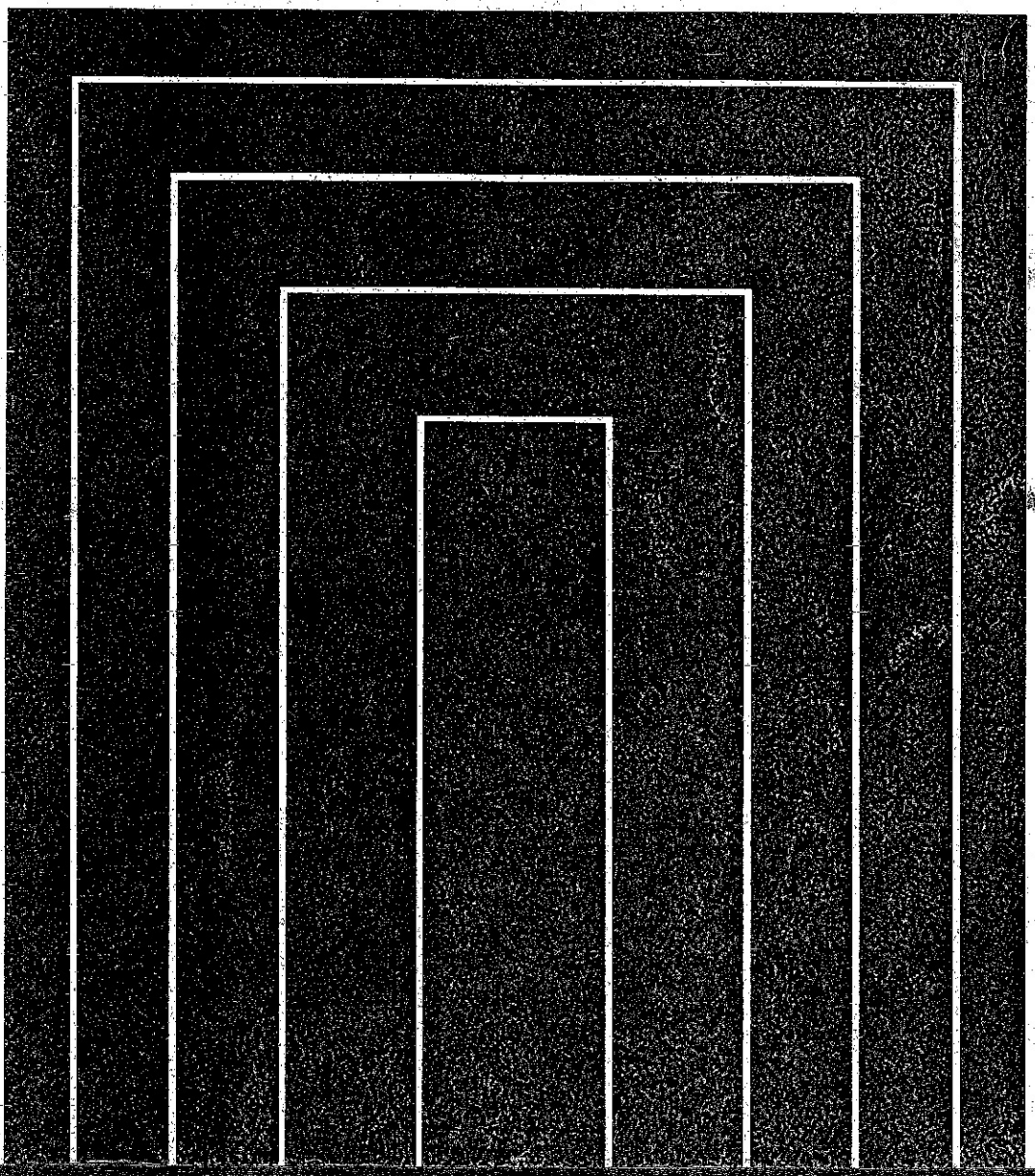
TOYOTA

1E,2E,2E-C ENGINE

REPAIR MANUAL

Oct.,1984



Pub.No.36259

TOYOTA 1E, 2E, 2E-C ENGINE REPAIR MANUAL

FOREWORD

This repair manual has been prepared to provide information covering general service repairs for the 1E, 2E and 2E-C engines equipped on the TOYOTA STARLET and COROLLA.

Applicable models:
EP70, 71 series
EE80 series

All information contained in this manual is the most up-to-date at the time of publication. However specifications and procedures are subject to change without notice.

TOYOTA MOTOR CORPORATION

INTRODUCTION

HOW TO USE THIS MANUAL

To assist in finding your way through this manual, the Section Title and major heading are given at the top of every page.

An **INDEX** is provided on the 1st page of each section to guide you to the item to be repaired.

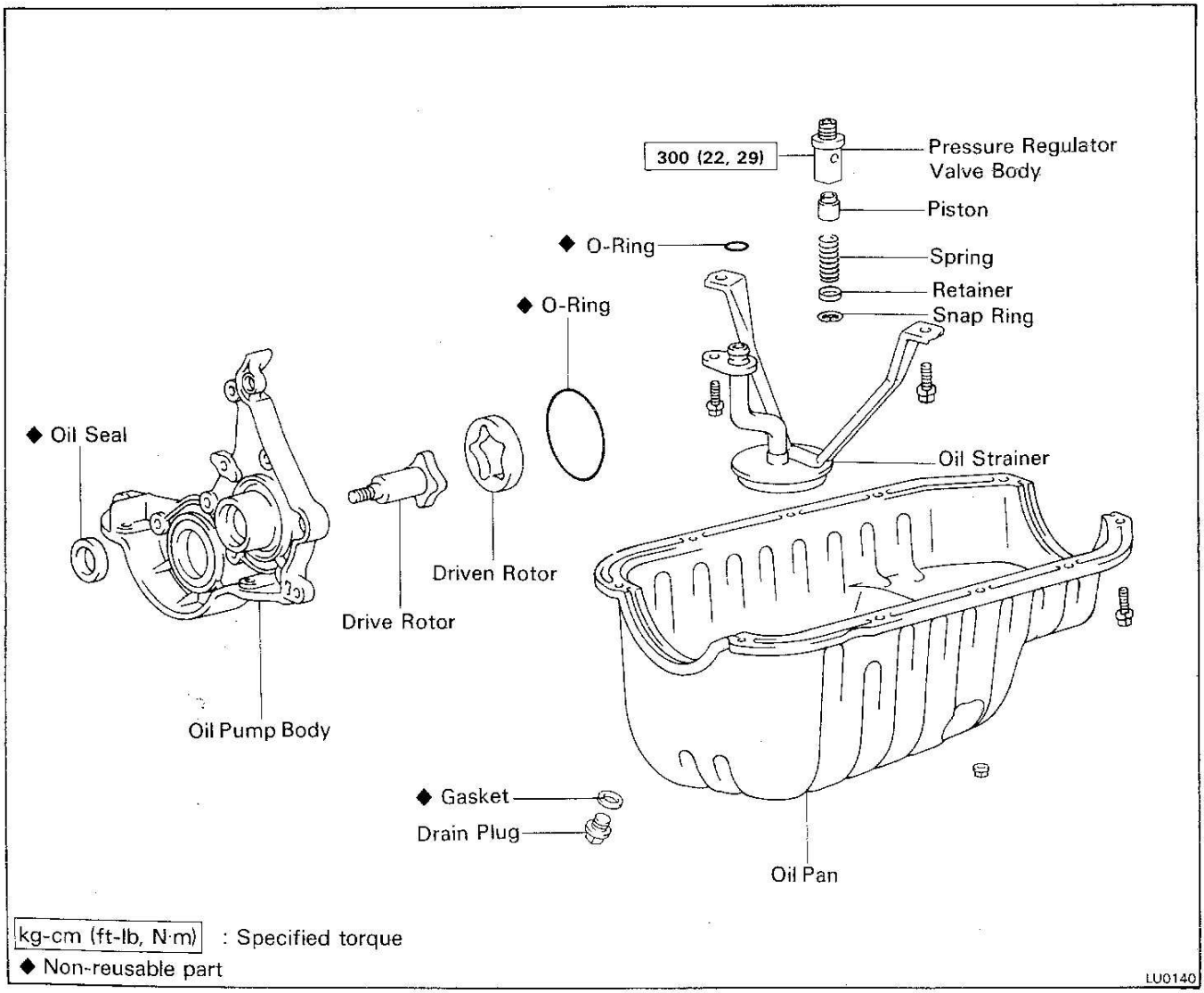
At the beginning of each section, **PRECAUTIONS** are given that pertain to *all* repair operations contained in that section. *Read these precautions before starting any repair task.*

TROUBLESHOOTING tables are included for each system to help you diagnose the system problem and find the cause. The repair for each possible cause is referenced in the remedy column to quickly lead you to the solution.

REPAIR PROCEDURES

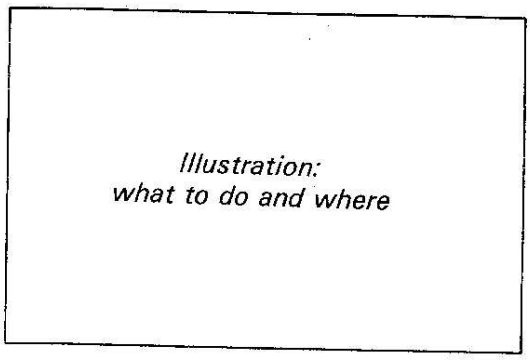
Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.

Example:



The procedures are presented in a step-by-step format:

- The illustration shows *what* to do and *where* to do it.
- The task heading tells *what* to do.
- The detailed text tells *how* to perform the task and gives other information, such as specifications and warnings.



Example:

Task heading: what to do

INSTALL FLYWHEEL

Install the flywheel on the crankshaft with six bolts. Torque the bolts.

Detail text: how to do it

Torque: 750 kg-cm (54 ft-lb, 74 N·m)

Specification

This format enables the experienced technician to have a FAST TRACK. He can read the task headings and refer to the detailed text only when he needs it. Important specifications and warnings always stand out in bold type.

REFERENCES

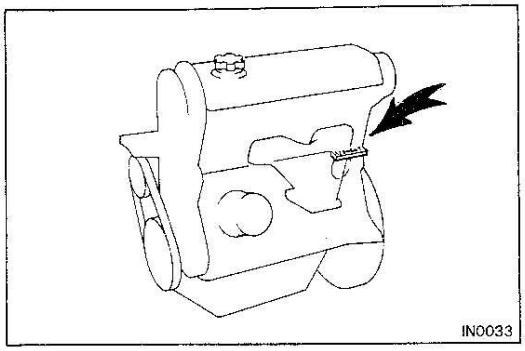
References have been kept to a minimum. However, when they are required you are given the *page* to go to.

SPECIFICATIONS

Specifications are presented in bold type throughout the text in the applicable step. You never have to leave the procedure to look up your specs. All specifications are also found in Appendix A, Specifications, for quick reference.

WARNINGS, CAUTIONS, NOTES:

- WARNINGS are presented in bold type and indicate there is a possibility of injury to you or other people.
- CAUTIONS are also presented in bold type, and indicate there is a possibility of damage to the components being repaired.
- NOTES are separated from the text but do not appear in bold type. They provide additional information to help you perform the repair.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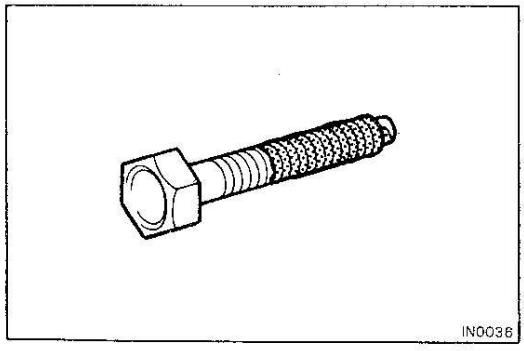
IDENTIFICATION INFORMATION

ENGINE SERIAL NUMBER

The engine serial number is stamped on the left side of the cylinder block.

GENERAL REPAIR INSTRUCTIONS

1. Use fender, seat and floor covers to keep the vehicle clean and prevent damage.
2. During disassembly, keep parts in order to facilitate reassembly.
3. Observe the following:
   (a) Before performing electrical work, disconnect the cable from the battery terminal.
   (b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative (−) terminal which is grounded to the vehicle body.
   (c) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable straight up without twisting or prying it.
   (d) Clean the battery terminal posts and cable terminals with a shop rag. Do not scrape them with a file or such.
   (e) Install the cable terminal to the battery post with the nut loose, and tighten the nut after installation. Do not use a hammer or such to tap the terminal onto the post.
   (f) Be sure the cover for the positive (+) terminal is properly in place.
4. Check hose and wiring connectors to make sure that they are secure and correct.
5. Non-reusable parts
   (a) Always replace cotter pins, gaskets, O-rings and oil seals etc. with new ones.
   (b) Parts which cannot be reused are indicated by the "◆" symbol.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6. Precoated Parts

   Precoated parts are the bolts, nuts, etc., which are coated with a seal lock adhesive at the factory.
   (a) If a precoated part is retightened loosened or moved in any way, it must be recoated with the specified adhesive.

(b) Recoating of Precoated Parts

(1) Clean off the old adhesive from the part's threads.

(2) Dry with compressed air.

(3) Apply the specified seal lock adhesive to the part's threads.

(c) Precoated parts are indicated in the component illustrations by the "★" symbol.

7. When necessary, use a sealer on gaskets to prevent leaks.

8. Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.

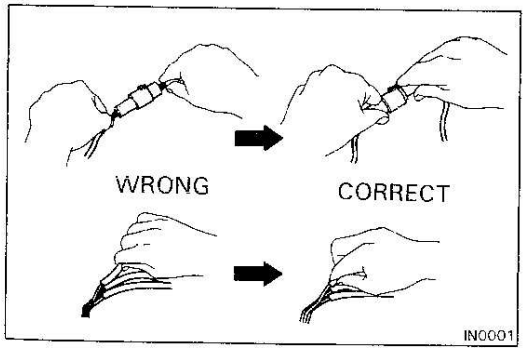
9. Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found at the back of this manual.

10. When replacing fuses, be sure the new fuse is of the correct amperage. DO NOT exceed the fuse amp rating or use one of a lower rating.

Care must be taken when jacking up and supporting the vehicle. Lift and support the vehicle only at the proper locations.

(a) If the vehicle is to be jacked up at the front or rear end only, be sure to block the wheels in order to ensure safety.

(b) After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on the vehicle raised on one jack alone, even for a small job that can be finished quickly.



11. Observe the following precautions to avoid damage to parts:

(a) To disconnect vacuum hoses, pull on the end, not the middle of the hose.

(b) To pull apart electrical connectors, pull on the connector itself, not the wires.

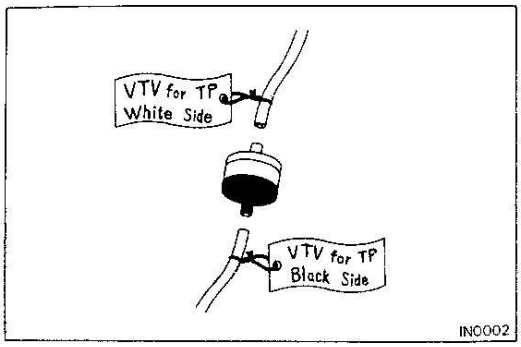
(c) Be careful not to drop electrical components, such as sensors or relays. If they are dropped on a hard floor, they should be replaced and not reused.

(d) When steam cleaning an engine, protect the distributor, coil, air filter, and VCV from water.

(e) Never use an impact wrench to remove or install thermo switches or thermo sensors.

(f) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.

(g) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step-down adapter instead.



12. Tag hoses before disconnecting them:
    (a) When disconnecting vacuum hoses, use tags to identify how they should be reconnected.
    (b) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.

ABBREVIATIONS USED IN THIS MANUAL

A/C	Air Conditioner
A/T	Automatic Transmission
BTDC	Before Top Dead Center
BVSV	Bimetal Vacuum Switching Valve
DP	Dash Pot
EC	European Country
EGR	Exhaust Gas Recirculation
EX	Exhaust
Ex.	Except
FIPG	Formed in Place Gasket
HAI	Hot Air Intake
HIC	Hot Idle Compensation
IIA	Integrated Ignition Assembly
IN	Intake
K TYPE CARBURETOR	Conventional (Two barrel) Type Carburetor
LLC	Long Life Coolant
MP	Multipurpose
M/T	Manual Transmission
O/S	Oversize
PCV	Positive Crankcase Ventilation
RON	Research Octane Number
SSM	Special Service Materials
SST	Special Service Tools
STD	Standard
TDC	Top Dead Center
U/S	Undersize
VCV	Vacuum Control Valve
V TYPE CARBURETOR	Variable Venturi Type Carburetor
w/	With
w/o	Without

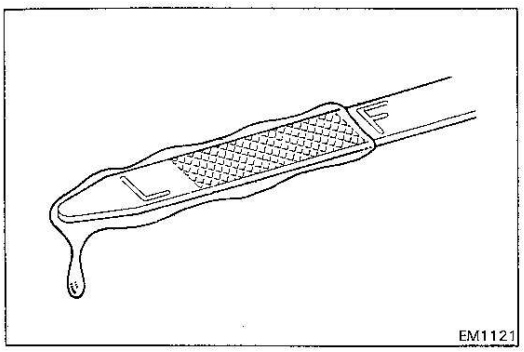
ENGINE MECHANICAL

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine overheats	Cooling system faulty	Troubleshoot cooling system	CO-2
	Incorrect ignition timing	Reset timing	EM-6
Engine will not crank or cranks slowly	Starting system faulty	Troubleshoot starting system	ST-2
Engine will not start/ hard to start (cranks ok)	No fuel supply to carburetor	Check fuel line	
	Carburetor problems	Troubleshoot fuel system	FU-2, 3
	Ignition problems	Troubleshoot ignition system	IG-2
	Vacuum leaks	Repair as necessary	
	• HIC line		
	• PCV line		
	• Intake manifold		
	Compression low	Check compression	EM-15
Rough idle or stalls	Vacuum leaks	Repair as necessary	
	• HIC line		
	• PCV line		
	• Intake manifold		
	Ignition problems	Troubleshoot ignition system	IG-2
	Carburetor problems	Troubleshoot fuel system	FU-2, 3
	HAI system faulty	Check HAI system	
	Engine overheats	Troubleshoot cooling system	CO-2
	Compression low	Check compression	EM-15
Engine hesitates/ poor acceleration	Ignition problems	Troubleshoot ignition system	IG-2
	Vacuum leaks	Repair as necessary	
	• HIC line		
	• PCV line		
	• Intake manifold		
	• Carburetor hoses		
	Air cleaner clogged	Check air filter	EM-4
	Fuel line clogged	Check fuel line	
	Carburetor problems	Troubleshoot fuel system	FU-2, 3
	Emission control system problem		
	• HAI system always on (hot engine)	Check HAI system	
	Engine overheats	Troubleshoot cooling system	CO-2
	Compression low	Check compression	EM-15

TROUBLESHOOTING (Cont'd)

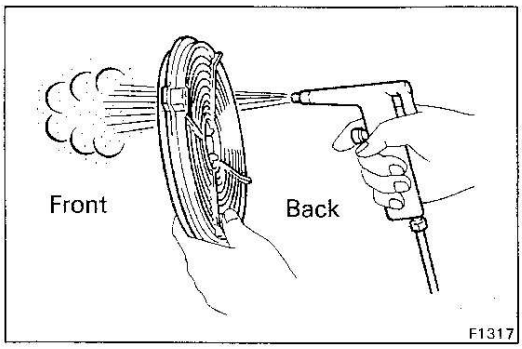
Problem	Possible cause	Remedy	Page
Engine dieseling (runs after ignition switch is turned off)	Carburetor problems	Troubleshoot fuel system	FU-2, 3
	Incorrect ignition timing	Reset timing	EM-6
Muffler explosion (after fire) on deceleration only	DP system faulty	Check DP system	EM-13
	Deceleration fuel cut system always off	Check fuel cut system	
Muffler explosion (after fire) all the time	Air cleaner clogged	Check air filter	EM-4
	Choke system faulty (K type carburetor only)	Check choke system	
	Incorrect ignition timing	Reset timing	EM-6
Engine backfires	Choke valve open (cold engine) (K type carburetor only)	Check choke system	
	Carburetor vacuum leak	Check hoses and repair as necessary	
	Insufficient fuel flow	Troubleshoot fuel system	FU-2, 3
	Incorrect ignition timing	Reset timing	EM-6
Excessive oil consumption	Oil leak	Repair as necessary	
	PCV line clogged	Check PCV system	
	Piston ring worn or damaged	Check rings	
	Valve stem worn	Check valves and guides	EM-32
	Valve stem oil seal worn or damaged	Check oil seal	
Poor fuel mileage	Fuel leak	Repair as necessary	
	Air cleaner clogged	Check air filter	EM-4
	Ignition problems	Troubleshoot ignition system	IG-2
	Carburetor problems	Troubleshoot fuel system	FU-2, 3
	Compression low	Check compression	EM-15
	Tires improperly inflated	Inflate tires to proper pressure	
	Clutch slips	Troubleshoot clutch	
	Brakes drag	Troubleshoot brakes	



ENGINE TUNE-UP

CHECK OIL LEVEL

The oil level should be between the L and F maks on the level gauge. If low, check for leakage and add oil up to the F mark.

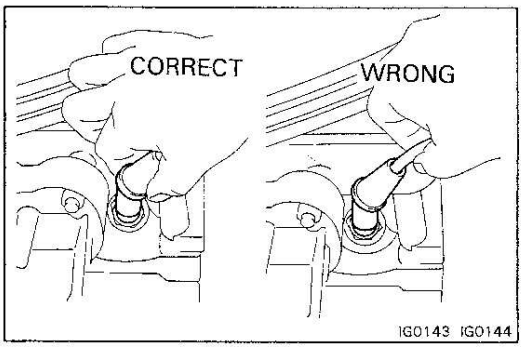


INSPECT AIR FILTER

(a) Visually check that the air cleaner element is not excessively dirty, damaged or oily.

(b) Clean the element with compressed air.

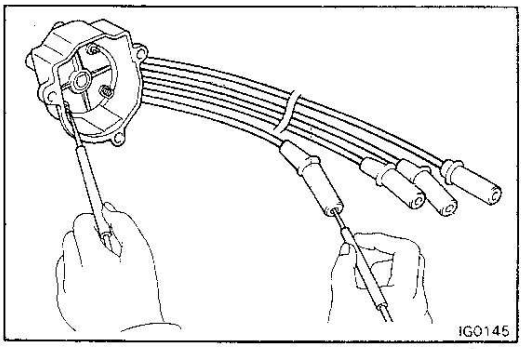
First blow from the back side thoroughly. Then blow off the front side of the element.



INSPECTION OF HIGH TENSION CORD

1. **CAREFULLY REMOVE HIGH TENSION CORD BY RUBBER BOOT FROM SPARK PLUGS**

CAUTION: Pulling on or bending the cords may damage the conductor inside.



2. **INSPECT RESISTANCE OF HIGH TENSION CORD WITH DISTRIBUTOR CAP**

Using an ohmmeter, check that the resistance does not exceed the maximum.

Maximum resistance: Less than 25 kΩ/cord

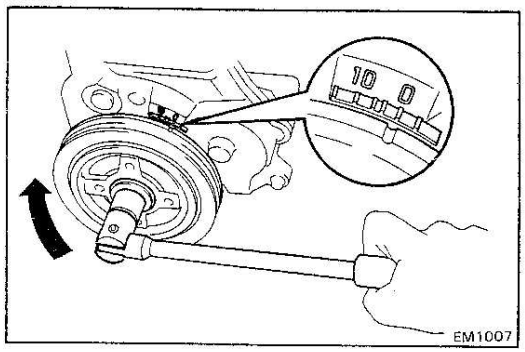
If more than maximum, check the terminals, and replace the high tension cord and/or distributor cap as required.

INSPECTION AND ADJUSTMENT OF VALVE CLEARANCES

NOTE: Inspect and adjust the valve clearance after engine has reached normal operating temperature.

1. **REMOVE AIR CLEANER COVER**

2. **REMOVE CYLINDER HEAD COVER**
(See step 3 on page EM-16)

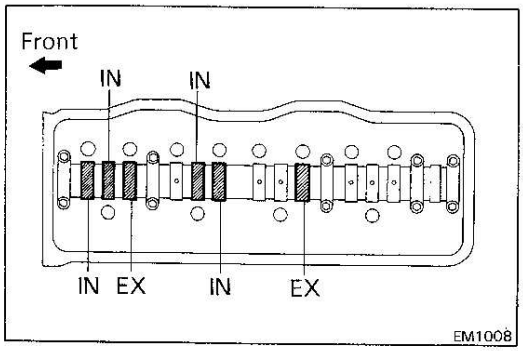


3. **SET NO. 1 CYLINDER TO TDC/COMPRESSION**

(a) Turn the crankshaft pulley and align its groove with the "0" mark on the No. 1 timing belt cover.

(b) Check that the rocker arms on No. 1 cylinder are loose and the rockers on No. 4 are tight.

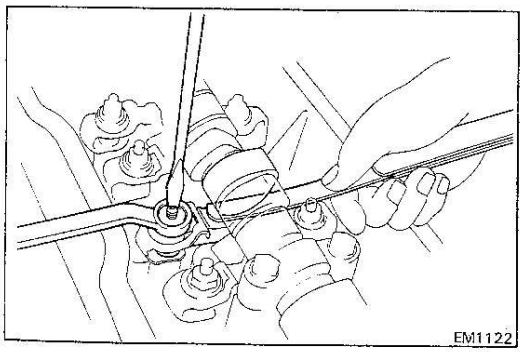
If not, turn the crankshaft one complete revolution and align the marks as above.



4. **INSPECT AND ADJUST VALVE CLEARANCE**

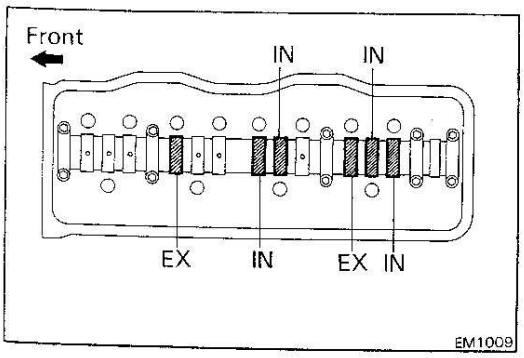
(a) Measure only those valves indicated.

Valve clearance (hot): 0.20 mm (0.008 in.)



(b) Using a feeler gauge, measure the gap between the cam and rocker arm. Loosen the lock nut and turn the adjusting screw to the specified clearance. Hold the adjusting screw in position and tighten the lock nut.

(c) Recheck clearance. The feeler gauge should move with a very slight drag.



(d) Turn the crankshaft one revolution and adjust the other valves.

5. **INSTALL CYLINDER HEAD COVER**
(See step 10 on page EM-24)

6. **INSTALL AIR CLEANER COVER**

Spark plug

	ND	NGK
1E (EC)	W20EXR-U	BPR6EY
2E (EC)	W20EXR-U11	BPR6EY11
Others	W20EX-U	BP6EY

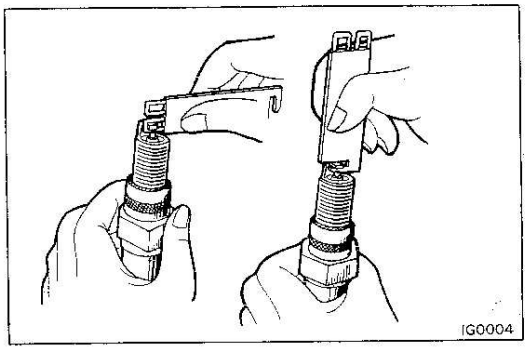
INSPECTION OF SPARK PLUG

1. CLEAN AND INSPECT SPARK PLUGS

(a) Clean the spark plugs with a spark plug cleaner or wire brush.

(b) Inspect the spark plugs for electrode wear, thread damage and insulator damage.

If a problem is found, replace the plugs.

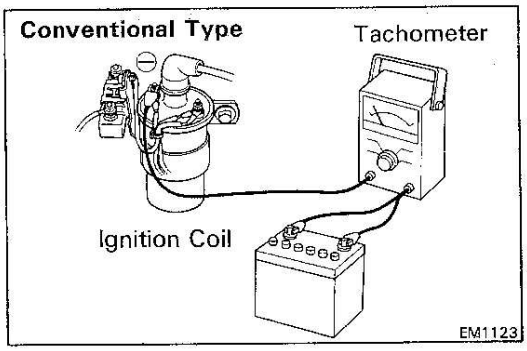


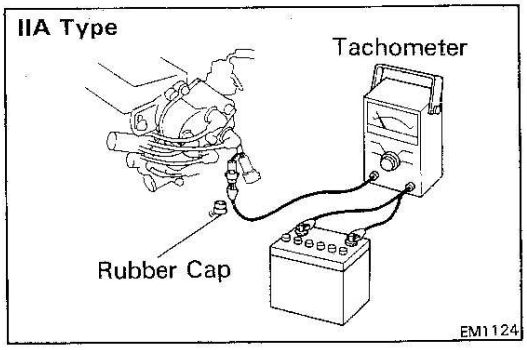
2. ADJUST ELECTRODE GAP

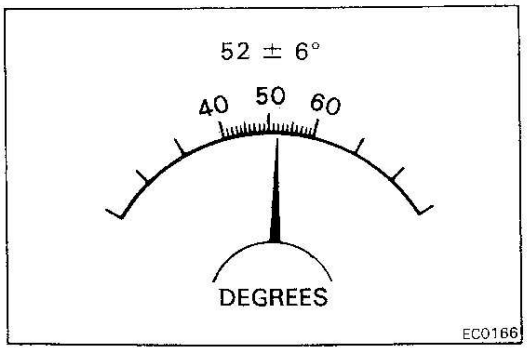
Carefully bend the outer electrode to obtain the correct electrode gap.

Electrode gap:

W20EXR-U	**BPR6EY**	**0.8 mm (0.031 in.)**
W20EX-U	**BP6EY**	**0.8 mm (0.031 in.)**
W20EXR-U11	**BPR6EY11**	**1.1 mm (0.043 in.)**







INSPECTION AND ADJUSTMENT OF IGNITION TIMING

1. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE

(Conventional Type):

Connect the tachometer positive (+) terminal to the ignition coil negative (−) terminal.

(IIA Type):

Remove the rubber cap and connect the test probe of a tester to the service connector at the distributor.

CAUTION:

- **NEVER allow the ignition coil terminals to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, it is recommended that you consult with the manufacturer.**

2. WARM UP ENGINE

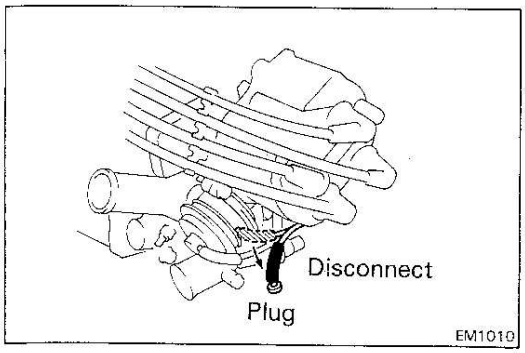
Allow the engine to reach normal operating temperature.

3. CHECK DWELL ANGLE (Conventional Type only)

Dwell angle: 52 ± 6°

(a) With the engine idling make sure the dwell angle is within the specified range.

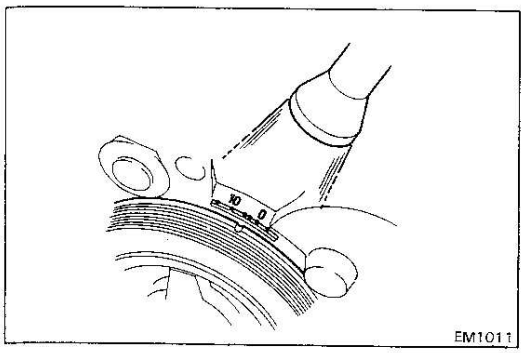
(b) If angle is too large, set the rubbing block gap closer. If too small, increase the gap.



4. CHECK IGNITION TIMING

(EC)

(a) Disconnect the vacuum hose from the distributor sub-diaphragm and plug the hose end.

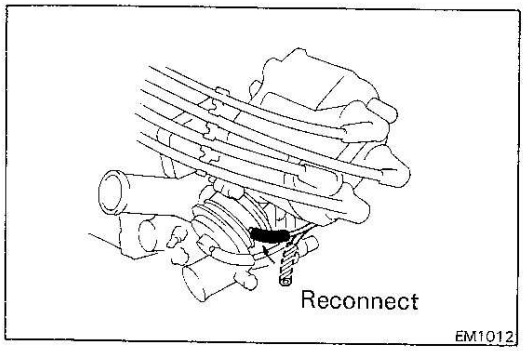


(b) With the engine idling as specified, use a timing light to check the timing.

Ignition timing: 5° BTDC @ Max. 950 rpm

(c) If necessary, loosen the distributor bolts and turn the distributor to align the marks. Recheck the timing after tightening the distributor.

Torque: 175 kg-cm (13 ft-lb, 17 N·m)

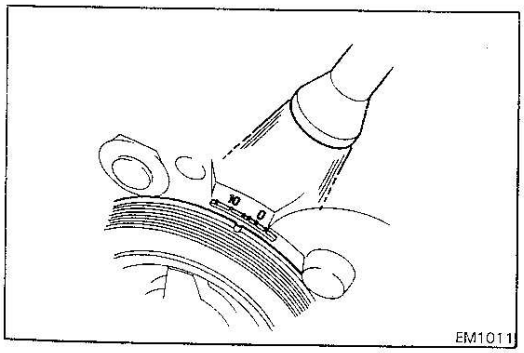


(d) Reconnect the vacuum hose to the distributor.

(e) Check the ignition timing.

Ignition timing: 12 – 18° BTDC

NOTE: Check the ignition timing with the electric cooling fan off.



(General)

(a) With the engine idling as specified, use a timing light to check the timing.

Ignition timing: 5° BTDC (85 RON version)
10° BTDC (90 RON version)

Refer to the information label under the engine hood.

NOTE: Check the ignition timing with the electric cooling fan off.

(b) If necessary, loosen the distributor bolt and turn the distributor to align the marks. Recheck the timing after tightening the distributor.

Torque: 175 kg-cm (13 ft-lb, 17 N·m)

CHECK AND ADJUSTMENT OF IDLE SPEED AND IDLE MIXTURE

NOTE: Check and adjust the idle speed and idle mixture with the electric cooling fan off.

1. CONNECT TACHOMETER TO ENGINE

2. WARM UP ENGINE

Allow the engine to reach normal operating temperature.

3. CHECK IDLE SPEED

Idle speed: M/T 800 rpm
A/T 850 rpm

If not as specified, adjust according to the following procedure:

CAUTION:

- **Always use a CO meter when adjusting the idle mixture. It is not necessary to adjust with the idle mixture adjusting screw in most vehicles if they are in good condition.**
- **If a CO meter is not available and it is absolutely necessary to adjust with the idle mixture adjusting screw, use the alternative method (See page EM-10).**

A. METHOD WITH CO METER

1. VISUALLY INSPECT CARBURETOR

(a) Check for loose screws or a loose mounting to the manifold.

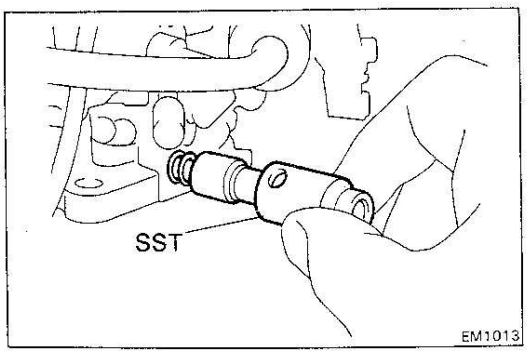
(b) Check for wear in the linkage, missing snap rings or excessive looseness in the throttle shaft. Correct any problems found.

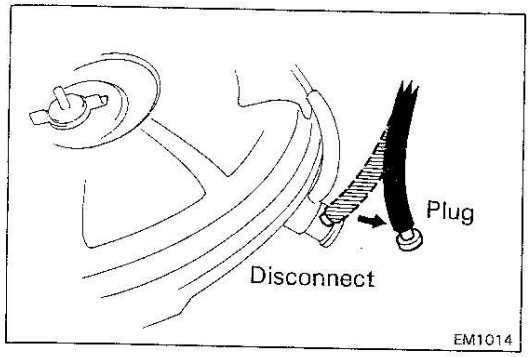
2. INITIAL CONDITIONS

(a) Initial conditions:

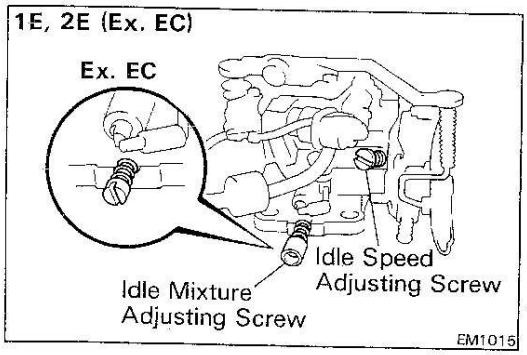
- Air cleaner installed
- Normal operating coolant temperature
- Choke valve fully open (K type carburetor only)
- All accessories switched off
- All vacuum lines connected
- Ignition timing set correctly
- Transmission in N range
- CO meter operates normally
- Use SST if necessary

SST 09243-00020





(b) Disconnect the HIC hose and plug the hose ends.

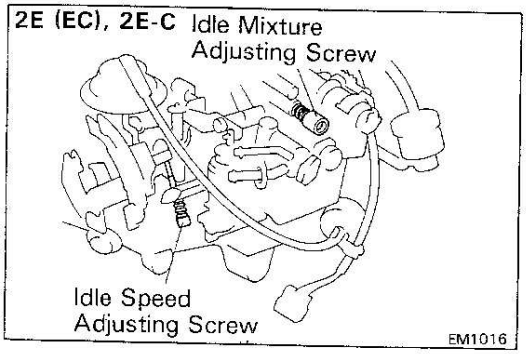


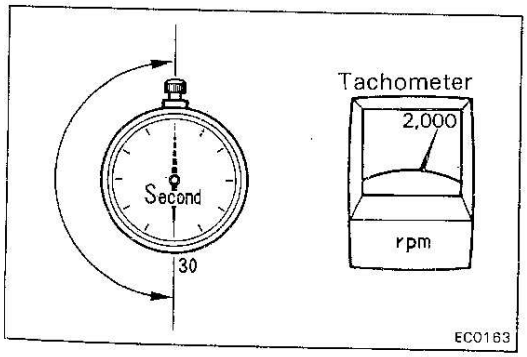
3. ADJUST IDLE SPEED

(a) Start the engine.

(b) Turn the idle speed adjusting screw to obtain the specified speed.

Idle speed: M/T 800 rpm
A/T 850 rpm





4. MEASURE CO CONCENTRATION

(a) Make sure the CO meter is properly calibrated.

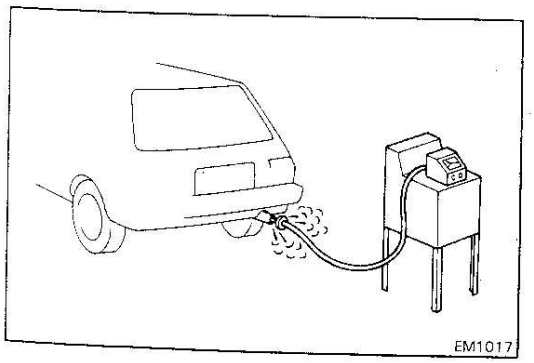
(b) Race the engine for 30 – 60 seconds at about 2,000 rpm before measuring the concentration.

(c) Wait about 3 minutes after racing the engine to allow the concentration to stabilize.

(d) Insert a testing probe at least 40 cm (1.3 ft) into the tailpipe, and measure the concentration with a short time.

Idle CO concentration:
1E, 2E (Ex. EC) 2.0 ± 0.5 %
2E (EC), 2E-C 1.5 ± 0.5 %

- If the CO concentration is within specification, this adjustment is complete.
- If the CO concentration is not within specification, turn the idle mixture adjusting screw to obtain the specified concentration value.
- If the CO concentration cannot be corrected by idle mixture adjustment, refer to the following table for other possible causes.



TROUBLESHOOTING

CO	Problems	Causes
Normal	Rough idle	1. Faulty ignition: ● Incorrect timing ● Fouled, shorted or improperly gapped plugs ● Open or crossed ignition wires ● Cracked distributor cap 2. Incorrect valve clearance 3. Leaky exhaust valves 4. Leaky cylinder
Low	Rough idle Fluctuating HC reading	1. Vacuum leak: ● Vacuum hose ● Intake manifold ● PCV line ● Carburetor base
High	Rough idle Black smoke from exhaust	1. Restricted air filter 2. Plugged PCV valve 3. Faulty carburetion: ● Faulty choke action ● Incorrect float setting ● Leaking needle or seat ● Leaking power valve

5. RECONNECT HIC HOSE

B. ALTERNATIVE METHOD

To be used only if CO meter is not available.

1. VISUALLY INSPECT CARBURETOR

(a) Check for loose screws or a loose mounting to the manifold.

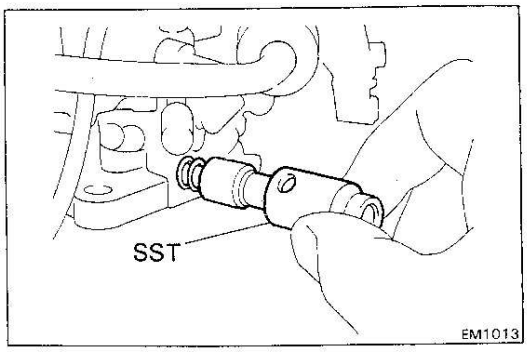
(b) Check for wear in the linkage, missing snap rings or excessive looseness in the throttle shaft. Correct any problems found.

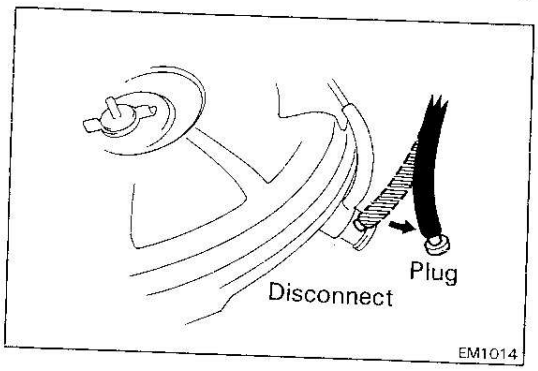
2. INITIAL CONDITIONS

(a) Initial conditions:

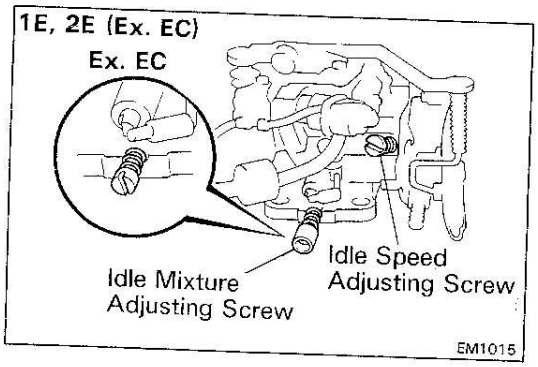
- Air cleaner installed
- Normal operating coolant temperature
- Choke valve fully open (K type carburetor only)
- All accessories switched off
- All vacuum lines connected
- Ignition timing set correctly
- Transmission in N range
- Use SST if necessary.

SST 09243-00020





(b) Disconnect the HIC hose and plug the hose ends.



3. ADJUST IDLE SPEED AND IDLE MIXTURE

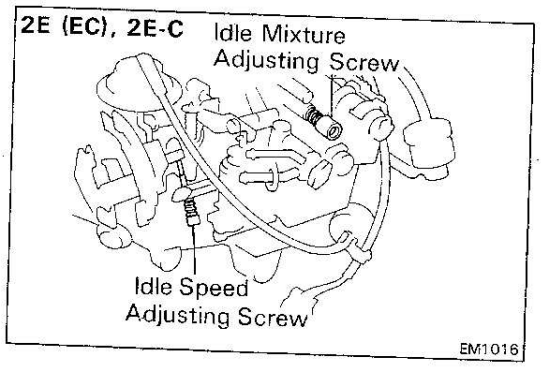
(a) Start the engine.

(b) Set to the maximum speed by turning the IDLE MIXTURE ADJUSTING SCREW.

(c) Set to the idle mixture speed by turning the IDLE SPEED ADJUSTING SCREW.

Idle mixture speed:

1E, 2E (Ex. EC)	M/T	850 rpm
	A/T	900 rpm
2E (EC), 2E-C	M/T	860 rpm
	A/T	910 rpm

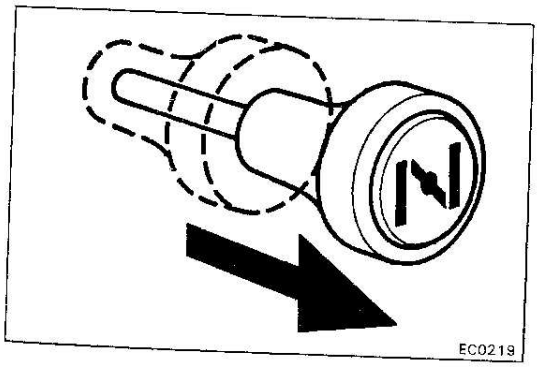


(d) Before moving to the next step, continue adjustments (b) and (c) until the maximum speed will not rise any further no matter how much the IDLE MIXTURE ADJUSTING SCREW is adjusted.

(e) Set to the idle speed by screwing in the IDLE MIXTURE ADJUSTING SCREW.

Idle speed: M/T 800 rpm
A/T 850 rpm

(f) Reconnect the HIC hose.



INSPECTION AND ADJUSTMENT OF FAST IDLE SPEED

1E, 2E (Ex. EC)

1. WARM UP AND STOP ENGINE

2. REMOVE AIR CLEANER

Plug the HIC hose.

3. CONNECT TACHOMETER

4. FULLY PULL OUT CHOKE KNOB

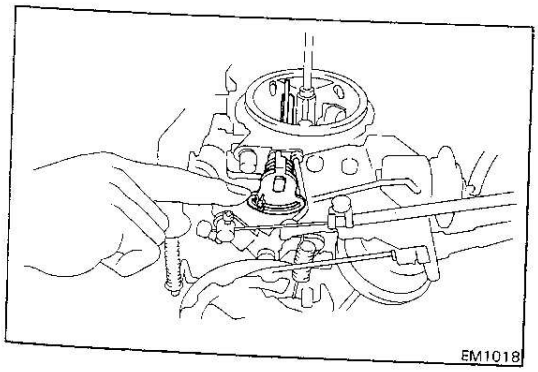
5. INSPECT AND ADJUST FAST IDLE SPEED

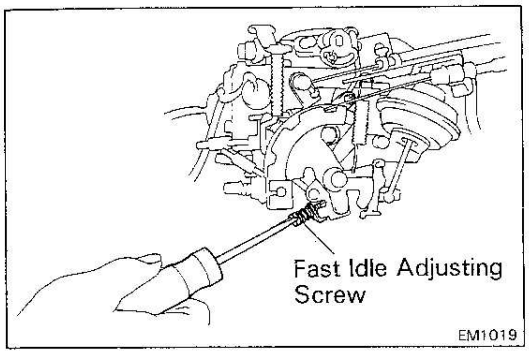
(a) Start the engine.

(b) Fully open the choke valve.

(c) Check the fast idle speed.

Fast idle speed: 1E 4,800 ± 200 rpm
2E 3,400 ± 200 rpm





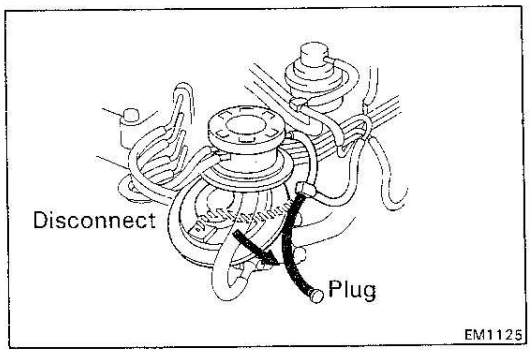
(d) Adjust the fast idle speed by turning the FAST IDLE ADJUSTING SCREW.

(e) Recheck the fast idle speed.

6. INSTALL AIR CLEANER

2E (EC), 2E-C

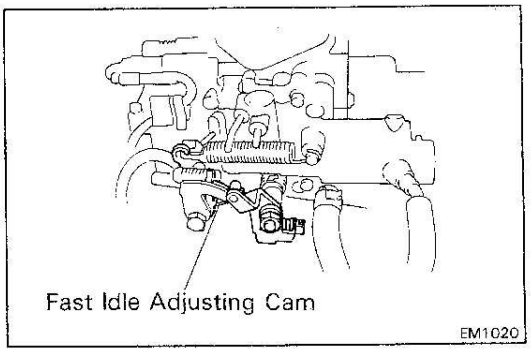
1. WARM UP AND STOP ENGINE



2. CUT OPERATION OF EGR SYSTEM (2E-C only)

Disconnect the vacuum hose from the EGR valve and plug the hose end.

3. CONNECT TACHOMETER



4. INSPECT AND ADJUST FAST IDLE SPEED

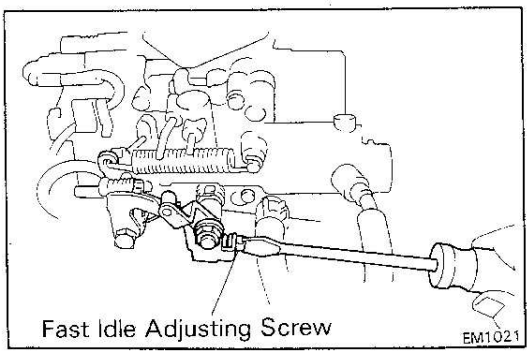
NOTE: Inspect and adjust the fast idle speed with the electric cooling fan off.

(a) Start the engine.

(b) While holding the throttle valve slightly open, set the fast idle adjusting cam, and release the throttle valve.

(c) Check the fast idle speed.

Fast idle speed: 3,600 ± 200 rpm



(d) Adjust the fast idle speed by turning the FAST IDLE ADJUSTING SCREW.

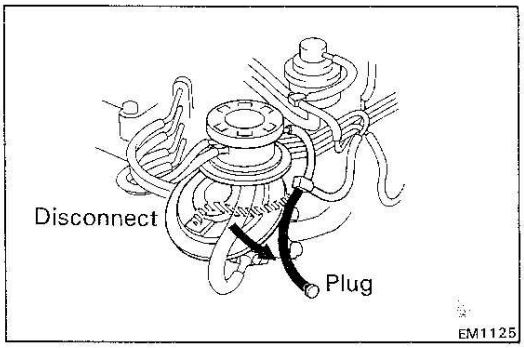
(e) Recheck the fast idle speed.

5. CONNECT EGR SYSTEM (2E-C only)

Connect the vacuum hose to the EGR valve.

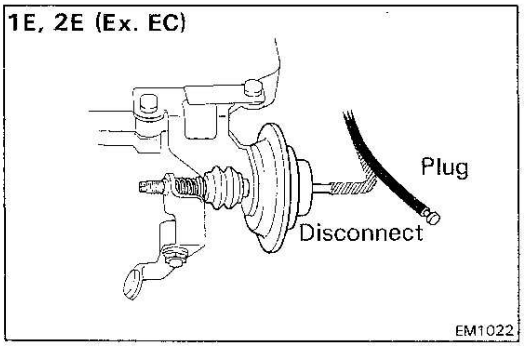
INSPECTION AND ADJUSTMENT OF DASH POT (DP) SYSTEM

1. WARM UP ENGINE
2. CHECK IDLING SPEED AND ADJUST IF NECESSARY
3. CONNECT TACHOMETER



4. CUT OPERATION OF EGR SYSTEM (2E-C only)

Disconnect the vacuum hose from the EGR valve and plug the hose end.

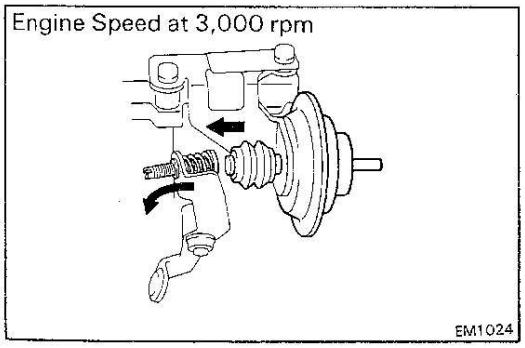


5. INSPECT AND ADJUST DASH POT SETTING SPEED

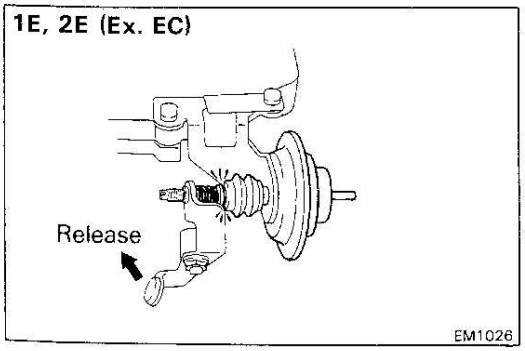
NOTE: Inspect and adjust the dash pot setting speed with the electric cooling fan off.

(1E, 2E (Ex. EC))

(a) Disconnect the vacuum hose from the dash pot and plug the vacuum hose end.



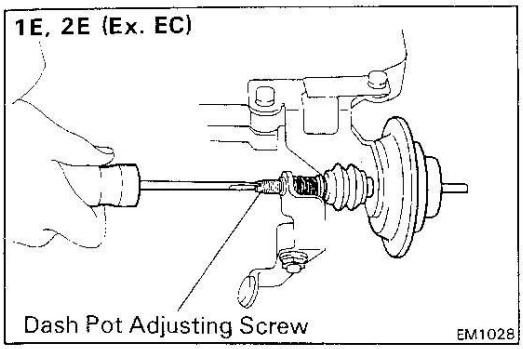
(b) Maintain the engine speed at 3,000 rpm.



(c) Release the throttle valve.

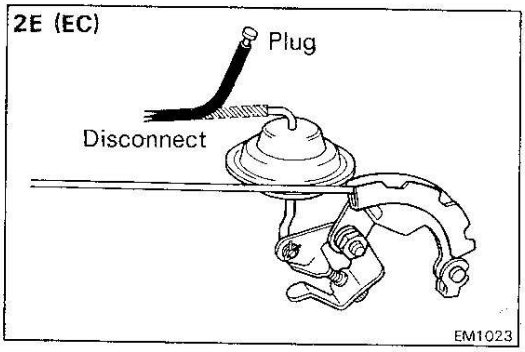
(d) Check the dash pot setting speed.

DP setting speed: 2,000 ± 200 rpm



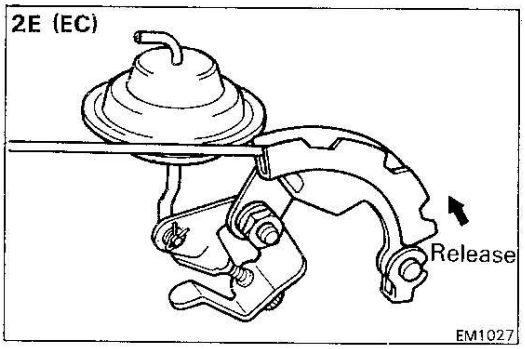
If not at specified speed, adjust with the dash pot adjusting screw.

(e) Reconnect the vacuum hose to the dash pot.

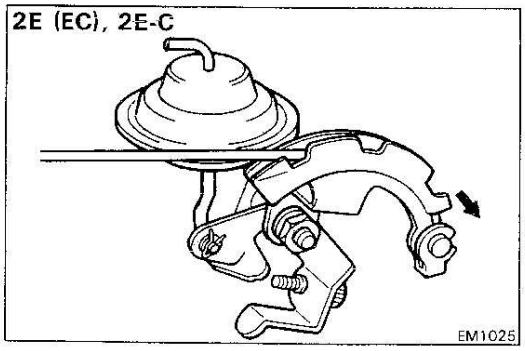


(2E (EC), 2E-C)

(a) Disconnect the vacuum hose from the dash pot and plug the vacuum hose end.



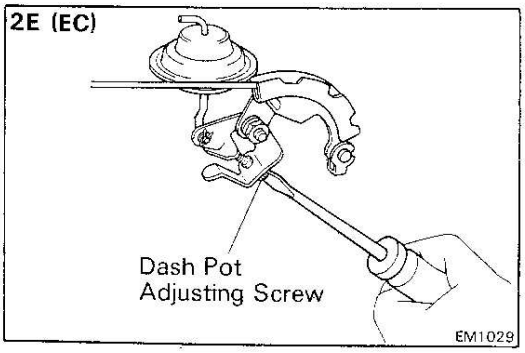
(b) Maintain the engine speed at 3,000 rpm.



(c) Release the throttle valve.

(d) Check the dash pot setting speed.

DP setting speed: 2,000 ± 200 rpm



If not at specified speed, adjust with dash pot adjusting screw.

(e) Reconnect the vacuum hose to the dash pot.

6. CONNECT EGR SYSTEM (2E-C only)

Connect the vacuum hose to the EGR valve.

COMPRESSION CHECK

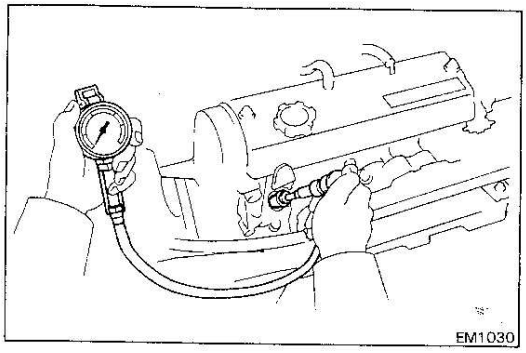
NOTE: If there is lack of power, excessive oil consumption or poor fuel milage after engine tune up, measure the cylinder compression pressure.

1. **WARM UP ENGINE**

2. **REMOVE FOUR SPARK PLUGS**

3. **DISCONNECT DISTRIBUTOR CONNECTOR**

4. **MEASURE CYLINDER COMPRESSION PRESSURE**


EM1030

(a) Insert a compression gauge into the spark plug hole.

(b) Fully open the throttle.

(c) While cranking the engine, measure the compression pressure.

NOTE: Always use a fully charged battery to insure that at least 250 rpm can be attained.

(d) Repeat steps (a) through (c) for each cylinder.

Compression pressure:

2E (EC), 2E-C	**13.0 kg/cm² (184 psi, 1270 kPa)**
Others	**12.0 kg/cm² (171 psi, 1180 kPa)**

Minimum pressure:

10.0 kg/cm² (142 psi, 981 kPa)

Difference between each cylinder:

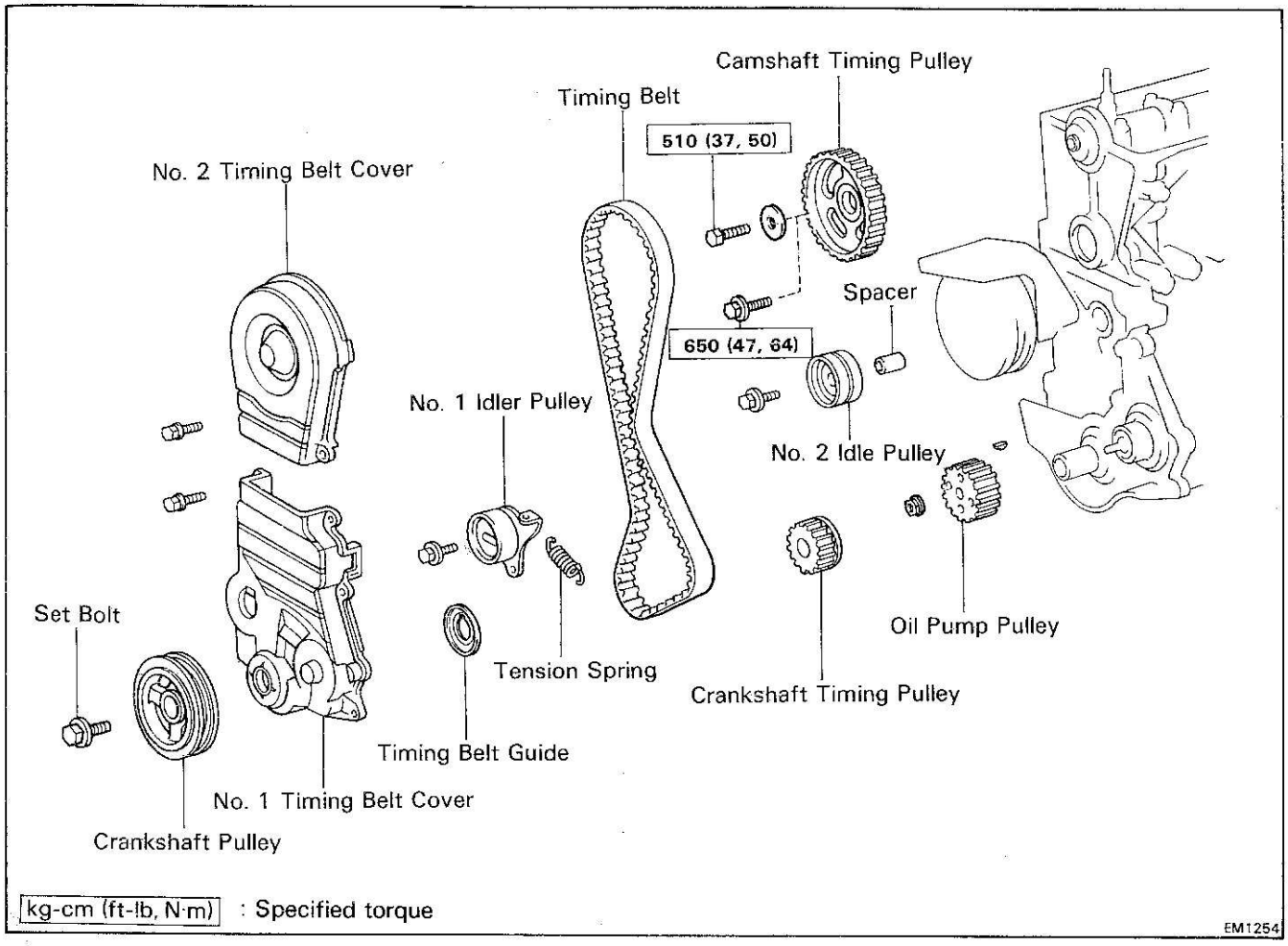
Less than 1.0 kg/cm² (14 psi, 98 kPa)

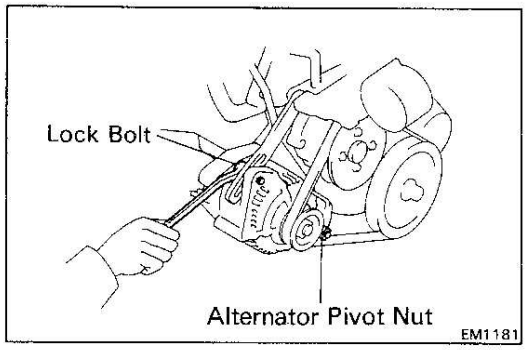
(e) If compression of one or more cylinder is low, pour a small amount of engine oil into that cylinder through the spark plug hole and repeat steps (a) through (c) for the cylinder with low compression.

- If adding oil helps the compression, chances are that the piston rings and/or cylinder bore are worn or damaged.
- If pressure remains low, a valve may be sticking or seated improperly, or there may be leakage past the gasket surface.

TIMING BELT

COMPONENTS



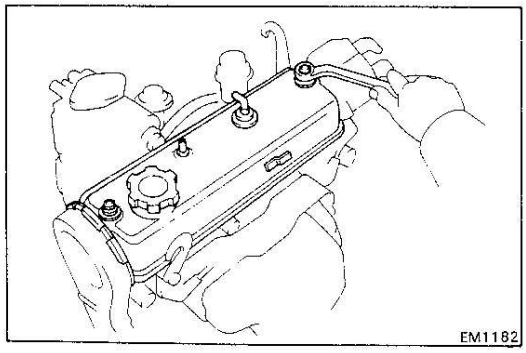


REMOVAL OF TIMING BELT

1. IF VEHICLE HAS AIR CONDITIONING, REMOVE DRIVE BELT

2. REMOVE ALTERNATOR DRIVE BELT

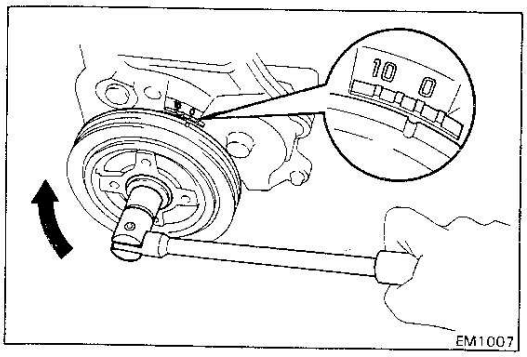
Loosen the alternator pivot nut, lock bolt and remove the alternator drive belt.



3. REMOVE CYLINDER HEAD COVER

(a) Disconnect the PCV hose from PCV valve.

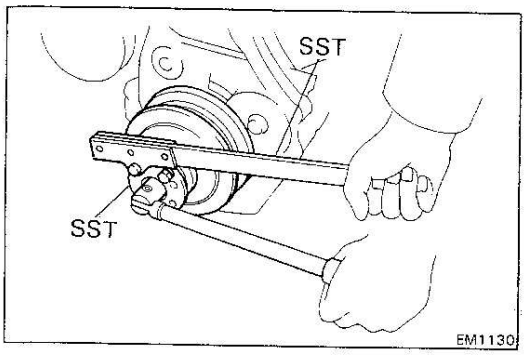
(b) Remove the two nuts and cylinder head cover with gasket.



4. SET NO. 1 CYLINDER TO TDC/COMPRESSION

Turn the crankshaft pulley and align its groove with the "0" mark on the No. 1 timing belt cover.

NOTE: Check that the rocker arms on the No. 1 cylinder are loose. If not, turn the crankshaft pulley one complete revolution.



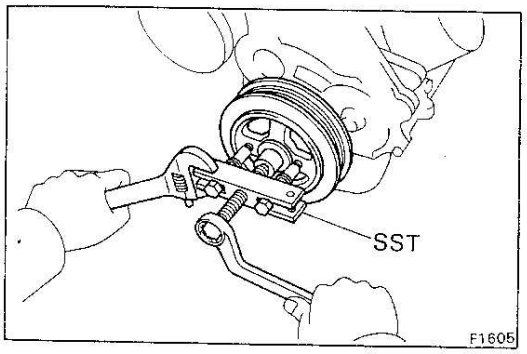
5. REMOVE CRANKSHAFT PULLEY

(a) Install the SST to the crankshaft pulley.

SST 09213-14010

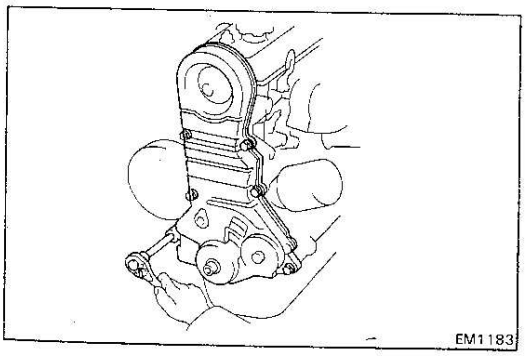
(b) Using SST to hold the crankshaft pulley, remove the pulley bolt.

SST 09330-00020



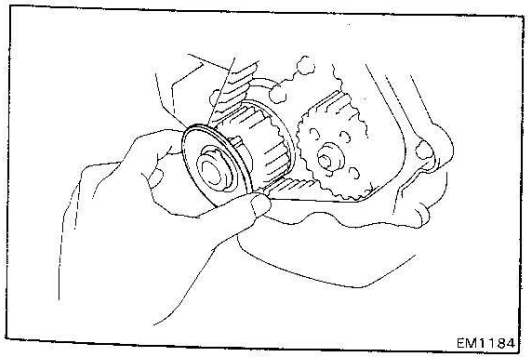
(c) Using SST, remove the pulley.

SST 09213-31021

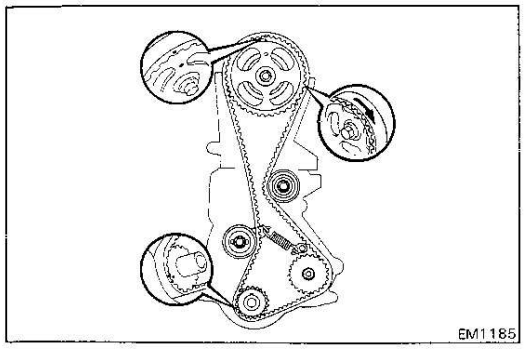


6. REMOVE TIMING BELT COVERS

Remove the six bolts and the No. 1 and No. 2 timing belt covers.



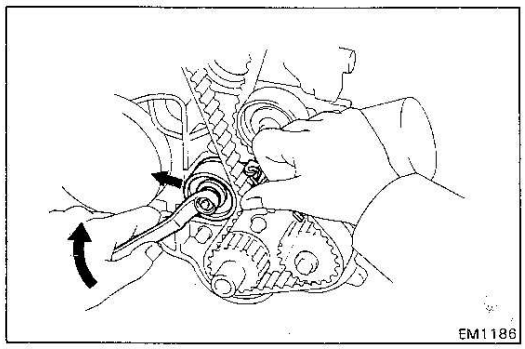
7. REMOVE TIMING BELT GUIDE



8. REMOVE TIMING BELT AND NO. 1 IDLER PULLEY

CAUTION: Do NOT turn the camshaft or crankshaft while the timing belt is removed as this will desynchronize the timing of the piston head with the subintake valve.

NOTE: If reusing the timing belt, draw a direction arrow on the belt (in direction of engine revolution), and place matchmarks on the pulleys and belt as shown in the figure.

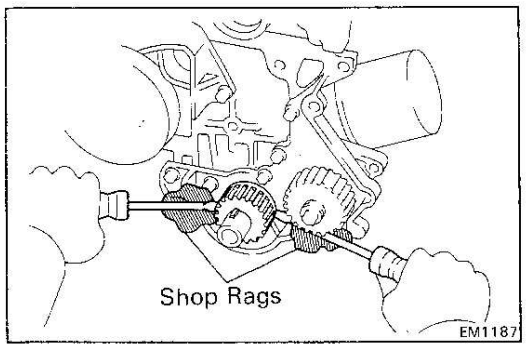


(a) Loosen the idler pulley bolt and push it left as far as it will go and then temporarily tighten it.

(b) Remove the belt.

(c) Remove the idler pulley bolt, pulley and tension spring.

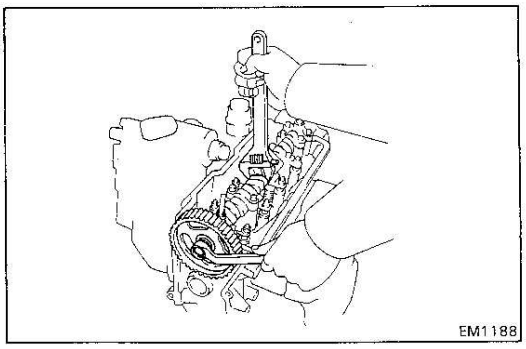
9. REMOVE NO. 2 IDLER PULLEY



10. REMOVE CRANKSHAFT TIMING PULLEY

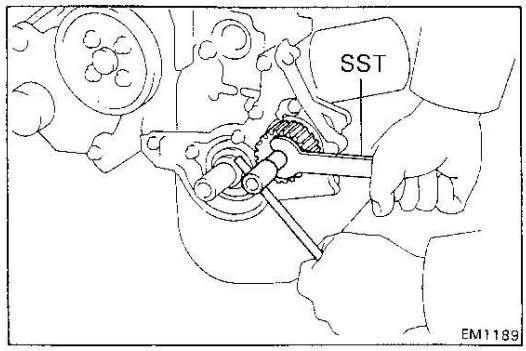
If the timing pulley cannot be removed by hand, use two screwdrivers.

NOTE: Position shop rags as shown to prevent damage.



11. REMOVE CAMSHAFT TIMING PULLEY

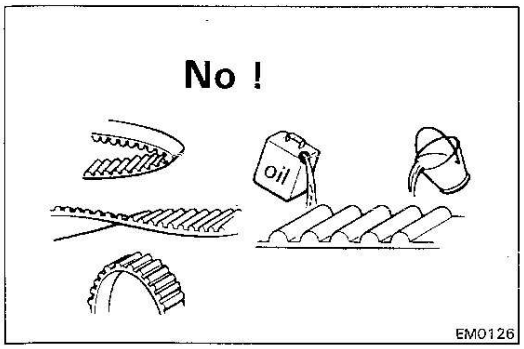
Hold the camshaft with the wrench, and remove the pulley set bolt and timing pulley.



12. REMOVE OIL PUMP PULLEY

Using SST to hold the pulley, remove the pulley nut and pulley.

SST 09612-24012

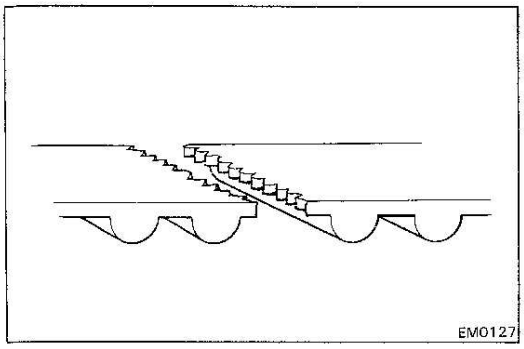


INSPECTION OF COMPONENTS

1. INSPECT TIMING BELT

CAUTION:

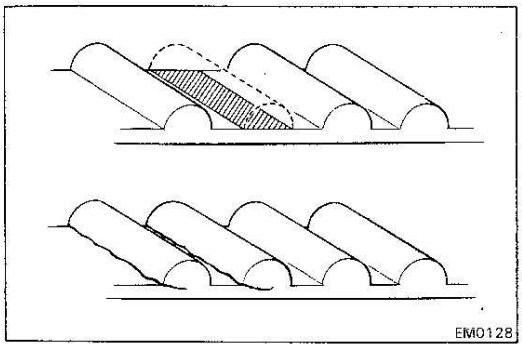
- **Do not bend, twist or turn the belt inside out.**
- **Do not allow the belt to come into contact with oil, water or steam.**
- **Do not utilize belt tension when installing or removing the set bolt of the camshaft timing pulley.**



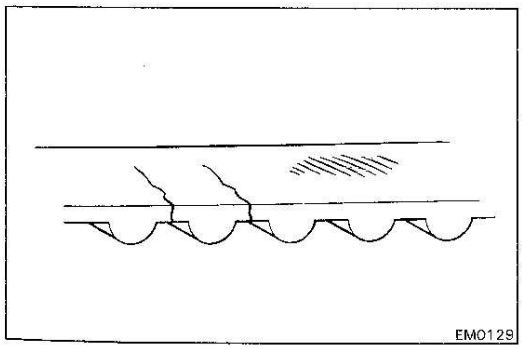
If there are defects as shown in the figures, check the following points and replace the timing belt if necessary.

