ENGINE (2TR–FE)

1420C–01

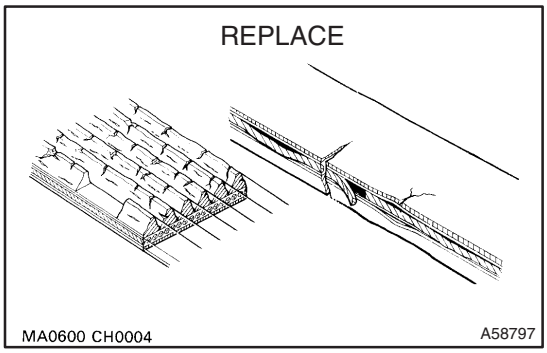
INSPECTION

1. **INSPECT ENGINE COOLANT (SEE PAGE 16–1)**
2. **INSPECT ENGINE OIL (SEE PAGE 17–1)**
3. **INSPECT BATTERY (SEE PAGE 19–4)**
4. **INSPECT AIR CLEANER FILTER ELEMENT SUB–ASSY**

(a) Remove the air filter.

(b) Visually check that the air filter is not excessively damaged or oily. If necessary, replace the air filter.

5. **INSPECT SPARK PLUG (SEE PAGE 18–3)**



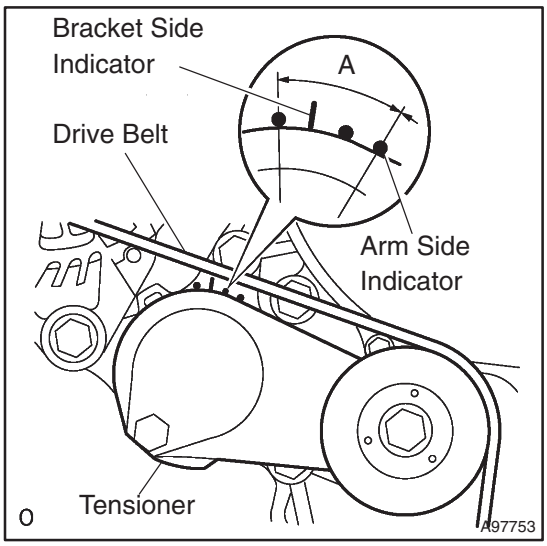
6. **INSPECT FAN AND GENERATOR V BELT**

(a) Visually check the drive belt for excessive wear, frayed cords, etc.

If any defect has been found, replace the drive belt.

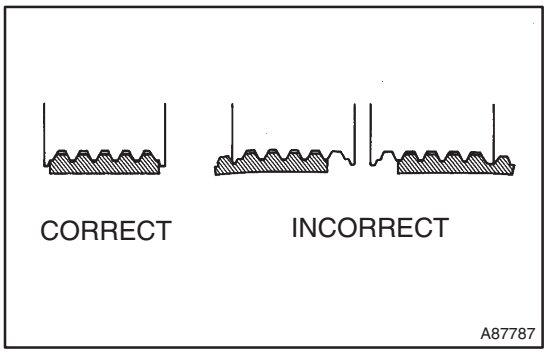
HINT:

Cracks on the rib side of a drive belt are considered acceptable. If the drive belt has chunks missing from the ribs, it should be replaced.



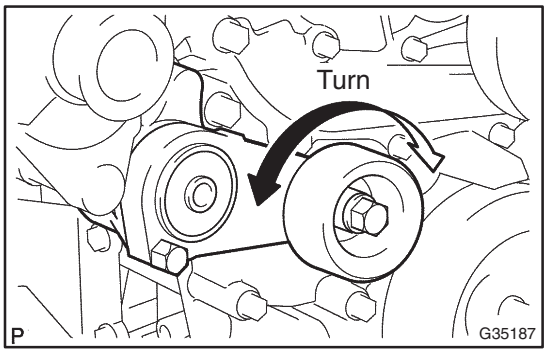
(b) Check that the tensioner indicator mark is within range A shown in the illustration.

