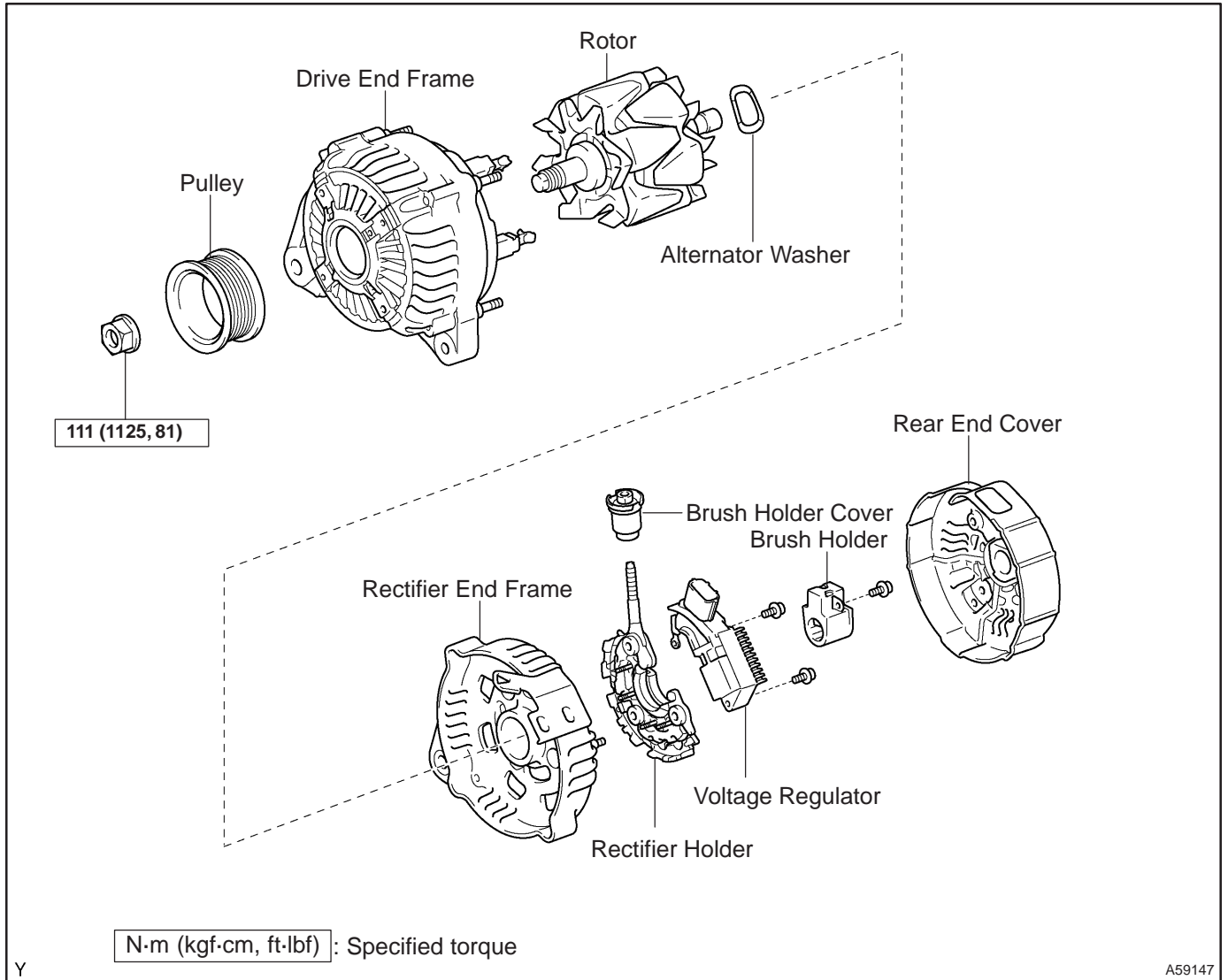
- (a) Align the claws of the brush holder with the grooves of the magnetic switch, and install the yoke and armature.
- (b) Align the punch mark of the yoke with the line of the magnetic switch.



- (c) Install the yoke and armature with the 2 through bolts.
Torque: 12.7 N·m (130 kgf·cm, 9 ft·lbf)
- (d) Connect the lead wire to terminal C with the nut.
Torque: 5.9 N·m (60 kgf·cm, 52 in·lbf)

GENERATOR ASSY(90A) (1CD-FTV) COMPONENTS

19094-02



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Y

A59147

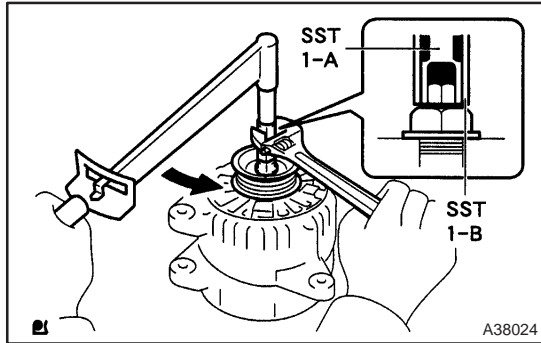
OVERHAUL

1. REMOVE GENERATOR PULLEY

SST 09820-63010 (09820-06010, 09820-06020)

HINT:

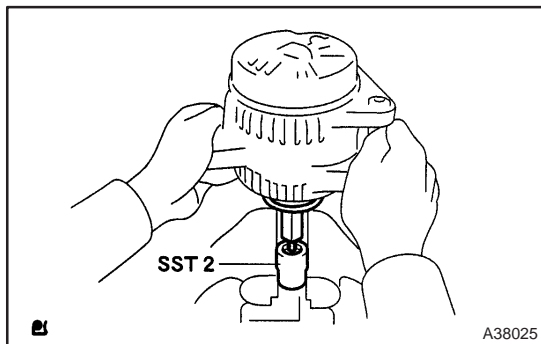
SST1 - A, B	09820-06010
SST2	09820-06020



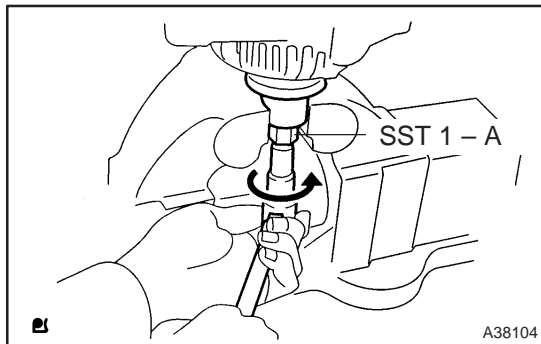
- (a) Hold SST 1 - A with a torque wrench, and tighten SST 1 - B clockwise to the specified torque.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

NOTICE:

Check that SST is secured to the rotor shaft.



- (b) Mount SST 2 in a vise.
- (c) Insert SST 1 - A, B into SST 2, and attach the pulley nut to SST 2.

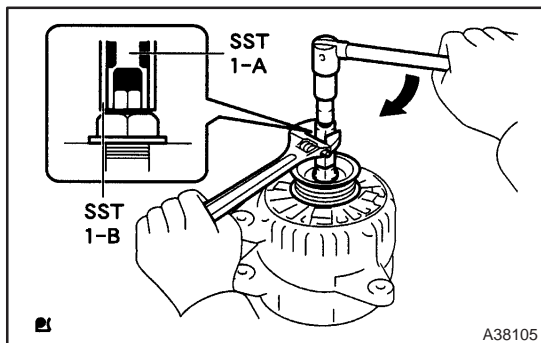


- (d) To loosen the pulley nut, turn SST 1 - A in the direction shown in the illustration.

NOTICE:

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

- (e) Remove the alternator form SST 2.



- (f) Turn SST 1 - B, and remove SST 1 - A, B.
- (g) Remove the pulley nut and pulley.

2. REMOVE GENERATOR BRUSH HOLDER ASSY

- (a) Remove the nut and terminal insulator.
- (b) Remove the bolt, 3 nuts, plate terminal and end cover.
- (c) Remove the brush cover.
- (d) Remove the 2 screws and brush holder.

3. REMOVE GENERATOR REGULATOR ASSY

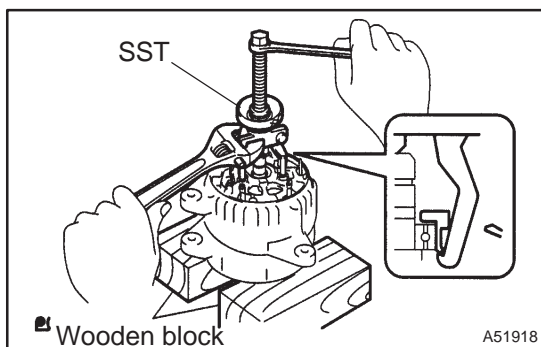
- (a) Remove the 3 screws and voltage regulator.

4. REMOVE GENERATOR HOLDER W/RECTIFIER

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

5. REMOVE ALTERNATOR RECTIFIER END FRAME

- (a) Remove the rubber insulator.
- (b) Remove the seal plate.
- (c) Remove the 4 nuts.



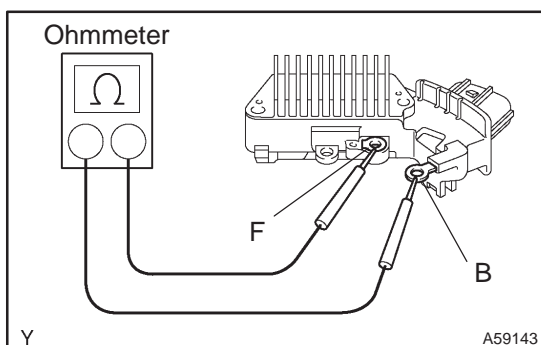
- (d) Using bearing puller set, remove the rectifier end frame.

6. REMOVE GENERATOR ROTOR ASSY

- (a) Remove the alternator washer from the rotor.
- (b) Remove the rotor from drive end frame.

NOTICE:

Do not drop the rotor.

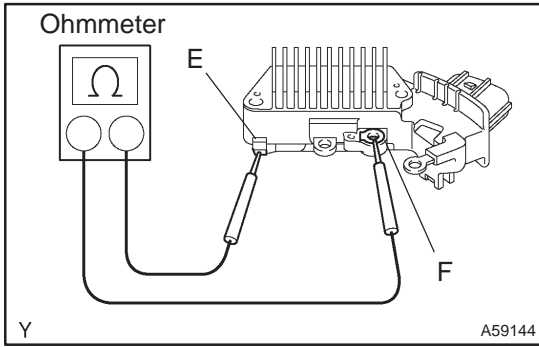
**7. INSPECT GENERATOR REGULATOR ASSY**

- (a) Using an ohmmeter, check the continuity between terminals F and B.

Standard:

When the positive and negative poles between terminals F and B are exchanged, there is continuity in one way but no continuity in another way.

