ENGINE ASSEMBLY (1MZ–FE)

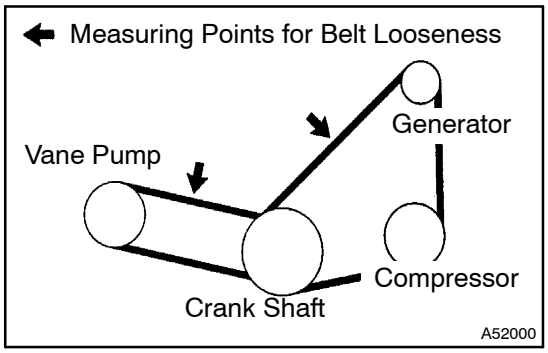
1401U–02

INSPECTION

1. **INSPECT COOLANT (See page 16–31)**
2. **INSPECT ENGINE OIL**
3. **INSPECT BATTERY**

   Standard specific gravity: 1.25 – 1.29 at 20°C (68°F)
4. **INSPECT AIR CLEANER FILTER ELEMENT SUB–ASSY**

5. **INSPECT SPARK PLUG**
   (See page 18–5)



6. **INSPECT V–RIBBED BELT**

(a) Belt deflection:

Pressing force: 98 N (10 kgf, 221 lbf)

	New belt mm (in.)	Used belt mm (in.)
V ribbed belt (For fan and generator)	9.1 – 10.5 (0.358 – 0.413)	11 – 13.5 (0.433 – 0.531)
V ribbed belt (for vane pump)	7 – 9 (0.276 – 0.354)	10 – 12 (0.394 – 0.472)

(b) Tension:

	New belt N (kg , lb)	Used belt N (kg , lb)
V ribbed belt (for fan and generator)	617 – 853 (63 – 87 , 139 – 192)	294 – 490 (30 – 50 , 66 – 110)
V ribbed belt (for vane pump)	647 – 843 (66 – 86 , 146 – 190)	323 – 519 (33 – 53 , 73 – 117)

NOTICE:

- **Check the drive belt deflection at the specified point.**
- **When installing a new belt, set its tension value as specified.**
- **When checking a belt used for over 5 minutes, confirm the deflection value is within the specified one.**
- **When reinstalling a belt used for over 5 minutes, perform the check based on the used deflection value.**
- **V–ribbed belt tension and deflection value should be checked after 2 revolutions of engine cranking.**
- **When using a belt tension gauge, confirm the accuracy first by using a master gauge.**

7. **INSPECT IGNITION TIMING**

(a) Warm up engine.

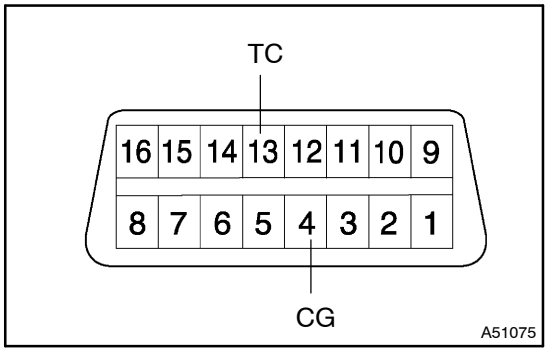
(b) When using hand–held tester.

(1) Connect the hand–held tester to the DLC3.

HINT:

Please refer to the hand–held tester operator's manual for further details.

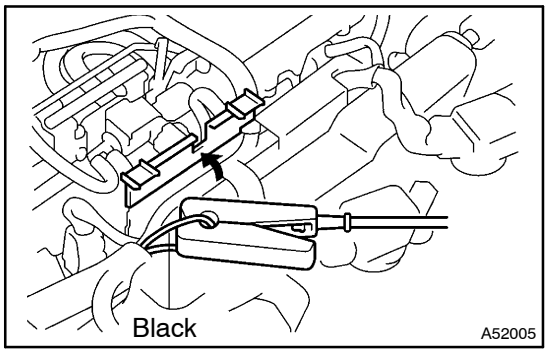
Ignition timing : 8 – 12° BTDC



(c) When not using hand–held tester.
(1) Using SST, connect terminals 13 (TC) and 4 (CG) of DLC3.
SST 09843–18040

NOTICE:
- **Be sure not to connect incorrectly. It causes breakage of the engine.**
- **Turn OFF all electrical systems.**
- **Operate the inspection when the cooling fan motor is turned OFF.**

(2) Remove the V–bank cover.



(3) Pull out the wire harness as shown in the illustration. Connect the clip of the timing light to the engine.

NOTICE:
Use a timing light which can detect the first signal.

(4) Inspect ignition timing at idle.
Ignition timing : 8 – 12° BTDC

NOTICE:
When checking the ignition timing, the transmission is at neutral position.

