ENGINE TUNE-UP (1RZ AND 2RZ)

INSPECTION OF ENGINE COOLANT

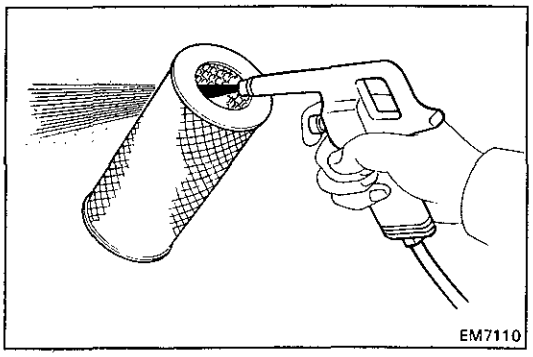
(See steps 1, 2 on page CO-5)

INSPECTION OF ENGINE OIL

(See steps 1, 2 on page LU-5)

INSPECTION OF BATTERY

(See steps 1, 2 on page CH-4)



CLEANING OF AIR FILTER

(Paper Filter Type)

1. **INSPECT OF AIR FILTER**

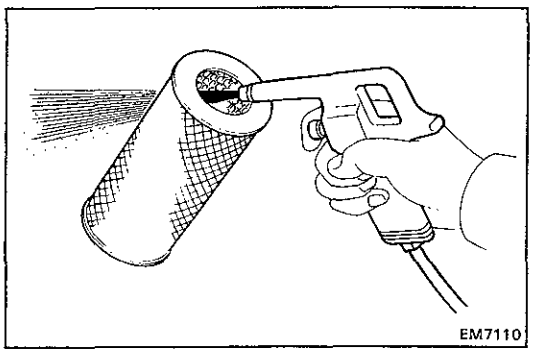
   Visually check that the air filter element is not excessively dirty, damaged or oily.

   If necessary, replace the air filter element.

2. **CLEAN AIR FILTER**

   Clean the element with compressed air.

   First blow from the inside thoroughly. Then blow off the outside of the element.

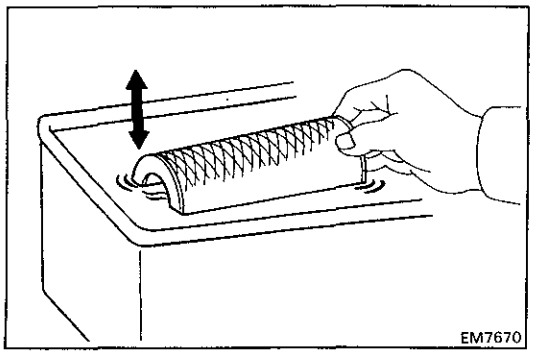


(Fabric Type)

1. **INSPECT OF AIR FILTER**

   Visually check that the air filter element is not excessively dirty, damaged or oily.

   If necessary, replace the air filter element.

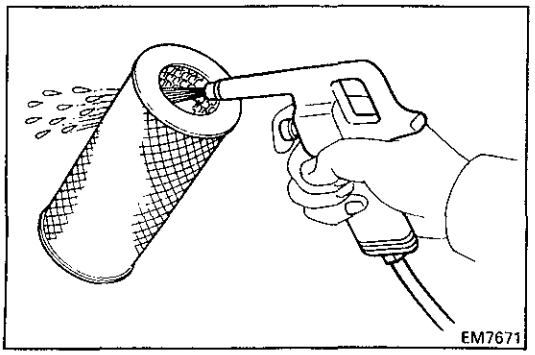


2. **CLEAN AIR FILTER**

   (a) Blow dirt off in the element with compressed air from the inside.

   (b) Submerge the element in the water and agitate it up and down ten or more times.

   (c) Repeat rinsing in clean water until rinse water is clear.



   (d) Remove excess water by shaking the element or blowing with compressed air.

   NOTICE: Do not beat or drop filter element.

   (e) Wipe off dust on the air cleaner case interior.

INSPECTION OF HIGH-TENSION CORDS

(See page IG-8)

INSPECTION OF SPARK PLUGS

(See page IG-9)

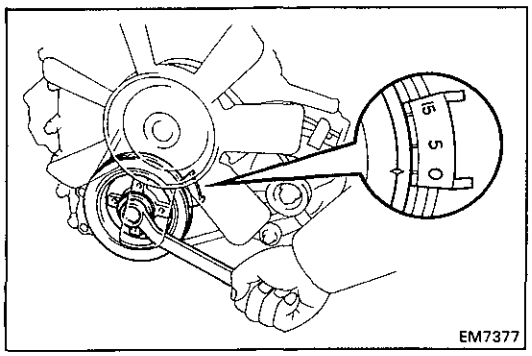
INSPECTION OF ALTERNATOR DRIVE BELT

(See step 3 on pages CH-4, 5)

INSPECTION AND ADJUSTMENT OF VALVE CLEARANCE

HINT: Check and adjust the valve clearance while the engine is cold.

1. **REMOVE CYLINDER HEAD COVER**
   (See step 3 on page EM-39)

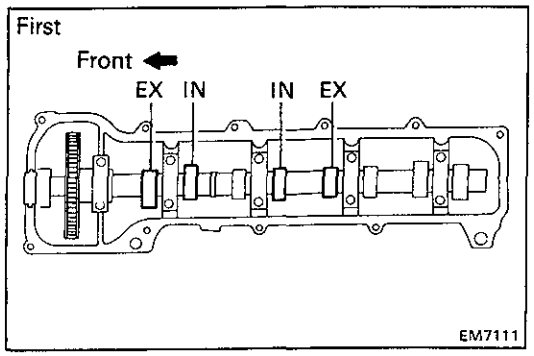


2. **INSPECT VALVE CLEARANCE**

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

   - Turn the crankshaft with a wrench to align the timing marks at TDC. Set the groove on the pulley to the "O" position.
   - Check that the valve lifters on the No.1 cylinder are loose and valve lifters on the No.4 are tight.

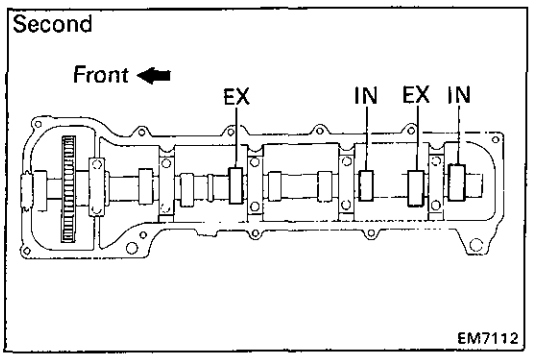
   If not, turn the crankshaft one complete revolution and align marks as above.



   (b) Measure the clearance of half of the valves.

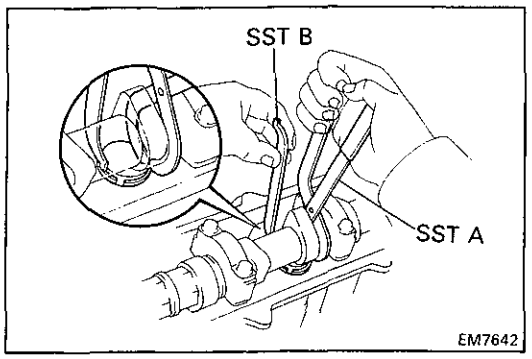
   - Measure only those valves indicated in the figure.
   - Record the measurements which are out of specification. They will be used later to determine the required replacement shims.

   Valve clearance (Cold):
   Intake 0.20 – 0.30 mm (0.008 – 0.012 in.)
   Exhaust 0.25 – 0.35 mm (0.010 – 0.014 in.)



