

## ENGINE TUNE-UP

### INSPECTION OF ENGINE COOLANT

(See steps 1 and 2 on page [CO-5](#))

### INSPECTION OF ENGINE OIL

(See steps 1 and 2 on page [LU-5](#))

### INSPECTION OF BATTERY

(See steps 1 and 2 on page [CH-2](#))

Standard specific gravity:

1.25 – 1.27 when fully charged at 20°C (68°F)

### INSPECTION OF AIR FILTER

(See step 3 on page [MA-5](#))

### INSPECTION OF HIGH-TENSION CORDS

(See page [IG-7](#), 11 or 16)

Maximum resistance: 25 kΩ per cord

### INSPECTION OF SPARK PLUGS (Conventional Type only (4A-FE))

(See page [IG-7](#))

Correct electrode gap: 0.8 mm (0.031 in.)

Recommended spark plugs: ND Q16R-U

NGK BCPRSEY

### INSPECTION OF ALTERNATOR DRIVE BELT

(See step 3 on page [CH-3](#))

Drive belt tension:

4A-FE		New belt 160 ±20 lbf
		Used belt 130 t 20 lbf
3S-GTE	w/ A/C	New belt 165 ±10 lbf
		Used belt 84 ±15 lbf
	w/o	A/C New belt 150 ±25 lbf
		Used belt 130 ±25 lbf
5S-FE	w/ A/C	New belt 165 ±10 lbf
		Used belt 110 ±10 lbf
	w/o A/C	New belt 125 + 25 lbf
		Used belt 95 ±20 lbf

## INSPECTION AND ADJUSTMENT OF VALVE CLEARANCE (4A-FE)

HINT: Inspect and adjust the valve clearance when the engine is cold.

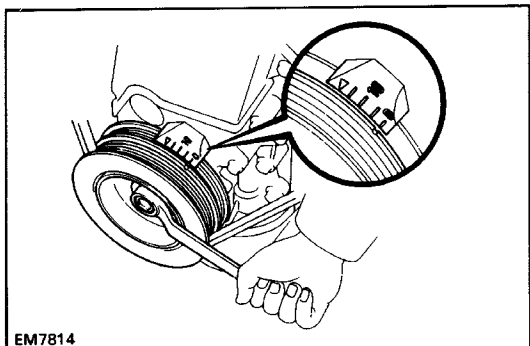
### 1. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

### 2. REMOVE CYLINDER HEAD COVER

(See steps 18 and 24 on pages EM-85 and 87)

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

- Turn the crankshaft pulley and align its groove with timing mark "0" of the No.1 timing belt cover.
  - Check that the valve lifters on the No.1 cylinder are loose and valve lifters on the No.4 are tight.
- If not, turn the crankshaft one revolution (360°) and align the mark as above.



EM7814

### 4. INSPECT VALVE CLEARANCE

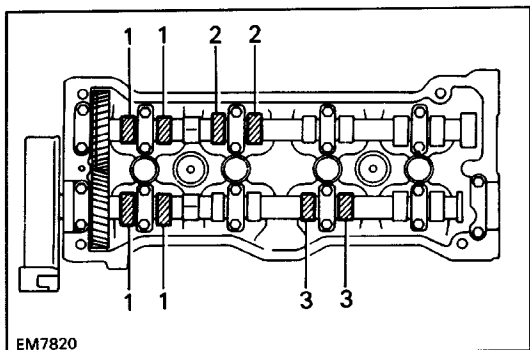
- Check only the valves indicated.
  - Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
  - Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

#### Valve clearance (Cold):

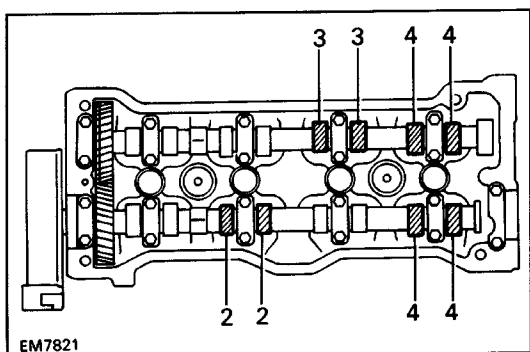
Intake 0.15 – 0.25 mm (0.006 – 0.010 in.)

