ENGINE DIFFICULT TO START OR STALLING

HINT:
Specified values in the following troubleshooting flowchart are for reference only. Variations in the Data List result values may occur depending on the measuring conditions or the vehicle's age. Do not judge the vehicle to be normal even when the Data List values indicate a standard level. There are possibly some concealed factors of the malfunction.

INSPECTION PROCEDURE

1 READ OUTPUT DTC (RELATED TO ENGINE)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch ON and turn the intelligent tester II ON.
(c) Enter the following menus: Powertrain / Engine / DTC.
(d) Read DTCs.
Result:

Display (DTC Output)	Proceed to
Other than engine–related DTCs (see page 05–477)	A
DTCs related to engine (see page 05–477)	B

B → **REPAIR OR REPLACE ENGINE CONTROL SYSTEM ACCORDING TO DTC OUTPUT (See page 05–477)**

A

2 CHECK FUEL FILTER

HINT:
Check that the fuel filter is not clogged.
OK: Fuel filter is not clogged.

NG → **REPLACE FUEL FILTER (See Pub. No. RM990E, page 11–121)**

OK

3 CHECK ENGINE CRANKING CONDITION

(a) Check the engine cranking condition.
(b) Compare the cranking condition with that of a normal engine of the same model, and carefully check if there is any difference between them.
OK: Engine cranking condition is normal.

NG → **CHECK AND REPAIR BATTERY, CHARGING SYSTEM, STARTER ASSY AND STARTING SYSYTEM**

OK

4	READ DATA LIST (FUEL PRESSURE)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch ON and turn the intelligent tester II ON.
(c) Enter the following menus: Powertrain / Engine / Data List / Fuel Press.
(d) Read the values.
Reference:

Item	Inspection Condition	Reference Value
Fuel Press	Cranking, and engine coolant temperature 0°C (32°F) or more	32,000 kPa

NG → **BLEED AIR FOR FUEL SYSTEM**

OK

5	CHECK IF INITIAL COMBUSTION OCCURS

(a) Check if initial combustion occurs.
Result:

Result	Proceed to
No occurrence with cold engine	A
No occurrence with hot engine	B
Occurred	C

B → **Go to step 7**

C → **Go to step 8**

A

6	CHECK INDICATOR LIGHTING TIME AND AFTER GLOW TIME (See Pub. No. RM990E, page 19–42)

OK: The indicator lighting time is normal.

NG → **REPAIR OR REPLACE PRE–HEATING SYSTEM**

OK

7 READ DATA LIST (FUEL PRESSURE)

(a) Connect the intelligent tester II to the DLC3.
(b) Start the engine and turn the intelligent tester II ON.
(c) Enter the following menus: Powertrain / Engine / Data List / Common Rail Pressure.
(d) Check that the internal fuel pressure of the common rail is within the specification below.

Standard:

Engine Speed	Fuel Pressure
Idling	Approximately 30 to 40 MPa
3,000 rpm (No engine load)	Approximately 50 to 70 MPa

NG → **Go to step 13**

OK

8 CHECK AIR INTAKE SYSTEM AND EXHAUST SYSTEM

(a) Remove the air cleaner filter.
(b) Inspect the EGR valve operation.
  (1) Start the engine and warm it up.
  (2) Check that clicking sounds are heard from the EGR valve when the vacuum hose is disconnected from the EGR valve with the engine in an idling condition.
(c) Inspect the throttle valve operation.
  (1) Start the engine.
  (2) Check if the throttle valve fully opens when accelerating the engine speed.

HINT:
While revving up, the EGR valve is fully closed and the intake shutter is fully opened. If the systems are normal, the volume of black smoke will decrease.

OK: EGR valve and throttle valve operate normally.

NG → **CHECK AND REPAIR LOCATIONS WHERE MALFUNCTIONS EXIST**

OK

9	READ DATA LIST (COMMON RAIL PRESSURE, INJECTION VOLUME)

(a) Connect the intelligent tester II to the DLC3.
(b) Start the engine and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine / Data List.
(d) Select the following menu items in order and read the values.
- Fuel Press
- Injection Volume

Standard:

Item	Engine Speed *	Reference Value
Fuel Press	Idling	30 to 40 MPa
Fuel Press	2,000 rpm (No engine load)	35 to 50 MPa
Fuel Press	3,000 rpm (No engine load)	50 to 80 MPa
Injection Volume	Idling	3 to 12 mm^3
Injection Volume	2,000 rpm (No engine load)	5 to 12 mm^3
Injection Volume	3,000 rpm (No engine load)	7 to 14 mm^3

HINT:
*: If no idling conditions are specified, the shift lever should be in the neutral position, the A/C switch and all accessory switches should be OFF.