   (c) Turn the crankshaft pulley one revolution and measure the other valves.

   - Turn the crankshaft pulley one revolution and align the timing marks as stated in (a) above.
   - Measure only the valves indicated as shown.

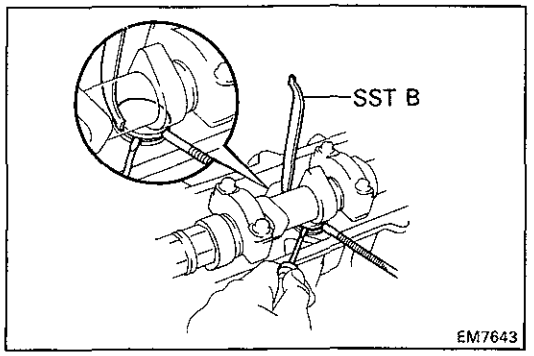


3. **ADJUST VALVE CLEARANCE**

(a) Using SSTs, press down the valve lifter with SST A and hold the valve lifter down with SST B.

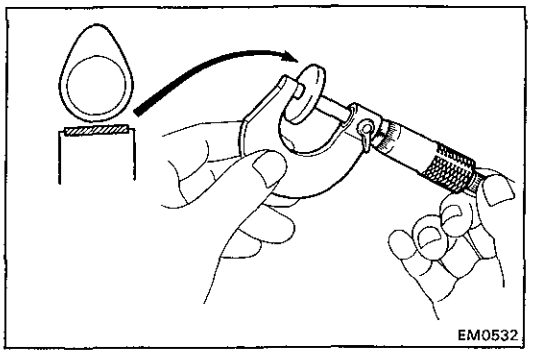
SST 09248-55010

HINT: Before pressing down the valve lifter, position the notch as shown in the illustration.



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

HINT: For easy removal of the shim, when setting SST B, set it on the lifter so there is a wide space in the removal direction



(c) Determine the replacement shim size by using the following Formula or Charts.

- Using a micrometer, measure the thickness of the shim which was removed.
- Calculate the thickness of the new shim so the valve clearance comes within specified value.

T ..... Thickness of shim used
A ..... Valve clearance measured
N ..... Thickness of shim new

Intake side: N = T + (A – 0.25 mm (0.010 in.))
Exhaust side: N = T + (A – 0.30 mm (0.012 in.))

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

HINT: Shims are available in 25 sizes, in increments of 0.050 mm (0.0020 in.), from 2.200 mm (0.0866 in.) to 3.400 mm (0.1339 in.). Thickness is stamped on the new shims.

(d) Install a new adjusting shim.

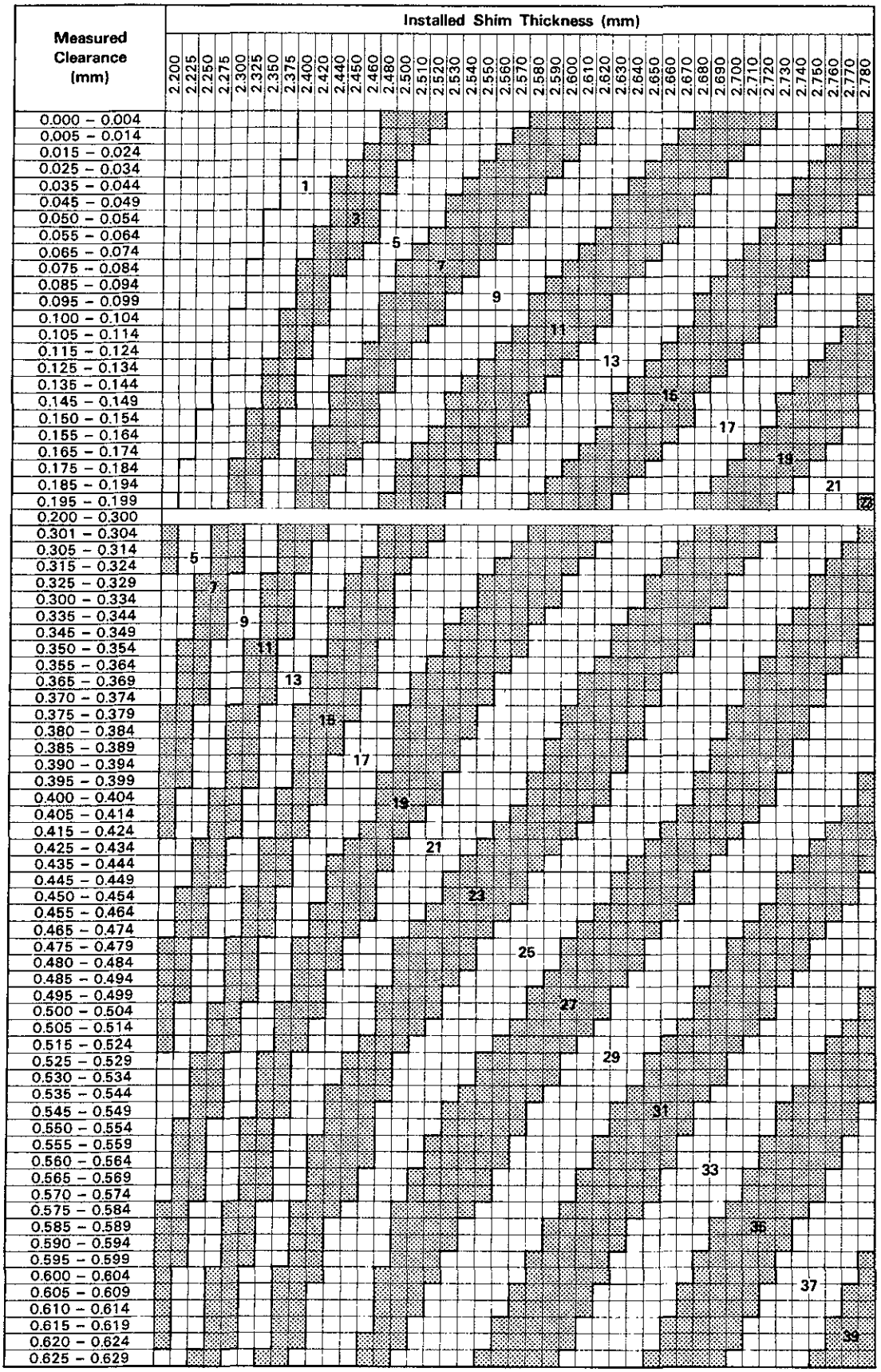
- Place a new adjusting shim on the valve lifter.
- Using SST A, press down the valve lifter and remove SST B.