If the continuity is not as specified, replace the voltage regulator.

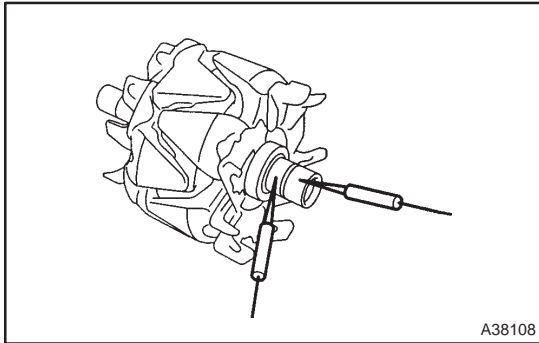


- (b) Using an ohmmeter, check the continuity between terminals F and E.

Standard:

When the positive and negative poles between terminals F and E are exchanged, there is continuity in one way but no continuity in another way.

If the continuity is not as specified, replace the voltage regulator.

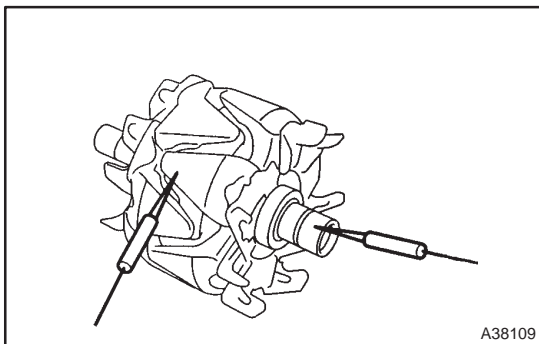


8. INSPECT GENERATOR ROTOR ASSY

- (a) Inspect rotor for open circuit.
 (1) Using an ohmmeter, check that there is continuity between the slip rings.

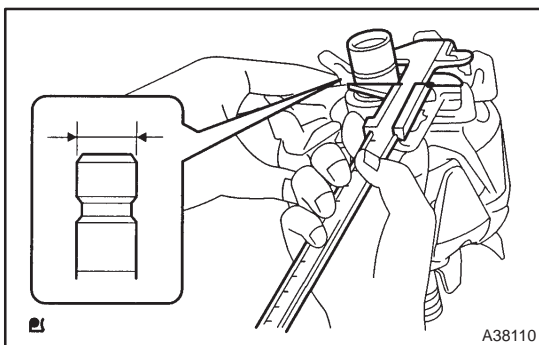
Standard resistance: 2.7 – 3.1 Ω at 20°C (68°F)

If there is no continuity, replace the rotor.



- (b) Inspect rotor for ground.
 (1) Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

If there is continuity, replace the rotor.

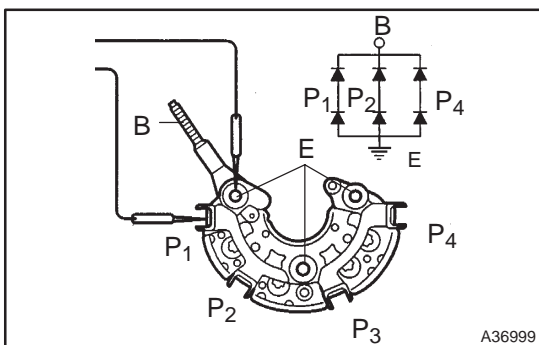


- (c) Inspect slip rings.
 (1) Using vernier calipers, measure the slip ring diameter.

Standard diameter: 14.2 – 14.4 mm (0.559 – 0.567 in.)

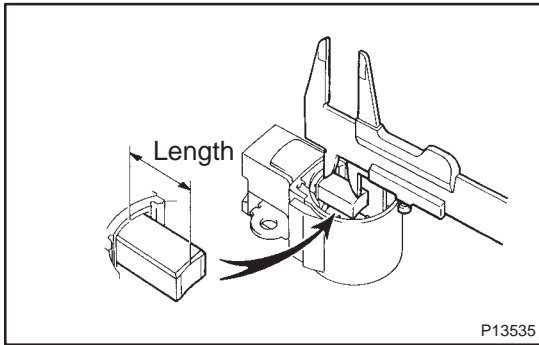
Minimum diameter: 12.8 mm (0.504 in.)

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



9. INSPECT GENERATOR HOLDER W/RECTIFIER

- (a) Using an ohmmeter, connect one tester probe to the B or E terminal and the other to each rectifier terminal.
 (b) Reverse the polarity of the tester probes and repeat step (a).
 (c) Check that one shows continuity and the other shows no continuity.



10. INSPECT BRUSH

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

Standard exposed length:

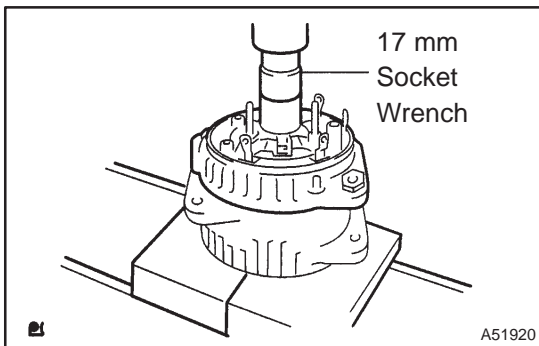
9.5 – 11.5 mm (0.374 – 0.453 in.)

Minimum exposed length: 1.5 mm (0.059 in.)