If the mark is not within range A, replace the drive belt.



HINT:

- After installing the drive belt, check that it fits properly in the ribbed grooves. Check to confirm that the belt has not slipped out of the groove on the bottom of the crank pulley by hand.
- A ”new belt” is a belt which has been used for less than 5 minutes with the engine running.
- A ”used belt” is a belt which has been used for 5 minutes or more with the engine running.
- After installing a new belt, run the engine for approximately 5 minutes and then recheck the tension.

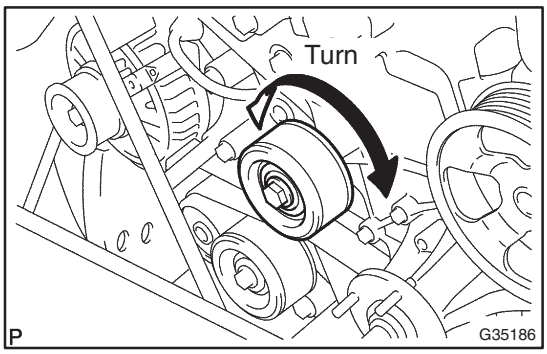


7. INSPECT V–RIBBED BELT TENSIONER ASSY

(a) Idle the engine and then stop the engine. Check that the drive belt is between the edges of the tensioner pulley.
(b) Remove the drive belt from the tensioner pulley.
(c) Turn the pulley, and check that the tensioner bearing moves smoothly and quietly.

If necessary, replace the tensioner.

(d) Install the drive belt.



8. INSPECT IDLER PULLEY SUB–ASSY NO.1

(a) Idle the engine and then stop the engine. Check that the drive belt is between the edges of the idler pulley.
(b) Remove the drive belt from the idler pulley.
(c) Turn the pulley, and check that the idler bearing moves smoothly and quietly.

If necessary, replace the idler pulley.

(d) Install the drive belt.

9. INSPECT VALVE LASH ADJUSTER NOISE

(a) Rev up the engine several times. Check that the engine does not emit unusual noises.

If unusual noises occur, warm up the engine and idle it for over 30 minutes. Then repeat step (a).

HINT:

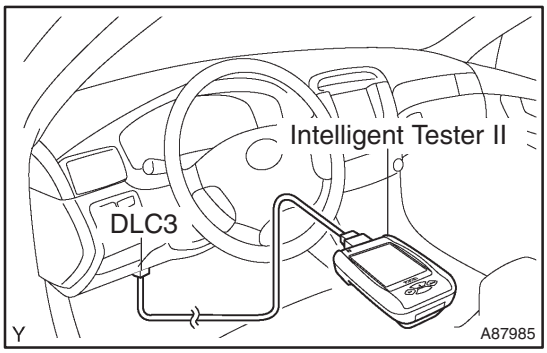
If any defects or problems are found during the inspection above, perform a lash adjuster inspection (see page 14–78).

10. INSPECT IGNITION TIMING

(a) Warm up the engine and stop the engine.

NOTICE:

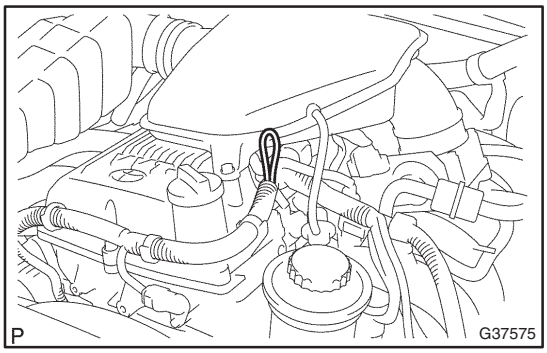
A warmed up engine should have an engine coolant temperature of over 80°C (176°F), have an engine oil temperature of 60°C (140°F), and the engine rpm should be stabilized.