4. **RECHECK VALVE CLEARANCE**

5. **INSTALL CYLINDER HEAD COVER**
(See step 10 on page EM-63)

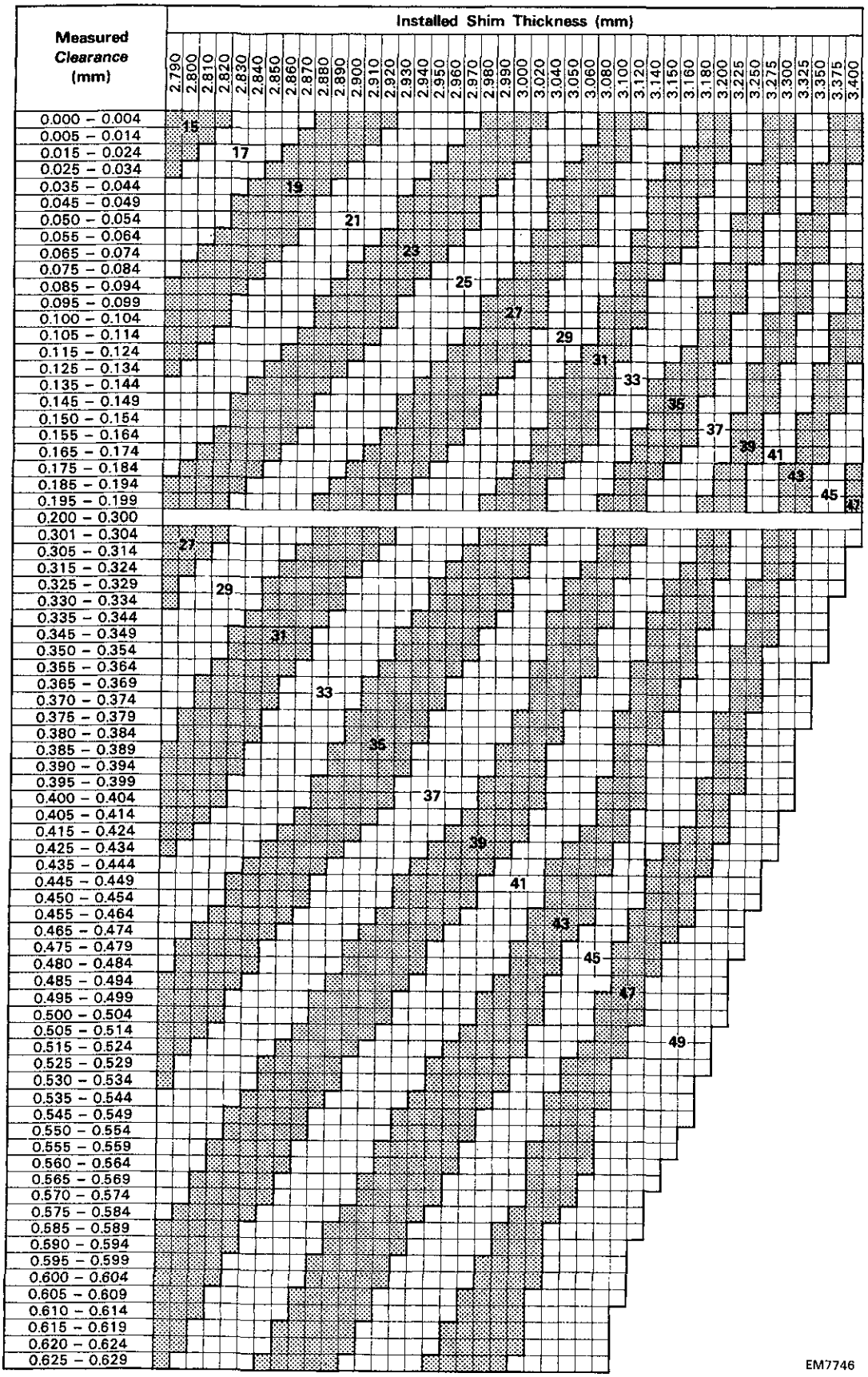
Adjusting Shim Selection Using Chart

Intake

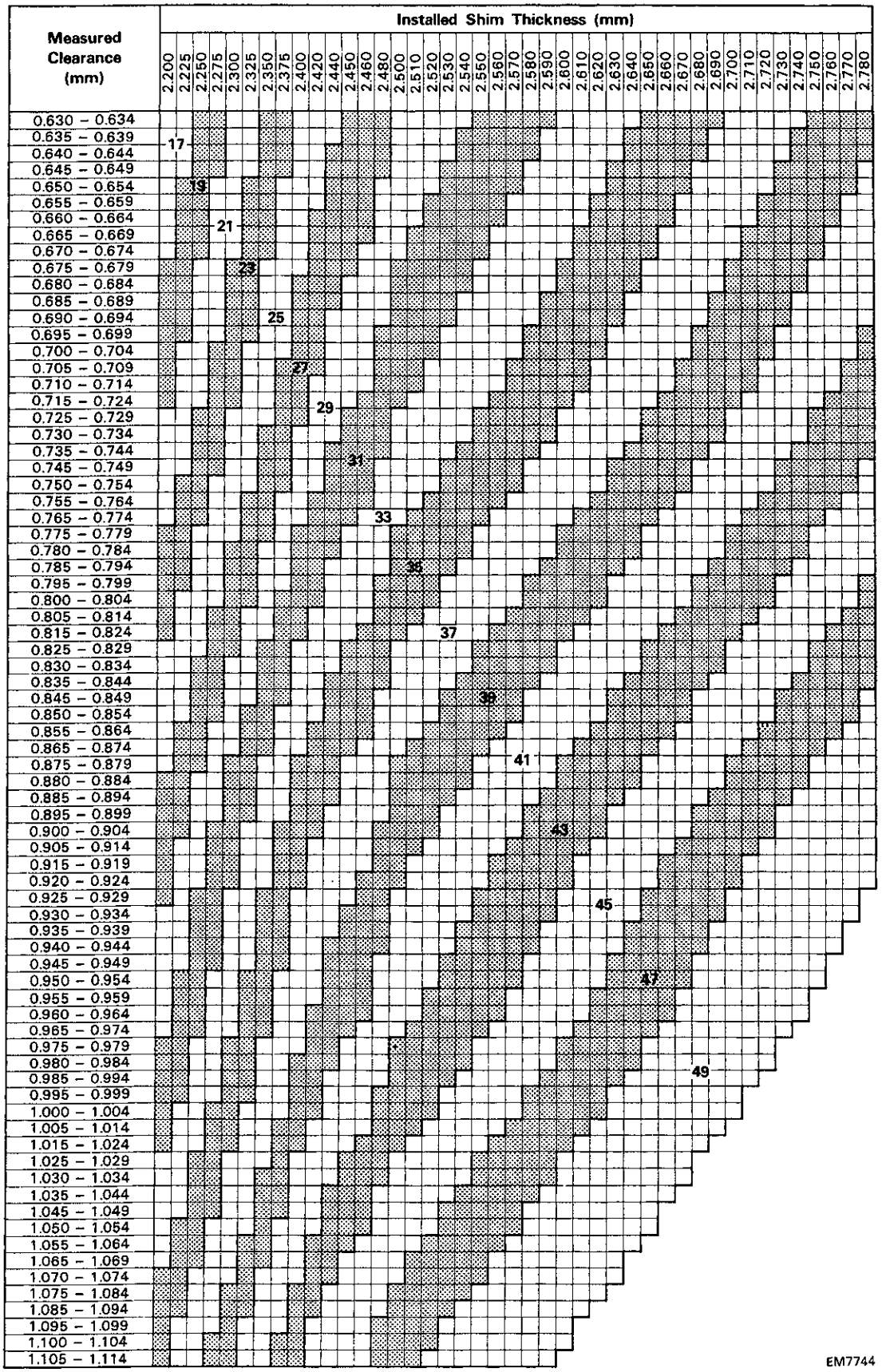


EM7743

Intake (Cont'd)



Intake (Cont'd)