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

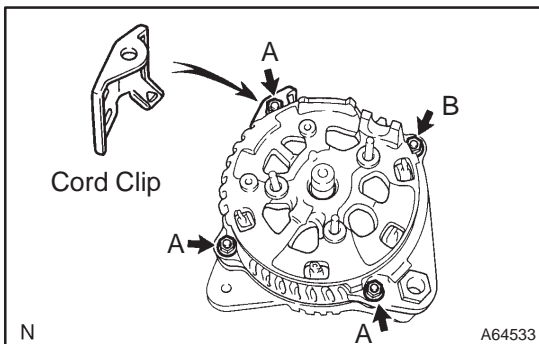
11. INSTALL GENERATOR ROTOR ASSY

- (a) Install the generator rotor.
 (b) Install the alternator washer to the rotor.



12. INSTALL ALTERNATOR RECTIFIER END FRAME

- (a) Using a 17 mm socket wrench and press, slowly press in the rectifier end frame.



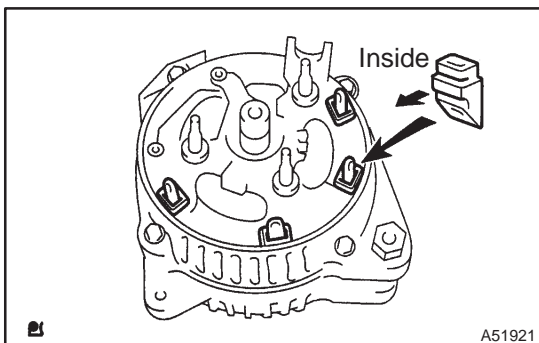
- (b) Install the cord clip and 4 nuts.

Torque:

Nut A 4.5 N·m (46 kgf·cm, 39 in·lbf)

Nut B 5.4 N·m (55 kgf·cm, 47 in·lbf)

- (c) Install the seal plate on the rectifier end frame.



- (d) Install the 4 rubber insulators on the lead wires.

NOTICE:

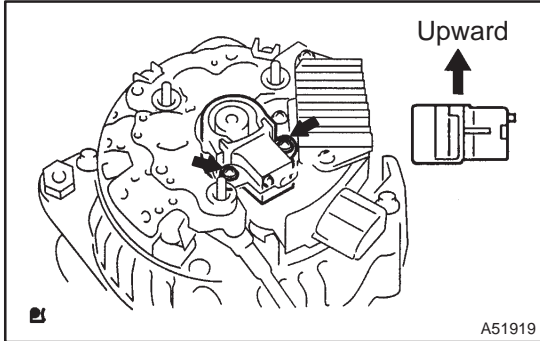
Be careful of the rubber insulators installation direction.

13. INSTALL GENERATOR HOLDER W/RECTIFIER

- (a) Install the rectifier holder while pushing it with the 4 screws.
Torque: 2.9 N·m (30 kgf·cm, 26 in·lbf)

14. INSTALL GENERATOR REGULATOR ASSY

- (a) Install the 3 screws and voltage regulator.
Torque: 3.9 N·m (40 kgf·cm, 35 in·lbf)



15. INSTALL GENERATOR BRUSH HOLDER ASSY

- (a) Install the 2 screws and brush holder.
Torque: 2.0 N·m (20 kgf·cm, 18 in·lbf)

NOTICE:
Be careful of the holder installation direction.

- (b) Install the brush cover.
- (c) Install the end cover and plate terminal with the bolt and 3 nuts.

Torque:
Nut 4.4 N·m (45 kgf·cm, 39 in·lbf)
Bolt 3.9 N·m (39 kgf·cm, 35 in·lbf)

- (d) Install the terminal insulator with the nut.
Torque: 4.1 N·m (42 kgf·cm, 36 in·lbf)

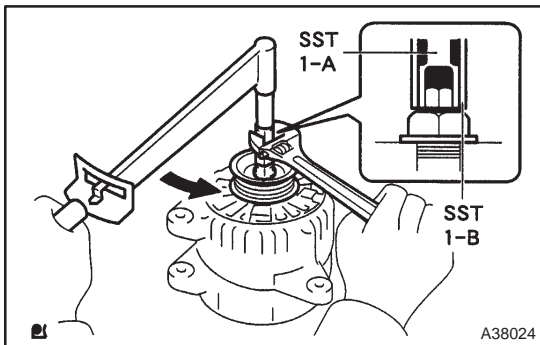
16. INSTALL GENERATOR PULLEY

SST 09820-63010 (09820-06010, 09820-06020)

HINT:

SST1 - A, B	09820-06010
SST2	09820-06020

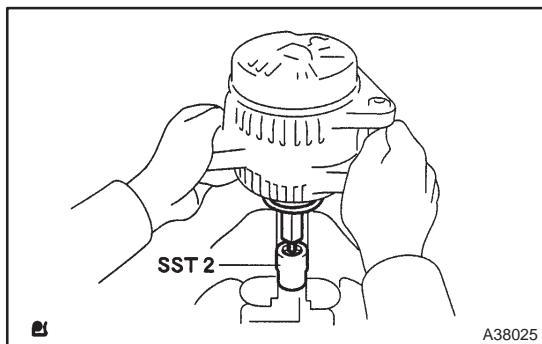
- (a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.



