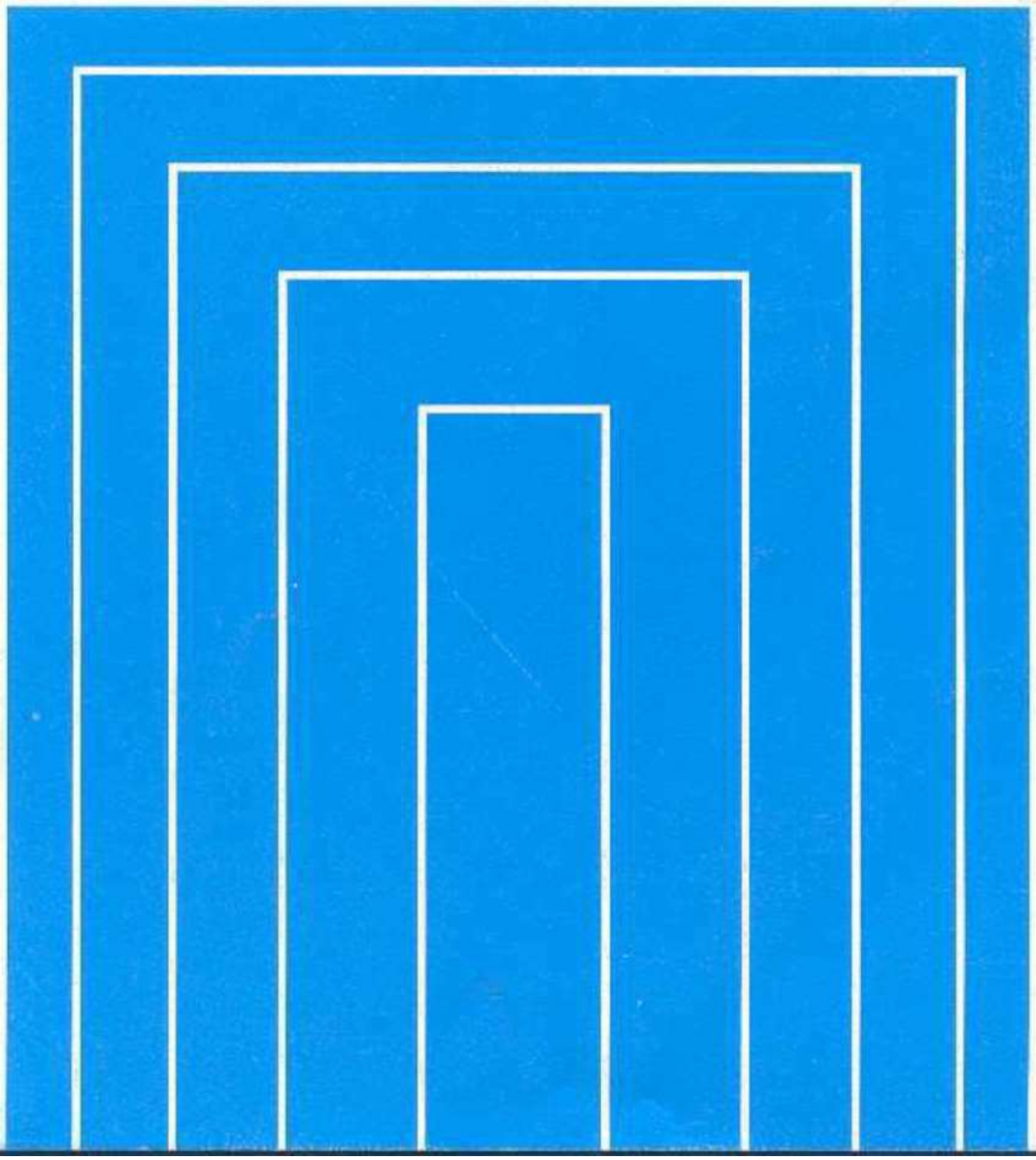
TOYOTA

1KZ-TE ENGINE

REPAIR MANUAL SUPPLEMENT

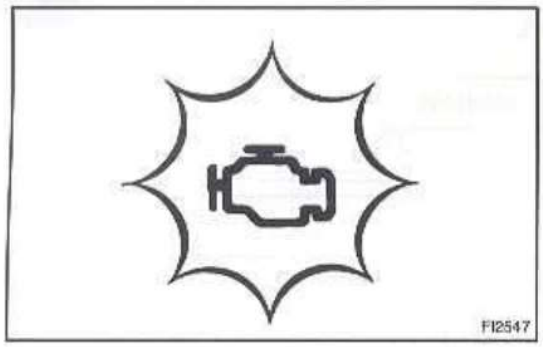
Aug., 2000



Pub. No. RM790E

DIAGNOSTICS

DI



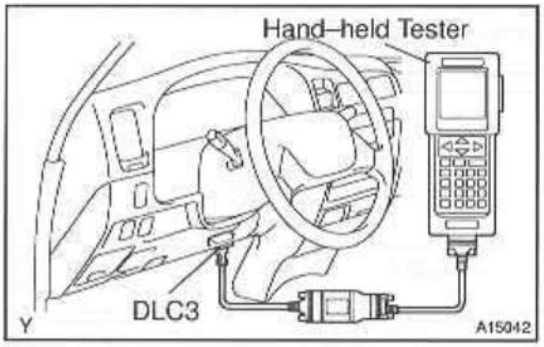
PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

- When troubleshooting Multiplex OBD (M–OBD) vehicles, the only difference from the usual troubleshooting procedure is that you need to connect the vehicle to the hand–held tester, and read off various data output from the vehicle's engine ECU.
- The vehicle's on–board computer lights up the check engine warning light on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components. In addition to the check engine warning light lighting up when a malfunction is detected, the applicable diagnostic trouble codes are recorded in the engine ECU memory. (See page DI–14)

If the malfunction has been repaired, the check engine warning light goes off automatically but the diagnostic trouble codes remain recorded in the engine ECU memory.

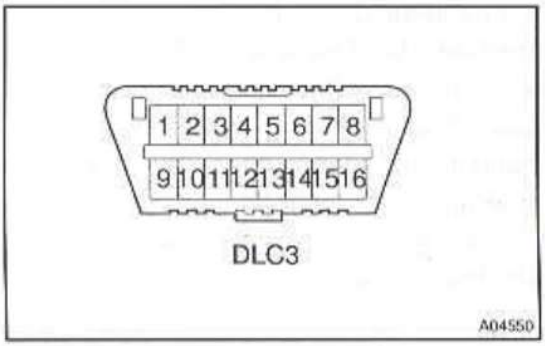


- To check the diagnostic trouble codes, connect the hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle or read the number of blinks of the check engine warning light when TC and CG terminals on the DLC3 are connected. The hand–held tester also enables you to erase the diagnostic trouble codes and activate the several actuators and check freeze frame date and various forms of engine data. (For operating instructions, see the hand–held tester instruction book.)
- The diagnosis system operates in the normal mode during a normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Some diagnostic trouble codes use 2 trip detection logic* to prevent an erroneous detection and ensure thorough the malfunction detection. By switching the engine ECU to the check (test) mode using hand–held tester when troubleshooting, a technician can cause the check engine warning light to light up for a malfunction that is only detected once or momentarily. (hand–held tester only) (See page DI–14)

- *2 trip detection logic:
  When a logic malfunction is first detected, the malfunction is temporarily stored in the engine ECU memory.

If the same malfunction is detected again during the second drive test, this second detection causes the check engine warning light to light up. The 2 trip repeats the same mode twice time. (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip).

- Freeze frame data:
  Freeze frame data records the engine condition when a malfunction is detected, as freeze frame data records the engine conditions (fuel system, calculator load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

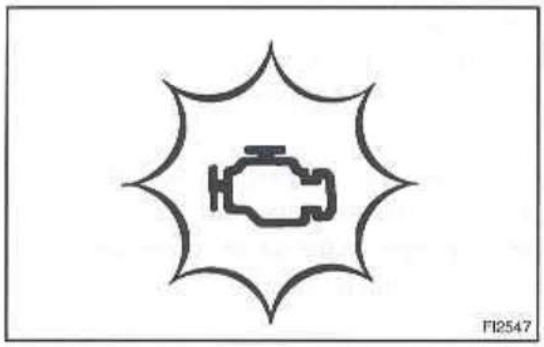


(b) Check the DLC3.
The vehicle's engine ECU uses ISO 14230 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 14230 format.

Terminal No.	Connection/Voltage or Resistance	Condition
7	Bus+ Line/Pulse generation	During transmission
4	Chassis Ground – Body Ground/1 Ω or less	Always
16	Battery Positive – Body Ground/9 – 14 V	Always

HINT:
If your display shows UNABLE TO CONNECT TO VEHICLE when you have connected the cable of the hand–held tester to the DLC3, turned the ignition switch ON and operated the hand–held tester, there is a problem on the vehicle side or tool side.

- If the communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If the communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.



2. Normal Mode:
INSPECT DIAGNOSIS

(a) Check the check engine warning light.
(1) The check engine warning light comes on when the ignition switch is turned ON and the engine is not running.

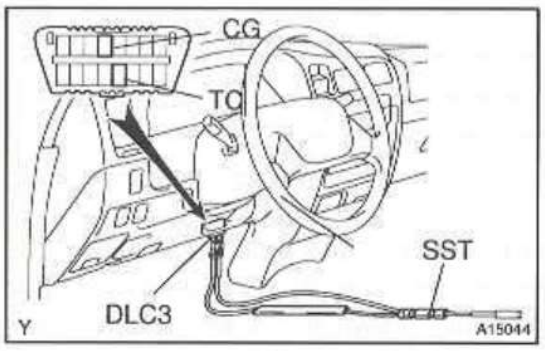
HINT:
If the check engine warning light does not light up, troubleshoot the combination meter.

(2) when the engine is started, the check engine warning light should go off. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

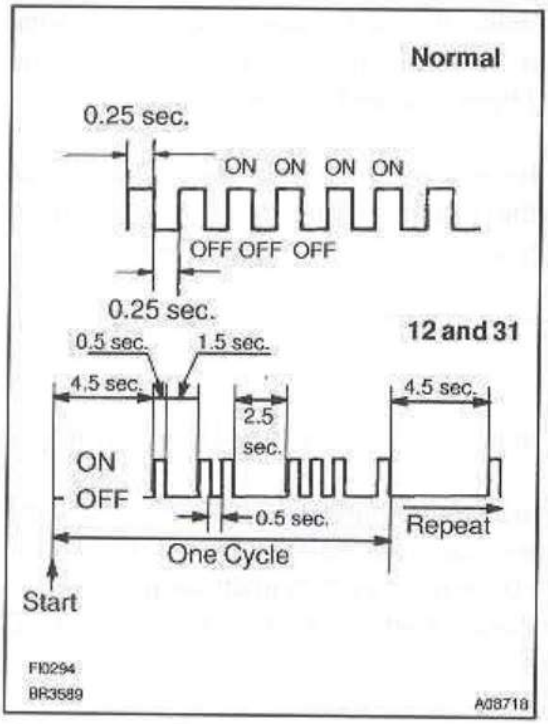
(b) Check the DTC using hand–held tester.

NOTICE:
When the diagnosis system is switched from the normal mode to the check (test) mode, all the DTCs and freeze frame data recorded in the normal mode will be erased. So before switching modes, always check the DTCs and freeze frame data, and note them down.

(1) Prepare the hand–held tester.
(2) Connect the hand–held tester to the DLC3.
(3) Turn the ignition switch ON and the hand–held tester main switch ON.
(4) Use the hand–held tester to check the DTCs and freeze frame data. (for operating instructions, see the hand–held tester's instruction book.)
(5) Confirm the details of the DTCs.



(c) Check the DTC not using hand–held tester.
(1) Turn the ignition switch ON.
(2) Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3 together.
SST 09843–18040



(3) Read the DTC from the check engine warning light. As an example, the blinking patterns for codes; normal, 12 and 31 are as shown in the illustration.

HINT:

If theTC is not output, check the diagnostic connector (DLC3) circuit (See page DI–98).

(4) Check the details of the malfunction using the DTC chart on page DI–14.

(5) After completing the check, disconnect terminals 13 (TC) and 4 (CG) and turn off the display.

HINT:

In the event of 2 or more malfunction codes, the indication will begin from the smaller numbered code to the larger in order.

NOTICE:

When simulating symptoms without a hand–held tester to check the DTCs, use the normal mode. For code on the DTCs chart subject to "2 trip detection logic", turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again. When the problem has been simulated twice, the check engine warning light lights up and the DTCs are recorded in the engine ECU.

3. Check (Test) Mode:

INSPECT DIAGNOSIS

Hand–held tester only:

Compared to the normal mode, the check mode has a further sensitivity to detect malfunctions.

Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check (test) mode.

(a) Check the DTC.

(1) Initial conditions.

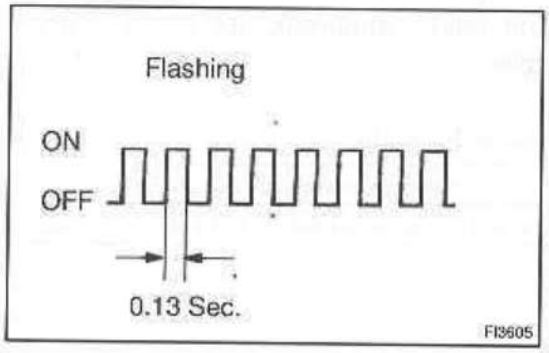
- Battery voltage 22 V or more
- Throttle valve fully closed.
- Transmission in the neutral position

(2) Turn the ignition switch OFF.

(3) Prepare the hand–held tester.

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

(5) Turn the ignition switch ON and push the hand–held tester main switch ON.



(6) Switch the hand–held tester from the normal mode to the check (test) mode (Check that the check engine warning light flashes.).

(7) Start the engine (The check engine warning light goes off after the engine starts.).

(8) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTCs, etc.

(9) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

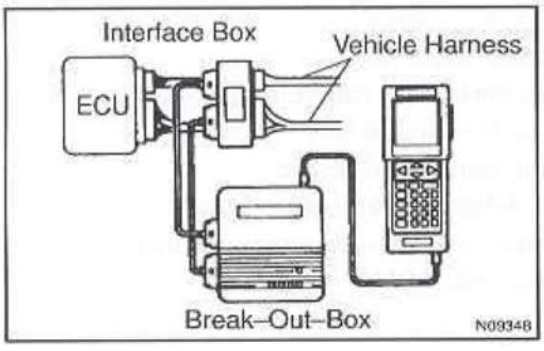
HINT:
Take care not to turn the ignition switch OFF. Turning the ignition switch OFF switches the diagnosis system from the check (test) mode to the normal mode, so all the diagnostic codes, etc. are erased.

(10) After checking the DTCs, inspect the applicable circuit.

(b) Clear the DTC.
The following actions will erase the DTCs and freeze frame data.

- Operating the hand–held tester to erase the codes. (See the hand–held tester's instruction book for operating instructions.)
- Disconnecting the battery terminals, ECD fuse.