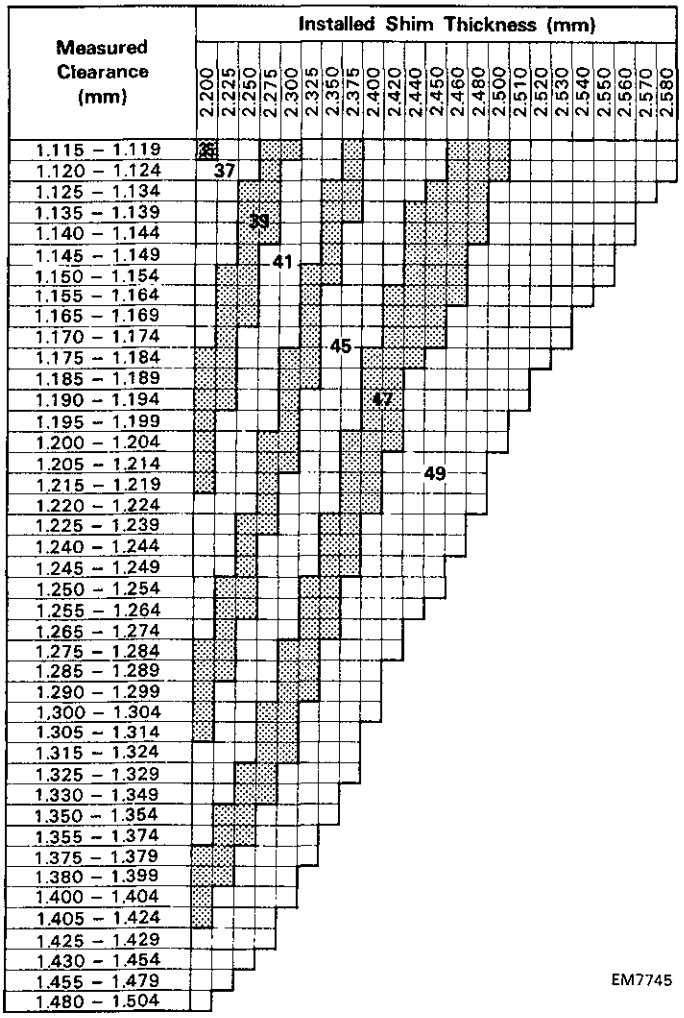
EM7744

Intake (Cont'd)

Measured Clearance (mm)	Installed Shim Thickness (mm)																								
	2.790	2.800	2.810	2.820	2.830	2.840	2.850	2.860	2.870	2.880	2.890	2.900	2.910	2.920	2.930	2.940	2.950	2.960	2.970	2.980	2.990	3.000	3.020	3.040	3.050	3.060
0.630 – 0.634	39																									
0.635 – 0.639																										
0.640 – 0.644			41																							
0.645 – 0.649																										
0.650 – 0.654																										
0.655 – 0.659																										
0.660 – 0.664						43																				
0.665 – 0.669																										
0.670 – 0.674																										
0.675 – 0.679																										
0.680 – 0.684									45																	
0.685 – 0.689																										
0.690 – 0.694																										
0.695 – 0.699																										
0.700 – 0.704											47															
0.705 – 0.709																										
0.710 – 0.714																										
0.715 – 0.724																										
0.725 – 0.729																										
0.730 – 0.734															49											
0.735 – 0.744																										
0.745 – 0.749																										
0.750 – 0.754																										
0.755 – 0.764																										
0.765 – 0.774																										
0.775 – 0.779																										
0.780 – 0.784																										
0.785 – 0.794																										
0.795 – 0.799																										
0.800 – 0.804																										
0.805 – 0.814																										
0.815 – 0.824																										
0.825 – 0.829																										
0.830 – 0.834																										
0.835 – 0.844																										
0.845 – 0.849																										
0.850 – 0.854																										
0.855 – 0.864																										
0.865 – 0.874																										
0.875 – 0.879																										
0.880 – 0.884																										
0.885 – 0.894																										
0.895 – 0.899																										
0.900 – 0.904																										

EM7747

Intake (Cont'd)



EM7745

Shim Thickness

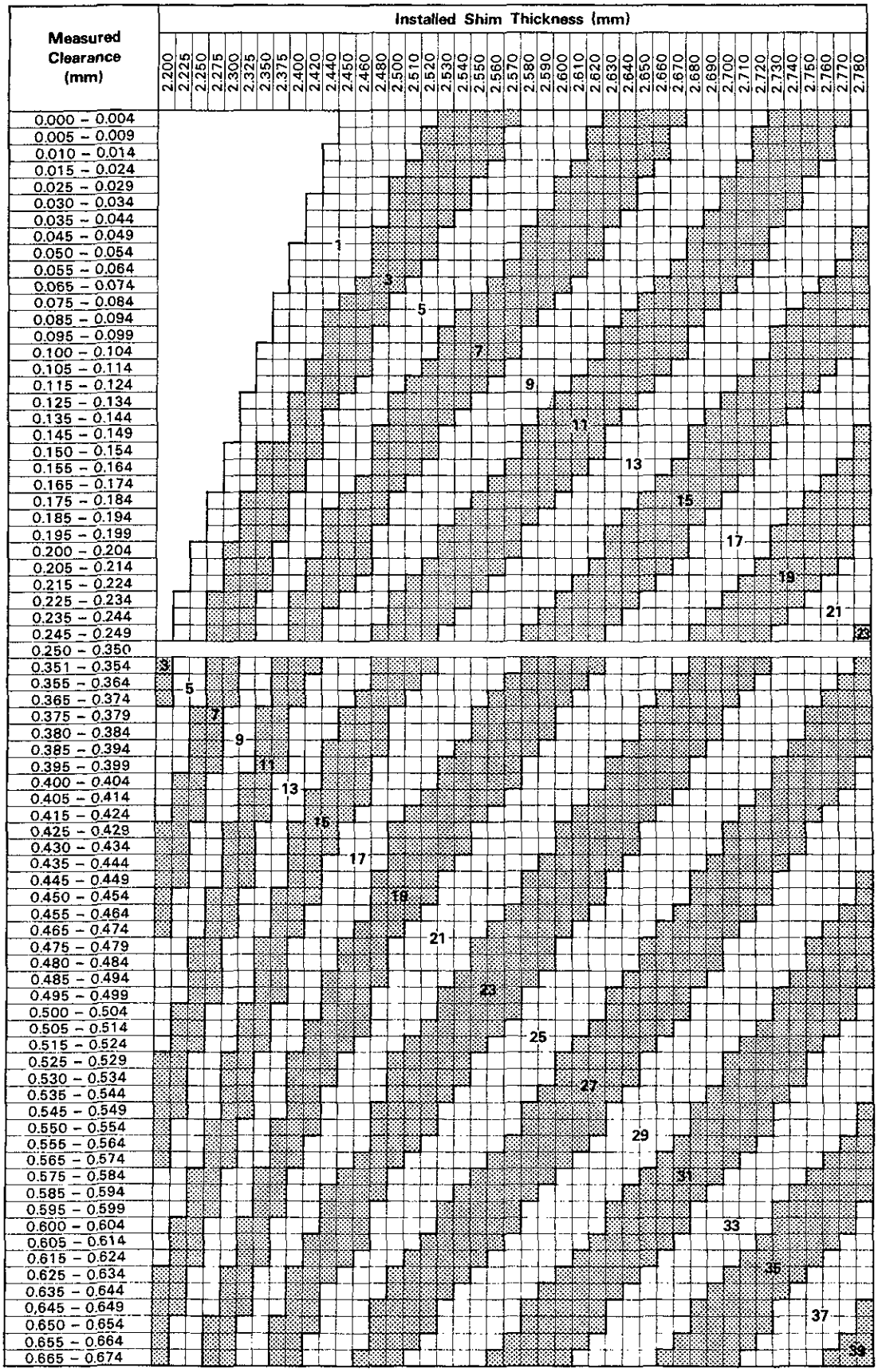
Shim No.	Thickness mm (in.)	Shim No.	Thickness mm (in.)
01	2.20 (0.0866)	27	2.85 (0.1122)
03	2.25 (0.0886)	29	2.90 (0.1142)
05	2.30 (0.0906)	31	2.95 (0.1161)
07	2.35 (0.0925)	33	3.00 (0.1181)
09	2.40 (0.0945)	35	3.05 (0.1201)
11	2.45 (0.0965)	37	3.10 (0.1220)
13	2.50 (0.0984)	39	3.15 (0.1240)
15	2.55 (0.1004)	41	3.20 (0.1260)
17	2.60 (0.1024)	43	3.25 (0.1280)
19	2.65 (0.1043)	45	3.30 (0.1299)
21	2.70 (0.1063)	47	3.35 (0.1319)
23	2.75 (0.1083)	49	3.40 (0.1339)
25	2.80 (0.1102)		

Intake valve clearance (Cold):
0.20 – 0.30 mm (0.008 – 0.012 in.)