Exhaust 0.20 – 0.30 mm (0.008 – 0.012 in.)

- Turn the crankshaft one revolution (360°) and align the mark as above. (See procedure in step 3)
- Check only the valves indicated as shown. Measure the valve clearance. (See procedure in step (a))



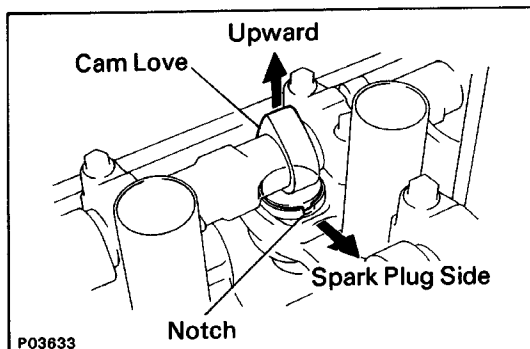
EM7820



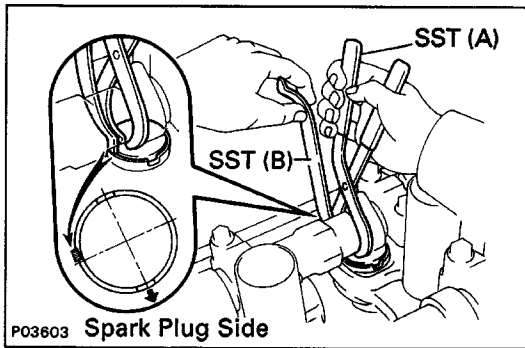
EM7821

### 5. ADJUST VALVE CLEARANCE

- Remove the adjusting shim.
  - Turn the crankshaft to position the cam lobe of the camshaft on the adjusting valve upward.
  - Position the notch of the valve lifter facing the spark plug side.



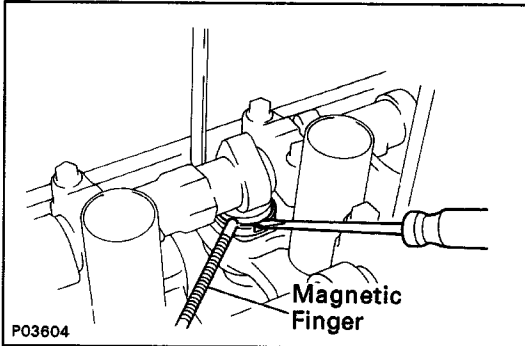
P03633



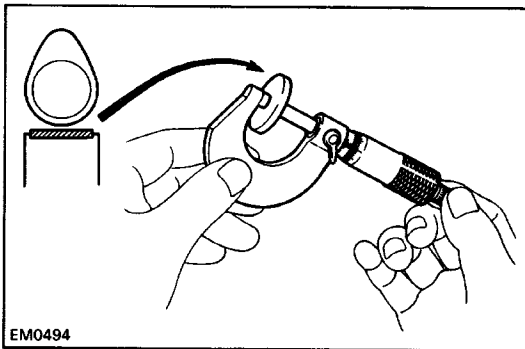
- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

SST 09248-55020 (09248-05011 (A), 09248-05021 (B))

HINT: Apply SST (B) on the side marked with "7", at the position shown in the illustration.



- Remove the adjusting shim with small screwdriver and magnetic finger.



(b) Determine the replacement adjusting shim size by following the Formula or Charts:

- Using a micrometer, measure the thickness of the removed shim.
  - Calculate the thickness of a new shim so that the valve clearance comes within specified value.
- T ..... Thickness of used shim  
 A ..... Measured valve clearance  
 N ..... Thickness of new shim

**Intake  $N = T + (A - 0.20 \text{ mm (0.008 in.)})$**

**Exhaust  $N = T + (A - 0.25 \text{ mm (0.010 in.)})$**

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

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

(c) Install a new adjusting shim.