(a) Premature severance

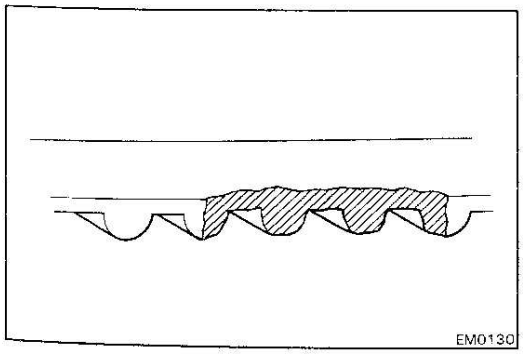
- Check for proper installation.



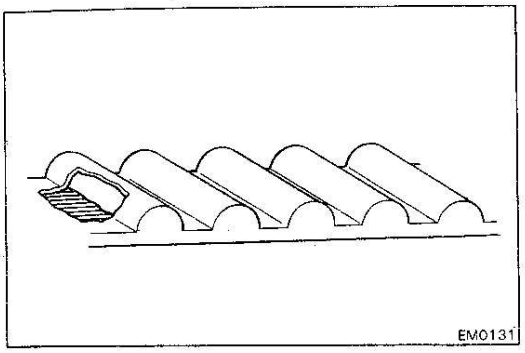
(b) If the belt teeth are cracked or damaged, check to see if the camshaft or oil pump is locked.



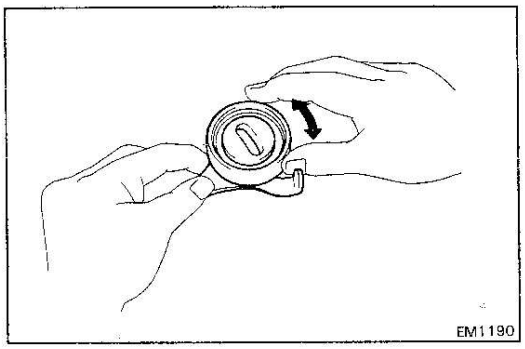
(c) If there is noticeable wear or cracks on the belt face, check to see if there are nicks on one side of the idler pulley lock.



(d) If there is wear or damage on only one side of the belt, check the belt guide and the alignment of each pulley.



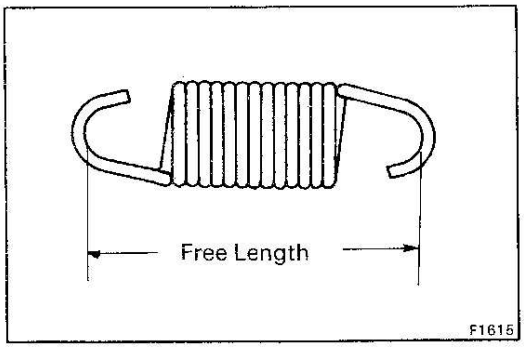
(e) If there is noticeable wear on the belt teeth, check the timing cover for damage. Check for foreign materials on the pulley teeth.



2. INSPECT NO. 1 IDLER PULLEY

Check the turning smoothness of the timing belt idler pulleys.

If necessary, replace the idler pulley.



3. INSPECT TENSION SPRING

(a) Check the free length of the spring.

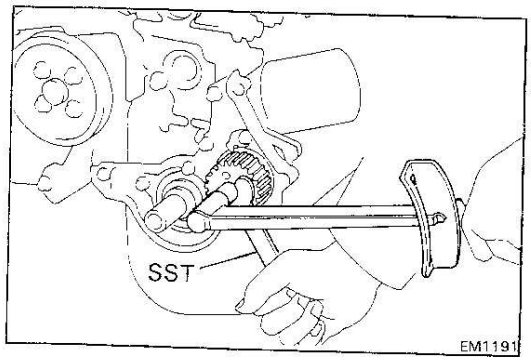
Free length: 38.4 mm (1.512 in.)

(b) Check the tension of the spring at the specified installed length.

Installed tension:

1E 4.71 kg (10.4 lb, 46 N) at 50.2 mm (1.976 in.)
2E 5.11 kg (11.3 lb, 50 N) at 51.5 mm (2.028 in.)

If not specified, replace the spring.



INSTALLATION OF TIMING BELT

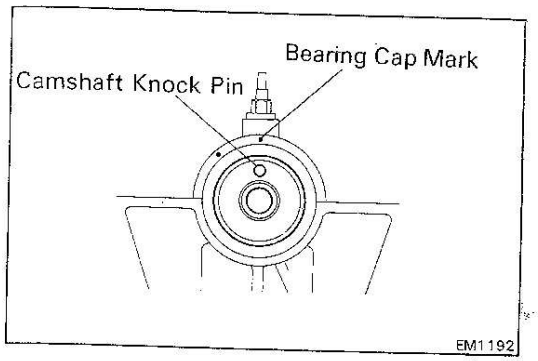
(See page EM-16)

1. INSTALL OIL PUMP PULLEY

Using SST to hold the pulley, tighten the nut.

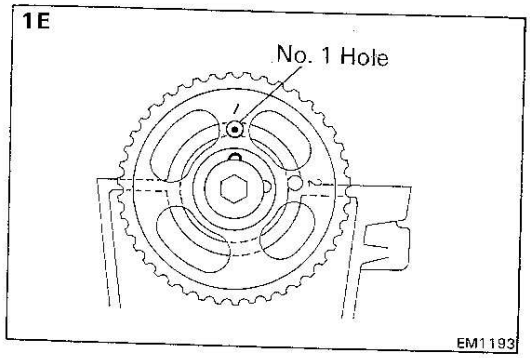
SST 09612-24012

Torque: 270 kg-cm (20 ft-lb, 26 N·m)



2. INSTALL CAMSHAFT TIMING PULLEY

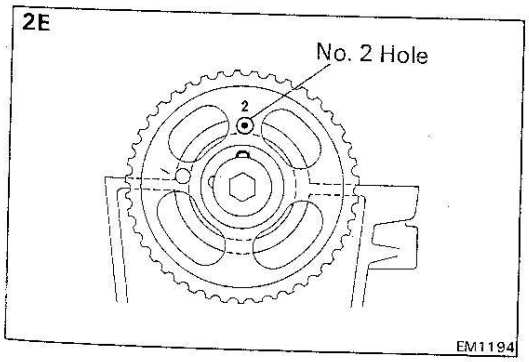
(a) Align the camshaft knock pin with the No. 1 camshaft bearing cap mark as shown in the figure.

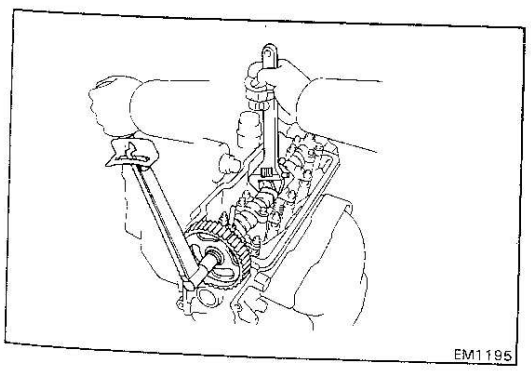


(b) Align the camshaft knock pin with the camshaft timing pulley as shown in the figure.

NOTE:

- Check that the No. 1 bearing cap mark and center of the small hole on the camshaft timing pulley align.
- On 1E engine mount the timing pulley with the No. 1 hole over the bearing cap mark, on 2E engine align the No. 2 hole over the mark.



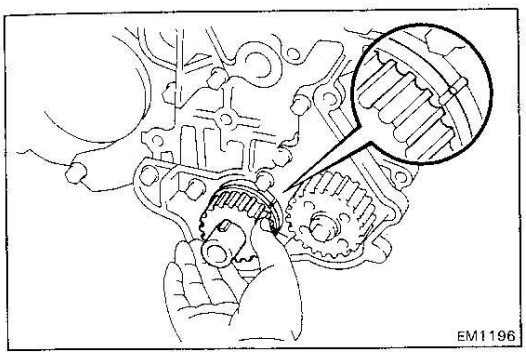


(c) Hold the camshaft with a wrench, and tighten the pulley set bolt.

Torque:

Bolt w/o washer 510 kg-cm (37 ft-lb, 50 N·m)
Bolt w/ washer 650 kg-cm (47 ft-lb, 64 N·m)

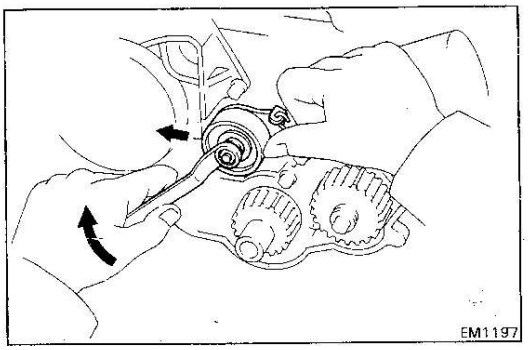
NOTE: Remove any oil or water on the camshaft timing pulley and keep it clean.



3. INSTALL CRANKSHAFT TIMING PULLEY

Install the crankshaft timing pulley and align the TDC marks on the oil pump body and crankshaft timing pulley.

NOTE: Remove any oil or water on the crankshaft timing pulley and keep it clean.



4. INSTALL TIMING BELT IDLER PULLEYS

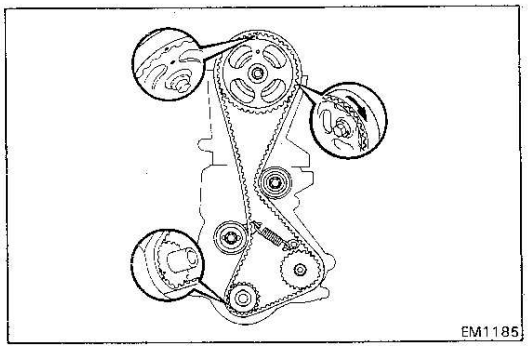
(a) Install the No. 1 idler pulley and tension spring.

(b) Pry the No. 1 idler pulley toward the left as far as it will go and temporarily tighten it.

(c) Install the No. 2 idler pulley.

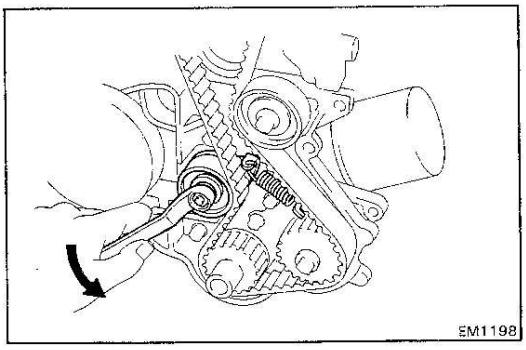
Torque: 200 kg-cm (14 ft-lb, 20 N·m)

NOTE: Remove any oil or water on the idler pulleys and keep them clean.



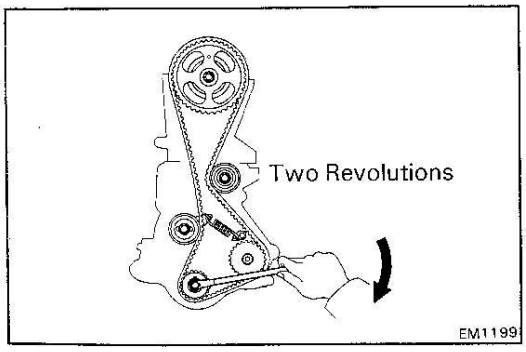
5. INSTALL TIMING BELT

NOTE: If reusing the timing belt, align the points marked during removal and install the belt with the arrow pointing in the direction of engine revolution.



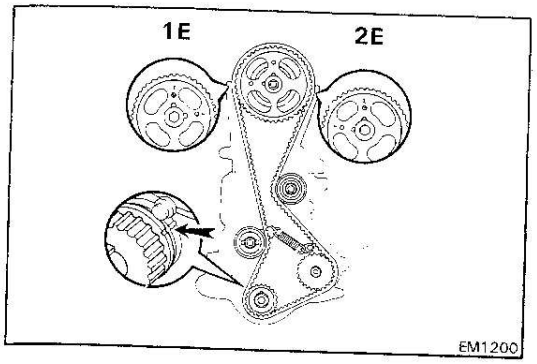
6. INSPECT VALVE TIMING AND TIMING BELT TENSION

(a) Loosen the timing belt No. 1 idler pulley set bolt.

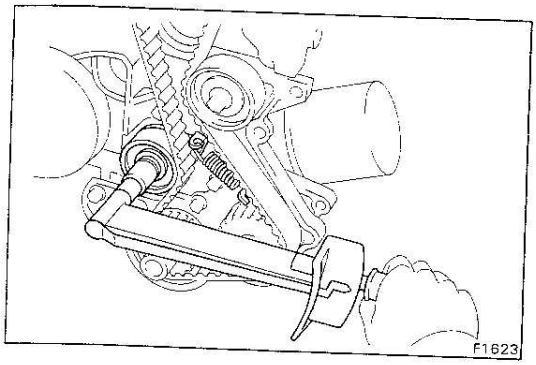


(b) Temporarily install the crankshaft pulley bolt and turn the crankshaft two revolutions from TDC to TDC.

NOTE: Always turn the crankshaft clockwise.

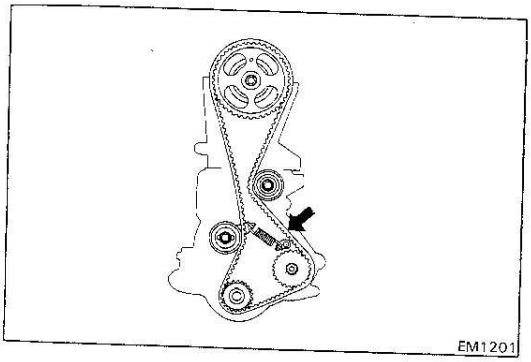


(c) Check that each pulley aligns with the marks as shown in the figure.

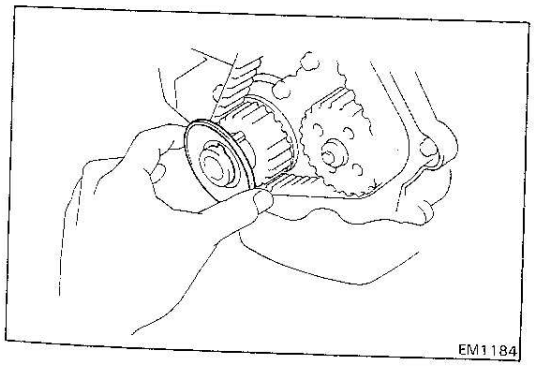


(d) Tighten the No. 1 idler pulley set bolt.

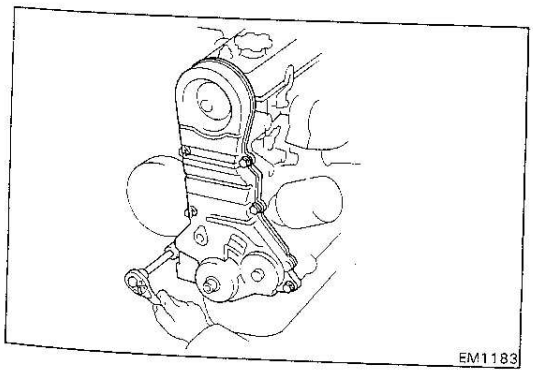
Torque: 185 kg-cm (13 ft-lb, 18 N·m)



(e) Make sure that there is belt tension at the position indicated in the figure.

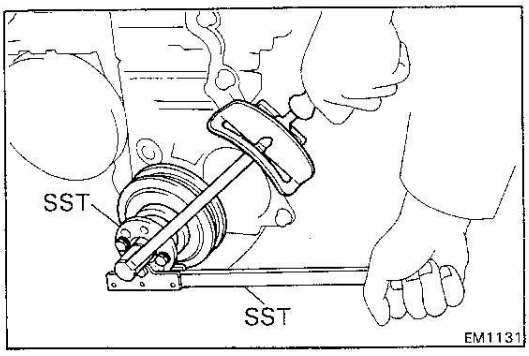


7. INSTALL TIMING BELT GUIDE



8. INSTALL TIMING BELT COVERS

Install the No. 1 and No. 2 timing belt covers with the six bolts.



9. INSTALL CRANKSHAFT PULLEY

(a) Align the pulley set key with the key groove of the pulley.

(b) Install the SST to the crankshaft pulley.

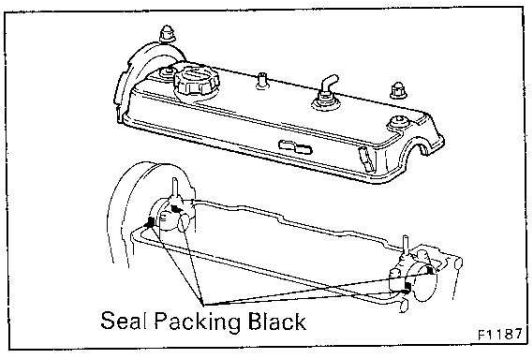
SST 09213-14010

(c) Using SST to hold the crankshaft pulley, install and torque the pulley bolt.

SST 09330-00020

Torque: 1,000 — 1,500 kg-cm (73 — 108 ft-lb, 99 — 147 N·m)

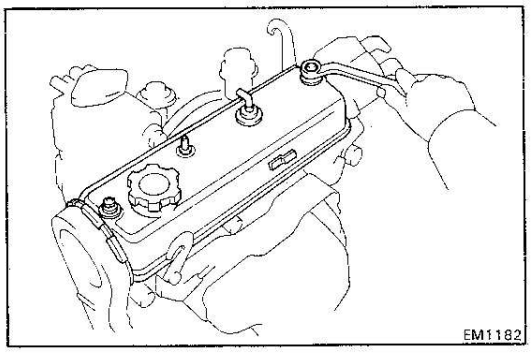
NOTE: Apply a light coating of engine oil on the bolt threads and under the bolt head before installing.



10. INSTALL CYLINDER HEAD COVER

(a) Apply seal packing black (Part No. 08826-00080) or equivalent to the cylinder head as shown in the figure.

NOTE: Install the head cover as soon as the seal packing is applied.

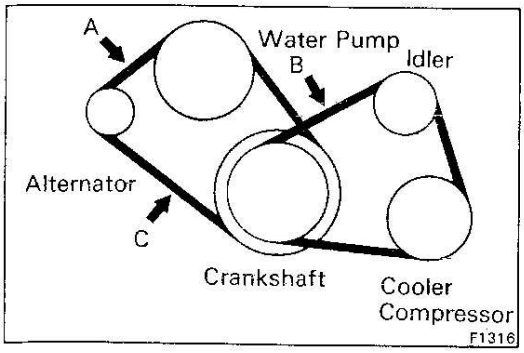


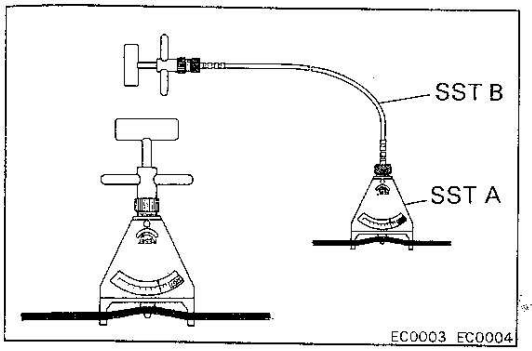
(b) Install the gasket and head cover with the two nuts.

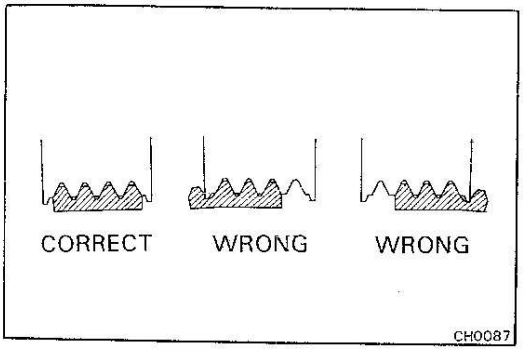
(c) Connect the PCV hose to the PCV valve.

11. INSTALL ALTERNATOR DRIVE BELT

12. IF VEHICLE HAS AIR CONDITIONING, INSTALL DRIVE BELT







13. ADJUST DRIVE BELTS

Drive belt deflection with 10 kg (22.1 lb, 98 N)

New belt	**A**	**3.5 – 4.5 mm (0.138 – 0.177 in.)**
	B	**5.5 – 7.0 mm (0.217 – 0.276 in.)**
Used belt	**A**	**5.0 – 6.0 mm (0.197 – 0.236 in.)**
	B	**7.0 – 8.5 mm (0.276 – 0.335 in.)**

[Reference]

Using SST, check the V-ribbed type drive belt tension.

SST A 09216-00020
SST B 09216-00030

Drive belt tension:

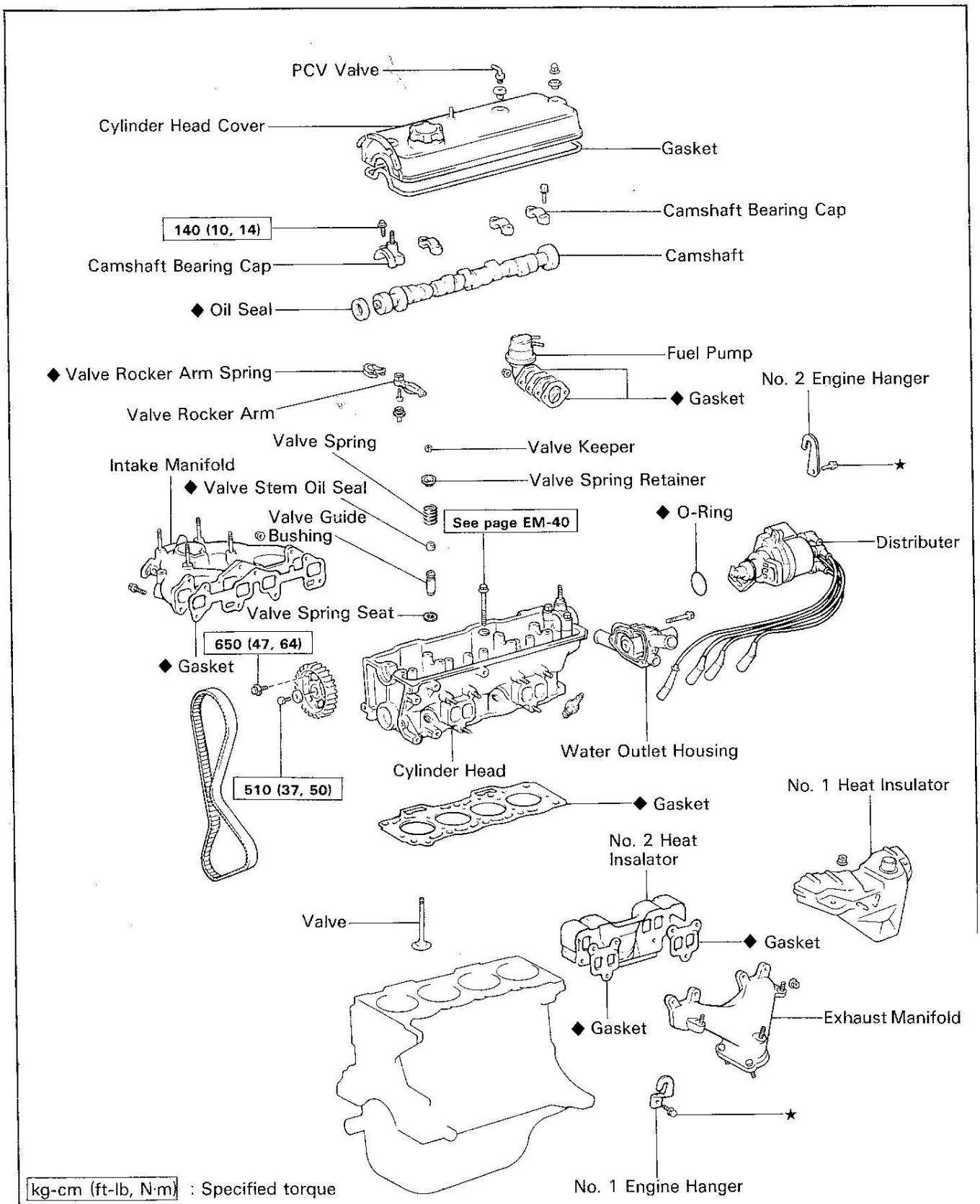
New belt	**C**	**55 – 65 kg**
	B	**55 – 65 kg**
Used belt	**C**	**25 – 40 kg**
	B	**35 – 45 kg**

NOTE

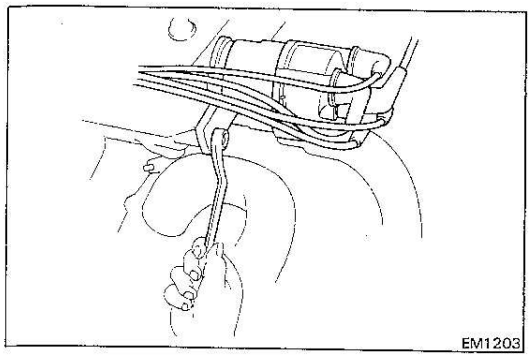
- "New belt" refers to a new belt which has never been used.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the drive belt, check that it fits properly in the ribbed grooves.
- Check by hand to confirm that the belt has not slipped out of the groove on the bottom of the crankshaft pulley.
- After installing the belt, run the engine for about 5 minutes and then recheck the deflection.

CYLINDER HEAD

COMPONENTS



EM1202


EM1203

REMOVAL OF CYLINDER HEAD

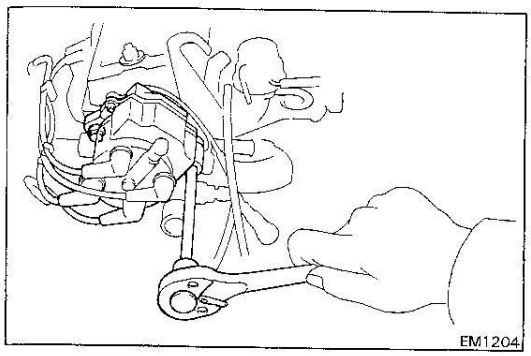
(See page EM-26)

1. REMOVE DISTRIBUTOR

(Conventional Type)

(a) Disconnect the vacuum hoses.

(b) Remove the distributor hold-down bolts. Remove the distributor from the cylinder head with the cap and cords attached.

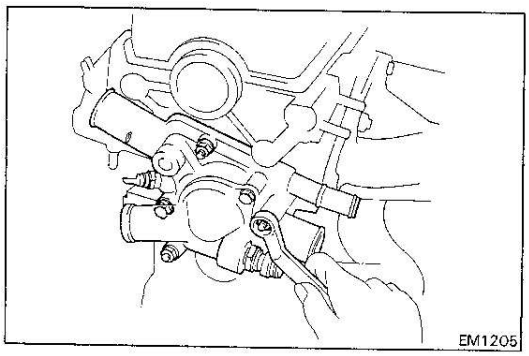

EM1204

(IIA Type)

(a) Disconnect the vacuum hoses.

(b) Remove the two distributor hold-down bolts.

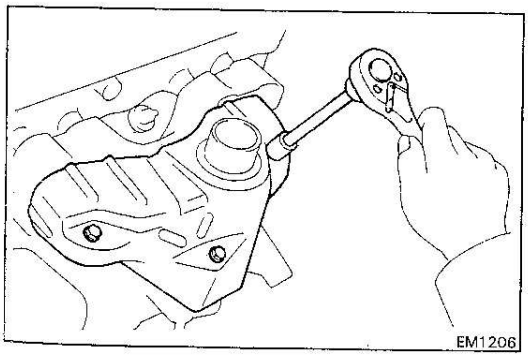
Remove the distributor from the cylinder head with the cap and cords attached.


EM1205

2. REMOVE WATER OUTLET HOUSING

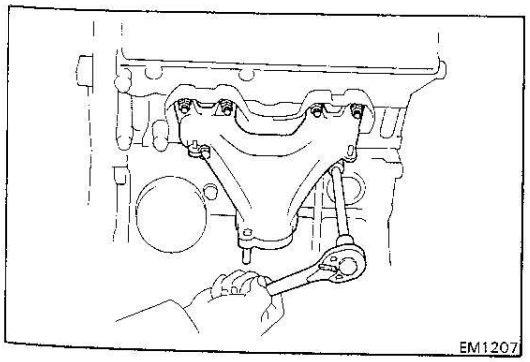
(a) Disconnect the water hose.

(b) Remove the bolt, two nuts and water outlet housing from the cylinder head.


EM1206

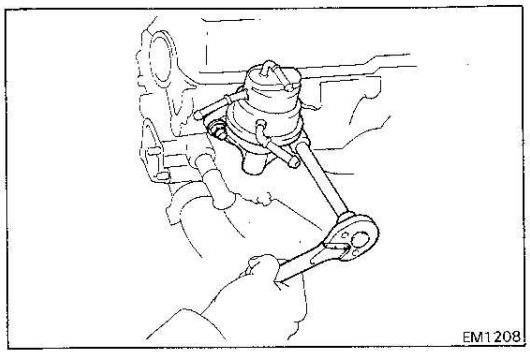
3. REMOVE EXHAUST MANIFOLD

(a) Remove the three bolts and No. 1 heat insulator.


EM1207

(b) Remove the six nuts, exhaust manifold, two gaskets and No. 2 heat insulator.

4. REMOVE FOUR SPARK PLUGS



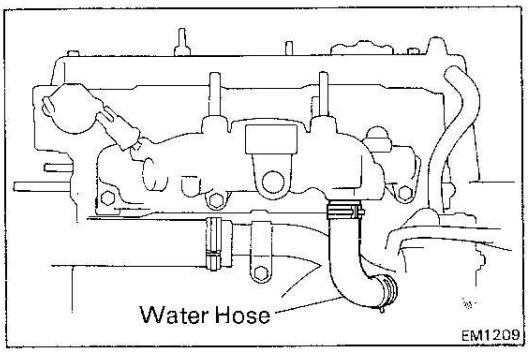
5. REMOVE FUEL PUMP

(a) Disconnect the fuel hoses.

(b) Remove the two nuts, fuel pump and insulator with the two gaskets.

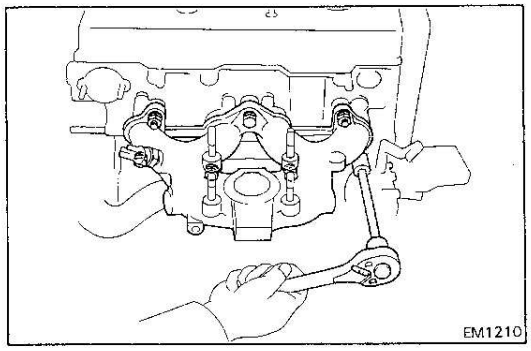
6. REMOVE CARBURETOR ASSEMBLY
(See page FU-8)

7. REMOVE VACUUM PIPES (EC only)



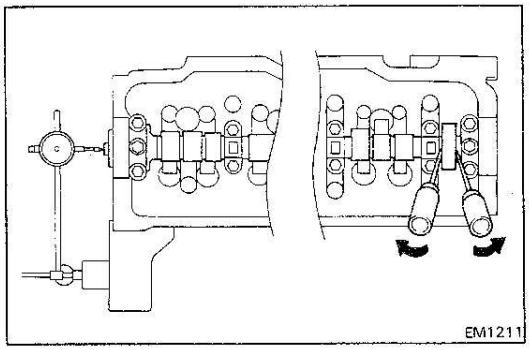
8. REMOVE INTAKE MANIFOLD

(a) Disconnect the water hose from the manifold.



(b) Remove the five bolts, two nuts and manifold with the gasket.

9. REMOVE TIMING BELT AND CAMSHAFT TIMING PULLEY
(See steps 1 to 8 and 11 on pages EM-16 to 18)



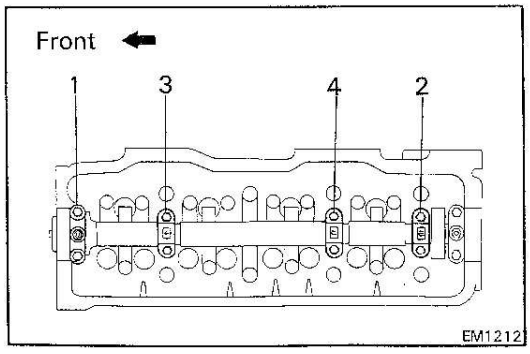
10. MEASURE CAMSHAFT THRUST CLEARANCE

Using a dial gauge, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance: **0.08 – 0.18 mm (0.0031 – 0.0071 in.)**

Maximum thrust clearance: **0.25 mm (0.0098 in.)**

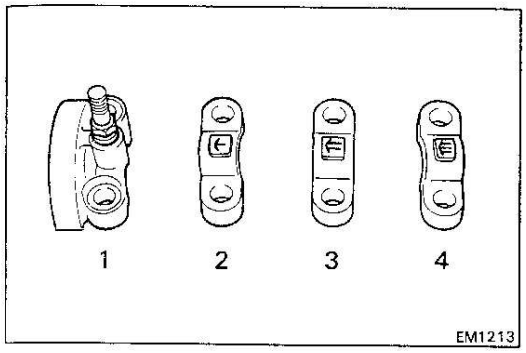
If clearance is greater then the maximum, replace the head and/or camshaft.



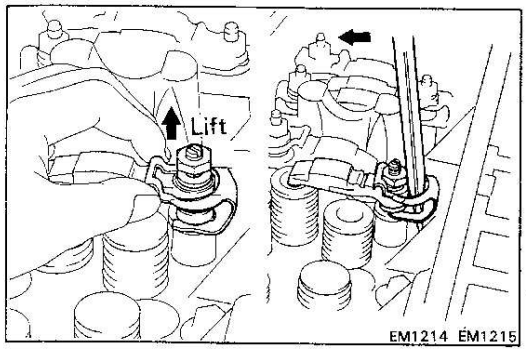
11. REMOVE BEARING CAPS AND CAMSHAFT

(a) Loosen each bearing cap bolts a little at a time and in the sequence shown in the figure.

(b) Remove the camshaft, oil seal and camshaft bearing caps.

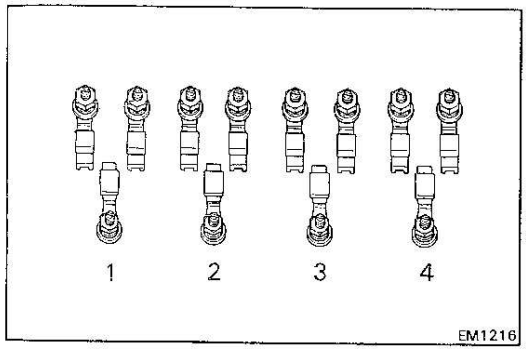


(c) Arrange the camshaft bearing caps in order.

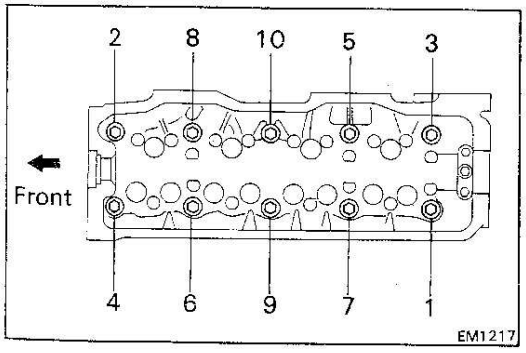


12. REMOVE ROCKER ARMS

While lifting the top of the spring, pry off with a screwdriver.



NOTE: Arrange the rocker arms.

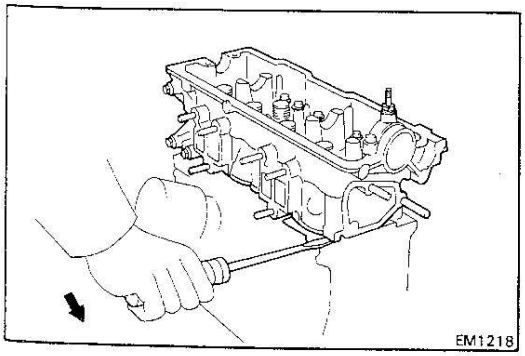


13. REMOVE CYLINDER HEAD

(a) Remove and loosen the head bolts gradually in three passes in the numerical order shown.

CAUTION: Head warpage or cracking could result from removing out of order.

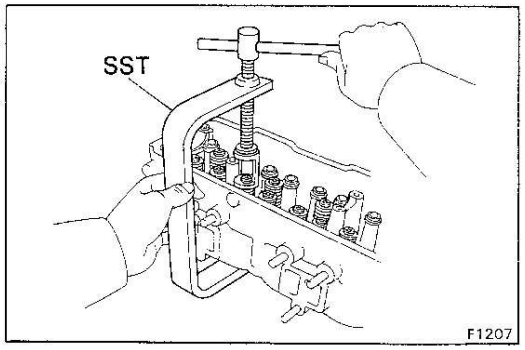
NOTE: Some engines include head bolts with a smoothly grinded head surfaces.

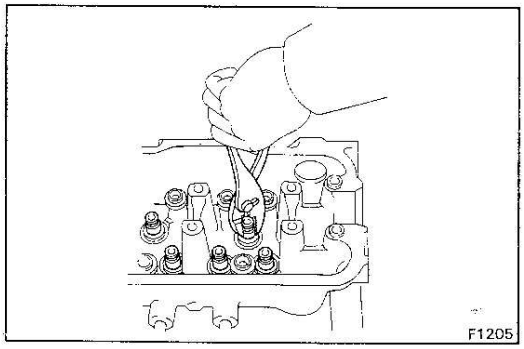


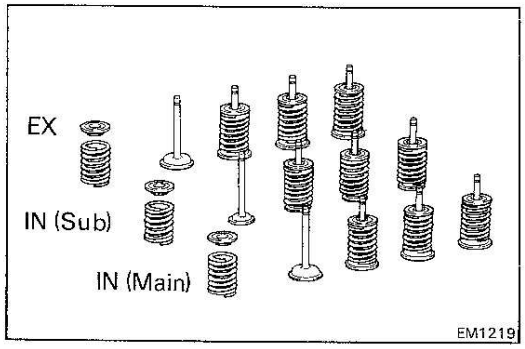
(b) Lift the cylinder head from the dowels on the cylinder block and place it on the wooden blocks on a bench.

If the cylinder head is difficult to lift off, pry with a bar between the head and block projection.

CAUTION: Be careful not damage the cylinder head and block surfaces of the cylinder head gasket side.







DISASSEMBLY OF CYLINDER HEAD

(See page EM-26)

REMOVE VALVES

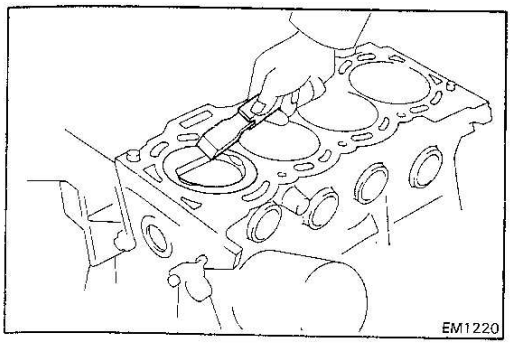
(a) Using SST, press the valve spring and remove the two keepers.

SST 09202-70010

(b) Remove the spring retainer (or valve rotator), valve spring, seat and valve.

(c) Pull out the oil seal.

NOTE: Arrange the disassembled parts in order.


EM1220

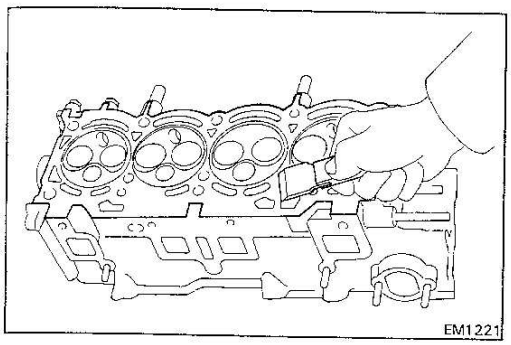
INSPECTION, CLEANING AND REPAIR OF CYLINDER HEAD COMPONENTS

1. CLEAN TOP OF PISTONS AND TOP OF CYLINDER BLOCK

(a) Turn the crankshaft and bring each piston to top dead center. Using a gasket scraper, remove all the carbon from the piston tops.

(b) Using a gasket scraper, remove all gasket material from the top of the block.
Blow carbon and oil from the bolt holes.

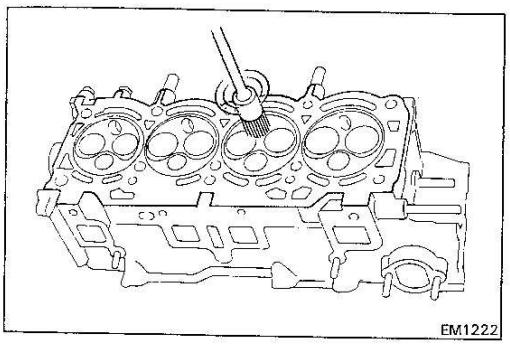
WARNING: Protect your eyes when using high pressure air.


EM1221

2. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all gasket material from the head and manifold surfaces.

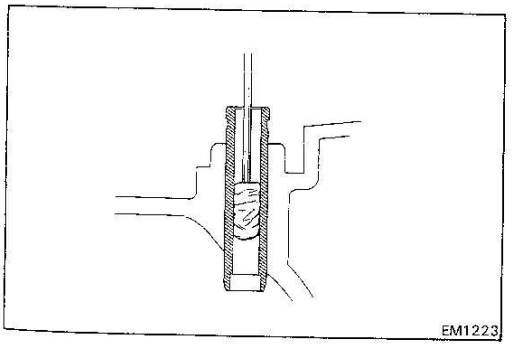
CAUTION: Be careful not to scratch the surfaces.


EM1222

3. CLEAN COMBUSTION CHAMBER

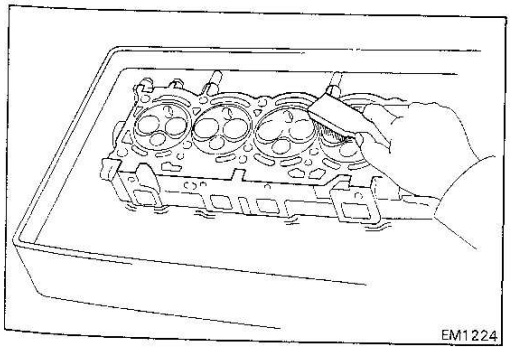
Using a wire brush, remove all the carbon from the combustion chambers.

CAUTION: Be careful not to scratch the head gasket contact surface.


EM1223

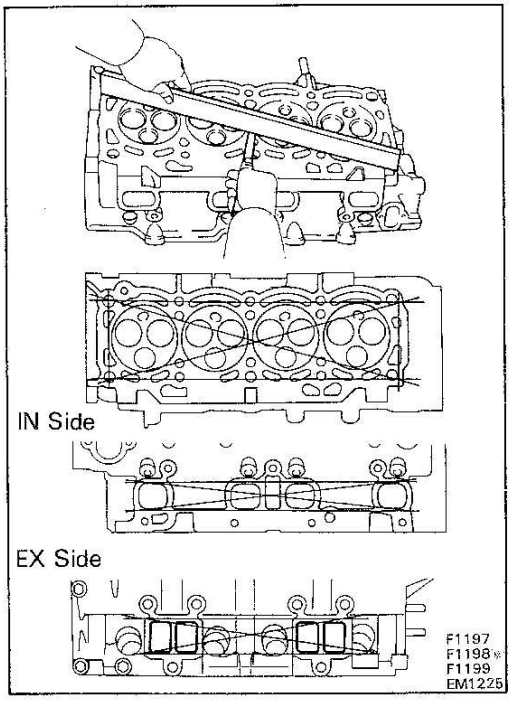
4. CLEAN VALVE GUIDE BUSHINGS

Using a valve guide brush and solvent, clean all the valve guide bushings.


EM1224

5. CLEAN CYLINDER HEAD

Using a soft brush and solvent, throughly clean the head.



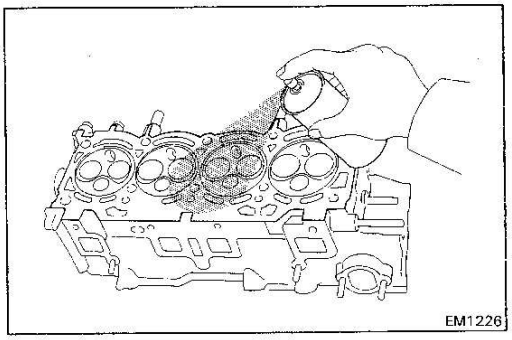
6. INSPECT CYLIDER HEAD FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block and manifold for warpage.

Maximum warpage:

Cylinder block side	**0.05 mm (0.0020 in.)**
Manifold side	**0.05 mm (0.0020 in.)**

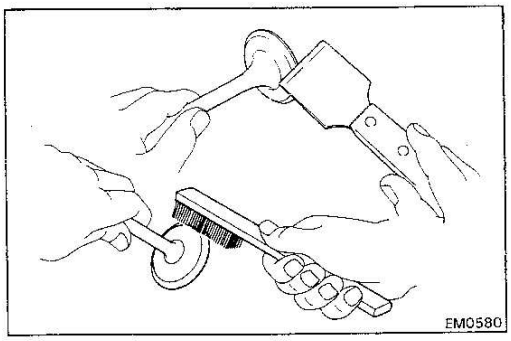
If warpage is greater than maximum, replace the cylider head.



7. INSPECT CYLIDER HEAD FOR CRACKS

Using a dye penetrant, check the combustion chamber, intake and exhaust ports, head surface and the top of the head for cracks.

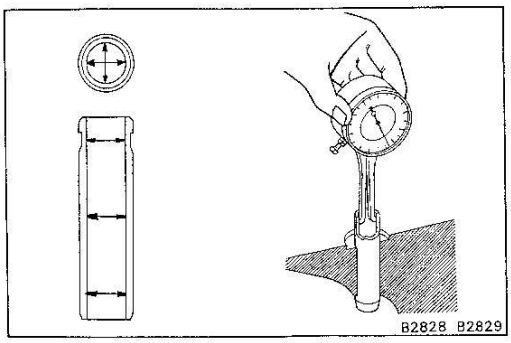
If cracked, replace the head.



8. CLEAN VALVES

(a) Using a gasket scraper, chip any carbon from the valve.

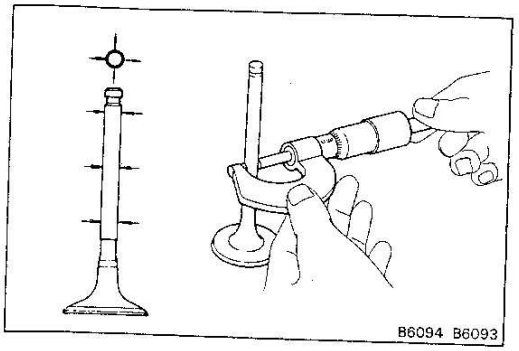
(b) Using a wire brush, thoroughly clean the valve.



9. INSPECT VALVE STEM AND GUIDE BUSHINGS

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

Guide inside diameter: 6.01 – 6.03 mm (0.2366 – 0.2374 in.)



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

Stem diameter:

Intake	**5.970 – 5.985 mm (0.2350 – 0.2356 in.)**
Exhaust	**5.965 – 5.980 mm (0.2348 – 0.2354 in.)**

(c) Subtract the valve stem measurement from the valve guide measurement.

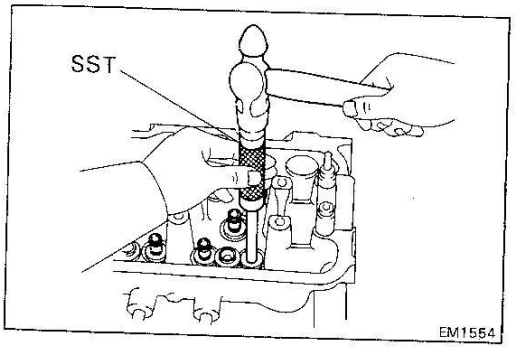
Standard stem oil clearance:

Intake	**0.025 – 0.060 mm (0.0010 – 0.0024 in.)**
Exhaust	**0.030 – 0.065 mm (0.0012 – 0.0026 in.)**

Maximum stem oil clearance:

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

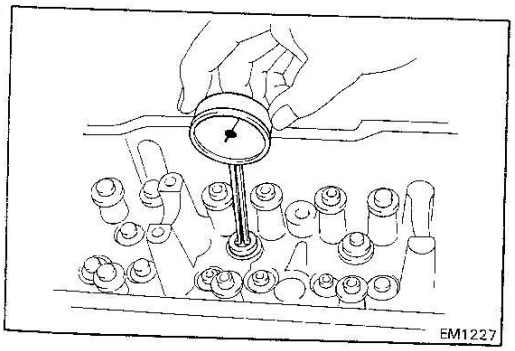
If the clearance is greater than the maximum, replace the valve and guide.



10. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

(a) Using SST and hammer, drive out the valve guide bushing.

SST 09201-70010



(b) Using a caliper gauge, measure the valve guide bore of the cylinder head.

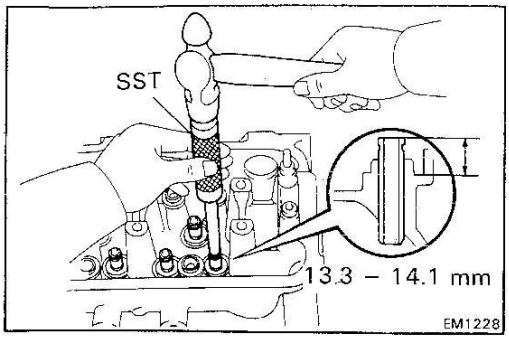
Both intake and exhaust

Bushing bore mm (in.)	Bushing size
11.000 – 11.027 (0.4331 – 0.4341)	Use STD
Over 11.027 (0.4341)	Use O/S 0.05

(c) Select a new valve guide bushing.

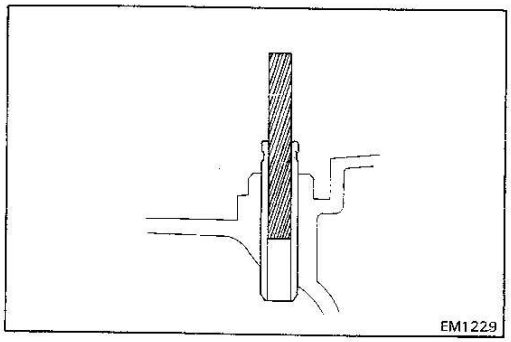
If the valve guide bushing bore of the cylinder head is more than 11.027 mm (0.4341 in.), machine the bore to the following dimension.

Rebored valve guide bushing bore dimension:
11.050 – 11.077 mm (0.4350 – 0.4361 in.)

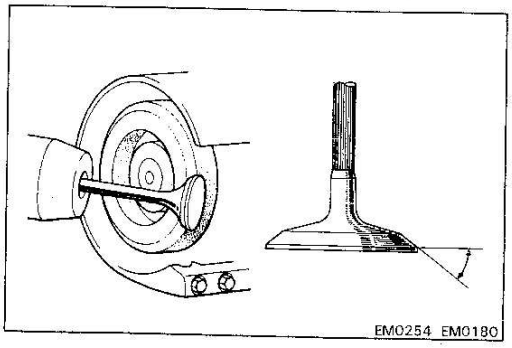


(d) Using SST and a hammer, drive in a new valve guide to where there is 13.3 – 14.1 mm (0.5236-0.5551 in.) protruding from the cylinder head.

SST 09201-70010



(e) Using a sharp 6 mm reamer, ream the valve guide to obtain the standard specified clearance (See page EM-32) between the valve guide and new valve stem.

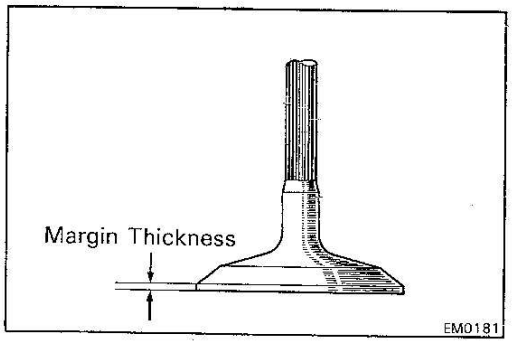


11. INSPECT AND GRIND VALVES

(a) Grind the valve only enough to remove pits and carbon.

(b) Check that the valves are ground to the correct valve face angle.

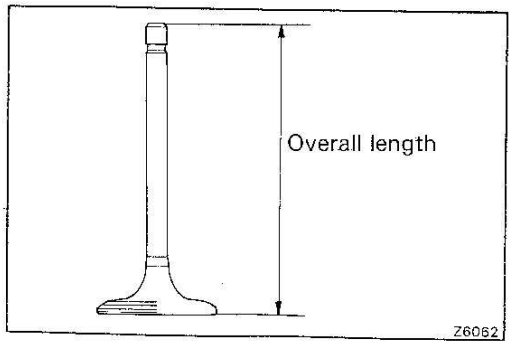
Valve face angle: 44.5°



(c) Check the valve head margin thickness.

Standard margin thickness: 1.0 mm (0.039 in.)
Minimum margin thickness: 0.8 mm (0.031 in.)

If the valve head margin thickness is less than minimum replace the valve.



(d) Check the valve overall length.

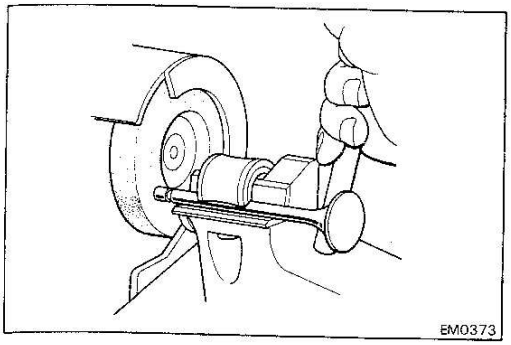
Standard overall length:

Intake (Main)	**92.26 mm (3.6323 in.)**
(Sub)	**98.50 mm (3.8779 in.)**
Exhaust	**92.26 mm (3.6323 in.)**

Minimum overall length:

Intake (Main)	**91.76 mm (3.6126 in.)**
(Sub)	**98.00 mm (3.8583 in.)**
Exhaust	**91.76 mm (3.6126 in.)**

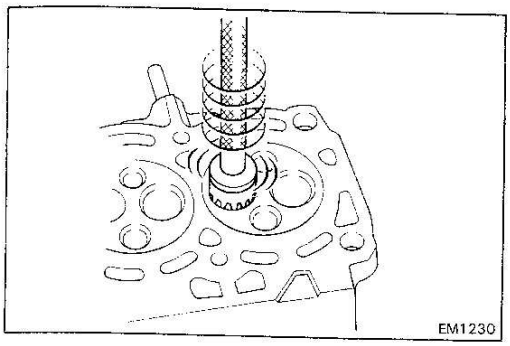
If the valve overall length is less than minumum, replace the valve.



(e) Check the surface of the valve stem tip for wear.

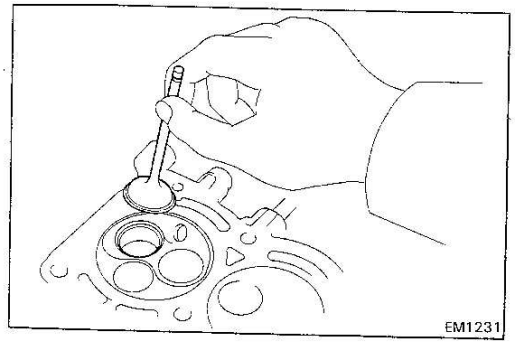
If the valve stem tip is worn, regrind it with grinder or replace the valve if necessary.

CAUTION: Do not grind off more than the minimum overall length (See page EM-34).



12. INSPECT AND CLEAN VALVE SEATS

(a) Using a 45° carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.



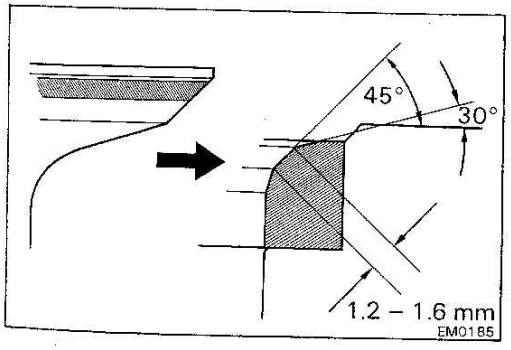
(b) Check the valve seating position.

Apply a thin coat of prussian blue (or white lead) to the valve face. Install the valve. Lightly press the valve against the seat. Do not rotate the valve.

(c) Check the valve face and seat for the following:

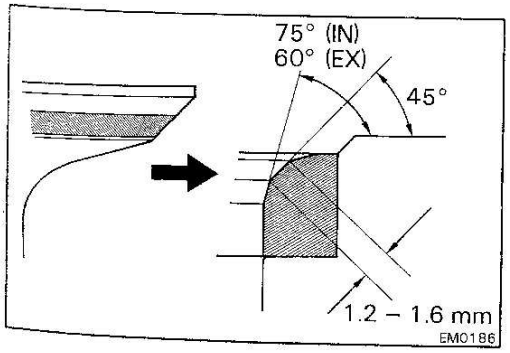
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and seat are concentric. If not, resurface the seat.
- Check that the seat contact is on the middle of the valve face with the following width.

1.2 – 1.6 mm (0.047 – 0.063 in.)

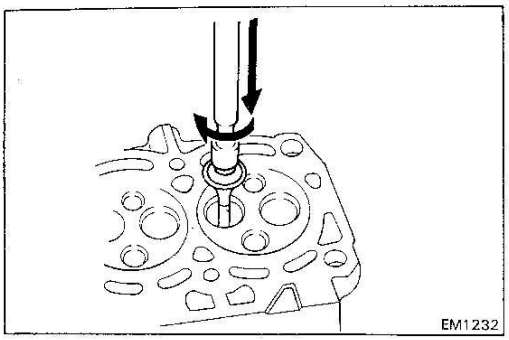


If not, correct the valve seat as follows:

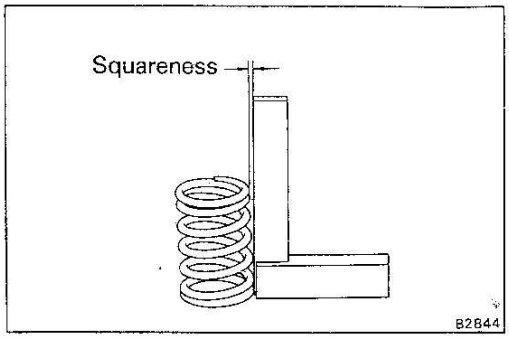
(1) If seating is too high on the valve face, use 30° and 45° cutters to correct the seat.



(2) If seating is too low on the valve face, use 75° (IN), 60° (EX) and 45° cutters to correct the seat.



(d) Hand-lap the valve and valve seat with on abrasive compound.

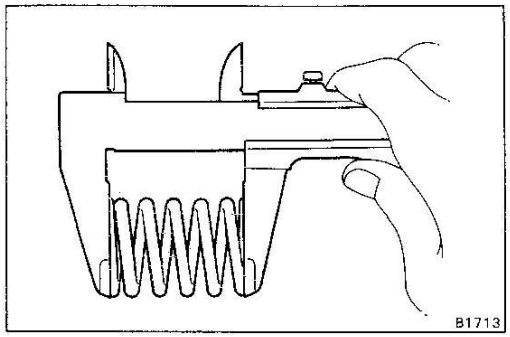


13. INSPECT VALVE SPRINGS

(a) Using a steel square, measure the squareness of the valve springs.

Maximum squareness: 2.0 mm (0.079 in.)

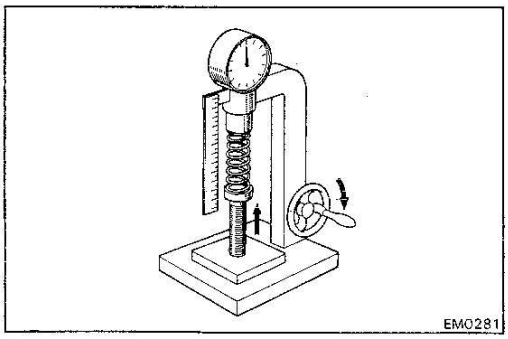
If squareness is greater than maximum, replace the valve spring.



(b) Using calipers, measure the free length of the valve spring.

Free length: 41.52 mm (1.6346 in.)

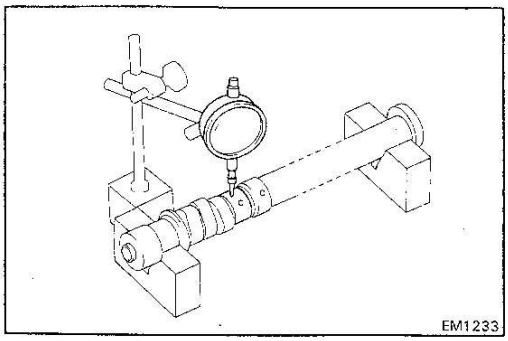
If the free length is not within specification, replace the valve spring.



(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:
15.91 kg (35.1 lb, 156 N) at 35.16 mm (1.3842 in.)

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

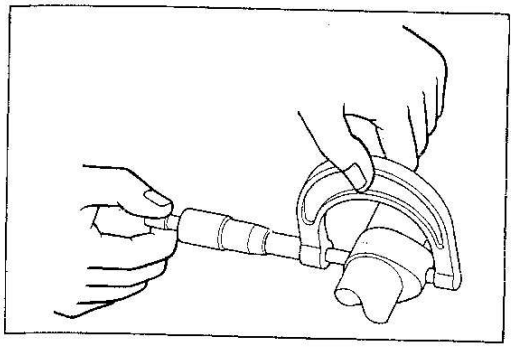


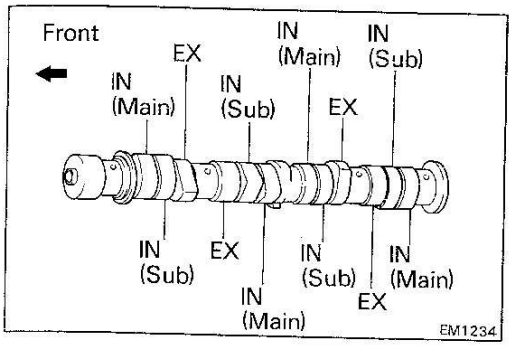
14. INSPECT CAMSHAFT

(a) Place the camshaft on V-blocks and, using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.04 mm (0.0016 in.)

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





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

Standard cam lobe height:

1E

Intake (Main)	35.35 – 35.45 mm (1.3917 – 1.3957 in.)
(Sub)	34.91 – 35.01 mm (1.3744 – 1.3783 in.)
Exhaust	35.83 – 35.93 mm (1.4106 – 1.4146 in.)

2E

Intake (Main)	35.87 – 35.97 mm (1.4122 – 1.4161 in.)
(Sub)	35.38 – 35.48 mm (1.3929 – 1.3968 in.)
Exhaust	35.83 – 35.93 mm (1.4106 – 1.4146 in.)

Minimum cam lobe height:

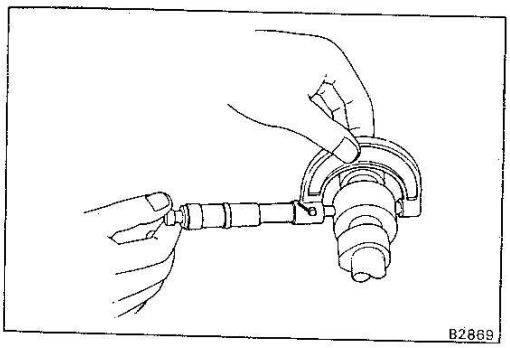
1E

Intake (Main)	35.15 mm (1.3839 in.)
(Sub)	34.71 mm (1.3665 in.)
Exhaust	35.63 mm (1.4028 in.)

2E

Intake (Main)	35.67 mm (1.4043 in.)
(Sub)	35.18 mm (1.3850 in.)
Exhaust	35.63 mm (1.4028 in.)

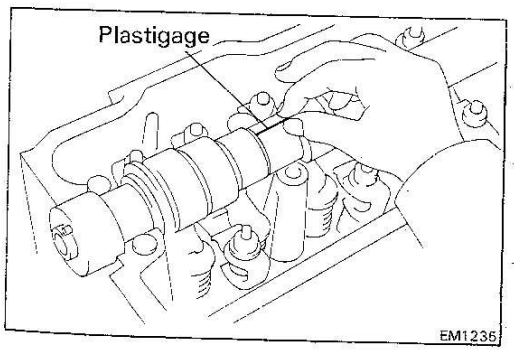
If the cam lobe height is less than minimum, replace the camshaft.



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

Standard diameter: 26.979 – 26.995 mm (1.0622 – 1.0628 in.)

If the journal diameter is less than specified, replace the camshaft.

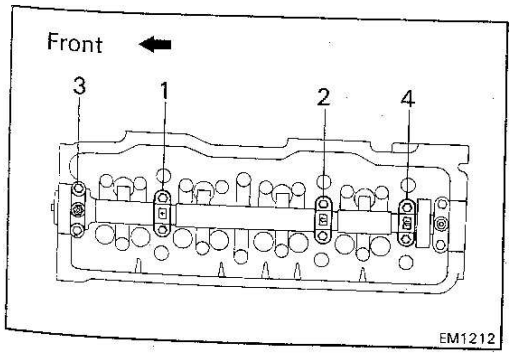


15. INSPECT CAMSHAFT OIL CLEARANCE

(a) Clean the bearing caps and camshaft journal.

(b) Place the camshaft in the cylinder head.

(c) Lay a strip of Plastigage across each journal.

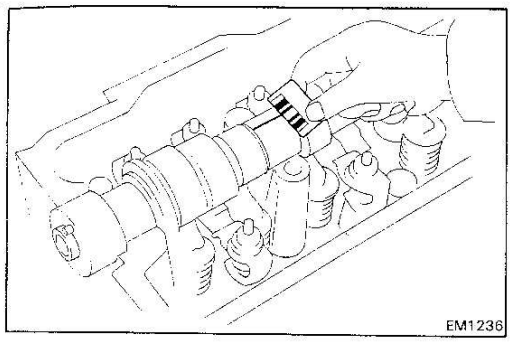


(d) Place the bearing caps with the top of the number on the cap pointing toward the front and in numerical order from the front side.

(e) Torque the cap bolts gradually from the inside in three passes.

Torque: 140 kg-cm (10 ft-lb, 14 N·m)

NOTE: Do not turn the camshaft while the Plastigage is in place.

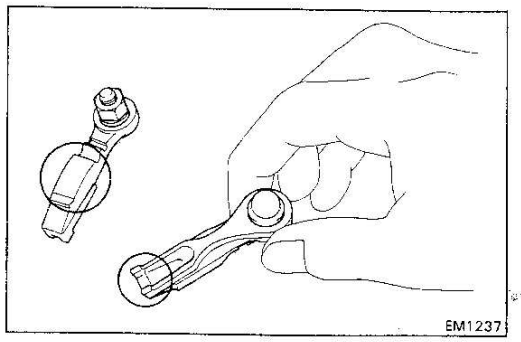


(f) Remove the caps and measure the Plastigage at its widest point.

Standard oil clearance: 0.037 – 0.073 mm (0.0015 – 0.0029 in.)
Maximum oil clearance: 0.10 mm (0.0039 in.)

If clearance is greater than the maximum, replace the cylinder head and/or camshaft.

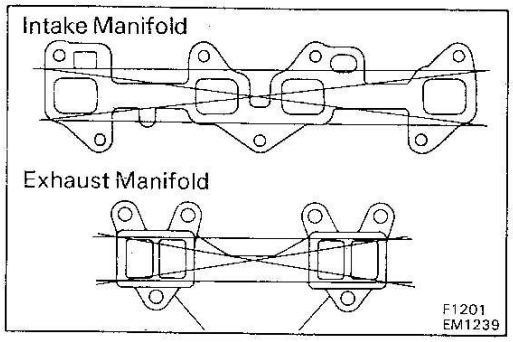
(g) Clean out the pieces of Plastigage from the bearing caps and journals.



16. INSPECT ROCKER ARMS

Check the contact surface of the valve rocker arm and valve stem end and/or camshaft lobe.

If the contact surface of the valve stem end and/or camshaft lobe is worn excessively, replace the rocker arm.



17. INSPECT INTAKE AND EXHAUST MANIFOLDS

Using a precision straight edge and feeler gauge, check the surfaces contacting the cylinder head for warpage.

Maximum warpage:

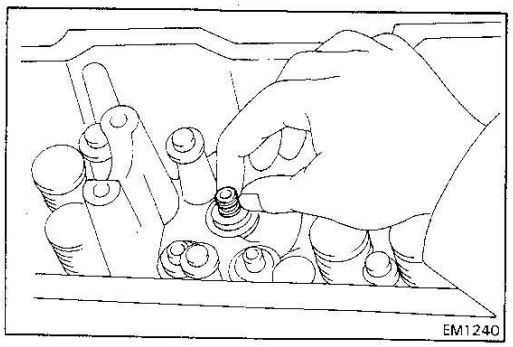
Intake manifold	**0.20 mm (0.0079 in.)**
Exhaust manifold	**0.30 mm (0.0118 in.)**

ASSEMBLY OF CYLINDER HEAD

(See page EM-26)

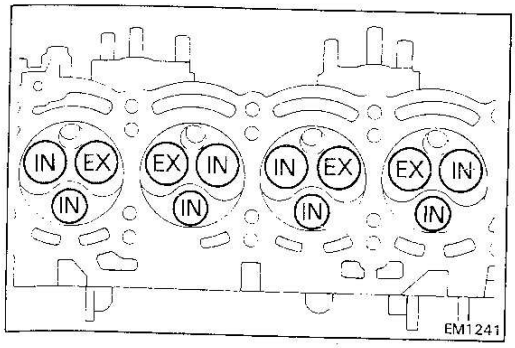
NOTE:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.

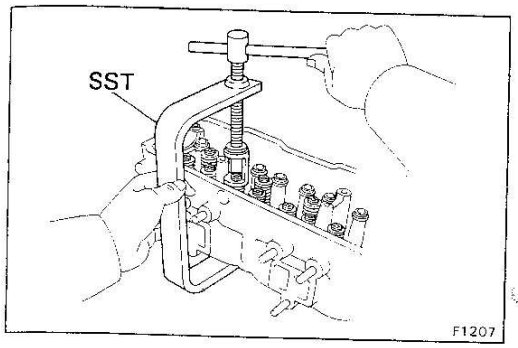


INSTALL VALVES

(a) Install new oil seals on the valve guide bushings.



(b) Insert the valves in the cylinder head valve guide bushing. Make sure the valves are installed in the correct order.

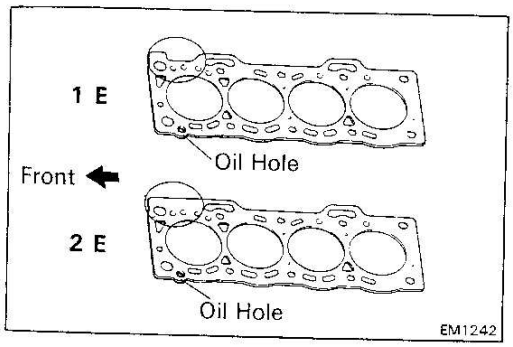


(c) Install the seats, springs and spring retainers on the cylinder head.

(d) Using SST, compress the valve retainers and place two keepers around the valve stem.

SST 09202-70010

(e) Tap the stem lightly to assure proper fit.



INSTALLATION OF CYLINDER HEAD

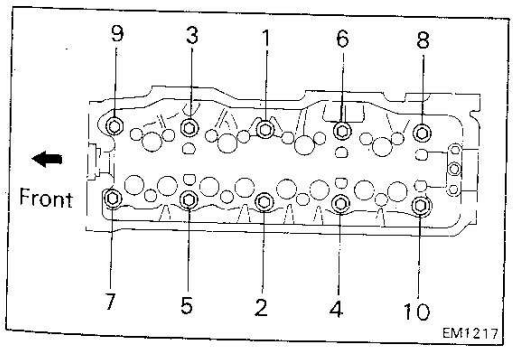
(See page EM-26)

1. INSTALL CYLINDER HEAD

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

CAUTION: Be careful of the installation direction.

(b) Place the cylinder head on the cylinder head gasket.



2. TIGHTEN CYLINDER HEAD BOLTS

NOTE:

- The cylinder head bolts are tighten in three progressive steps.
- If any of the bolts break or deform, replace them.

(a) Apply a light coat of engine oil on the threads and under the cylinder head bolts.

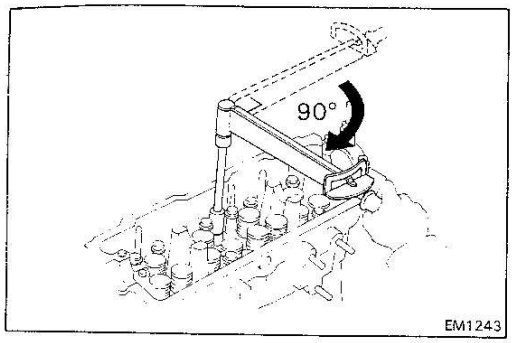
(b) First, uniformly tighten the ten cylinder head bolts in several passes and in the sequence shown.