NOTICE:
If the hand–held tester switches the engine ECU from the normal mode to the check (test) mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check (test) mode, the DTCs and freeze frame data will be erased.



(c) Measure the engine ECU terminal values using break–out box and hand–held tester.

(1) Connect up the break–out–box and hand–held tester to the vehicle.

(2) Read the engine ECU input/output values by following the prompts on the tester screen.

HINT:
Hand–held tester has a "Snapshot" function.
This records the measured values and is effective in the diagnosis of intermittent problems.
Please refer to the hand–held tester/break–out–box operator's manual for further details.

4. FAIL–SAFE CHART

If any of the following codes is recorded, the engine ECU enters fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
12	TCV duty is fixed at 30.0 %	2 of more TDC signals are detected for 4 engine revolution
13	•Fuel cut •TCV duty is fixed at 1.0 % •Close diesel throttle valve	2 of more NE signals are detected for 0.5 sec.

19(1)	Accelerator pedal closed position SW ON : Accelerator pedal position is fixed at 0 % Accelerator pedal closed position SW OFF : Accelerator pedal position is fixed at 8 %	+B OFF
19(2)	Accelerator pedal closed position SW ON : Accelerator pedal position is fixed at 0 % Accelerator pedal closed position SW OFF : Accelerator pedal position is fixed at 8 %	+B OFF
	Accelerator pedal position below 10 %	+B OFF
19(3)	When the idle SW is faulty. Accelerator pedal closed position SW ON: Accelerator pedal position is fixed at 0 % Accelerator pedal closed position SW OFF: Accelerator pedal position is fixed at 8 %	+B OFF
	When the idle SW is okay. Idle SW ON : Accelerator pedal position is fixed at 0 % Idle SW OFF : Accelerator pedal position below 10 %	+B OFF
19(4)	Accelerator pedal position below 10 %	+B OFF
22	Engine coolant temp. is fixed at 100°C (212°F)	Return to normal condition
24	Intake air temp. is fixed at 20°C (68°F)	Return to normal condition
35	Intake air pressure is fixed at 101.3 kPa (760 mmHg, 30 in.Hg)	Return to normal condition
39	Fuel temp. is fixed at 60°C (140°F)	Return to normal condition
42	Vehicle speed is fixed at 0 km/h (0 mph)	Vehicle speed > 0 km/h (0 mph)

5. CHECK FOR INTERMITTENT PROBLEMS

Hand–held tester only:

By putting the vehicle's engine ECU in the check (test) mode, 1 trip detection logic is possible instead of 2 trip detection logic and sensitivity to detect open circuits is increased. This makes it easier to detect intermittent problems.

(1) Clear the DTC (See step 2).
(2) Set the check (test) mode (See step 3).
(3) Perform a simulation test (See page IN–10).
(4) Check the connector and terminal (See page IN–20).
(5) Handle the connector (See page IN–20).

6. BASIC INSPECTION

When the malfunction code is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits to be considered as causes of the problems.

In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore use of this check is essential in the engine troubleshooting.

1	**Is battery positive voltage 11 V or more when engine is stopped?**

NO → **Charge or replace battery.**

YES

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may not be exactly the same as your readings due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in the check(test) mode, check the circuit for that code listed in the table below. For details of each code, refer to the See page under the respective "DTC No." in the DTC chart.

DTC No. (See page)	Detection Item	Trouble Area	*1 Check Engine Warning Light (NormalMode/ Test Mode)	*2 Memory
12 (DI–26)	Engine speed Sensor Circuit Malfunction (TDC or G1 Circuit)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Engine ECU	ON/ON	○
13 (DI–29)	Engine Speed Sensor Circuit Malfunction (NE Circuit)	• Open or short in engine speed sensor circuit • Engine speed sensor • Engine ECU	ON/ON	○
14 (DI–31)	Timing Control System Malfunction	• Open or short in timing control valve circuit • Fuel filter (Clogging) • Fuel (Freezing, Air in) • Injection pump (Internal pressure and timing control valve) • Engine ECU	ON/N.A.	○
15 (DI–34)	Throttle Control Motor Circuit Malfunction	• Open or short in throttle control motor circuit • Throttle control motor • Throttle valve • Throttle body • Engione ECU	ON/N.A.	○
17	Interior IC Malfunction	• Engine ECU	ON/N.A.	○
18 (DI–38)	Spill Control Valve Malfunction	• Open or short in spill control valve circuit • Spill control valve • Engine ECU	ON/N.A.	○
19 (1) (DI–42)	Accelerator Pedal Position Sensor Circuit Malfunction (Open/Short)	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • Engine ECU	ON/ON	○
19 (2) (DI–50)	Accelerator Pedal Position Sensor Circuit Malfunction (IDL Switch/Range)	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • Engine ECU	ON/N.A.	○
19 (3) (DI–55)	Accelerator Pedal Closed Position Switch Circuit Malfunction (Short)	• Short in accelerator pedal closed position switch circuit • Accelerator pedal closed position switch • Engine ECU	ON/N.A.	○
19 (4) (DI–55)	Accelerator Pedal Closed Position Switch Circuit Malfunction (Open)	• Open in accelerator pedal closed position switch circuit • Accelerator pedal closed position switch • Engine ECU	ON/N.A.	○
22 (DI–57)	Water Temp. Sensor Circuit Malfunction	• Open or short in water temp. sensor circuit • Water temp. sensor • Engine ECU	ON/ON	○
24 (DI–63)	Intake Air Temp. Sensor Circuit Malfunction	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • Engine ECU	OFF/ON	○

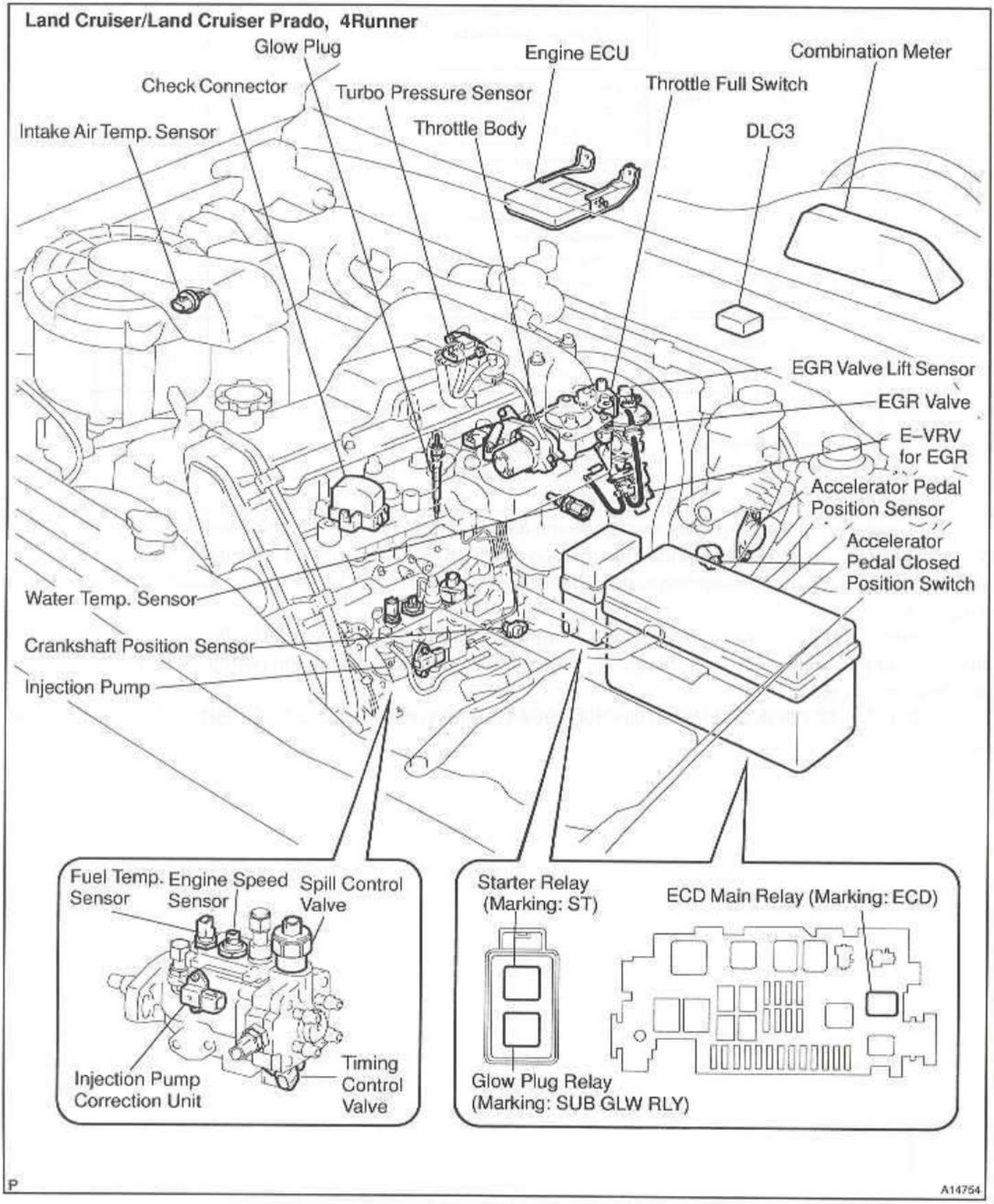
32 (DI–69)	Injection Pump Correction System Malfunction	• Open or short in injection pump correction unit cuicuit • Injection pump correction unit • Vacuum hose disconnected or crogged • Engine ECU	OFF/N.A.	○
35 (DI–71)	Turbo Pressure Sensor Circuit Malfunction	• Open or short in turbo pressure sensor circuit • Turbo pressure sensor • Engine ECU	ON/ON	○
39 (DI–78)	Fuel Temp. Sensor Circuit Malfunction	• Open or short in fuel temp. sensor circuit • Fuel temp. sensor • Engine ECU	ON/ON	○
42 (DI–84)	Vehicle Speed Sensor Signal Circuit Malfunction	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • Engine ECU	ON/ON	○
96 (DI–87)	EGR Valve Lift Sensor Circuit Malfunction	• Open or short in EGR valve lift sensor circuit • EGR valve lift sensor • Engine ECU	ON/ON	○
99*3	Engine Immobilizer System Malfunction	• Open or short in engine immobilizer system circuit • Transponder key amplifier • Transponder key computer • Transponder key coil • Engine ECU	OFF/N.A.	○

*1: "ON" displayed in the diagnosis mode column indicates that the check engine warning light is on when a malfunction is detected. "OFF" indicates that the "CHECK ENGINE" does not light up during the malfunction diagnosis, even if a malfunction is detected. "N.A." indicates that the item is not included in malfunction diagnosis.

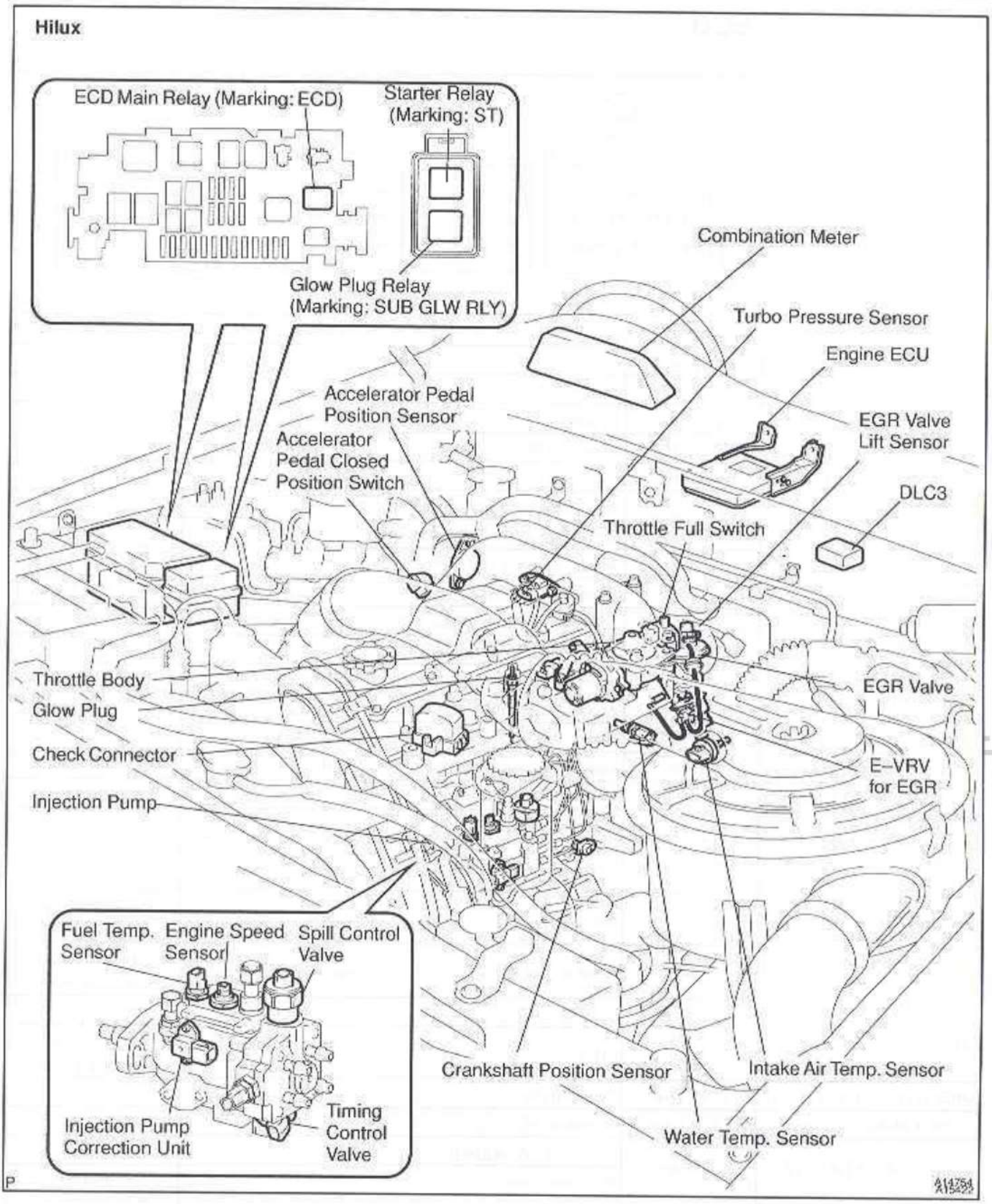
*2: "○" in the memory column indicates that a diagnostic trouble code is recorded in the engine ECU memory when a malfunction occurs. Accordingly, on output of diagnostic results in the normal or test mode is done with the ignition switch ON.

*3: See Pub. No. RM789E (HILUX), RM663U (1999 4Runner) or RM805E (LAND CRUISER PRADO) on BE section.