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

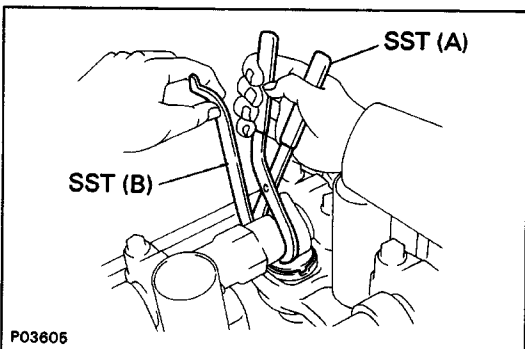
SST 09248-55020 (09248-05011 (A), 09248-05021 (B))

(d) Recheck the valve clearance.

## 6. REINSTALL CYLINDER HEAD COVER

(See steps 11 and 17 on pages [EM-109](#) and 111)

## 7. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS







## INSPECTION AND ADJUSTMENT OF VALVE CLEARANCE (3S-GTE)

HINT: Inspect and adjust the valve clearance when the engine is cold.

### 1. REMOVE INTERCOOLER

(See steps 13 to 15 on pages TC-9 and 10)

### 2. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

### 3. REMOVE EGR VACUUM MODULATOR AND VSV

(See step 20 on page EM-121)

### 4. REMOVE EGR VALVE AND PIPE

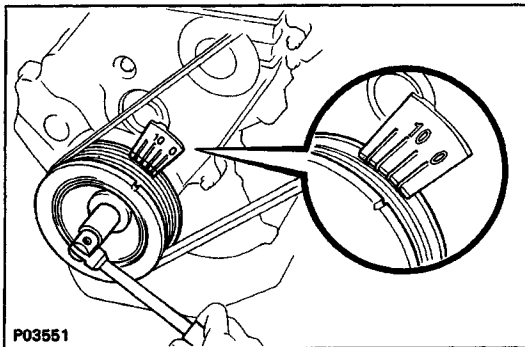
(See step 21 on page EM-121)

### 5. REMOVE THROTTLE BODY

(See steps 2, 3, 5 to 8, 10 and 11 on pages FI-194 and 195)

### 6. REMOVE CYLINDER HEAD COVER

(See step 33 on page EM-124)

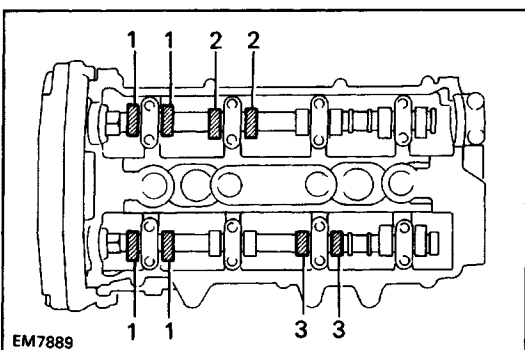


### 7. SET NO.1 CYLINDER TO TDC/COMPRESSION

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

(b) Check that the valve lifters on the No.1 cylinder are loose and valve lifters on No.4 are tight.

If not, turn the crankshaft one revolution (360°) and align the mark as above.



### 8. INSPECT VALVE CLEARANCE

(a) Check only the valves indicated.

- Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
- Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

#### Valve clearance (Cold):

Intake 0.15 – 0.25 mm (0.006 – 0.010 in.)

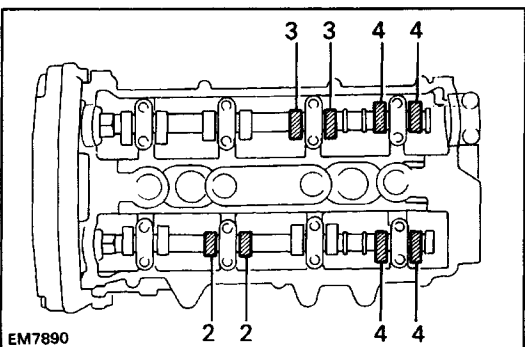
Exhaust 0.28 – 0.38 mm (0.071 – 0.015 in.)