(b) When using the intelligent tester II:
(1) Connect the intelligent tester II to the DLC3.
(2) Start the engine and idle it.
(3) Push the intelligent tester II main switch ON.
(4) Enter the following items:
Powertrain / Engine and ECT / Data list / IGN Advance

Ignition timing: 5 to 15° BTDC at idle

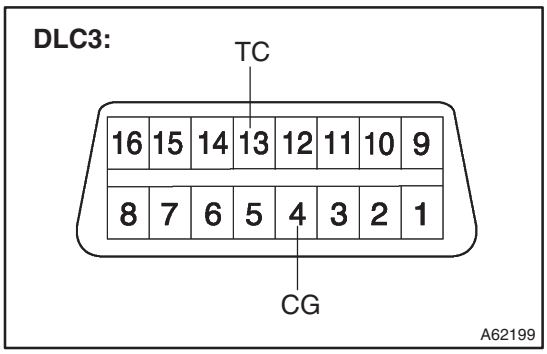
HINT:
Please refer to the intelligent tester II operator's manual for further detail.



(c) When not using the intelligent tester II:
(1) Install the tester terminal of a timing light to the position shown in the illustration.

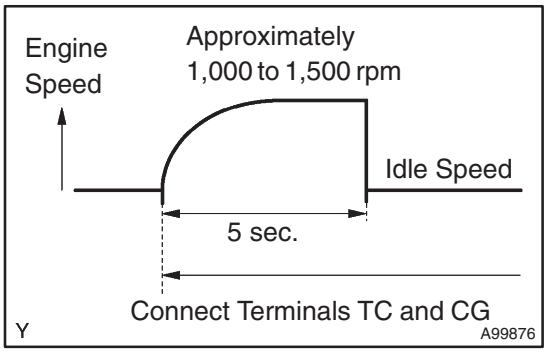
NOTICE:
- **Use a timing light that detects the first signal.**
- **After checking, be sure to wrap the wire harness with tape.**

(2) Turn the ignition switch ON.

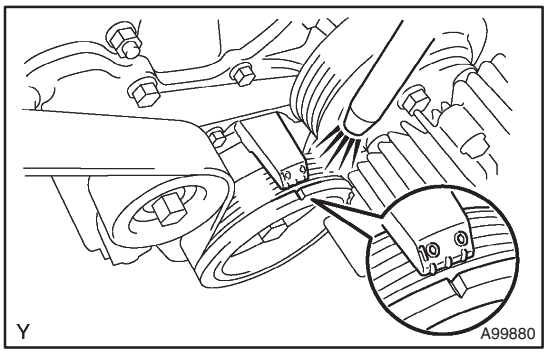


(3) Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.
SST 09843–18040

NOTICE:
- **Confirm the terminal numbers before connecting them. Connecting the wrong terminals can damage the engine.**
- **When checking the ignition timing, the transmission should be in the neutral.**



HINT:
- After connecting terminals (TC and CG), engine rpm changes to approximately 1,000 to 1,500 rpm for 5 seconds, then returns to idle speed. This is because the ECM checks that the ISC (idle speed control system) operates properly.
- Perform the inspection of the ignition timing after engine rpm is returned to idle speed.



(4) Inspect the ignition timing

Ignition timing: 3 to 7° BTDC at idle

(5) Disconnect terminals 13 (TC) and 4 (CG) of the DLC3.

(6) Inspect the ignition timing

Ignition timing: 5 to 15° BTDC at idle

(7) Check that the ignition timing advances immediately when the engine speed is increased.

(8) Turn the ignition switch off.

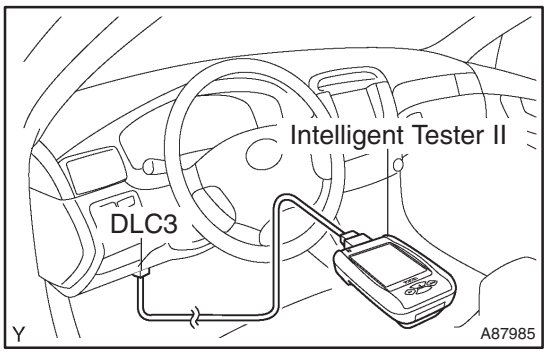
(9) Remove the timing light.