Torque: 300 kg-cm (22 ft-lb, 29 N·m)

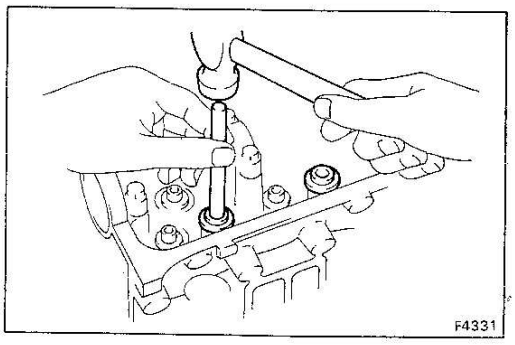
(c) Second, uniformly tighten the ten cylinder head bolts in sequence shown.

Torque: 500 kg-cm (36 ft-lb, 49 N·m)

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

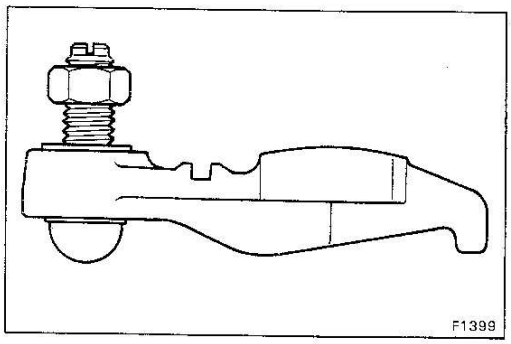


(d) Third retighten the cylinder head bolts an additional 90° in order, as shown above left.

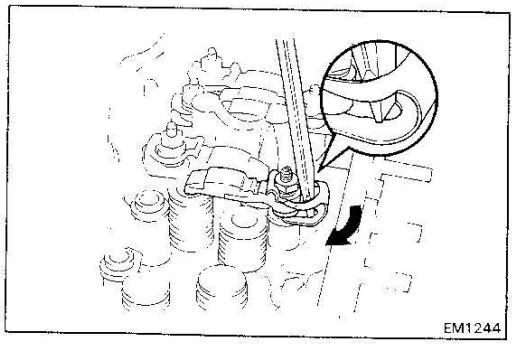


3. INSTALL ROCKER ARMS

NOTE: Use a brass bar and hammer to install the valve rocker arm pivot onto the cylinder head.

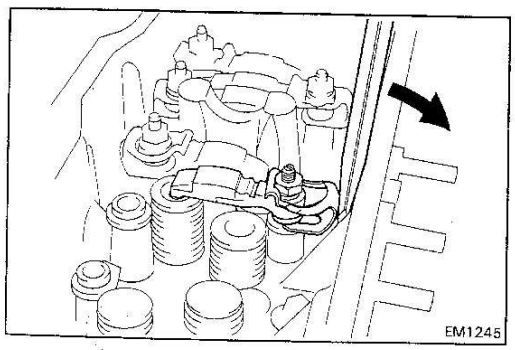


(a) Before installing the rocker arm, check that adjusting screw is as shown in the illustration.

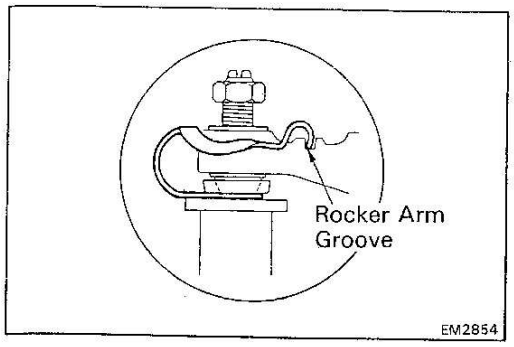


(b) Using a screwdriver, press the bottom lip of a new rocker arm spring until it fits into the groove on the rocker arm pivot.

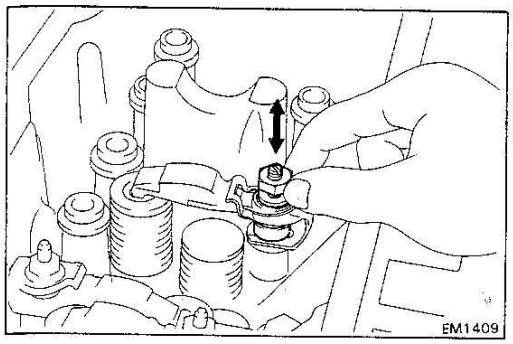
NOTE: Put the valve adjusting screw in the rocker arm pivot.



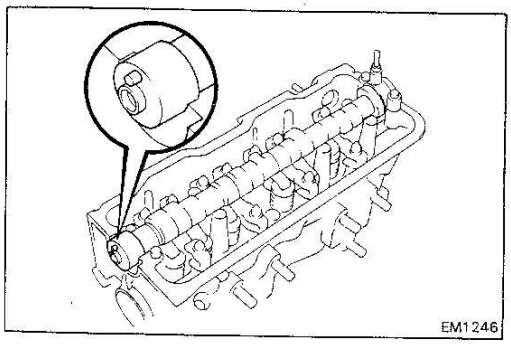
(c) Using a screwdriver, pry the rocker arm spring on to the rocker arm pivot.



NOTE: Put the edge of the rocker arm spring into the rocker arm groove.



(d) Pulling the rocker arm up and down, check that there is spring tension on the rocker arm and that the rocker does not rattle freely



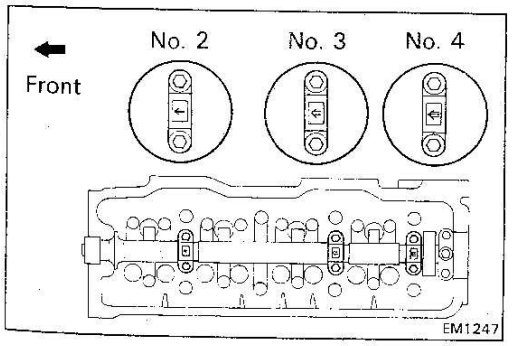
4. INSTALL CAMSHAFT AND OIL SEAL

NOTE: To prevent the sub intake valve and the piston head from damage perform step (a) and (c) below.

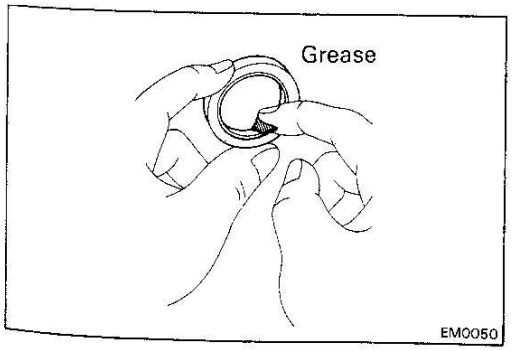
(a) Set No. 1 cylinder to TDC/compression.

(b) Coat all bearing journals with engine oil.

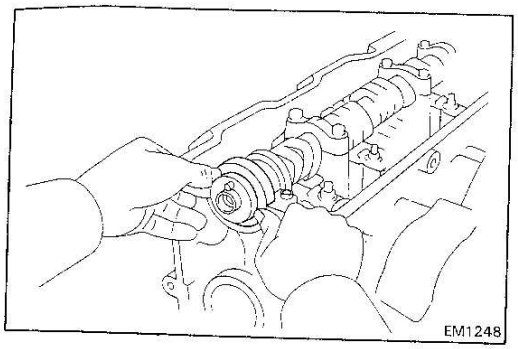
(c) With the knock pin in the 12 o'clock position, place the camshaft on the cylinder head.



(d) Place No. 2, 3 and 4 bearing caps on each journal with the arrows pointing toward the front.

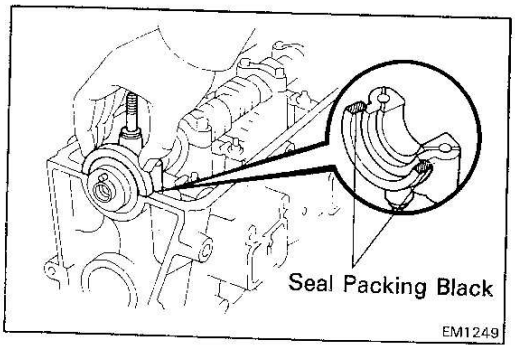


(e) Apply MP grease to the oil seal.



(f) Install the oil seal.

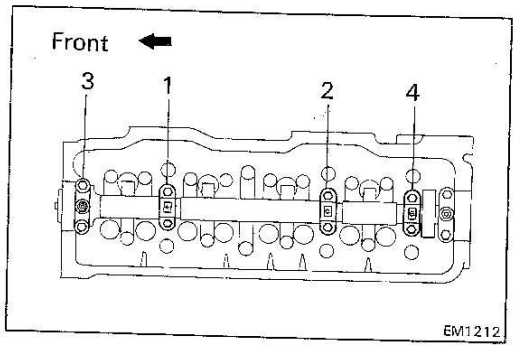
NOTE: Be careful not to install the oil seal slantwise.



(g) Apply seal packing (part No. 08826-00080) or equivalent to the No. 1 bearing caps as shown in the figure.

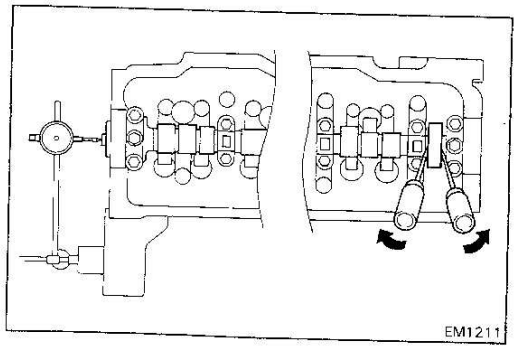
NOTE: Install the No. 1 bearing caps im-mediately after applying the seal packing.

(h) Place the No. 1 bearing caps on the cylinder head.



(i) Torque each bearing cap bolt a little at a time in the sequence shown in the figure.

Torque: 140 kg-cm (10 ft-lb, 14 N·m)

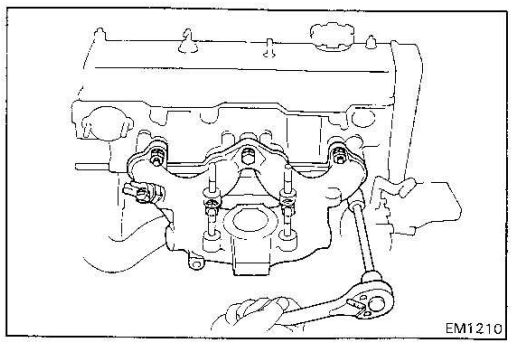


(j) Check the camshaft thrust clearance. (See page EM-28)

Standard clearance: 0.08 — 0.18 mm (0.0031 — 0.0071 in.)
Maximum clearance: 0.25 mm (0.0098 in.)

5. INSTALL CAMCHAFT TIMING PULLEY AND TIMING BELT
(See steps 2 and 4 to 13 on pages EM-21 to 25)

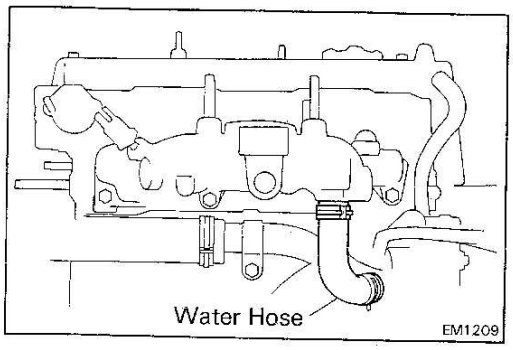
6. ADJUST VALVE CLEARANCE (See page EM-5)



7. INSTALL INTAKE MANIFOLD

(a) Install a new gasket and the manifold with the five bolts and two nuts. Tighten the bolts and nuts.

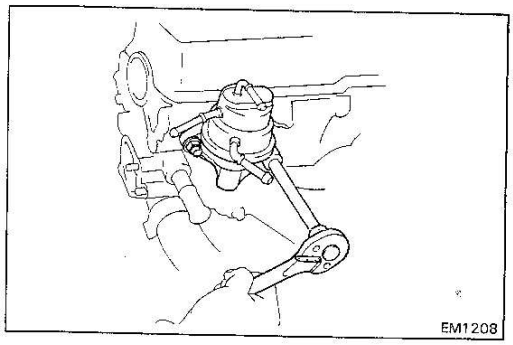
Torque: 195 kg-cm (14 ft-lb, 19 N·m)



(b) Connect the water hose to the intake manifold.

8. INSTALL VACUUM PIPES (EC only)

9. INSTALL CARBURETOR ASSEMBLY
(See page FU-21)



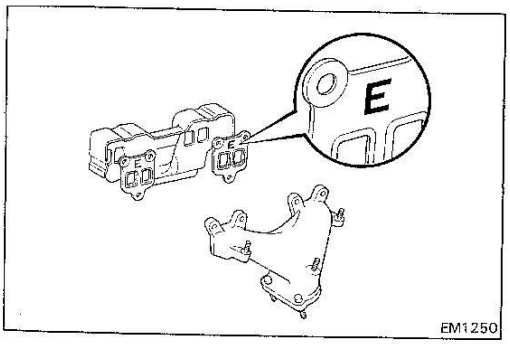
10. INSTALL FUEL PUMP

(a) Install two new gaskets, insulator and fuel pump with the two nuts.

(b) Connect the fuel hoses.

11. INSTALL FOUR SPARK PLUGS

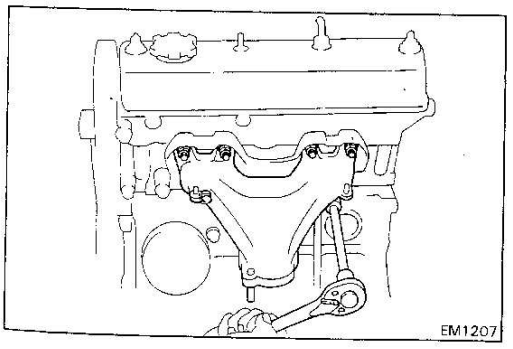
Torque: 180 kg-cm (13 ft-lb, 18 N·m)



12. INSTALL EXHAUST MANIFOLD

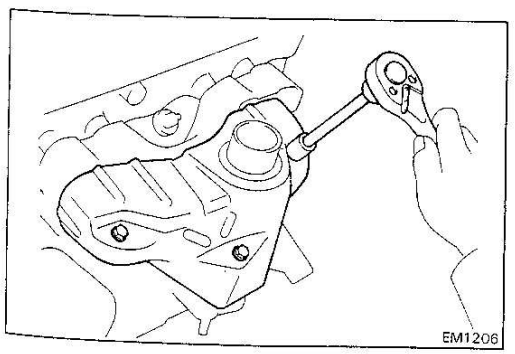
(a) Install the No. 2 heat insulator, two gaskets and manifold with the six nuts.

NOTE: Install the exhaust manifold gaskets with the "E" mark facing outward.

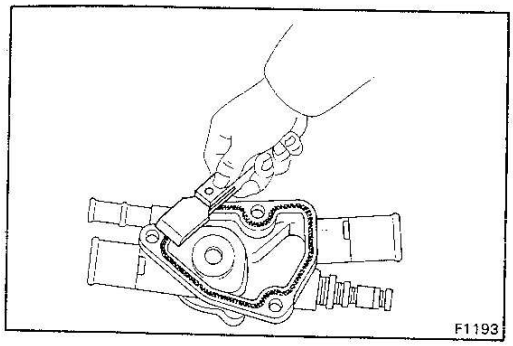


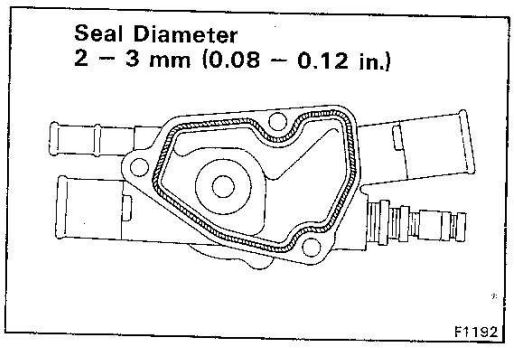
(b) Tighten the six nuts.

Torque: 425 kg-cm (31 ft-lb, 42 N·m)



(c) Install the No. 1 heat insulator with three bolts.





13. INSTALL WATER OUTLET HOUSING

(a) Remove any old packing material and be careful not to drop any oil on the contacting surfaces of the water outlet housing and cylinder head.

- Using a razor blade and gasket scraper, remove all the packing (FIPG) material from the gasket surfaces.
- Thoroughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non-residue solvent.

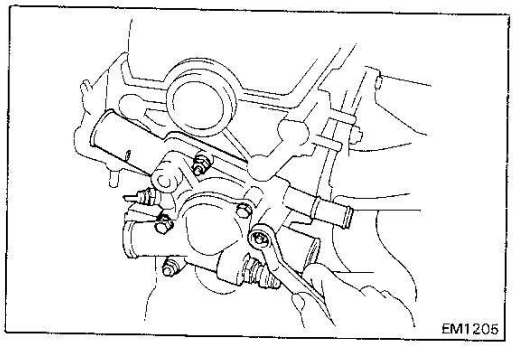
CAUTION: Do not use a solvent which will affect the painted surfaces.

(b) Apply seal packing No. 1282-B (Part No. 08826-00100) or equivalent to the water outlet housing as shown in the figure.

- Install a nozzle that has been cut to a 2 mm (0.08 in.) opening.

NOTE: Avoid applying an excess amount to the surface. Be especially careful near oil passages.

- Parts must be assembled within 15 minutes of application. Otherwise, the material must be removed and re-applied.
- Immediately remove nozzle from tube and reinstall cap.

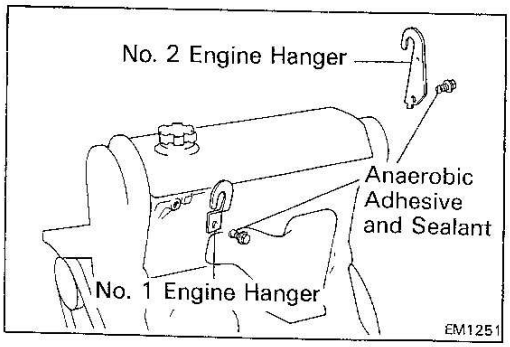


(c) Install the water outlet housing with the bolt and two nuts.

(d) Connect the water hose.

14. INSTALL DISTRIBUTOR
(See page IG-14)

15. INSTALL VACUUM HOSES



16. INSTALL ENGINE HANGERS

(a) Apply anaerobic adhesive and sealant [THREE BOND 1324 (Part No. 08833-00070) or equivalent] to 2 or 3 threads of the bolt end (See page EM-65).

NOTE: Cleaning and application instruction of adhesive and sealant See page EM-65.

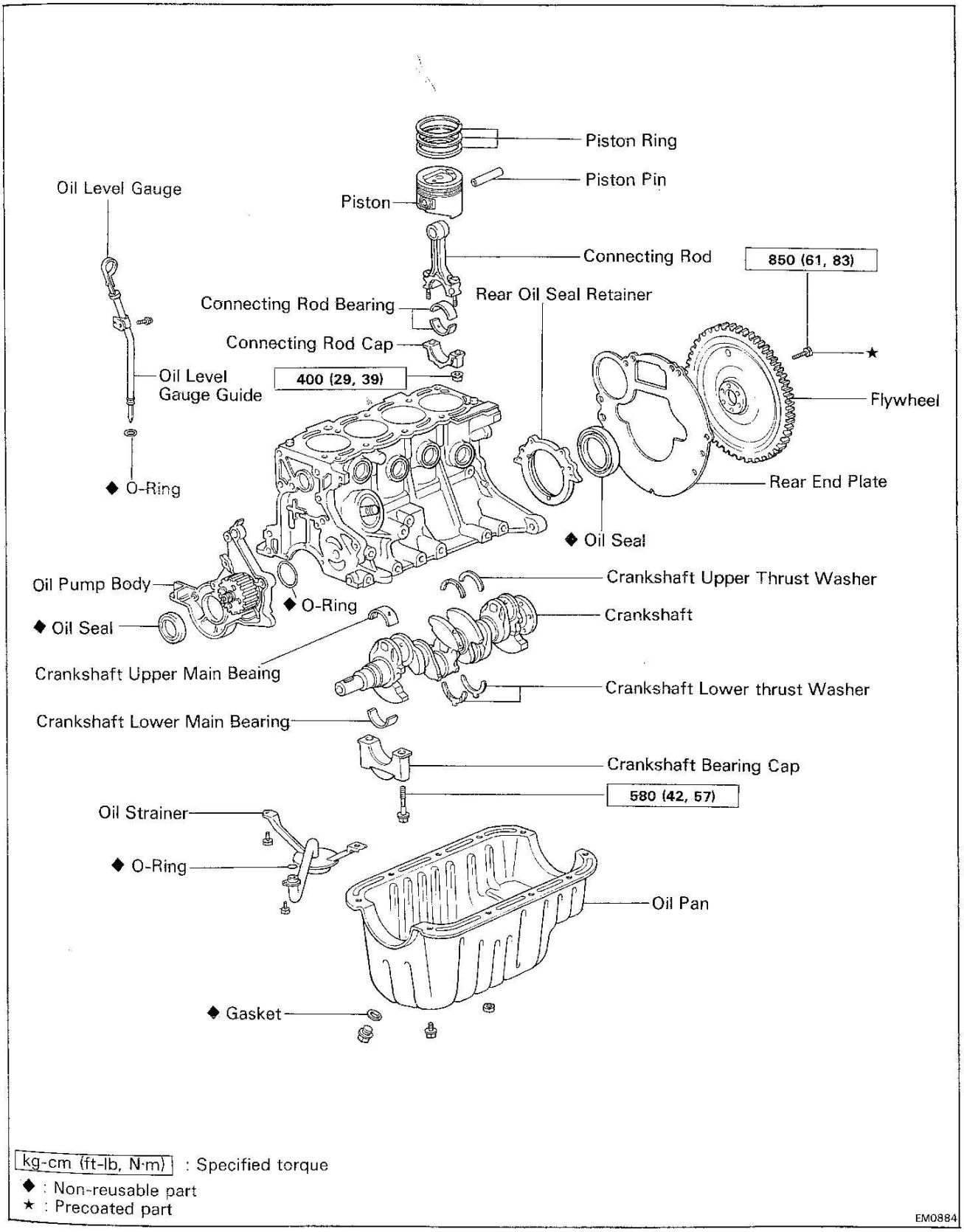
(b) Install the No. 1 and No. 2 engine hangers tighten the bolts.

Torque:

No. 1 210 kg-cm (15 ft-lb, 21 N·m)
No. 2 440 kg-cm (32 ft-lb, 43 N·m)

CYLINDER BLOCK

COMPONENTS



kg-cm (ft-lb, N·m) : Specified torque
◆ : Non-reusable part
★ : Precoated part

EM0884

PREPARATION FOR DISASSEMBLY

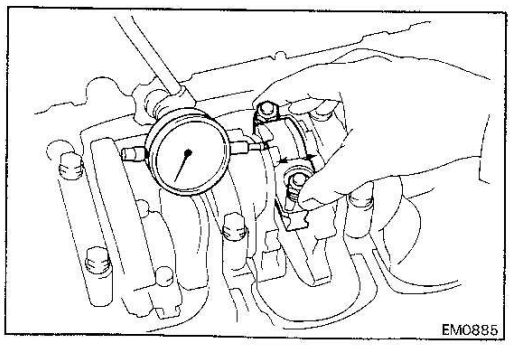
1. REMOVE CLUTCH COVER AND DISC(M/T only)
2. REMOVE FLYWHEEL OR DRIVE PLATE
3. REMOVE REAR END PLATE
4. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY
5. REMOVE TIMING BELT
   (See steps 1 to 10 on page EM-16 to 18)
6. DISCONNECT WATER INLET HOSE FROM WATER OUTLET HOUSING
7. DISCONNECT WATER INTAKE MANIFOLD HOSE AND WATER BY-PASS HOSES FROM WATER PUMP AND INLET PIPE
8. REMOVE CYLINDER HEAD
   (See step 13 on page EM-29)
9. REMOVE WATER PUMP WITH BY-PASS PIPE
   (See steps 2, 3 and 6 on pages CO-4 and 5)
10. REMOVE OIL PAN, STRAINER AND PUMP
    (See steps 2 to 7 on pages LU-4 and 5)
11. REMOVE ENGINE MOUNT RH

DISASSEMBLY OF CYLINDER BLOCK

(See page EM-45)

1. REMOVE REAR OIL SEAL RETAINER

   Remove four bolts, rear oil seal retainer.



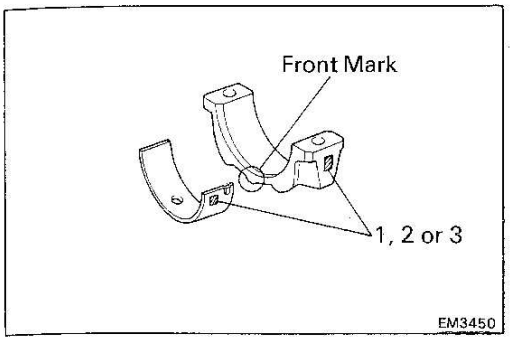
2. MEASURE CONNECTING ROD THRUST CLEARANCE

   Using a dial indicator, measure the thrust clearance while moving the rod back and forth.

   Standard thrust clearance: 0.15 — 0.35 mm (0.0059 — 0.0138 in.)

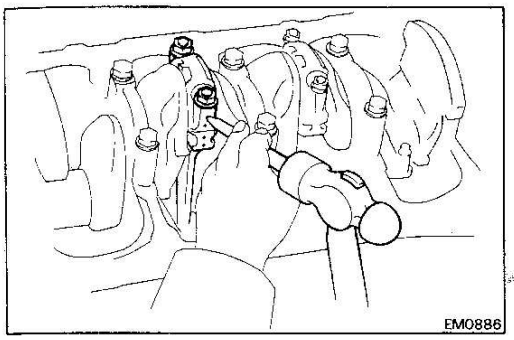
   Maximum thrust clearance: 0.45mm (0.0177 in.)

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

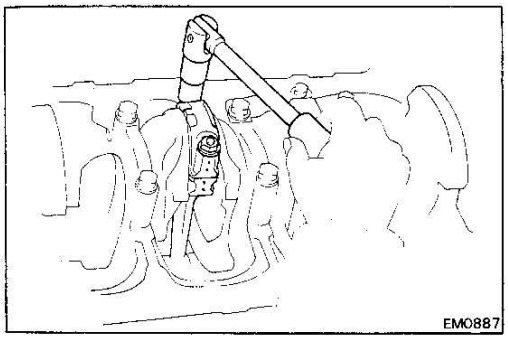


3. REMOVE ROD CAPS AND MEASURE OIL CLEARANCE

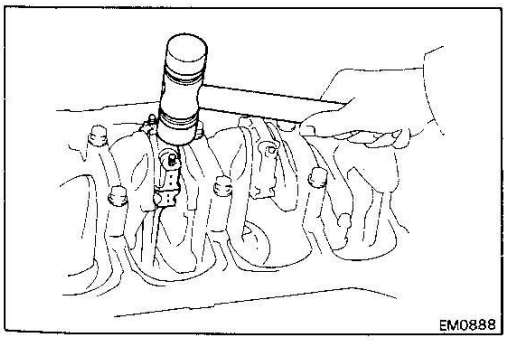
NOTE: If replacing the bearing, replace with one having the same number as marked on the bearing cap.
There are three sizes of standard bearings supplied, marked 1, 2 or 3 respectively.



(a) Using a punch or numbering stamp, place the matchmarks on the rod and cap to ensure correct assembly.

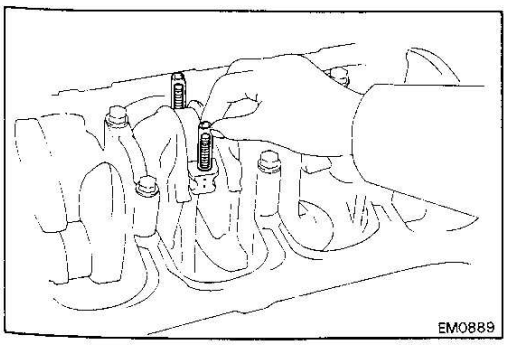


(b) Remove the rod cap nuts.

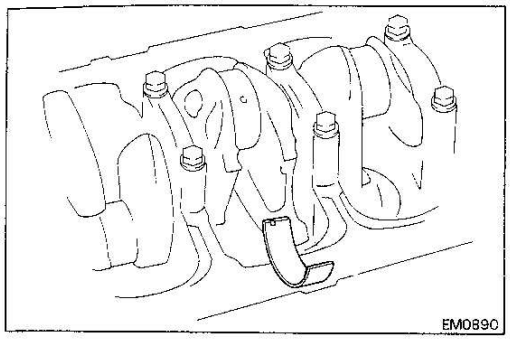


(c) Using a plastic-faced hammer, lightly tap the connecting rod bolt and lift off the cap and lower bearing.

NOTE: Keep the lower bearing inserted with the cap.



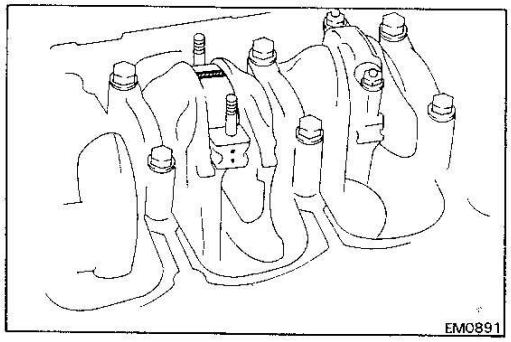
(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.


EM0890

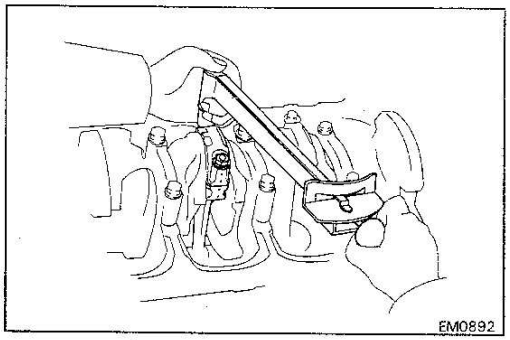
(e) Clean the crank pin and bearing.

(f) Check the crank pin and bearing for pitting and scratches.

If the crank pin or bearing are damaged, grind or replace the crankshaft and replace bearing.


EM0891

(g) Lay a strip of Plastigage across the crankshaft pin.


EM0892

(h) Aligh the punched marks on the rod and cap. Install and torque the cap nuts alternately, in two or three passes.

Torque: 400 kg-cm (29 ft-lb, 39 N·m)

NOTE:

- Do not turn the crankshaft.
- Apply a light coating of engine oil on the nut threads and under the nut before installation.

(i) Remove the rod cap. (See procedure (b) and (c) above.)

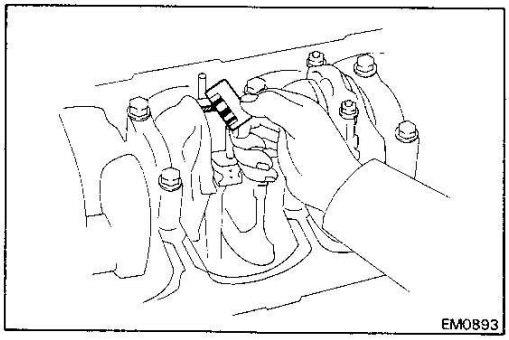
(j) Measure the Plastigage at its widest point.

Standard clearance: 0.016 – 0.048 mm (0.0006 – 0.0019 in.)

Maximum clearance: 0.08 mm (0.0031 in.)

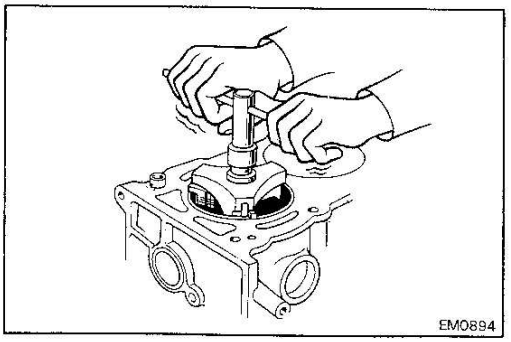
If the clearance is greater than the maximum, replace the bearing. Grind the crankshaft pins or replace the crankshaft as required.

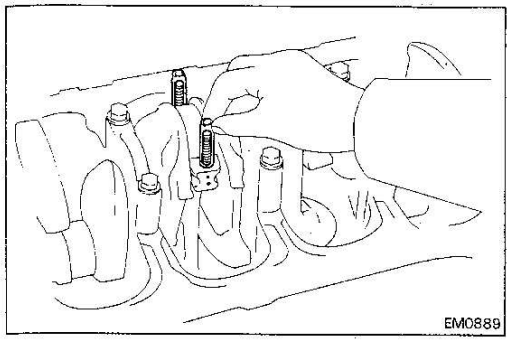
(k) Completely remove the Plastigage.


EM0893

4. PUSH OUT PISTON AND CONNECTING ROD ASSEMBLIES

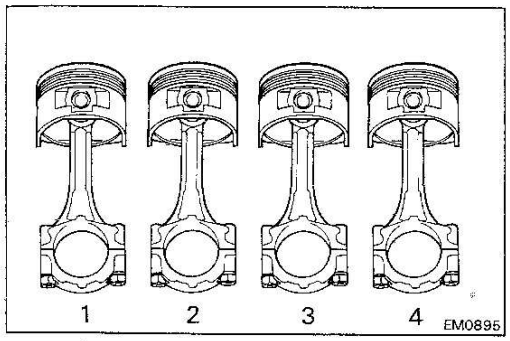
(a) Remove all the carbon from the piston ring ridge.


EM0894

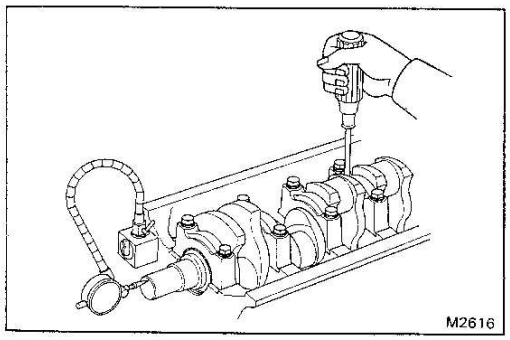


(b) Cover the rod bolts with a short piece of hose to protect the crankshaft from damage.

(c) Push out the piston and connecting rod assembly and the upper bearing through the top of the cylinder block.



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



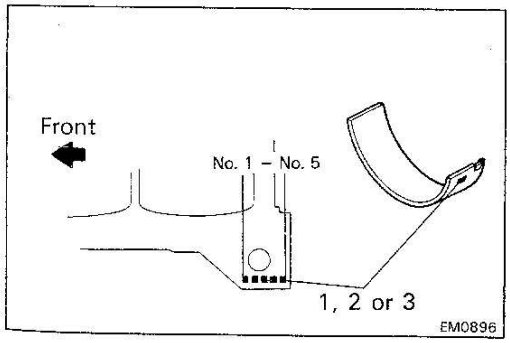
5. CHECK CRANKSHAFT THRUST CLEARANCE

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

Standard thrust clearance: 0.02 — 0.22 mm (0.0008 — 0.0087 in.)
Maximum thrust clearance: 0.3 mm (0.012 in.)

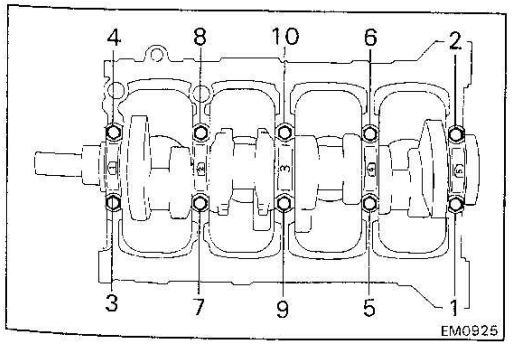
If the clearance is greater than maximum, replace the thrust washers as a set.

Over size thrust washer: O/S 0.125

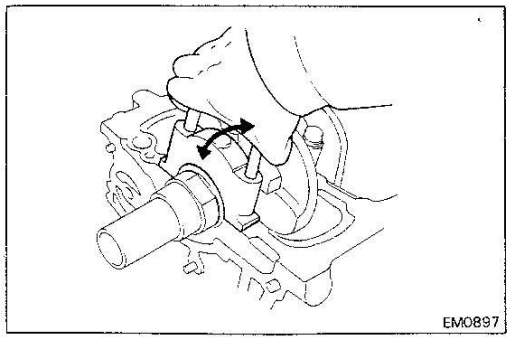


6. REMOVE BEARING CAPS AND MEASURE OIL CLEARANCE

NOTE: If replacing the bearing, replace with one having the same number as marked on the cylinder block.
There are three sizes of standard bearings, marked with a 1, 2 or 3 accordingly. Be sure to recheck the oil clearance after installing a new bearing.



(a) Gradually loosen and remove the bearing cap bolts in three passes and in the numerical order shown.


EM0897

(b) Using the removed bearing cap bolts, pry the bearing cap fore and aft, and remove it with the lower bearing and thrust washers (No. 3 journal only).

NOTE:
- Keep the lower bearing inserted with the cap.
- Arrange the caps and lower thrust washers in correct order.

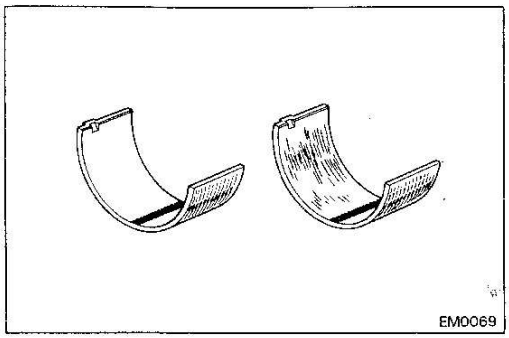
(c) Lift off the crankshaft.

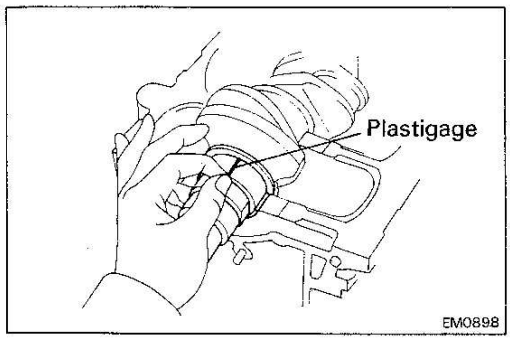
NOTE: Keep the upper bearings and upper thrust washers (for the No. 3 journal only) inserted in the cylinder block.

(d) Clean the journals and bearings.

(e) Check the journals and bearings for pitting and scratiches.

If the journal or bearing is damaged, grind or replace the crankshaft and replace the bearing.

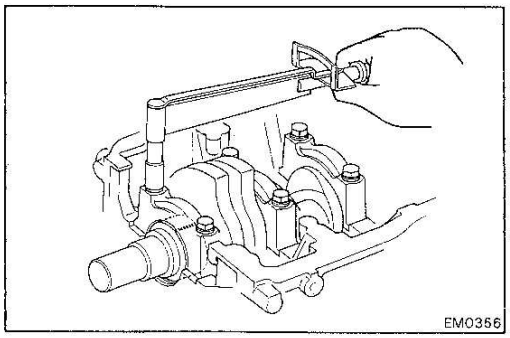

EM0069



EM0898

(f) Place the crankshaft on the cylinder block.

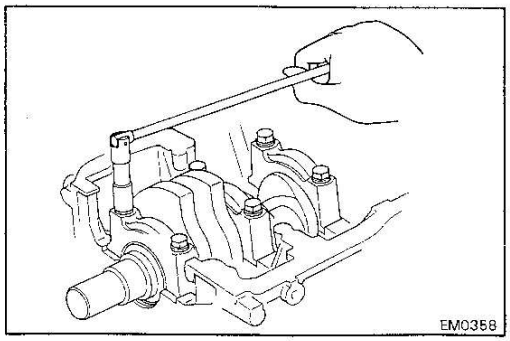
(g) Lay a strip of plastigage across each journal.


EM0356

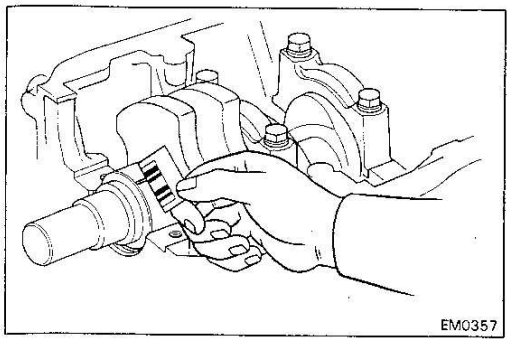
(h) Install the bearing caps with the lower bearing and lower thrust washers.
(See step 4 on page EM-62)

Torque: 580 kg-cm (42 ft-lb, 57 N·m)

NOTE: Do not turn the crankshaft.


EM0358

(i) Remove the bearing caps with the lower bearing and lower thrust washers.
(See procedure (a) and (b) above)

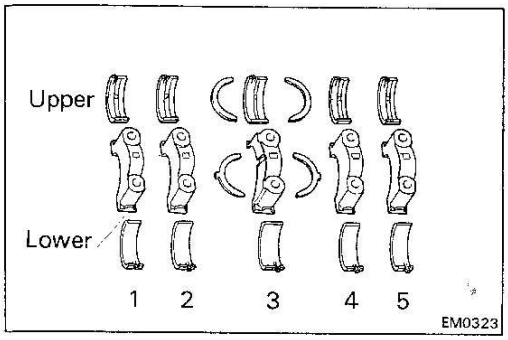

EM0357

(j) Measure the Plastigage at its widest point.

Standard clearance: 0.016 – 0.049 mm (0.0006 – 0.0019 in.)
Maximum clearance: 0.08 mm (0.0031 in.)

If the clearance is greater than the maximum, replace the bearings. Grind the journals or replace the crankshaft as required.

(k) Completely remove the plastigage from the bearing and journals.



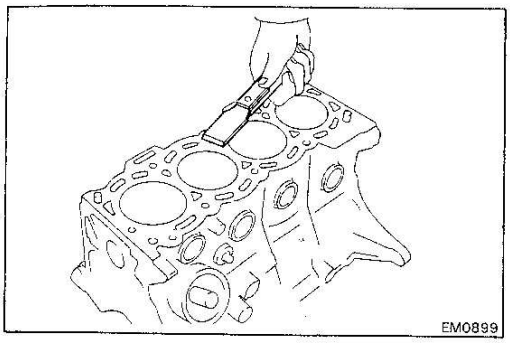
EM0323

7. REMOVE CRANKSHAFT

(a) Remove the crankshaft.

(b) Remove the upper bearings and upper thrust washers from the cylinder block.

NOTE: Arrange the caps, bearings and thrust washers in correct order.



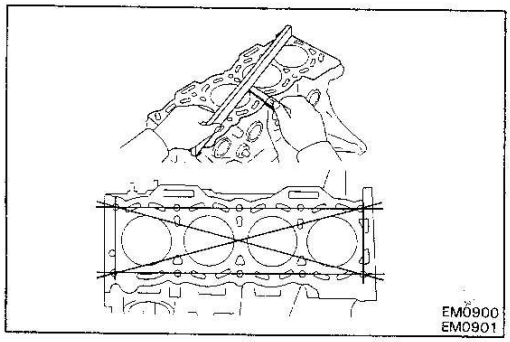
INSPECTION OF CYLINDER BLOCK

1. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all gasket material from the cylinder block surface.

2. CLEAN CYLINDER BLOCK

Using a soft brush and solvent, clean the block.

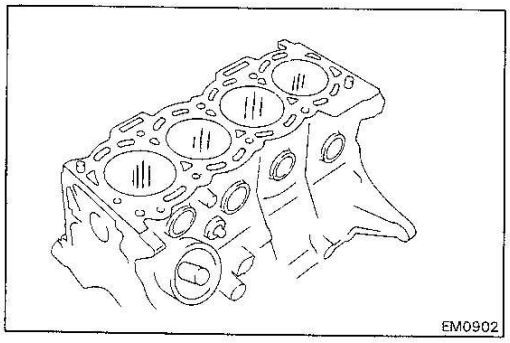


3. INSPECT TOP OF BLOCK

Using a precision straight edge and feeler gauge, check the surface contacting the cylinder head gasket for warpage.

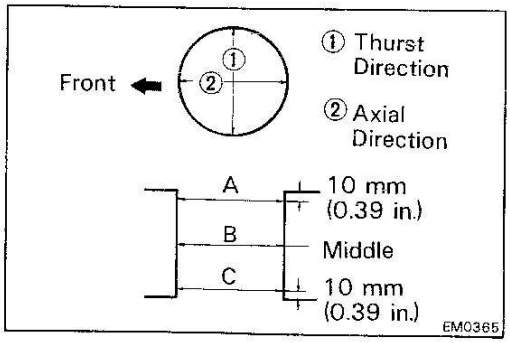
Maximum warpage: 0.05 mm (0.0020 in.)

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



4. INSPECT CYLINDERS

Visually inspect cylinders for vertical scratches. If deep scratches are present, rebore all four cylinders.
(See page EM-57)

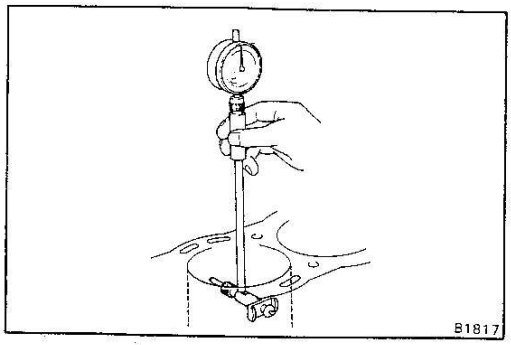


5. MEASURE CYLINDER BORE

Using a cylinder micrometer, measure the cylinder bore at positions A, B and C in the thrust and axial directions.

Standard diameter

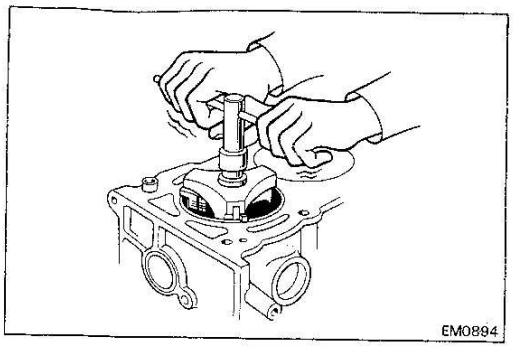
Piston size	Cylinder bore mm (in.)	
	1E	2E
STD	70.50 – 70.53 (2.7756 – 2.7768)	73.00 – 73.03 (2.8740 – 2.8752)
O/S 0.25	70.75 – 70.78 (2.7854 – 2.7866)	73.25 – 73.28 (2.8839 – 2.8850)



Maximum diameter

Piston size	Cylinder bore mm (in.)	
	1E	2E
STD	70.73 (2.7846)	73.23 (2.8831)
O/S 0.25	70.98 (2.7945)	73.48 (2.8929)

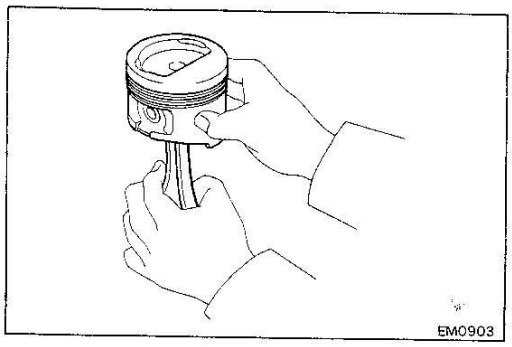
If the diameter is greater than maximum, rebore all four cylinders. If necessary replace cylinder block.



6. REMOVE CYLINDER RIDGE

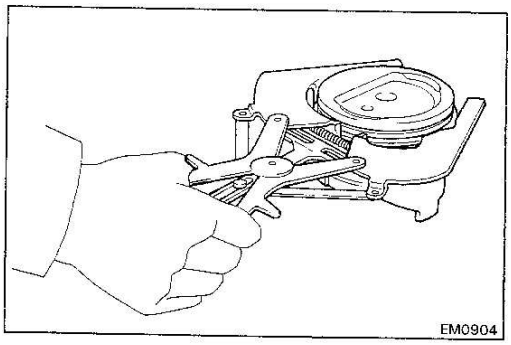
If the wear is less than 0.2 mm (0.008 in.), use a ridge reamer to machine the piston ring ridge at the top of the cylinder.

DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES



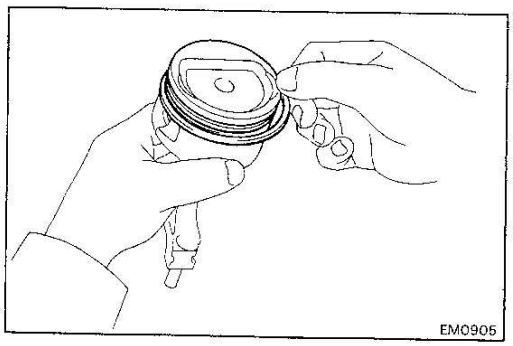
1. CHECK FIT BETWEEN PISTON AND PIN

Try to move the piston back and forth on the piston pin. If any movement is felt, replace the piston and pin as set.



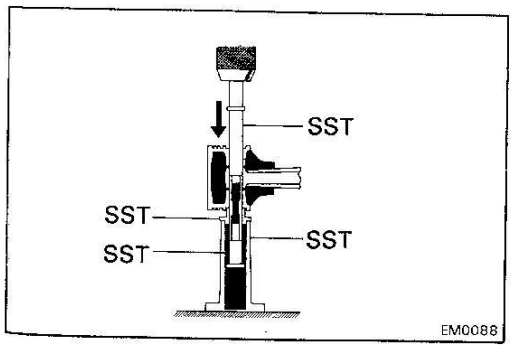
2. REMOVE PISTON RINGS

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



(b) Remove the two side rails and oil ring expander by hand.

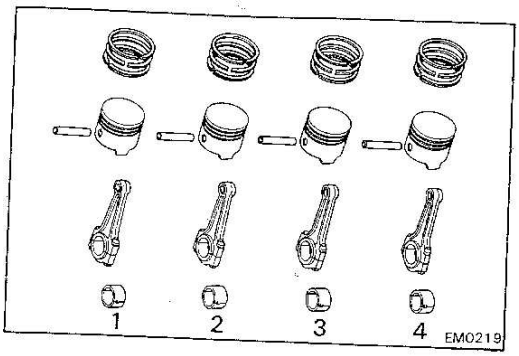
NOTE: Arrange the rings in the correct order.



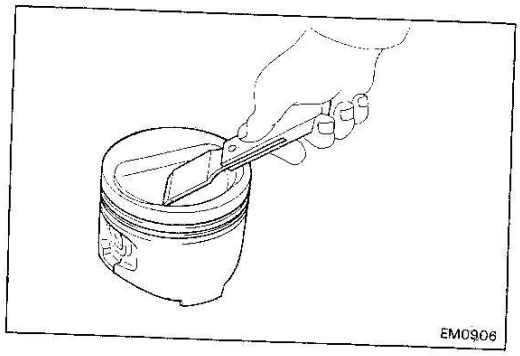
3. DISCONNECT CONNECTING ROD FROM PISTON

Using SST, press out the pin from the piston.

SST 09221-25018



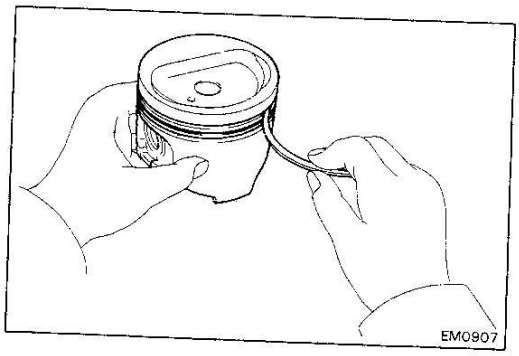
NOTE:
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearing in correct order.



INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLIES

1. CLEAN PISTON

(a) Using a gasket scraper, remove the carbon from the piston top.



(b) Using a groove cleaning tool or broken ring, clean the ring grooves.

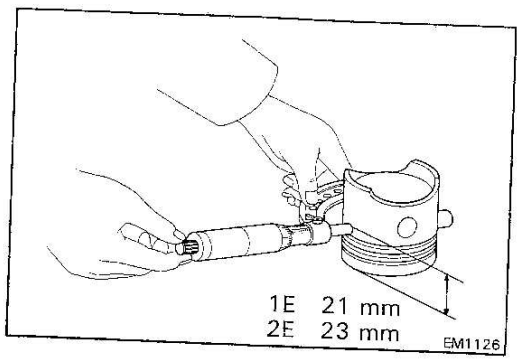
(c) Using a soft brush and solvent, thoroughly clean the piston.

CAUTION: Do not damage the piston.

2. MEASURE PISTON DIAMETER

(a) Using a micrometer and with the piston upside down, measure the piston diameter at right angles to the piston pin the indicated distance from the top edge of the piston.

1E 21 mm (0.83 in.)
2E 23 mm (0.91 in.)



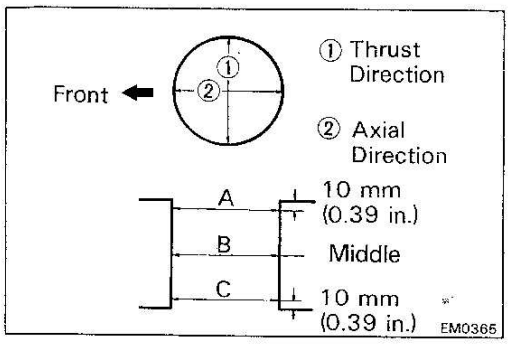
Piston diameter:

1E

STD	**70.41 – 70.44 mm (2.7720 – 2.7732 in.)**
O/S 0.25	**70.66 – 70.69 mm (2.7819 – 2.7831 in.)**

2E

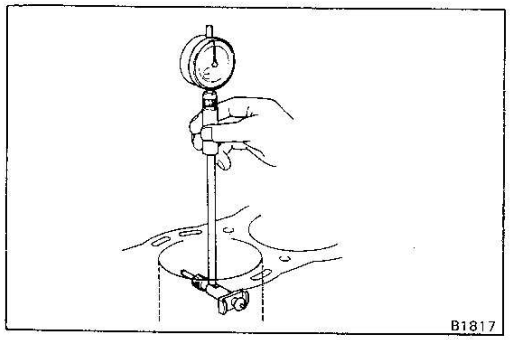
STD	**72.91 – 72.94 mm (2.8705 – 2.8716 in.)**
O/S 0.25	**73.16 – 73.19 mm (2.8803 – 2.8815 in.)**

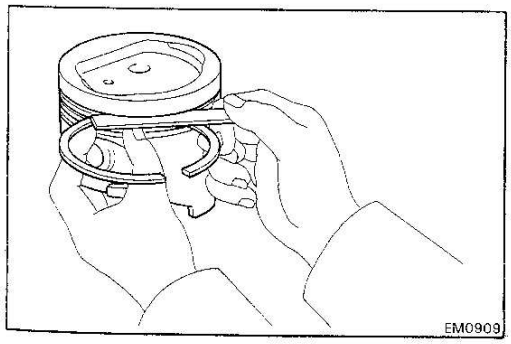


(b) Measure the cylinder bore diameter in thrust directions (See page EM-52) and subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:
0.08 – 0.10 mm (0.0031 – 0.0039 in.)
Maximum oil clearance: 0.20 mm (0.0079 in.)

If the oil clearance is greater than maximum, replace all four pistons. Regrind all four cylinders or replace the cylinder block if necessary.



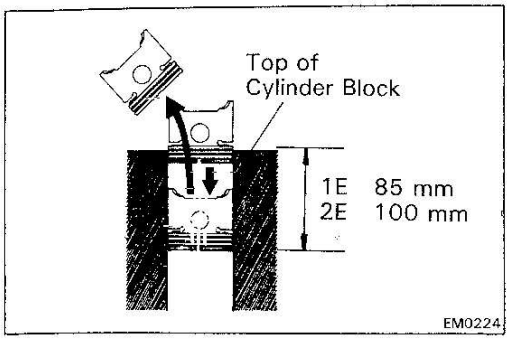


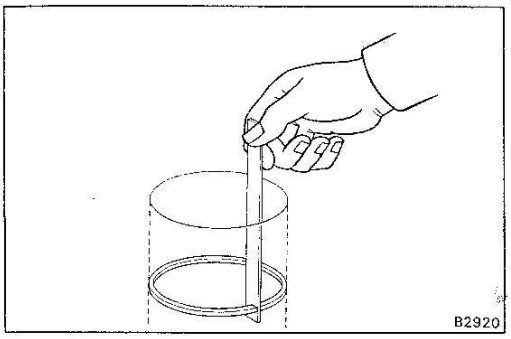
3. INSPECT PISTON RING GROOVE CLEARANCE

Using a feeler gauge, measure the clearance between the new piston ring and the ring land.

Piston ring groove clearance:
No. 1 0.04 – 0.08 mm (0.0016 – 0.0031 in.)
No. 2 0.03 – 0.07 mm (0.0012 – 0.0028 in.)

If the clearance is not within specification, replace the piston.





4. INSPECT PISTON RING END CAP

(a) Insert the piston ring into the cylinder.

(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel to the following depth from the top of the cylinder block.

Depth

1E 85 mm (3.35 in.)
2E 100 mm (3.94 in.)

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

1E

Piston ring end gap mm (in.)

	Standard	Maximum
No. 1	0.25 – 0.48 (0.0058 – 0.0189)	1.08 (0.0425)
No. 2	0.15 – 0.43 (0.0059 – 0.0169)	1.03 (0.0406)
Oil	0.20 – 0.83 (0.0079 – 0.0327)	1.43 (0.0563)

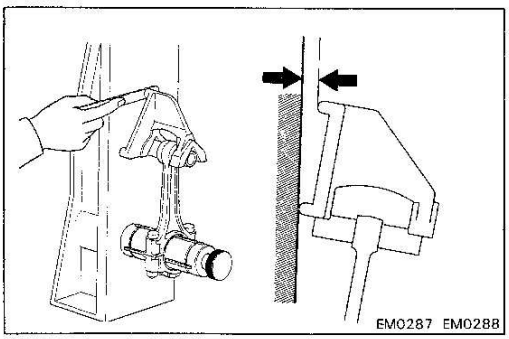
2E

Piston ring end gap mm (in.)

	Standard	Maximum
No. 1	0.26 – 0.49 (0.0102 – 0.0193)	1.09 (0.0429)
No. 2	0.15 – 0.43 (0.0059 – 0.0169)	1.03 (0.0406)
Oil	0.20 – 0.83 (0.0039 – 0.0327)	1.43 (0.0563)

If the gap exceeds the specified maximum, replace the piston ring.

If the gap exceeds the specified maximum even with a new piston ring, rebore the cylinder and use an O/S piston ring.



5. INSPECT CONNECTING RODS

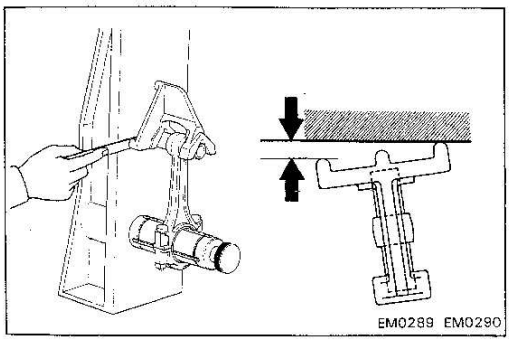
Using a rod aligner, check the connecting rod alignment.

(a) Check for bend.

Maximum bend:

0.03 mm (0.0012 in.) per 100 mm (3.94 in.)

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



(b) Check for twist.

Maximum twist:

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

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

NOTE: If replacing the connecting rods, replace the same number of connecting rod bearings as that of new connecting rod caps.

BORING OF CYLINDERS

NOTE:
- Bore all four cylinders for the oversized piston outside diameter.
- Replace the piston rings with ones matching the pistons.

1. **SELECT OVERSIZED PISTON**

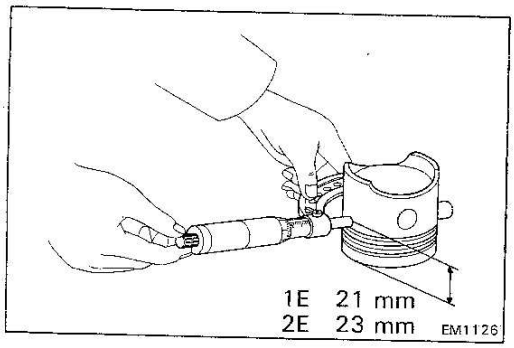
Oversized piston diameter:

1E

O/S 0.25 70.66 – 70.69 mm (2.7819 – 2.7831 in.)

2E

O/S 0.25 73.16 – 73.19 mm (2.8803 – 2.8815 in.)



2. **CALCULATE DIMENSION TO BORE CYLINDERS**

(a) Using a micrometer and with the piston upside down, measure the piston diameter at a right angle to the piston pin the indicated distance from the top edge of the piston.

1E 21 mm (0.83 in.)
2E 23 mm (0.91 in.)

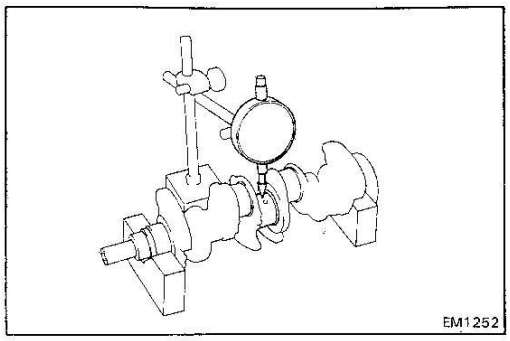
(b) Calculate the size each cylinder is to be rebored as follows.

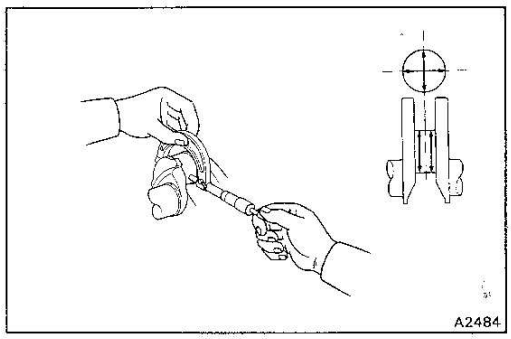
Size to be rebored = P + C – H
P = piston diameter
C = piston clearance
0.08 – 0.10 mm (0.0031 – 0.0039 in.)
H = allowance for honing
Less than 0.02 mm (0.0008 in.)

3. **BORE AND HONE CYLINDERS TO CALCULATED DIMENSIONS**

Amount of honing: 0.02 mm (0.0008 in.) maximum

CAUTION: Excess honing will destroy the finished roundness.


EM1252


A2484

INSPECTION OF CRANKSHAFT

1. MEASURE CRANKSHAFT FOR RUNOUT

(a) Place the crankshaft on V-blocks.

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

Maximum circle runout: 0.03 mm (0.0012 in.)

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

2. INSPECT MAIN JOURNALS AND CRANK PINS

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

Journal diameter: 46.985 – 47.000 mm (1.8498 – 1.8504 in.)
Crank pin diameter: 39.985 – 40.000 mm (1.5742 – 1.5748 in.)

(b) Measure the journals for out-of-round and taper as shown.

Maximum taper and out-of-round: 0.02 mm (0.0008 in.)

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

3. GRIND AND HONE MAIN JOURNAL AND/OR CRANK PIN

Grind and hone the main journals and/or crank pins to the undersized finished diameter.

Main journal finished diameter:
U/S 0.25 46.735 – 46.750 mm (1.8400 – 1.8405 in.)
Crank pin finished diametr:
U/S 0.25 39.735 – 39.750 mm (1.5644 – 1.5650 mm)

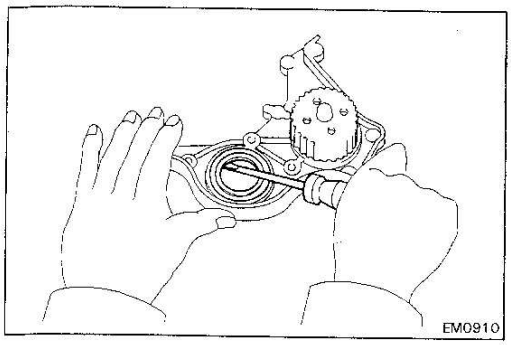
Install new main journal and/or crank pin undersize bearings.

REPLACEMENT OF OIL SEAL

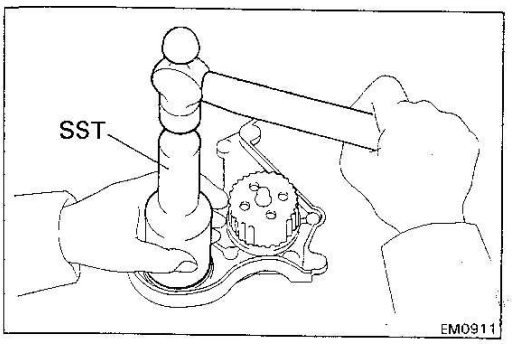
NOTE: There are two methods to replace the oil seal depending on whether the oil pump body or rear oil seal retainer is assembled to the engine or not.

1. REPLACEMENT OF FRONT OIL SEAL

(a) If the oil pump body is not installed to the cylinder block:



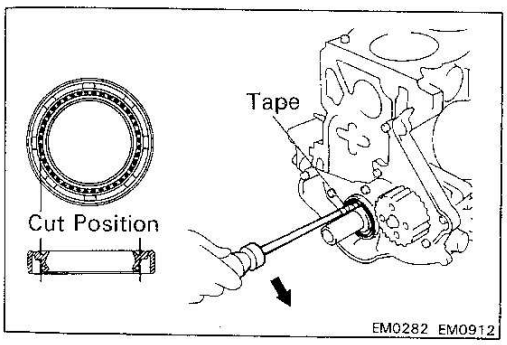
- Using a screwdriver, remove the oil seal.



- Apply multipurpose grease to a new oil seal.
- Using SST, install the new oil seal.

SST 09214-60010

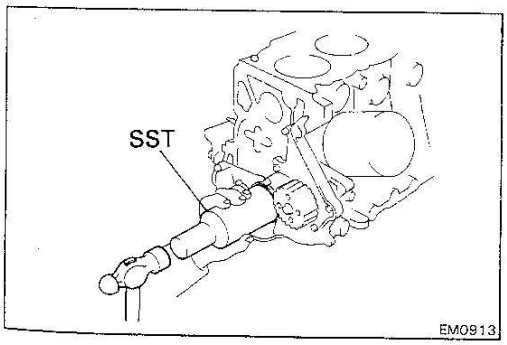
(b) If the oil pump body is installed on the cylinder block:



- Using a knife, cut off the lip of the oil seal as shown in the figure.
- Using a screwdriver, pry out the oil seal.

NOTE: Tape the screwdriver to avoid damaging the crankshaft.

- Check the oil seal lip contact surface of the crankshaft for cracks or damage.

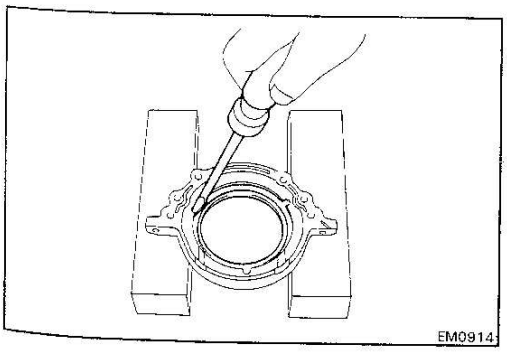


- Apply multipurpose grease to a new oil seal.
- Using SST, install a new oil seal.

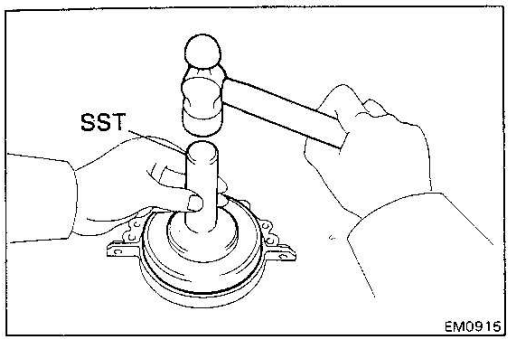
SST 09214-60010

2. REPLACEMENT OF REAR OIL SEAL

(a) If the rear oil seal retainer is not installed to the cylinder block:



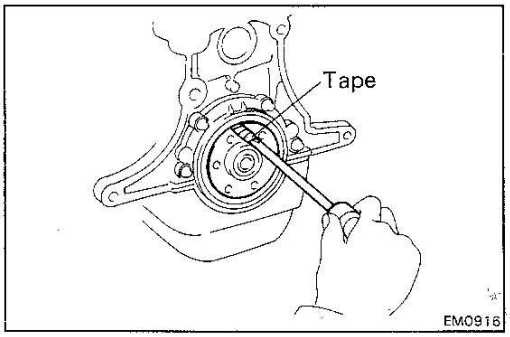
- Using a screwdriver, remove the oil seal.



- Apply multipurpose grease to a new oil seal.
- Using SST, install the new oil seal.

SST 09223-41020

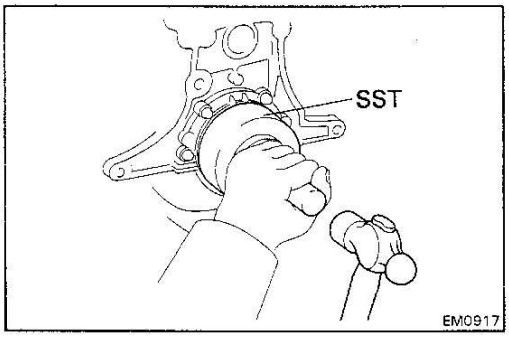
NOTE: Be careful not to install the oil seal slantwise.



(b) If the rear oil seal retainer is installed on the cylinder block:

- Using a knife, cut off the lip of oil seal.
- Using a screwdriver, pry out the oil seal.

NOTE: Tape the screwdriver to avoid damaging the crankshaft.



- Check the oil seal lip contact surface of the crankshaft for cracks or damage.
- Apply multipurpose grease to a new oil seal.
- Using SST, install the new oil seal.

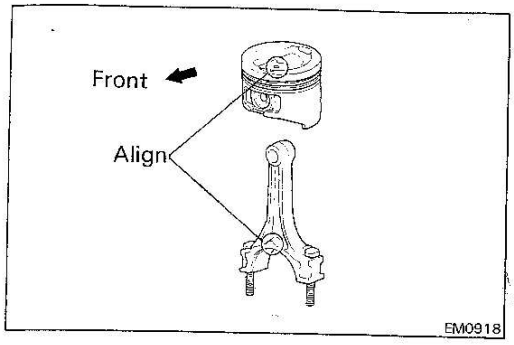
SST 09223-41020

NOTE: Be careful not to install the oil seal slantwise.

ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

1. ASSEMBLE PISTON AND CONNECTING ROD

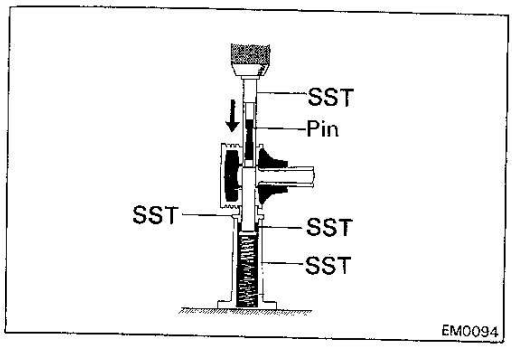
(a) Align the cavity on the piston with the protrusion or the connecting rod.



(b) Using SST, press in the piston pin.

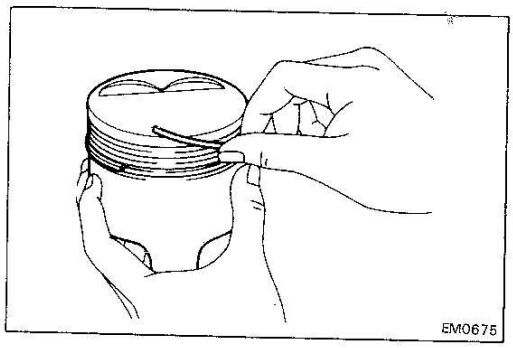
SST 09221-25018

NOTE: Coat the piston pin and hole with engine oil.

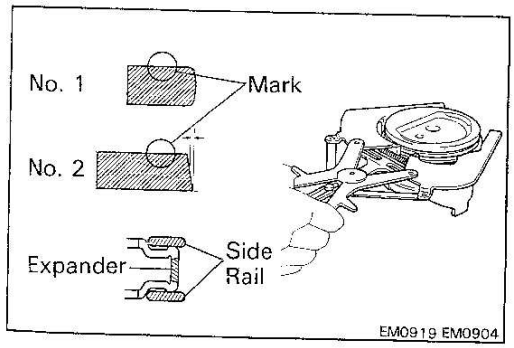


2. INSTALL PISTON RINGS

(a) Install the oil ring expander and two side rails by hand.

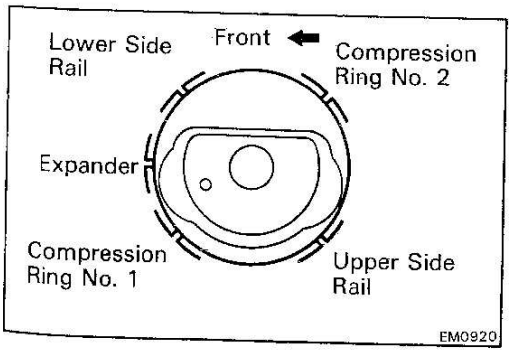


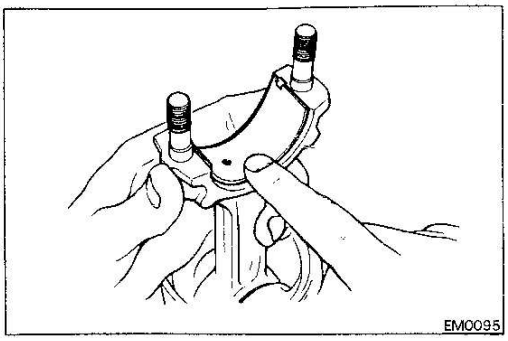
(b) Using a piston ring expander, install the two compression rings with the code mark facing upward.