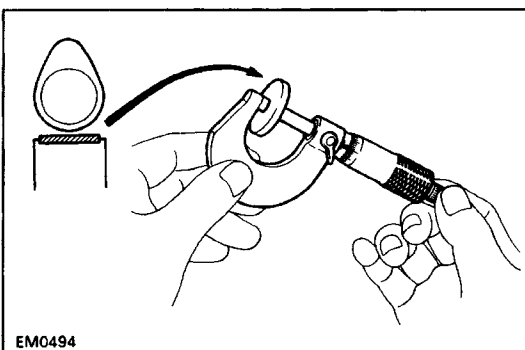
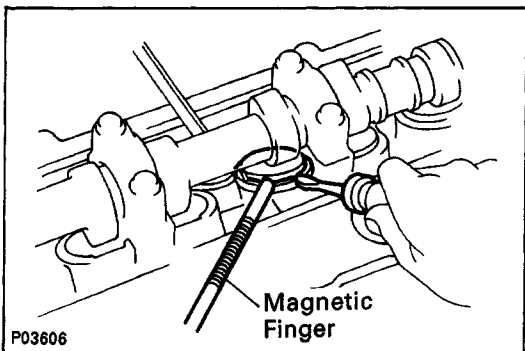
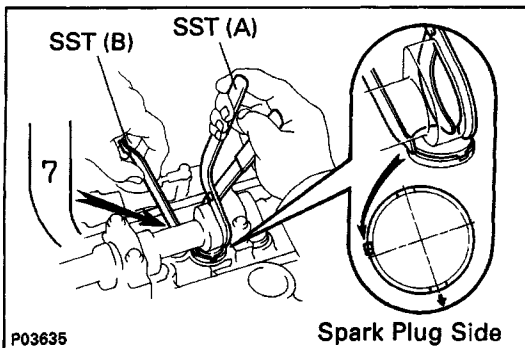
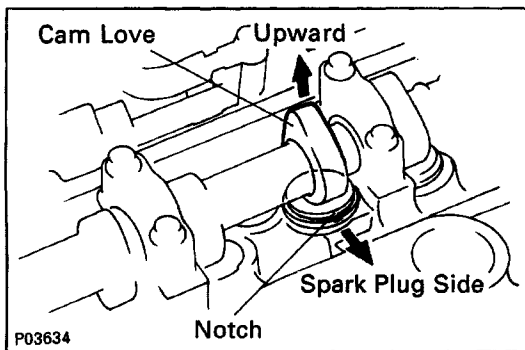
(b) Turn the crankshaft one revolution (360°) and align the mark as above. (See procedure in step 7)

(c) Check only the valves indicated as shown.

Measure the valve clearance.

(See procedure in step (a))





## 9. ADJUST VALVE CLEARANCE

(a) Remove the adjusting shim.

- Turn the crankshaft to position the cam lobe of the camshaft on the adjusting valve upward.
- Position the notch of the valve lifter facing the spark plug side.

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

SST 09248-55020 (09248-05011 (A), 09248-05021 (B))

HINT: Apply SST (B) at a slight angle on the side marked with "7", at the position shown in the illustration.

- Remove the adjusting shim with small screwdriver and magnetic finger.

(b) Determine the replacement adjusting shim size by following the Formula or Charts:

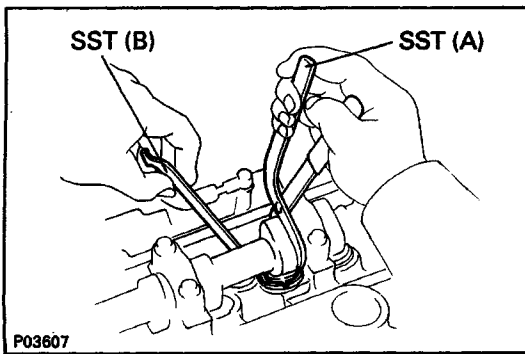
- Using a micrometer, measure the thickness of the removed shim.
  - Calculate the thickness of a new shim so that the valve clearance comes within the specified value.
- T ..... Thickness of used shim  
A ..... Measured valve clearance  
N ..... Thickness of new shim

**Intake  $N = T + (A - 0.20 \text{ mm (0.008 in.)})$**

**Exhaust  $N = T + (A - 0.33 \text{ mm (0.013 in.)})$**

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

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



- (c) Install a new adjusting shim.
- Place a new adjusting shim on the valve lifter.
  - Using SST (A), press down the valve lifter and remove SST (B).  
SST 09248-55020 (09248-05011 (A), 09248-05021 (B))
- (d) Recheck the valve clearance.