11. INSPECT ENGINE IDLE SPEED

(a) Warm up and stop the engine.

NOTICE:

A warmed up engine should have an engine coolant temperature of over 80°C (176°F), have an engine oil temperature of 60°C (140°F), and the engine rpm should be stabilized.



(b) When using the intelligent tester II:

Check the idle speed.

(1) Connect the intelligent tester II to the DLC3.

HINT:

Please refer to the intelligent tester II operator's manual for further details.

(2) Start the engine and idle it.

(3) Push the intelligent tester II main switch ON.

(4) Enter the following items:

Powertrain / Engine and ECT / Data list / Engine SPD

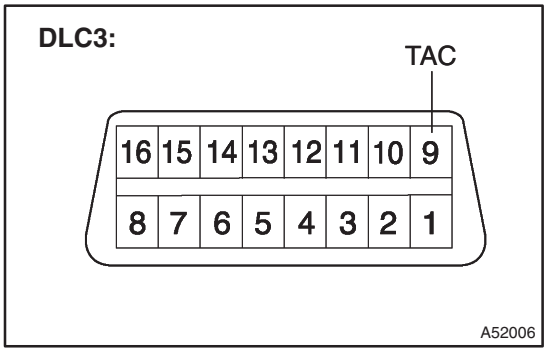
Idle speed: 600 to 700 rpm

NOTICE:

- **When checking the idle speed, the transmission should be in the neutral.**
- **Switch off all accessories and air conditioning before connecting the intelligent tester II.**

(5) Turn the ignition switch off.

(6) Disconnect the intelligent tester II from the DLC3.



(c) When not using the intelligent tester II:

(1) Install SST to terminal 9 (TAC) of DLC3, then connect a tachometer.

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NOTICE:

Confirm the terminal numbers before connecting them. Connecting the wrong terminals can damage the engine.

(2) Turn the ignition switch ON.

(3) Inspect the engine idling speed.

Idle speed: 600 to 700 rpm

(4) Turn the ignition switch off.

(5) Disconnect the tachometer.

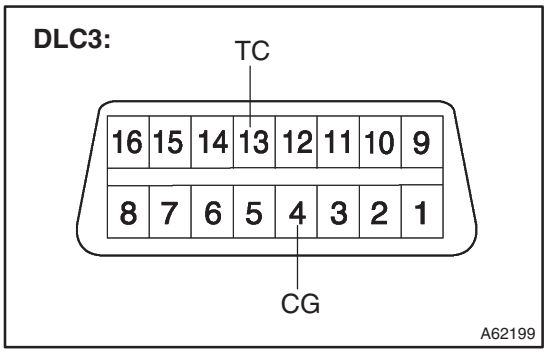
(6) Remove the SST from terminal 9 (TAC).

12. INSPECT IDLE SPEED CONTROL SYSTEM

(a) Warm up and stop the engine.

NOTICE:

A warmed up engine should have an engine coolant temperature of over 80°C (176°F), have an engine oil temperature of 60°C (140°F), and the engine rpm should be stabilized.



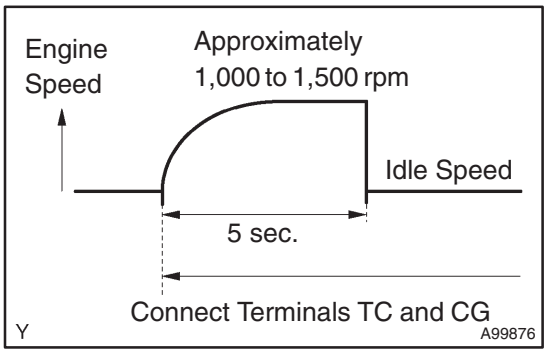
(b) Check the idle speed control system.

(1) Using SST, connect terminals TC and CG of the DLC3.