NG → **Go to step 14**

OK

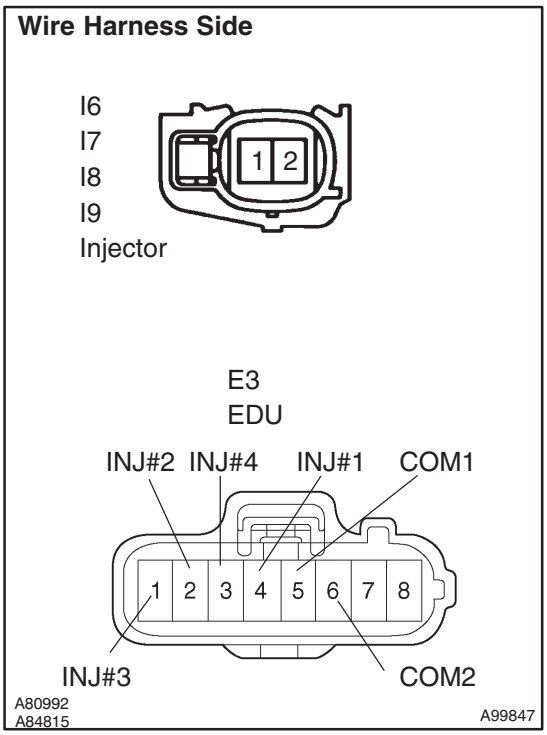
10	INSPECT CYLINDER COMPRESSION PRESSURE (See Pub. No. RM990E, page 14–186)

NG → **CHECK AND REPAIR ENGINE**

OK

11 CHECK WIRE HARNESS (INJECTOR – EDU)

Wire Harness Side



HINT:
DTC P0200/97 is set if there is an open or short malfunction in the EDU circuit (1 trip detection logic).

(a) Disconnect the I6, I7, I8 and I9 injector connectors.
(b) Disconnect the E3 EDU connector.
(c) Measure the resistance of the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
I6–2 – E3–4 (INJ#1)	Below 1 Ω
I7–2 – E3–2 (INJ#2)	Below 1 Ω
I8–2 – E3–1 (INJ#3)	Below 1 Ω
I9–2 – E3–3 (INJ#4)	Below 1 Ω
I6–1 – E3–5 (COM1)	Below 1 Ω
I7–1 – E3–6 (COM2)	Below 1 Ω
I8–1 – E3–6 (COM2)	Below 1 Ω
I9–1 – E3–5 (COM1)	Below 1 Ω
I6–2 or E3–4 (INJ#1) – Body ground	10 kΩ or higher
I7–2 or E3–2 (INJ#2) – Body ground	10 kΩ or higher
I8–2 or E3–1 (INJ#3) – Body ground	10 kΩ or higher
I9–2 or E3–3 (INJ#4) – Body ground	10 kΩ or higher
I6–1 or E3–5 (COM1) – Body ground	10 kΩ or higher
I7–1 or E3–6 (COM2) – Body ground	10 kΩ or higher
I8–1 or E3–6 (COM2) – Body ground	10 kΩ or higher
I9–1 or E3–5 (COM1) – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

12 PERFORM ACTIVE TEST (INJECTOR CUT)

(a) Connect the intelligent tester II to the DLC3.
(b) Start the engine and turn the intelligent tester II ON.
(c) Enter the following menus: Powertrain / Engine / Active Test / Injector cut #1, #2, #3 and #4.
(d) Check the engine idling condition while the fuel injection of each cylinder is cut using the intelligent tester II.

Result:

Engine Idling Condition	Proceed to
Becomes unstable	A
Does not change	B

HINT:
Replace the injector mounted on the cylinder that causes rough idling.