#### 10. REINSTALL CYLINDER HEAD COVER

(See step 7 on pages [EM-143](#) and 144)

#### 11. REINSTALL THROTTLE BODY

(See steps 2, 3, 5 to 8, 10 and 11 on pages [FI-197](#) and 198)

#### 12. REINSTALL EGR VALVE AND PIPE

(See step 19 on page [EM-145](#))

#### 13. REINSTALL EGR VACUUM MODULATOR AND VSV

(See step 20 on page [EM-146](#))

#### 14. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

#### 15. REINSTALL INTERCOOLER

(See steps 11 to 13 on page [TC-17](#))



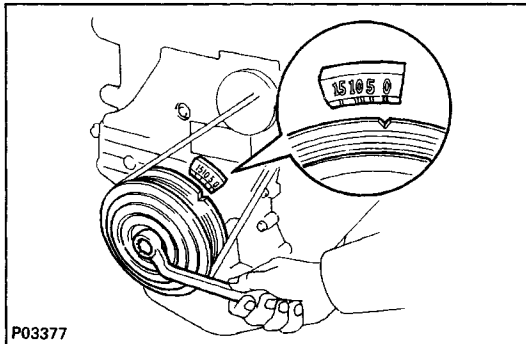




## INSPECTION AND ADJUSTMENT OF VALVE CLEARANCE (5S-FE)

HINT: Inspect and adjust the valve clearance when the engine is cold.

1. REMOVE ACCELERATOR BRACKET
2. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS
3. DISCONNECT ENGINE WIRE PROTECTOR BETWEEN CYLINDER HEAD COVER AND NO.3 TIMING BELT COVER
4. REMOVE CYLINDER HEAD COVER  
(See step 33 on page EM-156)
5. SET NO.1 CYLINDER TO TDC/COMPRESSION



P03377

- (a) Turn the crankshaft pulley and align its groove with timing mark "0" of the No.1 timing belt cover.
  - (b) Check that the valve lifters on the No.1 cylinder are loose and valve lifters on the No.4 are tight.
- If not, turn the crankshaft one revolution (360°) and align the mark as above.

### 6. INSPECT VALVE CLEARANCE

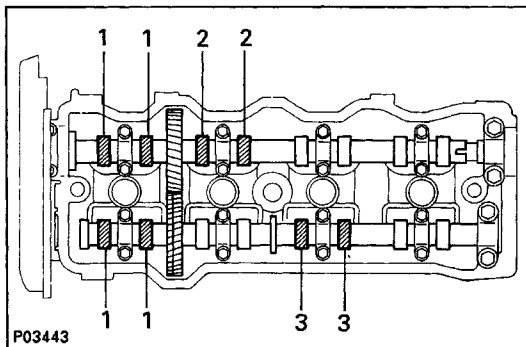
- (a) Check only the valves indicated.
  - Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
  - Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

#### Valve clearance (Cold):

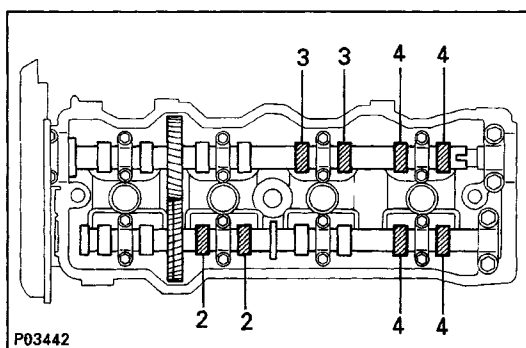
Intake 0.19 – 0.29 mm (0.007 – 0.011 in.)

Exhaust 0.28 – 0.38 mm (0.011 – 0.015 in.)