PARTS LOCATION



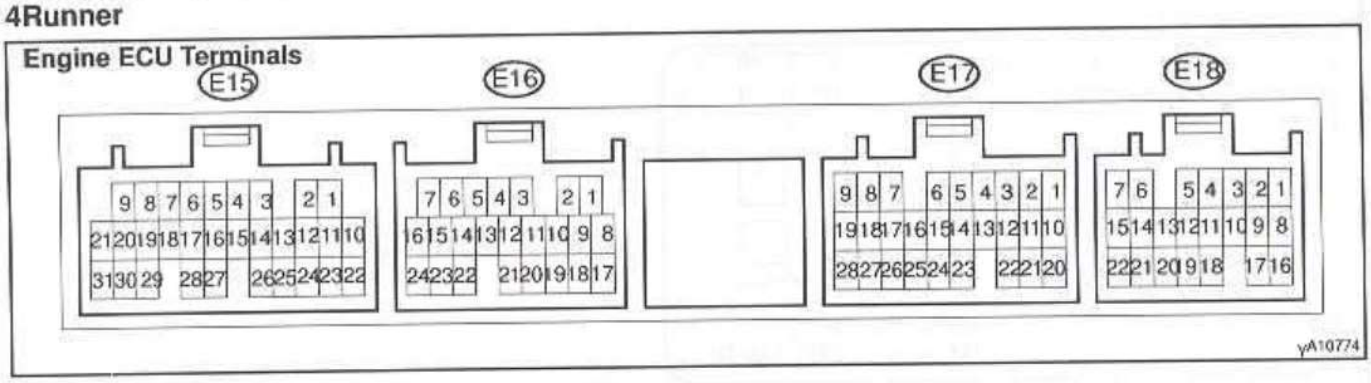
Hilux



TERMINALS OF ECU

4Runner

Engine ECU Terminals

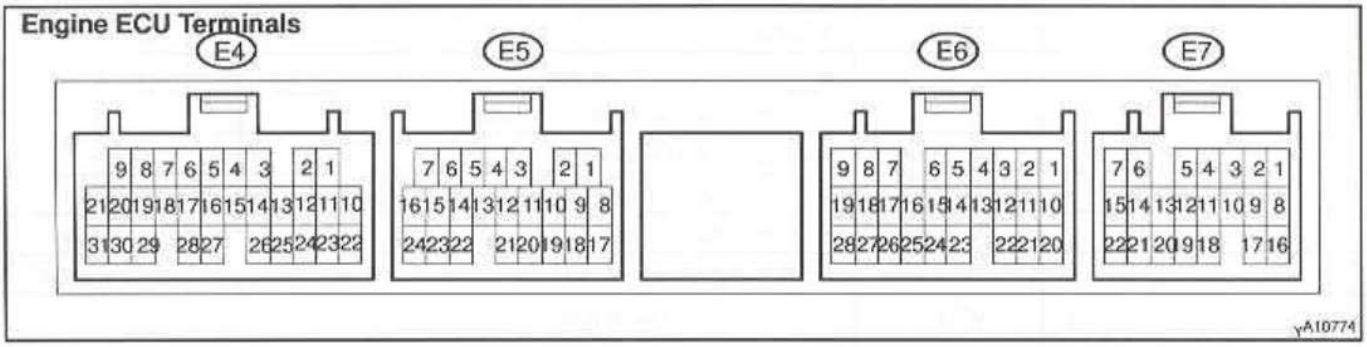


Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E18–2) – E1 (E15–22)	L–R – BR	Always	9 – 14
+ B (E18–9) – E1 (E15–22)	W–R – BR	IG switch ON	9 – 14
VC (E16–21) – E2 (E15–22)	L–B – R	IG switch ON	4.5 – 5.5
VCC (E17–8) – E2C (E17–27)	B–R – BR–B	IG switch ON	4.5 – 5.5
VA (E17–19) – E2C (E17–27)	Y–R – BR–B	Accelerator pedal fully closed	0.6 – 1.3
		Accelerator pedal fully opened	2.8 – 4.5
VAS (E17–28) – E2C (E17–27)	V–W – BR–B	Accelerator pedal fully closed	0.6 – 1.3
		Accelerator pedal fully opened	2.8 – 4.5
IDL (E17–18) – E2C (E17–27)	LG–R – BR–B	Accelerator pedal fully closed	9 – 14
		Accelerator pedal fully opened	0 – 3
PIM (E16–16) – E2 (E16–20)	B–Y – R	Apply vacuum 40 kPa (300 mmHg, 11.8 in.Hg)	1.0 – 1.8
		Apply vacuum 135 kPa (1,000 mmHg, 39.4 in.Hg)	2.3 – 4.2
THA (E16–22) – E2 (E16–20)	Y–G – R	Idling air intake temp. 0°C (32°F) to 60°C (140°F)	0.2 – 3.8
THW (E16–14) – E2 (E16–20)	G – R	Idling engine coolant temp. 60°C (140°F) to 120°C (248°F)	0.1 – 1.5
THF (E16–5) – E2 (E16–20)	W – R	IG switch ON (at engine cold)	0.5 – 3.8
STA (E17–24) – E1 (E15–22)	B–W – BR	Cranking	6.0 or more
TDC+ (E15–16) – TDC– (E15–27)	R – G	Idling	Pulse generation (See page DI–26)
NE+ (E15–17) – NE– (E15–28)	Y – L	Idling	Pulse generation (See page DI–26)
SP1 (E17–22) – E1 (E15–22)	G–O	IG switch ON Rotate driving wheel slowly	Pulse generation (See page DI–84)
TCV (E15–5) – E01 (E15–21)	G–W	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–31)
MREL (E18–7) – E01 (E15–21)	L–Y – W–B	IG switch ON	9 – 14
IGSW (E18–9) – E1 (E15–21)	GR–B – BR	IG switch ON	9 – 14
AC (E17–4) – E1 (E15–22)	L–Y – BR	A/C switch ON (at idling)	0 – 1.5
		A/C switch OFF	9 – 14
ACT (E17–13) – E1 (E15–22)	L–B – BR	IG switch ON	9 – 14
		At A/C cut controlled (Driving below 30 km/h, accelerator pedal fully opened for 5 sec.)	0 – 3
PDL (E17–9) – E1 (E15–22)	L–W – BR	Accelerator pedal fully closed	9 – 14
		Accelerator pedal fully opened	0 – 3

TACH (E17–2) – E1 (E15–22)	LG – BR	Idling	Pulse generation
TC (E18–18) – E1 (E15–22)	GR – BR	IG switch ON	9 – 14
W (E18–12) – E1 (E15–22)	R–W – BR	Check engine warning light lights up	0 – 3
		Except check engine warning light lights up	9 – 14
GIND (E18–3) – E1 (E15–22)	BR – BR	Glow indicator light lights up	0 – 3
		Except glow indicator light lights up	9 – 14
DATA (E16–13) – E1 (E15–22)	V – BR	For 0.5 sec. after IG switch ON	Pulse generation
CLK (E16–12) – E1 (E15–22)	P – BR	For 0.5 sec. after IG switch ON	Pulse generation
SIL (E18–19) – E1 (E18–22)	W – BR	Connect hand–held tester to DLC3	Pulse generation
IMI (E19–17) – E1 (E18–22)	L–B – BR	Idling	Pulse generation
IMO (E19–6) – E1 (E18–22)	L–R – BR	A few sec. after engine staring	Pulse generation

Hilux

Engine ECU Terminals

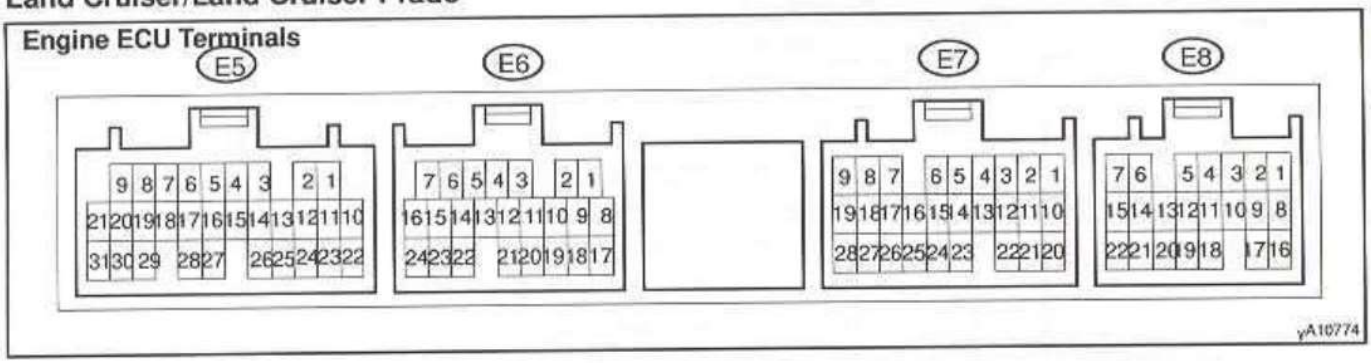


Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E7–2) – E1 (E4–22)	Y – BR	Always	9 – 14
+ B (E7–9) – E1 (E4–22)	R–L – BR	IG switch ON	9 – 14
VC (E5–21) – E2 (E4–22)	B – G–R	IG switch ON	4.5 – 5.5
VCC (E6–8) – E2C (E6–27)	R–W – LG	IG switch ON	4.5 – 5.5
VA (E6–19) – E2C (E6–27)	B–L – LG	Accelerator pedal fully closed	0.6 – 1.3
		Accelerator pedal fully opened	2.8 – 4.5
VAS (E6–28) – E2C (E6–27)	P – LG	Accelerator pedal fully closed	0.6 – 1.3
		Accelerator pedal fully opened	2.8 – 4.5
IDL (E6–18) – E2C (E6–27)	B–R – LG	Accelerator pedal fully closed	9 – 14
		Accelerator pedal fully opened	0 – 3
PIM (E5–16) – E2 (E5–20)	B–Y – G–R	Apply vacuum 40 kPa (300 mmHg, 11.8 in.Hg)	1.0 – 1.8
		Apply vacuum 135 kPa (1,000 mmHg, 39.4 in.Hg)	2.3 – 4.2
THA (E5–22) – E2 (E5–20)	P–L – BR–W	Idling air intake temp. 0°C (32°F) to 60°C (140°F)	0.2 – 3.8
THW (E5–14) – E2 (E5–20)	P – BR–W	Idling engine coolant temp. 60°C (140°F) to 120°C (248°F)	0.1 – 1.5
THF (E5–5) – E2 (E5–20)	LG – B	IG switch ON (at engine cold)	0.5 – 3.8
STA (E6–24) – E1 (E4–22)	V–Y– BR	Cranking	6.0 or more
TDC+ (E4–16) – TDC– (E4–27)	R – G	Idling	Pulse generation (See page DI–26)
NE+ (E4–17) – NE– (E4–28)	W – B	Idling	Pulse generation (See page DI–26)
SP1 (E6–22) – E1 (E4–22)	G–O – BR	IG switch ON Rotate driving wheel slowly	Pulse generation
TCV (E4–5) – E01 (E5–21)	G–B – W–B	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–31)
EGR (E4–4) – E01 (E4–21)	G–W – W–B	IG switch ON	9 – 14
		EGR ON	Pulse generation (See page DI–109)
MREL (E7–7) – E01 (E4–21)	L–O – W–B	IG switch ON	9 – 14
IGSW (E7–9) – E1 (E4–21)	B–W – BR	IG switch ON	9 – 14
AC1 (E6–4) – E1 (E4–22)	Y – BR	A/C switch ON (at idling)	0 – 1.5
		A/C switch OFF	9 – 14
ACT (E6–13) – E1 (E4–22)	LG–R – BR	IG switch ON	9 – 14
		At A/C cut controlled (Driving below 30 km/h, accelerator pedal fully opened for 5 sec.)	0 – 3

PDL (E6–9) – E1 (E4–22)	L – BR	Accelerator pedal fully closed	9 – 14
		Accelerator pedal fully opened	0 – 3
TAC (E6–2) – E1 (E4–22)	B – BR	Idling	Pulse generation
TC (E7–18) – E1 (E4–22)	V – BR	IG switch ON	9 – 14
W (E7–12) – E1 (E4–22)	P – BR	Check engine warning light lights up	0 – 3
		Except check engine warning light lights up	9 – 14
G–IND (E7–3) – E1 (E4–22)	R–W – BR	Glow indicator light lights up	0 – 3
		Except glow indicator light lights up	9 – 14
DATA (E5–13) – E1 (E4–22)	V – BR	For 0.5 sec. after IG switch ON	Pulse generation
CLK (E5–12) – E1 (E4–22)	P – BR	For 0.5 sec. after IG switch ON	Pulse generation
FSW (E6–7) – E1 (E4–22)	R–L – BR	At shift position in first position	9 – 14
		At other shift position in first position	0 – 3
SIL (E7–19) – E1 (E4–22)	V–W – BR	Connect hand–held tester to DLC3	Pulse generation
IMI (E7–17) – E1 (E4–22)	L–B – BR	Idling	Pulse generation
IMO (E7–6) – E1 (E4–22)	L–R – BR	A few sec. after engine staring	Pulse generation

Land Cruiser/Land Cruiser Prado

Engine ECU Terminals



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E8–2) – E1 (E5–22)	B–R – BR	Always	9 – 14
+ B (E8–9) – E1 (E5–22)	B–Y – BR	IG switch ON	9 – 14
VC (E6–21) – E2 (E5–22)	L–R – BR–W	IG switch ON	4.5 – 5.5
VCC (E7–8) – E2C (E7–27)	L–R – BR–W	IG switch ON	4.5 – 5.5
VA (E7–19) – E2C (E7–27)	R–Y – BR–W	Accelerator pedal fully closed	0.6 – 1.3
		Accelerator pedal fully opened	2.8 – 4.5
VAS (E7–28) – E2C (E7–27)	P–L – BR–W	Accelerator pedal fully closed	0.6 – 1.3
		Accelerator pedal fully opened	2.8 – 4.5
IDL (E7–18) – E2C (E7–27)	LG–B – BR–W	Accelerator pedal fully closed	9 – 14
		Accelerator pedal fully opened	0 – 3
PIM (E6–16) – E2 (E6–20)	P–L – BR–W	Apply vacuum 40 kPa (300 mmHg, 11.8 in.Hg)	1.0 – 1.8
		Apply vacuum 135 kPa (1,000 mmHg, 39.4 in.Hg)	2.3 – 4.2
THA (E6–22) – E2 (E6–20)	W–G – BR–W	Idling Air intake temp. 0°C (32°F) to 60°C (140°F)	0.2 – 3.8
THW (E6–14) – E2 (E6–20)	G–B – BR–W	Idling Engine coolant temp. 60°C (140°F) to 120°C (248°F)	0.1 – 1.5
THF (E6–5) – E2 (E6–20)	B–R – BR–W	IG switch ON (at engine cold)	0.5 – 3.8
STA (E7–24) – E1 (E5–22)	B–W – BR	Cranking	6.0 or more
TDC+ (E5–16) – TDC– (E5–27)	B – W	Idling	Pulse generation (See page DI–26)
NE+ (E5–17) – NE– (E5–28)	L – G	Idling	Pulse generation (See page DI–26)
SP1 (E7–22) – E1 (E5–22)	V – BR	IG switch ON Rotate driving wheel slowly	Pulse generation
TCV (E5–5) – E01 (E5–21)	R–Y – W–B	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–31)
EGR (E7 – 24) – E01 (E7–13)	R–G – W–B	EGR ON	Pulse generation (See page DI–109)
S/TH (E7–10) – E01 (E7–13)	W–L – W–B	VSV OFF at idling	9 – 14
		VSV ON (after IG switch OFF for 2 sec.)	0 – 3
PA (E7–9) – E01 (E7–13)	W–R – W–B	VSV for atmospheric pressure leaning OFF	9 – 14
		VSV for atmospheric pressure leaning ON	0 – 3
MREL (E8–7) – E01 (E5–21)	B–W – W–B	IG switch ON	9 – 14
IGSW (E1–9) – E1 (E5–21)	B–R – BR	IG switch ON	9 – 14
AC (E7–4) – E1 (E5–22)	W–G – BR	A/C switch ON at idling	0 – 1.5
		A/C switch OFF	9 – 14