Example: 2.400 mm (0.0945 in.) shim installed
Measured clearance is 1.140 mm (0.0449 in.)
Replace 3.30 mm (0.1299 in.) shim with shim No. 45

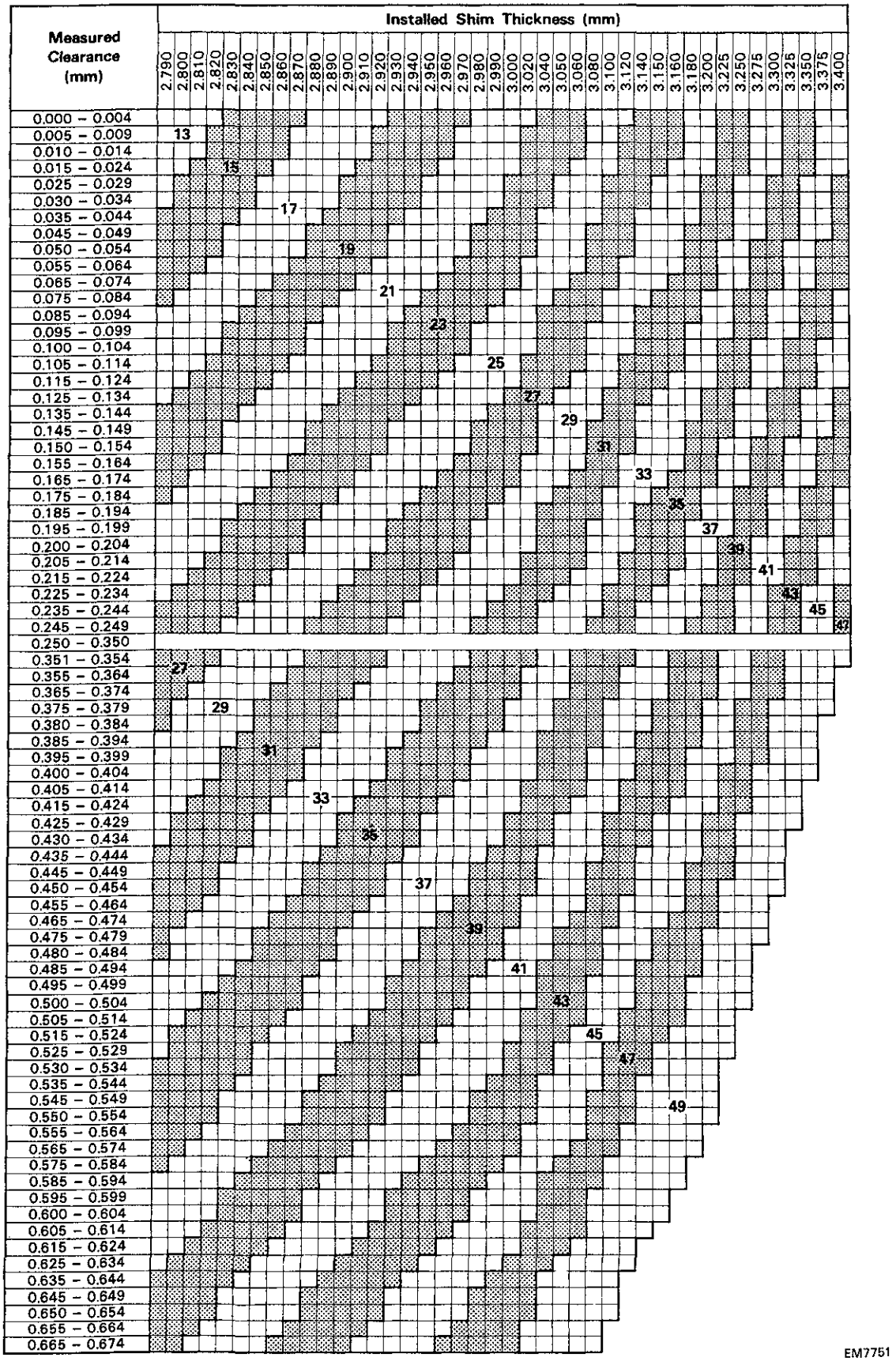
Adjusting Shim Selection Using Chart

Exhaust



EM7748

Exhaust (Cont'd)



EM7751

Exhaust (Cont'd)

| Measured Clearance (mm) | Installed Shim Thickness (mm) | | |

Exhaust (Cont'd)

Measured Clearance (mm)	Installed Shim Thickness (mm)																									
	2.790	2.800	2.810	2.820	2.830	2.840	2.850	2.860	2.870	2.880	2.890	2.900	2.910	2.920	2.930	2.940	2.950	2.960	2.970	2.980	2.990	3.000	3.020	3.040	3.050	3.060
0.575 – 0.684	39																									
0.685 – 0.694																										
0.695 – 0.699		41																								
0.700 – 0.704																										
0.705 – 0.714																										
0.715 – 0.724				43																						
0.725 – 0.734																										
0.735 – 0.744																										
0.745 – 0.749								45																		
0.750 – 0.754																										
0.755 – 0.764																										
0.765 – 0.774									47																	
0.775 – 0.784																										
0.785 – 0.794																										
0.795 – 0.799																										
0.800 – 0.804													49													
0.805 – 0.814																										
0.815 – 0.824																										
0.825 – 0.834																										
0.835 – 0.844																										
0.845 – 0.849																										
0.850 – 0.854																										
0.855 – 0.864																										
0.865 – 0.874																										
0.875 – 0.884																										
0.885 – 0.894																										
0.895 – 0.899																										
0.900 – 0.904																										
0.905 – 0.914																										
0.915 – 0.924																										
0.925 – 0.934																										
0.935 – 0.944																										
0.945 – 0.949																										
0.950 – 0.954																										
0.955 – 0.964																										

EM7752

Exhaust (Cont'd)

Measured Clearance (mm)	Installed Shim Thickness (mm)									
	2.200	2.225	2.250	2.275	2.300	2.325	2.350	2.375	2.400	2.420
1.315 – 1.324	41									
1.325 – 1.334		43								
1.335 – 1.349										
1.350 – 1.354			45							
1.355 – 1.374				47						
1.375 – 1.379										
1.380 – 1.399										
1.400 – 1.404					49					
1.405 – 1.424										
1.425 – 1.429										
1.430 – 1.449										
1.450 – 1.454										
1.455 – 1.474										
1.475 – 1.479										
1.480 – 1.504										
1.505 – 1.529										
1.530 – 1.549										