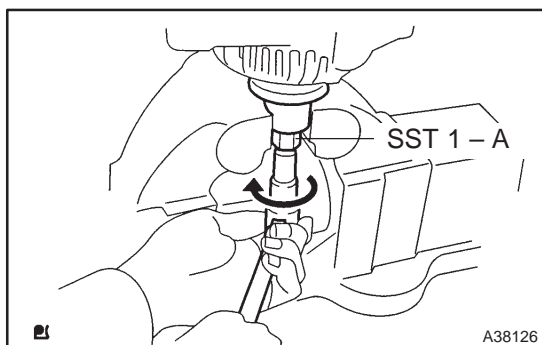
- (b) Hold SST 1 - A with a torque wrench, and tighten SST 1 - B clockwise to the specified torque.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

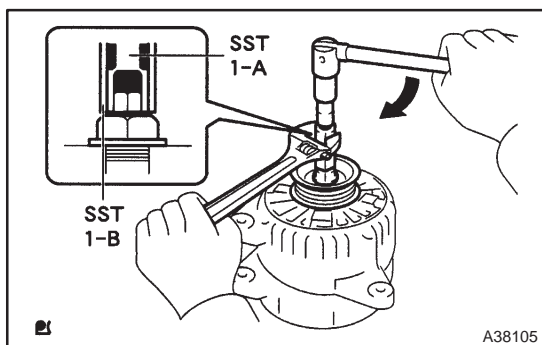
NOTICE:
Check that SST is secured to the pulley shaft.



- (c) Mount SST 2 in a vise.
- (d) Insert SST 1 - A, B into SST 2, and attach the pulley nut to SST 2.



- (e) Tighten the pulley nut, turn SST 1 - A in the direction shown in the illustration.
Torque: 111 N·m (1,125 kgf·cm, 81 ft·lbf)
- (f) Remove the alternator form SST 2.

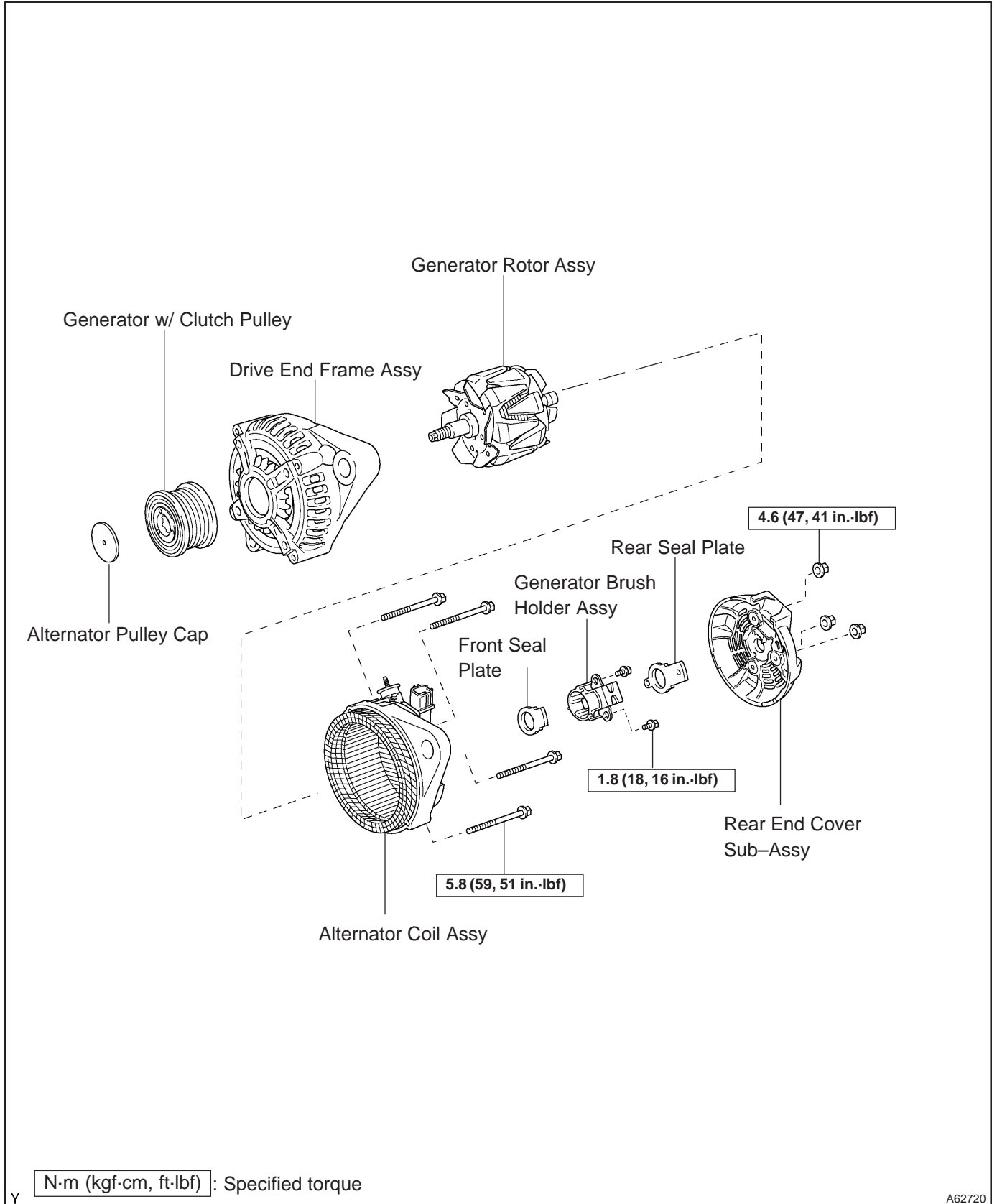


- (g) Turn SST 1 - B, and remove SST 1 - A, B.
- (h) Turn the pulley, and check that the pulley moves smoothly.