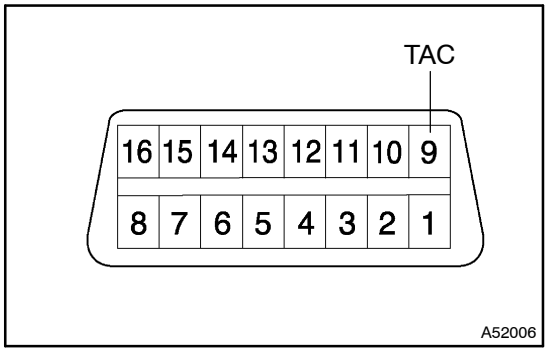
HINT:
After engine rpm is kept at 1,000 – 1,300 r/min. for 5 seconds, check that it returns idle speed.

(5) Disconnect terminals 13 (TC) and 4 (CG) of DLC3.
(6) Inspect ignition timing at idle.
Ignition timing : 7 – 25° BTDC
(7) Confirm that ignition timing moves to advanced angle side when the engine rpm is increased.
(8) Remove the timing light.

8. INSPECT ENGINE IDLE SPEED

(a) Warm up engine.
(b) When using hand–held tester.
(1) Connect the hand–held tester to the DLC3.
Idle speed: 550 – 650 r/min.

HINT:
Please refer to the hand–held tester operator's manual for further details.

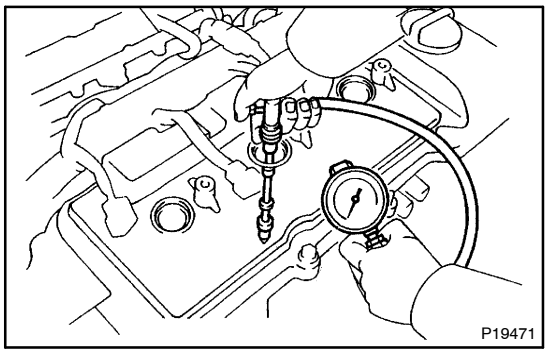


(c) When not using hand–held tester.
(1) Using SST, connect tachometer test prove to terminal 9 (TAC) of DLC3.
SST 09843–18040
(2) Check the idle speed.
Idle speed: 550 – 650 r/min.

NOTICE:
- **Check idle speed with cooling fan OFF.**
- **Switch off all accessories and air conditioning.**

9. INSPECT COMPRESSION

(a) Warm up and stop engine.
(b) Disconnect the injector connectors.
(c) Remove intake air surge tank. (See page 14–143)
(d) Remove ignition coil.
(e) Remove spark plugs.



(f) Inspect cylinder compression pressure.
SST 09992–00500
(1) Insert a compression gauge into the spark plug hole.
(2) While cranking the engine, measure the compression pressure.
Compression pressure:
1.47 MPa (15 kgf/cm^2, 213 psi)
Minimum pressure:
0.98 MPa (10 kgf/cm^2, 142 psi)
Difference between each cylinder:
100 kPa (1.0 kgf/cm^2, 14 psi)

NOTICE:
- **Always use a fully charged battery to obtain engine speed of 250 rpm or more.**
- **Check other cylinder's compression pressure in the same way.**
- **This measurement must be done in as short a time as possible.**
(3) If the cylinder compression is low, pour a small amount of engine oil into the cylinder through the spark plug hole and inspect again.

HINT:
- If adding oil increases the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seating improperly, or there may be leakage past the gasket.

10. INSPECT CO/HC

(a) Start the engine.
(b) Race engine at 2,500 r/min. for approx. 180 seconds.

(c) Insert CO/HC meter testing probe at least 40 cm (1.3 ft) into tailpipe during idling.
(d) Immediately check CO/HC concentration at idle and/or 2,500 r/min.

HINT:

- Complete the measuring within 3 minutes.
- When doing the 2 mode (idle and 2,500 r/min) test, these measuring orders are prescribed by the applicable local regulations.

(e) If the CO/HC concentration does not comply with regulations, troubleshoot in the order given below.
  (1) Check heated oxygen sensor operation. (See page 12–11)
  (2) See the table below for possible causes, and then inspect and correct the applicable causes if necessary.

CO	HC	Problems	Causes
Normal	High	Rough idle	4. Faulty ignitions: • Incorrect timing • Fouled, shorted or improperly gapped plugs 5. Incorrect valve clearance 6. Leaky intake and exhaust valves 7. Leaky 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 EFI systems: • Faulty pressure regulator • Defective water temperature sensor • DEFECTIVE Air–flow meter • Faulty ECU • Faulty injectors • Faulty throttle position sensor