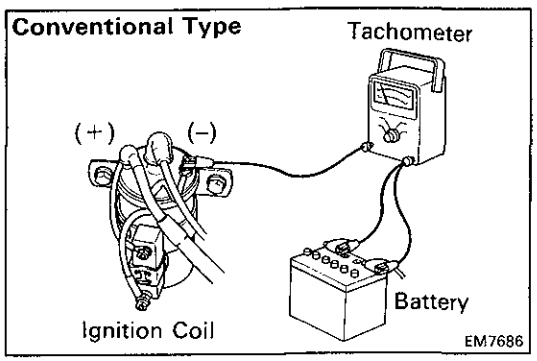
EM7750

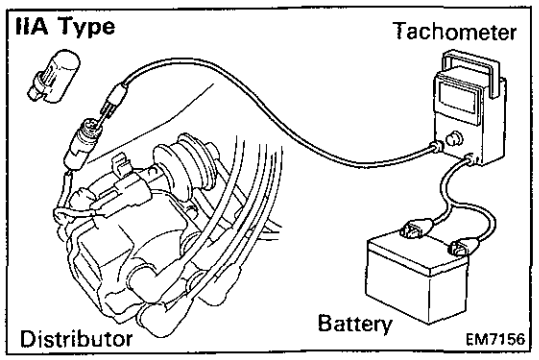
Shim Thickness

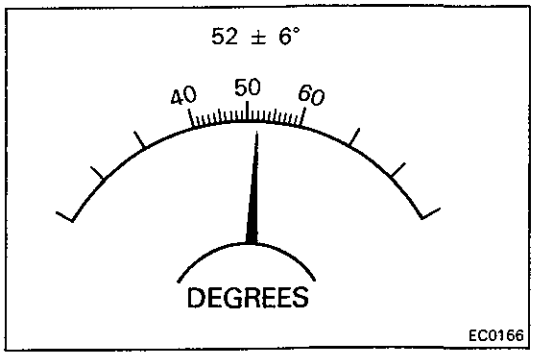
Shim No.	Thickness mm (in.)	Shim No.	Thickness mm (in.)
01	2.20 (0.0866)	27	2.85 (0.1122)
03	2.25 (0.0886)	29	2.90 (0.1142)
05	2.30 (0.0906)	31	2.95 (0.1161)
07	2.35 (0.0925)	33	3.00 (0.1181)
09	2.40 (0.0945)	35	3.05 (0.1201)
11	2.45 (0.0965)	37	3.10 (0.1220)
13	2.50 (0.0984)	39	3.15 (0.1240)
15	2.55 (0.1004)	41	3.20 (0.1260)
17	2.60 (0.1024)	43	3.25 (0.1280)
19	2.65 (0.1043)	45	3.30 (0.1299)
21	2.70 (0.1063)	47	3.35 (0.1319)
23	2.75 (0.1083)	49	3.40 (0.1339)
25	2.80 (0.1102)		

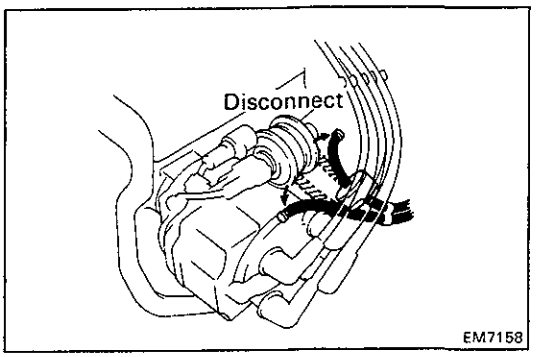
Exhaust valve clearance (Cold):
0.25 – 0.35 mm (0.010 – 0.014 in.)

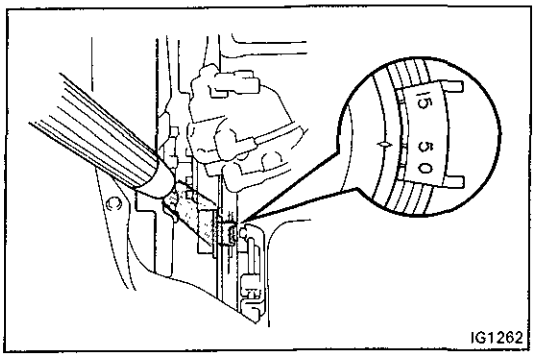
Example: 2.300 mm (0.1063 in.) shim installed
Measured clearance is 1.400 mm (0.0551 in.)
Replace 3.40 mm (0.1339 in.) shim with shim No. 49











INSPECTION AND ADJUSTMENT OF IGNITION TIMING

1. WARM UP ENGINE

Allow the engine to reach normal operating temperature.

2. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE

(Conventional Type)

Connect the test probe of a tester to the ignition coil negative (–) terminal.

(IIA Type)

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

NOTICE:

- **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, we recommended that you confirm the compatibility of your unit before using.**

3. (CONVENTIONAL TYPE) CHECK DWELL ANGLE

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

Dwell angle: 52 ± 6°

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

If too small, increase the gap.

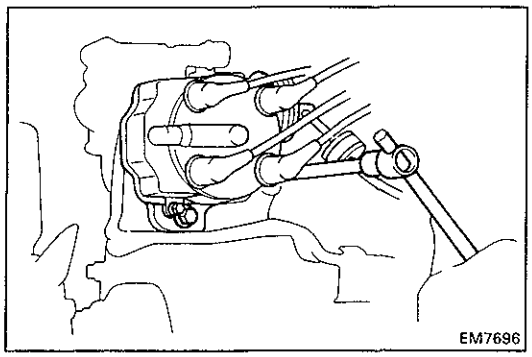
4. CHECK AND ADJUST IGNITION TIMING

(a) Disconnect the hoses from the vacuum advancer diaphragms and plug the hose ends.

(b) Remove the service hole cover from the radiator fan shroud.

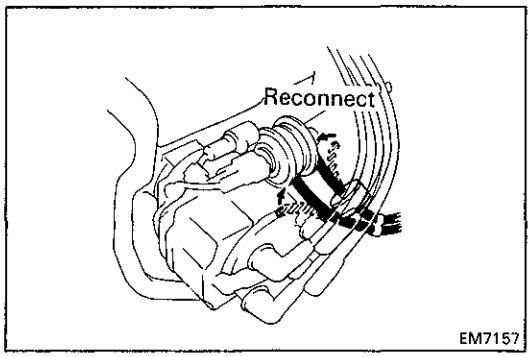
(c) With the engine idling as specified, use a timing light to check the timing.

Ignition timing: China 0° BTDC @ Max.950 rpm
Ex. China 5° BTDC @ Max.950 rpm



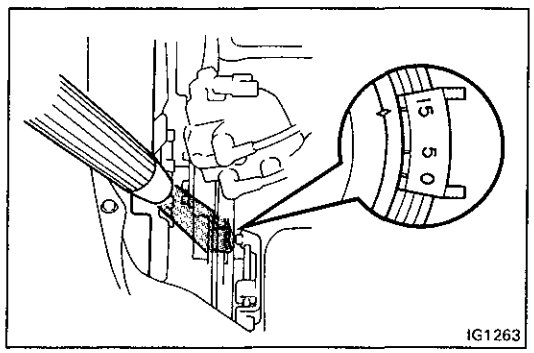
If necessary, loosen the distributor bolts and turn the distributor to align the marks. Recheck the timing after tightening the distributor.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)



5. FURTHER CHECK IGNITION TIMING

(a) Reconnect vacuum hoses to the distributor.



(b) Check that the ignition timing.

Ignition timing: China Approx. 10° BTDC @ Idle
Ex. China Approx. 15° BTDC @ Idle

(c) Install the service hole cover.