B → **REPLACE INJECTOR (See page 11–52)**

A

REPLACE INJECTOR DRIVER

13 CHECK IF FUEL IS BEING SUPPLIED TO SUPPLY PUMP

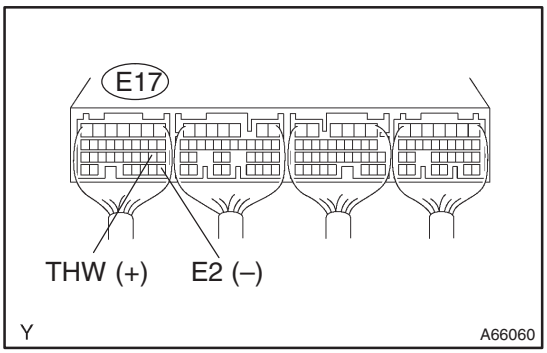
(a) Disconnect the inlet hose from the supply pump.
(b) Operate the priming pump and check that the fuel is being supplied to the supply pump.
OK: Fuel is properly supplied to the supply pump when the priming pump is actuated.

OK	**REPLACE SUPPLY PUMP ASSY (See page 11–63)**

NG

CHECK AND REPAIR FUEL PIPE CLOGGING (INCLUDING FUEL FREEZING) (FUEL TANK – SUPPLY PUMP)

14 CHECK ECM (THW VOLTAGE)



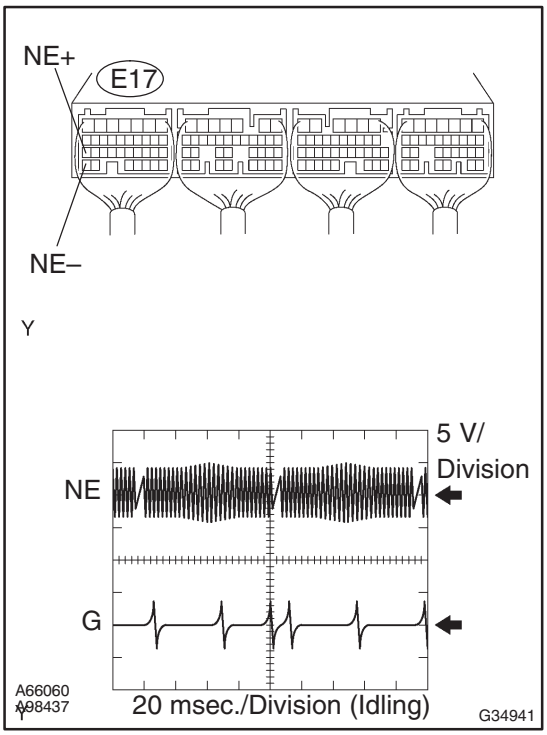
(a) Start the engine.
(b) Measure the voltage of the ECM connector.
Standard:

Tester Connection	Condition	Specified Condition
E17–19 (THW) – E17–28 (E2)	Idling, engine coolant temperature between 60°C and 120°C (140°F and 248°F)	0.2 to 1.0 V

NG	**Go to step 18**

OK

15 CHECK ECM (NE SIGNAL)



(a) While idling the engine, check the waveform between the specified terminals of the E17 ECM connector using an oscilloscope.

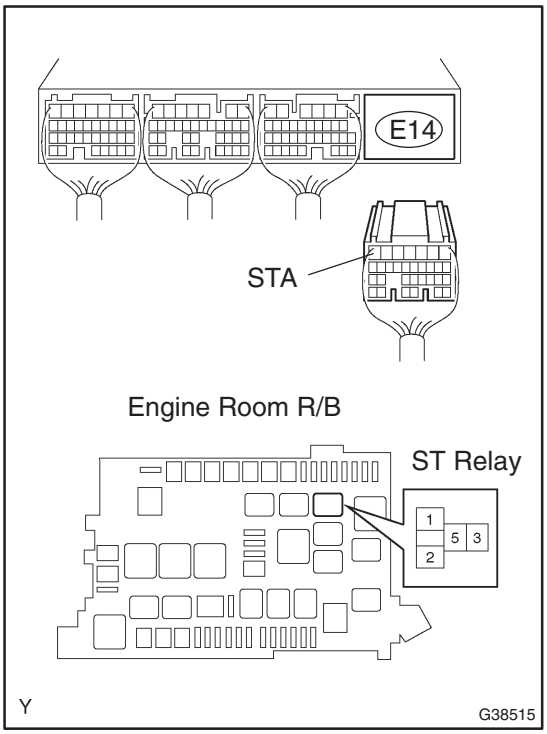
Standard:

Tester Connection	Specified Condition
E17–27 (NE+) – E17–34 (NE–)	Correct waveform is shown

NG → **Go to step 19**

OK

16 CHECK WIRE HARNESS (ECM – ST RELAY)



(a) Disconnect the E15 ECM connector.
(b) Remove the ST relay from the engine room R/B.
(c) Measure the resistance of the wire harness side connectors.