ACT (E7–13) – E1 (E5–22)	L–B – BR	IG switch ON	9 – 14
		At A/C cut controlled (Driving below 30 km/h, accelerator pedal fully opened for 5 sec.)	0 – 3
PDL (E7–9) – E1 (E5–22)	GR – BR	Accelerator pedal fully closed	9 – 14
		Accelerator pedal fully opened	0 – 3
TAC (E7–2) – E1 (E5–22)	B – BR	Idling	Pulse generation
TC (E8–18) – E1 (E5–22)	P–B – BR	IG switch ON	9 – 14
W (E8–12) – E1 (E5–22)	W – BR	Check engine warning light lights up	0 – 3
		Except check engine warning light lights up	9 – 14
G–IND (E8–3) – E1 (E5–22)	Y–R – BR	Glow indicator light lights up	0 – 3
		Except glow indicator light lights up	9 – 14
DATA (E6–13) – E1 (E5–22)	G–B – BR	For 0.5 sec. after IG switch ON	Pulse generation
CLK (E6–12) – E1 (E5–22)	G–W – BR	For 0.5 sec. after IG switch ON	Pulse generation
EGRC (E7–3) – E1 (E5–22)	R – BR	IG switch ON	0 – 3
		Maintain engine speed at 1500 rpm after warming up	9 – 14
IREL (E9–2) – E1 (E5–22)	G–Y – BR	IG switch ON	0 – 3
		At intake heater ON	9 – 14
VCH (E7–23) – E1 (E5–22)	Y–R – BR	Heater blower switch ON	0 – 3
		Heater blower switch OFF	9 – 14
SVR (E9–13) – E1 (E5–22)	L–W – BR	IG switch ON	0 – 1.5
VCT (E6–7) – E1 (E5–22)	L–B – BR	Heater blower switch ON	0 – 3
		Heater blower switch OFF	9 – 14
HSW (E9–20) – E1 (E5–22)	B–L – BR	Push on power heater switch	0 – 3
		Push off power heater switch	9 – 14
FSW (E7–7) – E1 (E5–22)	R–L – BR	At shift position in first position	9 – 14
		At other shift position in first position	0 – 3
PS (E7–9) – E1 (E8–22)	P – BR	Idling Turn steering wheel	0 – 3
		IG switch ON	9 – 14
SIL (E8–19) – E1 (E8–22)	V–W – BR	Connect hand–held tester to DLC3	Pulse generation
IMI (E9–17) – E1 (E8–22)	L–B – BR	Idling	Pulse generation
IMO (E9–6) – E1 (E8–22)	L–R – BR	A few sec. after engine staring	Pulse generation

PROBLEM SYMPTOMS TABLE

When the malfunction code is not confirmed the DTC check and the problem still can not be confirmed in the basic inspection, then proceed to this step and perform a troubleshooting according to the numbered order given in the table below.

Symptom	Suspect Area	See page
Does not crank (Difficult to start)	1. Starter 2. Starter relay 3. Neutral start switch circuit (A/T)	# # –
Cold engine (Difficult to start)	1. STA signal circuit 2. Injection nozzle 3. Fuel filter 4. Engine ECU 5. Injection pump	DI–104 FU–3 # # FU–5
Hot engine (Difficult to start)	1. STA signal circuit 2. Injection nozzle 3. Fuel filter 4. Compression 5. Engine ECU 6. Injection pump	DI–104 FU–3 # # # FU–5
Soon after starting (Engine stall)	1. Fuel filter 2. ECU power source circuit 3. Engine ECU 4. Injection pump	# DI–92 # FU–5
Others (Engine stall)	1. ECU power source circuit 2. Engine ECU 3. Injection pump	DI–92 # FU–5
Incorrect first idle (Poor idling)	1. Fuel filter 2. Engine ECU 3. Injection pump	# # FU–5
High engine idle speed (Poor idling)	1. A/C signal circuit 2. STA signal circuit 3. Engine ECU 4. Injection pump	DI–125 DI–104 # FU–5
Lower engine idle speed (Poor idling)	1. A/C signal circuit 2. Injection nozzle 3. EGR control circuit 4. Compression 5. Valve clearance 6. Fuel line (Air beed) 7. Engine ECU 8. Injection pump	DI–125 FU–3 DI–109 # # – # FU–5
Rough idling (Poor idling)	1. Injection nozzle 2. Fuel line (Air beed) 3. EGR control circuit 4. Compression 5. Valve clearance 6. Engine ECU 7. Injection pump	FU–3 – DI–109 # # # FU–5

Hunting at hot engine (Poor idling)	1. Injection nozzle 2. ECU power source circuit 3. Compression 4. Fuel line (Air bleed) 5. Valve clearance 6. Engine ECU 7. Injection pump	FU–3 DI–92 # – # # FU–5
Hunting at cold engine (Poor idling)	1. Injection nozzle 2. ECU power source circuit 3. Compression 4. Fuel line (Air bleed) 5. Valve clearance 6. Engine ECU 7. Injection pump	FU–3 DI–92 # – # # FU–5
Hesitation/ Poor acceleration (Poor driveability)	1. Injection nozzle 2. Fuel filter 3. EGR control circuit 4. Compression 5. Engine ECU 6. Injection pump	FU–3 # DI–109 # # FU–5
Knocking (Poor driveability)	1. Injection nozzle 2. EGR control circuit 3. Engine ECU	FU–3 DI–109 #
Black smoke (Poor driveability)	1. Injection nozzle 2. EGR control circuit 3. Engine ECU 4. Injection pump	FU–3 DI–109 # FU–5
White smoke (Poor driveability)	1. EGR control circuit 2. Injection nozzle 3. Fuel filter 4. Engine ECU 5. Injection pump	DI–109 FU–3 # # FU–5
Surging/ Hunting (Poor driveability)	1. Injection nozzle 2. Engine ECU 3. Injection pump	FU–3 # FU–5

#: See Pub. No. RM710E (1KZ–TE), RM789E (Hilux Sup.), RM663U (1999 4Runner) or RM805E (Land Cruiser/Land Cruiser Prado Sup.).

CIRCUIT INSPECTION

D310-05

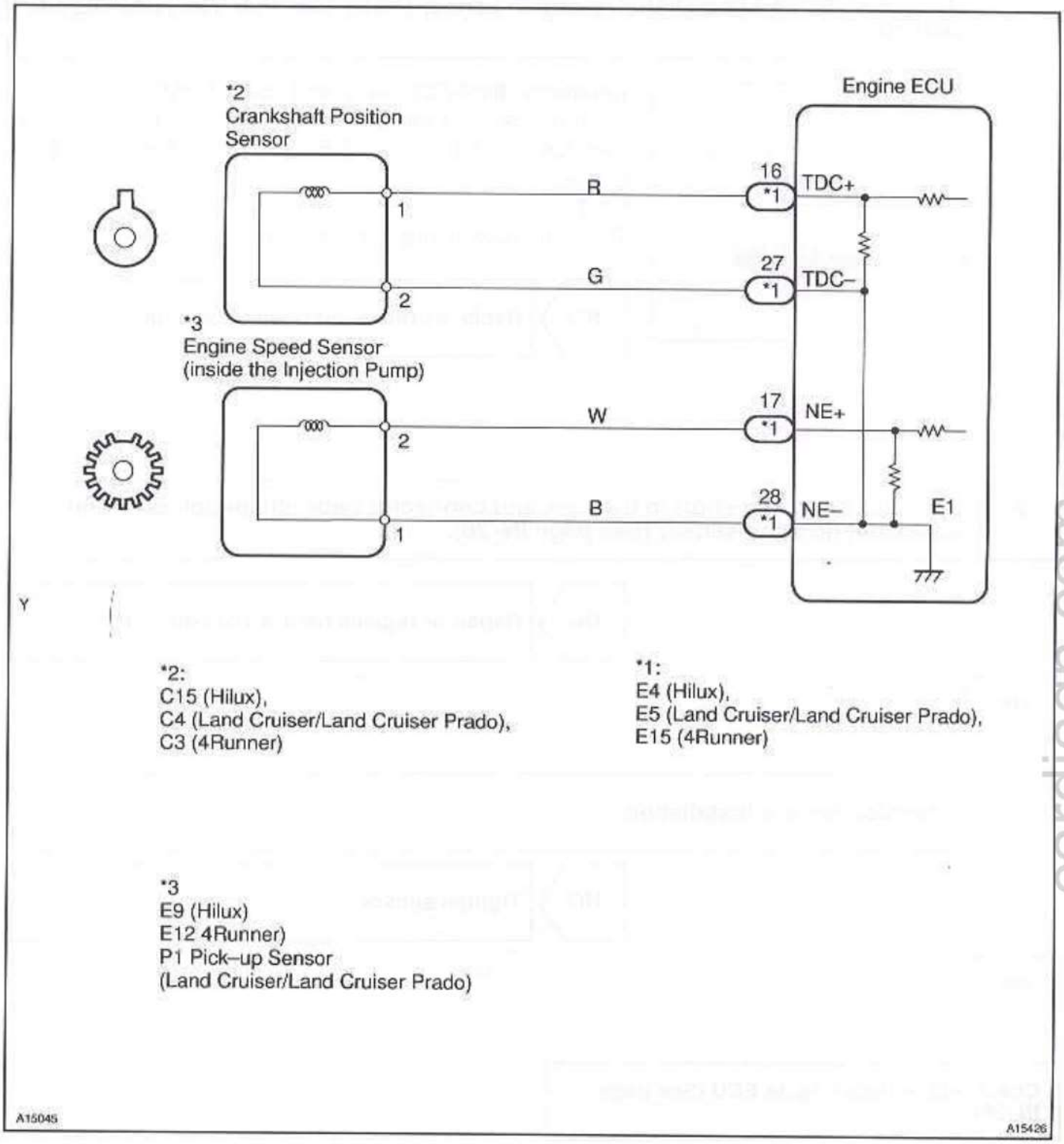
DTC	12	Crankshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

The crankshaft position sensor in the Engine Control System contains a signal plate and a pickup coil for a TDC signal. The TDC signal plate has 1 tooth on its outer circumference. The TDC signal sensor generates 1 signal for every engine revolution. The engine ECU detects the top dead center by the TDC signals.
The engine speed sensor in the Engine Control System contains a signal plate and a pickup coil for a NE signal. The NE signal plate has 78 teeth and is mounted in the injection pump. The NE signal sensor generates 78 signals of 2 engine revolutions. The engine ECU detects the engine speed and cam lift position of the injection pump. The engine ECU uses TDC signal and NE signals for injection timing control. And NE signal is used for injection volume control, too.

DTC No.	DTC Detection Condition	Trouble Area
12	No TDC signal to engine ECU at 400 rpm or more	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Engine ECU

WIRING DIAGRAM



*2:
C15 (Hilux),
C4 (Land Cruiser/Land Cruiser Prado),
C3 (4Runner)

*1:
E4 (Hilux),
E5 (Land Cruiser/Land Cruiser Prado),
E15 (4Runner)

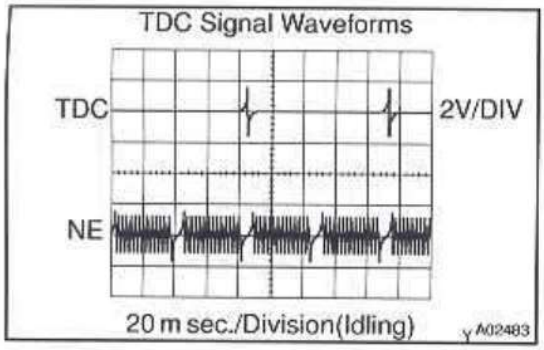
*3
E9 (Hilux)
E12 4Runner)
P1 Pick–up Sensor
(Land Cruiser/Land Cruiser Prado)

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand–held tester, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Check resistance of crankshaft position sensor (TDC) (See Pub. No. RM710E, ED section).



Reference: INSPECTION USING OSCILLOSCOPE
During cranking or idling, check the wveforms between terminals TDC+ and TDC–, and NE+ and NE– of the engine ECU connector.
HINT:
The correct wavaforms are as shown.

NG → Replace crankshaft position sensor.

OK

2	Check for open and short in harness and connector between engine ECU and crankshaft position sensor (See page IN–20).

NG → Repair or replace harness or connector.

OK

3	Inspection sensor installation.

NG → Tighten sensor.

OK

Check and replace engine ECU (See page IN–20).

DTC	13	Engine Speed Sensor Circuit Malfunction (NECircuit)

CIRCUIT DESCRIPTION

Refer to DTC12 on page DI–26.

DTC No.	DTC Detection Condition	Trouble Area
13	No NE signal to engine ECU for 0.5 sec. or more at 580 rpm or more	• Open or short in engine speed sensor circuit • Engine speed sensor • Engine ECU
	No NE signal to engine ECU for 2.0 sec. or more during cranking	

WIRING DIAGRAM

Refer to DTC12 on page DI–26.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand–held tester, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Check resistance of engine speed sensor (See Pub. No. RM710E, ED section).

NG → Replace injection pump (See page FU–5).

OK

2	Check for open and short in harness and connector between engine ECU and engine speed sensor (See page IN–20).

NG → Repair or replace harness or connector.

OK

3	Inspect sensor installation.

NG → Tighten sensor.