6. DISCONNECT TACHOMETER AND TIMING LIGHT

ADJUSTMENT OF IDLE SPEED AND IDLE MIXTURE

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 750 rpm
A/T 800 rpm

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

NOTICE

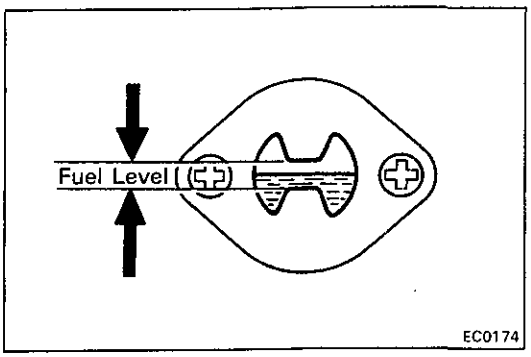
- **Always use a CO meter when adjusting the idle mixture. It is not necessary to adjust with the idle mixture adjusting screw in most vehicles if they are in good condition.**
- **If a CO meter is not available and it is absolutely necessary to adjust with the idle mixture adjusting screw, use the alternative method (See page EM-28).**

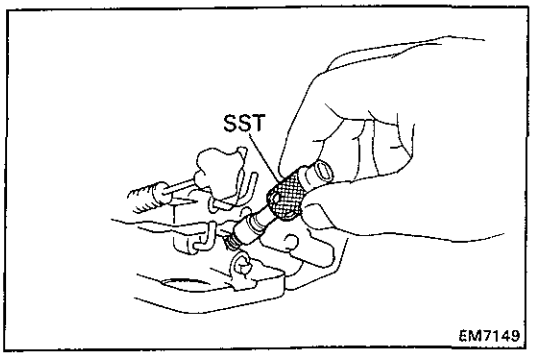
A. METHOD WITH CO METER

1. VISUALLY INSPECT CARBURETOR

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

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





2. INITIAL CONDITIONS

(a) Air cleaner installed.

(b) Normal operating coolant temperature.

(c) Choke fully open.

(d) All accessoris switched off.

(e) All vacuum lines connected.

(f) Ignition timing set correctly.

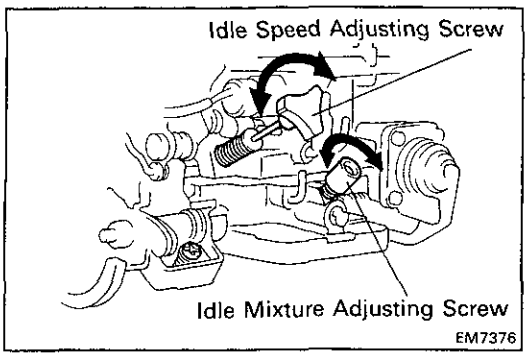
(g) Transmission in neutral.

(h) Fuel level should be about even with the correct level in the sight glass.

(i) CO meter operates normally.

(j) Use SST if necessary.

SST 09243-00020

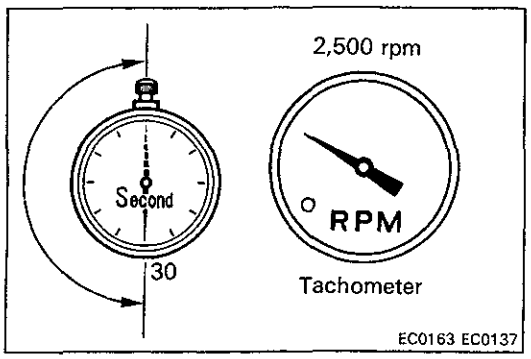


3. ADJUST IDLE SPEED AND IDLE MIXTURE

(a) Start the engine.

(b) Using a CO meter to measure the CO concentration in the exhaust, turn the idle speed and idle mixture adjusting screw to obtain the specified concentration value at idle speed.

Idle speed: M/T 750 rpm
A/T 800 rpm

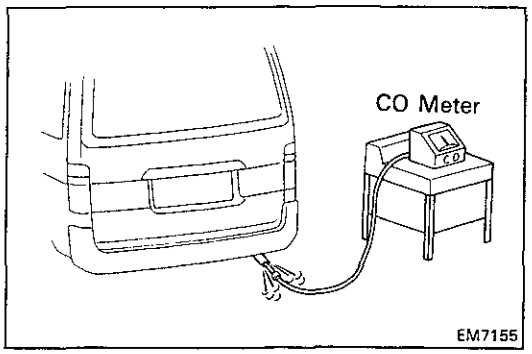


4. MEASURE CO CONCENTRATION

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

(b) Race the engine for three minutes at approx. 2,500 rpm before measuring concentration.

(c) Wait 1 – 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:
Europe, Singapore and Saudiarabia 1.0 ± 0.5 %
Others 2.5 % or less

- If the CO concentration is within specification, this adjustment is complete.
- If the CO concentration exceeds specification, or if the engine loses smoothness of operation, repeat the above adjustment.
- If the CO concentration cannot be corrected by idle mixture adjustment, see the table on the following page for other possible causes.

TROUBLESHOOTING

HC	CO	Problems	Causes
High	Normal	Rough idle	1. Faulty ignition: ● Incorrect timing ● Fouled, shorted or improperly gapped plugs ● Open or crossed high-tension cords ● Cracked distributor cap 2. Incorrect valve clearance 3. Leaky exhaust valves 4. Leaky cylinder
High	Low	Rough idle (Fluctuating HC reading)	Vacuum leak: ● Vacuum hose ● Intake manifold ● PCV line ● Carburetor base ● Air by-pass system
High	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 ● Secondary throttle valve not close

B. ALTERNATIVE METHOD

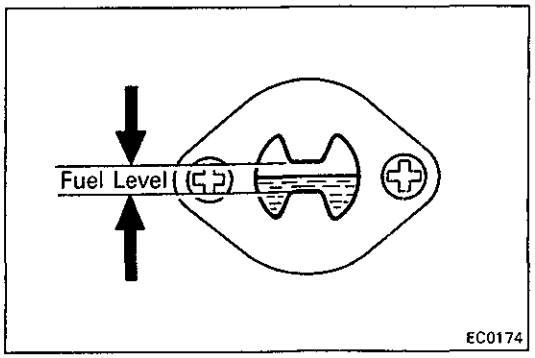
To be used only if CO meter is not available.

1. VISUALLY INSPECT CARBURETOR

(a) Check for loose screws or 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) Air cleaner installed

(b) Normal operating coolant temperature

(c) Choke fully open

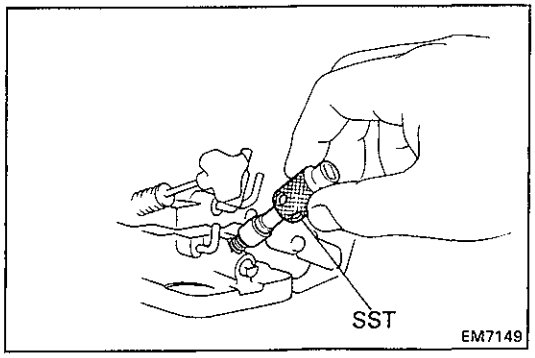
(d) All accessories switched off

(e) All vacuum lines connected

(f) Ignition timing set correctly

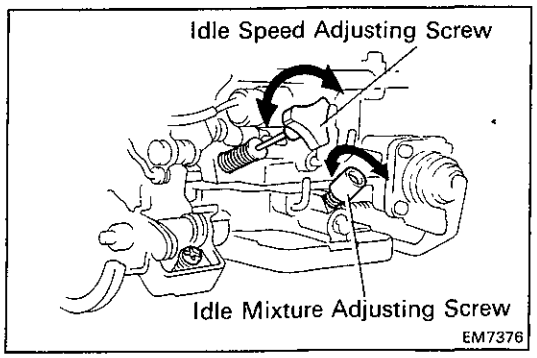
(g) Transmission in neutral

(h) Fuel level should be about even with the correct level in the sight glass



(i) Use SST if necessary.