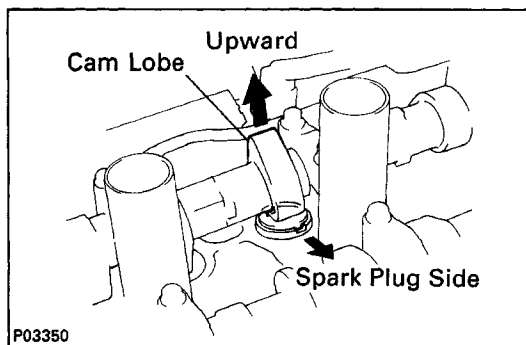
- (b) Turn the crankshaft one revolution (360°) and align the mark as above. (See procedure in step 3)
- (c) Check only the valves indicated as shown. Measure the valve clearance. (See procedure in step (a))



P03443



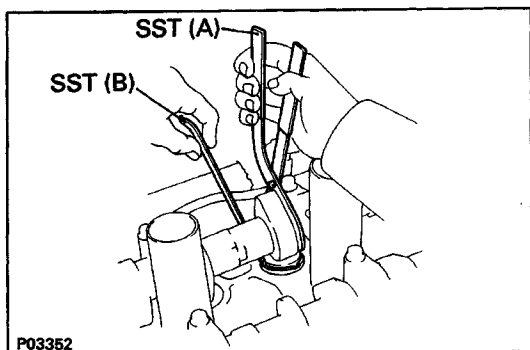
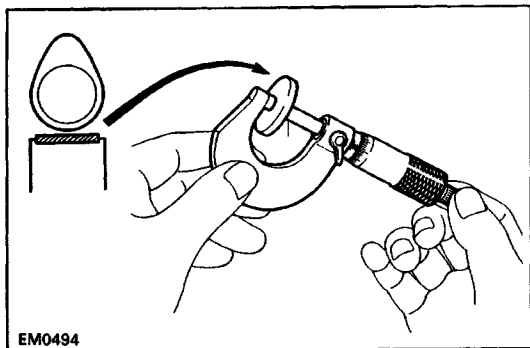
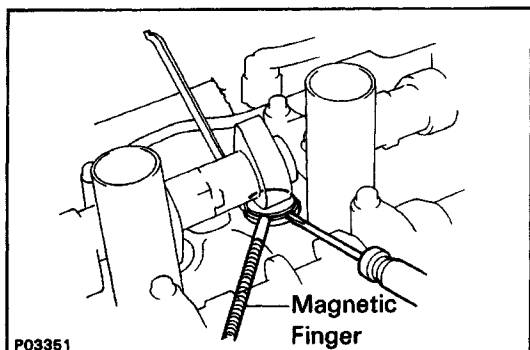
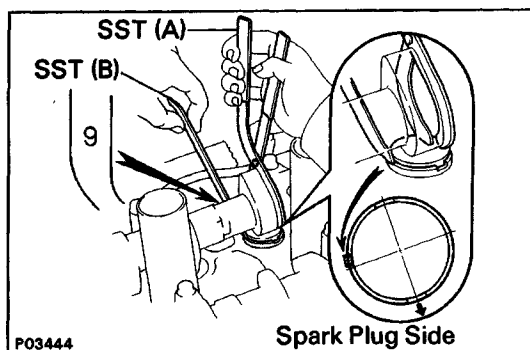
P03442



P03350

### 7. ADJUST VALVE CLEARANCE

- (a) Remove the adjusting shim.
  - Turn the crankshaft to position the cam lobe of the camshaft on the adjusting valve upward. Position the notch of the valve lifter facing the spark plug side.



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

SST 09248-55020 (09248-05011 (A), 09248-05021 (B))

HINT: Apply SST (B) at a slight angle on the side marked with "9", at the position shown in the illustration.

- Remove the adjusting shim with small screwdriver and magnetic finger.

(b) Determine the replacement adjusting shim size by following the Formula or Charts:

- Using a micrometer, measure the thickness of the removed shim.
  - Calculate the thickness of a new shim so that the valve clearance comes within specified value.
- T ..... Thickness of used shim  
 A ..... Measured valve clearance  
 N ..... Thickness of new shim

**Intake N = T + (A - 0.24 mm (0.009 in.))**

**Exhaust N = T + (A - 0.33 mm (0.013 in.))**

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

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

(c) Install a new adjusting shim.

- Place a new adjusting shim on the valve lifter.
- Using SST (A), press down the valve lifter and remove SST (13).

SST 09248-55020 (09248-05011 (A), 09248-05021 (B))

(d) Recheck the valve clearance.