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

CAUTION: Do not align the end gaps.




EM0095

3. INSTALL BERAINGS

(a) Install the bearings in the connecting rods and rod caps.

(b) Lubricate the face of the bearings with clean engine oil.

NOTE: If replacing the bearings, replace with one having the same number as marked on the bearing cap.

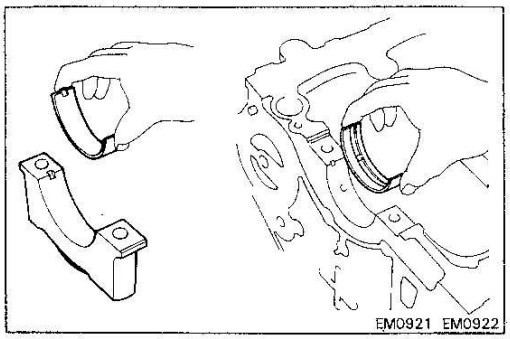
CAUTION: Install the bearing with the oil hole in the connecting rod.

INSTALLATION OF CRANKSHAFT, PISTON AND CONNECTING ROD ASSEMBLIES

(See page EM-45)

NOTE:

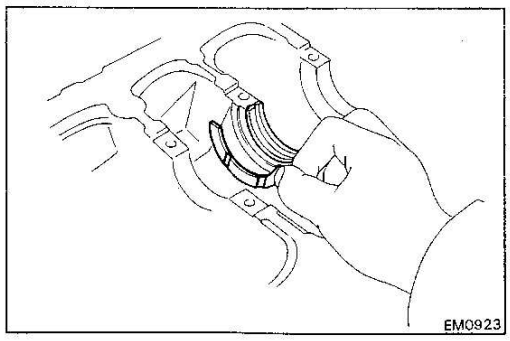
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets O-rings and oil seals with new parts.


EM0921 EM0922

1. INSTALL MAIN BEARINGS

Install the bearing in the cylinder block and bearing caps.

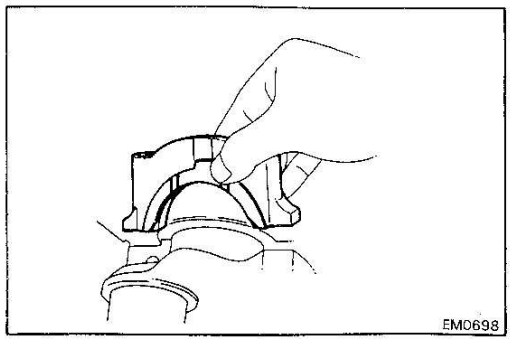
CAUTION: Install the bearing with the oil hole in the block.


EM0923

2. INSTALL UPPER THRUST WASHERS

Install the upper thrust washers on the center main bearing with the oil grooves facing outward.

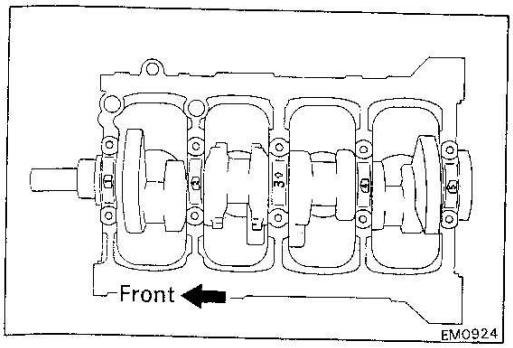
3. PLACE CRANKSHAFT IN CYLINDER BLOCK


EM0698

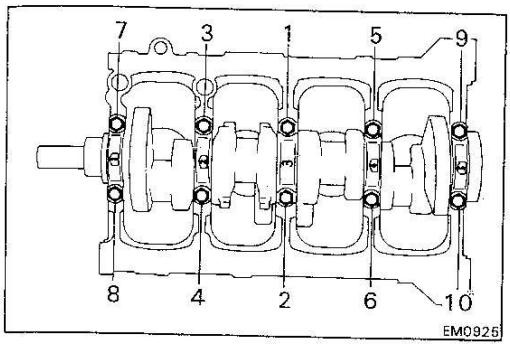
4. INSTALL MAIN BEARING CAPS

NOTE: Each bearing cap is numbered.

(a) Install the lower thrust washers on bearing cap No. 3 with the oil grooves facing outward.



(b) Install the bearing caps in numerical order with the arrows facing forward.



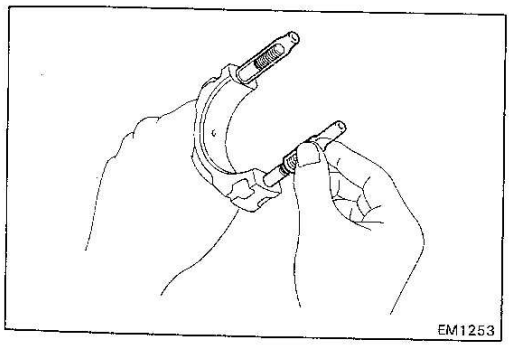
(c) Apply a light coat of engine oil on the threads and under the heads of the cap bolts.

(d) Tighten the cap bolts in two or three passes and in the sequence shown.

Torque: 580 kg-cm (42 ft-lb, 57 N·m)

(e) Check that the crankshaft turns smoothly.

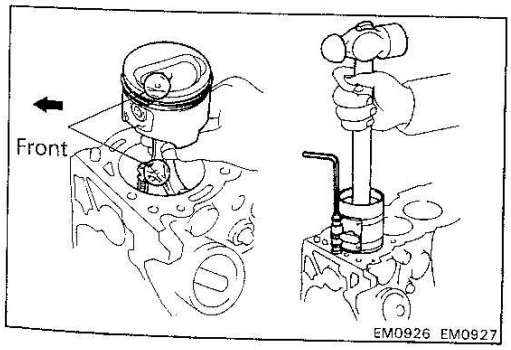
(f) Check the crankshaft thrust clearance. (See page EM-49)



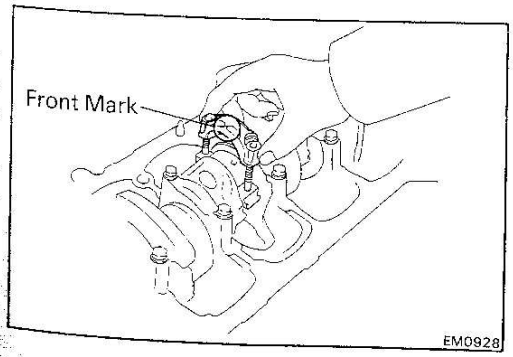
5. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

(a) Lubricate the cylinder bore and rod journals with clean engine oil.

(b) Cover the rod bolts with a short piece of hose to protect the crankshaft from damage.



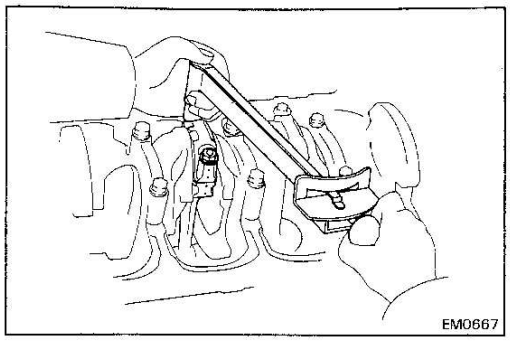
(c) Using a piston ring compressor, push the correctly numbered piston and connecting rod assembly into each cylinder with the front mark of the piston facing forward.



6. INSTALL CONNECTING ROD CAPS

(a) Match the numbered cap with the numbered connecting rod.

(b) Install the cap with the front mark facing forward.


EM0667

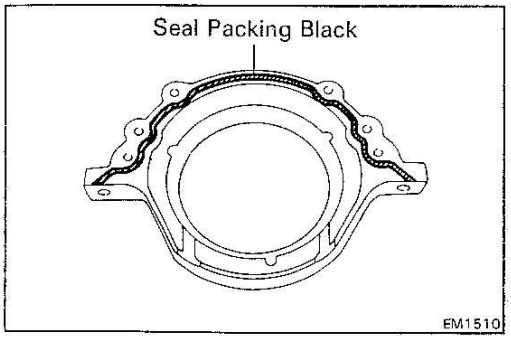
(c) Apply a light coat of the engine oil on the threads and under the heads of the rod nuts.

(d) Install and alternately tighten the cap nuts in several passes.

Torque: 400 kg-cm (29 ft-lb, 39 N·m)

(e) Check that the crankshaft turns smoothly.

(f) Check the connecting rod thrust clearance. (See page EM-46)



EM1510

7. INSTALL REAR OIL SEAL RETAINER

(a) Apply seal packing (Part No. 08826-00080) or equivalent to the oil seal retainer as shown in the figure.

NOTE: Cleaning and application of seal packing to the installation surface is the same as for the oil pan. However, use a nozzle cut to 2 mm (0.08 in.)

(b) Install the oil seal retainer with the four bolts. Torque the four bolts.

Torque: 75 kg-cm (65 in.-lb, 7.4 N·m)

ASSEMBLY OF CYLINDER BLOCK

1. INSTALL ENGINE MOUNT RH

2. INSTALL OIL PUMP, STRAINER AND OIL PAN (See steps 1 to 4 on page LU-9)

3. INSTALL WATER PUMP WITH BY-PASS PIPE (See steps 1, 4 and 5 on pages CO-10 and 11)

4. INSTALL CYLINDER HEAD (See step 1 on page EM-35)

5. CONNECT WATER INTAKE MANIFOLD HOSE AND WATER BY-PASS HOSES TO WATER PUMP AND INLET PIPE

6. CONNECT WATER INLET HOSE TO WATER OUTLET HOUSING

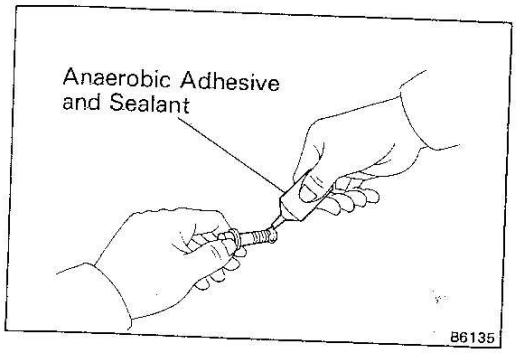
7. INSTALL TIMING BELT (See steps 2 to 13 on pages EM-21 to 25)

8. REMOVE ENGINE STAND

9. INSTALL REAR END PLATE

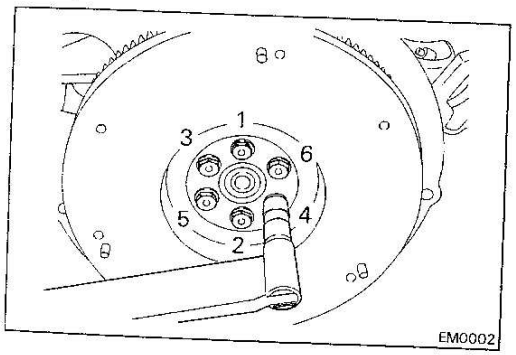
10. INSTALL FLYWHEEL OR DRIVE PLATE ON CRANKSHAFT

(a) Clean the set bolt threads and crankshaft bolt hole of any sealer, oil or foreign particles.
Remove any oil with kerosene or gasoline.



(b) Apply anaerobic adhesive and sealant* [THREE BOND 1324 (Part No. 08833-00070) or equivalent] to 2 or 3 threads of the bolt end.

* This adhesive will not harden while exposed to air. It will act as a sealer or binding agent only when applied to threads, etc. and air is cut off.



(c) Install the flywheel or drive plate on the crankshaft. Tighten the bolts to the specified torque in two or three passes in the sequence shown.

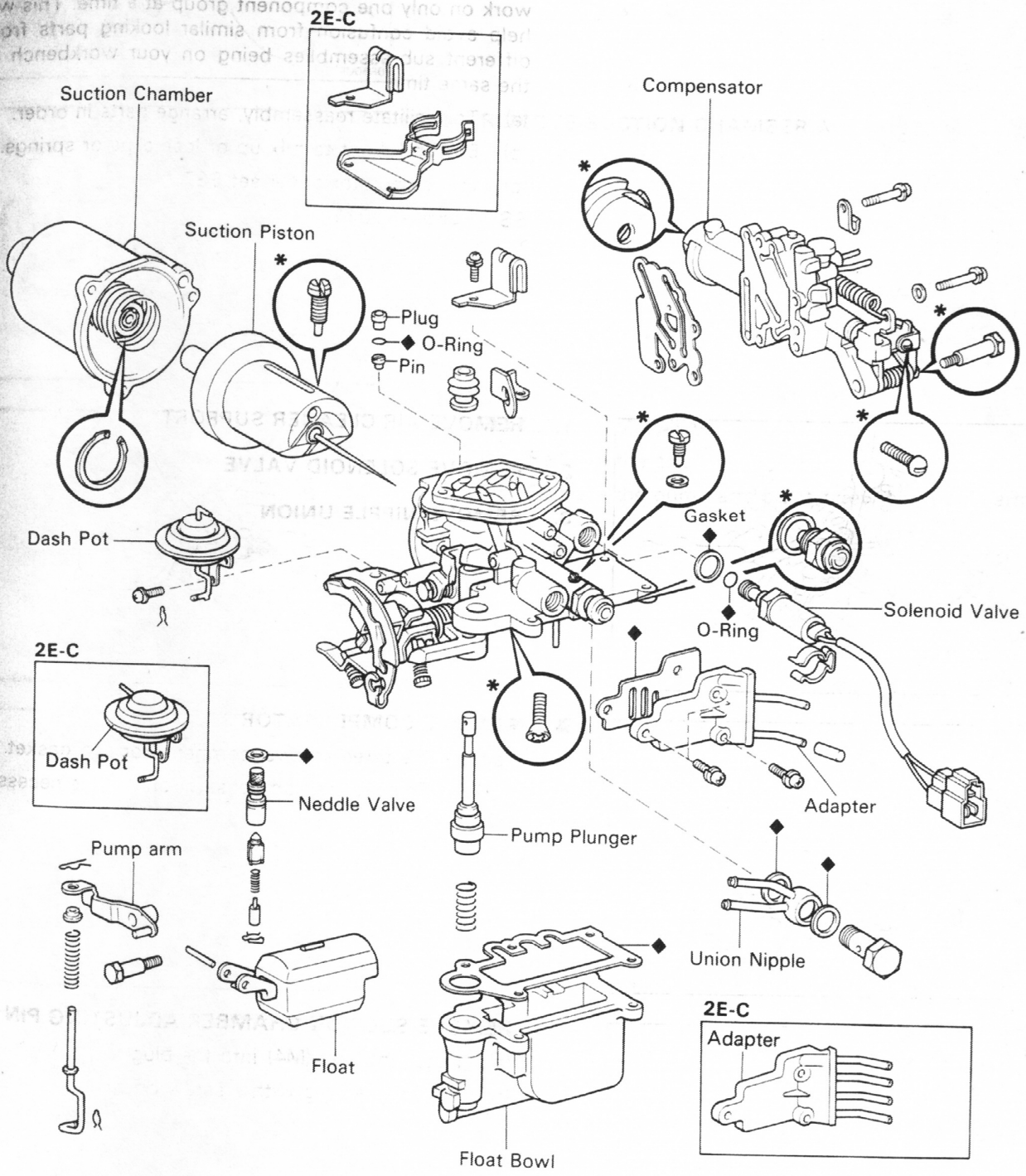
Torque: 850 kg-cm (61 ft-lb, 83 N·m)

11. INSTALL CLUTCH DISC AND COVER (M/T only)

NOTE: If necessary, inspect the clutch unit before installation.

COMPONENTS

✱ : CAUTION These components have been fincly adjusted at factory; do not disassemble or readjust.



◆ : Non-reusable part

FU0758

REMOVAL OF CARBURETOR

(See page FU-8)

DISASSEMBLY OF CARBURETOR

(See page FU-23)

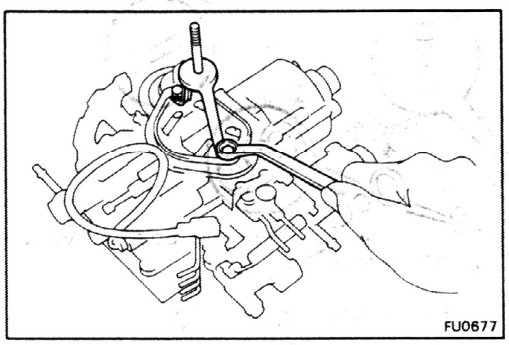
The following instructions are organized so t work on only one component group at a time. help avoid confusion from similar looking par different sub-assemblies being on your workb the same time.

(a) To facilitate reassembly, arrange parts in c

(b) Be careful not to mix up or lose clips or sp

(c) Use carburetor driver set SST.

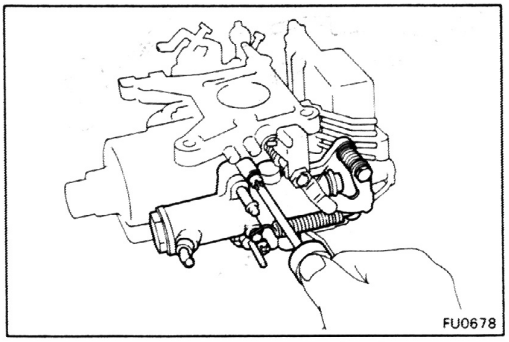
SST 09860-11011



1. REMOVE AIR CLEANER SUPPORT

2. REMOVE SOLENOID VALVE

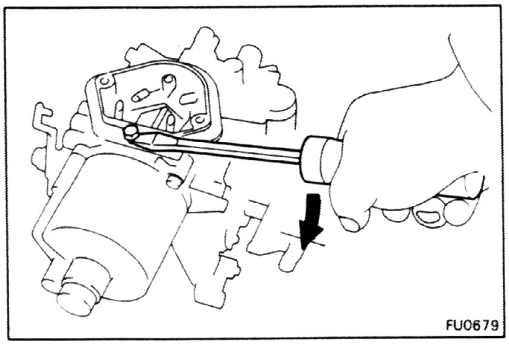
3. REMOVE NIPPLE UNION



4. REMOVE COMPENSATOR

Remove the three screws, compensator and ga

NOTE: Remove the compensator only if it is n to replace it.

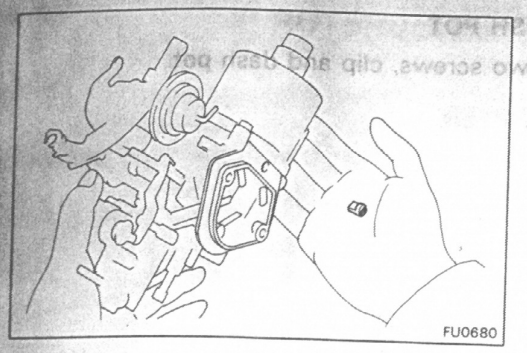


5. REMOVE SUCTION CHAMBER ADJUSTING S

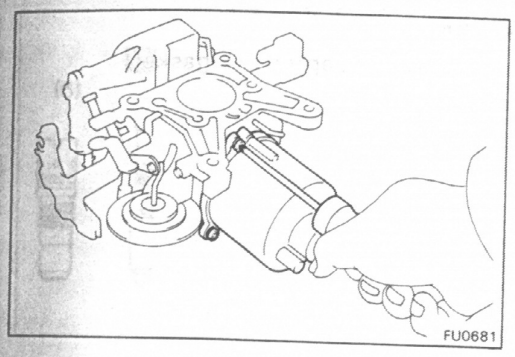
(a) Install the bolt (M4) into the plug.

(b) Pry off the plug with a screw driver.

(c) Remove the O-ring.



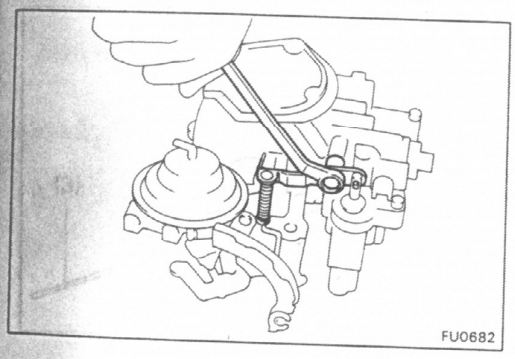
(d) Turn the carburetor over and shake the pin out.



6. REMOVE SUCTION CHAMBER AND PISTON

(a) Remove the three screws.

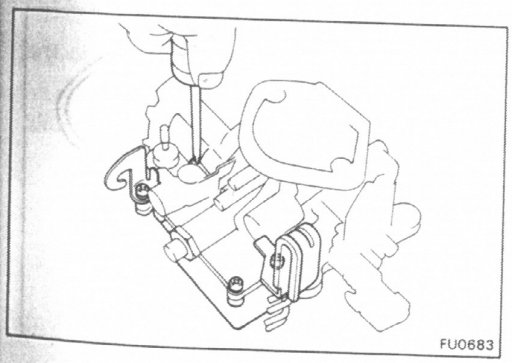
(b) Pull out the suction chamber, spring and piston from carburetor body.



7. REMOVE PUMP ARM

(a) Remove the crip.

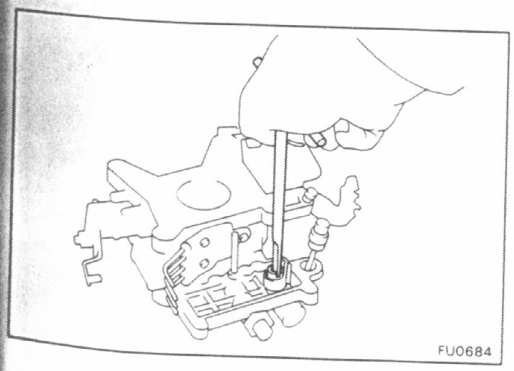
(b) Remove the pump arm pivot screw and pump arm.



8. REMOVE FLOAT BOWL

(a) Remove the four screws, union nipple clamp, solenoid valve clamp, float bowl and gasket.

(b) Remove the pump damping spring from float bowl.

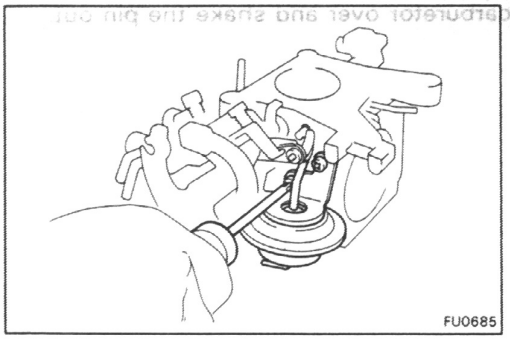


9. REMOVE FLOAT AND NEEDLE VALVE

(a) Remove the float pivot pin, float and needle valve subassembly.

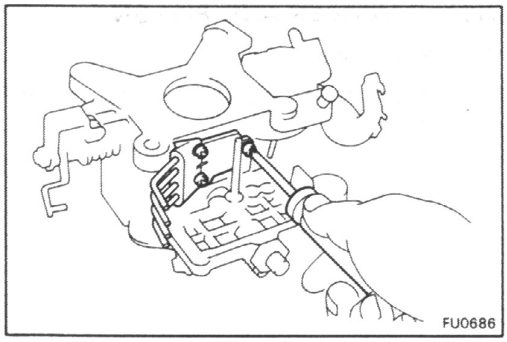
(b) Remove the needle valve seat and gasket.

10. REMOVE PUMP PLUNGER AND BOOTS



11. REMOVE DASH POT

Remove the two screws, clip and dash pot.



12. REMOVE ADAPTER

Remove the three screws, adapter and gasket.

GENERAL CLEANING PROCEDURE

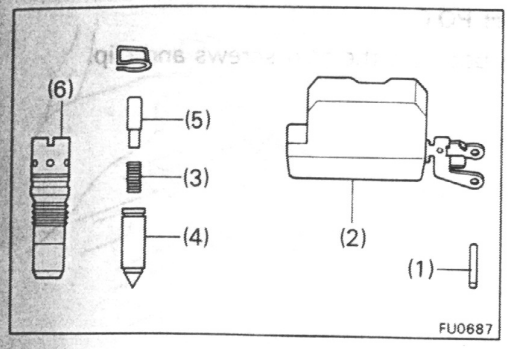
CLEAN DISASSEMBLED PARTS BEFORE INSPECTION

(a) Wash and clean the cast parts with a soft brush in carburetor cleaner.

(b) Clean off the carbon around the throttle valve.

(c) Wash the other parts thoroughly in carburetor cleaner.

(d) Blow all dirt and other foreign matter from the jets, fuel passages and restrictions in the body.



INSPECTION OF CARBURETOR

1. INSPECT FLOAT AND NEEDLE VALVE

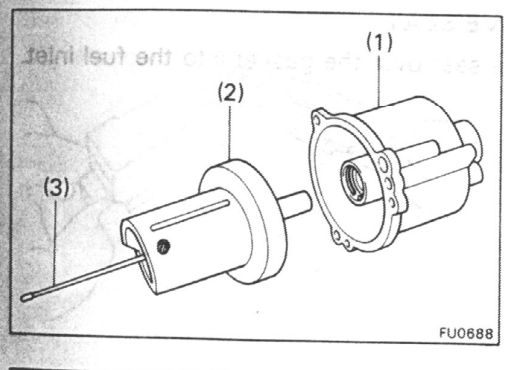
(a) Inspect the pivot pin (1) for scratches and excessive wear.

(b) Inspect the float (2) for broken lips and wear in the pivot pin holes.

(c) Inspect the spring (3) for breaks and deformation.

(d) Inspect the needle valve (4) and plunger (5) for wear or damage.

(e) Inspect the strainer (6) for rust and breaks.



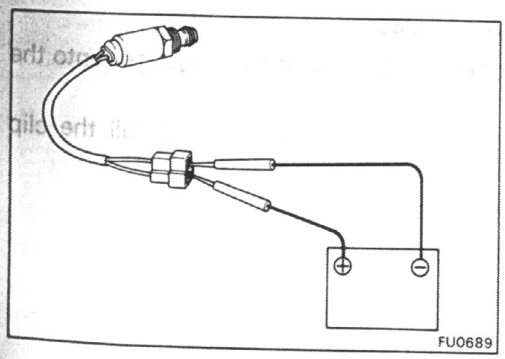
2. INSPECT SUCTION CHAMBER AND PISTON

(a) Inspect the suction chamber (1) for damage and scratches in the suction chamber.

(b) Inspect the suction piston (2) for damage and wear.

(c) Inspect metering needle (3) for damage and wear.

CAUTION: Do not disassemble suction piston and metering needle.



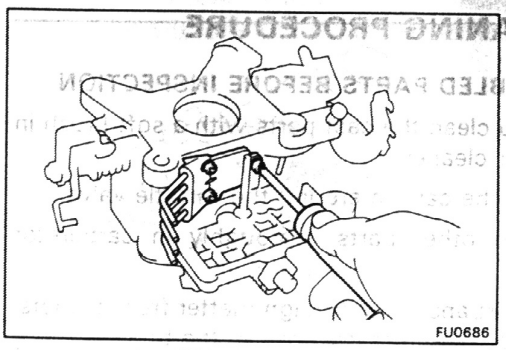
3. INSPECT SOLENOID VALVE

(a) Connect the solenoid valve body and terminal to the battery terminals.

(b) You should feel the click from the solenoid valve when the battery power is connected and disconnected.

If the solenoid valve is not operating properly, replace it.

(c) Replace the O-ring.

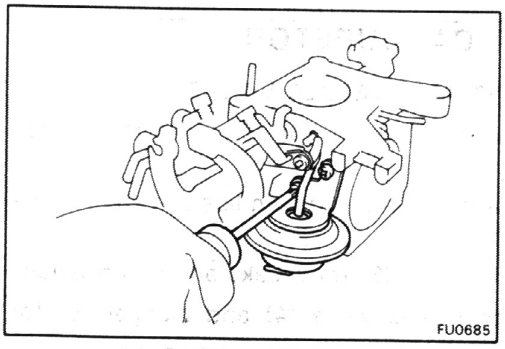

FU0686

ASSEMBLY OF CARBURETOR

(See page FU-23)

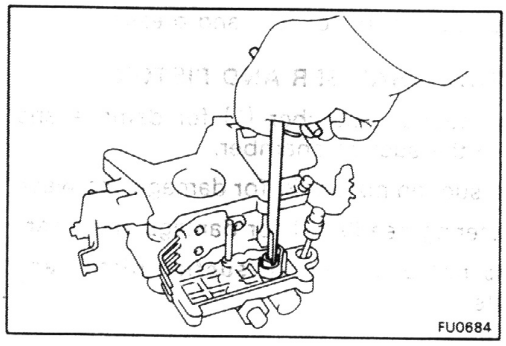
1. INSTALL ADAPTER

Install a new gasket and adapter with the three


FU0685

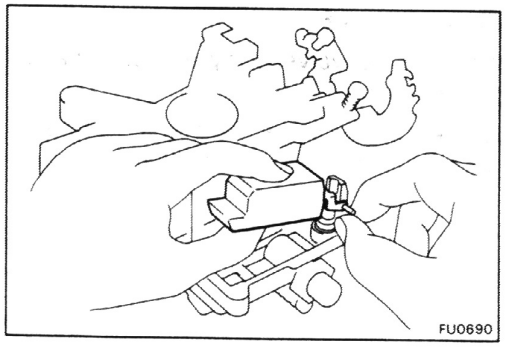
2. INSTALL DASH POT

Install the dash pot with the two screws and clip


FU0684

3. INSTALL VALVE SEAT

Install the valve seat over the gasket into the fue

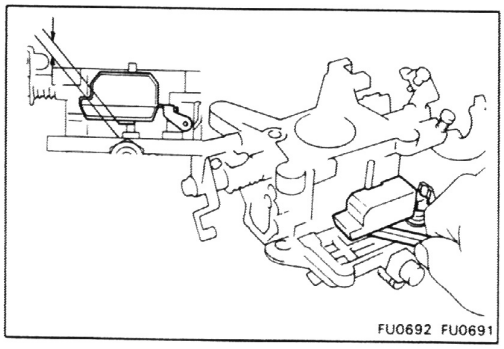

FU0690

4. ADJUST FLOAT LEVEL

(a) Install the needle valve, spring and plunger or seat.

NOTE: After adjusting the float level, install th onto the needle valve.

(b) Install the float and pivot pin.


FU0692 FU0691

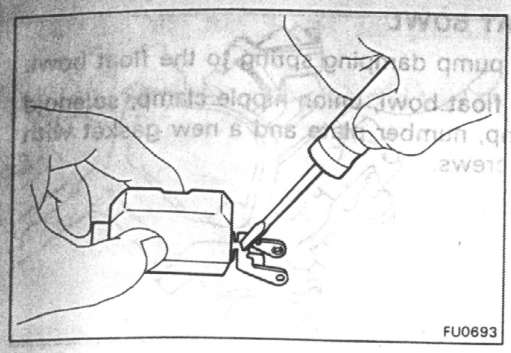
(c) Allow the float to hang down by its own weig Using SST, check the clearance between the tip and carburetor body.

SST 09240-00014

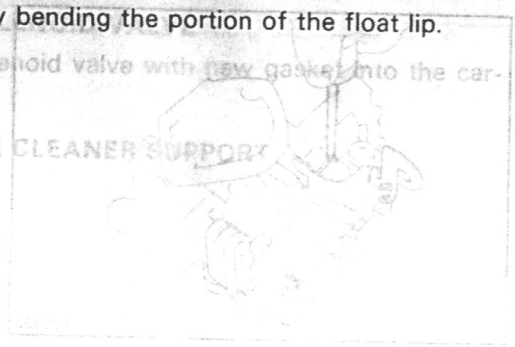
NOTE: This measurement should be made witho gasket on the air horn.

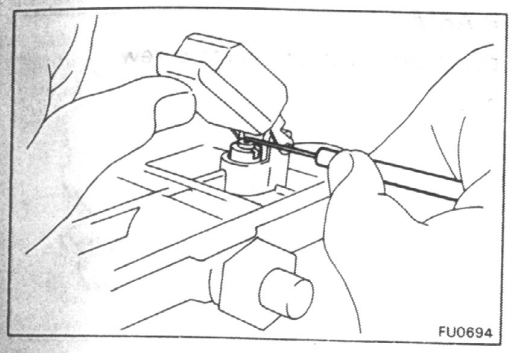
Float level (upper position): 4.3 mm (0.169 in.)

2,9



(d) Adjust by bending the portion of the float lip.

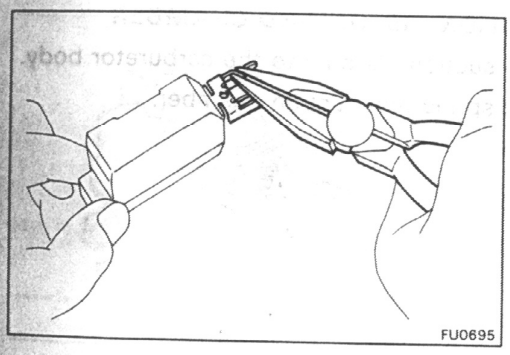




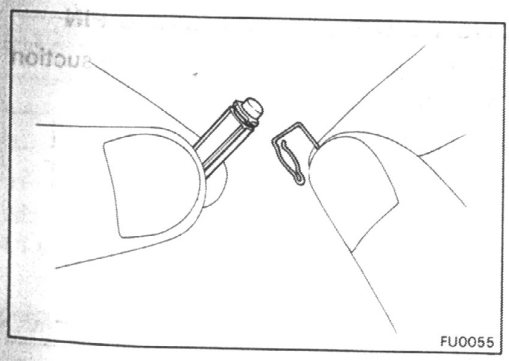
(e) Lift up the float and, using SST, check the clearance between the needle valve plunger and the float lip.

SST 09240-00020

Float level (lower position): 0.9 – 1.1 mm (0.035 – 0.043 in.)

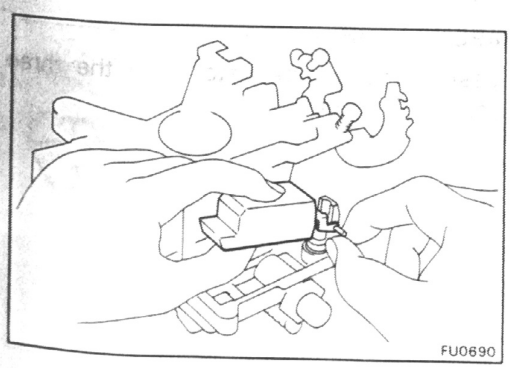


(f) Adjust by bending the portion of the float lip.



(g) After adjusting the float level, remove the float, plunger, spring and needle valve.

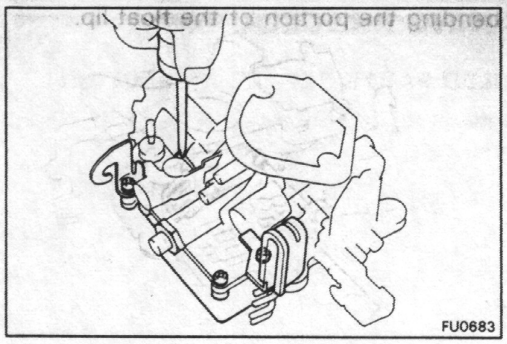
(h) Assemble the pin clip onto the needle valve.



5. INSTALL NEEDLE VALVE ASSEMBLY, FLOAT AND PIVOT PIN

Insert the float lip between the plunger and clip when installing the float.

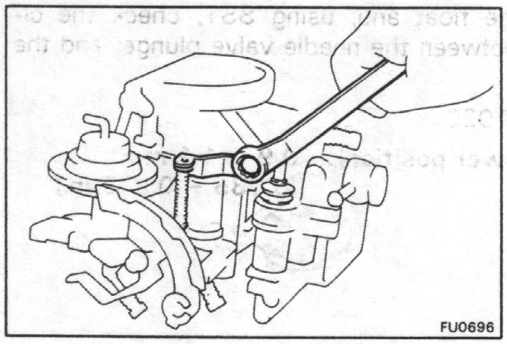
6. INSTALL BOOTS AND PUMP PLUNGER


FU0683

7. INSTALL FLOAT BOWL

(a) Install the pump damping spring to the float

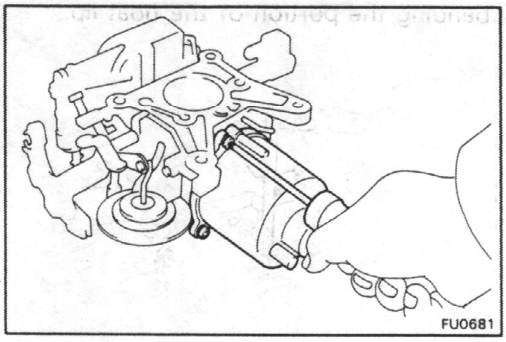
(b) Install the float bowl, union nipple clamp, sc valve clamp, number plate and a new gaske the four screws.


FU0696

8. INSTALL PUMP ARM

(a) Install the pump arm with the pivot screw.

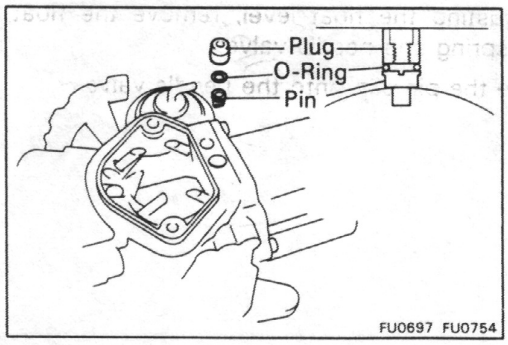
(b) Install the crip.


FU0681

9. INSTALL SUCTION PISTON AND CHAMBER

(a) Install the suction piston into the carburetor

(b) Install the spring and suction chamber.



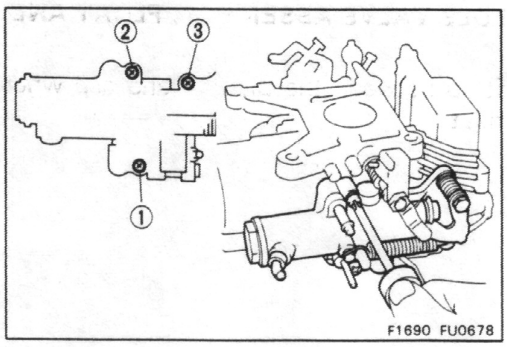
FU0697 FU0754

10. INSTALL SUCTION CHAMBER ADJUSTING PI

(a) Insert the suction pin into the groove on the s piston as shown in the figure.

(b) Install a new O-ring.

(c) Install the plug.



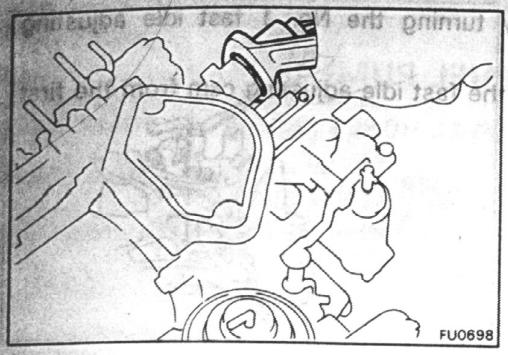
F1690 FU0678

11. INSTALL COMPENSATOR

Install a new gasket and compensator with the screws in the sequence shown.

12. INSTALL UNION NIPPLE

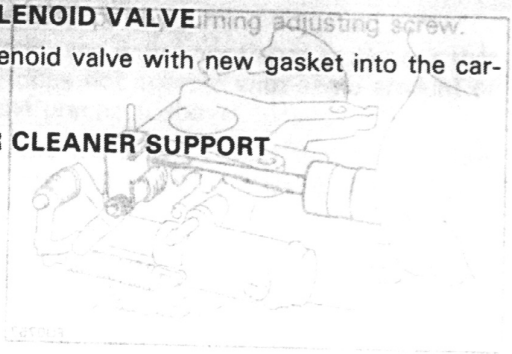
Install the union nipple with new gaskets.


FU0698

13. INSTALL SOLENOID VALVE

Install the solenoid valve with new gasket into the carburetor body.

14. INSTALL AIR CLEANER SUPPORT



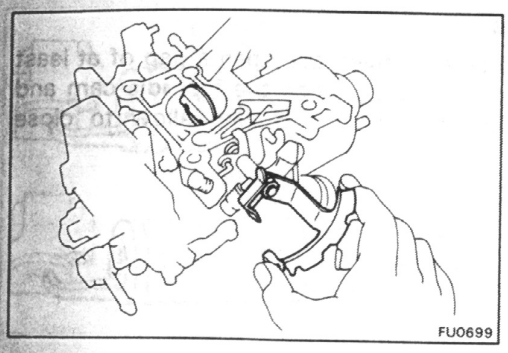
ADJUSTMENT OF CARBURETOR

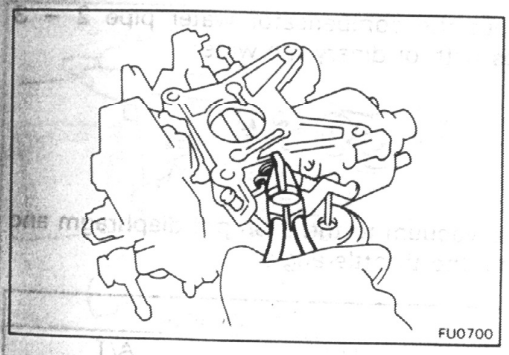
NOTE: Use SST 09240-00014 and 09240-00020 to make adjustment.

1. CHECK AND ADJUST THROTTLE VALVE OPENING

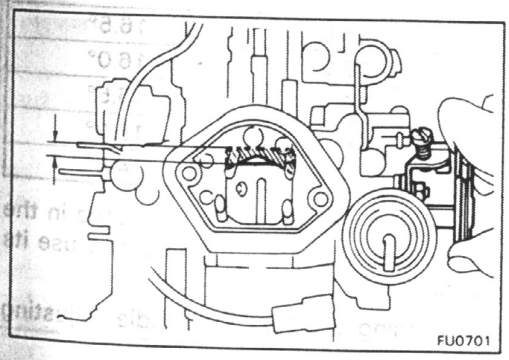
(a) Check the full opening angle of the throttle valve.

Standard angle: 87 – 93° from horizontal plane


FU0699


FU0700

(b) Adjust by bending the throttle lever stopper.

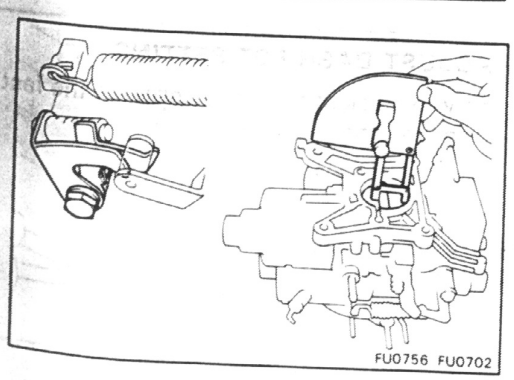

FU0701

2. CHECK AND ADJUST UNLOADER

(a) Apply vacuum to dash pot diaphragm.

(b) With the throttle valve fully opened, measure the piston lift stroke.

Standard stroke: more than 8 mm (0.31 in.)

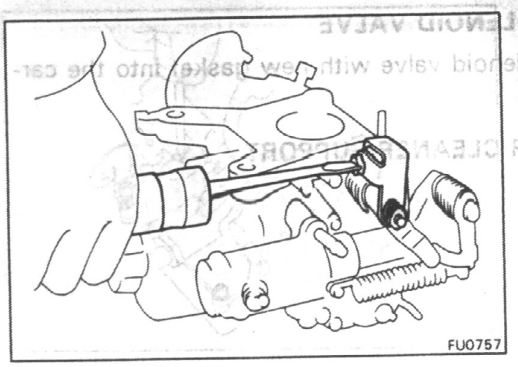

FU0756 FU0702

3. CHECK AND ADJUST FAST IDLE SETTING

(a) Set the fast idle adjusting cam to the roler of the throttle lever as shown.

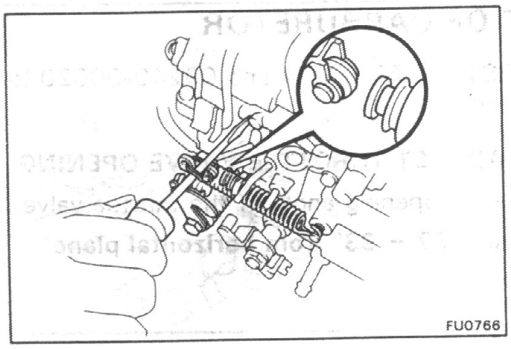
(b) Measure the throttle valve angle.

Reference angle: M/T 18.7° from horizontal plane
A/T 19.0° from horizontal plane


FU0757

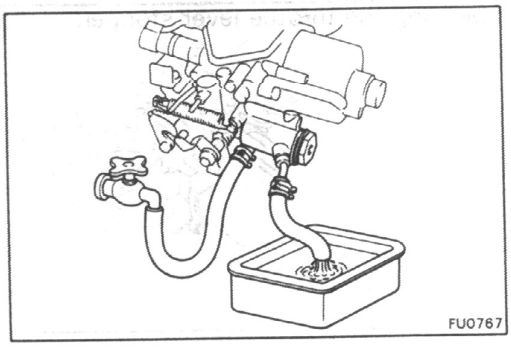
(c) Adjust by turning the No. 1 fast idle ad screw.

(d) Separate the fast idle adjusting cam from th idle lever.

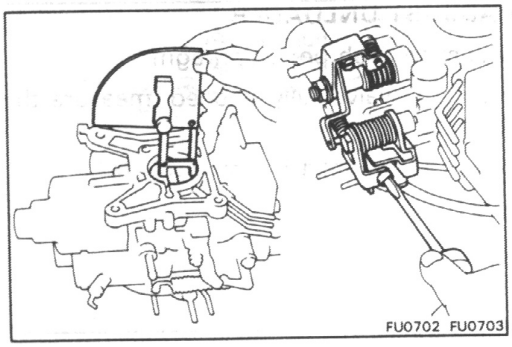

FU0766

(e) (Reference)

- Using a screw driver, pry open a gap of a 5 mm (0.20 in.) between the fast idle ca the cold enrichment rod, and allow to again.


FU0767

- Flush out the compensator water pipe minutes with or dinary tap water.

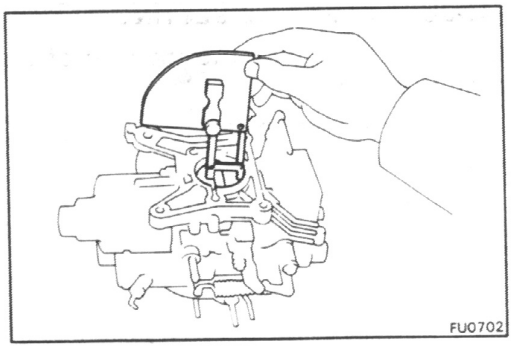

FU0702 FU0703

- Apply a vacuum to the dash pot diaphra measure the throttle angle.

Water Temperature	Throttle angle	
	M/T	A/T
5°C (41°F)	16.0°	16.5
10°C (50°F)	15.5°	16.0
15°C (59°F)	15.0°	15.5
20°C (68°F)	14.5°	15.0
25°C (77°F)	14.0°	14.5

NOTE: If the tap water temperature is not list table; select the closest temperature listed, an corresponding angles.

- Adjust by turning the No. 2 fast idle a screw.


FU0702

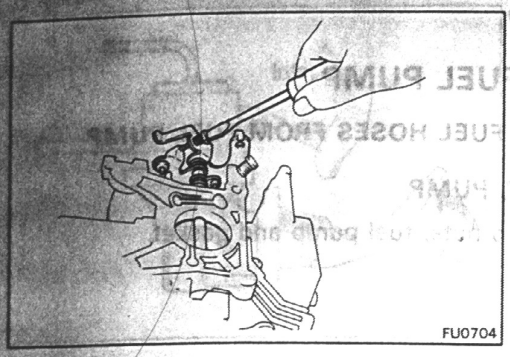
4. CHECK AND ADJUST DASH POT SETTING

(a) Remove the wax back springs and separate idle cam from the thermo wax.

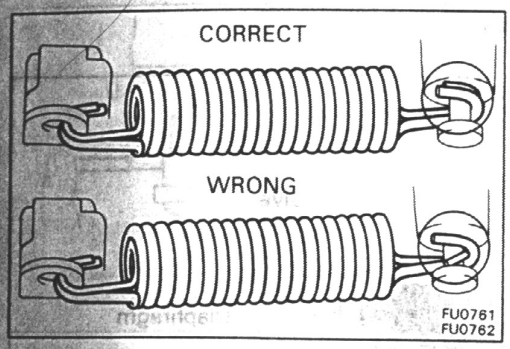
(b) Measure the throttle valve angle.

Reference angle:

M/T 14.3° from horizontal plane
A/T 14.5° from horizontal plane

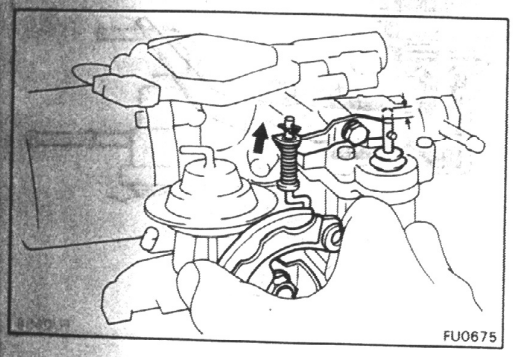


(c) Adjust the dash pot by turning adjusting screw.



(d) Install the wax back springs.

NOTE: Be sure the spring's hooks do not over lap.

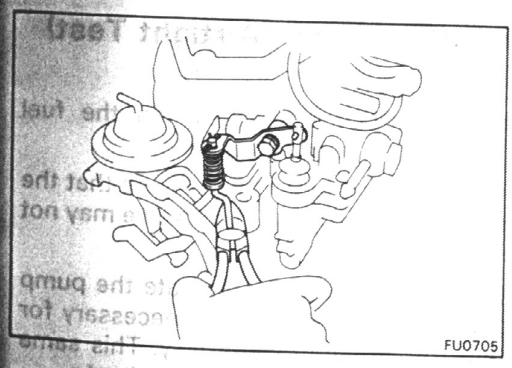


5. CHECK AND ADJUST PUMP STROKE

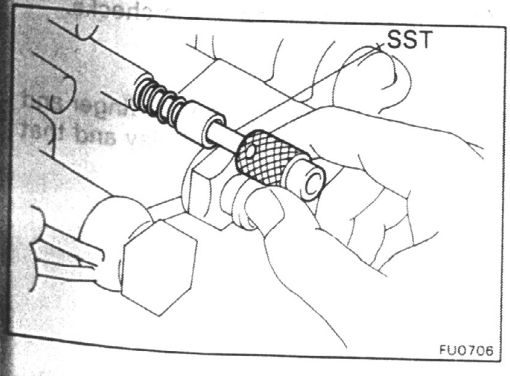
(a) Apply vacuum to dash pot diaphragm.

(b) Measure the length of the stroke.

Standard stroke: 4.5 mm (0.177 in.)



(c) Adjust the pump stroke by bending the connecting link.



6. PRESET IDLE MIXTURE ADJUSTING SCREW

If the idle mixture adjusting screw has been removed, fully screw it in and then unscrew it the following amount.

Standard: Return 3 turns from fully closed

SST 09243-00020

CAUTION: Use care not to screw it in too tightly and damage the screw tip.

7. CHECK FOR SMOOTH OPERATION OF EACH PART

INSTALLATION OF CARBURETOR

(See page FU-21)

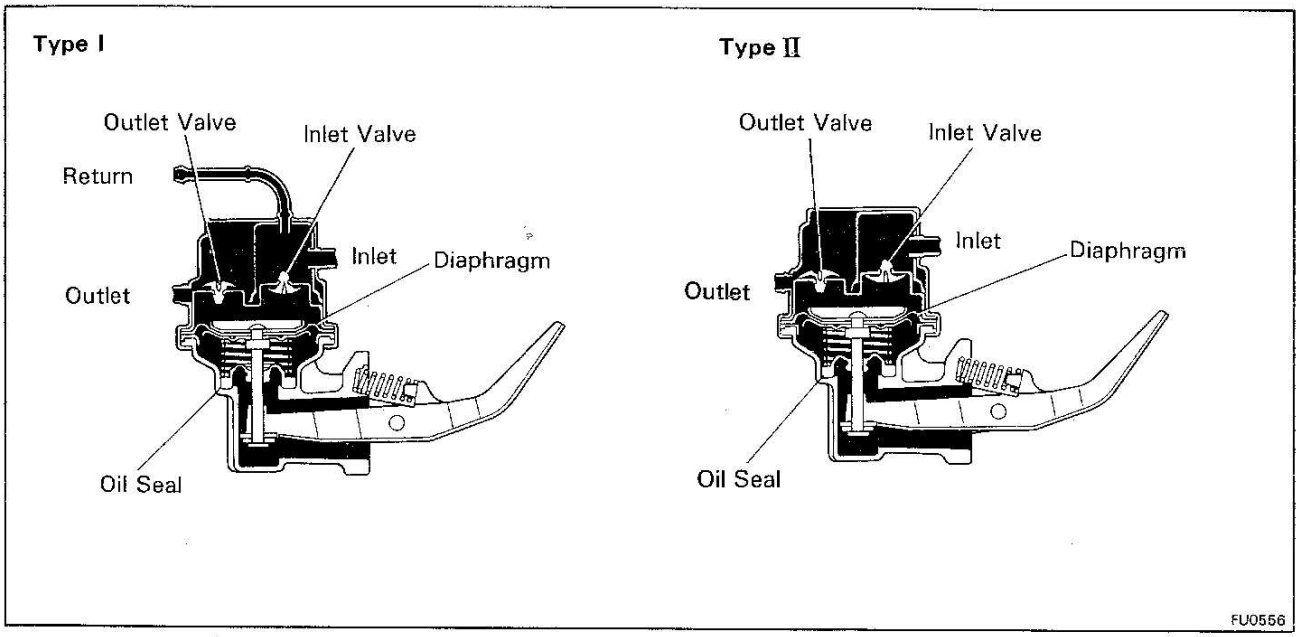
FUEL PUMP

REMOVAL OF FUEL PUMP

1. **DISCONNECT FUEL HOSES FROM FUEL PUMP**
2. **REMOVE FUEL PUMP**

Remove the two nuts, fuel pump and gasket.

CUTAWAY VIEW



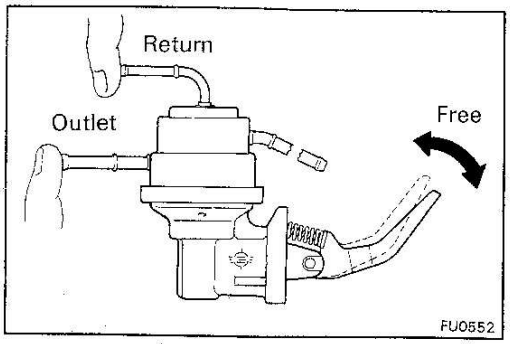
INSPECTION OF FUEL PUMP (Airtight Test)

PRECHECKS

Before performing the following checks on the fuel pump.

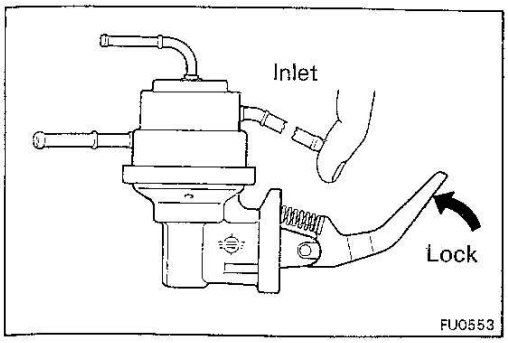
(a) Run some fuel through the pump to insure that the check valves seal tightly (a dry check valve may not seal properly).

(b) Without blocking off any pipes, operate the pump lever and check the amount of force necessary for operation and the amount of arm play. This same amount of force should be used in the checks.



1. **CHECK INLET VALVE**

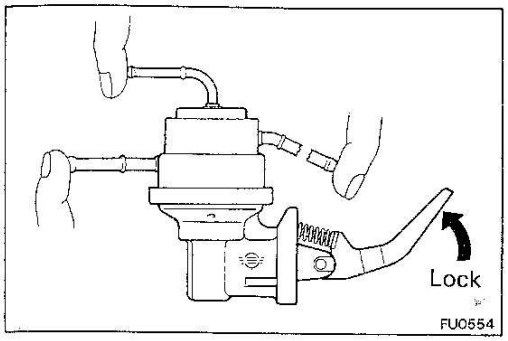
Block off the outlet and return pipes with your finger and check that there is an increase in lever arm play and that the lever arm moves freely (no reaction force).



2. CHECK OUTLET VALVE

Block off the inlet pipe with your finger and check that the arm locks (does not operate with same amount of force used in the precheck above).

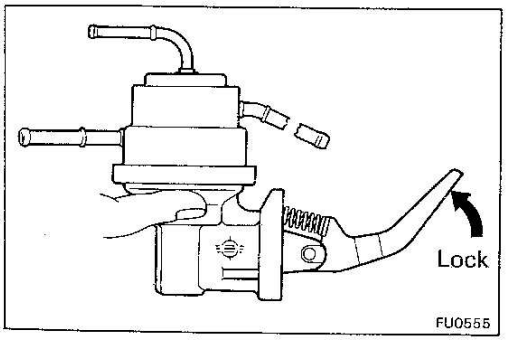
NOTE: Never use more force than that used in the precheck. This applies to checks 3 and 4 also.



3. CHECK DIAPHRAGM

Block off the inlet and outlet pipes and check that the pump arm locks.

NOTE: If all three of these checks are not as specified, the caulking (sealing) of the body and upper casing is defective.



4. CHECK OIL SEAL

Block off the vent hole with your finger and check that the pump arm locks.

INSTALLATION OF FUEL PUMP

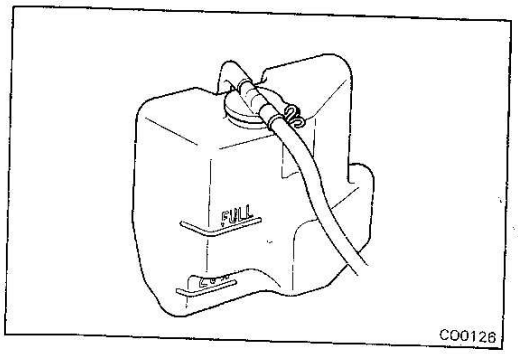
1. **INSTALL FUEL PUMP WITH NEW GASKET**
2. **INSTALL TWO NUTS**
3. **CONNECT FUEL HOSES TO FUEL PUMP**
4. **START ENGINE AND CHECK FOR LEAKS**

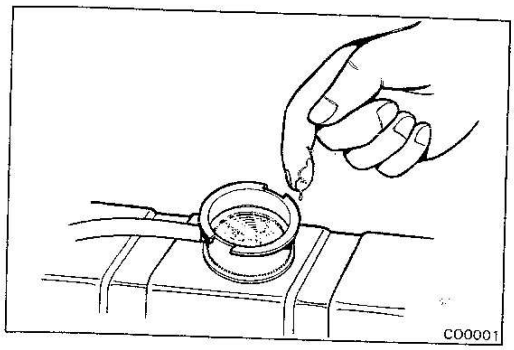
COOLING SYSTEM

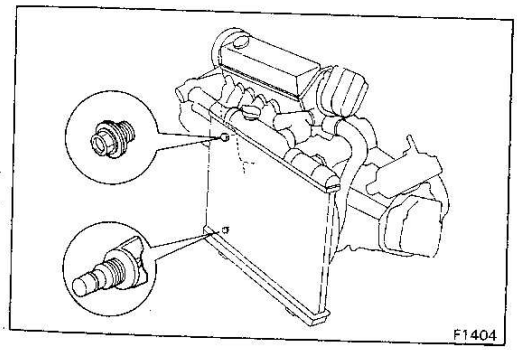
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine overheats	Check coolant	Replenish coolant	CO-3
	Water pump drive belt loose or missing	Adjust or replace belt	EM-25
	Dirt leaves, or insects on radiator or condenser	Clean radiator or condenser	CO-13
	Hoses, water pump, thermostat housing, radiator, heater, core plugs or head gasket leakage	Repair as necessary	CO-13
	Thermostat faulty	Check thermostat	CO-12
	Incorrect ignition timing	Adjust timing	EM-6
	Electric cooling system faulty	Inspect electric cooling system	CO-21
	Radiator hose plugged or rotted	Replace hose	
	Water pump faulty	Replace water pump	CO-4
	Radiator plugged or cap faulty	Check radiator or cap	CO-13
	Cylinder head or block, cracked or plugged	Repair as necessary	

NOTE: The thermostat on the 1E, 2E and 2E-C engines is equipped with a by-pass valve. Therefore, if the engine tends to overheat, removal of the thermostat would have an adverse effect, by causing a lower cooling efficiency.







CHECK AND REPLACEMENT OF ENGINE COOLANT

1. CHECK ENGINE COOLANT LEVEL AT RESERVE TANI

The coolant level should be between the "LOW" an "FULL" lines.

If low, check for leaks and add coolant up to the "FULL line.

2. CHECK ENGINE COOLANT QUALITY

There should be no excessive deposits of rust or scale around the radiator cap or radiator filler hole, and the coolant should be free from oil.

If excessively dirty, replace the coolant.

3. REPLACE ENGINE COOLANT

(a) Remove the radiator cap.

(b) Drain the coolant from the radiator and engine drain cocks. (The engine drain cock is near the oil filter.)

(c) Close the drain cocks.

Torque (Engine drain cock):
250 kg-cm (18 ft-lb, 25 N·m)

(d) Fill the system with coolant.

Use a good brand of ethylene-glycol base coolant, mixed according to the manufacturer's directions.

Coolant capacity (w/ Heater):

EP70, 71

M/T 4.6 liters (4.9 USqts, 4.0 Imp.qts)
A/T 4.5 liters (4.8 USqts, 4.0 Imp.qts)

EE80

M/T 4.9 liters (5.2 USqts, 4.3 Imp.qts)
A/T 4.8 liters (5.1 USqts, 4.2 Imp.qts)

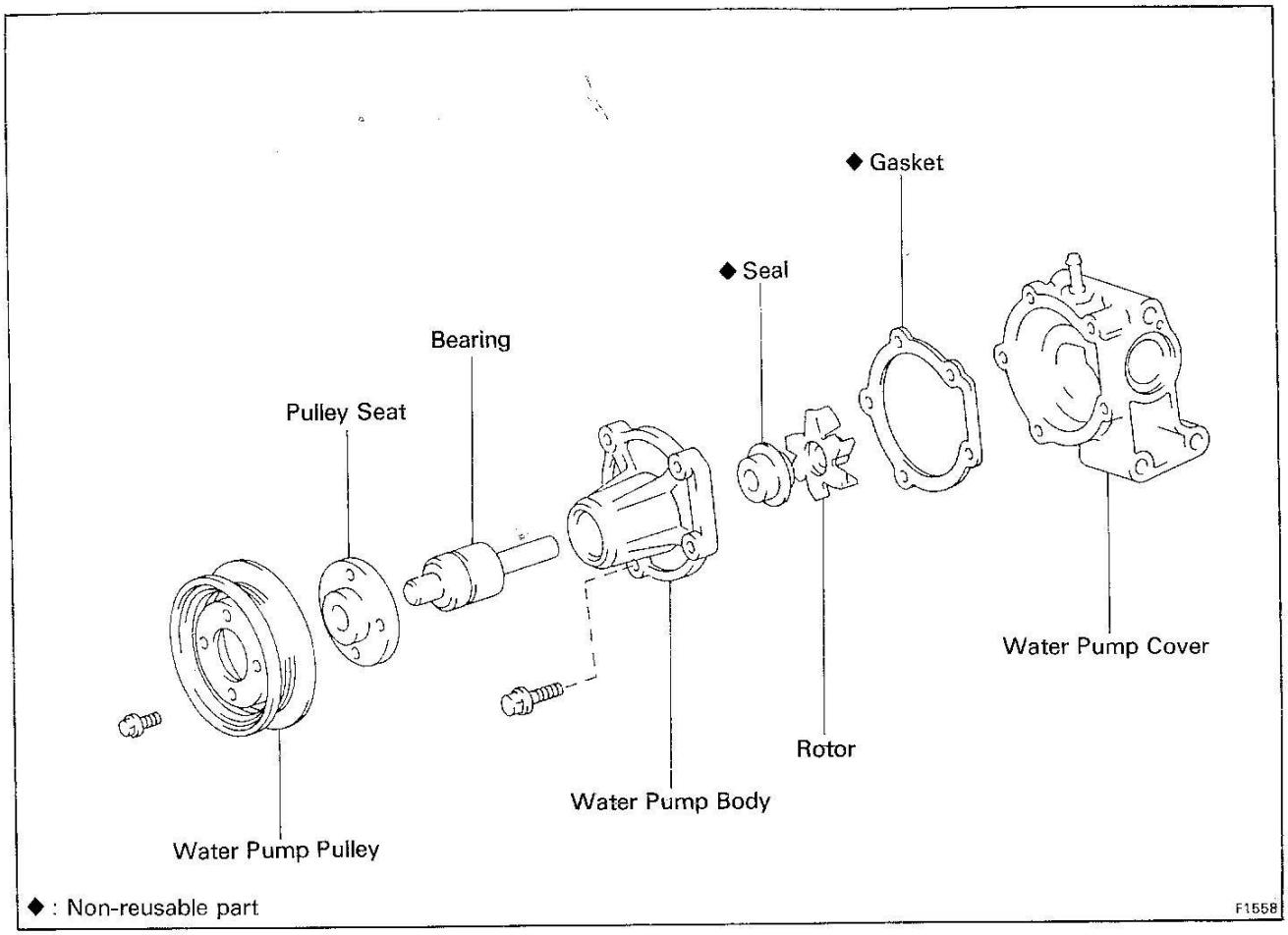
(e) Install the radiator cap.

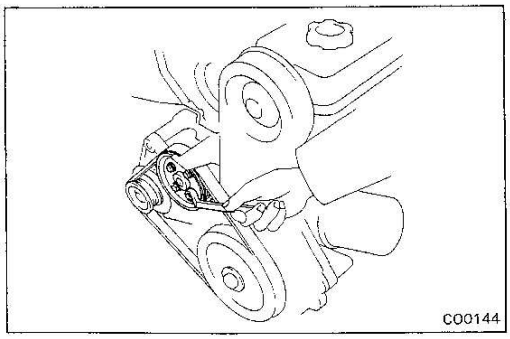
(f) Start the engine and check for leaks.

(g) Recheck the coolant level and refill as necessary.

WATER PUMP

COMPONENTS

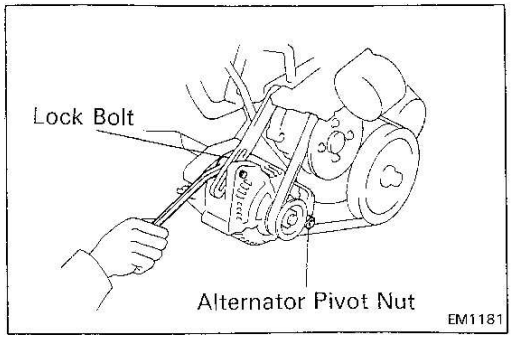




REMOVAL OF WATER PUMP

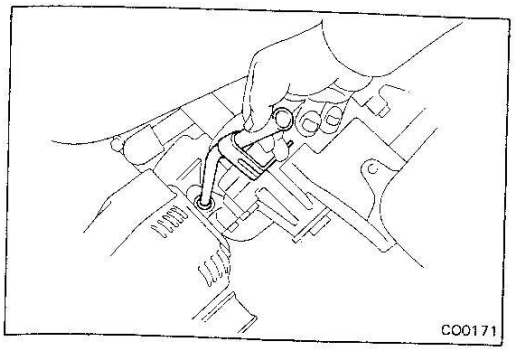
1. REMOVE DRIVE BELT AND WATER PUMP PULLEY

(a) Loosen the four mounting bolts.



(b) Loosen the alternator pivot nut and bolt, and remove the lock bolt.

(c) Remove the drive belt and water pump pulley with the four bolts.

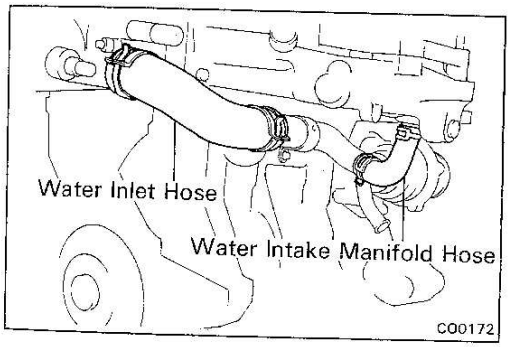


2. REMOVE OIL LEVEL GAUGE AND GAUGE GUIDE

(a) Remove the mounting bolt of the gauge guide clamp and alternator adjusting bar.

(b) Pull out the oil level gauge guide.

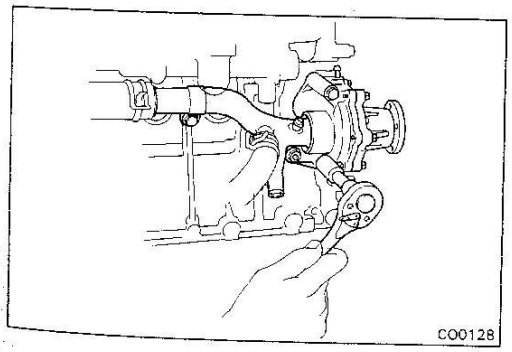
3. DISCONNECT WATER BY-PASS HOSE(S) FROM CARBURETOR



4. DISCONNECT WATER INTAKE MANIFOLD AND WATER INLET HOSES

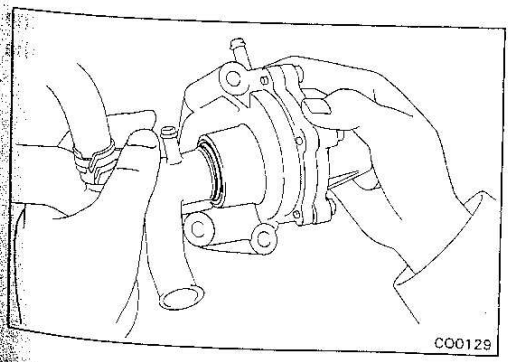
(a) Disconnect the water intake manifold hose from the water inlet pipe.

(b) Disconnect the water inlet hose from the water outlet housing.

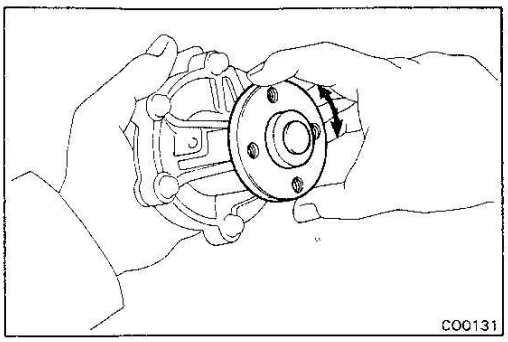


5. REMOVE WATER PUMP

(a) Remove the bolt, two nuts, clamp bolt and water pump with the inlet pipe.



(b) Disconnect the water inlet pipe from water pump.

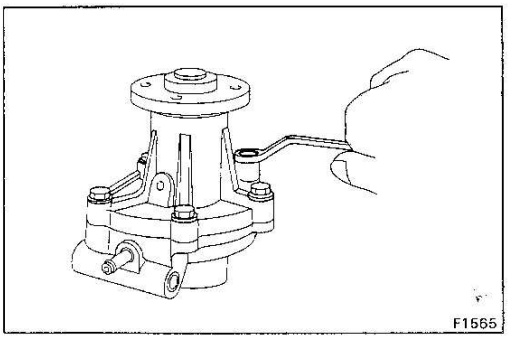


INSPECTION OF WATER PUMP

INSPECT WATER PUMP BEARING

Check that the water pump bearing operation is not rough or noisy.

If necessary, replace the water pump bearing.

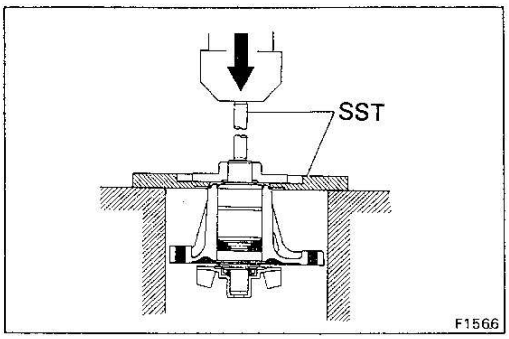


DISASSEMBLY OF WATER PUMP

(See page CO-4)

1. REMOVE WATER PUMP COVER

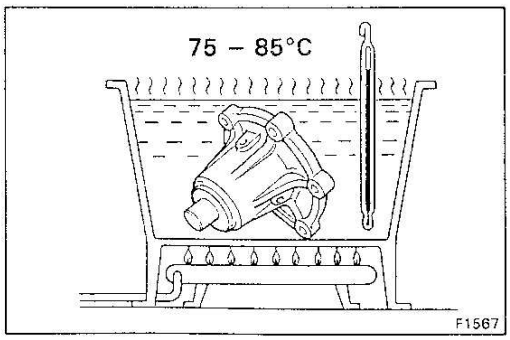
Remove the five bolts and water pump cover.



2. REMOVE PULLEY SEAT

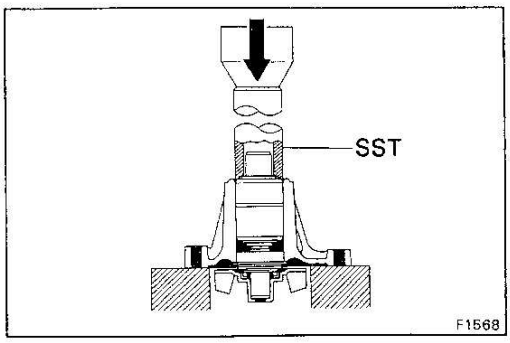
Using SST and a press, press the shaft of the bearing and remove the pulley seat.