(2) Start the engine and idle it.

NOTICE:

- **Confirm the terminal numbers before connecting them. Connecting the wrong terminals can damage the engine.**
- **Turn off all electrical systems before connecting the terminals.**
- **When checking ISC function, the transmission should be in the neutral.**



(3) After connecting terminals (TC and CG), check that the engine speed changes to approximately 1,000 to 1,500 rpm for 5 seconds, and then returns to idle speed.

If the result is not as specified, check the throttle body (see page 10–1), DTC (see page 05–18) and wire harness.

13. INSPECT COMPRESSION

(a) Warm up and stop the engine.

NOTICE:

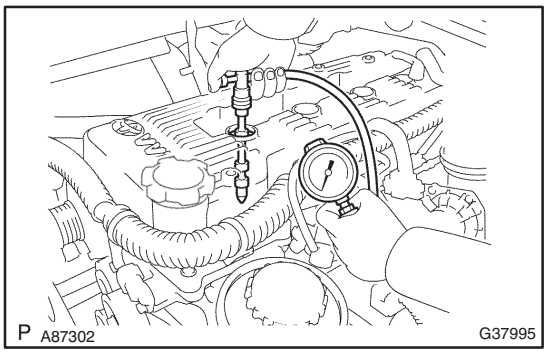
A warmed up engine should have an engine coolant temperature of over 80°C (176°F), have an engine oil temperature of 60°C (140°F), and the engine speed should be stabilized.

(b) Remove the intake air resonator.

(c) Disconnect the injector connectors.

(d) Remove the ignition coils.

(e) Remove the spark plugs.



(f) Check the cylinder compression pressure.
(1) Insert a compression gauge into the spark plug hole.
(2) Fully open the throttle.
(3) While cranking the engine, measure the compression pressure.

Compression pressure:
1,230 kPa (12.5 kgf/cm^2, 178 psi)
Minimum pressure: 883 kPa (9.0 kgf/cm^2, 128 psi)
Difference between each cylinder:
98 kPa (1.0 kgf/cm^2, 14 psi)

NOTICE:
- **Always use a fully charged battery to obtain an engine speed of 250 rpm or more.**
- **Check the other cylinders' compression pressure in the same way.**
- **This measurement must be done as quickly as possible.**

If the cylinder compression is low, pour a small amount of engine oil into the cylinder through the spark plug hole and perform inspection again.

HINT:
- If adding oil increases the compression, the piston rings and/or cylinder bore may be worn or damaged.
- If pressure stays low, a valve may be stuck or seated improperly, or there may be leakage in the gasket.

(g) Install the spark plugs.
(h) Install the ignition coils.
(i) Connect the injector connectors.
(j) Install the intake air resonator.

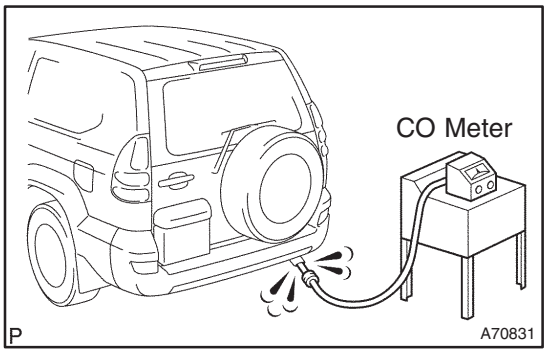
14. INSPECT CO (LEADED GASOLINE)

HINT:
This check is used only to determine whether or not the idle CO complies with regulations.