GENERATOR ASSY(130A) (1CD-FTV) COMPONENTS

190AJ-01

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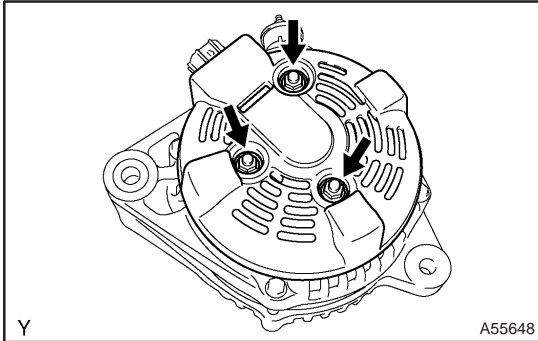


N·m (kgf·cm, ft·lbf) : Specified torque

A62720

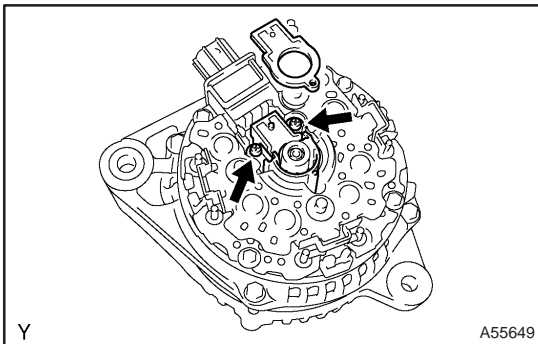
OVERHAUL

ProCarManuals.com

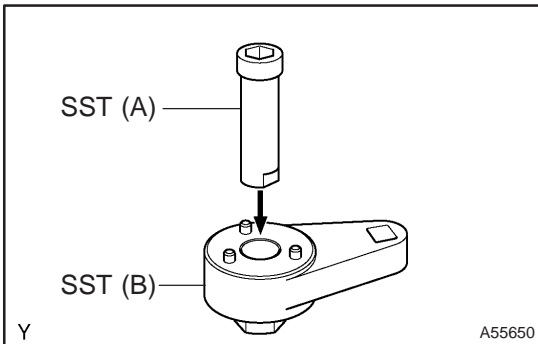


1. REMOVE GENERATOR BRUSH HOLDER ASSY

- (a) Remove the 3 nuts and rear end cover.
- (b) Remove the B terminal insulator.

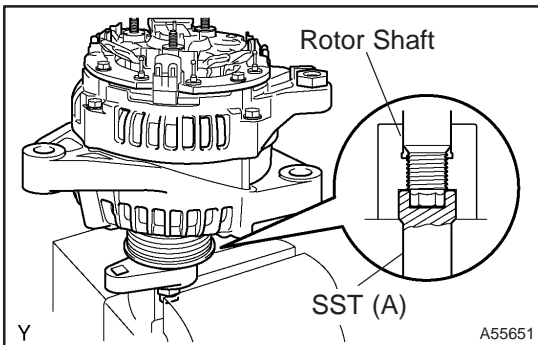


- (c) Remove the rear plate seal from the brush holder.
- (d) Remove the 2 screws and brush holder.
- (e) Remove the front seal plate from the rear frame.



2. REMOVE GENERATOR W/CLUTCH PULLEY

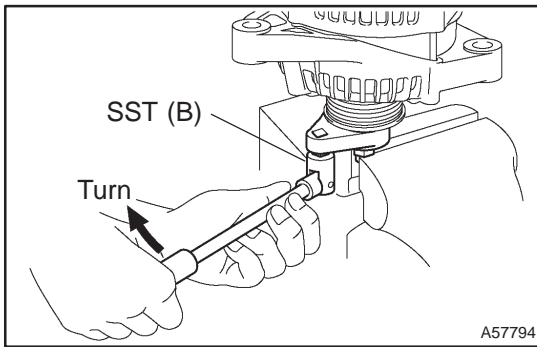
- (a) Set SST (A) and (B).
SST 09820-63020



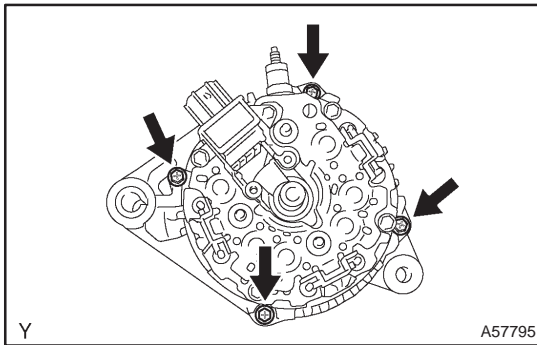
- (b) Mount SST (A) in a vise.
- (c) Set the alternator to SST.

NOTICE:

At this time, make sure that the alternator and SST are perpendicular to one another.

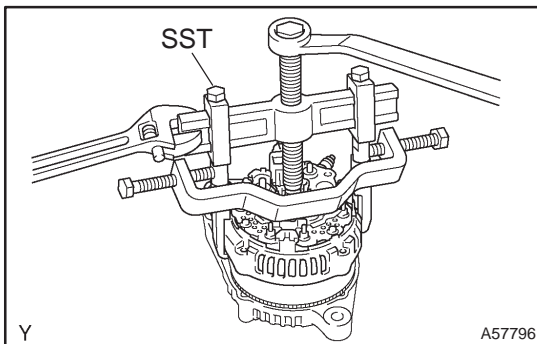


- (d) Insert the 3 tabs of SST (B) into the 3 holes on the pulley.
- (e) To loosen the pulley, turn SST (B) in the direction shown in the illustration.
- (f) Remove the alternator from SST.
- (g) Remove the pulley from the rotor shaft.