SST 09236-00101



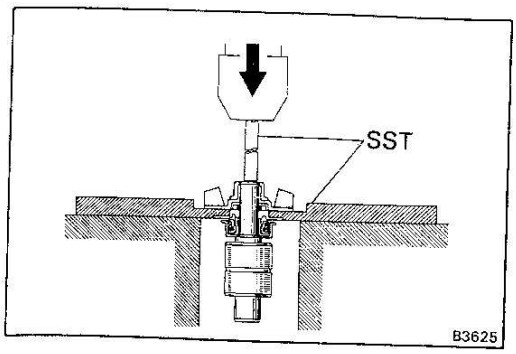
3. REMOVE WATER PUMP BEARING

(a) Gradually heat the water pump body to about 75 – 85°C (167 – 185°F).



(b) Using SST and a press, press the outer race of the bearing and remove the bearing together with the rotor.

SST 09236-00101

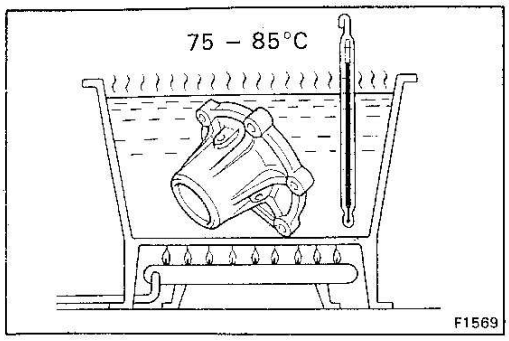


4. REMOVE ROTOR

Using SST and a press, press the shaft of the bearing and remove the rotor.

SST 09236-00101

5. REMOVE SEAL, SEAT AND PACKING



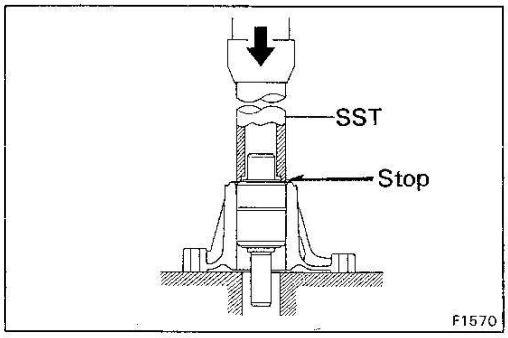
ASSEMBLY OF WATER PUMP

(See page CO-4)

NOTE: Always assemble the water pump with a new seal set.

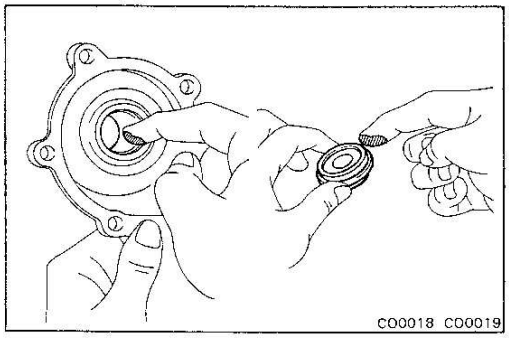
1. INSTALL WATER PUMP BEARING

(a) Gradually heat the water pump body to 75 – 85°C (167 – 185°F).



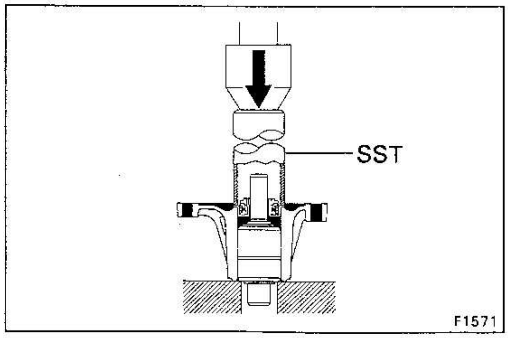
(b) Using SST and a press, press the outer race of the bearing until its surface is flush with the water pump body edge.

SST 09236-00101



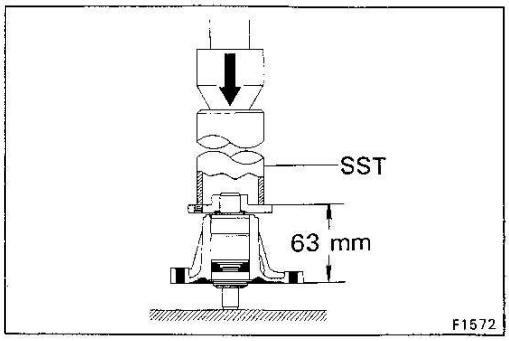
2. INSTALL SEAL

(a) Apply a little liquid sealer to the water pump contact surface of a new seal.



(b) Using SST and a press, press in the seal.

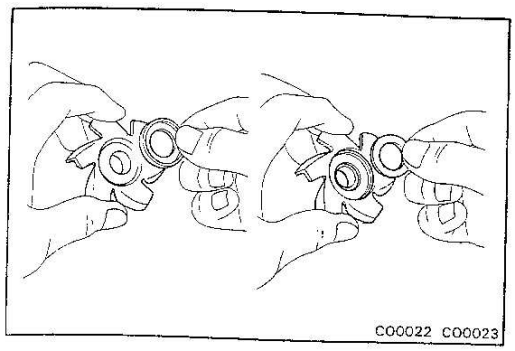
SST 09236-00101



3. INSTALL PULLEY SEAT

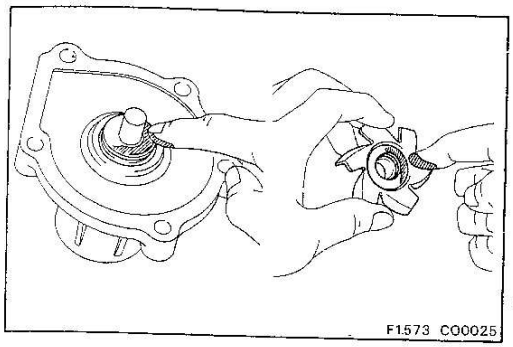
Using SST and a press, press in the pulley seat to 63 mm (2.48 in.) from the installation surface of the water pump body.

SST 09236-00101

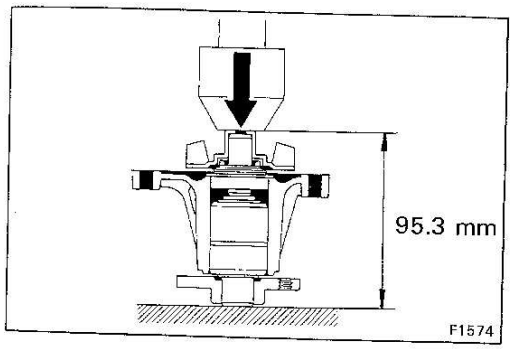


4. INSTALL ROTOR

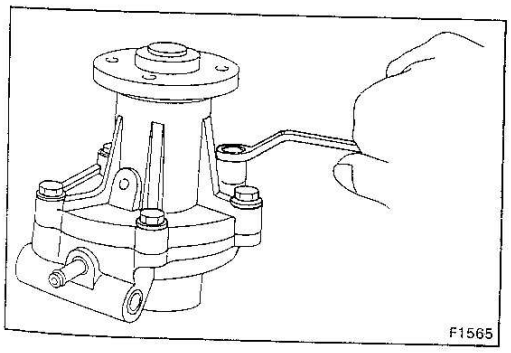
(a) Install a new packing and seat into the rotor.



(b) Apply a little LLC to the seal and rotor contact surface.



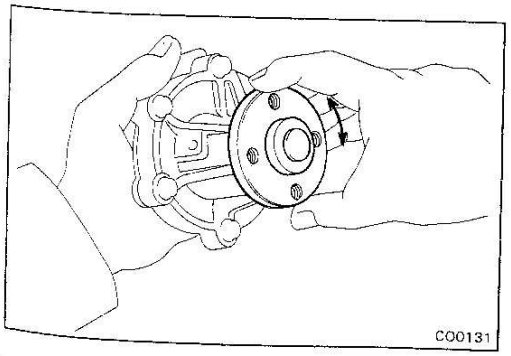
(c) Using a press, press in the rotor until the overall length of the pump is 95.3 mm (3.752 in.).



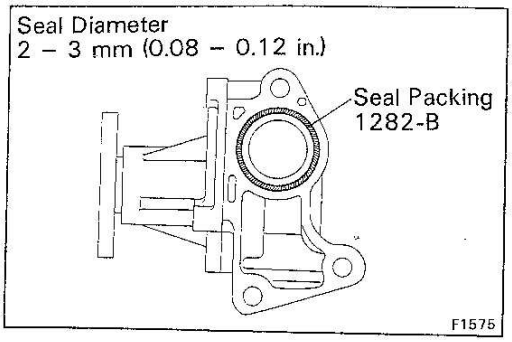
5. INSTALL WATER PUMP COVER

Install the cover with a new gasket and the five bolts.

Torque: 92.5 kg-cm (80 in.-lb, 9.1 N·m)



6. CHECK WATER PUMP BEARING ROTATES SMOOTHLY



INSTALLATION OF WATER PUMP

(See page CO-4)

1. INSTALL WATER PUMP

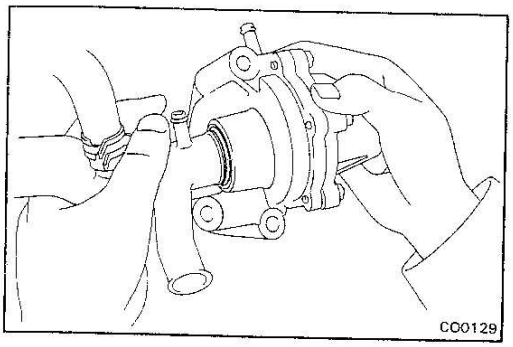
(a) Apply seal packing No. 1282-B (Part No. 08826-00100) or equivalent to the water pump cover.

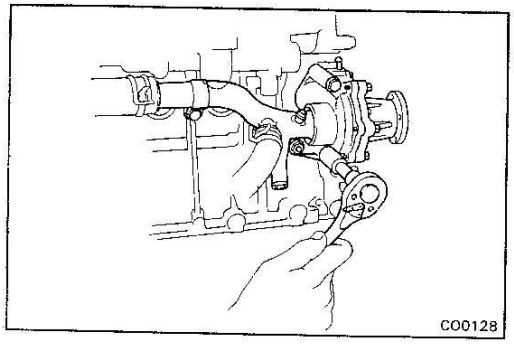
NOTE: Cleaning and application of seal packing to the installation surface is the same as for the oil pan. However, use a nozzle cut to 2 mm (0.08 in.).
(See page LU-9)

(b) Install a new O-ring to the water inlet pipe.

(c) Apply a little soap and water to the O-ring.

(d) Insert the water inlet to the water pump.

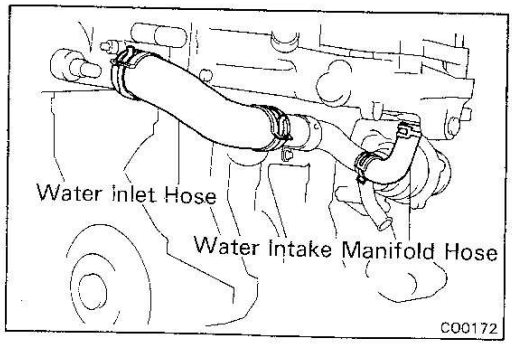




(e) Install the water pump with the bolt and two nuts.

Torque: 175 kg-cm (13 ft-lb, 17 N·m)

(f) Install the clamp bolt.

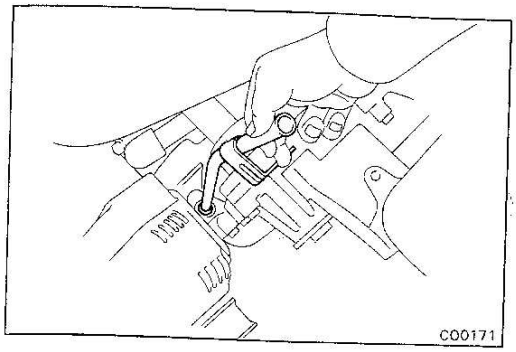


2. CONNECT WATER INTAKE MANIFOLD AND WATER INLET HOSES

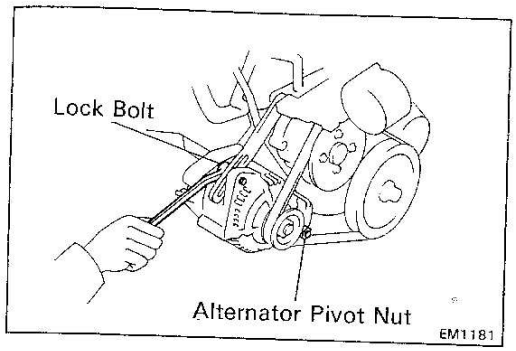
(a) Connect the water intake manifold hose to the water inlet pipe.

(b) Connect the water inlet hose to the water outlet housing.

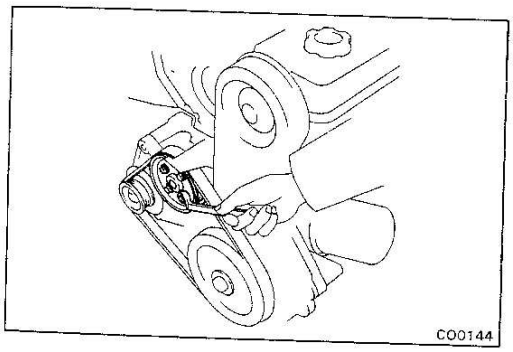
3. CONNECT WATER BY-PASS HOSE(S) TO CARBURETOR



4. **INSTALL OIL LEVEL GAUGE GUIDE AND GAUGE**
   (a) Install a new O-ring on the oil level gauge guide.
   (b) Apply a little engine oil to the O-ring.
   (c) Push in the oil level gauge guide with the O-ring coated with a small amount of engine oil.
   (d) Provisionally install the mounting bolt of the alternator adjusting bar and gauge guide clamp.



5. **INSTALL WATER PUMP PULLEY AND DRIVE BELT**
   (a) Temporarily install the water pump pulley, four bolts and drive belt.
   (b) Install the lock bolt.
   (c) Tighten the alternator pivot nut and bolt.



   (d) Tighten the four mounting bolts.

6. **ADJUST DRIVE BELT**
   (See step 13 on page EM-25)

7. **TIGHTEN PIVOT NUT AND ADJUSTING BAR MOUNTING BOLTS**

8. **REFILL WITH COOLANT (See page CO-3)**

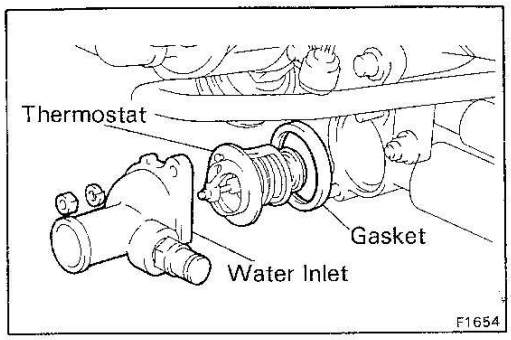
9. **START ENGINE AND CHECK FOR LEAKS**

THERMOSTAT

REMOVAL OF THERMOSTAT

1. DRAIN COOLANT

Open the radiator and engine drain cocks, and allow the coolant to drain into a clean container.



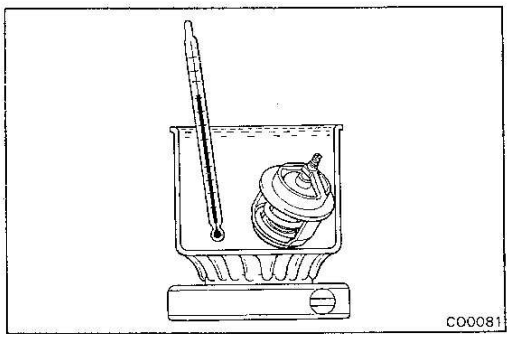
2. DISCONNECT CONNECTOR FROM WATER TEMPERATURE SWITCH

3. DISCONNECT RADIATOR OUTLET HOSE

4. REMOVE WATER INLET AND THERMOSTAT

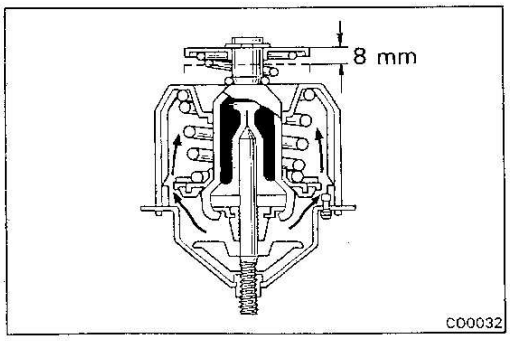
Remove the two nuts, and remove the water inlet, gasket and thermostat from the water pump cover.

INSPECTION OF THERMOSTAT



NOTE: The thermostat is numbered with the valve opening temperature.

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



(b) Check the valve opening temperature and the valve lift.

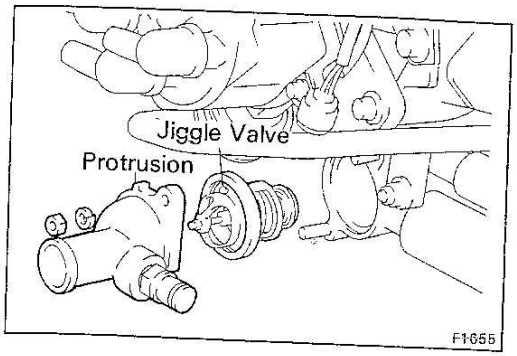
If the valve opening temperature and valve lift are not within the following specifications, replace the thermostat.

Valve opening temperature: 80 – 84°C (176 – 183°F)

Valve lift: More than 8 mm (0.31 in.) at 95°C (203°F)

(c) Check that the valve spring is tight when the thermostat is fully closed.

If not closed, replace the thermostat.



INSTALLATION OF THERMOSTAT

1. **PLACE THERMOSTAT IN WATER INLET**

   Install a new gasket to the thermostat and align the jiggle valve of the thermostat with the protrusion of the water inlet.

2. **INSTALL WATER INLET WITH THERMOSTAT**

   Install the water inlet with the thermostat.
   Install and torque the two nuts.

   Torque: 90 kg-cm (78 in.-lb, 8.8 N·m)

3. **CONNECT RADIATOR OUTLET HOSE**

4. **CONNECT CONNECTOR OF WATER TEMPERATURE SWITCH**

5. **REFILL WITH COOLANT (See page CO-3)**

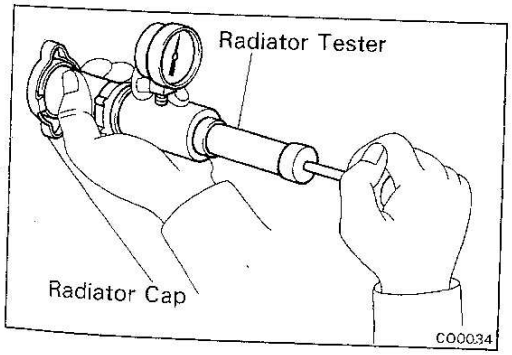
6. **START ENGINE AND CHECK FOR LEAKS**

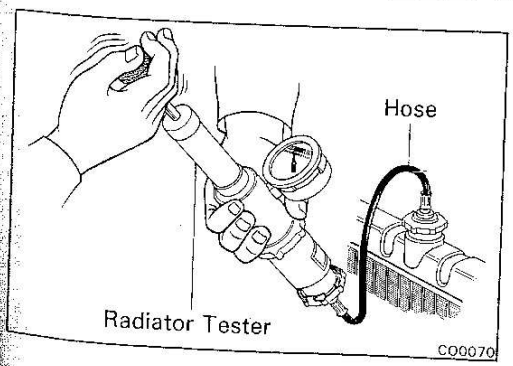
RADIATOR

CLEANING OF RADIATOR

Using water or steam cleaner, remove any mud or dirt from the radiator core.

CAUTION: If using high pressure type cleaner, be careful not to deform the fins of the radiator core. For example, keep a distance of more than 40 – 50 cm (15.75 – 19.69 in.) between the radiator core and cleaner nozzle when the cleaner nozzle pressure is 30 – 35 kg/cm² (427 – 498 psi, 2,942 – 3,432 kPa).





INSPECTION OF RADIATOR

1. **CHECK RADIATOR CAP**

   Using a radiator tester, pump the tester until the relief valve opens. Check that the valve opens between 0.75 kg/cm² (10.7 psi, 74 kPa) and 1.05 kg/cm² (14.9 psi, 103 kPa).

   Check that the pressure does not drop rapidly when the pressure on the cap is below 0.6 kg/cm² (8.5 psi, 59 kPa).

   If either check is not within limits, replace the cap.

2. **CHECK COOLING SYSTEM FOR LEAKS**

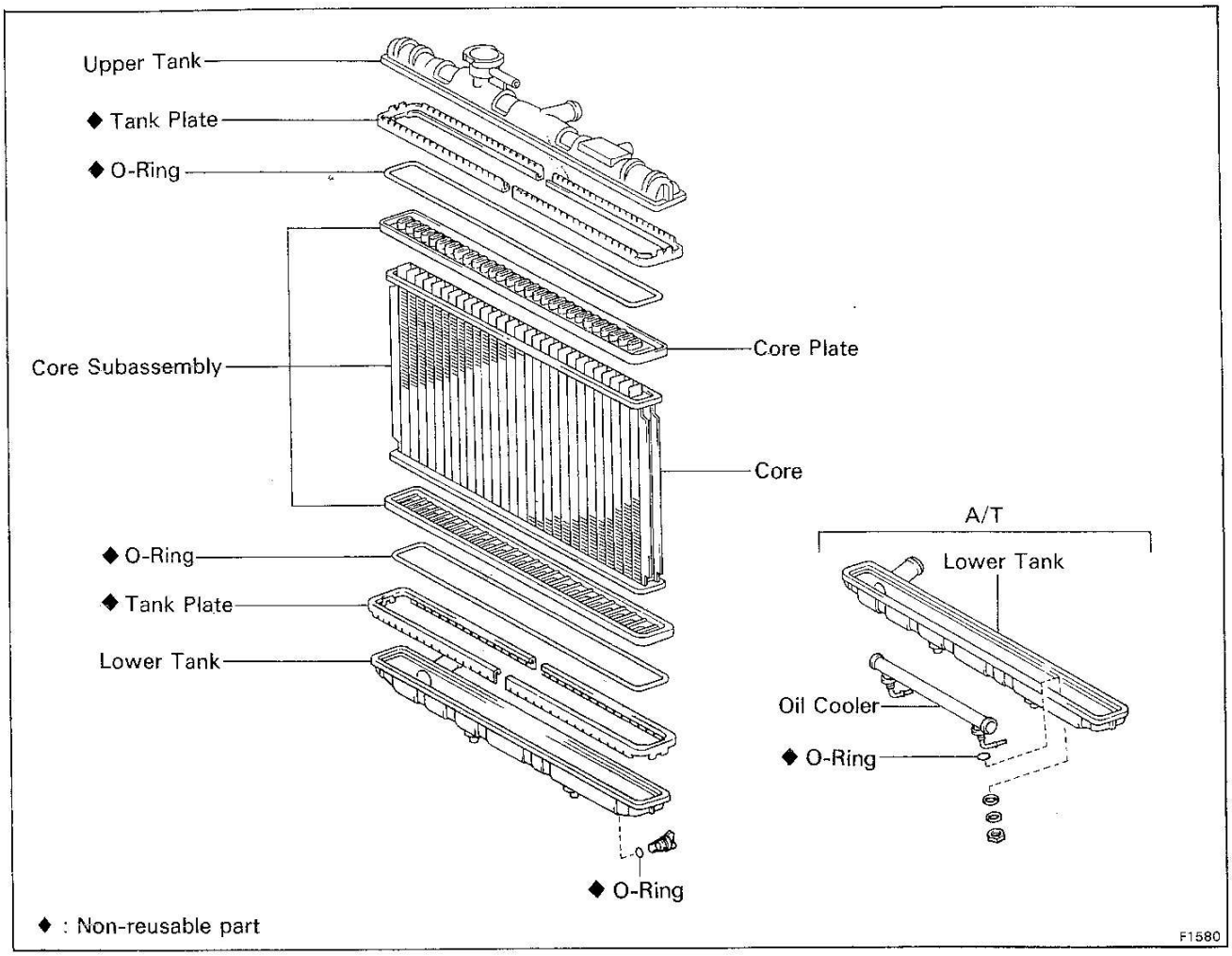
   (a) Fill the radiator with coolant and attach a pressure tester.

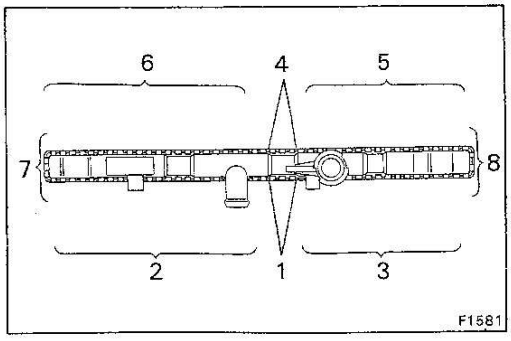
   (b) Warm up the engine.

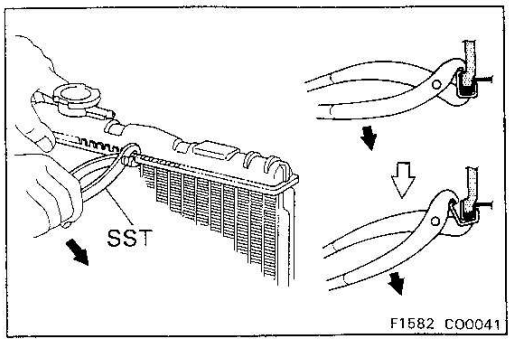
   (c) Pump it 1.2 kg/cm² (17.1 psi, 118 kPa), check that pressure does not drop.

   If the pressure drops, check for leaks from the hoses, radiator or water pump. If no external leaks are found, check the heater core, cylinder block and head.

COMPONENTS







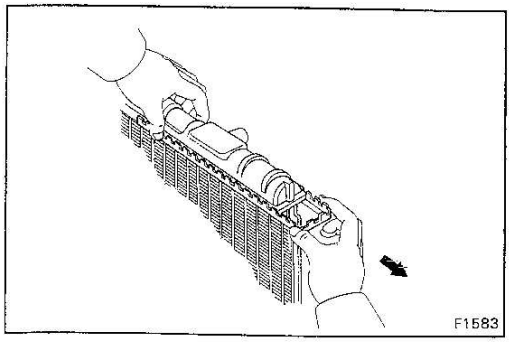
DISASSEMBLY OF RADIATOR

1. REMOVE TANK PLATE

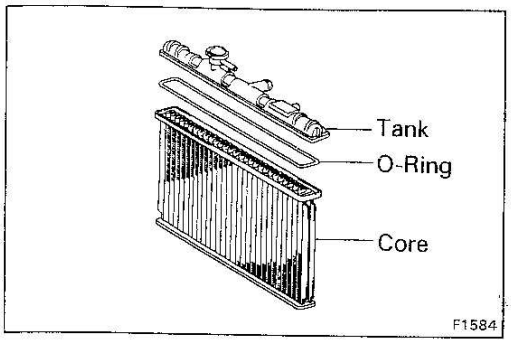
(a) Raise the claws of the tank plates with SST in the numerical order shown in the figure.

SST 09230-00010

NOTE: Be careful not to damage the core plate.



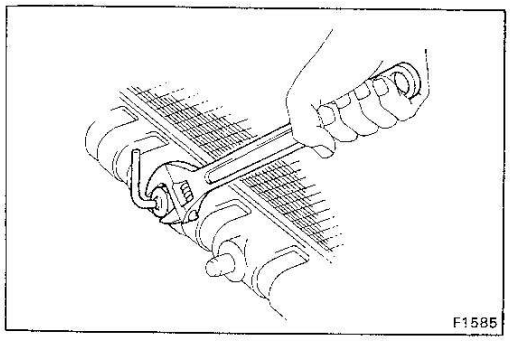
(b) Pull the tank plates outward.



2. REMOVE TANK AND O-RING

(a) Pull the tank upward.

(b) Remove the O-ring.



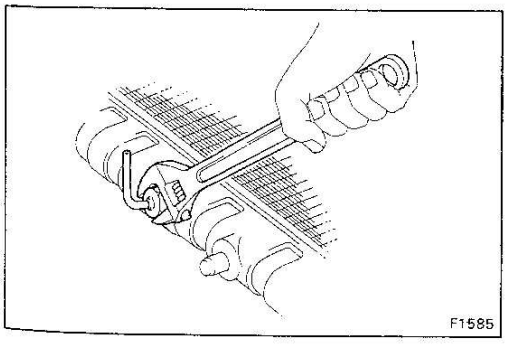
3. REMOVE OIL COOLER FROM LOWER TANK (with A/T)

(a) Remove the two nuts, spring washers, plate washers and oil cooler.

(b) Remove the O-rings from the oil cooler.

ASSEMBLY OF RADIATOR

(See page CO-15)



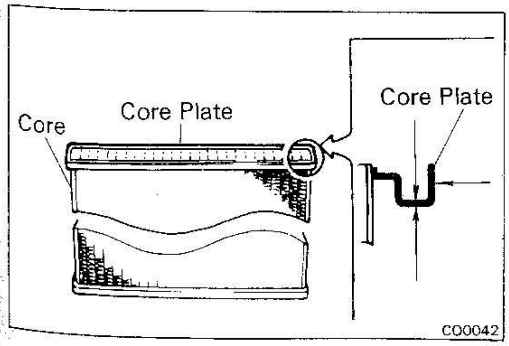
1. INSTALL OIL COOLER TO LOWER TANK (with A/T)

(a) Clean the O-ring contact surface of the lower tank and oil cooler.

(b) Install new O-rings to the oil cooler.

(c) Install the oil cooler with the O-rings to the lower tank.

(d) Install the plate washers, spring washers and nuts.

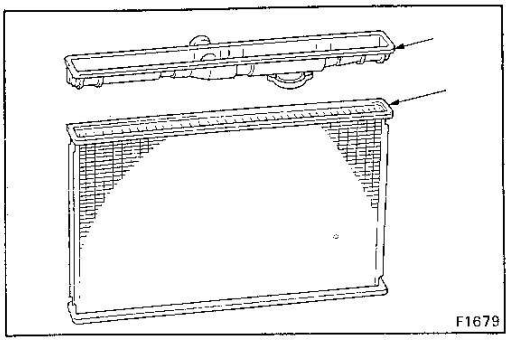


2. INSPECT CORE PLATE

Inspect the core plate for damage.

NOTE:

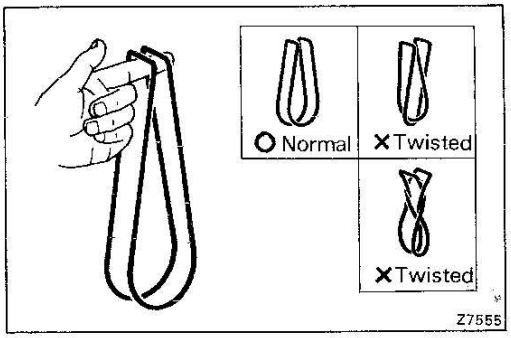
- If the sides of the core plate groove are deformed, reassembly of the tank will be impossible. Therefore, first correct any deformation with pliers or such.
- Water leakage will result if the bottom of the core plate groove is damaged or dented. Therefore, repair or replace if necessary.



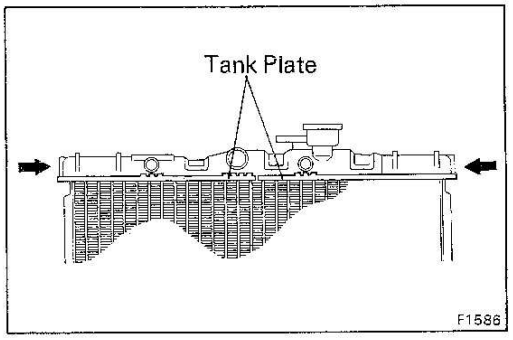
3. INSTALL NEW O-RING AND TANK

NOTE:

- Clean the tank and core plate.

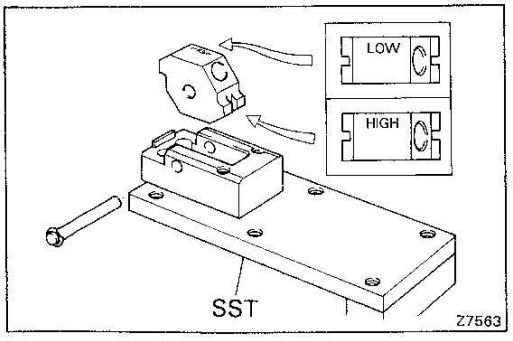


- Take out any twists.



4. INSTALL TANK PLATE

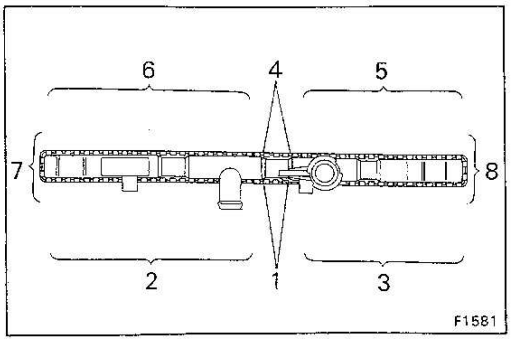
Insert the tank plates from both ends in the direction of the arrows. Insert to where the portions shown by the arrows contact with the tank.



5. STAKE CLAW OF TANK PLATE

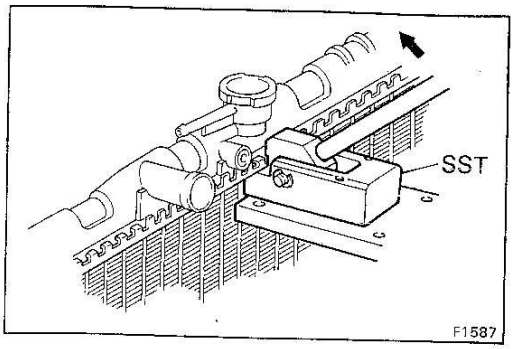
(a) Set the punch of SST to "LOW".

SST 09230-00010



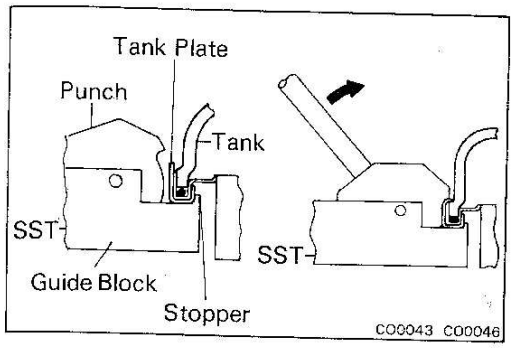
(b) Stake the claws of the tank plates with SST in the numerical order shown in the figure.

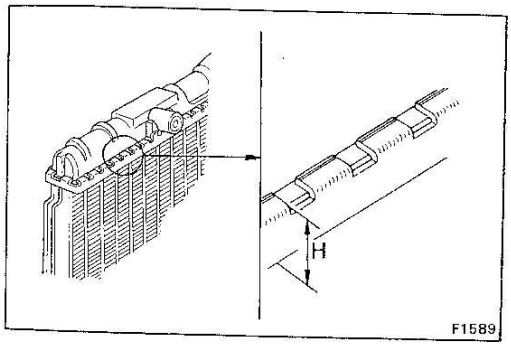
SST 09230-00010



CAUTION: If the bottom of the core plate is staked with the SST on the guide block stopper, it may result in water leakage.

SST 09230-00010

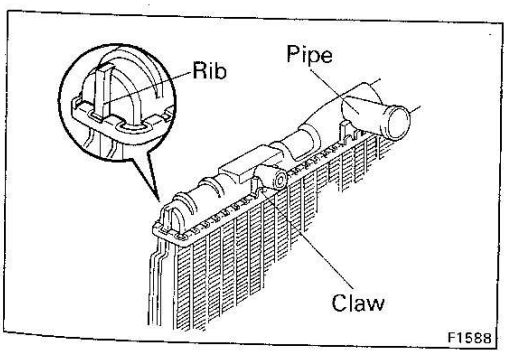




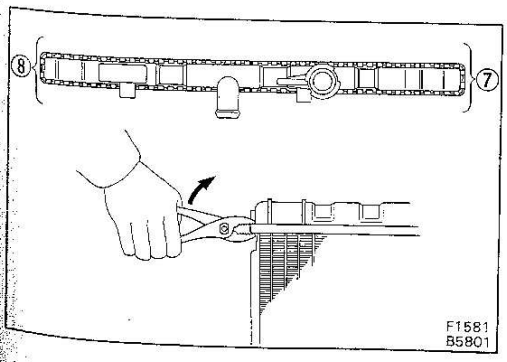
NOTE:

- Stake with just enough pressure to leave a mark on the claw. The staked plate height (H) should be as follows:

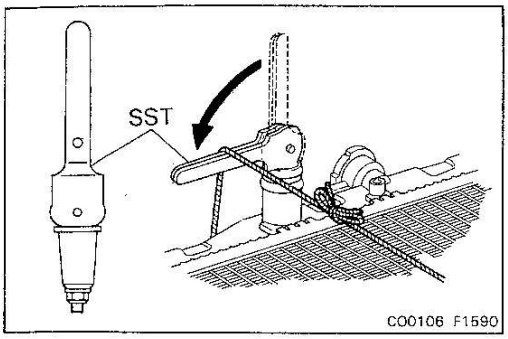
Plate height: 9.1 – 9.5 mm (0.353 – 0.374 in.)



- Do not stake the areas protruding around the pipes, brackets or tank ribs.



- the points shown in the illustration cannot be staked with the SST. Use pliers or such and be careful not to damage the core plate.



6. INSPECT FOR WATER LEAKS

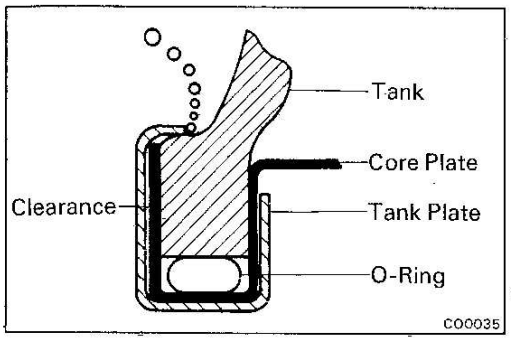
(a) Tighten the drain plug.

(b) Plug the inlet and outlet pipes of the radiator with SST.

SST 09230-00010

(c) Inspect for water leaks.

Test pressure: 1.8 kg/cm² (26 psi, 177 kPa)



NOTE: On radiators with resin tanks, there is a clearance between the core plate and tank plate where a minute amount of air will remain, causing an apperance of an air leak when the radiator is submerged in water. Therefore, before performing the water leak test, first swish the radiator around in the water until all air bubbles disappear.

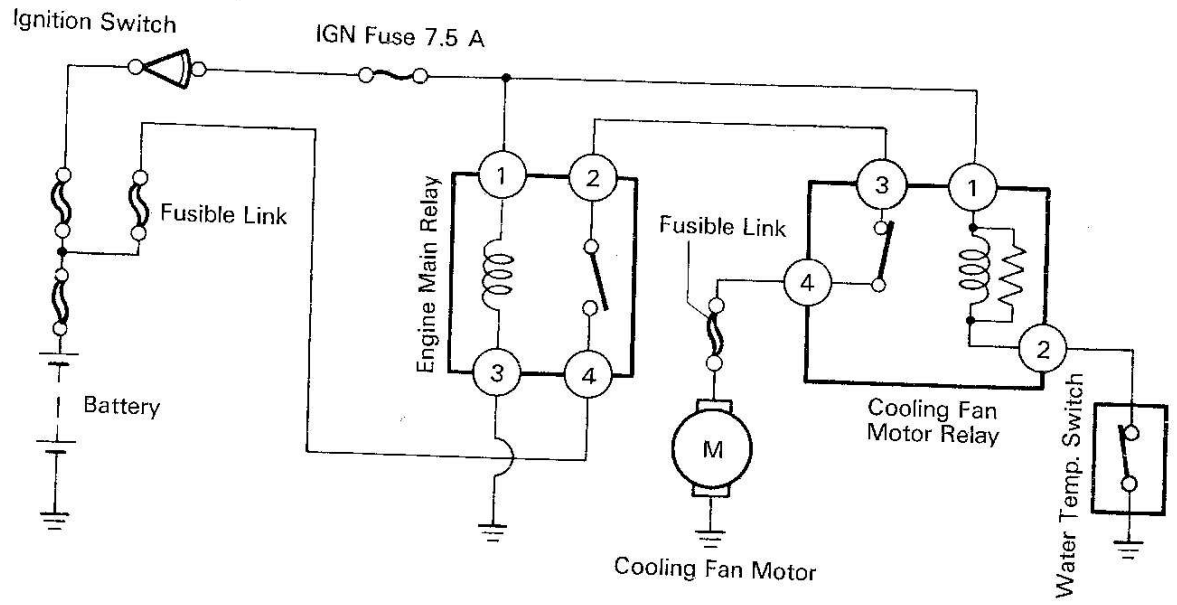
7. PAINT TANK PLATE

NOTE: If the water leak test checks out okay, allow the radiator to completely dry and then paint the tank plates.

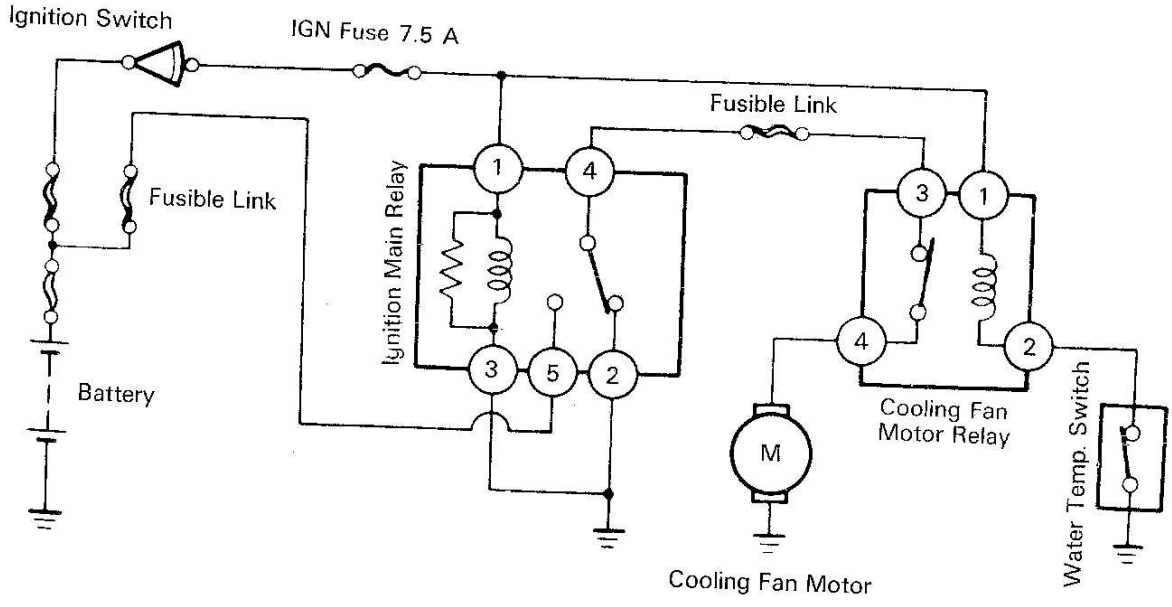
ELECTRIC COOLING FAN

SYSTEM CIRCUIT

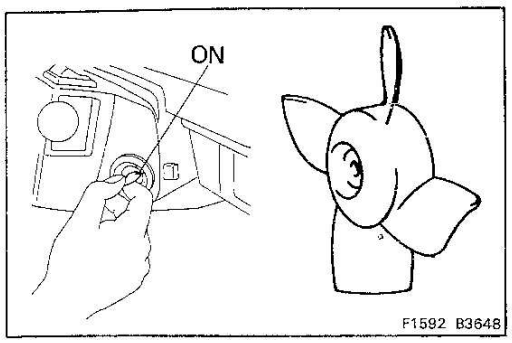
EPSeries



EE Series



C00142
C00143



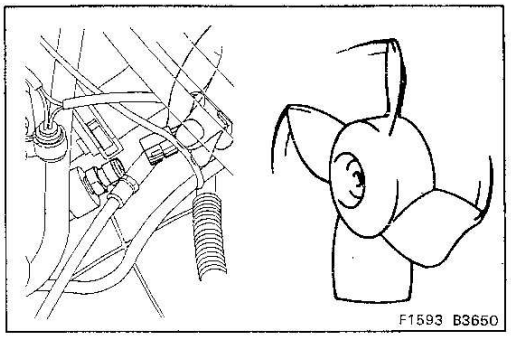
ON-VEHICLE INSPECTION

Low Coolant Temperature [below 78°C or 172°F]

1. TURN IGNITION SWITCH ON

Check that the fan is stopped.

If it does not, check the fan relay and temperature switch, and check for a separated connector or severed wire between the relay and temperature switch.

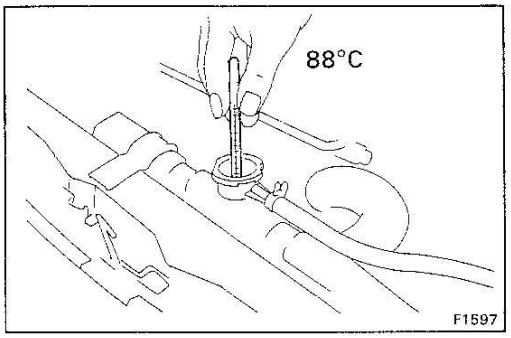


2. DISCONNECT TEMPERATURE SWITCH CONNECTOR

Check that the fan rotates.

If it doesn't, check the fan relay, fan motor, engine main relay and fuse, and check for a short circuit between the fan relay and temperature switch.

3. CONNECT TEMPERATURE SWITCH CONNECTOR



High Coolant Temperature [above 88°C or 190°F]

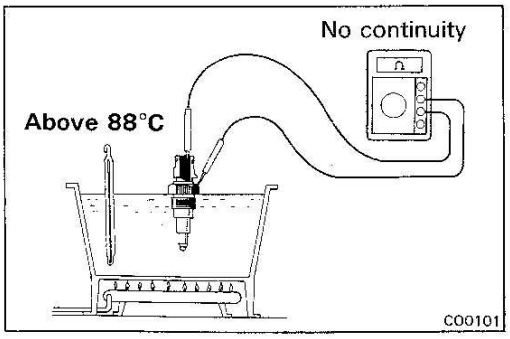
4. START ENGINE

(a) Raise engine coolant temperature to above 88°C (190°F).

(b) Check that the fan rotates.

(c) Check that the fan stops when coolant temperature is below 78°C (172°F).

If it doesn't replace the temperature switch.

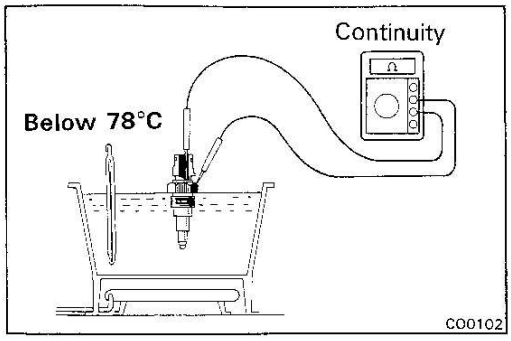


INSPECTION

1. INSPECT TEMPERATURE SWITCH

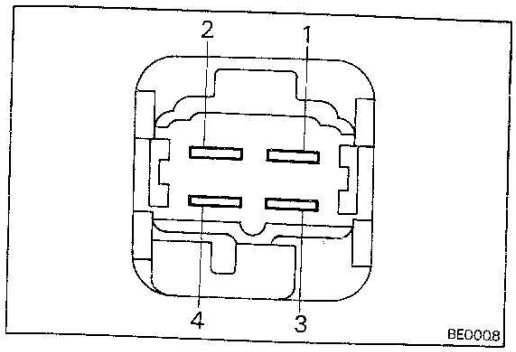
NOTE: Located on the water inlet housing.

(a) Using an ohmmeter, check that there is no continuity when the coolant temperature is above 88°C (190°F).



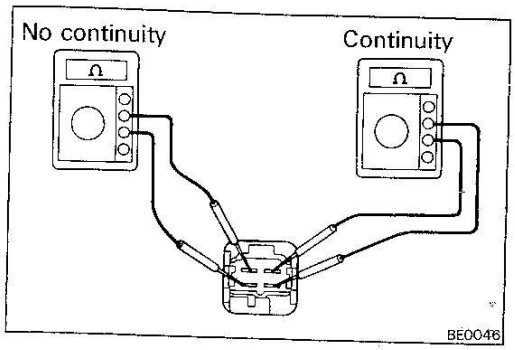
(b) Check that there is continuity when the coolant temperature is below 78°C (172°F).

If continuity is not as specified, replace the switch.



2. INSPECT ENGINE MAIN RELAY
[EP Series]

NOTE: Located in the engine compartment relay box.

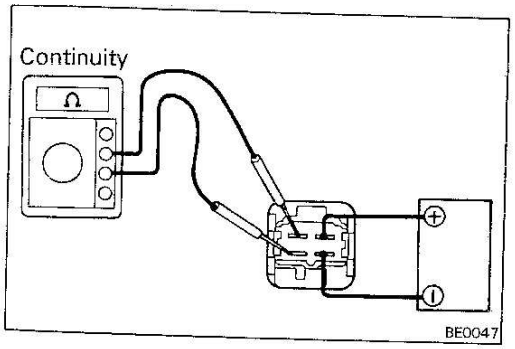


Inspect Relay Continuity

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 3.

(b) Check that there is no coninuity between terminals 2 and 4.

If continuity is not as specified, replace the relay.

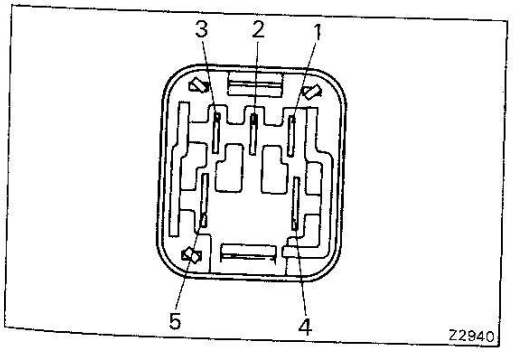


Inspect Relay Operation

(a) Apply battery voltage across terminals 1 and 3.

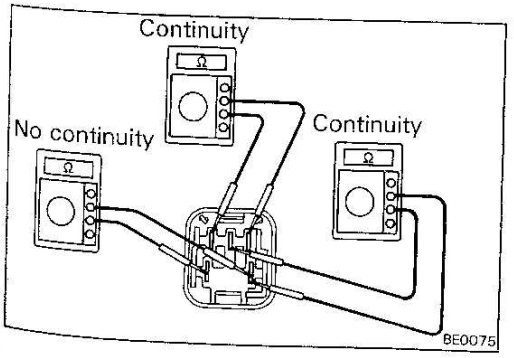
(b) Check that there is continuity between terminals 2 and 4.

If operation is not as specified, replace the replay.



[EE Series]

NOTE: Located in the engine compartment relay box.



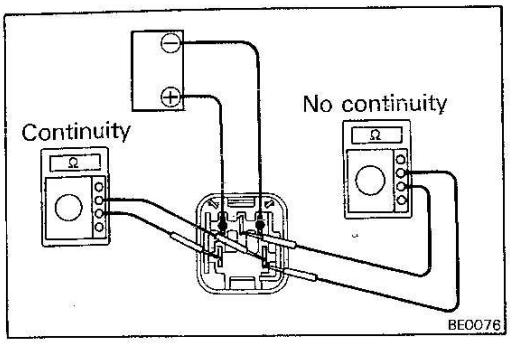
Inspect Relay Continuity

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 3.

(b) Check that there is continuity between terminals 2 and 4.

(c) Check that there is no continuity between terminals 4 and 5.

If continuity is not as specified, replace the relay.



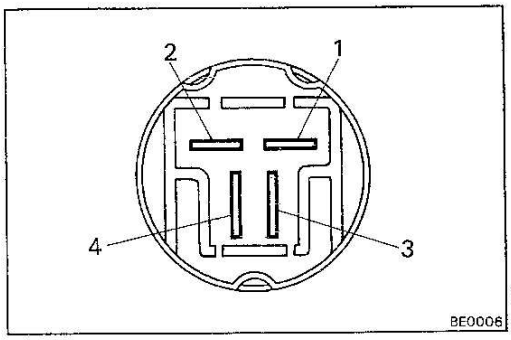
Inspect Relay Operation

(a) Apply battery voltage across terminals 1 and 3.

(b) Using an ohmmeter, check that there is continuity between terminals 4 and 5.

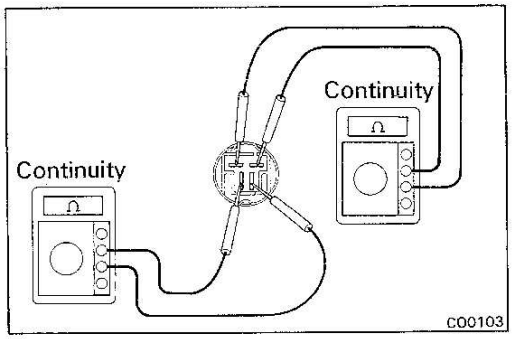
(c) Check that there is no continuity between terminals 2 and 4.

If operation is not as described, replace the relay.



3. INSPECT COOLING FAN MOTOR RELAY

NOTE: Located in the engine compartment relay box.

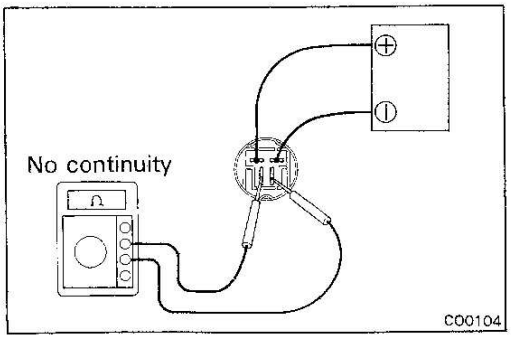


Inspect Relay Continuity

(a) Using an Ohmmeter, check that there is continuity between terminals 1 and 2.

(b) Check that there is continuity between terminals 3 and 4.

If continuity is not as specified, replace the relay.

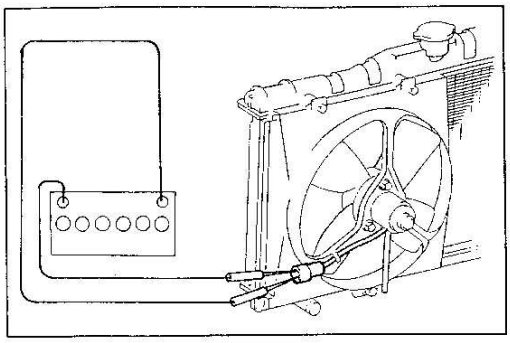


Inspect Relay Operation

(a) Apply battery voltage across terminals 1 and 2.

(b) Check that there is no continuity between terminals 3 and 4.

If operation is not as described, replace the relay.



4. INSPECT FAN MOTOR

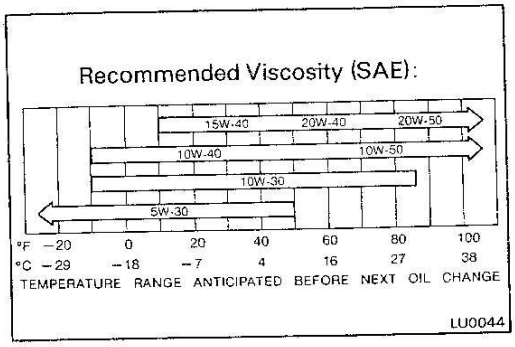
(a) Connect battery voltage to the fan motor connector.

(b) Check to see that the motor rotates smoothly.

LUBRICATION SYSTEM

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Oil leakage	Cylinder head, cylinder block or oil pump body damaged or cracked	Repair as necessary	
	Oil seal faulty	Replace oil seal	EM-59
	Gasket faulty	Replace gasket	
Low oil pressure	Oil leakage	Repair as necessary	
	Pressure regulator valve faulty	Replace pressure regulator valve	LU-4
	Oil pump faulty	Repair oil pump	LU-4
	Poor engine oil quality	Replace engine oil	LU-3
	Crankshaft bearing faulty	Replace bearing	EM-49
	Connecting rod bearing faulty	Replace bearing	EM-47
	Oil filter clogged	Replace oil filter	LU-3
High oil pressure	Pressure regulator valve faulty	Replace pressure regulator valve	LU-4



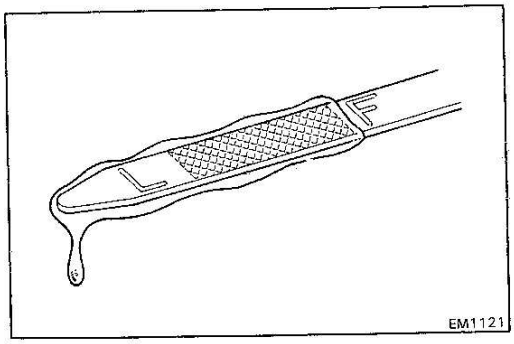
OIL PRESSURE CHECK

1. CHECK OIL QUALITY

Check the oil for deterioration, entry of water, discoloring or thinning.

If the oil quality is poor, replace it.

Use API grade SD, SE, SF or better and recommended viscosity oil.



2. CHECK OIL LEVEL

The oil level should be between the "L" and "F" marks on the level gauge.

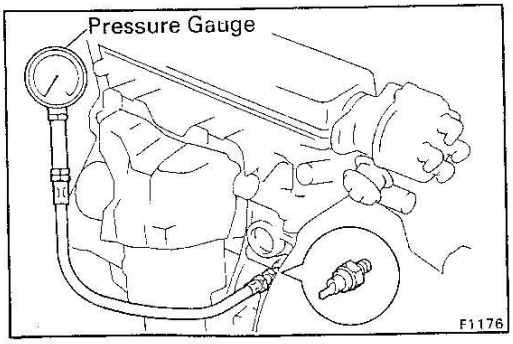
If low, check for leakage and add oil up to the "F" mark.

3. REMOVE OIL PRESSURE SWITCH

4. INSTALL OIL PRESSURE GAUGE

5. START ENGINE

Start the engine and warm it up to the normal operating temperature.



6. MEASURE OIL PRESSURE

Oil pressure:

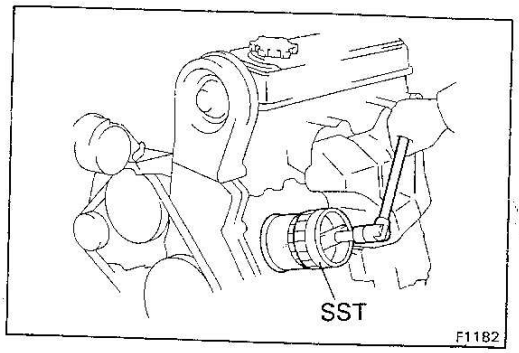
At idle speed

More than 0.3 kg/cm² (4.3 psi, 29 kPa)

At 3,000 rpm

2.5 — 5.0 kg/cm² (36 — 71 psi, 245 — 490 kPa)

NOTE: Check for oil leakage after reinstalling the pressure switch.



REPLACEMENT OF ENGINE OIL AND OIL FILTER

1. DRAIN ENGINE OIL

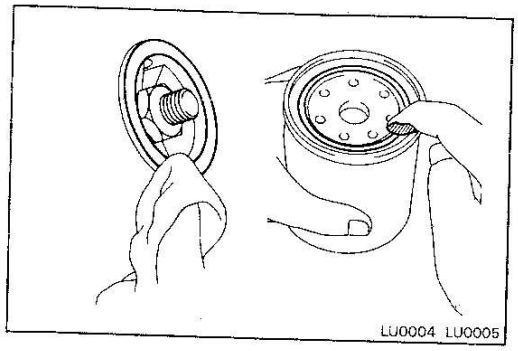
(a) Remove the oil filler cap.

(b) Remove the oil drain plug and drain the oil into a container.

2. REPLACE OIL FILTER

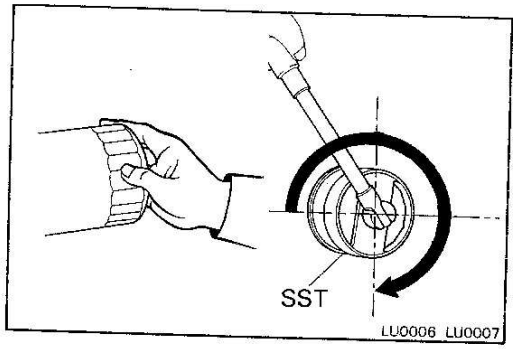
(a) Using SST, remove the oil filter.

SST 09228-22020



(b) Inspect and clean the oil filter installation surface.

(c) Apply clean engine oil to the gasket of a new oil filter.



(d) Lightly screw in the oil filter until you feel resistance.

(e) Then, using SST, tighten the oil filter an extra 3/4 turn.

SST 09228-22020

3. FILL WITH ENGINE OIL

(a) Clean and install the oil drain plug with a new gasket. Torque the drain plug.

Torque: 250 kg-cm (18 ft-lb, 25 N·m)

(b) Fill the engine with new oil, API grade SD, SE, SF or better.

Capacity:

Drain and refill—

w/o Oil filter change

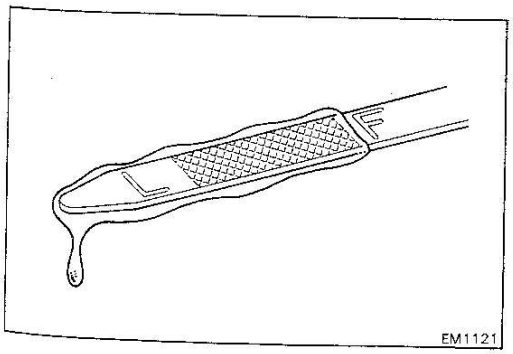
2.9 liters (3.1 US qts, 2.6 Imp.qts)

w/ Oil filter change

3.2 liters (3.4 US qts, 2.8 Imp.qts)

Dry fill— 3.4 liters (3.6 US qts, 3.0 Imp.qts)

(c) Install the oil filler cap with the gasket.



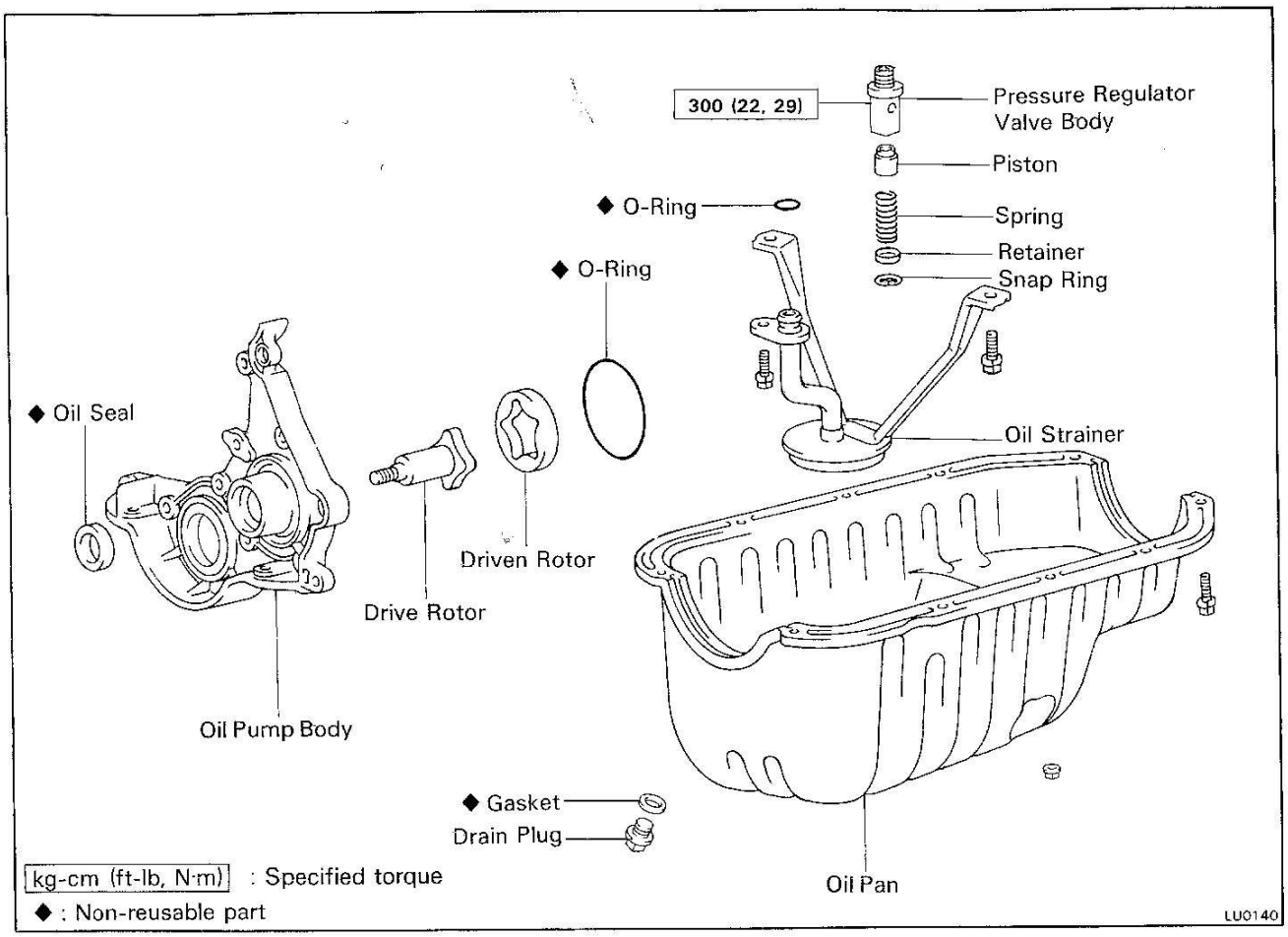
4. START ENGINE AND CHECK FOR LEAKS

5. RECHECK OIL LEVEL

Recheck the engine oil level and refill as necessary.

OIL PUMP AND PRESSURE REGULATOR VALVE

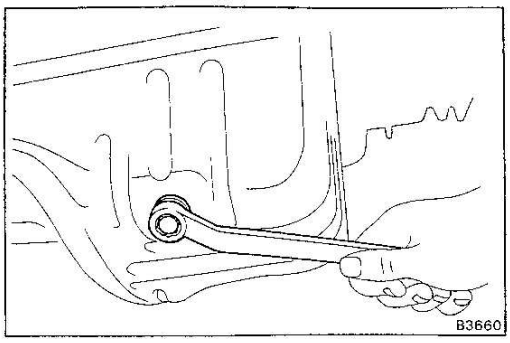
COMPONENTS



REMOVAL OF OIL PUMP AND PRESSURE REGULATOR VALVE

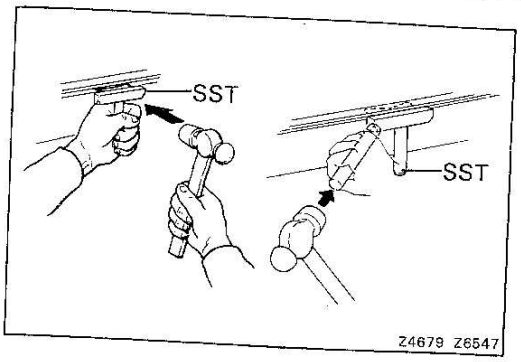
NOTE: When repairing the oil pump, the oil pan and strainer should be removed and cleaned.

1. **REMOVE TIMING BELT**
   (See steps 1 to 10 and 12 on pages EM-16 to 18)



2. **DRAIN ENGINE OIL**
   (a) Remove the oil filter cap.
   (b) Remove the oil drain plug and drain the oil into a container.

3. **REMOVE OIL LEVEL GAUGE**



4. REMOVE OIL PAN

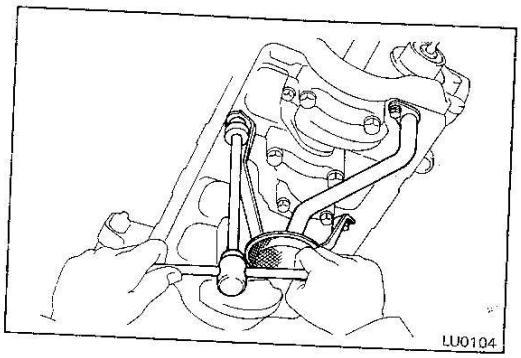
(a) Remove the two nuts and eight bolts.

(b) Insert the SST blade between the cylinder block and oil pan, cut off applied sealer and then remove the oil pan.

SST 09032-00100

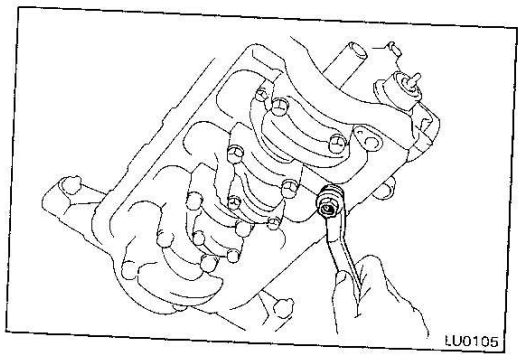
NOTE:

- Do not use SST for the oil pump body side. If necessary, use a screwdriver.
- When removing the oil pan, be careful not to damage the oil pan flange.

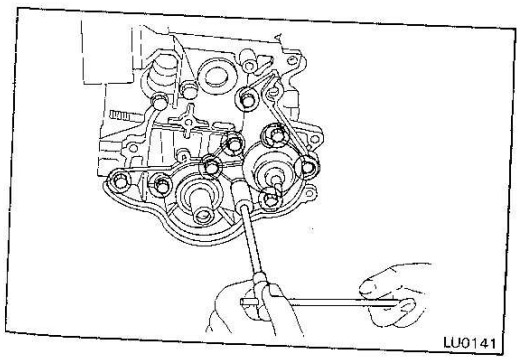


5. REMOVE OIL STRAINER

Remove the three bolts and oil strainer.

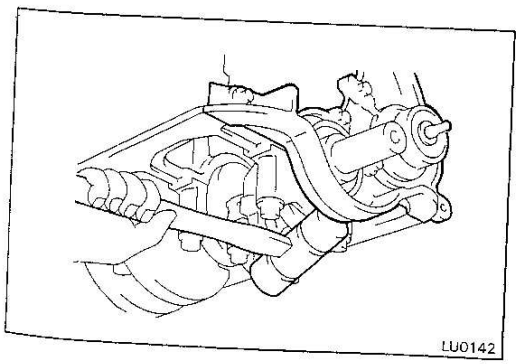


6. REMOVE PRESSURE REGULATOR VALVE ASSEMBLY



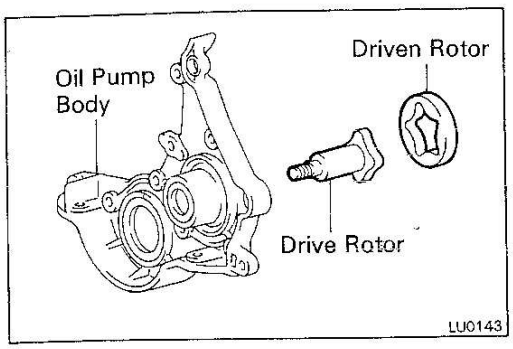
7. REMOVE OIL PUMP

(a) Remove the nine bolts with the clamp.



(b) Using a plastic-faced hammer, carefully tap off the oil pump.

(c) Remove the oil pump body with the O-ring.

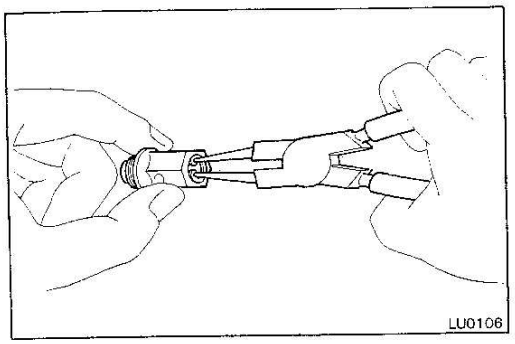


DISASSEMBLY OF OIL PUMP AND PRESSURE REGULATOR VALVE

(See page LU-4)

1. REMOVE DRIVE AND DRIVEN ROTORS

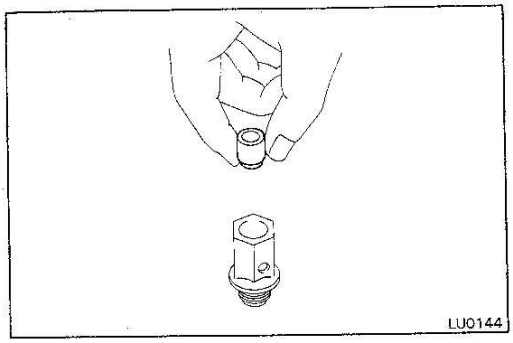
Pull out the drive and driven rotors.



2. DISASSEMBLE PRESSURE REGULATOR VALVE

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

(b) Remove the retainer, spring and pressure regulator valve piston.

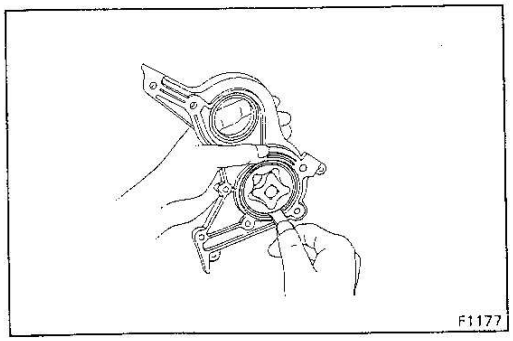


INSPECTION OF OIL PUMP AND PRESSURE REGULATOR VALVE

1. INSPECT PRESSURE REGULATOR VALVE

Coat the valve piston with engine oil and check that it falls smoothly into the valve hole by its own weight.

If necessary, replace the valve.