## 8. REINSTALL CYLINDER HEAD COVER

(See step 8 on page EM-178)

## 9. INSTALL ENGINE WIRE PROTECTOR BETWEEN CYLINDER HEAD COVER AND NO.3 TIMING BELT COVER

## 10. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

## 11. INSTALL ACCELERATOR BRACKET







## INSPECTION AND ADJUSTMENT OF IGNITION TIMING

4A-FE (See page [IG-25](#))

3S-GTE (See page [IG-29](#))

5S-FE (See page [IG-37](#))

Ignition timing:

10° BTDC @ idle

(w/ Terminals TE1 and E1 connected)

## INSPECTION AND ADJUSTMENT OF IDLE SPEED (4A-FE)

(See page [MA-8](#))

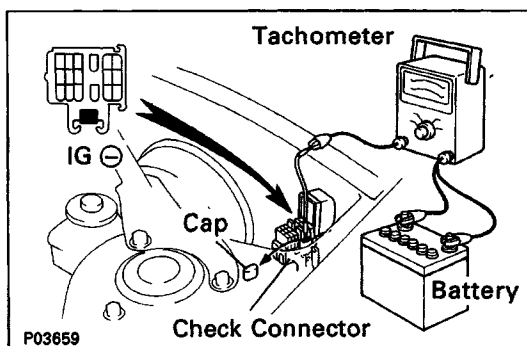
Idle speed: 800 rpm

## INSPECTION OF IDLE SPEED (5S-FE and 3S-GTE)

**HINT (5S-FE):** Disconnecting the battery will cause the idling speed data in the ISC to be returned to the initial idling speed, causing the idling speed to rise above 750 rpm. Should this happen, either carry out a driving test, including stop-go several times at a speed above 10 km/h (6 mph), or start the engine, idle for 30 seconds and then turn the engine off repeatedly. By doing this, idle data will be stored in the ISC and the idle rpm will be at specified value.

### 1. INITIAL CONDITIONS

- (a) Engine at normal operating temperature
  - (b) Air cleaner installed
  - (c) All pipes and hoses of air induction system connected
  - (d) All vacuum lines connected
- HINT:** All vacuum hoses for EGR systems, etc. should be properly connected.
- (e) EFI system wiring connectors fully plugged
  - (f) All operating accessories switched OFF
  - (g) Transmission in neutral position

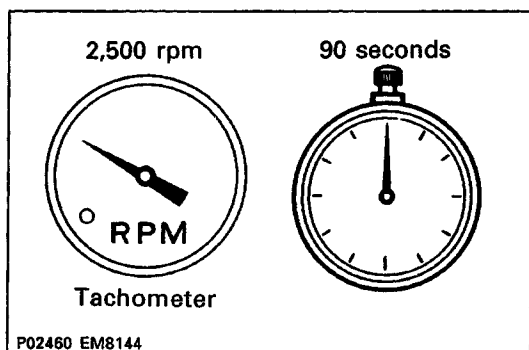


### 2. CONNECT TACHOMETER

Connect the test probe of a tachometer to terminal IG (-) of the check connector.

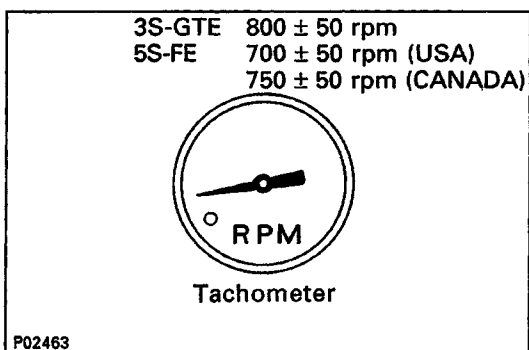
#### NOTICE:

- Never allow the tachometer terminal 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, we recommend that you confirm the compatibility of your unit before use.



### 3. INSPECT IDLE SPEED

(a) Race the engine at 2,500 rpm for approx. 90 seconds.



(b) Check the idle speed.

#### Idle speed:

3S-GTE	800 ± 50 rpm
5S-FE	700 ± 50 rpm USA
	750 ± 50 rpm CANADA

If the idle speed is not as specified, check the ISC system.

### 4. DISCONNECT TACHOMETER