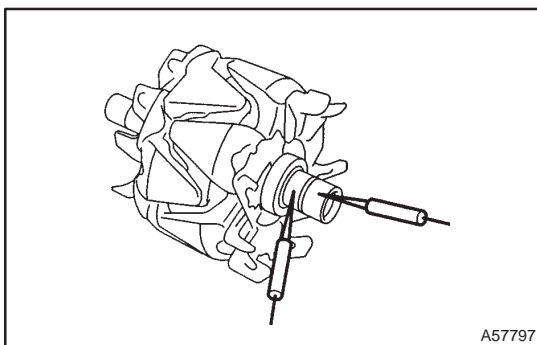


3. REMOVE GENERATOR ROTOR ASSY

- (a) Remove the 4 through bolts.



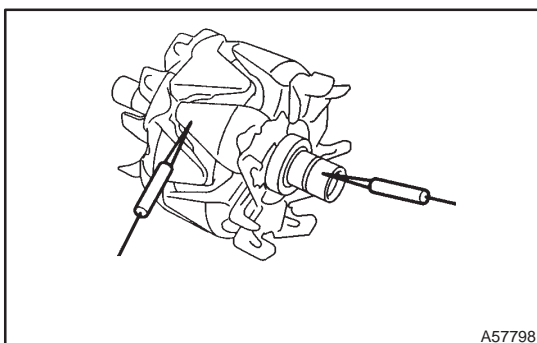
- (b) Using SST, remove the coil assembly.
SST 09950-40011 (09951-04020, 09952-04010, 09953-04020, 09954-04010, 09955-04071, 09958-04011)
- (c) Remove the alternator washer.
- (d) Remove the rotor from the drive end frame.



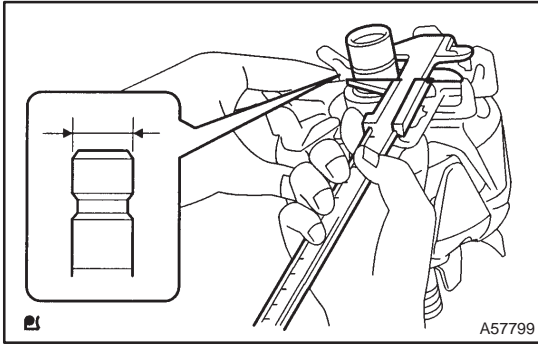
4. INSPECT GENERATOR ROTOR ASSY

- (a) Using an ohmmeter, check that there is continuity between the slip rings.

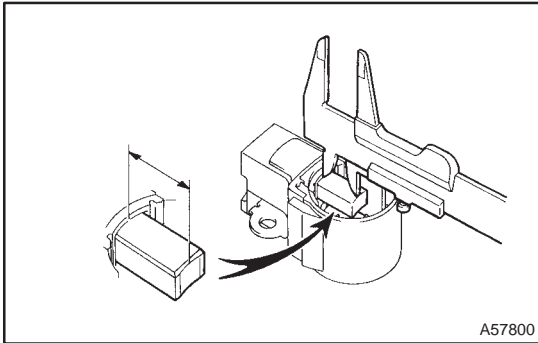
Standard resistance: 2.3 – 2.7 Ω at 20°C (68°F)



- (b) Using an ohmmeter, check that there is no continuity between the slip ring and rotor.



- (c) Check that the slip rings are not rough or scored.
 (d) Using vernier calipers, measure the slip ring diameter.
Standard diameter:
14.2 – 14.4 mm (0.5591 – 0.5669 in.)
Minimum diameter: 14.0 mm (0.551 in.)

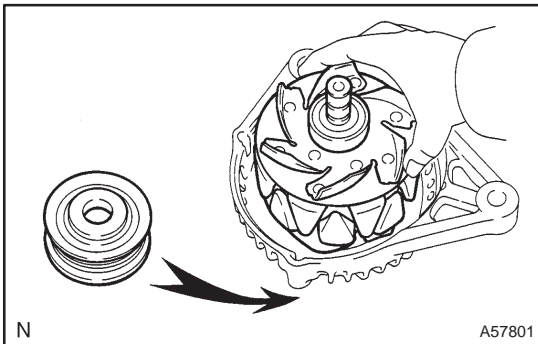


5. INSPECT GENERATOR BRUSH HOLDER ASSY

- (a) Using vernier calipers, measure the exposed brush length.
Standard exposed length: 10.5 mm (0.4134 in.)
Minimum exposed length: 4.5 mm (0.177 in.)