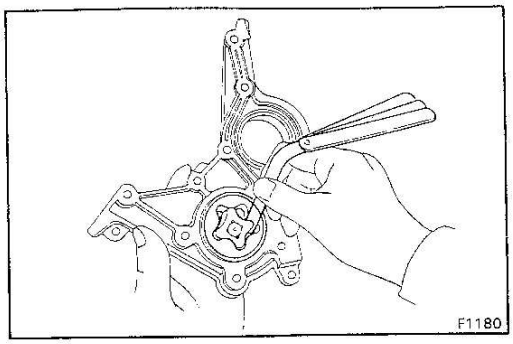
2. INSPECT BODY CLEARANCE

Using a feeler gauge, measure the clearance between the driven rotor and pump body.

Standard clearance: **0.10 – 0.16 mm (0.0039 – 0.0063 in.)**

Maximum clearance: **0.20 mm (0.0079 in.)**

If the clearance is greater than the maximum, replace the oil pump rotor set and/or pump body.



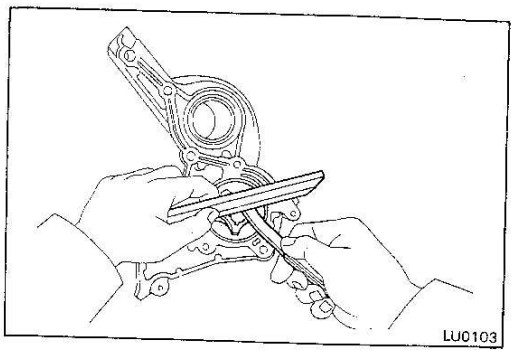
3. INSPECT TIP CLEARANCE

Using a feeler gauge, measure the clearance between both rotor trips.

Standard clearance: **0.06 – 0.15 mm (0.0024 – 0.0059 in.)**

Maximum clearance: **0.20 mm (0.0079 in.)**

If the clearance is greater than the maximum, replace the oil pump rotor set.



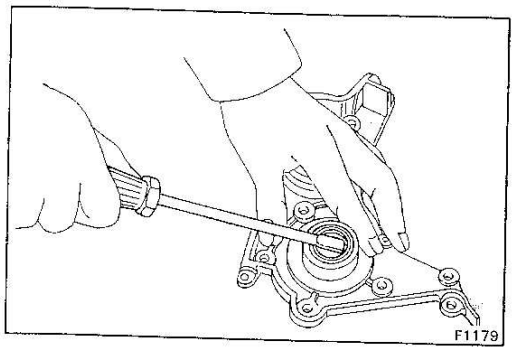
4. INSPECT SIDE CLEARANCE

Using a feeler gauge and flat block, measure the side clearance as shown.

Standard clearance: **0.03 – 0.09 mm (0.0012 – 0.0035 in.)**

Maximum clearance: **0.10 mm (0.0039 in.)**

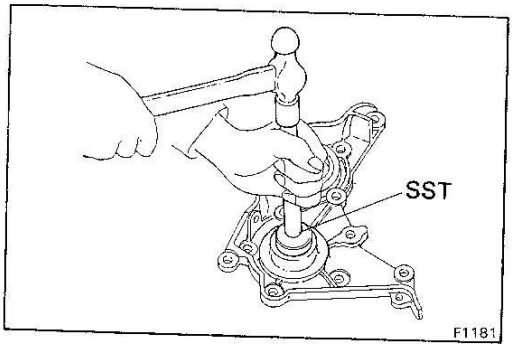
If the clearance is greater than maximum, replace the oil pump rotor set and/or pump body.



REPLACEMENT OF OIL SEAL

1. REMOVE OIL SEAL

Using a screwdriver, pry out the oil seal.

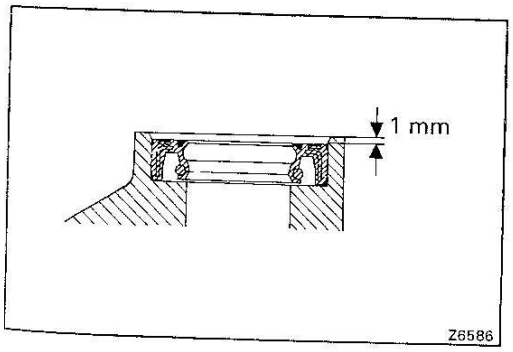


2. INSTALL OIL SEAL

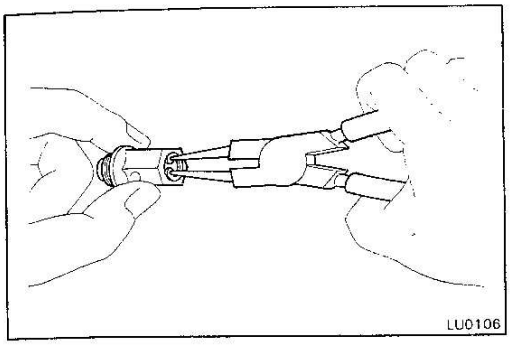
(a) Apply MP grease to a new oil seal.

(b) Using SST, drive in the new oil seal.

SST 09517-30010



CAUTION: Drive in the oil seal to a depth of about 1 mm (0.04 in.) from the oil pump body edge.


LU0106

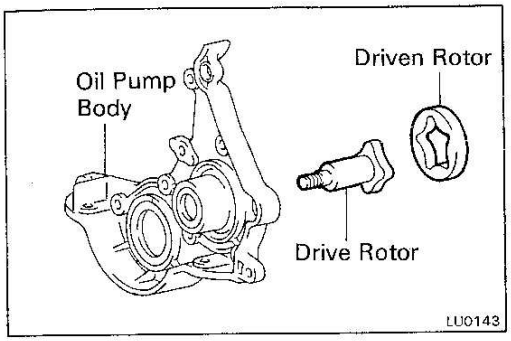
ASSEMBLY OF OIL PUMP AND PRESSURE REGURATOR VALVE

(See page LU-4)

1. ASSEMBLE PRESSURE REGULATOR VALVE

(a) Insert the pressure regulator valve piston, spring and retainer.

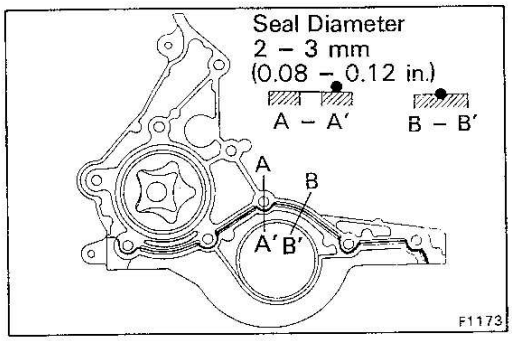
(b) Using snap ring pliers, install the snap ring.



LU0143

2. INSTALL DRIVE AND DRIVEN ROTORS

Put the drive and driven rotors in the pump body.



F1173

INSTALLATION OF OIL PUMP AND PRESSURE REGULATOR VALVE

(See page LU-4)

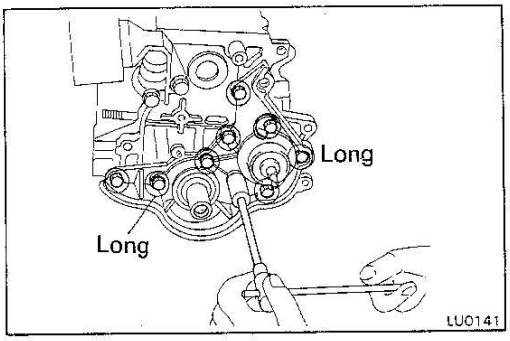
1. INSTALL OIL PUMP ASSEMBLY

(a) Place a new O-ring into the groove.

(b) Apply seal packing (Part No. 08826-00080) or equivalent to the oil pump body as shown in the figure.

NOTE: Cleaning and application of seal packing to the installation surface is the same as for the oil pan. However, use a nozzle cut to 2 mm (0.08 in.)

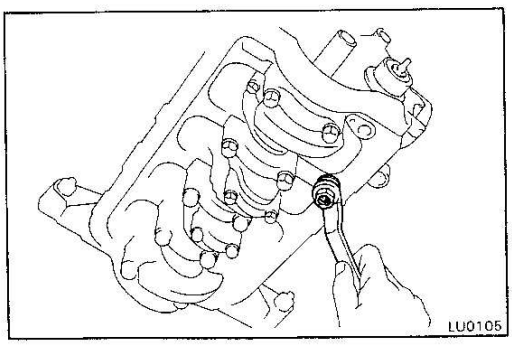
(c) Install the oil pump with the nine bolts and clamp.

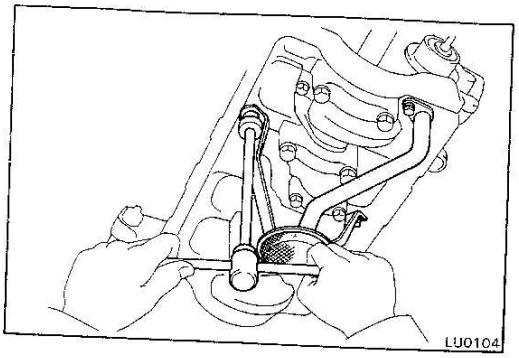


LU0141

2. INSTALL PRESSURE REGULATOR VALVE

Torque: 300 kg-cm (22 ft-lb, 29 N·m)


LU0105



3. INSTALL OIL STRAINER

(a) Apply a little engine oil to a new O-ring.

(b) Install the O-ring to the oil strainer.

(c) Install the oil strainer with the three bolts.

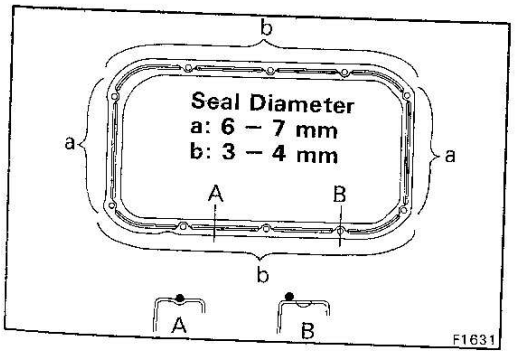
Torque: 75 kg-cm (65 in.-lb, 7.4 N·m)

4. INSTALL OIL PAN

(a) Remove any old packing material and be careful not to drop any oil on the contacting surfaces of the oil pan and cylinder block.

- Using a razor blade and gasket scraper, remove all the packing (FIPG) material from the gasket surfaces.
- Thoroughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non-residue solvent.

CAUTION: Do not use a solvent which will affect the painted surfaces.



(b) Apply seal packing (Part No. 08826-00080) or equivalent to the oil pan as shown in the figure.

Seal diameter:

a 6 – 7 mm (0.24 – 0.28 in.)
b 3 – 4 mm (0.12 – 0.16 in.)

- Install a nozzle that has been cut to a 3 mm (0.12 in.) or 6 mm (0.24 in.) opening.

NOTE: Avoid applying an excess amount to the surface. Be especially careful near oil passages.

- Parts must be assembled within 15 minutes of application. Otherwise, the seal packing must be removed and re-applied.
- Immediately remove nozzle from tube and reinstall cap.

(c) Install the oil pan with the two nuts and eight bolts.

torque: 85 kg-cm (74 in.-lb, 8.3 N·m)

5. **INSTALL OIL LEVEL GAUGE**

6. **INSTALL TIMING BELT**
   (See steps 1 and 3 to 13 on pages EM-21 to 25)

7. **INSTALL RH ENGINE UNDER COVER**

8. **LOWER VEHICLE**

9. **REFILL WITH ENGINE OIL (See step 3 on page LU-3)**

10. **START ENGINE AND CHECK FOR LEAKS**

11. **RECHECK OIL LEVEL**
    Recheck the engine oil level and refill as necessary.

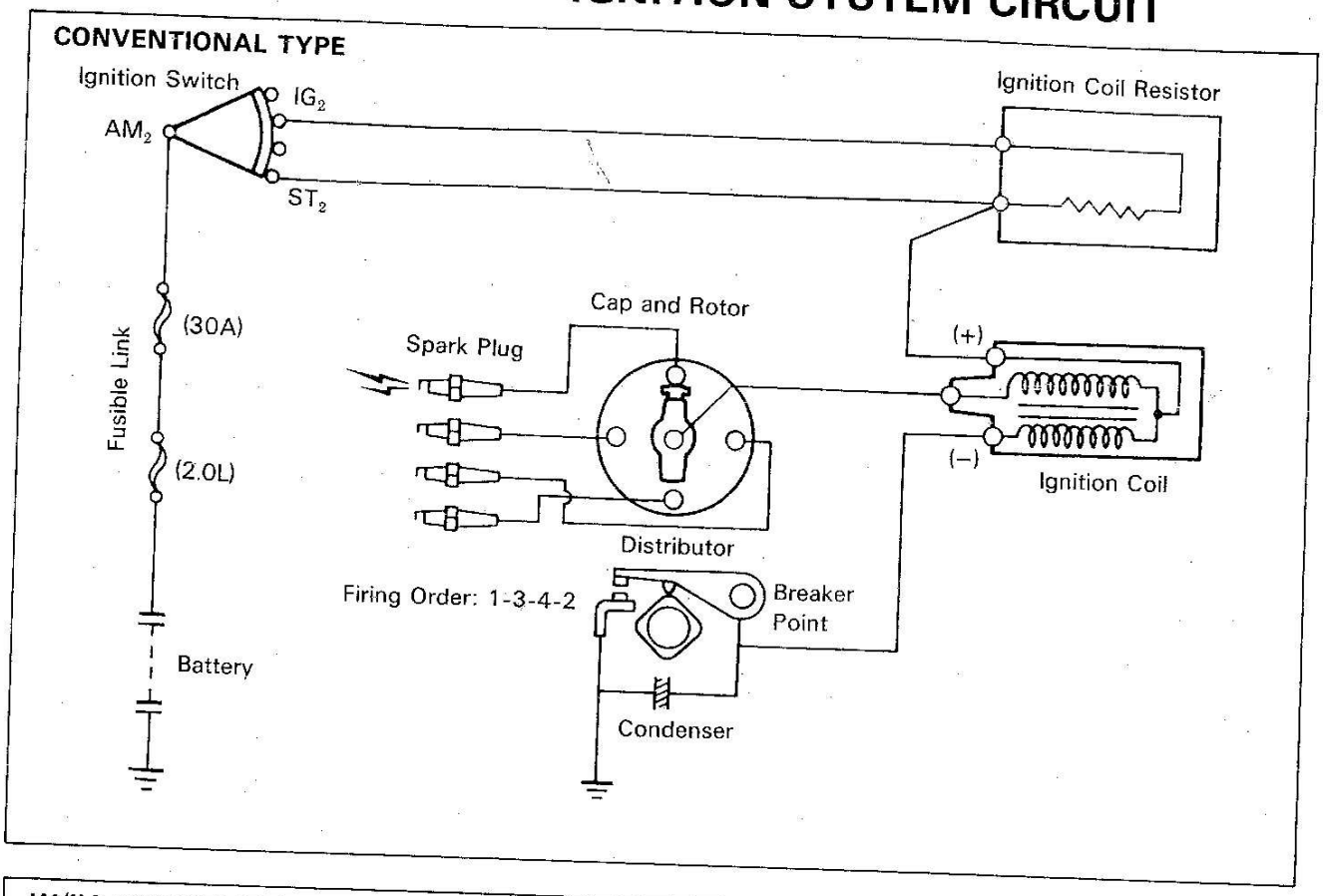
PRECAUTIONS

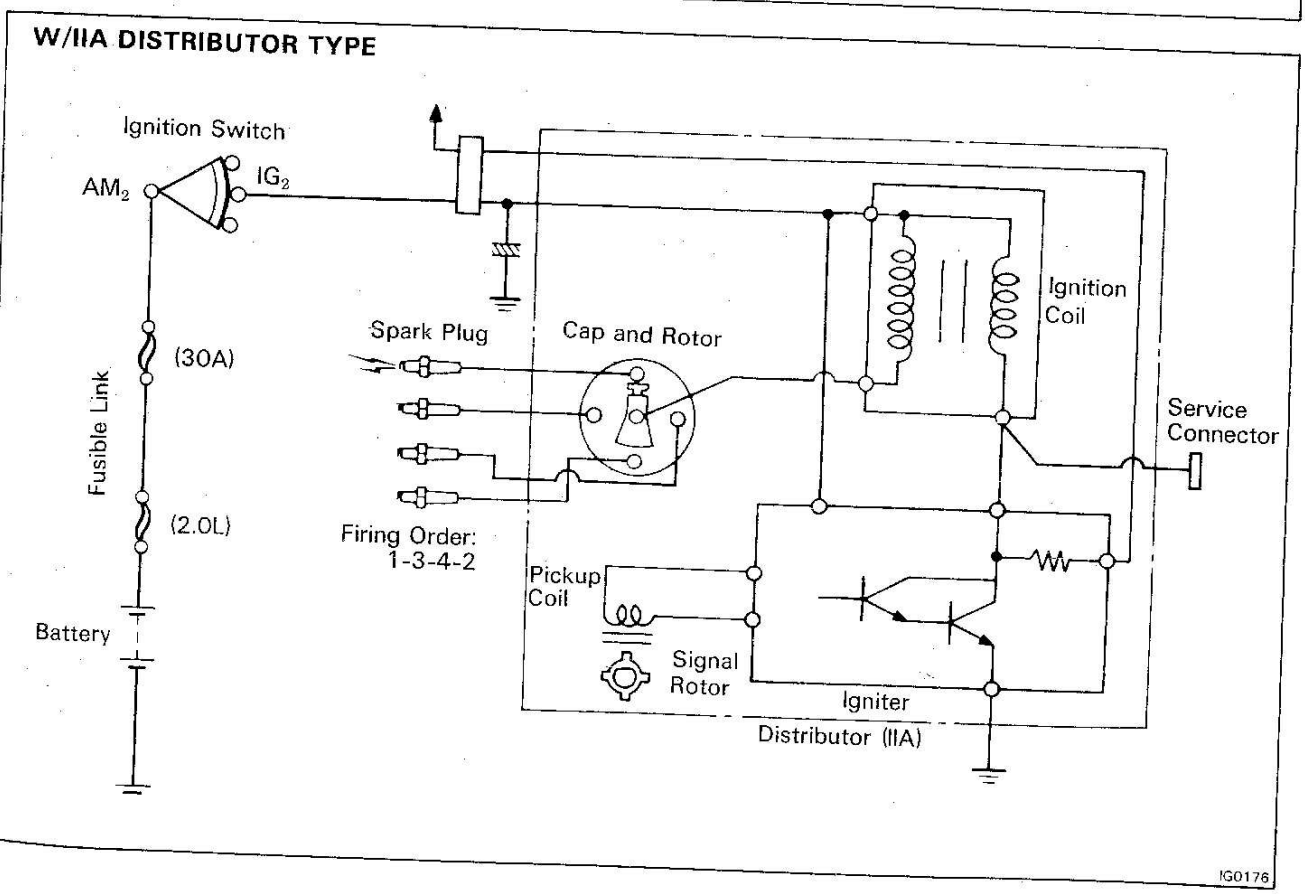
1. **Do not keep the ignition switch on for more than 10 minutes if the engine will not start.**
2. **When a tachometer is connected to the system, connect the tachometer positive (+) terminal to the ignition coil negative (−) terminal. (for Conventional system)**
3. **When a tachometer is connected to the system, connect the tachometer test probe to the service connector at the distributor. (for IIA)**
4. **As some tachometers are not compatible with this ignition system, it is recommended that you consult with the manufacturer.**
5. **NEVER allow the ignition coil terminals to touch ground as it could result in damage to the igniter and/or ignition coil.**
6. **Do not disconnect the battery when the engine is running.**
7. **Make sure that the igniter is properly grounded to the body.**

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not start/ hard to start (cranks ok)	Incorrect ignition timing	Reset timing	EM-6
	Ignition coil faulty	Inspect coil	IG-5, 6
	Igniter faulty	Inspect igniter	IG-6
	Distributor faulty	Inspect distributor	IG-7, 8
	High-tension cord faulty	Inspect high-tension cord	IG-4
	Spark plugs faulty	Inspect plugs	IG-4
	Ignition wiring disconnected or broken	Inspect wiring	
Rough idle or stalls	Spark plugs faulty	Inspect plugs	IG-4
	Ignition wiring faulty	Inspect wiring	
	Incorrect ignition timing	Reset timing	EM-4
	Ignition coil faulty	Inspect coil	IG-5, 6
	Igniter faulty	Inspect igniter	IG-6
	Distributor faulty	Inspect distributor	IG-7, 8
	High-tension cord faulty	Inspect high-tension cord	IG-4
Engine hesitates/ poor acceleration	Spark plugs faulty	Inspect plugs	IG-4
	Ignition wiring faulty	Inspect wiring	
	Incorrect ignition timing	Reset timing	EM-6
Engine dieseling (runs after ignition switch is turned off)	Incorrect ignition timing	Reset timing	EM-6
Muffler explosion (after fire) all the time	Incorrect ignition timing	Reset timing	EM-6
Engine backfires	Incorrect ignition timing	Reset timing	EM-6
Poor gasoline mileage	Spark plugs faulty	Inspect plugs	IG-4
	Incorrect ignition timing	Reset timing	EM-6
Engine overheats	Incorrect ignition timing	Reset timing	EM-6

IGNITION SYSTEM CIRCUIT





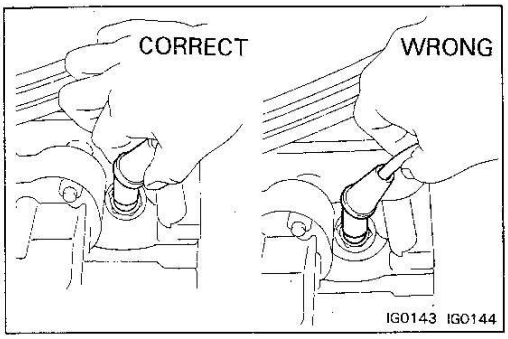
ON-VEHICLE INSPECTION

SPARK TEST

NOTE: Perform this test to check that there is voltage from the distributor to each spark plug.

CRANK ENGINE AND CHECK THAT LIGHT FLASHES

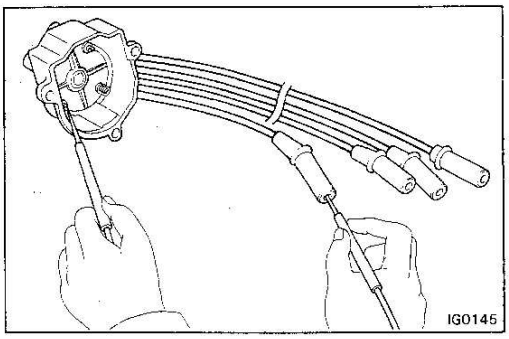
Connect the timing light to a spark plug. If the timing light does not flash, check wiring connections, ignition coil, igniter and distributor.



INSPECTION OF HIGH-TENSION CORD

1. **CAREFULLY REMOVE HIGH-TENSION CORD BY RUBBER BOOT**

   CAUTION: Pulling on or bending the cords may damage the conductor inside.



2. **INSPECT RESISTANCE OF HIGH TENSION CORD AND DISTRIBUTOR CAP**

   Using an ohmmeter, check that the resistance does not exceed the maximum.

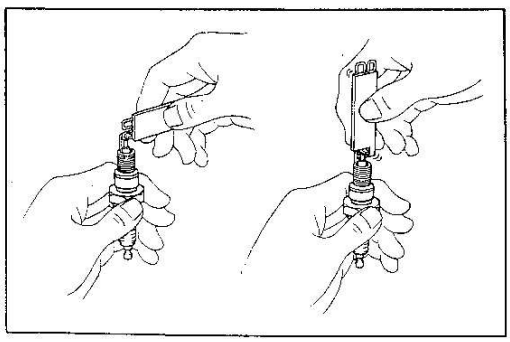
   Maximum resistance: Less than 25 kΩ/cord

   If more than maximum, check the terminals, and replace the high-tension cord and/or distributor cap as required.

INSPECTION OF SPARK PLUGS

Spark plug

	ND	NGK
1E (EC)	W20EXR-U	BPR6EY
2E (EC), 2E-C	W20EXR-U11	BPR6EY11
Others	W20EX-U	BP6EY



1. **REMOVE SPARK PLUGS**

2. **CLEAN AND INSPECT SPARK PLUGS**

   (a) Clean the spark plugs with a spark plug cleaner or wire brush.

   (b) Inspect the spark plugs for electrode wear, thread damage and insulator damage.

   If a problem is found, replace the plugs.

3. **ADJUST ELECTRODE GAP**

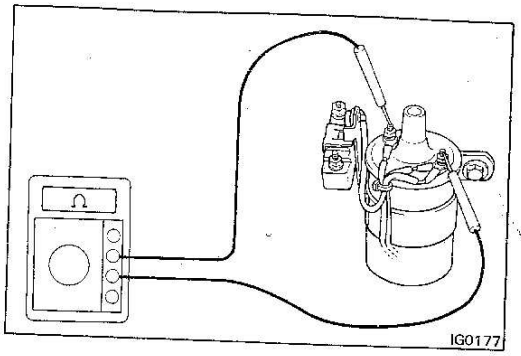
   Carefully bend the outer electrode to obtain the correct electrode gap.

   Correct electrode gap:

W20EXR-U11, BPR6EY11	**1.1 mm (0.043 in.)**
Ex. W20EXR-U11, BPR6EY11	**0.8 mm (0.031 in.)**

4. **INSTALL SPARK PLUGS**

   Torque: 180 kg-cm (13 ft-lb, 18 N·m)



INSPECTION OF IGNITION COIL (Conventional)

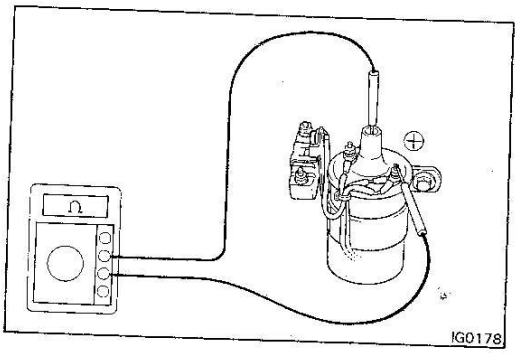
1. **DISCONNECT HIGH-TENSION CORD**

2. **DISCONNECT DISTRIBUTOR WIRE CONNECTOR**

3. **INSPECT PRIMARY COIL RESISTANCE**

   Using an ohmmeter, measure the resistance between th positive (+) and negative (−) terminals.

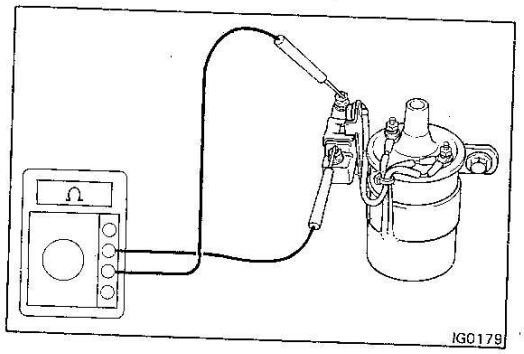
   Primary coil resistance (coid): 1.3 − 1.6 Ω



4. **INSPECT SECONDARY COIL RESISTANCE**

   Using an ohmmeter, measure the resistance between the positive (+) terminal and high-tension terminal.

   Secondary coil resistance (cold): 10.7 − 14.5 kΩ

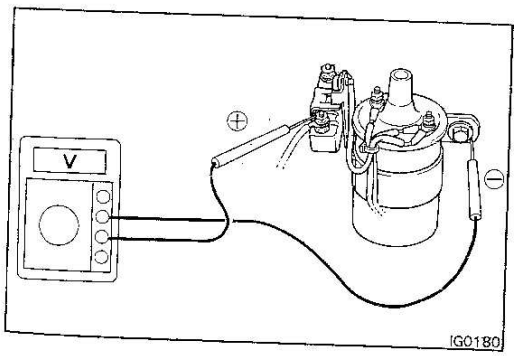


5. **INSPECT RESISTOR RESISTANCE**

   Using an ohmmeter, measure the resistance of the resistor.

   Resistor resistance (cold): 1.3 − 1.5 Ω

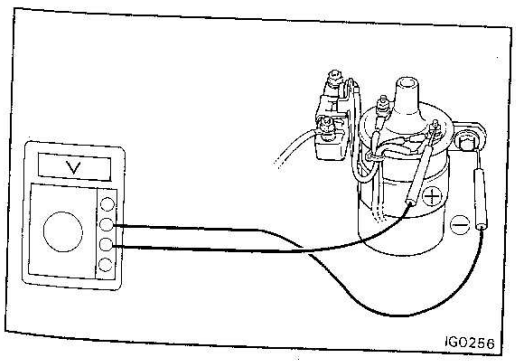
6. **CONNECT DISTRIBUTOR WIRE CONNECTOR**



7. **CHECK POWER SOURCE LINE**

   (a) With the ignition switch at ON and using a voltmeter, connect the positive (+) probe to the terminal of resistor (black and red wire) and the negative (−) probe to the body ground.

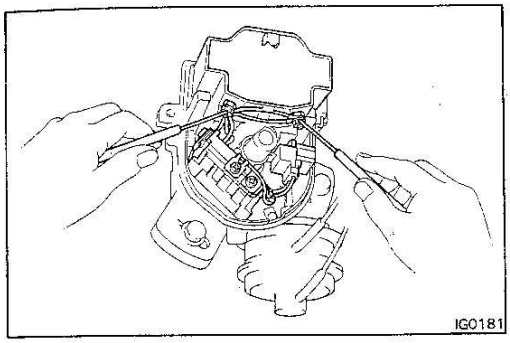
   Voltage: Approx. 12V



   (b) With the ignition switch at START and using a voltmeter, connect the positive (+) probe to the ignition coil (+) terminal and the negative (−) probe to the body ground.

   Voltage: Approx. 12V

If a problem is found, check the ignition switch and wire harness.


IG0181

INSPECTION OF IGNITION COIL (IIA)

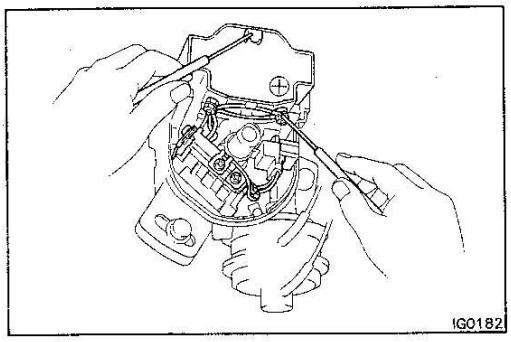
1. **REMOVE DISTRIBUTOR CAP, ROTOR AND DUST COVER**

2. **DISCONNECT DISTRIBUTOR WIRE CONNECTOR**

3. **INSPECT PRIMARY COIL RESISTANCE**

   Using an ohmmeter, measure the resistance between the positive (+) and negative (−) terminals.

   Primary coil resistance (cold): 1.2 − 1.5 Ω

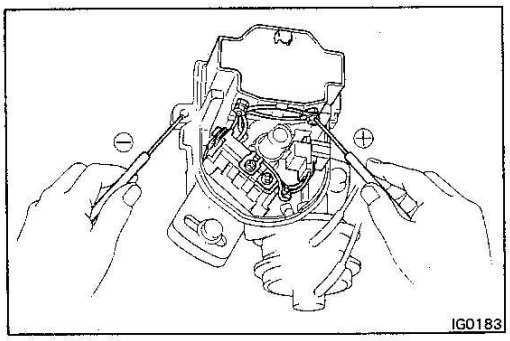

IG0182

4. **INSPECT SECONDARY COIL RESISTANCE**

   Using an ohmmeter, measure the resistance between the positive (+) terminal and high-tension terminal.

   Secondary coil resistance (cold): 10.2 − 13.8 kΩ

5. **CONNECT DISTRIBUTOR WIRE CONNECTOR**


IG0183

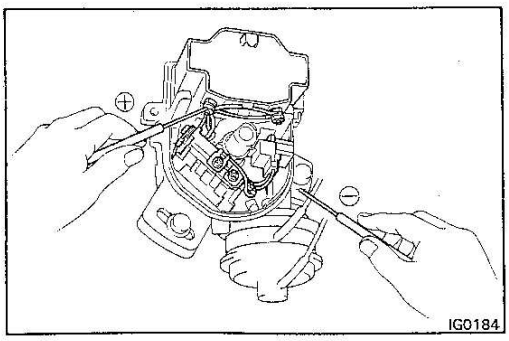
INSPECTION OF IGNITER (IIA)

1. **TURN IGNITION SWITCH ON**

2. **INSPECT POWER SOURCE LINE VOLTAGE**

   Using a voltmeter, connect the positive (+) probe to the ignition coil positive (+) terminal and the negative (−) probe to the body ground.

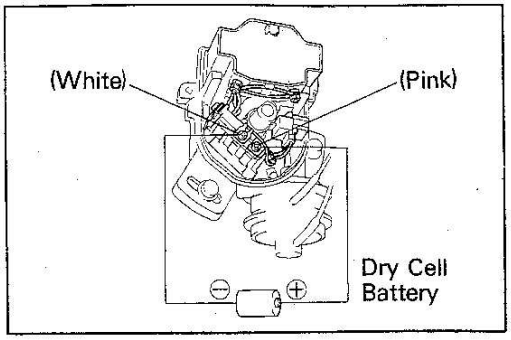
   Voltage: Approx. 12V


IG0184

3. **INSPECT POWER TRANSISTOR IN IGNITER**

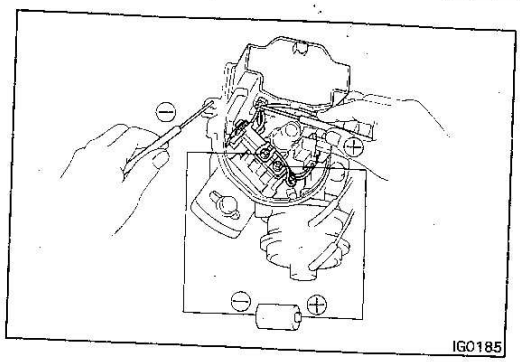
   (a) Using a voltmeter, connect the positive (+) probe to the ignition coil negative (−) terminal and the negative (−) probe to the body ground.

   Voltage: Approx. 12V



   (b) Using a dry cell battery (1.5 V), connect the positive (+) pole of the battery to the pink wire terminal and the negative (−) pole to the white wire terminal.

   CAUTION: Do not apply voltage more than 5 seconds to avoid destroying the power transistor in the igniter.



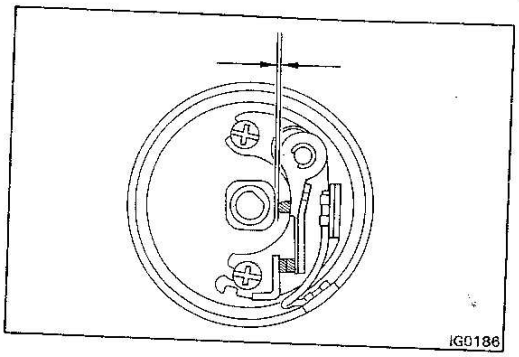
(c) Using a voltmeter, connect the positive (+) probe to the ignition coil negative (−) terminal and the negative (−) probe to the body ground.

(d) Check the voltage reading.

Voltage: 0 – 3 V

If a problem is found, replace the igniter.

4. TURN IGNITION SWITCH OFF



INSPECTION OF DISTRIBUTOR (Conventional)

1. CHECK BREAKER POINT

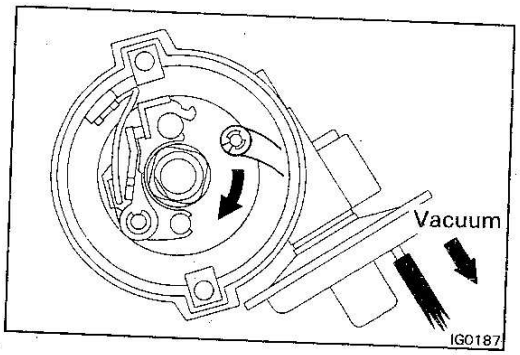
(a) Using a feeler gauge, measure the gap between the cam and the rubbing block.

Rubbing block gap: 0.45 mm (0.018 in.)

(b) Adjust the gap if necessary.

- Loosen the two screws and move the breaker point until the gap is correct. Tighten the screws and recheck the gap.

Clean the contact surface of the points with a piece of cloth saturated in solvent.

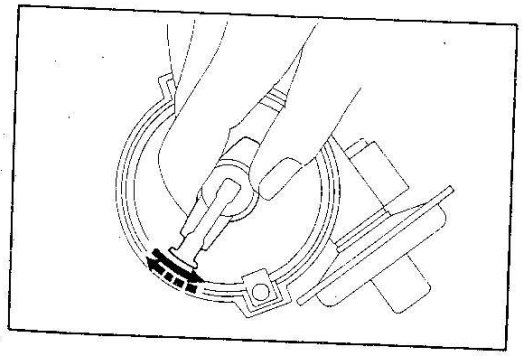


2. CHECK VACUUM ADVANCE

(a) Disconnect the vacuum hose and connect a vacuum pump to the diaphragm.

(b) Apply vacuum and check that the vacuum advancer moves.

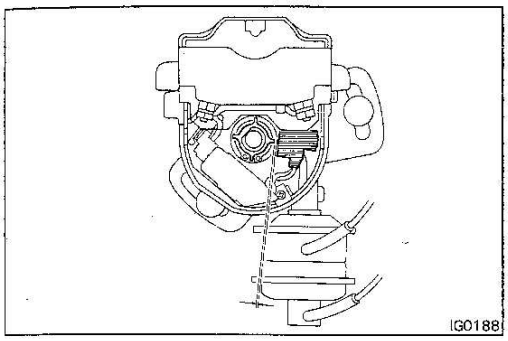
If the vacuum advance does not work, repair or replace as necessary.



3. CHECK GOVERNOR ADVANCE

(a) Turn the rotor counterclockwise, release it and check that the rotor quickly returns clockwise.

(b) Check that the rotor is not excessively loose.

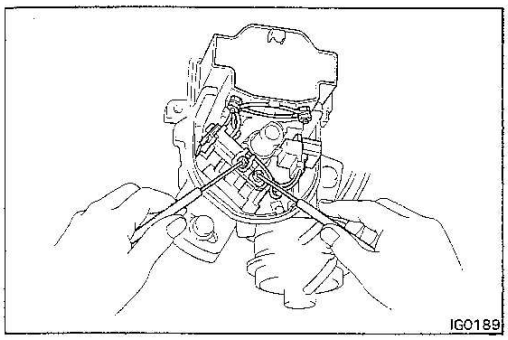


INSPECTION OF DISTRIBUTOR (IIA)

1. INSPECT AIR GAP

Using a feeler gauge, measure the gap between the signal rotor and the pickup coil projection.

Air gap: 0.2 – 0.4 mm (0.008 – 0.016 in.)

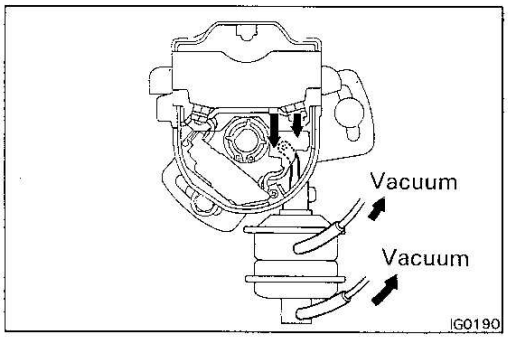


2. INSPECT PICKUP COIL

Using an ohmmeter, check the resistance of the pickup coil.

Pickup coil resistance: 140 – 180 Ω

If the resistance is not correct, replace the pickup coil.

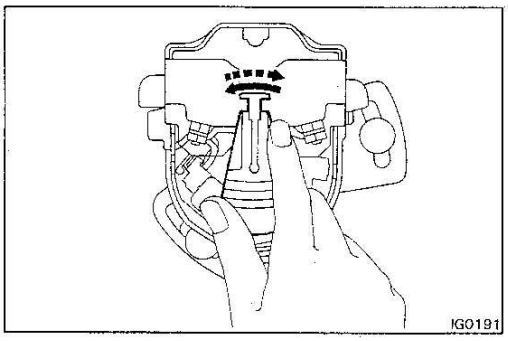


3. INSPECT VACUUM ADVANCE

(a) Disconnect the vacuum hose and connect a vacuum pump to the diaphragm.

(b) Apply vacuum and check that the vacuum advancer moves.

If the vacuum advancer does not work, repair or replace as necessary.



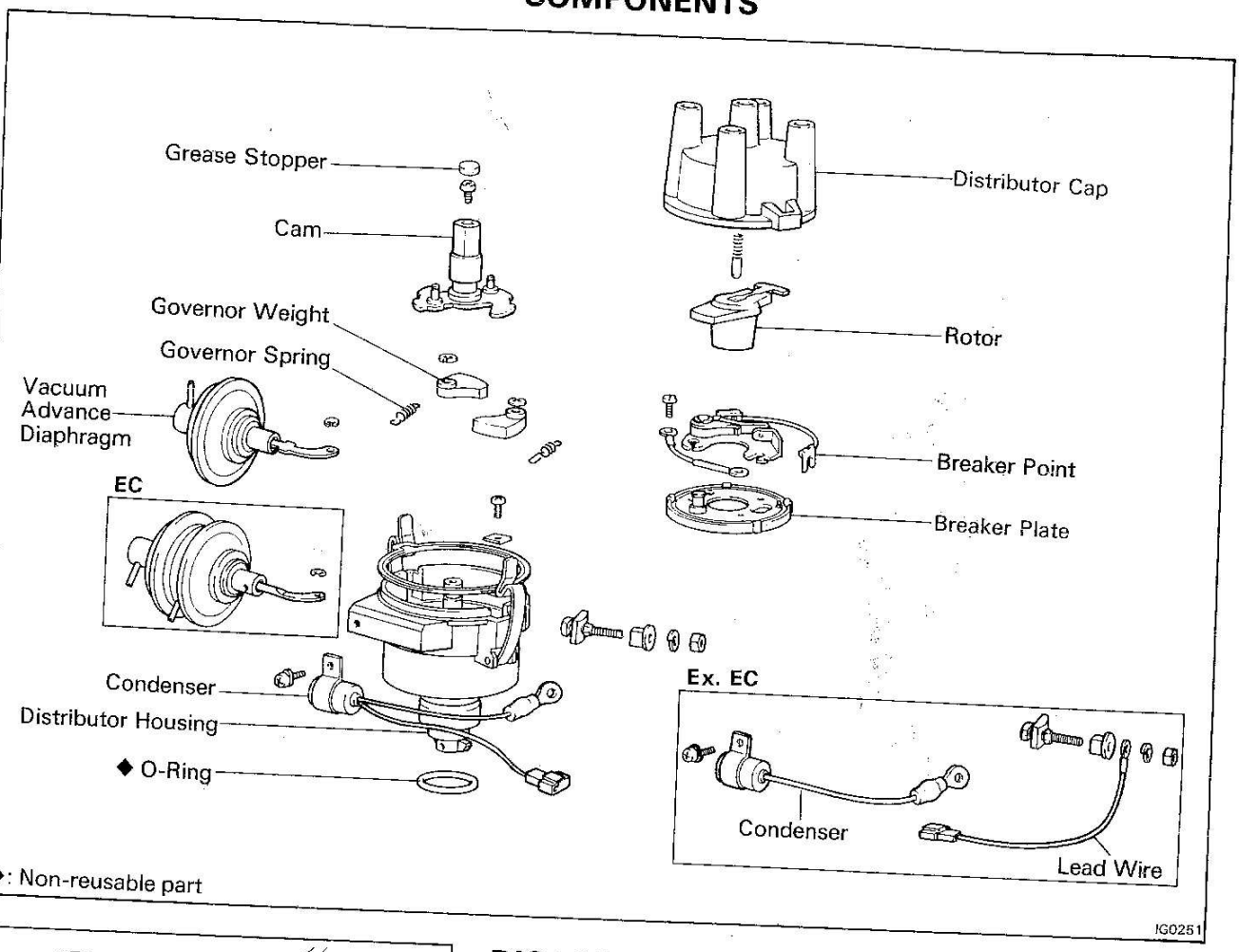
4. INSPECT GOVERNOR ADVANCE

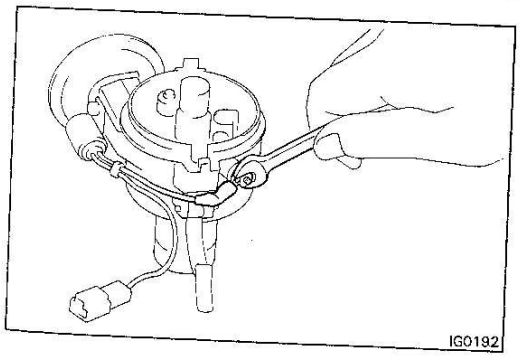
(a) Turn the rotor counterclockwise, release it and check that the rotor returns quickly clockwise.

(b) Check that the rotor is not excessively loose.

DISTRIBUTOR (Conventional)

COMPONENTS



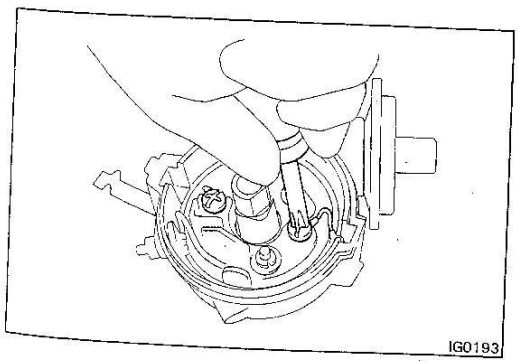


DISASSEMBLY OF DISTRIBUTOR

1. **REMOVE DISTRIBUTOR CAP AND PACKING**

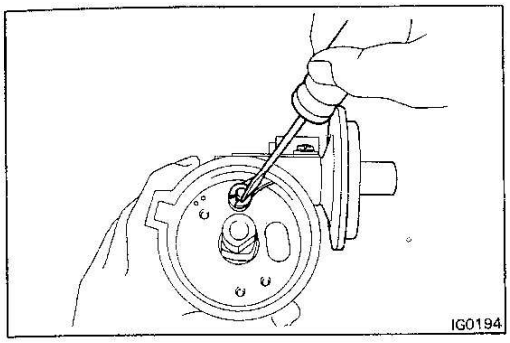
2. **REMOVE LEAD WIRE AND TERMINAL**

   Remove the terminal nut, lead wire condenser, insulators and terminal.



3. **REMOVE BREAKER POINT**

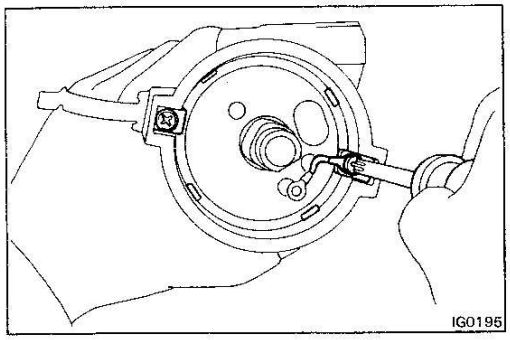
   Remove the two screws and breaker point.



4. REMOVE VACUUM ADVANCER

(a) Remove the mounting screw and condenser from the distributer housing.

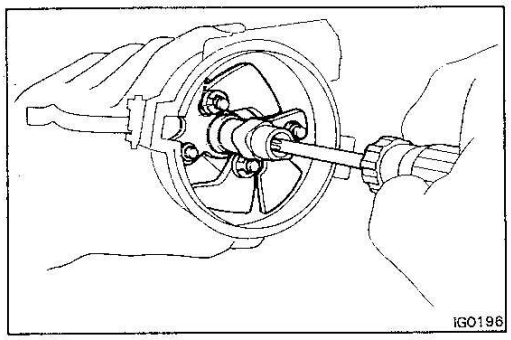
(b) Remove the E-ring. Turn and pull out the vacuum advancer.



5. REMOVE BREAKER PLATE

Remove the two screws, ground wire and plate washers. Pull out the breaker plate.

6. REMOVE GOVERNOR SPRINGS

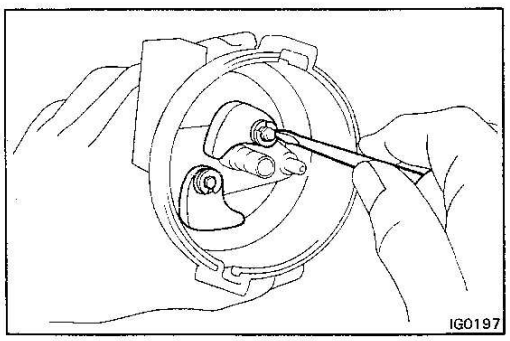


7. REMOVE CAM

(a) Pry out the grease stopper.

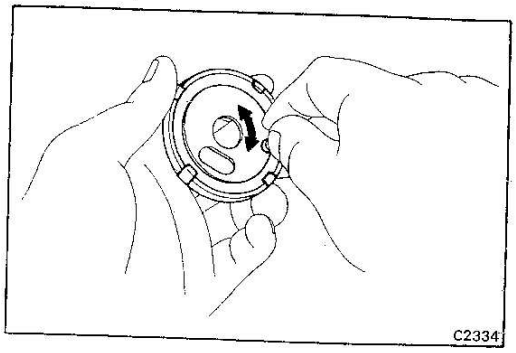
(b) Remove the screw at the top of the governor shaft.

(c) Pull out the cam.



8. REMOVE GOVERNOR WEIGHTS

Using a small screwdriver, remove the E-rings and pull out the weights.

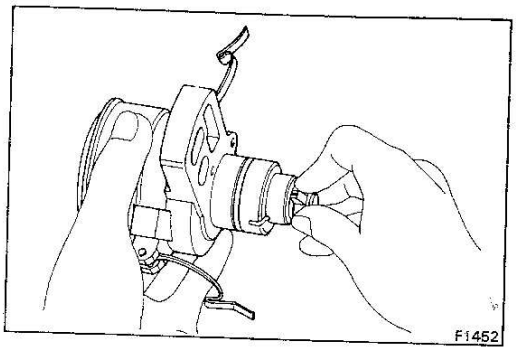


INSPECTION AND REPLACEMENT OF DISTRIBUTOR

1. INSPECT BREAKER PLATE

Turn the breaker plate and check that it has a slight drag.

If strong resistance or sticking is felt, replace the breaker plate.



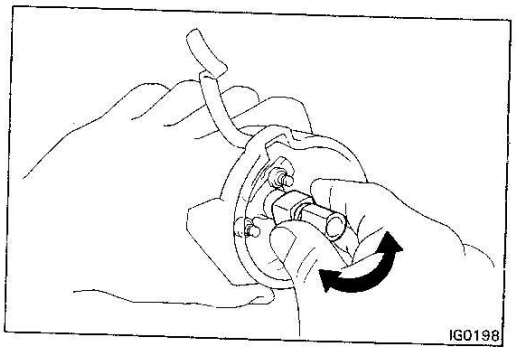
2. INSPECT GOVERNOR SHAFT AND HOUSING

Check for wear, sticking or damage.

3. CHECK BREAKER POINT

Check the breaker point for wear or damage.

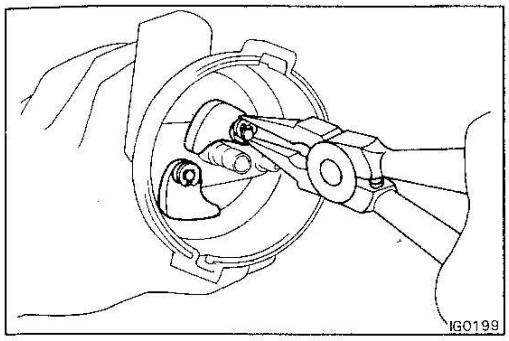
If a problem is found, replace the breaker point.



4. INSPECT CAM

Temporarily install the cam to the governor shaft and check that they fit correctly.

If necessary, replace the cam or housing.



ASSEMBLY OF DISTRIBUTOR

(See page IG-9)

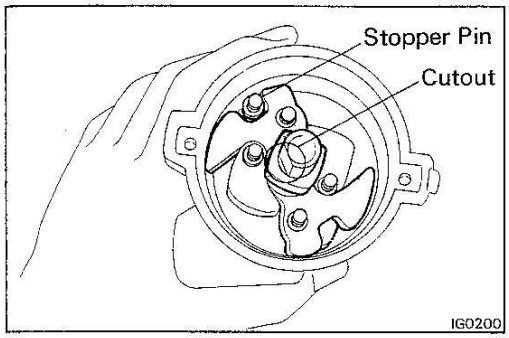
1. INSTALL GOVERNOR WEIGHTS

(a) Slide the weights over the small shafts.

(b) Install the E-rings.

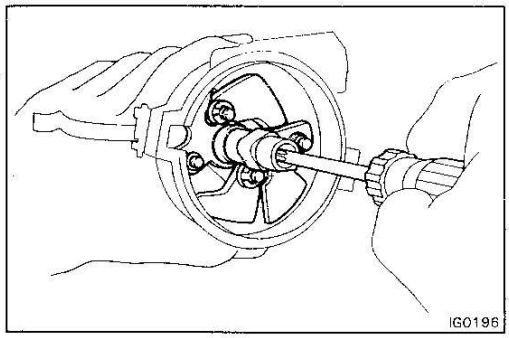
2. LIGHTLY COAT GOVERNOR SHAFT WITH GREASE

Use high-temperature grease.



3. INSTALL CAM ON GOVERNOR SHAFT

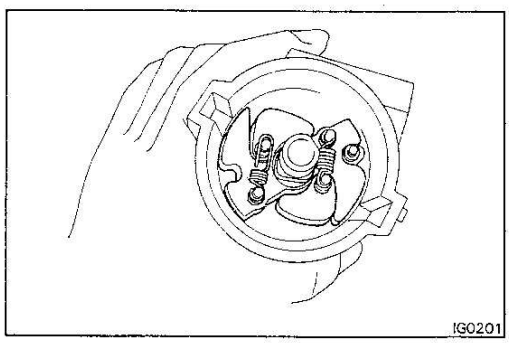
(a) Install the signal rotor on the governor shaft as shown.



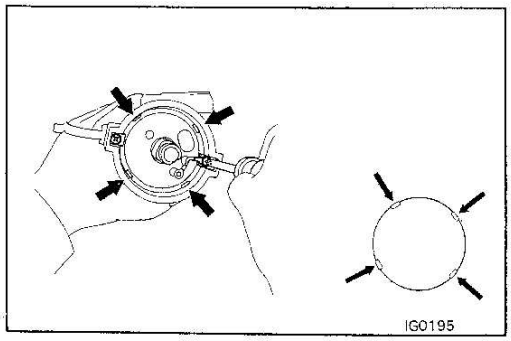
(b) Install the screw.

(c) Pack high-temperature grease into the shaft.

(d) Push on the grease stopper with your finger.



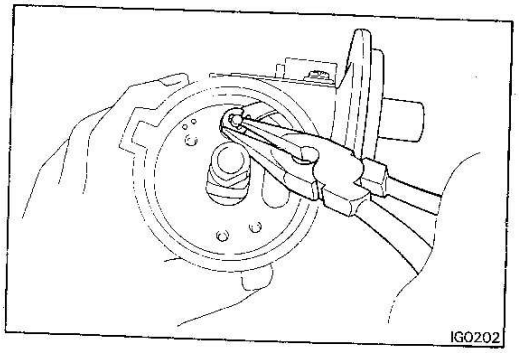
4. INSTALL GOVERNOR SPRINGS



5. INSTALL BREAKER PLATE

(a) Fit the four clips on the breaker plate into the housing slots.

(b) Install one end of the lead wire and two plate washers with screws.

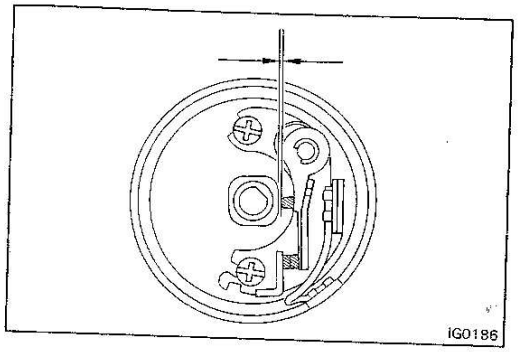

IG0202

6. INSTALL VACUUM ADVANCER

(a) Insert the advancer into the distributor and position the lever hole over the plate pin.

(b) Install the E-ring on the pin.

(c) Install the screw with the condenser to the distributor body.


IG0186

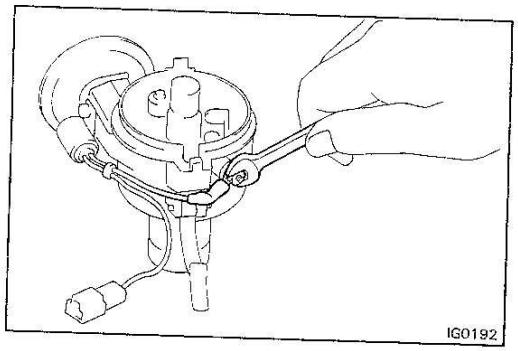
7. INSTALL AND ADJUST BREAKER POINTS

(a) Clean the contact surfaces of the points with a piece of cloth saturated in solvent.

(b) Loosenly install the breaker point and one end of the lead wire with two screws.

(c) Using a feeler gauge, set the rubbing block gap and tighten the two screws.

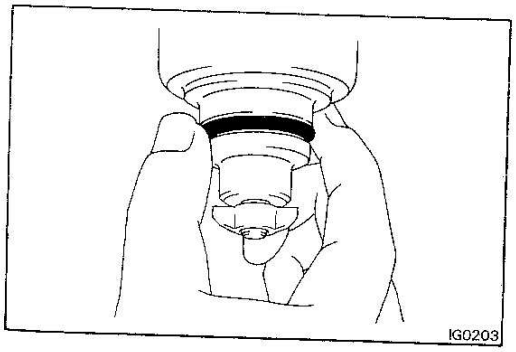
Rubbing block gap: 0.45 mm (0.018 in.)


IG0192

8. INSTALL LEAD WIRE AND TERMINAL

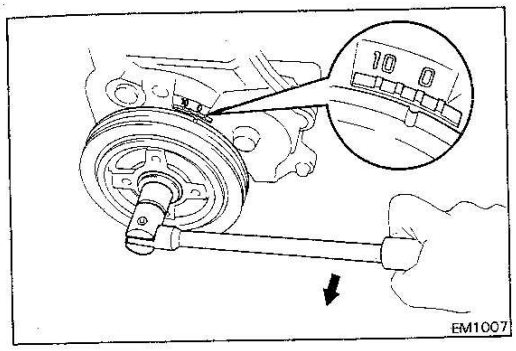
Insert the terminal with the point wire and install the insulators, condensor lead wire and terminal nut.

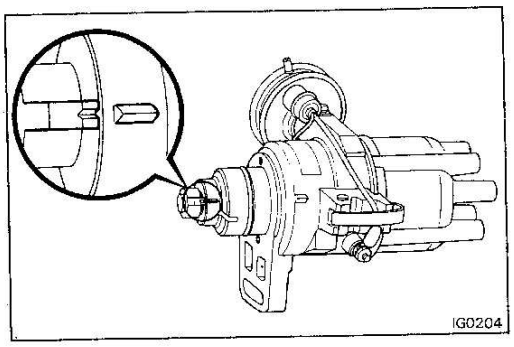
9. INSTALL DISTRIBUTOR CAP AND PACKING

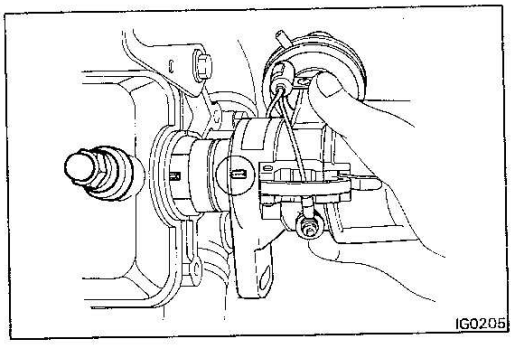

IG0203

10. INSTALL NEW O-RING TO DISTRIBUTOR HOUSING

NOTE: Lightly coat the new O-ring with engine oil.







INSTALLATION OF DISTRIBUTOR

1. SET NO. 1 CYLINDER TO TDC/COMPRESSION

Set to TDC/compression in the following manner.

(a) Remove the No. 1 spark plug.

(b) Place your finger over the hole of the No. 1 spark plug and rotate the crankshaft clockwise to TDC. If pressure is felt on your finger, this is TDC/compression of the No. 1 cylinder. If not, repeat the process.

(c) Install the No. 1 spark plug.

2. INSTALL DISTRIBUTOR

(a) Align the protrusion on the housing with the groove of the coupling side.

(b) Insert the distributor, aligning the protrusion of the flange with that of the nut on the cylinder head cover.

(c) Lightly tighten the hold down bolt.

3. CONNECT HIGH TENSION CORDS

Firing order: 1 – 3 – 4 – 2

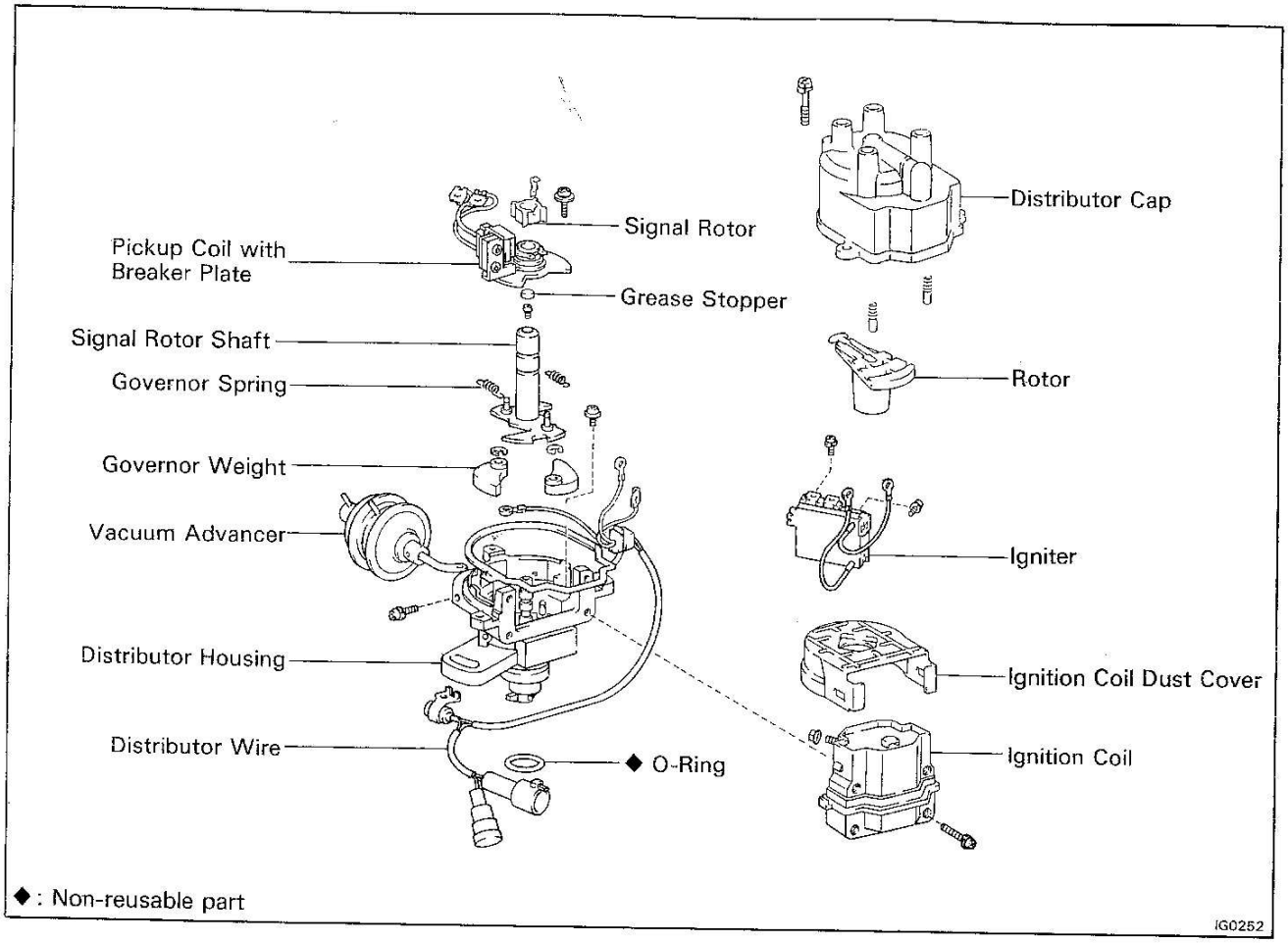
4. CONNECT DISTRIBUTOR WIRE CONNECTOR

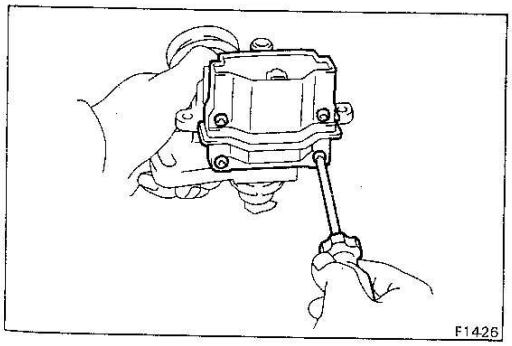
5. CONNECT VACUUM HOSE

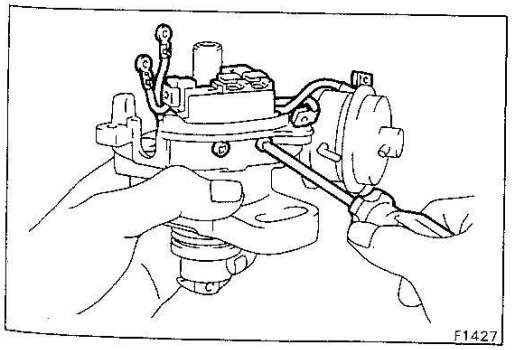
6. ADJUST IGNITION TIMING (See page EM-6)

DISTRIBUTOR (IIA)

COMPONENTS

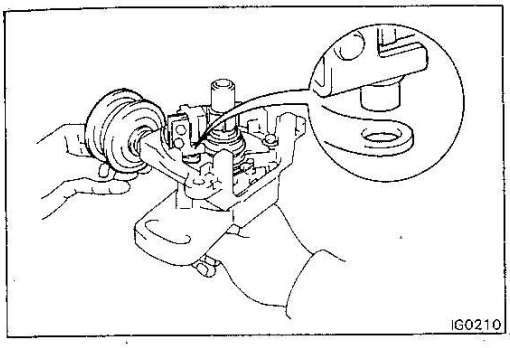






DISASSEMBLY OF DISTRIBUTOR

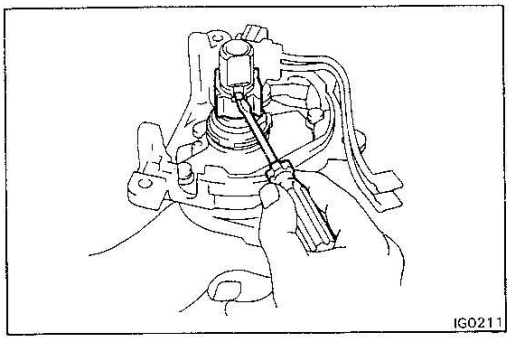
1. **REMOVE DISTRIBUTOR CAP, PACKING AND ROTOR**
2. **REMOVE IGNITION COIL DUST COVER**
3. **REMOVE IGNITION COIL**
   (a) Remove the nuts and disconnect the wires from the terminals of the ignition coil.
   (b) Remove the four screws and ignition coil.
4. **REMOVE DISTRIBUTOR WIRE WITH CONDENSER**
5. **REMOVE IGNITER**
   (a) Remove the two screws and disconnect the wires from the terminals of the igniter.
   (b) Remove the two screws and igniter.



6. REMOVE VACUUM ADVANCER

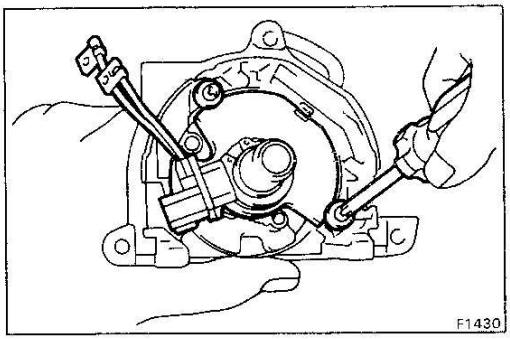
(a) Remove the screw.

(b) Disconnect the advancer link hole from the breaker plate pin and remove the advancer.



7. REMOVE SIGNAL ROTOR

Using a screwdriver, pry out the rotor and the spring.

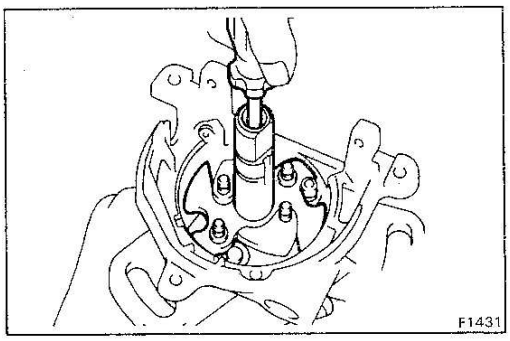


8. REMOVE BREAKER PLATE WITH PICKUP COIL

(a) Remove the two screws and plate washers.

(b) Remove the breaker plate with the pickup coil.

9. REMOVE GOVERNOR SPRINGS

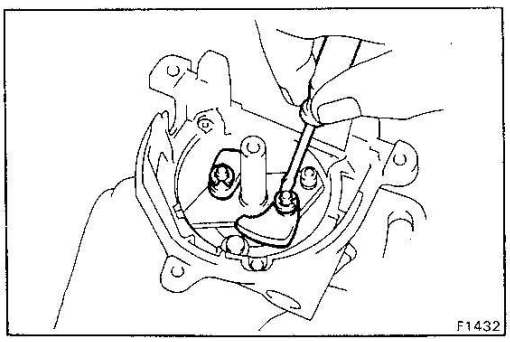


10. REMOVE SIGNAL ROTOR SHAFT

(a) Remove the grease stopper.

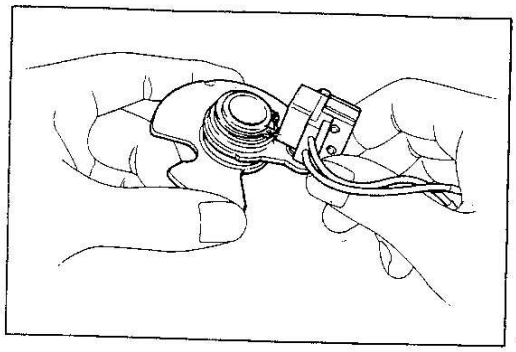
(b) Remove the screw at the end of the governor shaft.

(c) Pull out the signal rotor shaft.



11. REMOVE GOVERNOR WEIGHTS

Using a small screwdriver, remove the E-rings and pull out the weights.

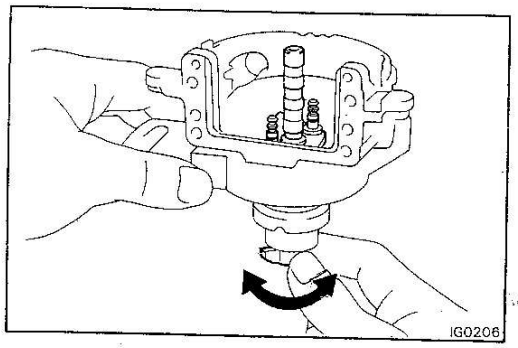


INSPECTION AND REPLACEMENT OF DISTRIBUTOR

1. INSPECT BREAKER PLATE

Turn the breaker plate and check that is has a slight drag.

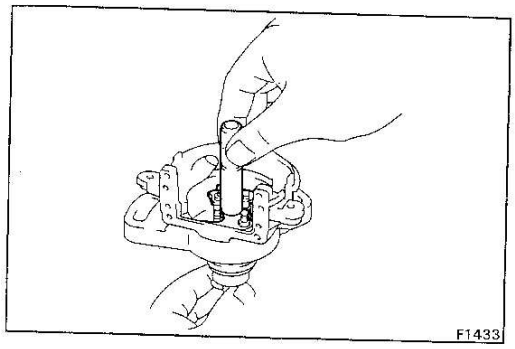
If strong resistance or sticking is felt, replace the breaker plate with the pickup coil assembly.



2. INSPECT GOVERNOR SHAFT BEARING

Turn the governor shaft and check that the bearing is not rough or worn.

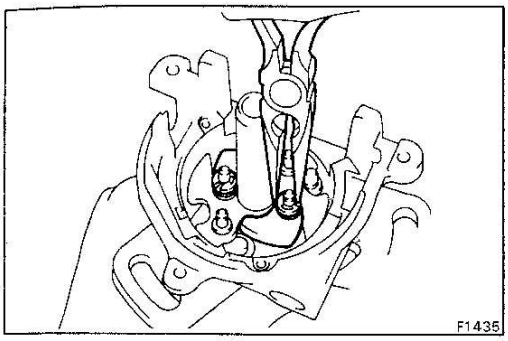
If necessary, replace the housing.



3. INSPECT SIGNAL ROTOR SHAFT

Temporarily install the signal rotor shaft to the governor shaft and check that they fit correctly.

If necessary, replace the signal rotor shaft or housing.



ASSEMBLY OF DISTRIBUTOR

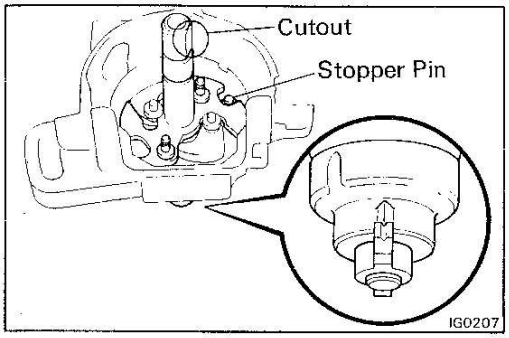
(See page IG-15)

1. INSTALL GOVERNOR WEIGHTS

Using needle nose pliers, install the weights with the E-rings.

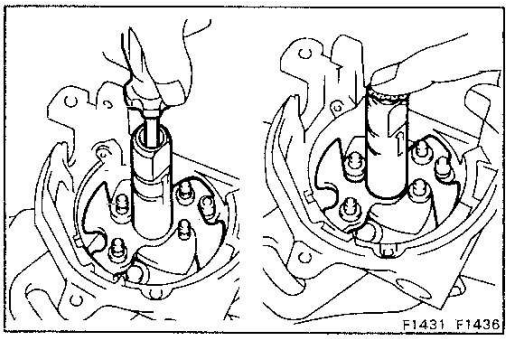
2. LIGHTLY COAT GOVERNOR SHAFT WITH GREASE

Use high-temperature grease.