DXFG-01

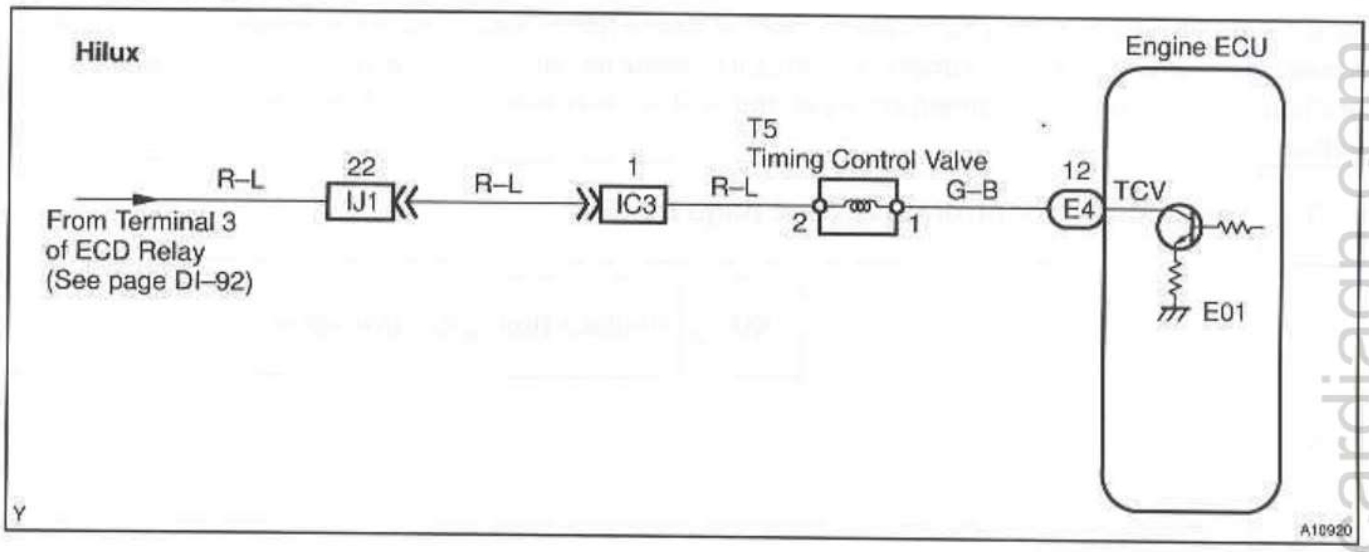
DTC	14	Timing Control System Malfunction

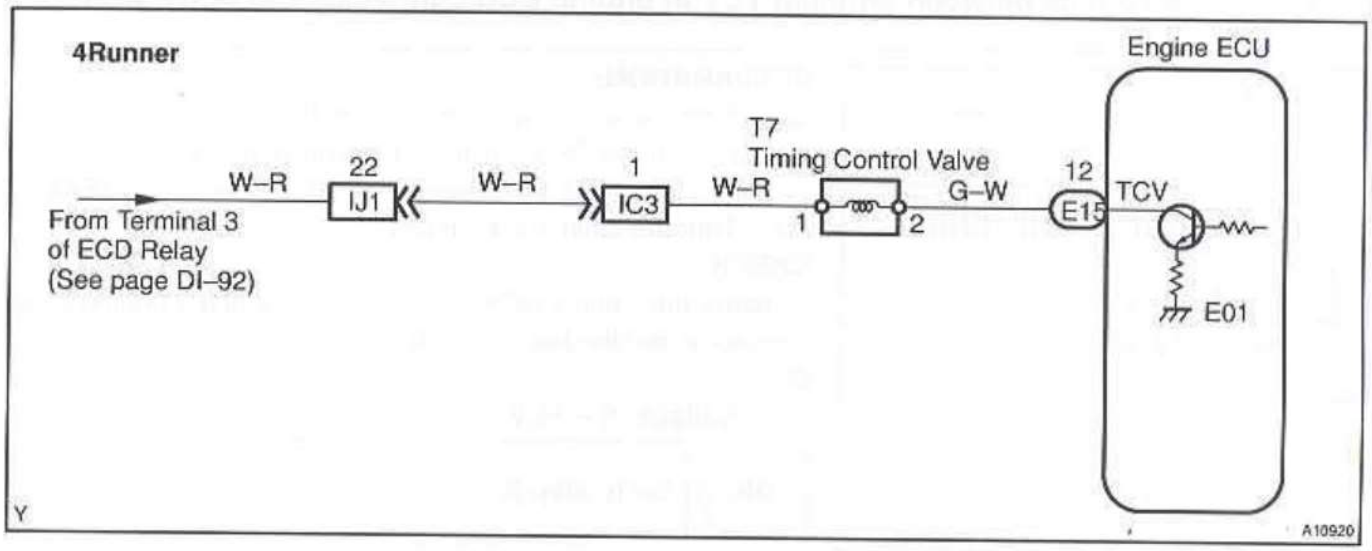
CIRCUIT DESCRIPTION

The engine ECU controls the injection timing by actuating the timing control valve. The timing control valve is mounted on the injection pump and delay one by duty control of pump internal fuel pressure.
The engine ECU detects the injection advance angle by TDC and NE signals.

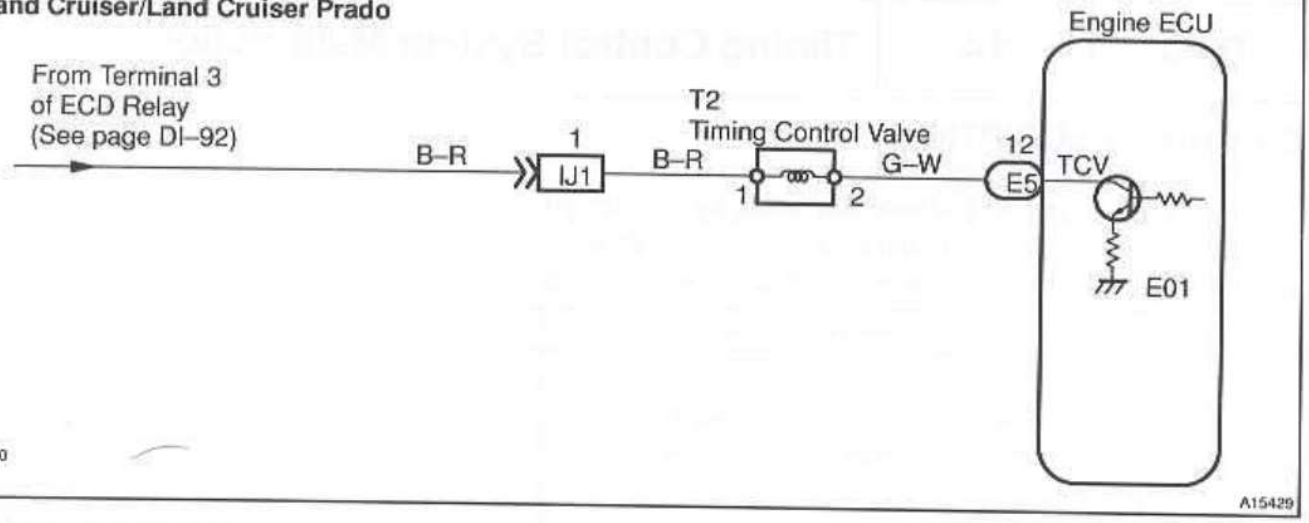
DTC No.	DTC Detection Condition	Trouble Area
14	After engine warmed up and during, actual injection timing is different from target value of engine ECU calculated for several sec.	• Open or short in timing control valve circuit • Timing control valve • Fuel filter (Clogging) • Fuel (Freezing, Air in) • Injection pump (Internal pressure and timing control valve) • Engine ECU

WIRING DIAGRAM





Land Cruiser/Land Cruiser Prado



INSPECTION PROCEDURE

HINT:

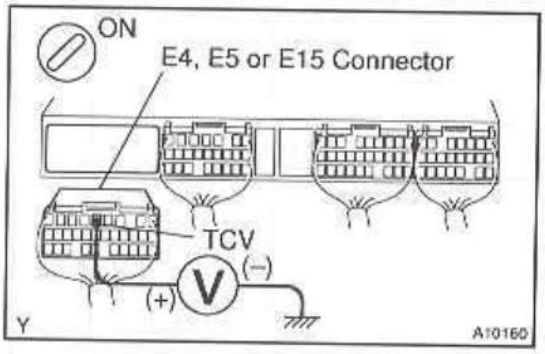
Read freeze frame data using hand–held tester, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Check timing control valve (See page FU–5).**

NG → **Replace timing control valve.**

OK

2	**Check voltage between terminal TCV of engine ECU connector and body ground.**



PREPARATION:

(a) Remove the glove compartment door.
(b) Disconnect the E4 (Hilux), E5 (Land Cruiser/Land Cruiser Prado) or E15 (4Runner) connector of the engine ECU.
(c) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal TCV of the engine ECU connector and the body ground.

OK:

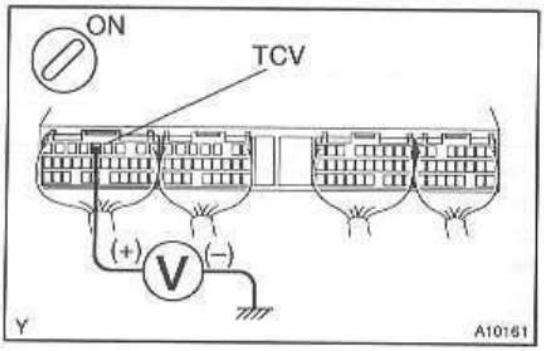
Voltage: 9 – 14 V

OK → **Go to step 3.**

NG

Check for open or short in harness and connector between timing control valve and engine ECU, and timing control valve and ECD main relay (Marking: ECD) (See page IN–20).

3	Check voltage between terminal TCV of engine ECU connector and body ground.



PREPARATION:

(a) Remove the glove compartment door.

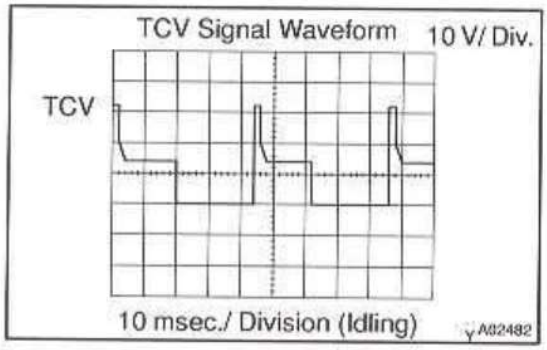
(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal TCV of the engine ECU connector and the body ground.

OK:

Voltage: 9 – 14 V



Reference: INSPECTION USING OSCILLOSCOPE

During idling, check the waveform between terminals TCV and E1 of the engine ECU connector.

HINT:

The correct waveform is as shown.

NG → **Check and replace engine ECU (See page IN–20).**

OK

4	Check fuel filter being clogged, fuel freezing and fuel air in.

NG → **Replace or repair.**

OK

Check and replace injection pump (See page FU–5).

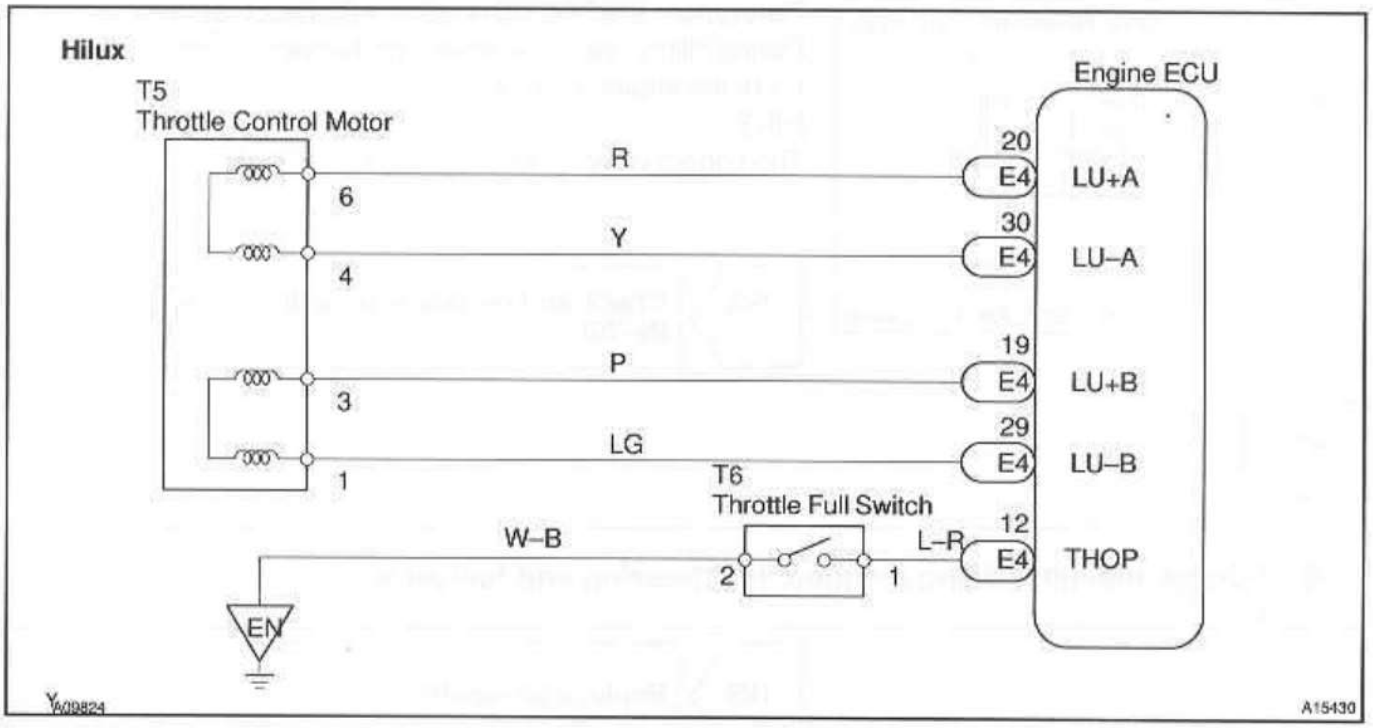
DTC	15	Throttle Control Motor Circuit Malfunction

CIRCUIT DESCRIPTION

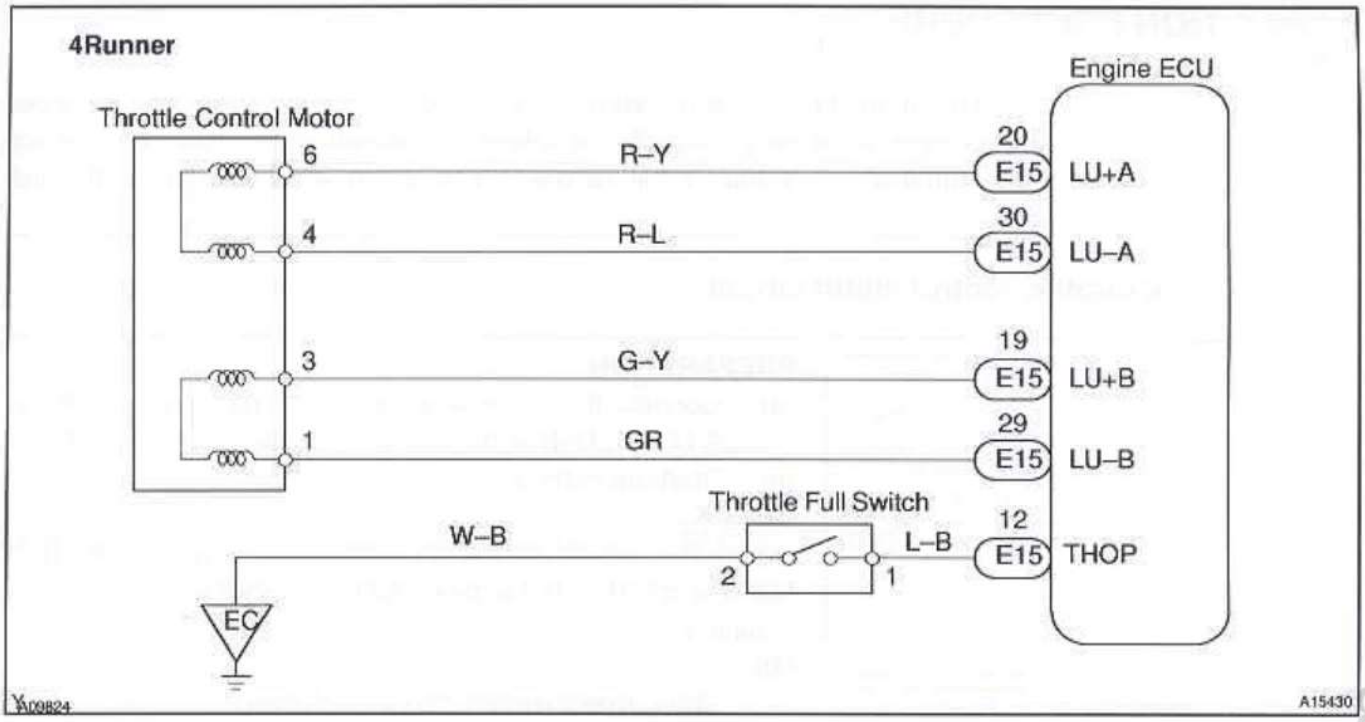
Throttle control motor is operated by the engine ECU and it opens and closes the throttle valve.
The fully opening of the throttle valve is detected by the throttle fully open position switch which is mounted on the throttle body.
If this DTC is stored, the engine ECU cuts the power for the throttle control motor.