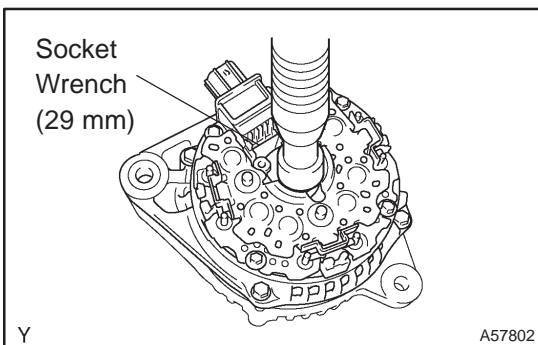
HINT:

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

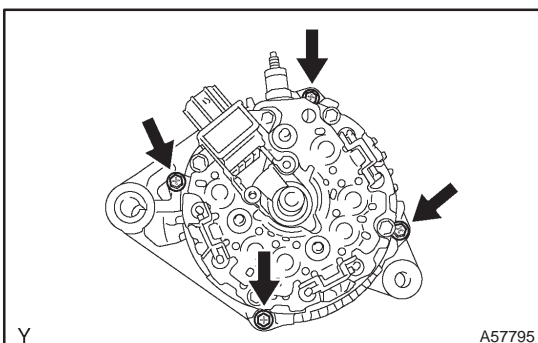


6. INSTALL GENERATOR ROTOR ASSY

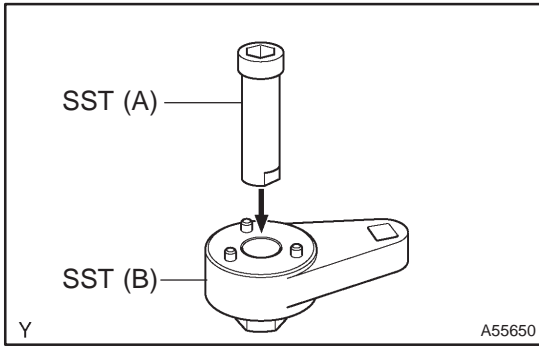
- (a) Place the drive end frame.
 (b) Install the rotor to the drive end frame.
 (c) Place the alternator washer on the rear bearing.



- (d) Using a socket wrench (29 mm) and press, slowly press in the coil assembly.

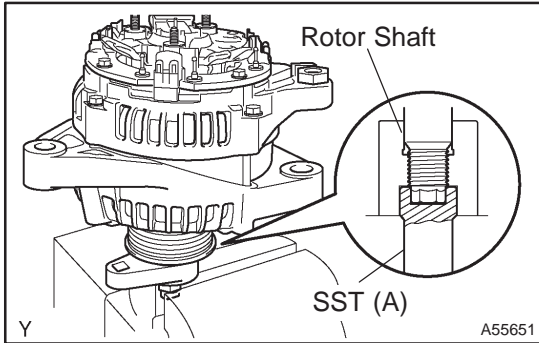


- (e) Install the 4 through bolts.
Torque: 5.8 N·m (59 kgf·cm, 51 in.·lbf)



7. INSTALL GENERATOR W/CLUTCH PULLEY

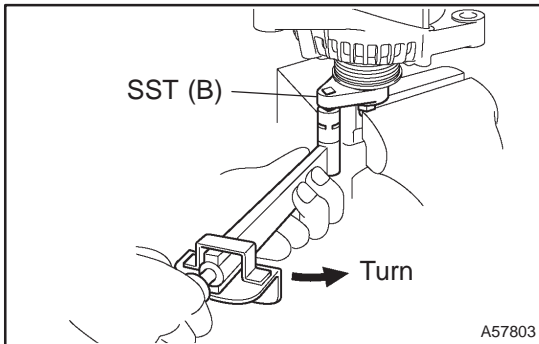
- (a) Temporarily install the pulley to the rotor shaft.
- (b) Set SST (A) and (B).
SST 09820-63020



- (c) Mount SST (A) in a vise.
- (d) Set the alternator to SST.

NOTICE:

At this time, make sure that the alternator and SST are perpendicular to one another.



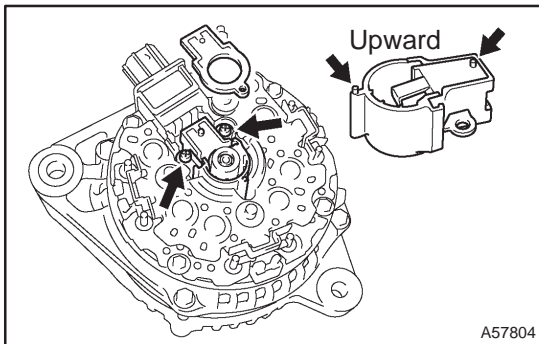
- (e) Insert the 3 tabs of SST (B) into the 3 holes on the pulley.
- (f) To torque the pulley, turn SST (B) in the direction shown in the illustration.

Torque: 111 N·m (1132 kgf·cm, 82 ft·lbf) for using SST

HINT:

Use a torque wrench with a fulcrum length of 50 cm (19.69 in.).

- (g) Remove the alternator from SST.
- (h) Install a new alternator pulley cap.



8. INSTALL GENERATOR BRUSH HOLDER ASSY

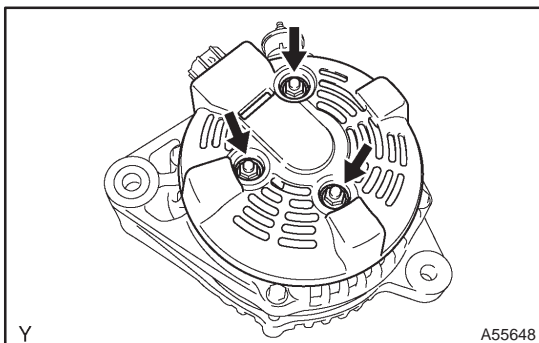
- (a) Place the front seal plate to the coil assembly.
- (b) Install the brush holder with the 2 screws.

Torque: 1.8 N·m (18 kgf·cm, 16 in·lbf)

NOTICE:

Be careful of the holder installation direction.

- (c) Place the plate seal on the brush holder.



- (d) Install the rear end cover with the 3 nuts.

Torque: 4.6 N·m (47 kgf·cm, 41 in·lbf)