3. INSTALL SIGNAL ROTOR SHAFT

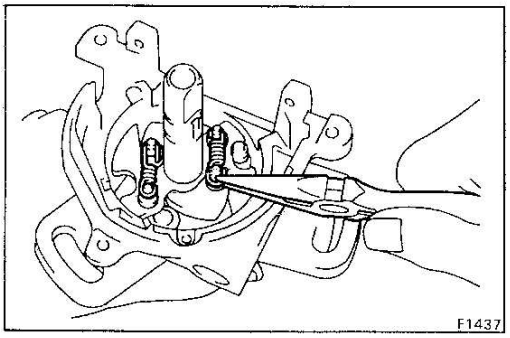
(a) Install the signal rotor shaft on the governor shaft as shown.



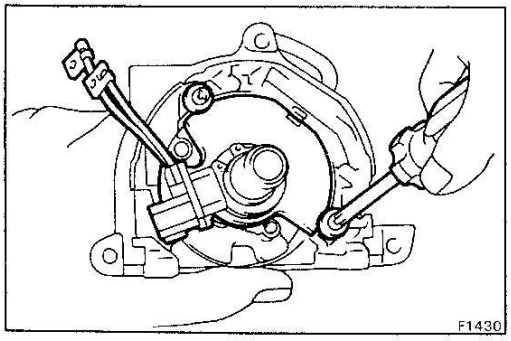
(b) Install the screw.

(c) Pack high-temperature grease into the shaft.

(d) Push on the grease stopper with your finger.



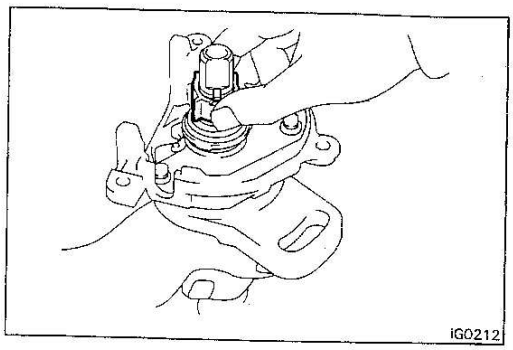
4. INSTALL GOVERNOR SPRINGS



5. INSTALL BREAKER PLATE WITH PICKUP COIL

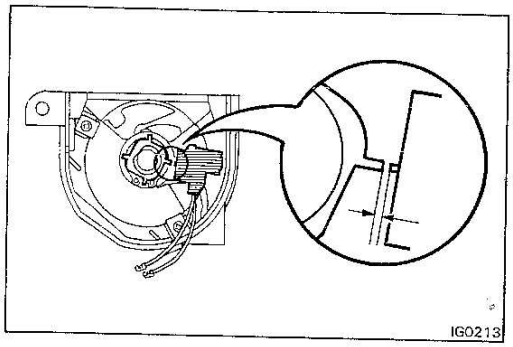
(a) Align the cutout parts of the breaker plate and housing, and install the breaker plate with the pickup coil.

(b) Secure the breaker plate with the two screws and plate washers.



6. INSTALL SIGNAL ROTOR

Push on the rotor with a new spring.

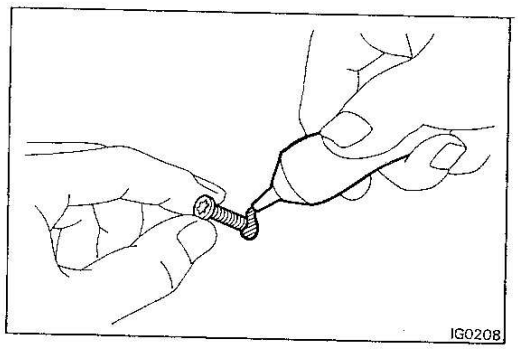


7. INSPECT AIR GAP

(a) Using a feeler gauge, check the gap between the signal rotor and pickup coil.

Air gap: 0.2 — 0.4 mm (0.008 — 0.016 in.)

If not within specification, replace the breaker plate with the pickup coil.



8. IF NECESSARY REPLACE BREAKER PLATE WITH PICKUP COIL

(a) Remove the signal rotor.
(See page IG-16)

(b) Remove the breaker plate with pickup coil.
(See page IG-16)

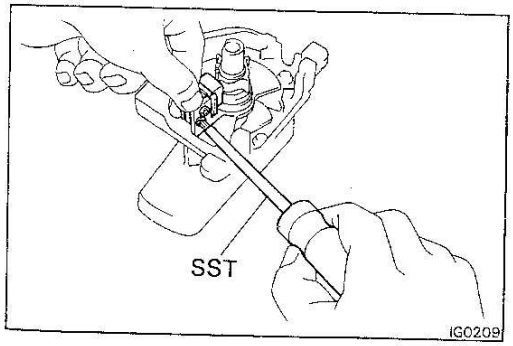
(c) Clean the pickup set screws and pickup screw holes of any oil and foregin particles.

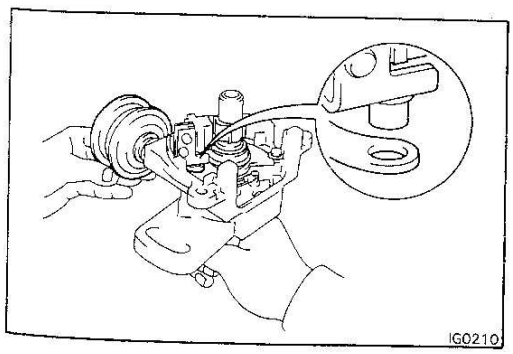
(d) Apply anaerobic adhesive and sealant [THREE BOND 1324 (Part No. 08833-00070) or equivalent] to 3 or 5 mm of the screw end.

(e) Using SST, install the set screws and adjust the air gap.

SST 09041-00040

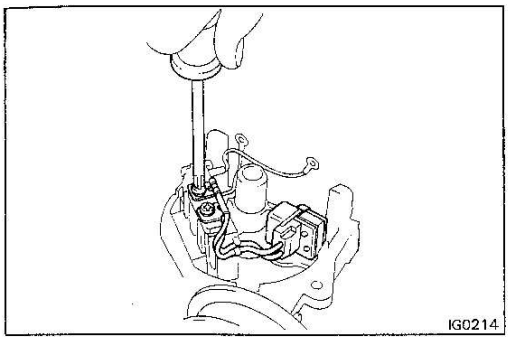
NOTE: After installing, do not run the engine for at least 30 min., or at high speed for at least 120 mim.





9. INSTALL VACUUM ADVANCER

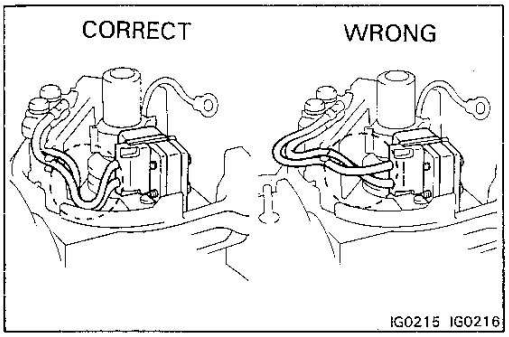
Connect the advancer link hole to the breaker plate pin and install the advancer with the screw.



10. INSTALL IGNITER

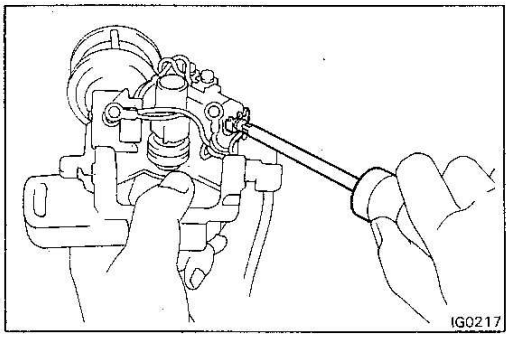
(a) Install the igniter with the two screws.

(b) Connect the two wires to the terminals of the igniter with the two screws and nuts as shown.



(c) As shown in the figure, secure the pick-up coil wires in the clips, allowing sufficient slack.

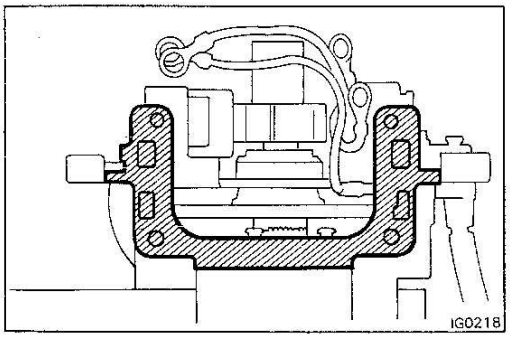
CAUTION: Be sure that the wires do not contact with signal rotor or IIA housing.



11. INSTALL DISTRIBUTOR WIRE

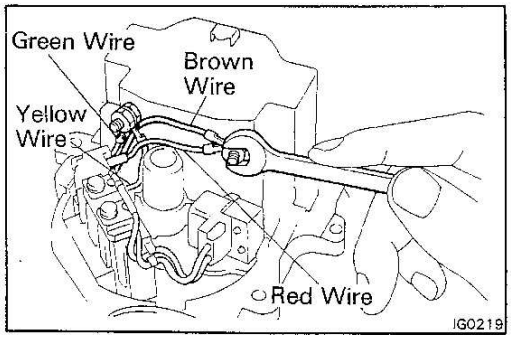
(a) Install the grommet of the wire to the housing.

(b) Connect the wire to the terminal of the igniter with the screw and plate.

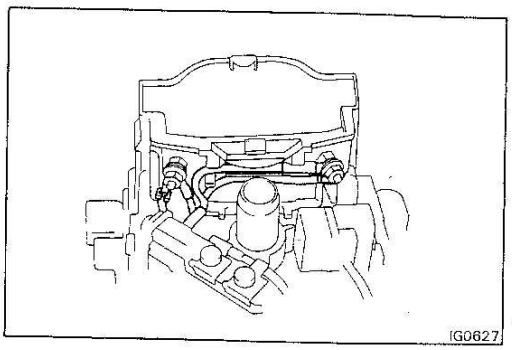


12. INSTALL IGNITION COIL

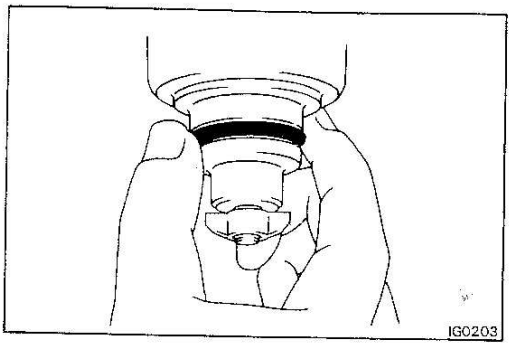
(a) Apply seal packing black (Part No. 08826-00080) or silicon base sealant to the ignition coil installing surface of the IIA.



(b) Connect the three wires to the terminals of the ignition coil with the two nuts and spring washers as shown.



CAUTION: When connecting the wires to the ignition coil, insert both properly into their grooves found on the side of the ignition coil.
Be sure that the wires do not contact with signal rotor or distributor housing.



13. INSTALL IGNITION COIL DUST COVER

14. INSTALL ROTOR AND CAP

(a) Install the rotor.

(b) Place the cap and new gasket in position.

(c) Install the three screws with the condenser.

15. INSTALL NEW O-RING

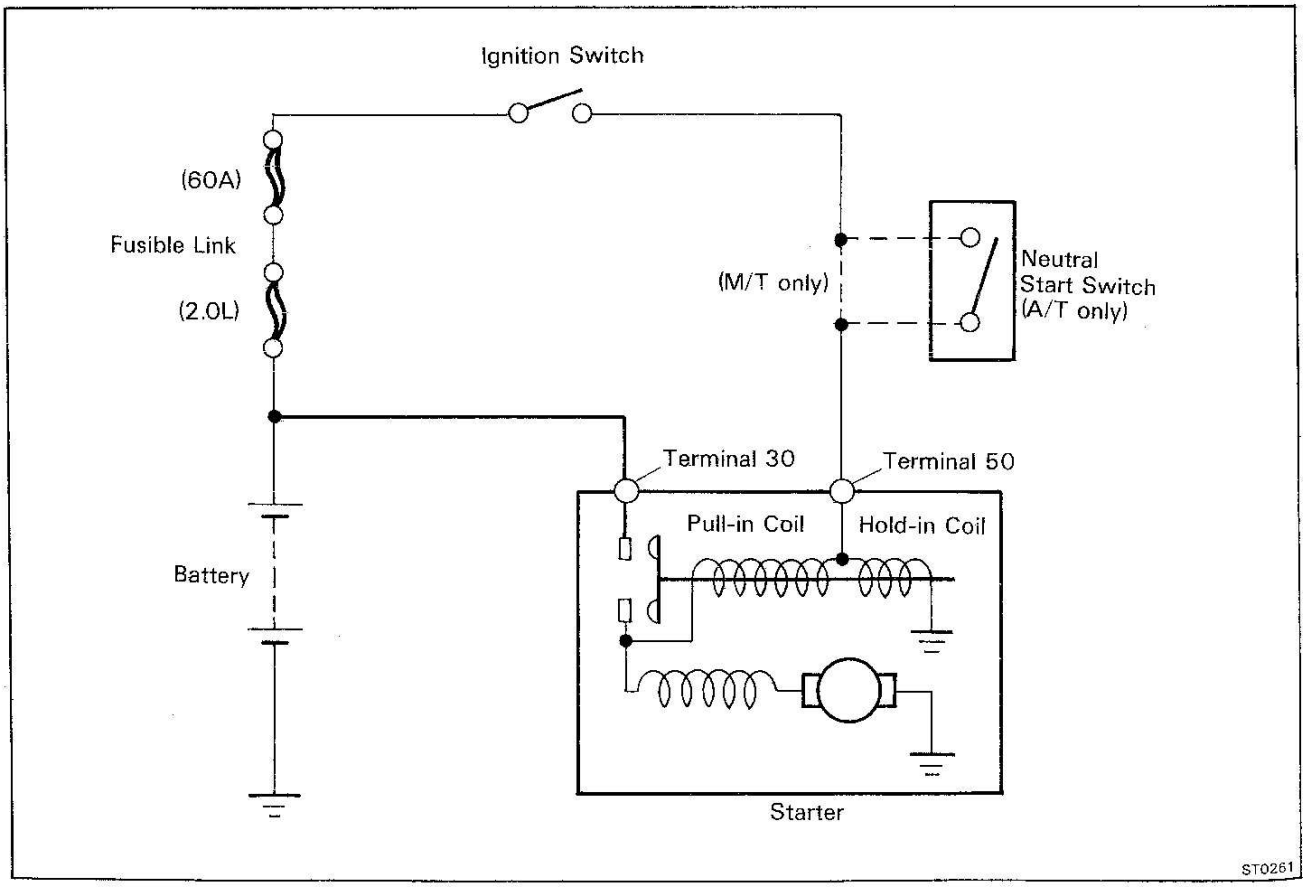
INSTALLATION OF DISTRIBUTOR

(See page IG-14)

TROUBLESHOOTING

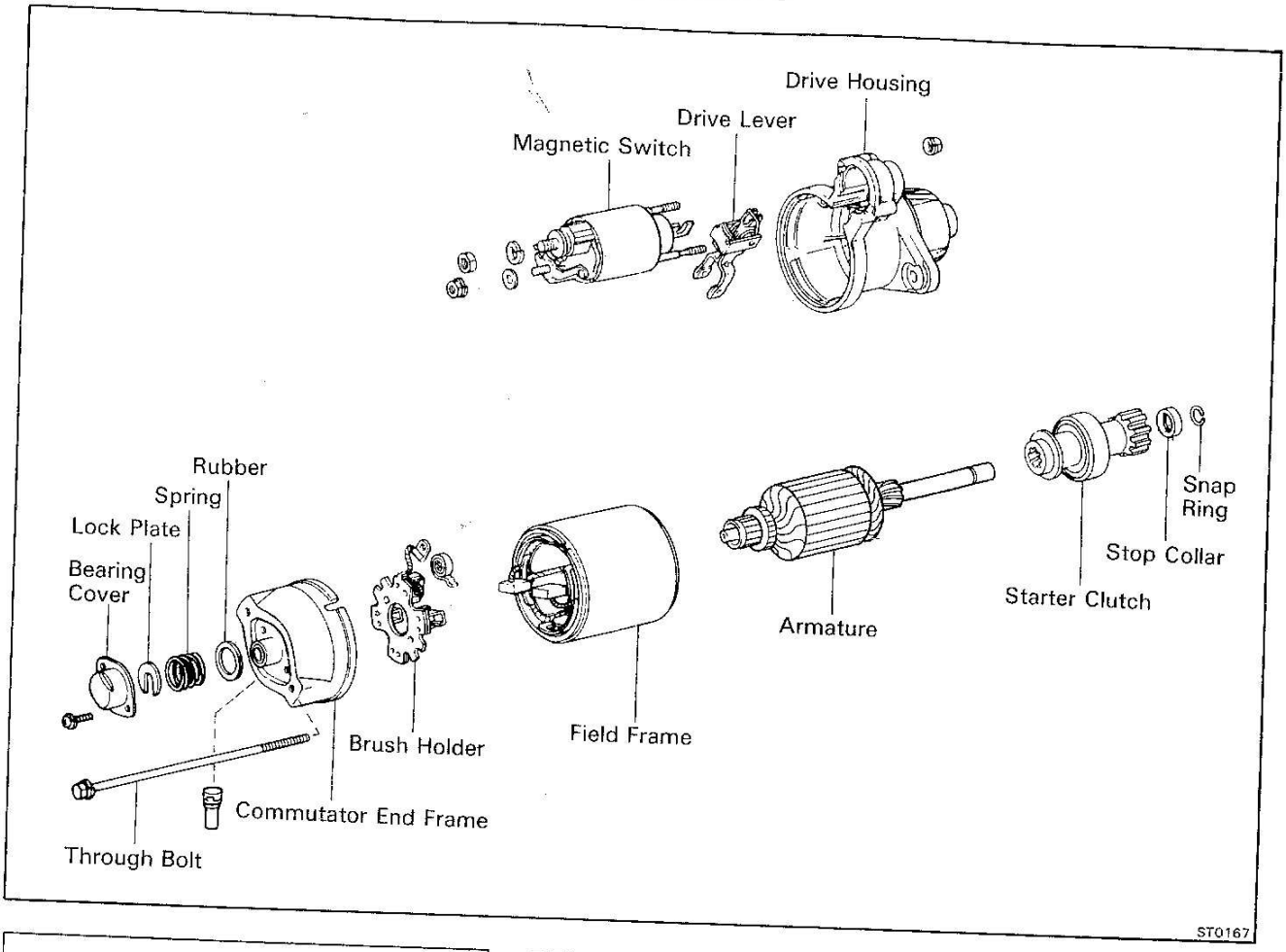
Problem	Possible cause	Remedy	Page
Engine will not crank	Battery charge low	Check battery specific gravity Charge or replace battery	CH-3
	Battery cables loose, corroded or worn	Repair or replace cables	
	Neutral start switch faulty (A/T)	Replace switch	
	Fusible link blown	Replace fusible link	
	Starter faulty	Repair starter	ST-3
	Ignition switch faulty	Replace ignition switch	
Engine cranks slowly	Battery charge low	Check battery specific gravity Charge or replace battery	CH-3
	Battery cables loose, corroded or worn	Repair or replace cables	
	Starter faulty	Repair starter	ST-3
Starter keeps running	Starter faulty	Repair starter	ST-3
	Ignition switch faulty	Replace ignition switch	
	Short in wiring	Repair wiring	
Starter spins – engine will not crank	Pinion gear teeth broken or faulty starter Flywheel teeth broken	Repair starter Replace flywheel	ST-3

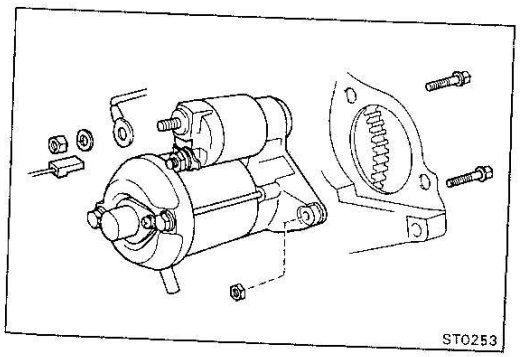
STARTING SYSTEM CIRCUIT



CONVENTIONAL STARTER

COMPONENTS





REMOVAL OF CONVENTIONAL STARTER

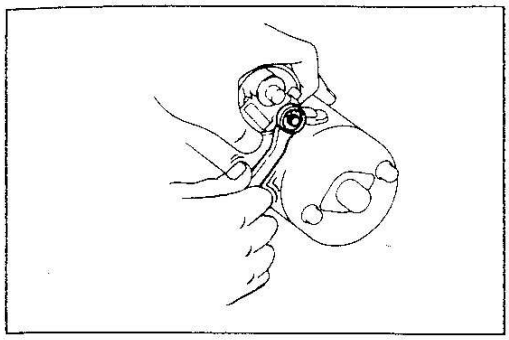
1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**

2. **DISCONNECT TWO WIRES FROM STARTER**

   Remove the nut and disconnect the battery calbe from the magnetic switch on the starter motor. Disconnect the other wire from the terminal.

3. **REMOVE STARTER MOTOR**

   Remove the two bolts, and remove the starter motor from the clutch housing.



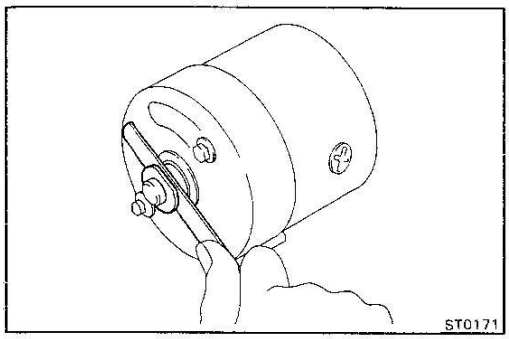
DISASSEMBLY OF CONVENTIONAL STARTER

(See page ST-3)

1. REMOVE MAGNETIC SWITCH

(a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.

(b) Loosen the two nuts holding the magnetic switch to the switch housing. Lift the magnetic switch up and out to unhook the plunger from the drive lever.

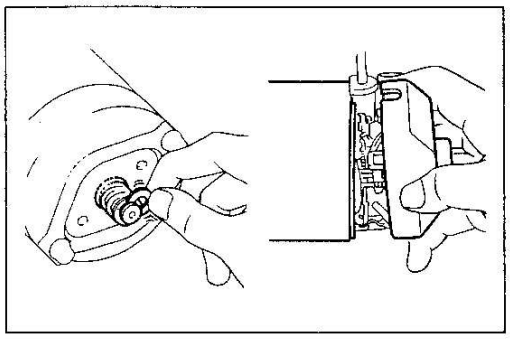


2. REMOVE END FRAME

(a) Remove the bearing cover.

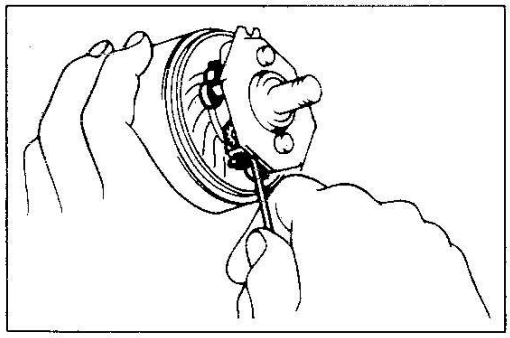
(b) Using a feeler gauge, check the armature shaft thrust clearance between the lock plate and end frame.

Thrust clearance: 0.05 — 0.60 mm (0.0020 — 0.0236 in.)



(c) Remove the lock plate, spring and rubber.

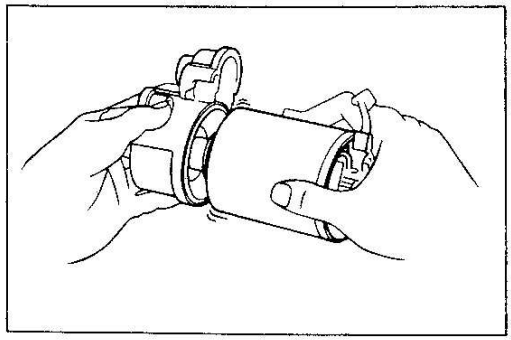
(d) Remove the two through bolts and pull out the commutator end frame.



3. REMOVE BRUSHES AND BRUSH HOLDER

(a) Using a piece of steel wire, separate the brush springs, and remove the brushes from the brush holder.

(b) Pull the brush holder off the armature.



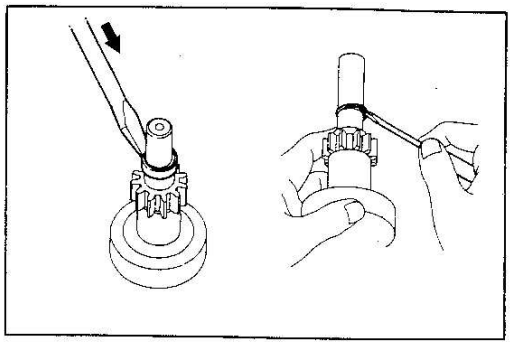
4. REMOVE FIELD FRAME FROM DRIVE HOUSING

Pull apart by hand.

5. REMOVE ARMATURE

(a) Remove the drive lever from the drive housing.

(b) Pull the armature from the drive housing.

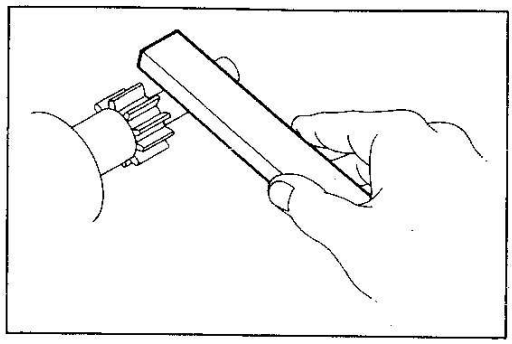


6. REMOVE STARTER CLUTCH

(a) Using a screwdriver, tap in the stop collar.

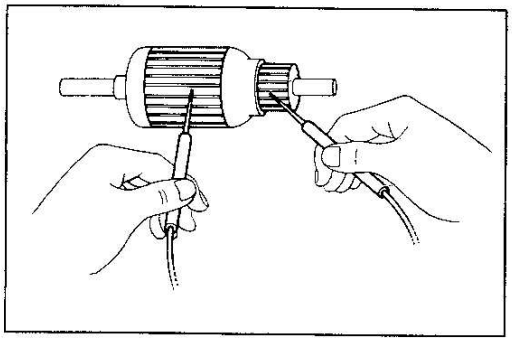
(b) Using a screwdriver, pry off the snap ring.

(c) Remove the rear collar from the shaft.



(d) If the pinion was difficult to pull out, smooth the shaft with an oil stone.

(e) Remove the starter clutch.

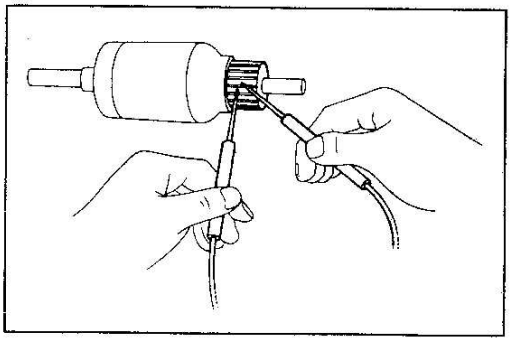


INSPECTION OF CONVENTIONAL STARTER

Armature Coil

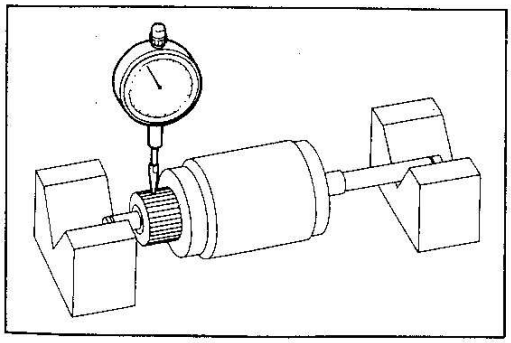
1. CHECK THAT COMMUTATOR IS NOT GROUNDED

Using an ohmmeter, check that there is no continuity between the commutator and armature coil core. If there is continuity, replace the armature.



2. CHECK COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check for continuity between the segments of the commutator. If there is no continuity between any segment, replace the armature.



Commutator

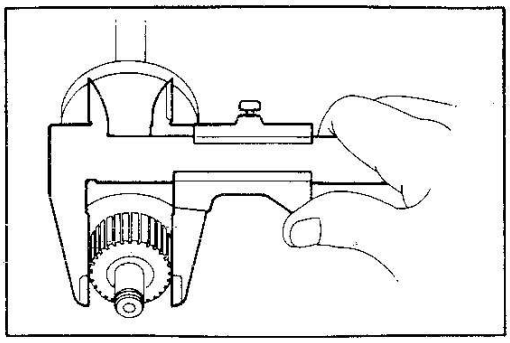
1. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

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

2. CHECK COMMUTATOR RUNOUT

If runout is greater than the maximum, correct with a lathe.

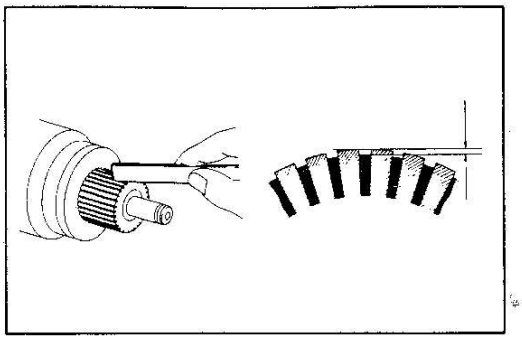
Maximum circle runout: 0.4 mm (0.016 in.)



3. MEASURE DIAMETER OF COMMUTATOR

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

Standard diameter: 28 mm (1.10 in.)
Minimum diameter: 27 mm (1.06 in.)



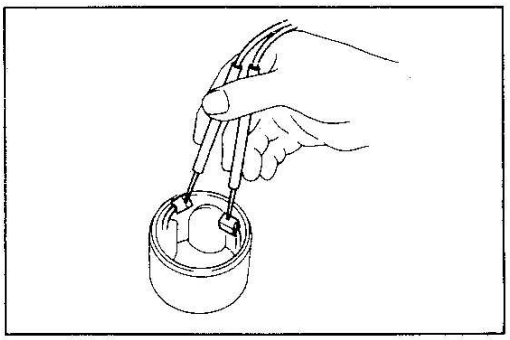
4. CHECK SEGMENT

Check that the segment is clean and free of foreign particles.

If the undercut depth is less than the minimum, correct with a hacksaw blade and smooth out the edge.

Standard undercut depth: 0.6 mm (0.024 in.)
Minimum undercut depth: 0.2 mm (0.008 in.)

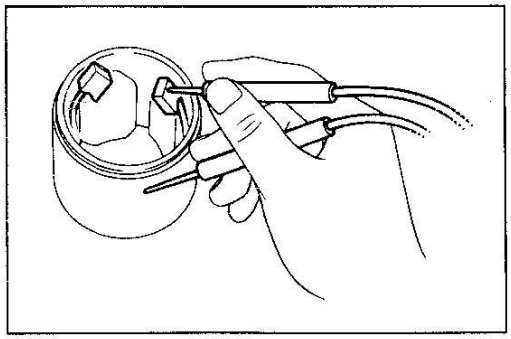
Field Coil



1. CHECK FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check for continuity between the lead wire and field coil brush lead.

If there is no continuity, replace the field frame.

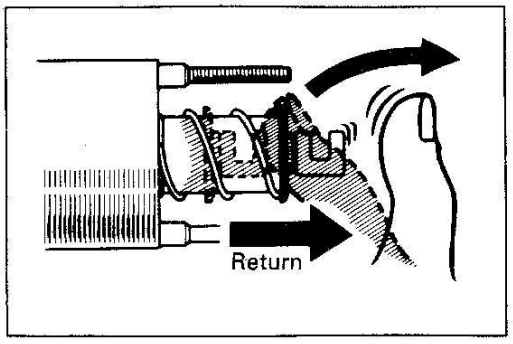


2. CHECK THAT FIELD COIL IS NOT GROUNDED

Using an ohmmeter, check for continuity between the field coil end and field frame.

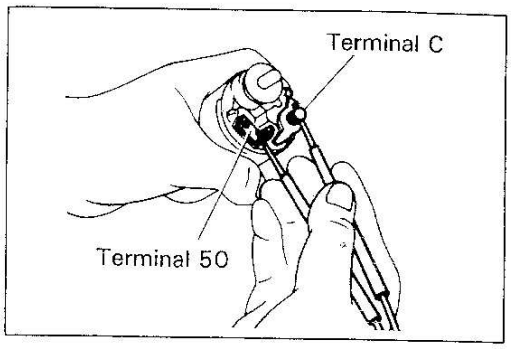
If there is continuity, replace the field coil.

Magnetic Switch



1. CHECK PLUNGER

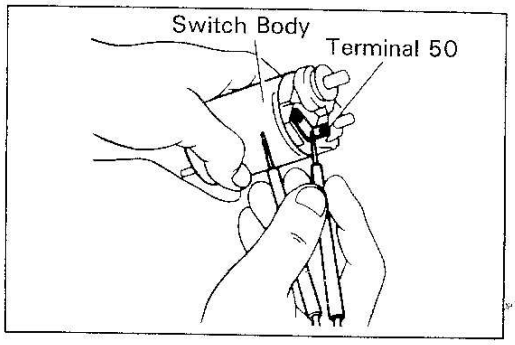
Push in the plunger and release it. Check that it returns quickly to its original position.



2. PERFORM PULL-IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check for continuity between terminal 50 and terminal C.

If there is no continuity, replace the magnetic switch.

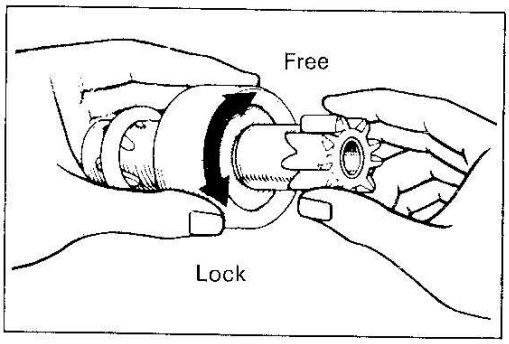


3. PERFORM HOLD-IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check for continuity between terminal 50 and the switch body.

If there is no continuity, replace the magnetic switch.

Starter Clutch



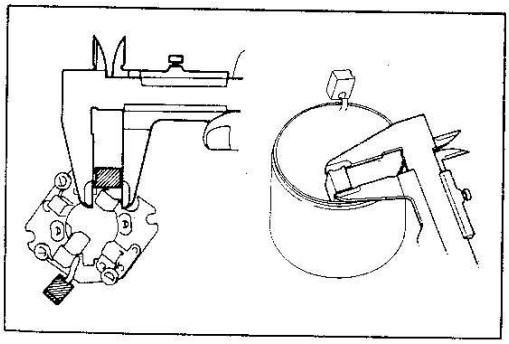
1. INSPECT PINION GEAR AND SPRINE TEETH

Inspect the pinion gear and spline teeth for wear or damage. If damaged, replace and also inspect the flywheel ring gear for wear or damage.

2. CHECK CLUTCH

Rotate the pinion clockwise and check that it turns freely. Try to rotate the pinion counterclockwise and check that it locks.

Brushes

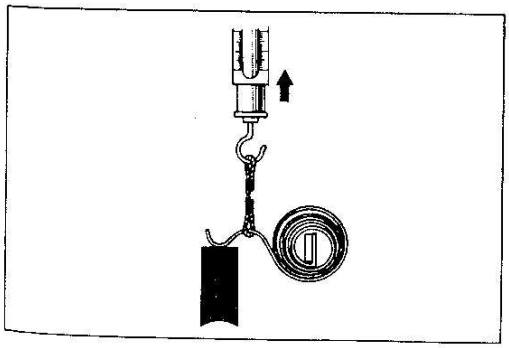


MEASURE BRUSH LENGTH

If the length is less than the minimum, replace the brush and dress with an emery cloth.

Standard length: 16 mm (0.63 in.)
Minimum length: 10 mm (0.3937 in.)

Brush Springs

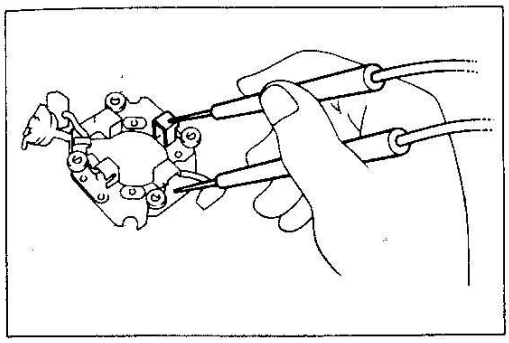


MEASURE BRUSH SPRING LOAD WITH A PULL SCALE

If the reading is below standard, replace the brush spring.

Spring installed load:
1.0 – 1.6 kg (2.2 – 3.5 lb, 10 – 16 N)

NOTE: Take the pull scale reading at the very instant the brush spring separates from the brush.

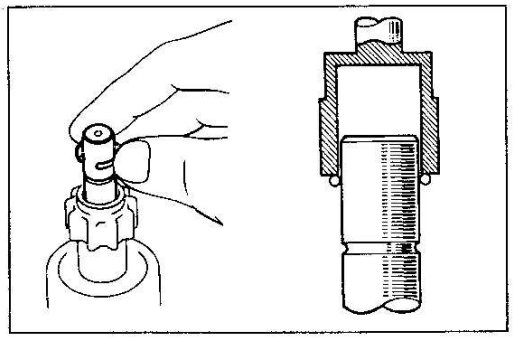


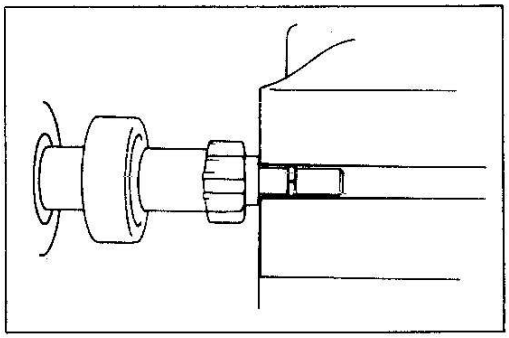
Brush Holder

CHECK INSULATION OF BRUSH HOLDER

Using an ohmmeter, check for continuity between the positive and negative brush holders.

If there is continuity, repair or replace the brush holder.





ASSEMBLY OF CONVENTIONAL STARTER

(See page ST-3)

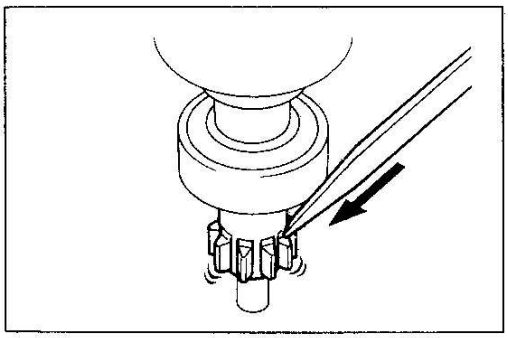
NOTE: Use high-temperature grease to lubricate the bearings and sliding parts when assemblying the starter.

1. ASSEMBLE STARTER CLUTCH TO ARMATURE

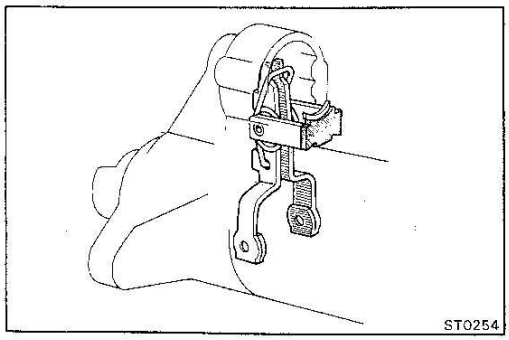
(a) Place a new stop collar on the armature.

(b) Drive in the snap ring with a 14 mm (0.55 in.) socket wrench, then fit it into the shaft groove.

(c) Using a vise, compress the snap ring.
Make sure that the snap ring fits correctly.



(d) Using a screwdriver, tap the pinion to slide the stop collar onto the snap ring.

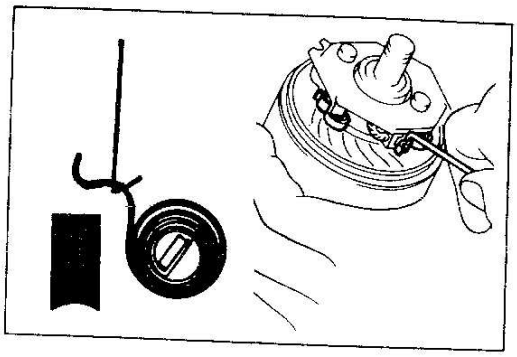


2. ASSEMBLE DRIVE HOUSING, DRIVE LEVER AND FIELD FRAME TO ARMATURE

(a) Apply grease to the drive lever and drive housing bushing.

(b) Install the drive lever to the drive housing.

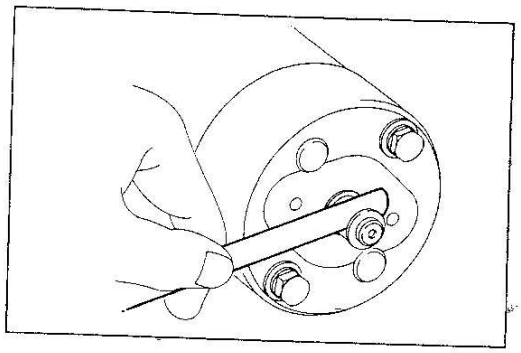
(c) Install the field frame on the armature.



3. INSTALL BRUSH HOLDER AND BRUSHES

(a) Place the brush holder, over the armature shaft.

(b) Using a piece of steel wire, hold the brush spring back and install the brush in the brush holder. Install the four the brushes.



4. INSTALL END FRAME

(a) Apply grease to the end frame bushing.

(b) Install the end frame on the armature shaft and secure with two through bolts.

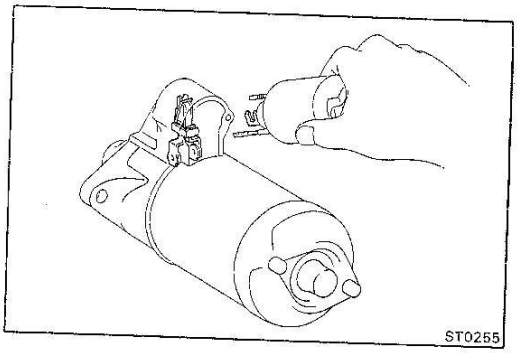
5. INSTALL BEARING COVER

(a) Install the rubber, spring and lock plate.

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

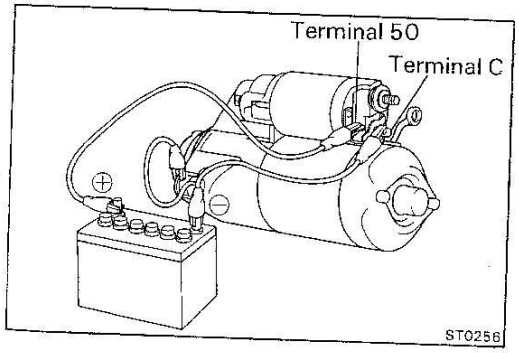
Thrust clearance: 0.05 – 0.60 mm (0.0020 – 0.0236 in.)

(c) Install the bearing cover with the two screws.



6. INSTALL MAGNETIC SWITCH

Hook the magnetic switch stud underneath the drive lever spring. Install the two nuts.



PERFORMANCE TEST OF CONVENTIONAL STARTER

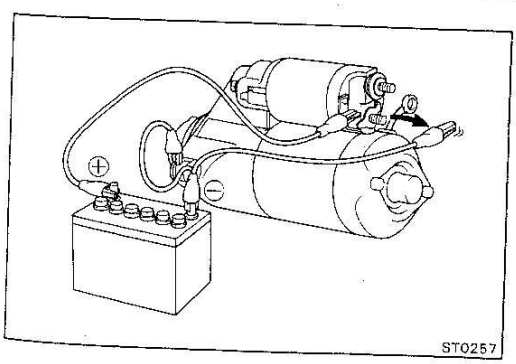
CAUTION: These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

1. PERFORM PULL-IN TEST

(a) Disconnect the field coil lead from terminal C.

(b) Connect the battery to the magnetic switch as shown. Check that the pinion moves outward.

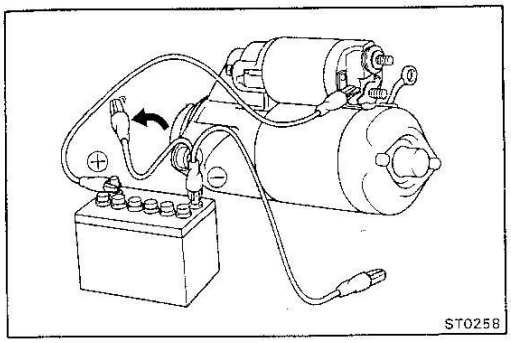
If the pinion does not move, replace the magnetic switch.



2. PERFORM HOLD-IN TEST

With the battery connected as above and with the pinion out, disconnect the negative lead from terminal C. Check that the pinion remains out.

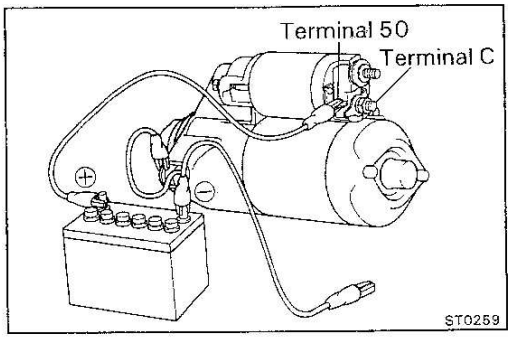
If the pinion returns inward, replace the magnetic switch.



3. CHECK PINION RETURN

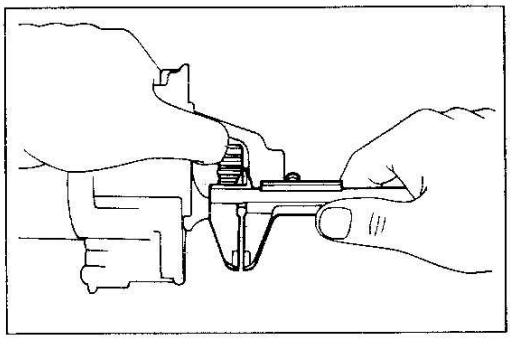
Disconnect the negative lead from the switch body. Check that the pinion returns inward.

If the pinion does not return, replace the magnetic switch.



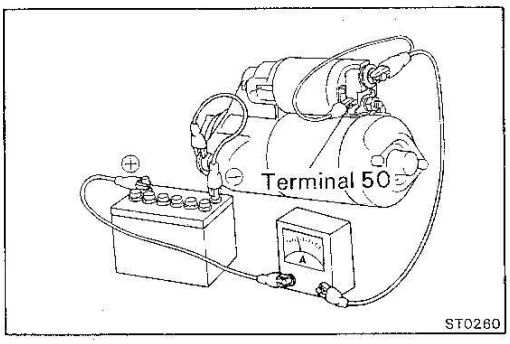
4. CHECK PINION CLEARANCE

(a) Connect the battery to the magnetic switch as shown.



(b) Move the pinion gear toward the armature to remove slack and measure the clearance between the pinion end and stop collar.

Standard clearance: 0.1 – 0.4 mm (0.004 – 0.016 in.)



5. PERFORM NO-LOAD PERFORMANCE TEST

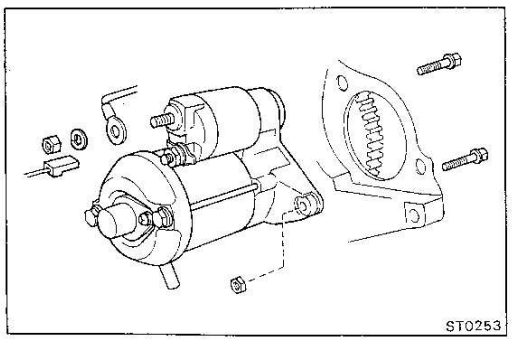
(a) Connect the field coil lead to terminal C. Make sure the lead is not grounded.

(b) Connect the battery and ammeter to the starter as shown.

(c) Check that the starter rotates smoothly and steadily with the pinion moving out.

(d) Check that the ammeter reads the specified current.

Specified current: Less than 50 A at 11V



INSTALLATION OF CONVENTIONAL STARTER

(See page ST-3)

1. INSTALL STARTER MOTOR IN CLUTCH HOUSING

2. CONNECT TWO WIRES TO STARTER

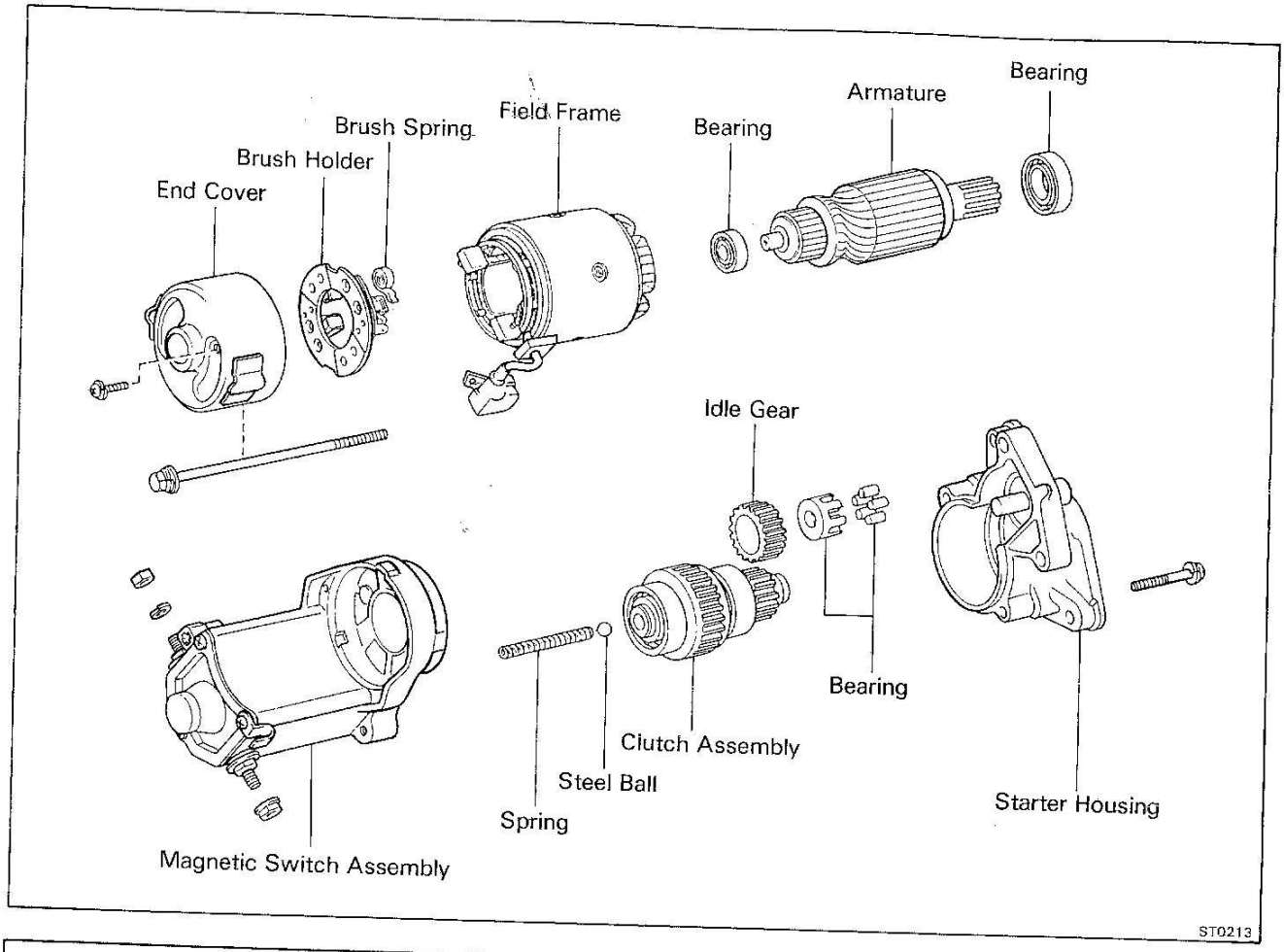
Connect the connector to the terminal on the magnetic switch. Connect the cable from the battery to the terminal on the switch, and install the nut.

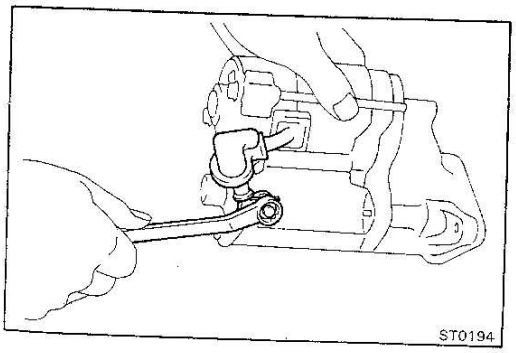
3. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

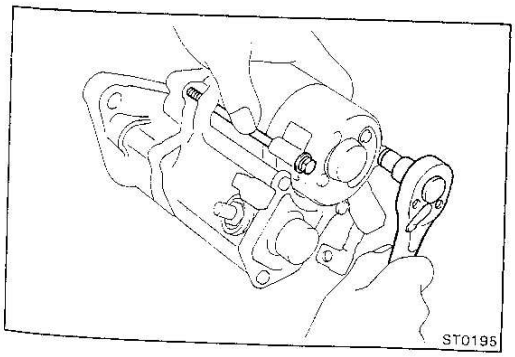
Check that the engine starts.

REDUCTION TYPE STARTER

COMPONENTS







REMOVAL OF REDUCTION TYPE STARTER

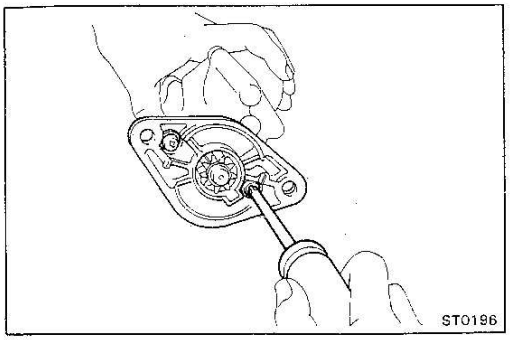
(See procedure on page ST-3)

DISASSEMBLY OF STARTER

1. **REMOVE FIELD FRAME WITH ARMATURE FROM MAGNETIC SWITCH**

   (a) Remove the nut. Disconnect the lead wire from the magnetic switch terminal.

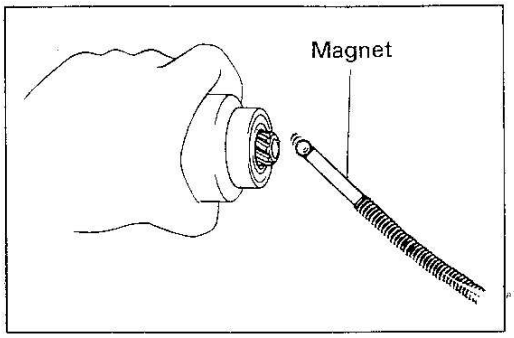
   (b) Remove the two through bolts. Pull out the field frame with the armature from the magnetic switch.



2. REMOVE STARTER HOUSING FROM MAGNETIC SWITCH ASSEMBLY

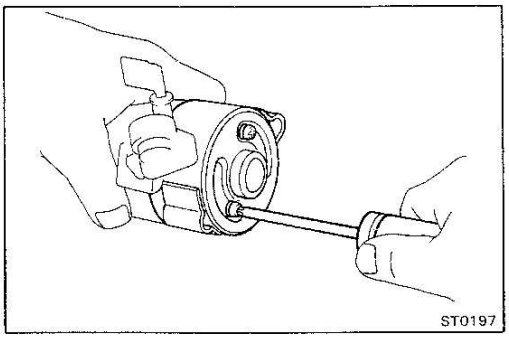
Remove the two screws and remove the starter housing with the idler gear and clutch assembly.

3. REMOVE CLUTCH ASSEMBLY AND IDLER GEAR FROM STARTER HOUSING



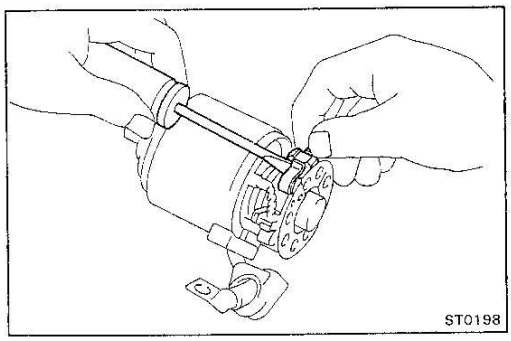
4. REMOVE STEEL BALL AND SPRING

Using a magnetic finger, remove the spring and steel ball from the clutch shaft hole.



5. REMOVE BRUSHES AND BRUSH HOLDER

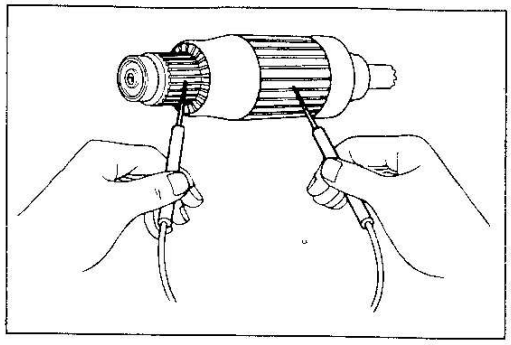
(a) Remove the two screws and end cover from the field frame.



(b) Using a screwdriver or steel wire, separate the brush springs, and remove the brushes from the brush holder.

(c) Pull the brush holder off the armature.

6. REMOVE ARMATURE FROM FIELD FRAME



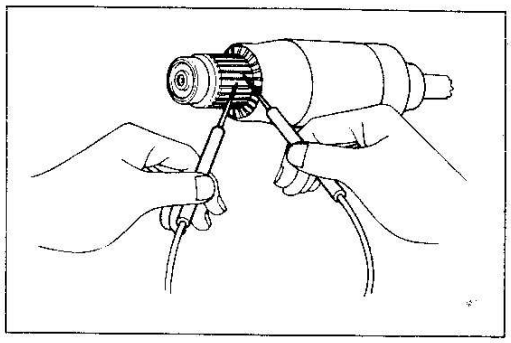
INSPECTION OF STARTER

Armature Coil

1. **INSPECT THAT COMMUTATOR IS NOT GROUNDED**

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

   If there is continuity, replace the armature.

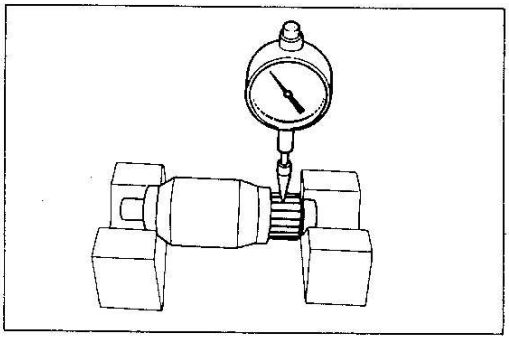


2. **INSPECT COMMUTATOR FOR OPEN CIRCUIT**

   Using an ohmmeter, check for continuity between the segments of the commutator.

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

Commutator



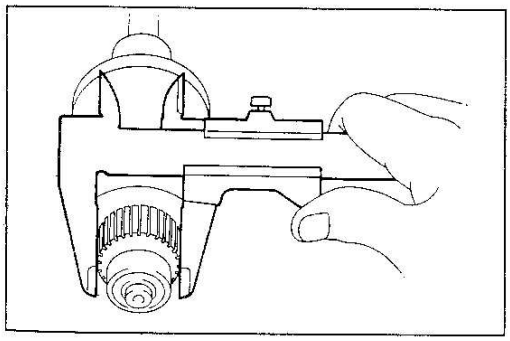
1. **INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES**

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

2. **INSPECT COMMUTATOR RUNOUT**

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

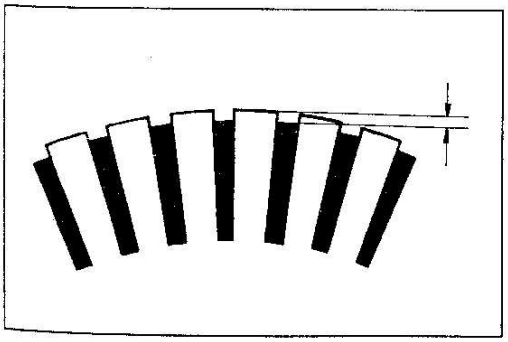
   Maximum circle runout: 0.05 mm (0.0020 in.)



3. **MEASURE DIAMETER OF COMMUTATOR**

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

   Standard diameter: 30 mm (1.18 in.)
   Minimum diameter: 29 mm (1.14 in.)

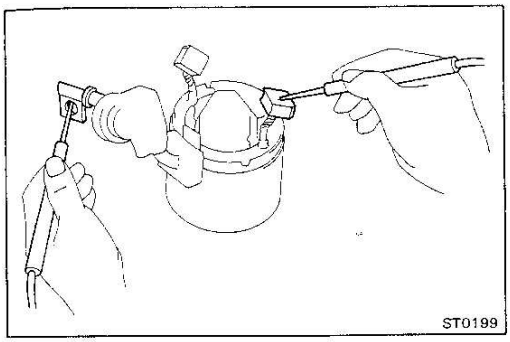


4. **CHECK SEGMENT**

   Check that the segment is clean and free of foreign particles, and smooth out the edge.

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

   Standard undercut depth: 0.6 mm (0.24 in.)
   Minimum undercut depth: 0.2 mm (0.008 in.)

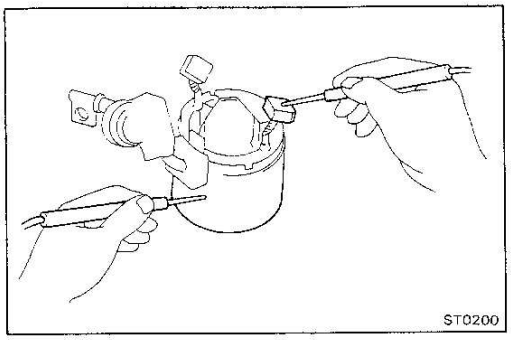


Field Coil

1. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check for continuity between the lead wire and field coil brush lead.

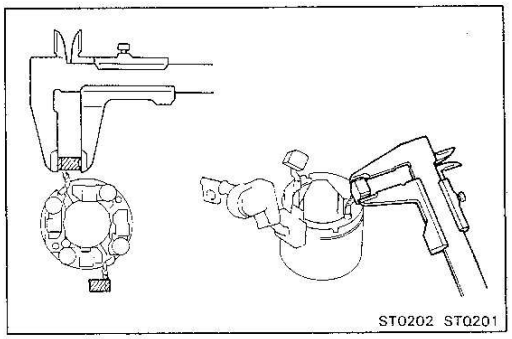
If there is no continuity, replace the field coil.



2. INSPECT THAT FIELD COIL IS NOT GROUNDED

Using an ohmmeter, check for continuity between the field coil end and field frame.

If there is continuity, repair or replace the field coil.

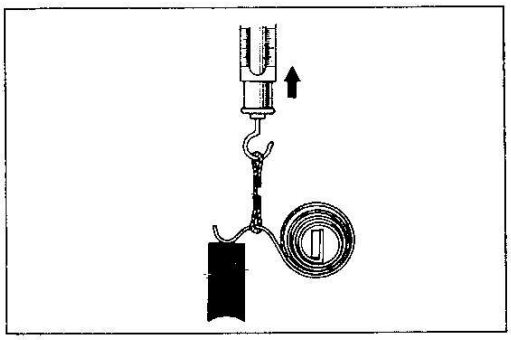


Brushes

MEASURE BRUSH LENGTH

If the length is less than the minimum, replace the brush and dress with an emery cloth.

Standard length: 13.5 mm (0.531 in.)
Minimum length: 8.5 mm (0.335 in.)



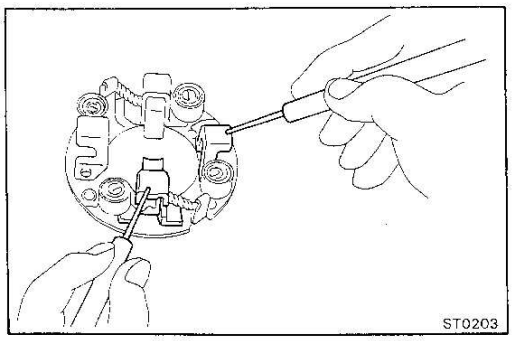
Brush Spring

MEASURE BRUSH SPRING LOAD WITH PULL SCALE

If the reading is below standard, replace the brush spring.

Spring Installed load: 1.2 — 2.1 kg (2.6 — 4.6 lb, 12 — 21 N)

NOTE: Take the pull scale reading at the very instant the brush spring separates from the brush.

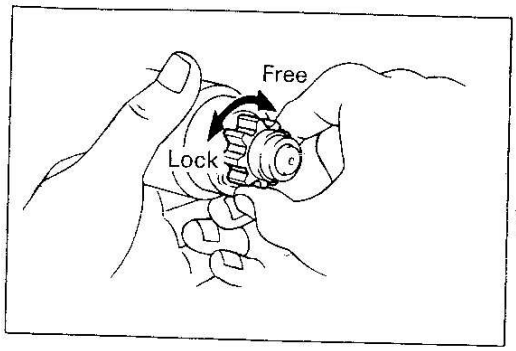


Brush Holder

INSPECT INSULATION OF BRUSH HOLDER

Using an ohmmeter, check for continuity between the positive and negative brush holders.

If there is continuity, repair or replace the brush holder.



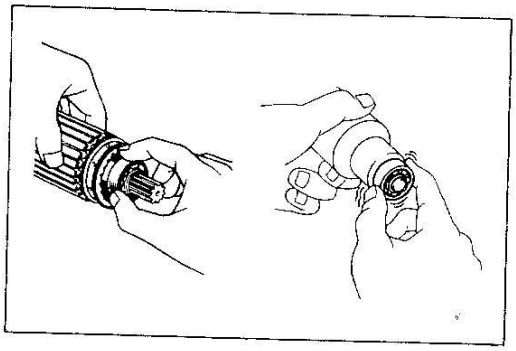
Clutch and Gears

1. INSPECT GEAR TEETH

Check the gear teeth on the pinion gear, idler gear and clutch assembly for wear or damage. If damaged, replace, and also check the flywheel ring gear for wear or damage.

2. INSPECT CLUTCH

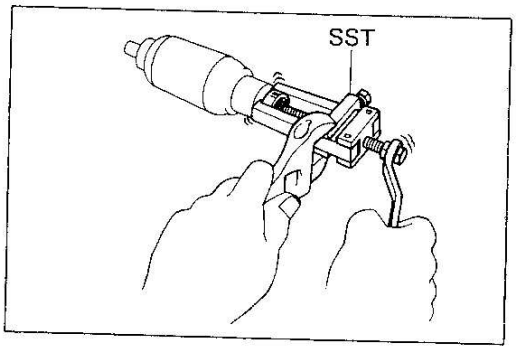
Rotate the pinion clockwise and check that it turns freely. Try to rotate the pinion counterclockwise and check that it locks.



Bearings

1. INSPECT BEARINGS

Turn each bearing by hand while applying inward force. If resistance is felt or if the bearing sticks, replace the bearing.

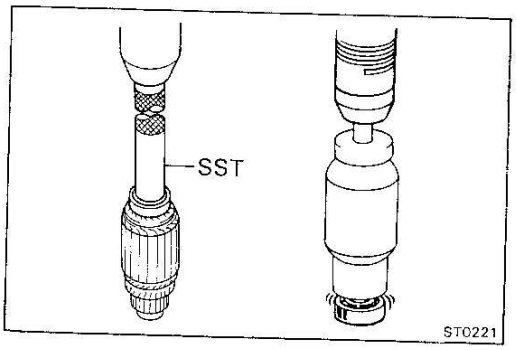


2. IF NECESSARY, REPLACE BEARINGS

(a) Using SST, remove the bearing from the armature shaft.

(b) Using SST, remove the other bearing from the opposite side.

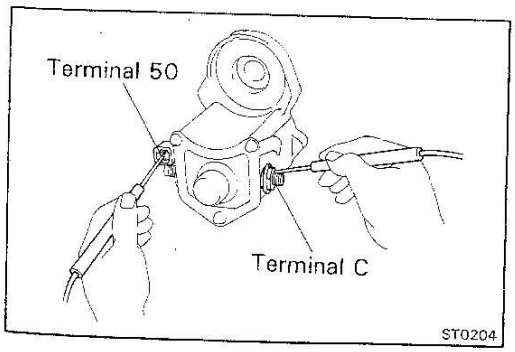
SST 09286-46011



(c) Using SST and a press, tap a new front bearing onto the shaft.

SST 09285-76010

(d) Using a press, install a new rear bearing onto the shaft.

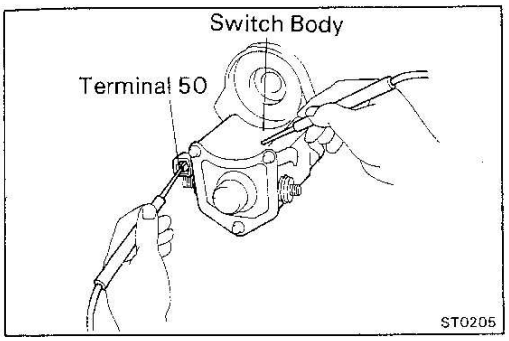


Magnetic Switch

1. PERFORM PULL-IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check for continuity between terminal 50 and terminal C.

If there is no continuity, replace the magnetic switch.



2. PERFORM HOLD-IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check for continuity between terminal 50 and the switch body.

If there is no continuity, replace the magnetic switch.

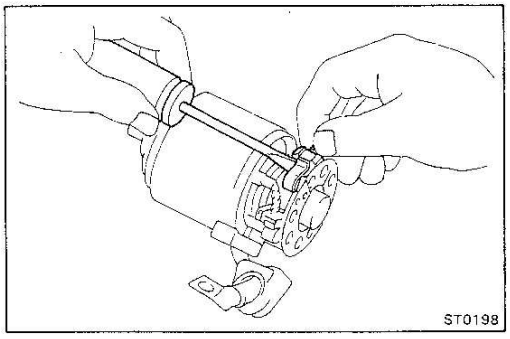
ASSEMBLY OF STARTER

(See page ST-11)

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

1. PLACE ARMATURE INTO FIELD FRAME

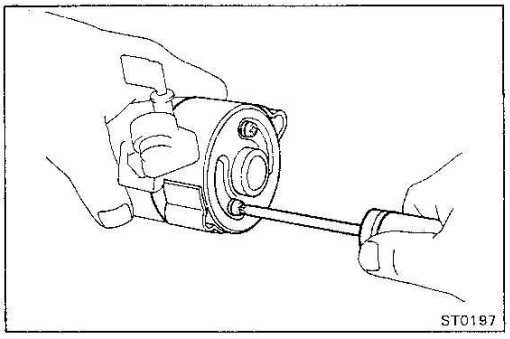
Apply grease to the armature bearings and insert the armature into the field frame.



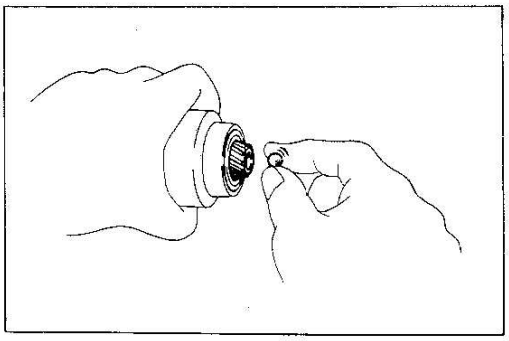
2. INSTALL BRUSH HOLDER AND BRUSHES

(a) Using a screwdriver, hold the brush spring back, and install the brush into the brush holder. Install the four brushes.

NOTE: Make sure that the positive lead wires are not grounded.

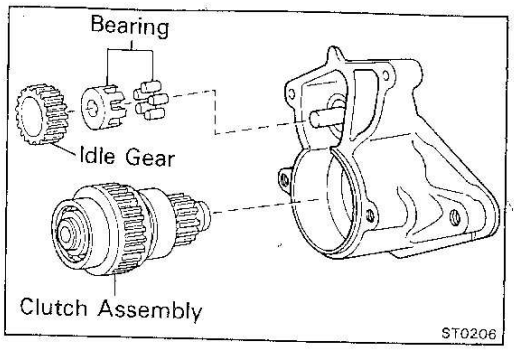


(b) Install the end cover to the field frame.



3. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE

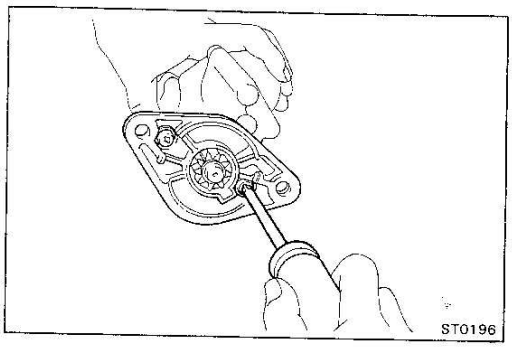
Apply grease to the ball and spring and insert them into the clutch shaft hole.