DTC No.	DTC Detection Condition	Trouble Area
15	Open or short in throttle control motor circuit	• Open or short in throttle control motor circuit • Throttle control motor • Throttle valve • Throttle body • Engine ECU
	Open or short in throttle full switch circuit	

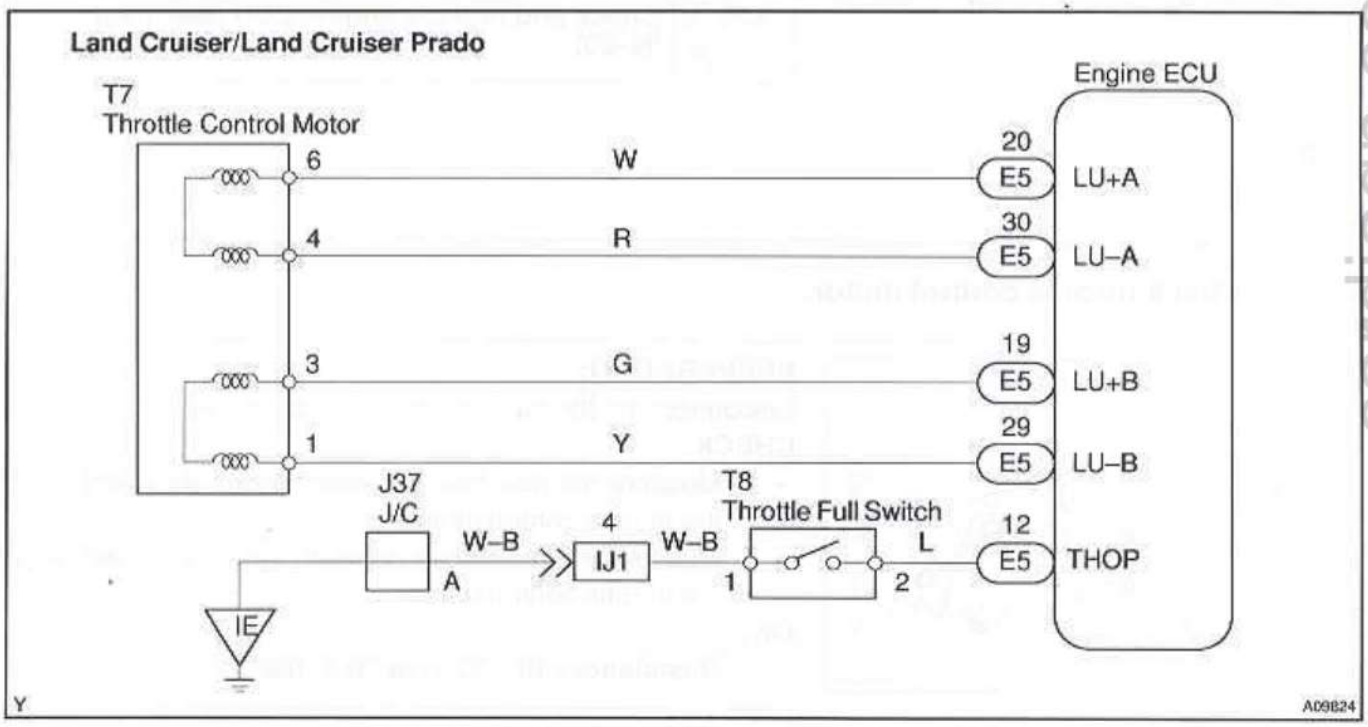
WIRING DIAGRAM



4Runner



Land Cruiser/Land Cruiser Prado

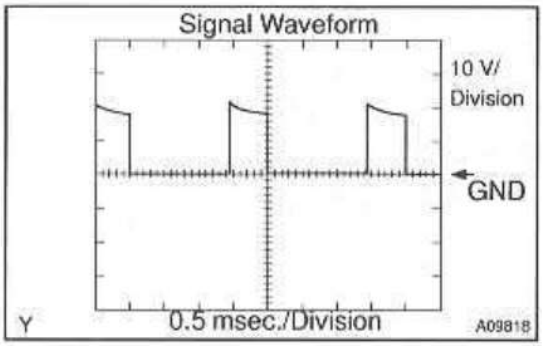


INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand–held tester, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Check throttle control motor circuit.**



PREPARATION:

(a) Connect the oscilloscope between terminals LU+A/LU–A/LU+B/LU–B and E01 of the engine ECU connector.

(b) Start the engine.

CHECK:

Check the waveform between terminals LU+A/LU–A/LU+B/LU–B and E01 of the engine ECU connector when the engine is racing.

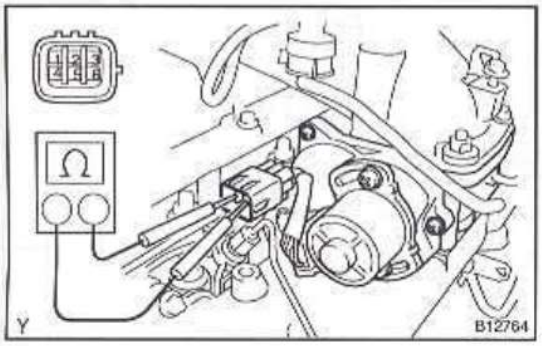
OK:

The correct waveform is as shown.

OK	**Check and replace engine ECU (See page IN–20).**

NG

2	**Check throttle control motor.**



PREPARATION:

Disconnect the throttle control motor connector.

CHECK:

- Measure the resistance between terminals 2 and 1/3 of the throttle control motor.
- Measure the resistance between terminals 5 and 4/6 of the throttle control motor.

OK:

Resistance: 18 – 22 Ω at 20°C (68°F)

NG	**Replace throttle body assembly (See page ED–1).**

OK

3	**Check for open and short in harness and connector between throttle control motor and engine ECU (See page IN–20).**

NG → Repair or replace harness or connector.

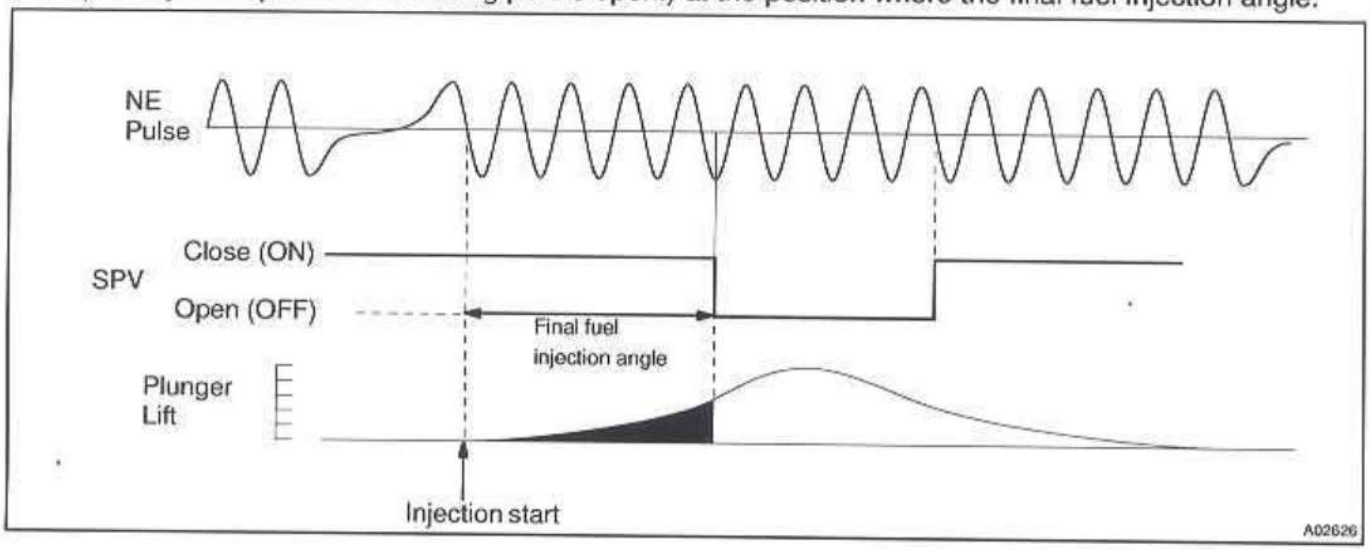
OK

Check and replace engine ECU.

DTC	18	Spill Control Valve Circuit

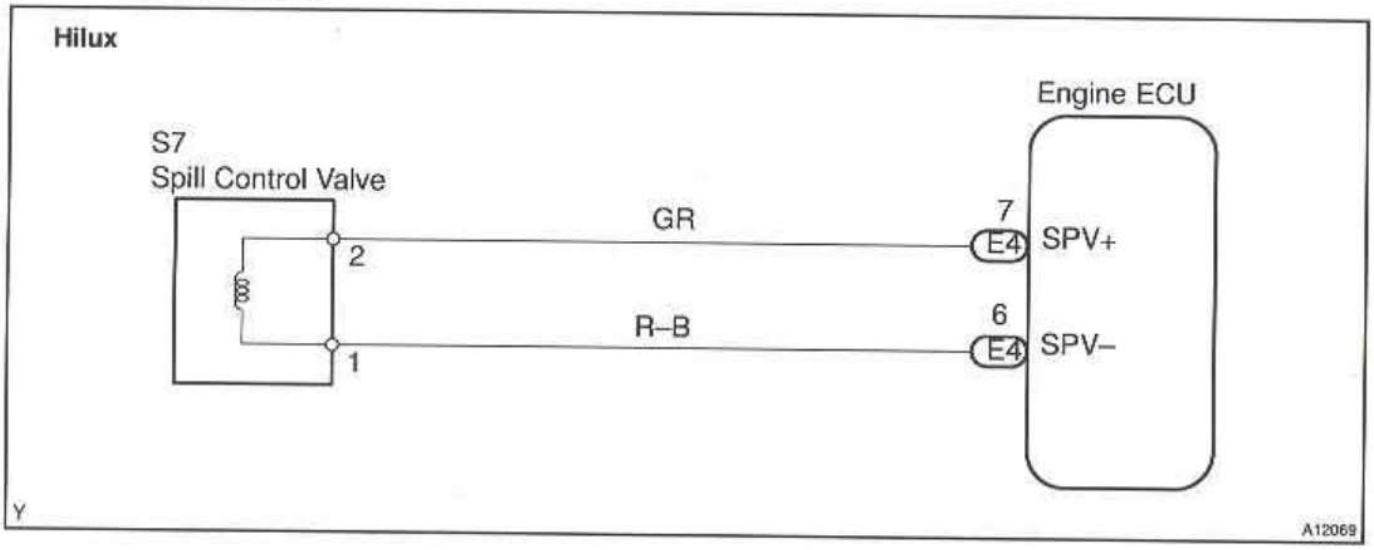
CIRCUIT DESCRIPTION

The engine ECU controls the fuel injection volume by operating the spill control valve. The spill control valve is mounted on the injection pump, and open or close the injection pressure releasing port by the solenoid valve in the spill control valve (During injection; valve is close (ON)). The engine ECU decides the basic fuel injection volume by the engine rpm and throttle valve opening angle, and calculates the final fuel injection angle to add the various corrections on the basic fuel injection volume. The engine ECU counts the NE pulse to detects the angle from the time when the injection starts and operates the spill control valve from ON to OFF (The injection pressure releasing port is open.) at the position where the final fuel injection angle.