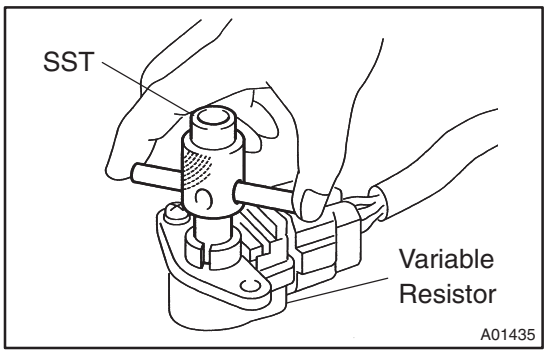
(a) Initial condition:
(1) Engine at normal operating temperature
(2) Air cleaner installed
(3) All pipes and hoses of the air induction system connected
(4) All accessories switched OFF
(5) All vacuum lines properly connected
(6) EFI system wiring connectors fully seated
(7) Ignition timing set correctly
(8) Transmission in neutral
(9) Tachometer and CO meter calibration at idle

NOTICE:
If a CO meter is not available, do not attempt to adjust the idle mixture. Always use a CO meter when adjusting the idle mixture. Use of the idle mixture screw for adjustments is typically not necessary if the vehicle is in good condition.

(b) Warm up the engine by driving at constant speed (approximately 50 km/h (31 mph)). Close the throttle valve for 5 minutes after the engine coolant temperature becomes stable (80 to 90°C (176 to 194°F)) and idle the engine for 5 minutes.

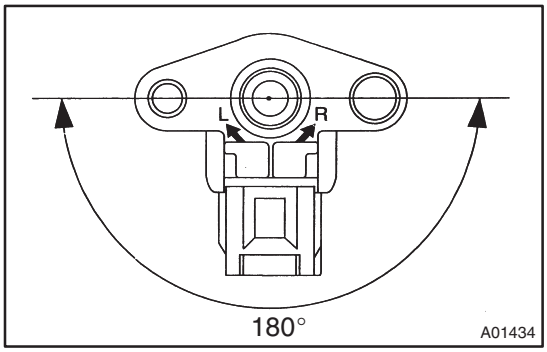


(c) Insert a tester probe at least 40 cm (1.3 ft) into the tail pipe.
(d) Wait at least 1 minute before measuring to allow the concentration to stabilize. Complete the measuring within 3 minutes.
Idle CO concentration: 1.5 ± 0.5%



If the CO concentration does not conform to regulations, adjust by turning the idle mixture adjusting screw in the variable resistor with SST.

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HINT:
The idle mixture adjusting screw can be adjusted within an 180° angle range.

- If the CO concentration is within the specification, this adjustment is complete.
- If the CO concentration cannot be corrected by idle mixture adjustment, see the table below for other possible causes.

(e) Remove the SST.

CO	Problems	Causes
High	Rough idle (black smoke from exhaust)	1. Clogged air filter 2. Plugged ventilation valve 3. Faulty SFI system: • Faulty fuel pressure regulator • Clogged fuel return line • Defective engine coolant temperature (ECT) sensor • Faulty ECM • Faulty injectors • Faulty throttle position sensor • Faulty MAF meter

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15. INSPECT CO/HC (UNLEADED GASOLINE)

HINT:
The ECM properly controls the CO/HC concentration in the emission gas.

(a) Start the engine.
(b) Run the engine at 2,500 rpm for approximately 180 seconds.
(c) Insert the CO/HC meter testing probe at least 40 cm (1.3 ft) into the tail pipe while idling.
(d) Check the CO/HC concentration with the engine idling and/or running at 2,500 rpm.

If the CO/HC concentration does not comply with the regulations, troubleshoot in the order given below.

- Check the heated oxygen sensor operation (see page 12–3).
- See the table below for possible causes, then inspect the applicable causes and repair them if necessary.

CO	HC	Problems	Causes
Normal	High	Rough idle	1. Faulty ignitions: • Incorrect timing • Fouled, shorted or improperly gapped plugs 2. Incorrect valve clearance 3. Leaks in intake and exhaust valves 4. Leaks in cylinders
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: • PCV hoses • Intake manifold • Throttle body • Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve 3. Faulty SFI systems: • Faulty pressure regulator • Defective engine coolant temperature sensor • Defective mass air flow meter • Faulty ECM • Faulty injectors • Faulty throttle body