4. INSTALL GEAR AND CLUTCH ASSEMBLY

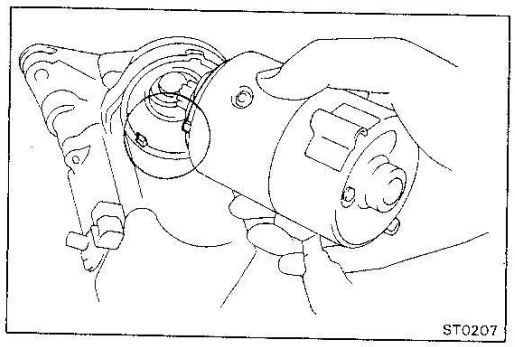
(a) Apply grease to the gear and clutch assembly.

(b) Place the clutch assembly, idler gear and bearing in the starter housing.



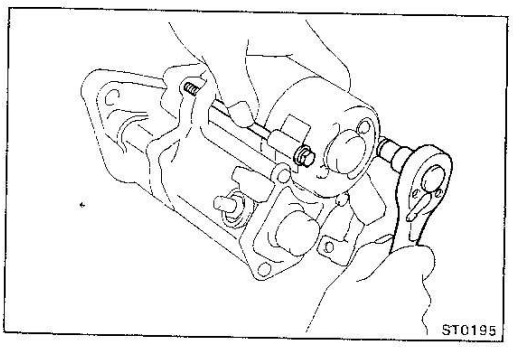
5. INSTALL STARTER HOUSING

Place the starter housing on the magnetic switch and install the two screws.

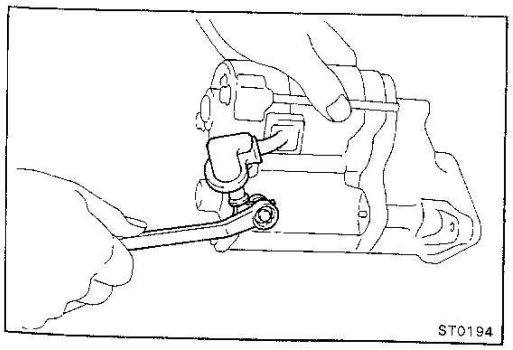


6. INSTALL FIELD FRAME WITH ARMATURE IN MAGNETIC SWITCH

(a) Match the protrusion of the field frame with the magnetic switch.



(b) Install the two through bolts.



(c) Connect the coil lead to the terminal on the magnetic switch.

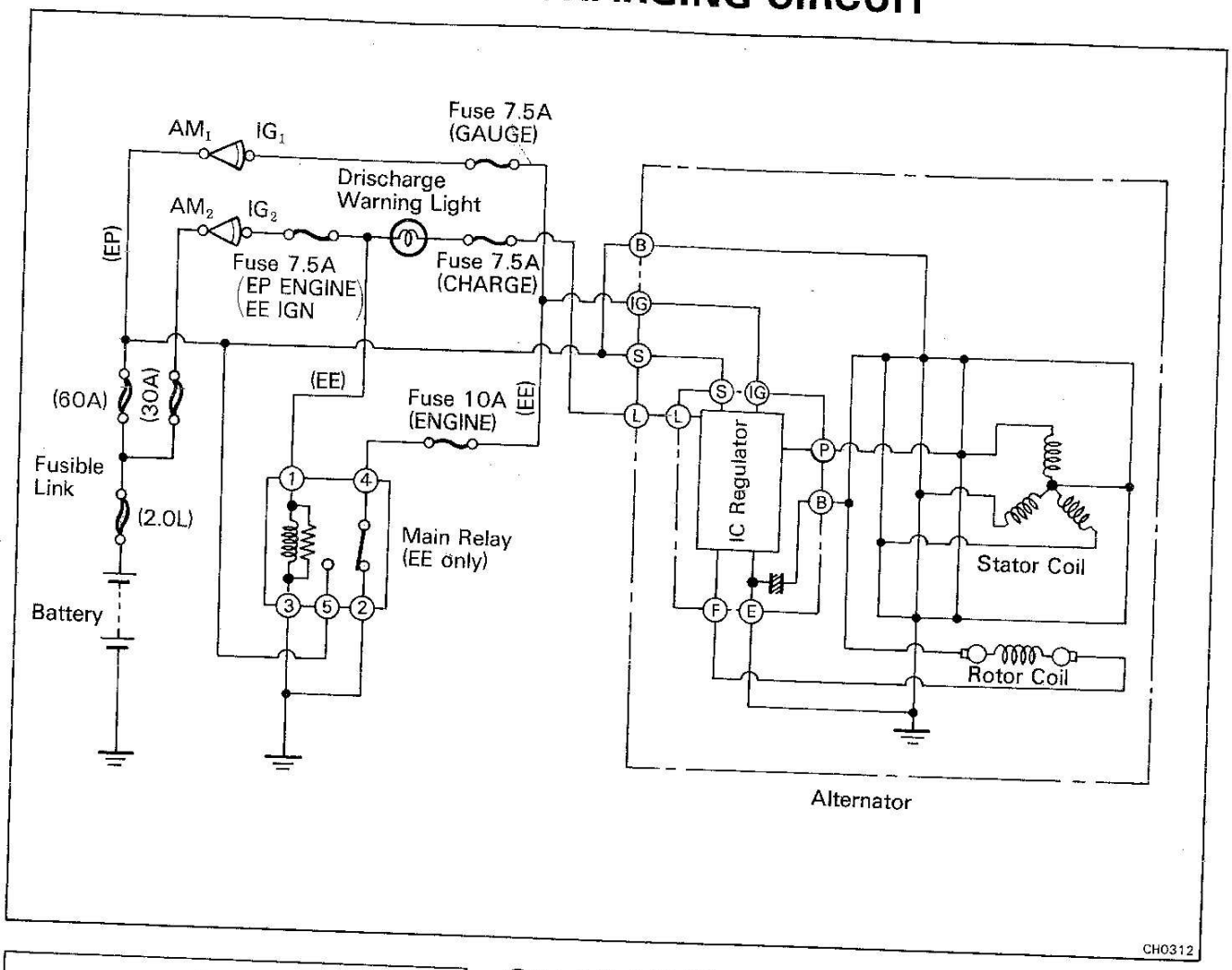
PRECAUTIONS

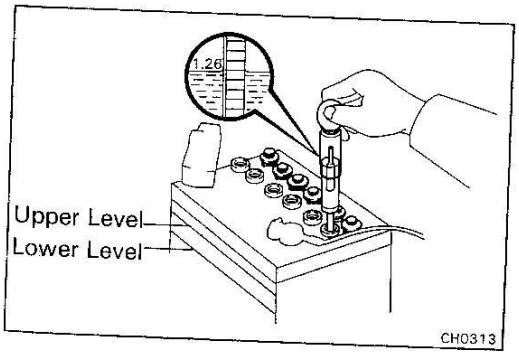
1. **Check that the battery cables are connected to the correct terminals.**
2. **Disconnect the battery cables when the battery is given a quick charge.**
3. **Do not perform tests with a high voltage insulation resistance tester.**
4. **Never disconnect the battery while the engine is running.**

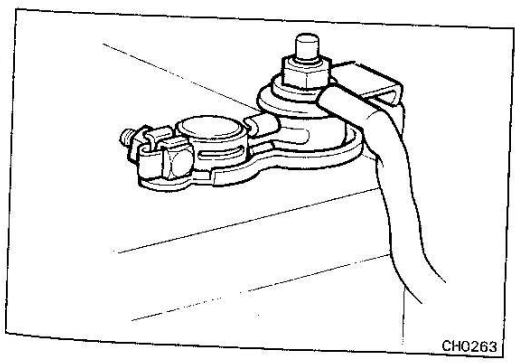
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Discharge warning light does not light with ignition ON and engine off	Fuse blown	Check "CHARGE" and "IGN" fuses	
	Light burned out	Replace light	
	Wiring connection loose	Tighten loose connections	
	IC regulator faulty	Replace IC regulator	CH-7
Discharge warning light does not go out with engine running (battery requires frequent recharging)	Drive belt loose or worn	Adjust or replace drive belt	CH-4
	Battery cables loose, corroded or worn	Repair or replace cables	
	Fuse blown	Check "CHARGE" or "ENGINE" fuse	
	Fusible link blown	Replace fusible link	
	IC regulator or alternator faulty	Check charging system	CH-3
	Wiring faulty	Repair wiring	

CHARGING CIRCUIT







ON-VEHICLE INSPECTION

1. **CHECK BATTERY SPECIFIC GRAVITY AND ELECTROLYTE LEVEL**

   (a) Check the specific gravity of each cell.

   Standard specific gravity
   When fully charged at 20°C (68°F): 1.25 – 1.27

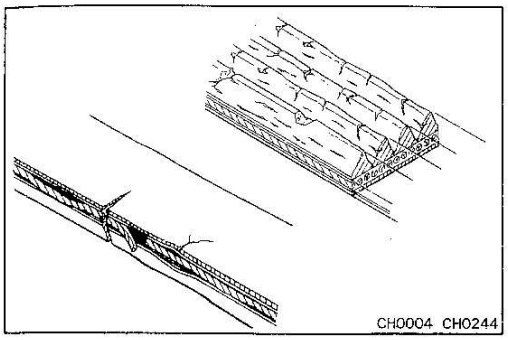
   (b) Check the electrolyte quantity of each cell.

   If insufficient, refill with distilled (or purified) water.

2. **CHECK BATTERY TERMINALS AND FUSIBLE LINK**

   (a) Check that the battery terminals are not loose or corroded.

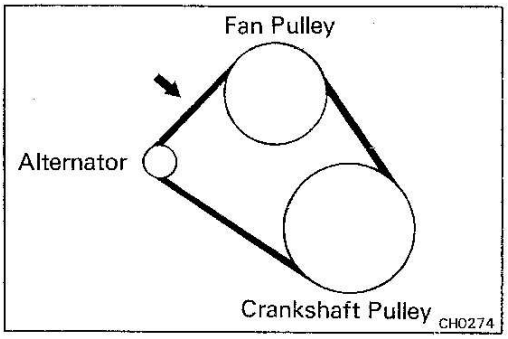
   (b) Check the fusible link for continuity.



3. DRIVE BELT

(a) Visually check the belt for separation of the adhesive rubber above and below the core, core separation from the belt side, severed core, separation of the rib from the adhesive rubber, cracking or separation of the ribs, torn or worn ribs or cracks in the inner ridges of the ribs.

If necessary, replace the drive belt.

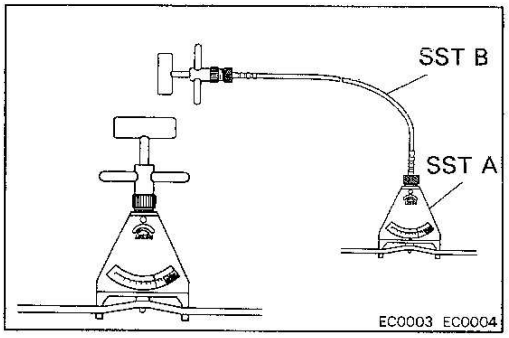


(b) Check the drive belt deflection of pressing on the belt at the points indicated in the figure with 10kg (22.0 lb, 98 N) pressure.

Drive belt deflection:

New belt	**3.5 – 4.5 mm (0.138 – 0.177 in.)**
Used belt	**5.0 – 6.0 mm (0.197 – 0.236 in.)**

If necessary, adjust the drive belt deflection.



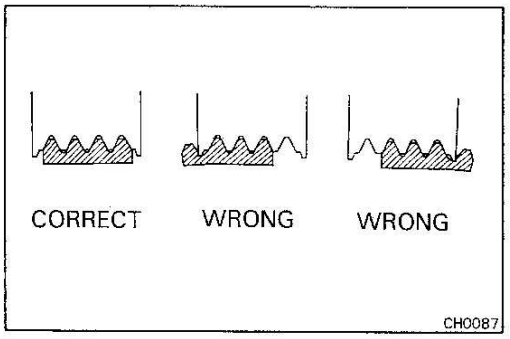
[Reference]

Using SST, check the drive belt tension.

SST A 09216-00020
SST B 09216-00030

Drive belt tension

New belt	**55 – 65 kg**
Used belt	**25 – 40 kg**

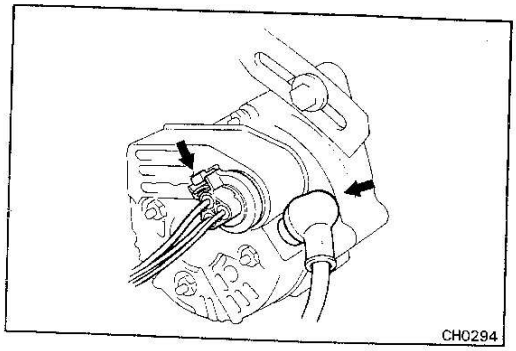


NOTE:

- "New belt" refers to a belt which has never been used.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the drive belt, check that it fits properly in the ribbed grooves.
- Check by hand to confirm that the belt has not slipped out of the groove on the bottom of the crank pulley.
- After installing the belt, run the engine for about 5 minutes and then recheck the deflection.

4. CHECK FUSES FOR CONTINUITY

CHARGE fuse	(7.5 A)
ENGINE fuse	(7.5 A)
IGN fuse	(7.5 A) (EE only)



5. VISUALLY CHECK ALTERNATOR WIRING AND LISTEN FOR ABNORMAL NOISES

(a) Check that the wiring is in good condition.

(b) Check that there is no abnormal noise from the alternator while the engine is running.

6. CHECK DISCHARGE WARNING LIGHT CIRCUIT

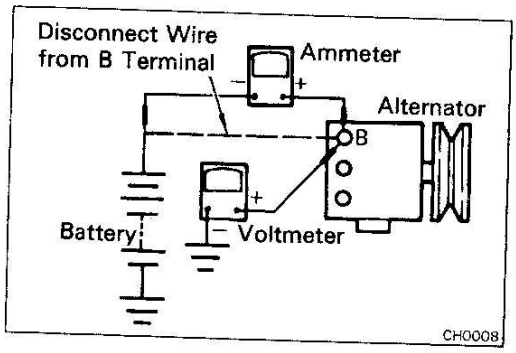
(a) Warm up the engine and then turn it off.

(b) Turn off all accessories.

(c) Turn the ignition switch to ON. Check that the discharge warning light is lit.

(d) Start the engine. Check that the light goes out.

If the light does not function as specified, troubleshoot the warning light circuit.

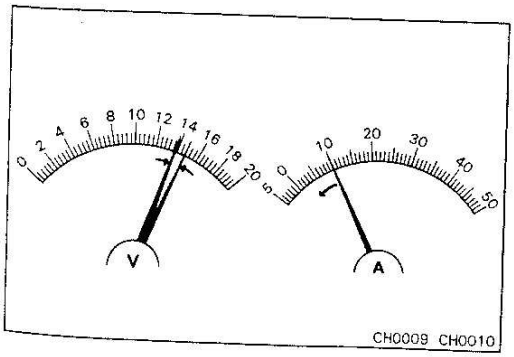


7. CHECK CHARGING CIRCUIT WITHOUT LOAD

NOTE: If a battery/alternator tester is available, connect the tester to the charging circuit according to the manufacturer's instructions.

(a) If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:

- Disconnect the wire from terminal B of the alternator and connect it to the negative terminal of the ammeter.
- Connect the test lead from the positive terminal of the ammeter to terminal B of the alternator.
- Connect the positive lead of the voltmeter to terminal B of the alternator.
- Connect the negative lead of the voltmeter to ground.

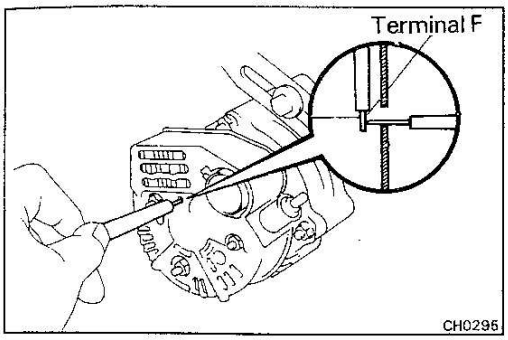


(b) Check the charging circuit as follows:

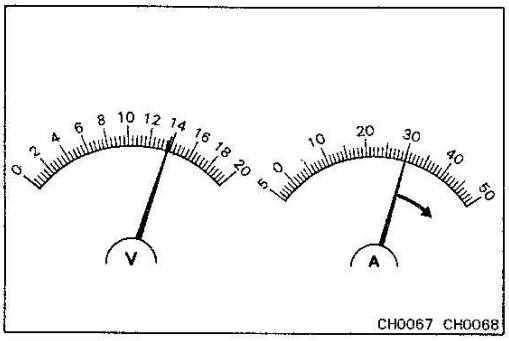
Run the engine from idle to 2,000 rpm, and check the reading on the ammeter and voltmeter.

Standard amperage: Less than 10 A
Standard voltage: 13.5 – 15.1 V (25°C or 77°F)

- If the voltage reading is greater than standard voltage, replace the IC regulator.



- If the voltage reading is less than standard voltage, check the IC regulator and alternator as tollows: With terminal F grounded, start the engine and check the voltage reading of terminal B.
- If the voltage reading is greater than standard, replace the IC regulator.
- If the voltage reading is less than standard, check the alternator.



8. CHECK CHARGING CIRCUIT WITH LOAD

(a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater fan control switch at HI.

(b) Check the reading on the ammeter.

Standard amperage: More than 30 A

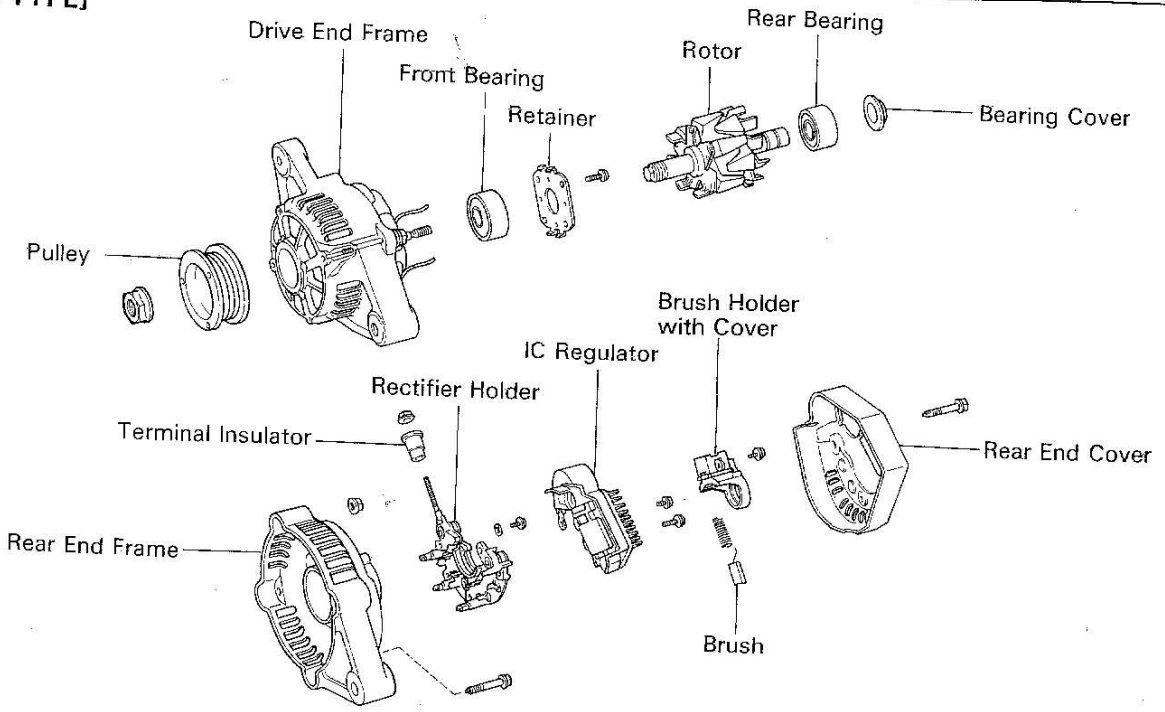
If the ammeter reading is less than 30A, repair the alternator. (See page CH-7)

NOTE: If the battery is fully charged, the indication be less than 30A.

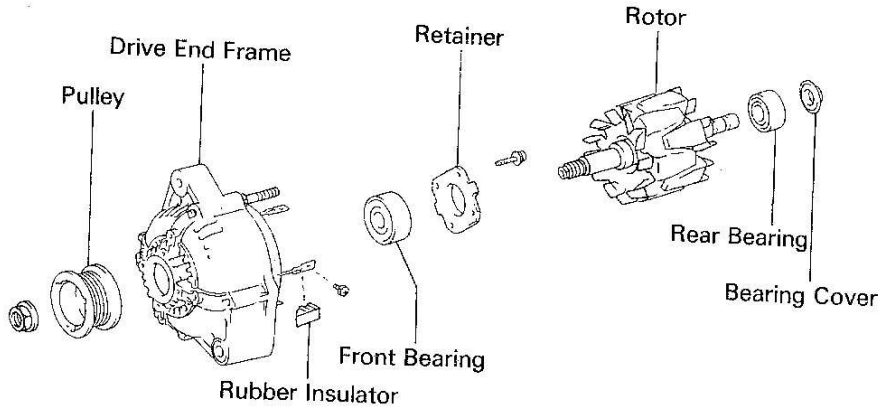
ALTERNATOR

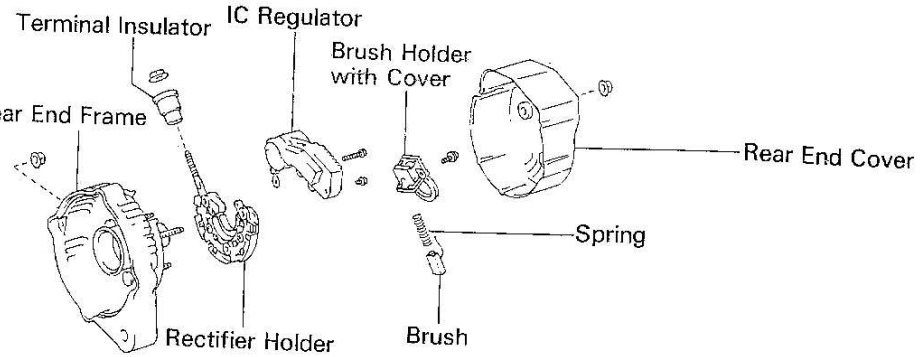
COMPONENTS

[40A TYPE]

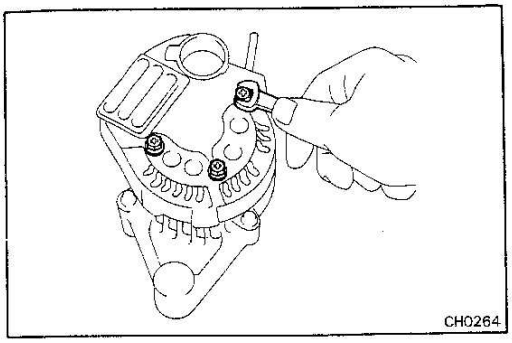


[45A TYPE]





CH0273
CH0314

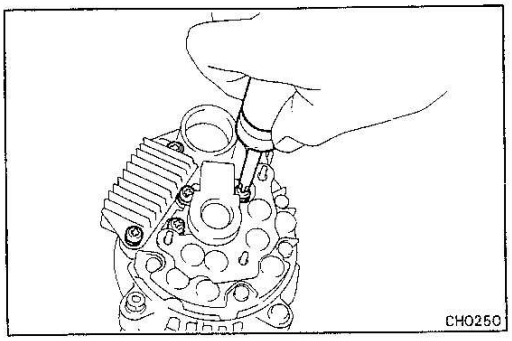


DISASSEMBLY OF ALTERNATOR

1. REMOVE REAR END COVER

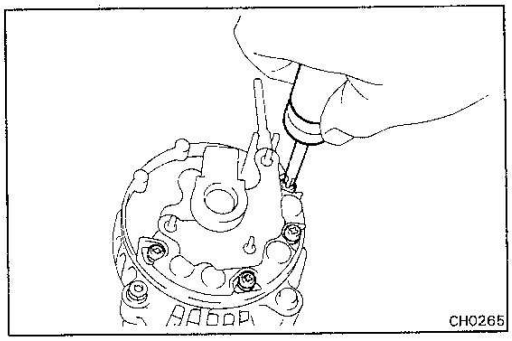
(a) Remove the nut and terminal insulator.

(b) (40A Type)
Remove the three bolts and end cover.
(45A Type)
Remove the three nuts and end cover.



2. REMOVE BRUSH HOLDER AND IC REGULATOR

Remove the five screws, brush holder and IC regulator.



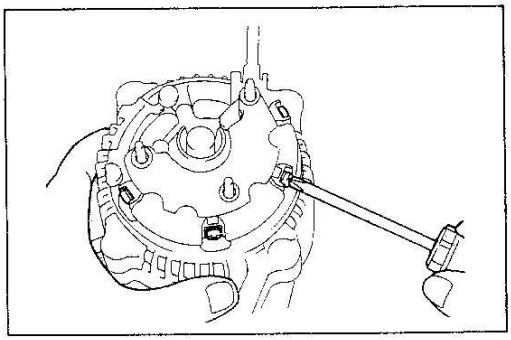
3. REMOVE RECTIFIER HOLDER

[40A Type]

(a) Remove the four screws.

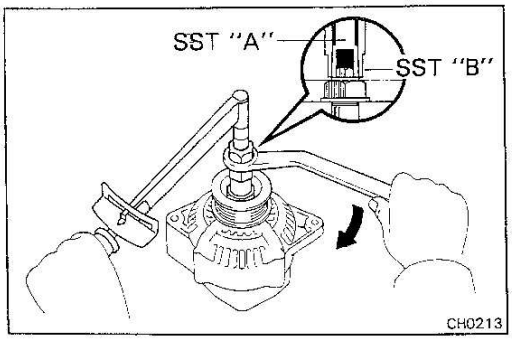
(b) Using pliers, straighten the stator lead wire.

(c) Remove the rectifier holder.



[45A Type]

Remove the four screws, rectifier holder and rubber insulators.



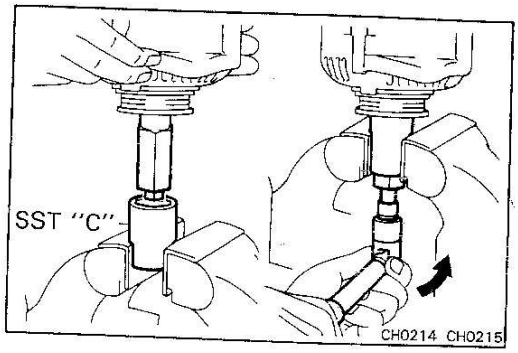
4. REMOVE PULLEY

(a) Hold SST "A" with a torque wrench and tighten SST "B" clockwise to the specified torque.

SST 09820-63010

Torque: 400 kg-cm (29 ft-lb, 39 N·m)

(b) Check that SST "A" is secured to the rotor shaft.



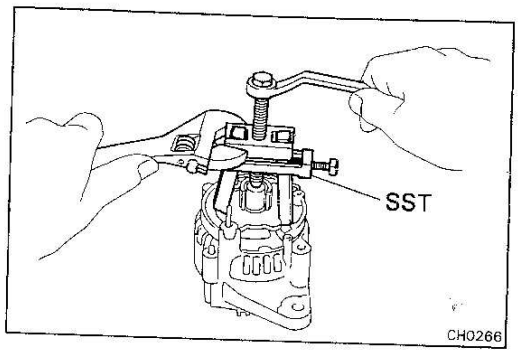
(c) As shown in the figure, mount SST "C" in a vise and then install the alternator to SST "C."

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

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

(e) Remove the alternator from SST "C."

(f) Turn SST "B" and remove SSTs "A" and "B." Remove the pulley nut and pulley.



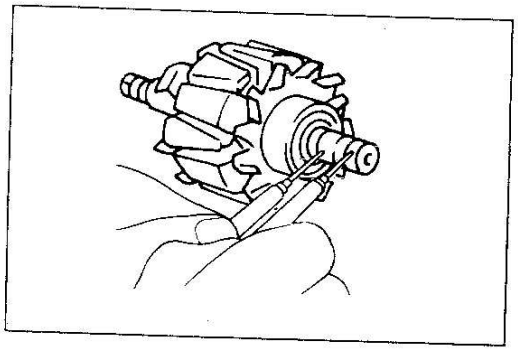
5. REMOVE REAR END FRAME

(a) (40A Type)
Remove the two nuts and bolts.
(45A Type)
Remove the four nuts.

(b) Using SST, remove the rear end frame.

SST 09286-46011

6. REMOVE ROTOR FROM DRIVE END FRAME



INSPECTION AND REPAIR OF ALTERNATOR

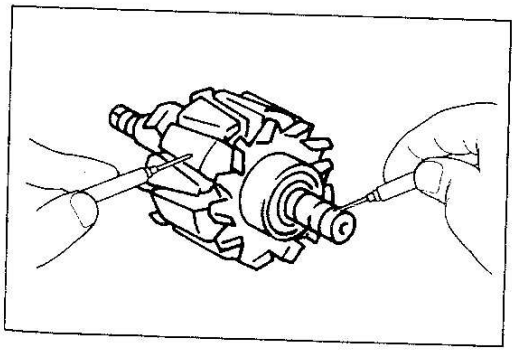
Rotor

1. INSPECT ROTOR FOR OPEN CIRCUIT

Using an ohmmeter, check for continuity between the slip rings.

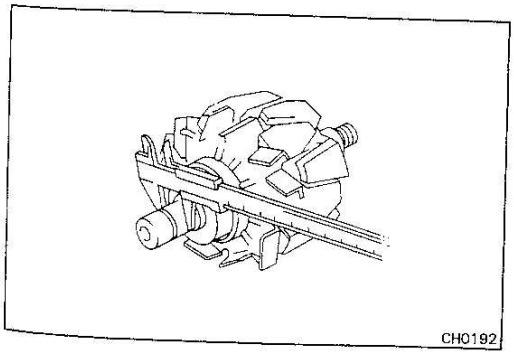
Standard resistance: 2.8 – 3.0Ω

If there is no continuity, replace the rotor.



2. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and rotor. If there is continuity, replace the rotor.



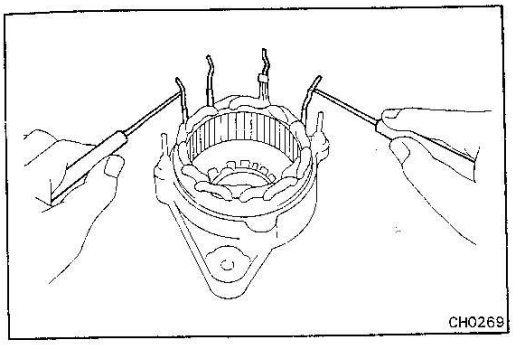
3. INSPECT SLIP RINGS

(a) Check that the slip rings are not rough or scored. If rough or scored, replace the rotor.

(b) Using calipers, measure the slip ring diameter.

If the diameter of the slip ring is less than the minimum, replace the rotor.

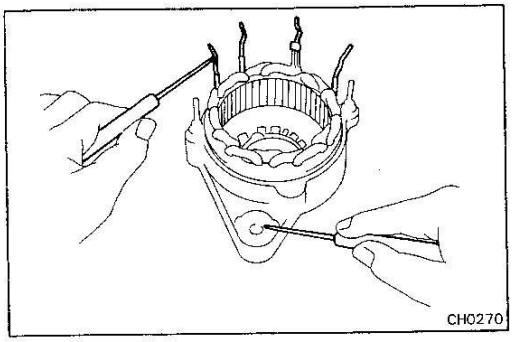
Standard diameter: 14.4 mm (0.567 in.)
Minimum diameter: 14.0 mm (0.551 in.)



Stator

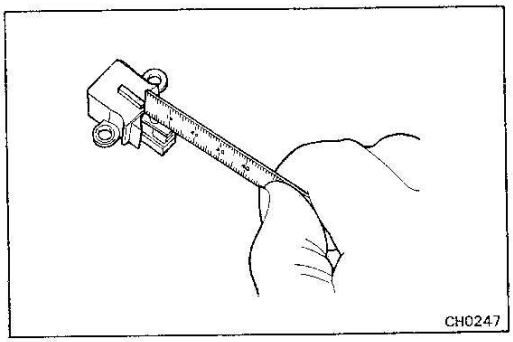
1. INSPECT STATOR FOR OPEN CIRCUIT

Using an ohmmeter, check all leads for continuity. If there is no continuity, replace the drive end frame assembly.



2. INSPECT THAT STATOR IS NOT GROUNDED

Using an ohmmeter, check that there is no continuity between the coil leads and drive end frame. If there is continuity, replace the drive end frame assembly.

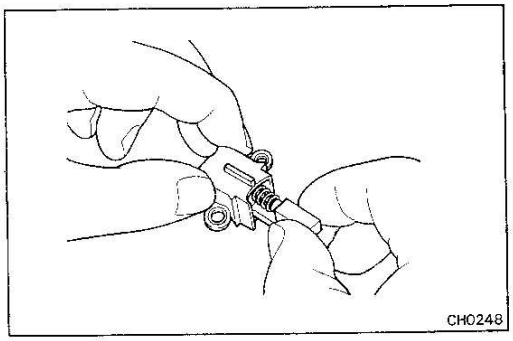


Brush and Brush Holder

1. MEASURE EXPOSED BRUSH LENGTH

Minimum exposed length: 4.5 mm (0.177 in.)

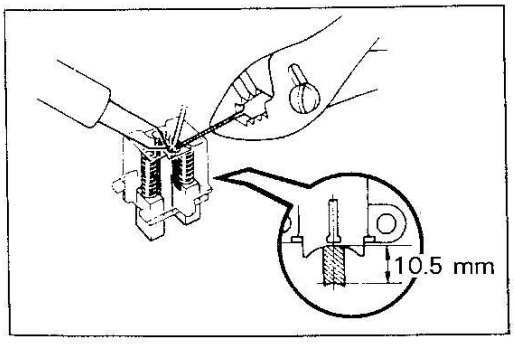
If the brush length is less than the minimum, replace the brush.



2. IF NECESSARY REPLACE BRUSH

(a) Unsolder and remove the brush and the spring.

(b) put the brush wire through the spring and insert the brush holder.

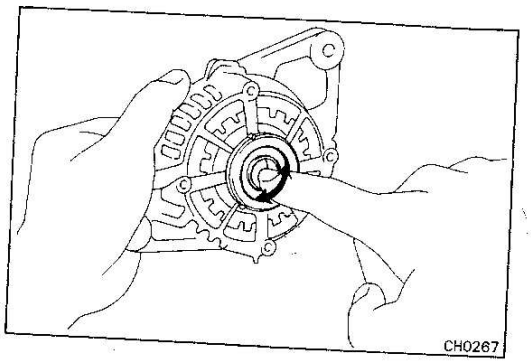


(c) Solder the wire to the brush holder as shown.

Standard exposed length: 10.5 mm (0.413 in.)

(d) Check that the brush moves smoothly in the brush holder.

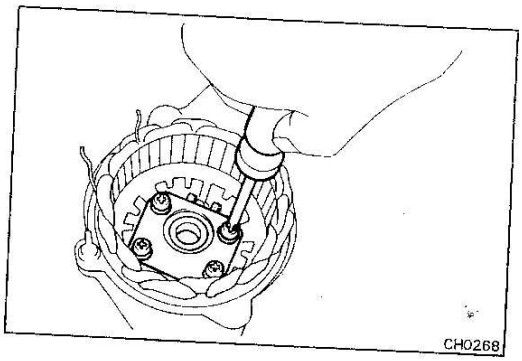
(e) Cut off the excess wire.



Bearings

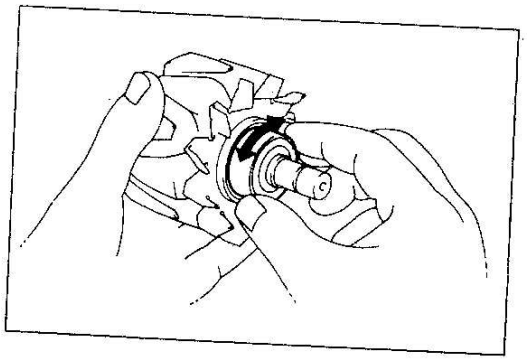
1. INSPECT FRONT BEARING

Check that the front bearing is not rough or worn. Replace if necessary.



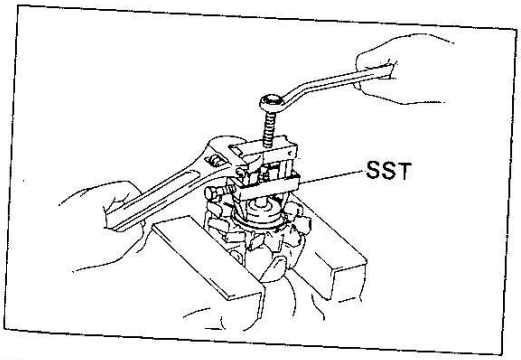
2. IF NECESSARY REPLACE FRONT BEARING

Remove the four screws and bearing retainer, and replace the front bearing.



3. INSPECT REAR BEARING

Check that the rear bearing is not rough or worn. Replace if necessary.

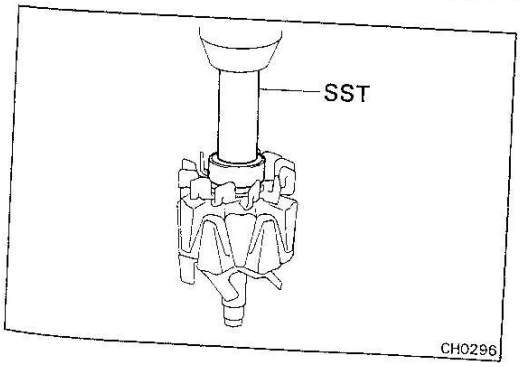


4. IF NECESSARY REPLACE REAR BEARING

(a) Using SST, remove the rear bearing with the bearing cover from the rotor shaft.

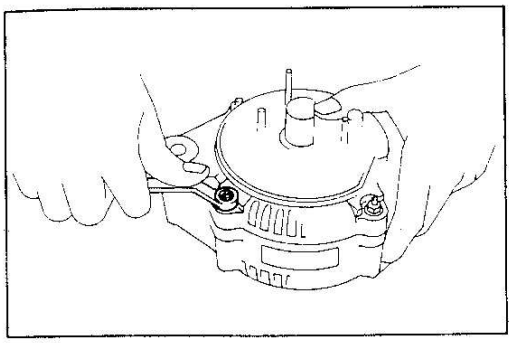
SST 09820-00021

CAUTION: Be careful not to damage the fan.



(b) Using SST and a press, install the rear bearing and bearing cover onto the rotor shaft.

SST 09820-00030



ASSEMBLY OF ALTERNATOR

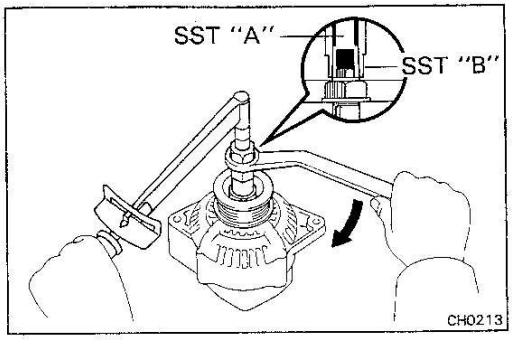
(See page CH-7)

1. INSTALL ROTOR TO DRIVE END FRAME

2. INSTALL REAR END FRAME

(a) Using a plastic hammer, lightly tap the rear end frame on the drive end frame.

(b) (40A Type)
Install the two nuts and bolts.
(45A Type)
Install the four nuts.



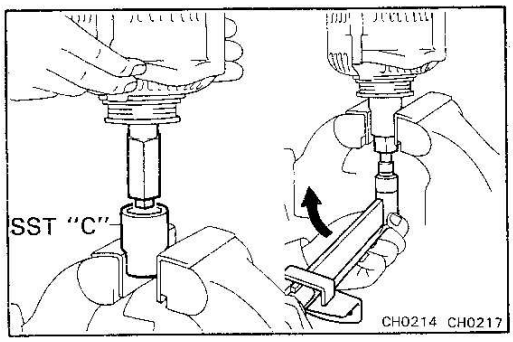
3. INSTALL PULLEY

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

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

SST 09820-63010

Torque: 400 kg-cm (29 ft-lb, 39 N·m)



(c) Check that SST "A" is secured to the pulley shaft.

(d) As shown in the figure, mount SST "C" in a vise and then install the alternator to SST "C."

(e) To torque the pulley nut turn SST "A" in the direction shown in the figure.

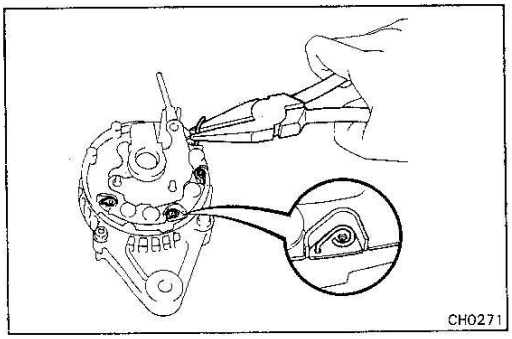
Torque: 1,125 kg-cm (81 ft-lb, 110 N·m)

(f) Remove the alternator from SST "C."

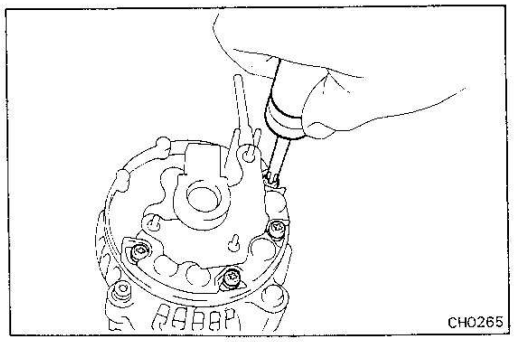
(g) Turn SST "B" and remove SSTs "A" and "B."

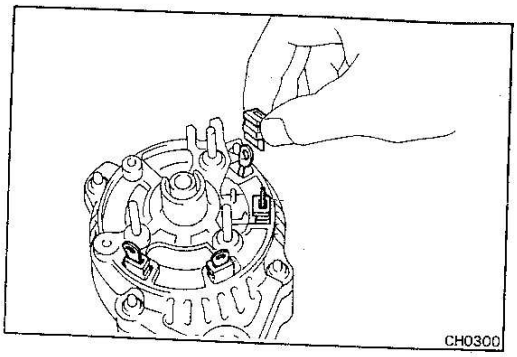
4. INSTALL RECTIFIER HOLDER [40A Type]

(a) Install the rectifier and bend lead wires as shown.



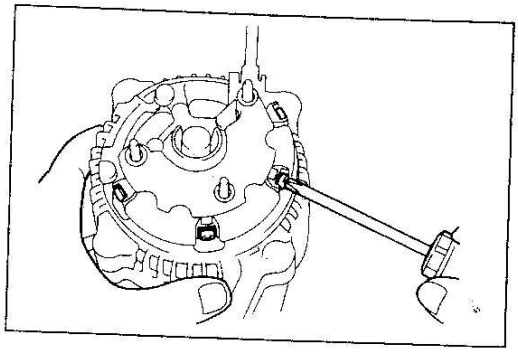
(b) Install the four screws.



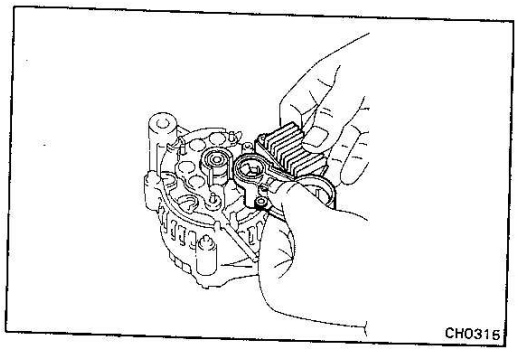


[45A Type]

(a) Install the four rubber insulators on the lead wires.



(b) Install the rectifier with four screws.

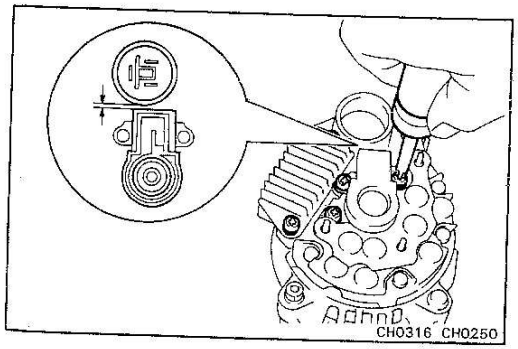


5. INSTALL BRUSH HOLDER AND IC REGULATOR

(a) Place the brush holder cover to the brush holder.

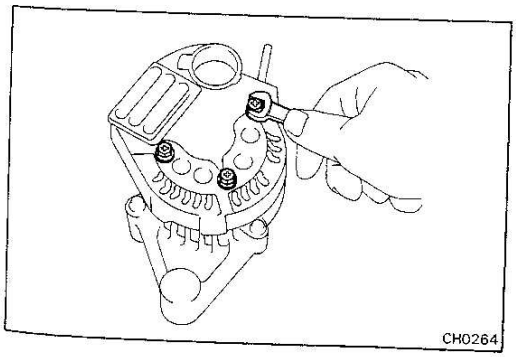
(b) Install the IC regulator and brush holder to the rear end frame horizontally as shown in the figure.

NOTE: Make sure the brush holder's cover dosn't slip to one side during installation.



(c) Insall and torque the three screws.

NOTE: Make sure the gap between the brush holder and connector is at least 1 mm (0.04 in.).

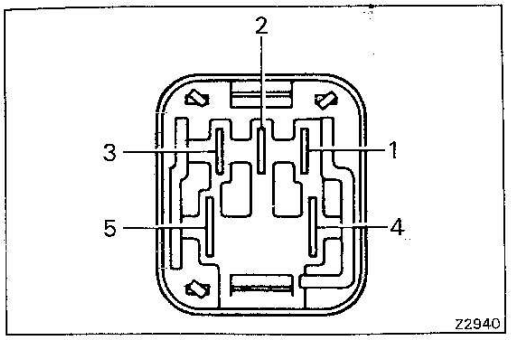


6. INSTALL REAR END COVER

(a) (40A Type)
Install the end cover with the three bolts.
(45A Type)
Install the end cover with the three nuts.

(b) Install the terminal insulator with the nut.

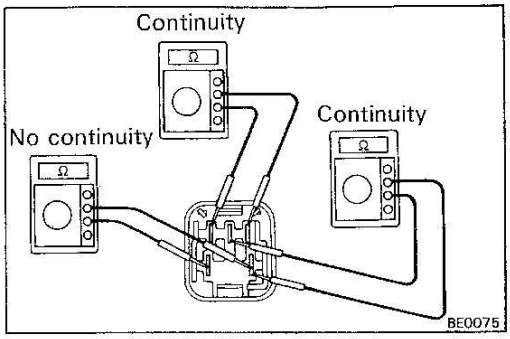
7. MAKE SURE ROTOR ROTATES SMOOTHLY



IGNITION MAIN RELAY (EE series only)

INSPECTION OF IGNITION MAIN RELAY

NOTE: Located in the engine compartment relay box.



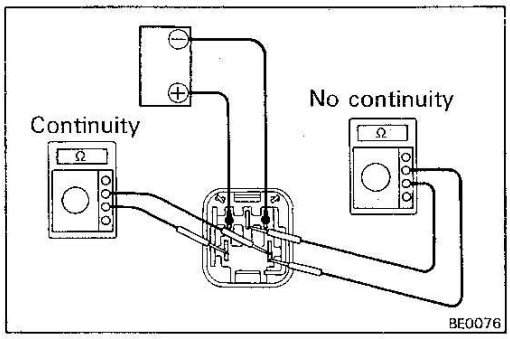
1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 3.

(b) Check that there is continuity between terminals 2 and 4.

(c) Check that there is no continuity between terminals 4 and 5.

If continuity is not as specifield, replace the relay.



2. INSPECT RELAY OPERATION

(a) Apply batterly voltage across termnals 1 and 3.

(b) Using an ohmmeter, check that there is continuity between terminals 4 and 5.

(c) Check that there is no continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.

SERVICE SPECIFICATIONS

A

ENGINE MECHANICAL

Specifications

Drive belt deflection or tension			with 10 kg (22.1 lb, 98 N)		w/SST (Reference)
Water pump – Alternator		New belt	3.5 – 4.5 mm	0.138 – 0.177 in.	55 – 65 kg
		Used belt	5.0 – 6.0 mm	0.197 – 0.236 in.	25 – 40 kg
Idler – A/C compressor		New belt	5.5 – 7.0 mm	0.217 – 0.276 in.	55 – 65 kg
		Used belt	7.0 – 8.5 mm	0.276 – 0.335 in.	35 – 45 kg
Engine oil capacity	Dry fill		3.4 liters	3.6 USqts	3.0 Imp.qts
	Drain and refill				
	w/ oil filter change		3.2 liters	3.4 USqts	2.8 Imp.qts
	w/o oil filter change		2.9 liters	3.1 USqts	2.6 Imp.qts
High-tension cord	Resistance	Limit	Less than 25 kΩ per cord		
Spark plug					
Type	1E (EC)	ND	W20EXR-U		
		NGK	BPR6EY		
	2E (EC), 2E-C	ND	W20EXR-U11		
		NGK	BPR6EY11		
	Others	ND	W20EX-U		
		NGK	BP6EY		
Gap	2E (EC), 2E-C		1.1 mm	0.043 in.	
	Others		0.8 mm	0.031 in.	
Distributor					
Conventional	Dwell angle		52 ± 6°		
	Rubbing block gap		0.45 mm	0.0177 in.	
Ignition timing	EC		5° BTDC @ Max. 950 rpm (T/M in N range)		
	General		5° BTDC (85 RON version)		
			10° BTDC (90 RON version)		
Firing order			1 – 3 – 4 – 2		
Valve clearance (Hot)		Intake	0.20 mm	0.0079 in.	
		Exhaust	0.20 mm	0.0079 in.	
[Reference] (Cold)		Intake	0.18 mm	0.0071 in.	
		Exhaust	0.18 mm	0.0071 in.	
Idle speed		M/T	800 rpm		
(W/ Cooling fan OFF & at Neutral)		A/T	850 rpm		
Fast idle speed	2E (EC), 2E-C		3,600 ± 200 rpm		
	Others	1E	4,800 ± 200 rpm		
		2E	3,400 ± 200 rpm		
DP setting speed			2,000 ± 200 rpm		
Idle CO concentration	2E (EC), 2E-C		1.5 ± 0.5%		
	Others		2.0 ± 0.5%		
Intake manifold vacuum at idle speed			More than 400 mmHg (15.75 in.Hg, 53.3 kPa)		
Compression pressure at 250 rpm					
	2E (EC), 2E-C	STD	13.0 kg/cm²	184 psi	1,270 kPa
		Limit	10.0 kg/cm²	142 psi	981 kPa
	Others	STD	12.0 kg/cm²	171 psi	1,180 kPa
		Limit	10.0 kg/cm²	142 psi	981 kPa
Differential of pressure between each cylinder			Less than 1.0 kg/cm² (14 psi, 98 kPa)		

Specifications (Cont'd)

Idler pulley tension spring	Free length		38.4 mm	1.512 in.
	Installed tension			
	1E	at 50.2 mm (1.976 in.)	4.71 kg	10.4 lb 46 N
	2E, 2E-C	at 51.5 mm (2.028 in.)	5.11 kg	11.3 lb 50 N
Cylinder head	Head surface warpage	Limit	0.05 mm	0.0020 in.
	Manifold surface warpage	Limit	0.05 mm	0.0020 in.
	Valve seat Refacing angle		30°, 45°, 75° (IN), 60° (EX)	
	Contacting angle		45°	
	Contacting width		1.2 – 1.6 mm	0.047 – 0.063 in.
Valve guide bushing	Inside diameter		6.01 – 6.03 mm	0.2366 – 0.2374 in.
	Outside diameter	STD	11.000 – 11.027 mm	0.4331 – 0.4341 in.
		O/S type 0.05	11.050 – 11.077 mm	0.4350 – 0.4361 in.
	Replacing temperature (Cylinder head side)		20°C	68°F
Valve	Valve overall length	STD Intake (Main)	92.26 mm	3.6223 in.
		(Sub)	98.50 mm	3.8779 in.
		Exhaust	92.26 mm	3.6223 in.
		Limit Intake (Main)	91.76 mm	3.6126 in.
		(Sub)	98.00 mm	3.8583 in.
		Exhaust	91.76 mm	3.6126 in.
	Valve face angle		44.5°	
	Stem diameter	Intake	5.970 – 5.985 mm	0.2350 – 0.2356 in.
		Exhaust	5.965 – 5.980 mm	0.2348 – 0.2354 in.
	Stem oil clearance	STD Intake	0.025 – 0.060 mm	0.0010 – 0.0024 in.
		Exhaust	0.030 – 0.065 mm	0.0012 – 0.0026 in.
		Limit Intake	0.08 mm	0.0031 in.
		Exhaust	0.10 mm	0.0039 in.
	Valve head margin thickness	Limit	0.8 mm	0.031 in.
Valve spring	Free length		41.52 mm	1.6346 in.
	Installed tension			
	at 35.16 mm (1.3842 in.)		15.91 kg	35.1 lb 156 N
	Squareness	Limit	2.0 mm	0.079 in.
Intake and exhaust manifold	Manifold surface warpage	Limit Intake	0.20 mm	0.0079 in.
		Exhaust	0.30 mm	0.0118 in.
Camshaft	Thrust clearance	STD	0.08 – 0.18 mm	0.0031 – 0.0071 in.
		Limit	0.25 mm	0.0098 in.
	Journal oil clearance	STD	0.037 – 0.073 mm	0.0015 – 0.0029 in.
		Limit	0.10 mm	0.0039 in.
	Journal diameter	STD	26.979 – 26.995 mm	1.0622 – 1.0628 in.
	Circle runout	Limit	0.04 mm	0.0016 in.

Specifications (Cont'd)

Camshaft (cont'd)	Cam lobe height	1E	Intake (Main)	STD	35.35 – 35.45 mm	1.3917 – 1.3957 in.
				Limit	35.15 mm	1.3839 in.
			(Sub)	STD	34.91 – 35.01 mm	1.3744 – 1.3783 in.
				Limit	34.71 mm	1.3665 in.
			Exhaust	STD	35.83 – 35.93 mm	1.4106 – 1.4146 in.
				Limit	35.63 mm	1.4028 in.
		2E, 2E-C	Intake (Main)	STD	35.87 – 35.97 mm	1.4122 – 1.4161 in.
				Limit	35.67 mm	1.4043 in.
			(Sub)	STD	35.38 – 35.48 mm	1.3929 – 1.3968 in.
				Limit	35.18 mm	1.3850 in.
			Exhaust	STD	35.83 – 35.93 mm	1.4106 – 1.4116 in.
				Limit	35.63 mm	1.4028 in.
Cylinder block	Warpage			Limit	0.05 mm	0.0020 in.
	Cylinder bore		STD	1E	70.50 – 70.53 mm	2.7756 – 2.7768 in.
				2E, 2E-C	73.00 – 73.03 mm	2.8740 – 2.8752 in.
	Cylinder bore wear			Limit	0.2 mm	0.008 in.
	On standard sized piston					
			Limit	1E	70.73 mm	2.7756 in.
				2E, 2E-C	73.23 mm	2.8831 in.
	On oversized piston (O/S 0.25)					
			Limit	1E	70.98 mm	2.7945 in.
				2E, 2E-C	73.48 mm	2.8929 in.
Piston and piston ring	Piston diameter	1E	STD		70.41 – 70.44 mm	2.7720 – 2.7732 in.
			O/S type 0.25		70.66 – 70.69 mm	2.7819 – 2.7831 in.
		2E, 2E-C	STD		72.91 – 72.94 mm	2.8705 – 2.8716 in.
			O/S type 0.25		73.16 – 73.19 mm	2.8803 – 2.8815 in.
	Piston to cylinder clearance				0.08 – 0.10 mm	0.0031 – 0.0039 in.
	Piston ring end gap					
	STD	1E		No. 1	0.25 – 0.48 mm	0.0058 – 0.0189 in.
				No. 2	0.15 – 0.43 mm	0.0059 – 0.0169 in.
				Oil	0.20 – 0.83 mm	0.0079 – 0.0327 in.
		2E, 2E-C		No. 1	0.26 – 0.49 mm	0.0102 – 0.0193 in.
				No. 2	0.15 – 0.43 mm	0.0059 – 0.0169 in.
				Oil	0.20 – 0.83 mm	0.0079 – 0.0327 in.
	Limit	1E		No. 1	1.08 mm	0.0425 in.
				No. 2	1.03 mm	0.0406 in.
				Oil	1.43 mm	0.0563 in.
		2E, 2E-C		No. 1	1.09 mm	0.0429 in.
				No. 2	1.03 mm	0.0406 in.
				Oil	1.43 mm	0.0563 in.

Specifications (Cont'd)

Piston and piston ring (Cont'd)	Ring to ring groove clearance limit	No. 1	0.04 – 0.08 mm	0.0016 – 0.0031 in
		No. 2	0.03 – 0.07 mm	0.0012 – 0.0028 in
	Piston pin installing temperature		20°C	68°F
Connecting rod and bearing	Thrust clearance	STD	0.15 – 0.35 mm	0.0059 – 0.0138 in
		Limit	0.45 mm	0.0177 in.
	Rod bend	Limit	0.03 mm	0.0012 in.
	Rod twist	Limit	0.05 mm	0.0020 in.
Crankshaft	Thrust clearance	STD	0.02 – 0.22 mm	0.0008 – 0.0087 in.
		Limit	0.3 mm	0.012 in.
	Thrust washer thickness	STD	2.440 – 2.490 mm	0.0961 – 0.0980 in.
		O/S 0.125	2.503 – 2.553 mm	0.0985 – 0.1005 in.
	Main journal oil clearance	STD	0.016 – 0.049 mm	0.0006 – 0.0019 in.
		Limit	0.08 mm	0.0031 in.
	Main journal diameter	STD	46.985 – 47.000 mm	1.8498 – 1.8504 in.
	Main journal finished diameter	U/S 0.25	46.735 – 46.750 mm	1.8400 – 1.8405 in.
	Crank pin oil clearance	STD	0.016 – 0.048 mm	0.0006 – 0.0019 in.
		Limit	0.08 mm	0.0031 in.
	Crank pin diameter	STD	39.985 – 40.000 mm	1.5742 – 1.5748 in.
	Crank pin finished diameter	U/S 0.25	39.735 – 39.750 mm	1.5644 – 1.5650 in.
	Circle runout	Limit	0.06 mm	0.0024 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
Cylinder head bolt	First	300	22	29
	Second	500	36	49
	Third	Tighten the bolt an additional 90° after achieving specified torque		
Cylinder head x Camshaft bearing gap		140	10	14
Cylinder head x Spark plug		180	13	18
Cylinder head x Intake manifold		195	14	19
Cylinder head x Exhaust manifold		425	31	42
Cylinder block x Oil pump		75	65 in.-lb	7.4
Cylinder block x Crankshaft bearing cap		580	42	57
No. 1 idler pulley x Oil pump		185	13	18
Camshaft x Camshaft timing pulley	Bolt w/o washer	510	37	50
	Bolt w/ washer	650	47	64
Crankshaft x Crankshaft pulley		1,000 – 1,500	72 – 108	98 – 147
Crankshaft x Flywheel		850	61	83
Connecting rod cap x Connecting rod		400	29	39

FUEL SYSTEM

K type carburetor	Part No.			
		1E	EC	21100 – 10050
			General	21100 – 10060
		2E	General A/T	21100 – 11170
			M/T (Saudi Arabia, South Afica) & Singapore	21100 – 11190
			Saudi Arabia A/T	21100 – 11200
			General M/T	21100 – 11210
	Float level		Upper position	6.5 mm 0.256 in.
			Lower position	1.5 – 1.7 mm 0.059 – 0.067 in.
	Throttle valve full open angle			
			Primary	89 – 91° from horizontal plane
			Secondary	89 – 91° from horizontal plane
	Kick up clearance			0.04 – 0.16 mm 0.0016 – 0.0063 in.
	Secondary touch angle			58 – 60° from horizontal plane
	Fast idle angle		1E	23 – 25° from horizontal plane
			2E	21 – 23° from horizontal plane
	Choke breaker angle			36 – 38° from horizontal plane
	DP setting angle		Ex. General	15.7° from horizontal plane
	Accelerating pump stroke			2.5 – 3.0 mm 0.098 – 0.118 in.
	Idle mixture adjusting screw presetting			Screw out 3 turns
V type carburetor	Part No.			
		2E-C		21100-11140
		2E	M/T	21100-11150
			A/T	21100-11160
	Float level		Upper position	5.4 mm 0.213 in.
			Lower position	0.9 – 1.1 mm 0.035 – 0.043 in.
	Throttle valve fully open angle			87 – 93° from horizontal plane
	Fast idle angle [Reference]		M/T	18.7° from horizontal plane
			A/T	19.0° from horizontal plane
	Unloader stroke			More than 8 mm 0.32 in.
	DP setting angle [Reference]		M/T	14.3° from horizontal plane
			A/T	14.5° from horizontal plane
	Accelerating pump stroke			4.5 mm 0.177 in.
	Idle mixture adjusting screw presetting			Screw out 3 turns

COOLING SYSTEM

Coolant capacity w/heater or air conditioner		EP M/T	4.6 liters	4.9 US qts	4.1 Imp.qts
		A/T	4.5 liters	4.8 US qts	4.0 Imp.qts
		EE M/T	4.9 liters	5.2 US qts	4.3 Imp. qts
		A/T	4.8 liters	5.1 US qts	4.2 Imp. qts
Radiator	Relief valve opening pressure	STD	0.75 – 1.05 kg/cm² (10.7 – 14.9 psi, 74 – 103 kPa)		
		Limit	0.6 kg/cm²	8.5 psi	59 kPa
Water pump	Bearing installing temperature		75 – 85°C		167 – 185°F
Thermostat	Valve opening temperature				
	Start to open at		80 – 84°C		176 – 183°F
	Valve opening travel		More than 8 mm (0.31 in.) at 95°C (203°F)		

LUBRICATION SYSTEM

Oil pressure (Normal operating temperature)		at idle speed	More than 0.3 kg/cm² (4.3 psi, 29 kPa)	
		at 3,000 rpm	2.5 – 5.0 kg/cm² (36 – 71 psi, 245 – 490 kPa)	
Oil pump	Body clearance	STD	0.10 – 0.16 mm	0.0039 – 0.0063 in.
		Limit	0.20 mm	0.0079 in.
	Tip clearance	STD	0.06 – 0.16 mm	0.0024 – 0.0063 in.
		Limit	0.20 mm	0.0079 in.
	Side clearance	STD	0.03 – 0.09 mm	0.0012 – 0.0035 in.
		Limit	0.10 mm	0.0039 in.

IGNITION SYSTEM

High-tension cord	Resistance	Limit	Less than 25 kΩ per cord	
Ignition coil			(Conventional)	(IIA)
	Primary coil resistance		1.3 – 1.6 Ω	1.2 – 1.5 Ω
	Secondary coil resistance		10.7 – 14.5 kΩ	10.2 – 13.8 kΩ
	Resistor resistance		1.3 – 1.5 Ω	—
Distributor	Air gap		0.2 – 0.4 mm	0.008 – 0.016 in.
	Pick up coil resistance		140 – 180 Ω	
	Rubbing block gap		0.45 mm	0.018 in.

IGNITION SYSTEM (Cont'd)

Distributor (Cont'd)	Distributor advance angle (Part No.)	Governor		Vacuum	
		Dis. rpm	Advance angle	mmHg (in-Hg, kPa)	Advance angle
	1E (19100-10020)	650	Advance begins	Sub	
		800	0.2 – 2.2°	210 (8.27, 28.0)	Advance begins
		1,200	3.7 – 5.7°	240 (9.45, 32.0)	0.3 – 2.7°
		2,000	9.1 – 11.1°	320 (12.60, 42.7)	3.8 – 6.0°
		2,600	11.5 – 13.5°	400 (15.75, 53.3)	4.0 – 6.0°
		3,000	11.4 – 13.4°	Main + Sub	
				100 (3.94, 13.3)	Advance begins
				120 (4.72, 16.0)	0.2 – 4.3°
				180 (7.09, 24.0)	5.4 – 8.6°
				320 (12.60, 42.7)	9.0 – 11.0°
				430 (16.93, 57.3)	14.0 – 16.0°
	1E, 2E (19100-10030)	650	Advance begins	100 (3.94, 13.3)	Advance begins
		800	0.2 – 2.2°	120 (4.72, 16.0)	0.2 – 3.2°
		1,200	3.7 – 5.7°	190 (7.48, 25.3)	5.8 – 8.4°
		2,000	9.1 – 11.1°	320 (12.60, 42.7)	9.0 – 11.0°
		2,600	11.5 – 13.5°		
		3,000	11.4 – 13.4°		
	2E (19100-11030)	600	Advance begins	100 (3.94, 13.3)	Advance begins
		750	0 – 2.0°	120 (4.72, 16.0)	0.2 – 3.2°
		1,100	2.7 – 4.7°	190 (7.48, 25.3)	5.8 – 8.4°
		1,900	8.3 – 10.3°	320 (12.60, 42.7)	9.0 – 11.0°
		2,500	10.8 – 12.8°		
		3,000	12.5 – 14.5°		
	2E (19020-11030)	600	Advance begins	Sub	
		750	0.3 – 1.8°	260 (10.24, 34.7)	Advance begins
		1,250	4.2 – 5.7°	290 (11.42, 38.7)	0.4 – 3.0°
		1,950	8.7 – 10.2°	350 (13.78, 46.7)	3.7 – 6.0°
		2,550	11.3 – 12.8°	430 (16.93, 57.3)	4.0 – 6.0°
		3,000	12.4 – 14.4°	Main + Sub	
				100 (3.94, 13.3)	Advance begins
				130 (5.12, 17.3)	0.3 – 3.5°
				220 (8.66, 29.3)	6.0 – 9.2°
				300 (11.8, 40.0)	10.4 – 13.6°
				430 (16.9, 57.3)	14.0 – 16.0°
	2E-C (19020-11050)	600	Advance begins	Sub	
		750	0.3 – 1.8°	210 (8.27, 28.0)	Advance begins
		1,250	4.2 – 5.7°	240 (9.45, 32.0)	0.2 – 2.6°
		1,950	8.7 – 10.2°	320 (12.60, 42.7)	3.8 – 6.0°
		2,550	11.3 – 12.8°	400 (15.75, 53.3)	4.0 – 6.0°
		3,000	12.4 – 14.4°	Main + Sub	
				100 (3.94, 13.3)	Advance begins
				130 (5.12, 17.3)	0.1 – 3.3°
				190 (7.48, 25.3)	3.5 – 6.8°
				320 (12.60, 42.7)	7.0 – 9.0°

STARTING SYSTEM

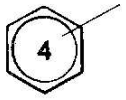
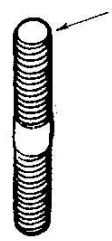
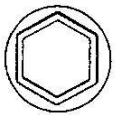
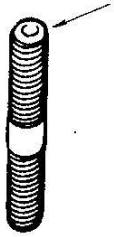
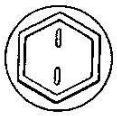
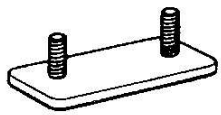
Starter	Rated voltage and output power		12V 0.8 kW	12V 1.0 kW
	No-load characterisic	Ampere	Less than 50A at 11 V	Less than 90A at 11.5 V
		rpm	More than 5,000 rpm	More than 3,000 rpm
	Brush Length	STD	16 mm 0.63 in.	13.5 mm 0.531 in.
		Limit	10 mm 0.39 in.	8.5 mm 0.335 in.
	Spring installed load		1.0 – 1.6 kg (2.2 – 3.5 lb, 9.8 – 16 N)	1.2 – 2.1 kg (2.6 – 4.6 lb, 12 – 21 N)
	Commutator			
	Outer diameter	STD	28 mm 1.10 in.	30 mm 1.18 in.
		Limit	27 mm 1.06 in.	29 mm 1.14 in.
	Undercut depth	STD	0.6 mm 0.024 in.	←
		Limit	0.2 mm 0.008 in.	←
	Circle runout	Limit	0.4 mm 0.016 in.	0.05 mm 0.0020 in.

CHARGING SYSTEM

Battery specific gravity	When fully charged at 20°C (68°F)		1.25 – 1.27
Alternator	Rated output		12V 40A, 12V 45A
	Rotor coil resistance		2.8 – 3.0 Ω
	Slip ring diameter	STD	14.4 mm 0.567 in.
		Limit	14.0 mm 0.551 in.
	Brush exposed length	STD	10.5 mm 0.413 in.
		Limit	4.5 mm 0.177 in.
Alternator regulator	Regulating voltage		13.5 – 15.1 V

STANDARD BOLT TORQUE SPECIFICATIONS

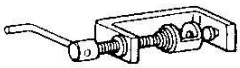
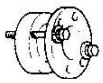
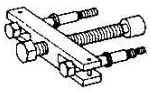
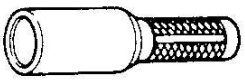
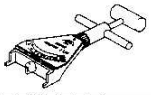
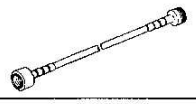
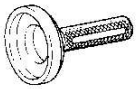
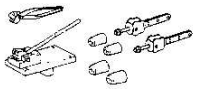
HOW TO DETERMINE BOLT STRENGTH

	Mark	Class		Mark	Class
Hexagon head bolt	 Bolt head No. 4– 5– 6– 7–	4T 5T 6T 7T	Stud bolt	 No mark	4T
	 No mark	4T			
Hexagon flange bolt w/washer hexagon bolt	 No mark	4T		 Grooved	6T
Hexagon head bolt	 Two protruding lines	5T			
Hexagon flange bolt w/washer hexagon bolt	 Two protruding lines	6T	Welded bolt		4T
Hexagon head bolt	 Three protruding lines	7T			

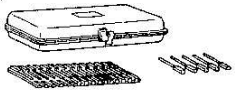
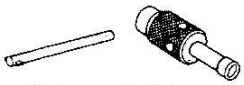
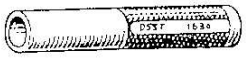
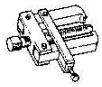
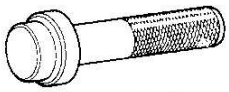
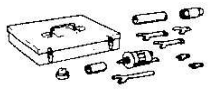
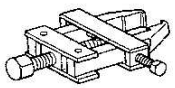
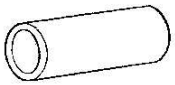
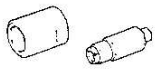
SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Torque specifications					
			Hexagon head bolt			Hexagon flange bolt		
			kg-cm	ft-lb	N·m	kg-cm	ft-lb	N·m
4T	6	1	55	48 in.-lb	5.4	60	52 in.-lb	5.9
	8	1.25	130	9	13	145	10	14
	10	1.25	260	19	25	290	21	28
	12	1.25	480	35	47	540	39	53
	14	1.5	760	55	75	850	61	83
	16	1.5	1,150	83	113		–	
5T	6	1	65	56 in.-lb	6.4		–	
	8	1.25	160	12	16		–	
	10	1.25	330	24	32		–	
	12	1.25	600	43	59		–	
	14	1.5	930	67	91		–	
	16	1.5	1,400	101	137		–	
6T	6	1	80	69 in.-lb	7.8	90	78 in.-lb	8.8
	8	1.25	195	14	19	215	16	21
	10	1.25	400	29	39	440	32	43
	12	1.25	730	53	72	810	59	79
	14	1.5		–		1,250	90	123
7T	6	1	110	8	11	120	9	12
	8	1.25	260	19	25	290	21	28
	10	1.25	530	38	52	590	43	58
	12	1.25	970	70	95	1,050	76	103
	14	1.5	1,500	108	147	1,700	123	167
	16	1.5	2,300	166	226		–	

SST (SPECIAL SERVICE TOOLS)

Illustration • Part No. • Part Name	EM	FU	CO	LU	IG	ST	CH
 09032-00100 (Oil Pan Seal Cutter)	●			●			
 09201-70010 (Valve Guide Bushing Remover & Replacer)	●						
 09202-70010 (Valve Spring Compressor)	●						
 09213-14010 (Crankshaft Pulley Holding Tool)	●						
 09213-31021 (Crankshaft Pulley Puller)	●						
 09214-60010 (Crankshaft Pulley & Gear Replacer)	●						
 09216-00020 (Belt Tension Gauge)	●						●
 09216-00030 (Belt Tension Cable)	●						●
 09221-25018 (Piston Pin Remover & Replacer)	●						
 09223-41020 (Crankshaft Rear Oil Seal Replacer)	●						
 09228-22020 (Oil Filter Wrench)				●			
 09230-00010 (Radiator Service Tool Set)			●				
 09236-00101 (Water Pump Overhaul Tool Set)			●				
 09240-00014 (Carburetor Adjusting Gauge Set)		●					

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Illustration • Part No. • Part Name (Section)	EM	FU	CO	LU	IG	ST	CH
 09240-00020 (Wire Gauge Set)		●					
 09243-00020 (Idle Adjusting Screw Wrench)	●	●					
 09285-76010 (Injection Camshaft Bearing Cone Replacer)						●	
 09286-46011 (Injection Pump Spline Shaft Puller)						●	●
 09330-00020 (Companion Flange Holding Tool)	●			●			
 09517-30010 (Rear Axle Shaft Oil Seal Replacer)				●			
 09612-24012 (Steering Gear Housing Overhaul Tool Set)	●						
 09820-00021 (Alternator Rear Bearing Puller)							●
 09820-00030 (Alternator Rear Bearing Replacer)							●
 09820-63010 (Alternator Pulley Set Nut Wrench Set)							●
 09860-11011 (Carburetor Drive Set)		●					

SSM (SPECIAL SERVICE MATERIALS)

Part Name	Part No.	Sec.	Use etc.
Seal packing or equivalent	08826-00080	EM	Cylinder head cover
			No. 1 camshaft bearing cap
			Rear oil seal retainer
		LU	Oil pump body
			Oil pan
		IG	IIA distributor housing
Anaerobic adhesive and sealant (THREE BOND 1324) or equivalent	08833-00070	EM	Flywheel or drive plate bolt
		IG	Pickup set screw
Seal packing No. 1282-B or equivalent	08826-00100	EM	Water outlet housing
		CO	Water pump