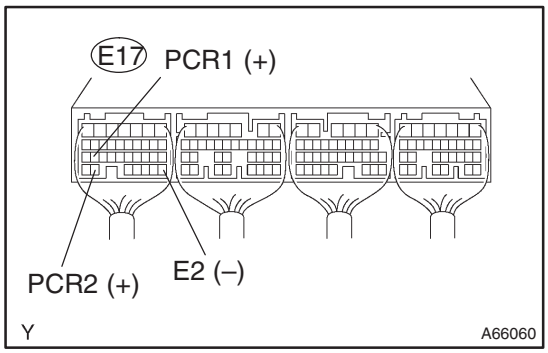
Standard:

Tester Connection	Specified Condition
R/B ST relay terminal 2 – E14–7 (STA)	Below 1 Ω
R/B ST relay terminal 2 or E14–7 (STA) – Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

17 CHECK ECM (PCR1, PCR2 VOLTAGE)



(a) Start the engine.
(b) Measure the voltage of the ECM connector.
Standard:

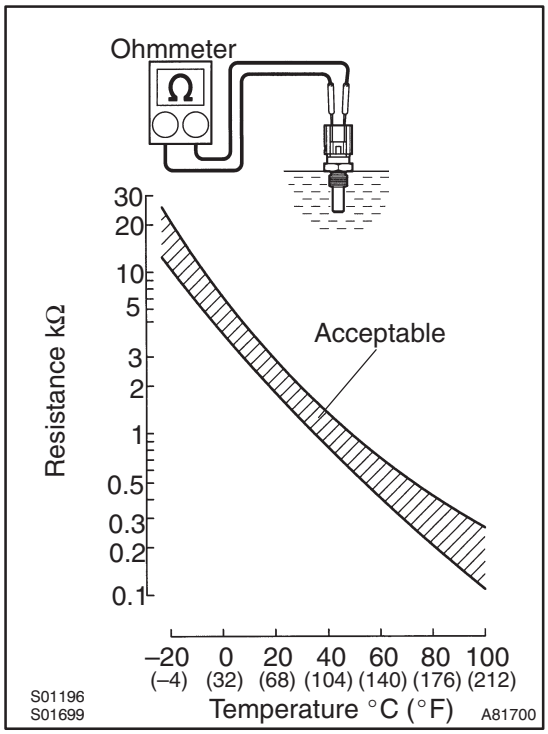
Tester Connection	Condition	Specified Condition
E17–26 (PCR1) – E17–28 (E2)	Idling	1.7 to 2.2 V
E17–33 (PCR2) – E17–28 (E2)	Idling	1.2 to 1.6 V

NG → **Go to step 20**

OK

REPLACE ECM (See Pub. No. RM990E, page 10–34)

18 INSPECT ENGINE COOLANT TEMPERATURE SENSOR



(a) Remove the sensor.
(b) Measure the resistance of the sensor.
Standard:

Tester Connection	Condition	Specified Condition
1 – 2	20°C (68°F)	2.32 to 2.59 kΩ
1 – 2	80°C (140°F)	0.310 to 0.326 kΩ

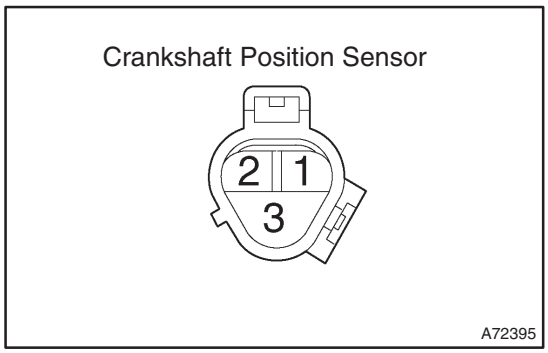
NOTICE:
If checking the ECT sensor in water, keep the terminals dry. After the check, wipe the sensor dry.
HINT:
Alternative procedure: Connect an ohmmeter to the installed ECT sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values against the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

19 INSPECT CRANKSHAFT POSITION SENSOR



(a) Disconnect the C4 connector.
(b) Measure the resistance of the sensor.
Standard:

Tester Connection	Condition	Specified Condition
1 – 2	Cold	1,630 to 2,740 Ω
1 – 2	Hot	2,065 to 3,225 Ω