SST 09243-00020



3. ADJUST IDLE SPEED AND IDLE MIXTURE

(a) Start the engine.

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

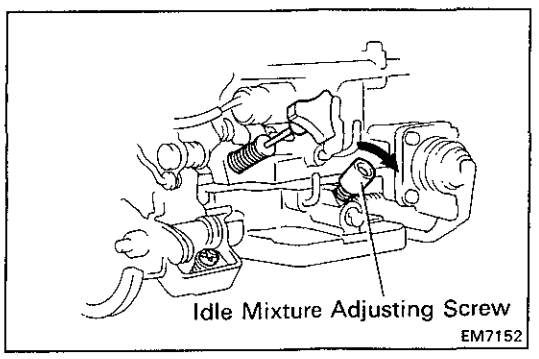
(c) Set to the idle mixture speed by turning the IDLE SPEED ADJUSTING SCREW.

Idle mixture speed: M/T 830 rpm
A/T 880 rpm

(d) Before moving to the next step, continue adjustments (b) and (c) until the maximum idle 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 750 rpm
A/T 800 rpm

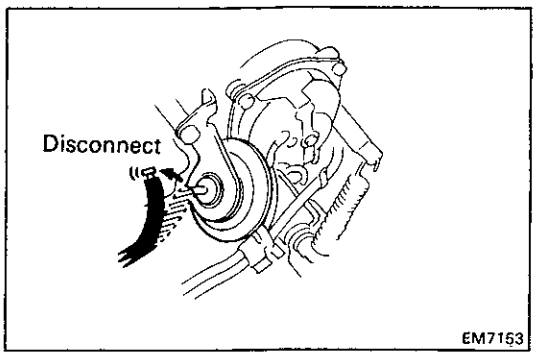


This is the Lean Drop Method for setting idle speed and mixture.

ADJUSTMENT OF FAST IDLE SPEED

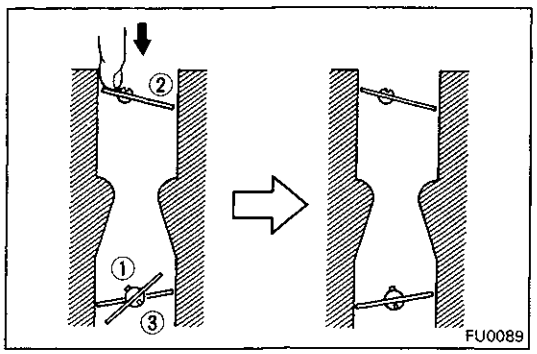
1. **REMOVE INTAKE AIR CONNECTOR**

2. **WARM UP AND STOP ENGINE**



3. **CUT OPERATION OF CHOKE OPENER (CO) SYSTEM**

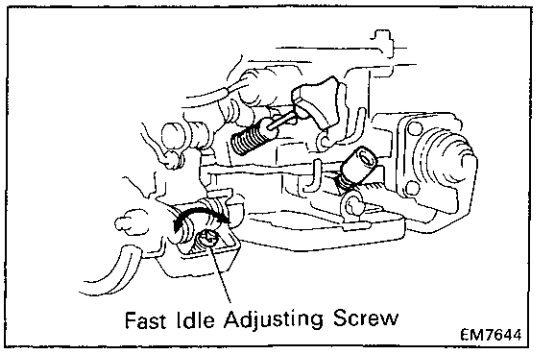
   Disconnect the vacuum hose from the choke opener diaphragm, and plug the hose end.



4. **SET FAST IDLE CAM**

   While holding the throttle valve slightly open, push the choke valve closed and hold it closed as you release the throttle valve.

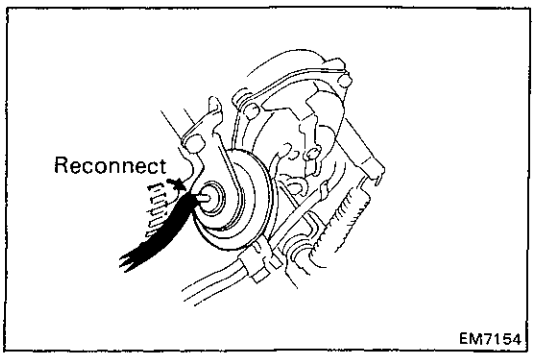
5. **START ENGINE, BUT DO NOT DEPRESS ACCELERATOR PEDAL**



6. **ADJUST FAST IDLE SPEED**

   Adjust the fast idle speed by turning the fast idle adjusting screw.

   Fast idle speed: 1RZ 2,600 rpm
   2RZ 2,400 rpm



7. **RECONNECT VACUUM HOSE TO PROPER LOCATIONS**

8. **INSTALL INTAKE AIR CONNECTOR**

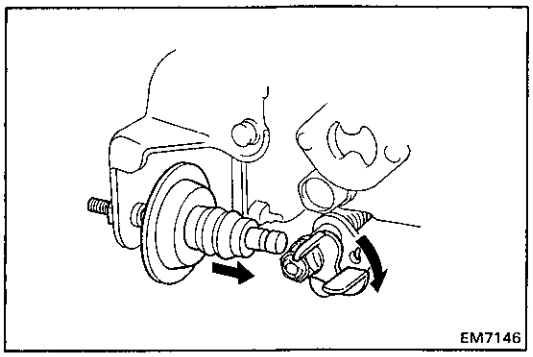
INSPECTION AND ADJUSTMENT OF DASH POT(DP)

1. **WARM UP AND STOP ENGINE**

2. **CONNECT TACHOMETER TO ENGINE**
(See step 2 on page EM-24)

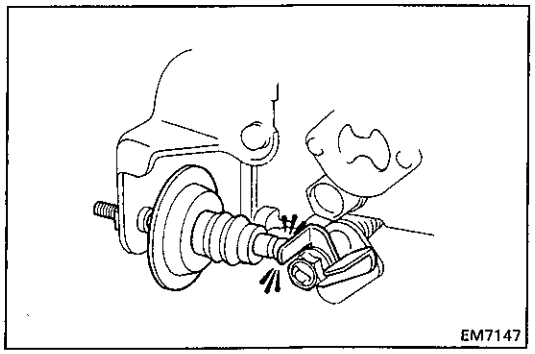
3. **START ENGINE**

4. **INSPECT AND ADJUST IDLE SPEED**
(See page EM-26)



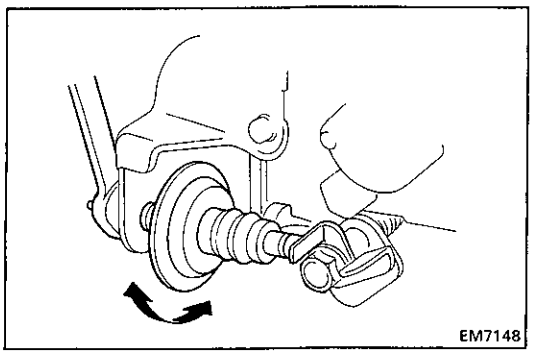
5. **ADJUST DASH POT (DP) SETTING SPEED**

(a) Open the throttle valve until the throttle lever separates from the dash pot end.



(b) Release the throttle valve gradually, and check the dash pot setting speed when the throttle lever touched the dash pot end.

Dash pot setting speed: 2,300 rpm



If the speed is not as specified, unlock the lock nut, and adjust the setting speed by turning the dash pot diaphragm.

6. **DISCONNECT TACHOMETER**