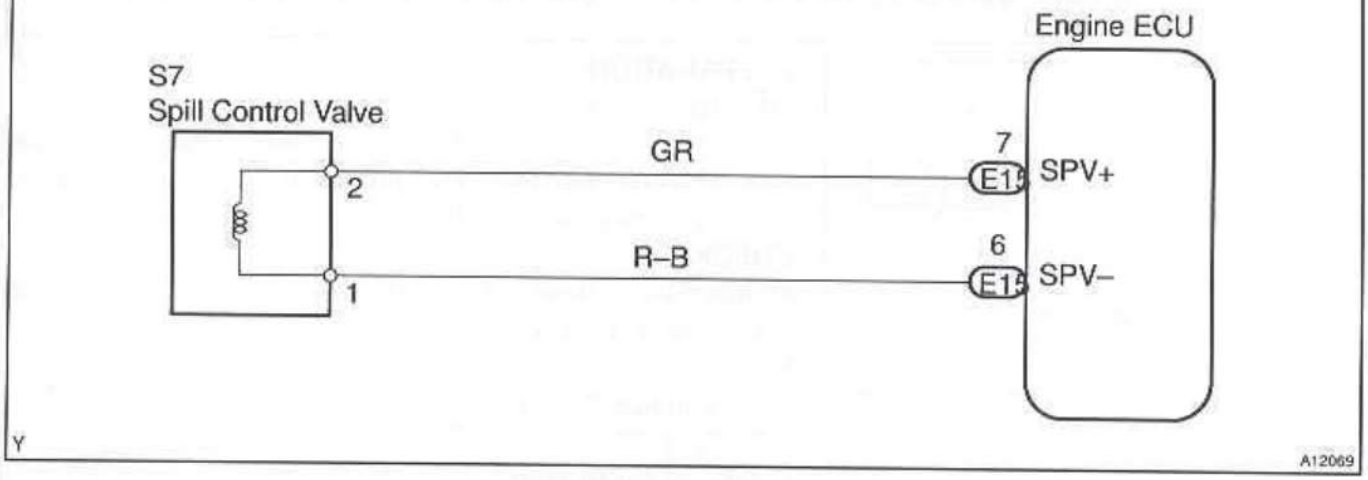


DTC No.	DTC Detection Condition	Trouble Area
18	Open or short in spill control valve circuit	• Open or short in spill control valve circuit • Spill control valve • Engine ECU

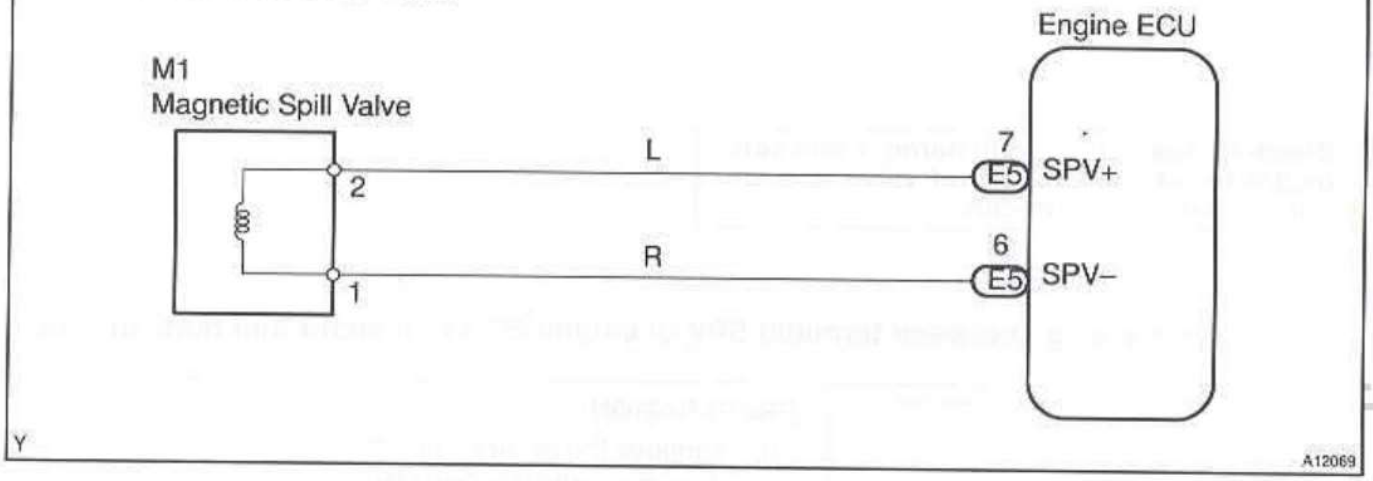
WIRING DIAGRAM



4Runner



Land Cruiser/Land Cruiser Prado



INSPECTION PROCEDURE

HINT:

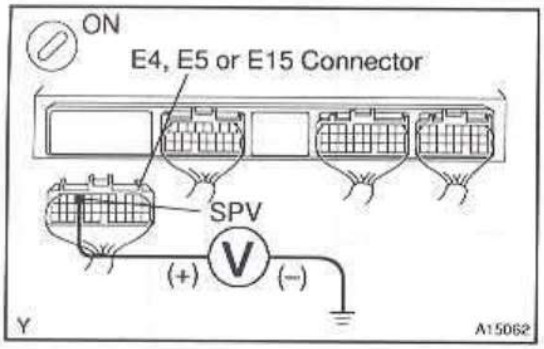
Read freeze frame data using hand–held tester, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Check spill control valve (See page ED–9).**

NG → **Replace injection pump (See page FU–12).**

OK

2	Check voltage between terminal SPV of engine ECU connector and body ground.



PREPARATION:
(a) Remove the glove compartment.
(b) Disconnect the E4 (Hilux), E5 (Land Cruiser/Land Cruiser Prado) or E15 (4Runner) connector from the engine ECU.
(c) Turn the ignition switch ON.

CHECK:
Measure the voltage between terminal SPV of the engine ECU connector and the body ground.

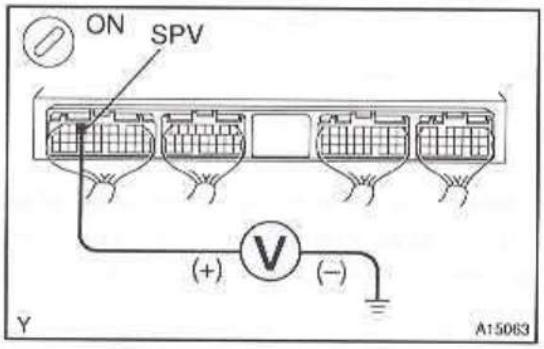
OK:
Voltage: 9 – 14 V

OK	Go to step 3.

NG

Check for open or short in harness and connector between spill control valve and engine ECU (See page IN–20).

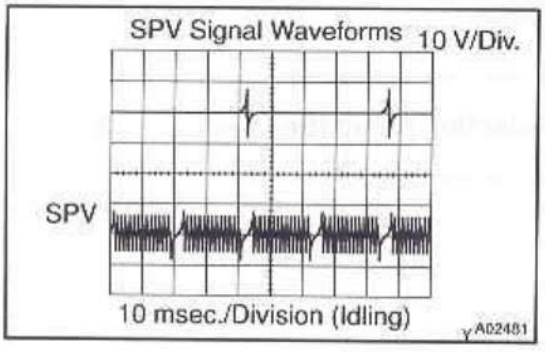
3	Check voltage between terminal SPV of engine ECU connector and body ground.



PREPARATION:
(a) Remove the glove compartment.
(b) Turn the ignition switch ON.

CHECK:
Measure the voltage between terminals SPV of the engine ECU connector and the body ground.

OK:
Voltage: 9 – 14 V



Reference: INSPECTION USING OSCILLOSCOPE
During idling, check the waveforms between terminals SPV and E1 of the engine ECU connector.
HINT:
The correct waveforms are as shown.

NG

Check and replace engine ECU (See page IN–20).

DTC	19 (1)	Accelerator Pedal Position Sensor circuit Malfunction (Open/Short)

CIRCUIT DESCRIPTION

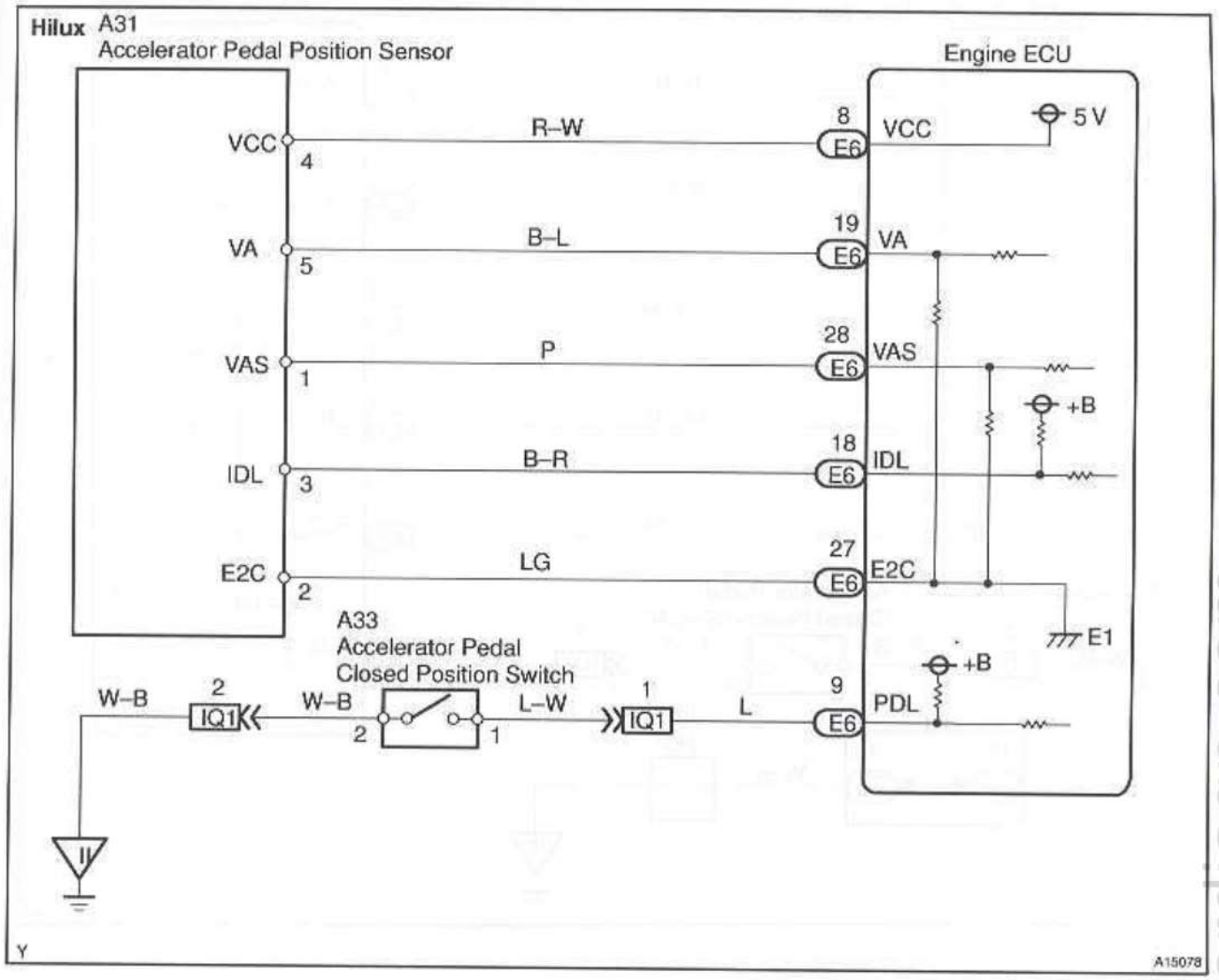
The accelerator pedal position sensor is mounted in the accelerator pedal and detects the accelerator pedal opening angle. When the accelerator pedal is fully closed, a voltage of approximately 1.0 V is applied to terminals VA, VAS of the engine ECU. The voltage applied to the terminals VA, VAS of the engine ECU increases in proportion to the opening angle of the accelerator pedal and becomes approximately 3.8 V when the accelerator pedal is fully opened. The engine ECU judges the vehicle driving conditions from these signals input from terminals VA, VAS and uses them as one of the conditions to control the injection volume and diesel throttle valve position. The idle switch is mounted in the accelerator pedal position sensor and sends the IDL signal to the engine ECU when the accelerator pedal is fully closed.
This system has the 2 ways accelerator pedal position sensor and accelerator pedal closed position switch for the fail safe.

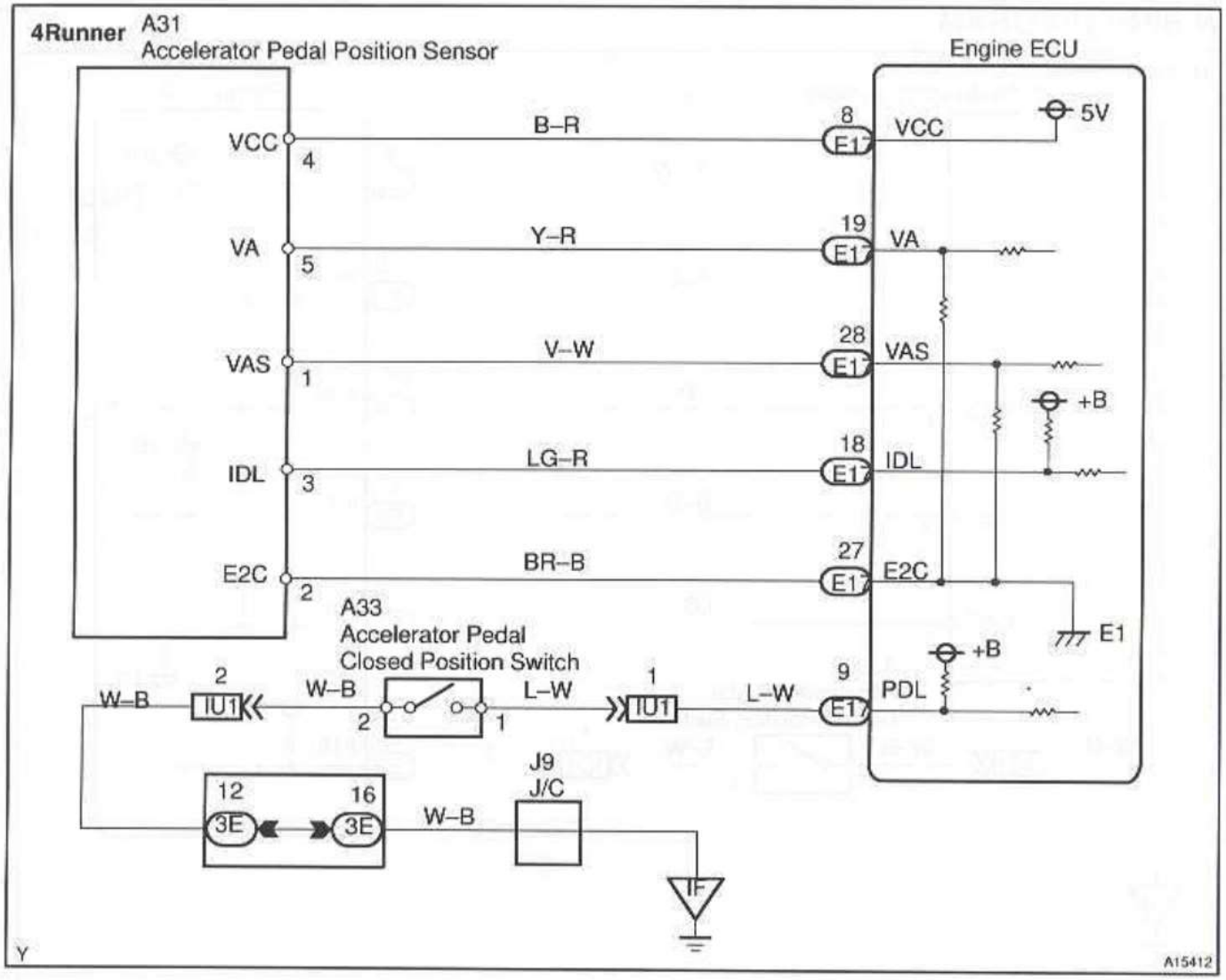
DTC No.	DTC Detection Condition	Trouble Area
19 (1)	Open or short in accelerator pedal position sensor circuit for 0.05 sec. or more	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • Engine ECU