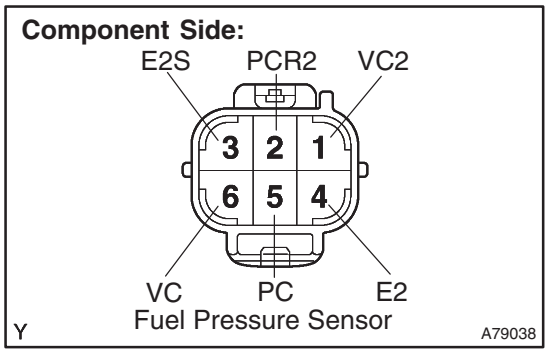
NOTICE:
In the chart above, the terms ”cold” and ”hot” refer to the temperature of the coils. ”Cold” means approximately –10 to 50°C (14 to 122°F). ”Hot” means approximately 50 to 100°C (122 to 212°F).

NG → **REPLACE CRANKSHAFT POSITION SENSOR**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

20 INSPECT COMMON RAIL ASSY (FUEL PRESSURE SENSOR)



(a) Disconnect the I9 fuel pressure sensor connector.
(b) Measure the resistance between each pair of the terminals of the fuel pressure sensor.
Standard:

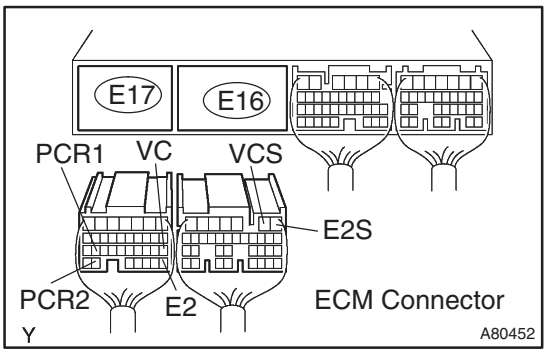
Tester Connection	Specified Condition
PC (I9–5) – E2 (I9–4)	16.4 kΩ or less
PCR2 (I9–2) – E2S (I9–3)	16.4 kΩ or less
PC (I9–5) – VC (I9–6)	3 kΩ or less
PCR2 (I9–2) – VC2 (I9–1)	3 kΩ or less

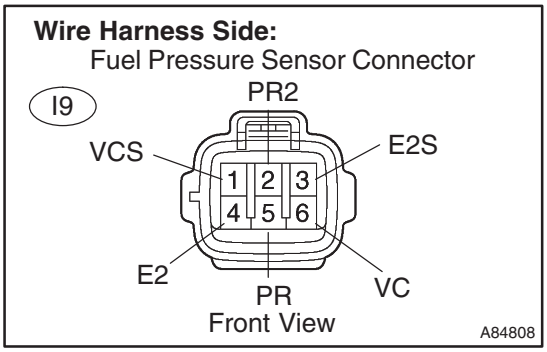
(c) Reconnect the fuel pressure sensor connector.

NG → **REPLACE COMMON RAIL ASSY (FUEL PRESSURE SENSOR) (See page 11–67)**

OK

21	CHECK WIRE HARNESS (FUEL PRESSURE SENSOR – ECM)





(a) Disconnect the E14 and E16 ECM connectors.
(b) Disconnect the I9 fuel pressure sensor connector.
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
PCR1 (E17–26) – PR (I9–5)	Below 1 Ω
PCR2 (E17–33) – PR2 (I9–2)	
VCS (E16–2) – VCS (I9–1)	
VC (E17–18) – VC (I9–6)	
E2 (E17–28) – E2 (I9–4)	
E2S (E16–1) – E2S (I9–3)	

Standard (Check for short):

Tester Connection	Specified Condition
PCR1 (E17–26) or PR (I9–5) – Body ground	10 kΩ or higher
PCR2 (E17–33) or PR2 (I9–2) – Body ground	
VCS (E16–2) or VCS (I9–1) – Body ground	
VC (E17–18) or VC (I9–6) – Body ground	
E2 (E17–28) or E2 (I9–4) – Body ground	
E2S (E16–1) or E2S (I9–3) – Body ground	

(d) Reconnect the ECM connectors.
(e) Reconnect the fuel pressure sensor connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

22	REPLACE ECM (See Pub. No. RM990E, page 10–34)

NOTICE:
After replacing the ECM, allow for ECM learning start the engine and idle it until it is fully warmed up.

NG → **REPLACE SUPPLY PUMP ASSY (See page 11–63)**

OK

END