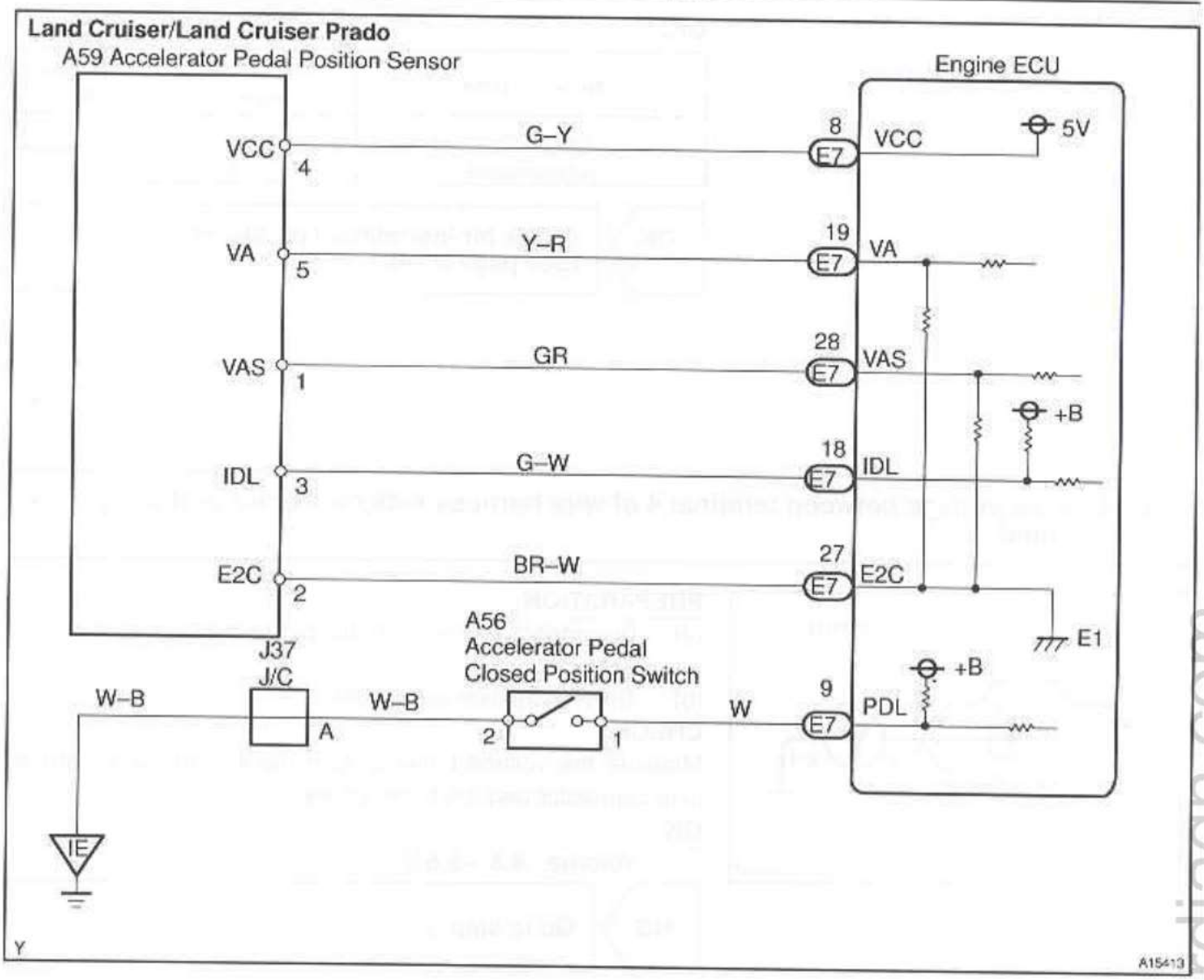
HINT:
After confirming DTC 19 (1), use the hand–held tester to confirm the accelerator pedal opening percentage and accelerator pedal close position switch condition.

Accelerator pedal opening position expressed as percentage		Trouble Area
Accelerator pedal fully closed	Accelerator pedal fully open	
0 %	0 %	VCC circuit open VA, VAS circuit open or short
Approx. 100 %	Approx. 100 %	E2C circuit open

WIRING DIAGRAM







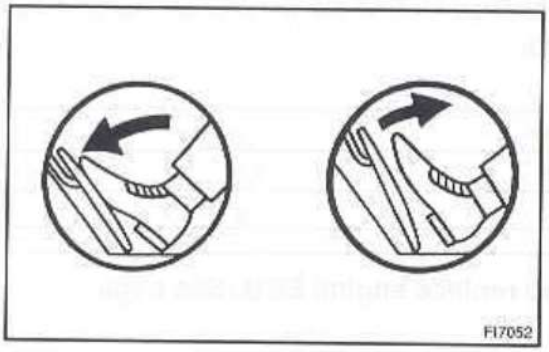
INSPECTION PROCEDURE

When using hand–held tester:

HINT:

Read freeze frame data using hand–held tester, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Connect hand–held tester, read accelerator pedal opening percentage.**



PREPARATION:

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

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

CHECK:

Read the accelerator pedal opening percentage.

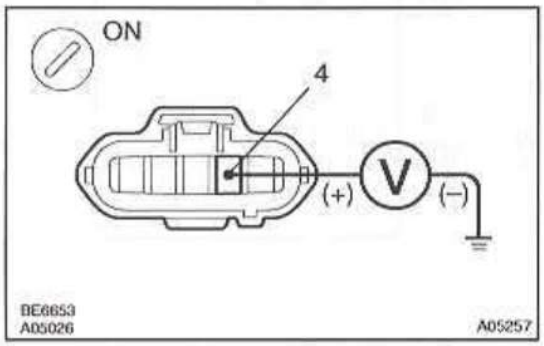
OK:

Accelerator pedal	Accelerator pedal opening position expressed as percentage
Fully released	Approx. 65 %
Fully depressed	Approx. 18 %

OK → **Check for intermittent problems (See page DI–4).**

NG

2	**Check voltage between terminal 4 of wire harness side connector and body ground.**



PREPARATION:
(a) Disconnect the accelerator pedal position sensor connector.
(b) Turn the ignition switch ON.

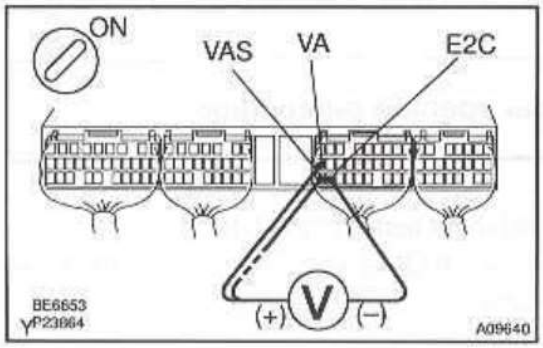
CHECK:
Measure the voltage between terminal 4 of the wire harness side connector and the body ground.

OK:
Voltage: 4.5 – 5.5 V

NG → **Go to step 5.**

OK

3	**Check voltage between terminals VA/VAS and E2C of engine ECU connector.**



PREPARATION:
(a) Remove the glove compartment door.
(b) Turn the ignition switch ON.

CHECK:
Measure the voltage between terminals VA/VAS and E2C of the engine ECU connector.

OK:

Accelerator Pedal	Voltage
Fully released	0.6 – 1.3 V
Fully depressed	2.8 – 4.5 V

OK → **Check and replace engine ECU (See page IN–20).**

NG

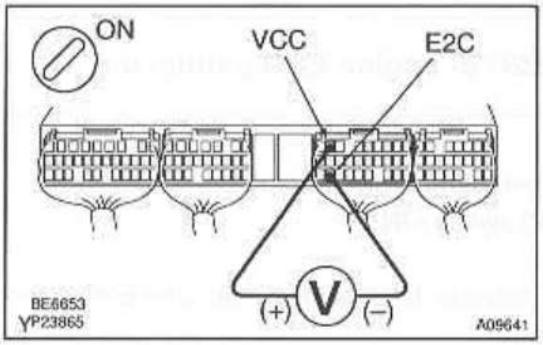
4	Check for open and short in harness and connector in VA or VAS between engine ECU and accelerator pedal position sensor (See page IN–20).

NG → Repair or replace harness or connector.

OK

Replace accelerator pedal.

5	Check voltage between terminals VCC and E2C of engine ECU connector.



PREPARATION:
(a) Remove the glove compartment door.
(b) Turn the ignition switch ON.

CHECK:
Measure the voltage between terminals VCC and E2C of the engine ECU connector.

OK:
Voltage: 4.5 – 5.5 V

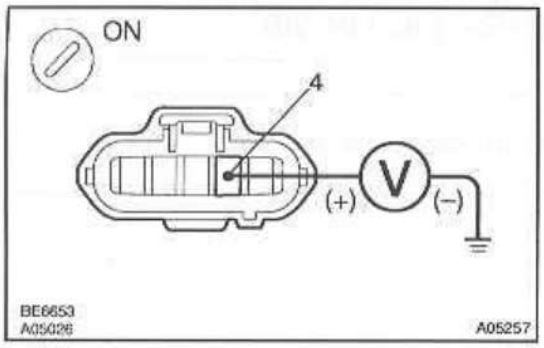
NG → Check and replace engine ECU (See page IN–20).

OK

Check for open in harness and connector in VCC circuit between engine ECU and accelerator pedal position sensor (See page IN–20).

When not using hand–held tester:

1	**Check voltage between terminal 4 of wire harness side connector and body ground.**



PREPARATION:
(a) Disconnect the accelerator pedal position sensor connector.
(b) Turn the ignition switch ON.

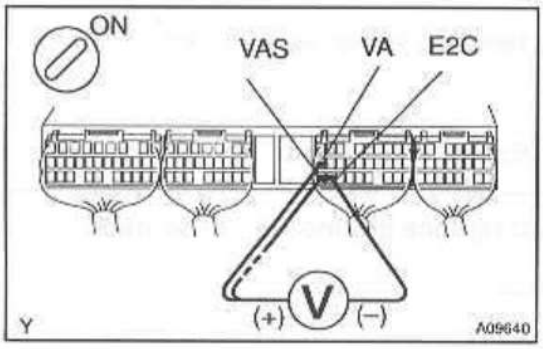
CHECK:
Measure the voltage between terminal 4 of the wire harness side connector and the body ground.

OK:
Voltage: 4.5 – 5.5 V

NG → **Go to step 4.**

OK

2	**Check voltage between terminals VA/VAS and E2C of engine ECU connector.**



PREPARATION:
(a) Remove the glove compartment door.
(b) Turn the ignition switch ON.

CHECK:
Measure the voltage between terminals VA/VAS and E2C of the engine ECU connector.

OK:

Accelerator pedal	Voltage
Fully released	0.6 – 1.3 V
Fully depressed	2.8 – 4.5 V

OK → **Check and replace engine ECU (See page IN–20).**

NG

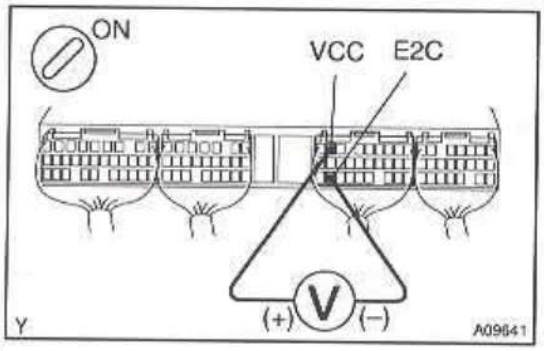
3	**Check for open and short in harness and connector inVA or VAS circuit between engine ECU and accelerator pedal position sensor (See page IN–20).**

NG → **Repair or replace harness or connector.**

OK

Replace accelerator pedal.

4	**Check voltage between terminals VCC and E2C of engine ECU connector.**



PREPARATION:

(a) Remove the glove compartment door.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VCC and E2C of the engine ECU connector.

OK:

Voltage: 4.5 – 5.5 V

NG → **Check and replace engine ECU (See page IN–20).**

OK

Check for open in harness and connector in VCC circuit between engine ECU and accelerator pedal position sensor (See page IN–20).

DTC	19 (2)	Accelerator Pedal Position Sensor Circuit Malfunction (IDL Switch/Range)

CIRCUIT DESCRIPTION

Refer to DTC 19 (1) on page DI–42.

DTC No.	DTC Detection Condition	Trouble Area
19 (2)	Condition (a) or (b) continues for 0.5 seconds or more: (a) IDL ON and VA > 1.4 V (b) IDL ON and VAS >1.4 V	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • Engine ECU
	Condition (a) or (b) continues for 0.5 seconds or more: (a) IDL OFF and VA < 0.6 V (b) IDL OFF and VAS < 0.6 V	
	Conditions (a) and (b) continue 0.05 seconds or more: (a) 0.6 V < VA < 4.4 V and 0.6 V < VAS < 4.4 V (b) VA – VAS > 0.5 V	

WIRING DIAGRAM

Refer to DTC 19 (1) on page DI–42.

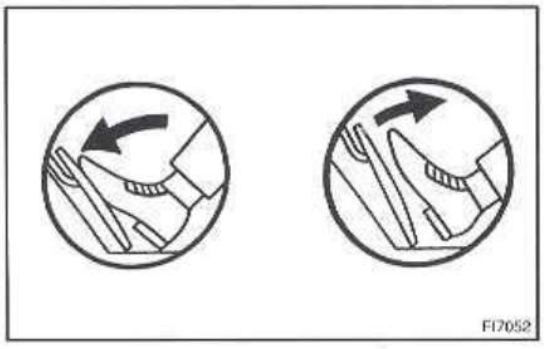
INSPECTION PROCEDURE

When using hand–held tester:

HINT:

Read freeze frame data using hand–held tester, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Connect hand–held tester to DLC3, read IDL signal.



PREPARATION:

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

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

CHECK:

Read the IDL signal.

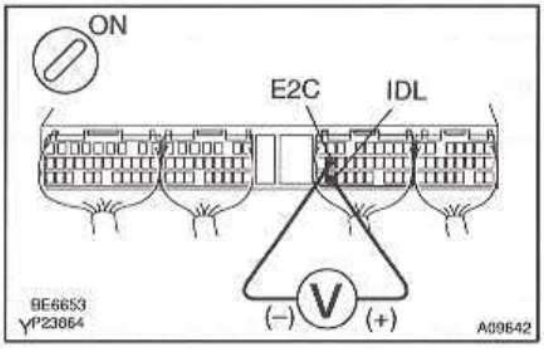
OK:

Accelerator Pedal	IDL Signal
Fully released	OFF
Fully depressed	ON

OK	Go to step 4.

NG

2	Check voltage between terminals IDL and E2C of engine ECU connector.



PREPARATION:

(a) Remove the glove compartment door.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals IDL and E2C of the engine ECU connector.

OK:

Accelerator Pedal	Voltage
Fully released	9 – 14 V
Fully depressed	0 – 3 V

OK → Check and replace engine ECU (See page IN–20).

NG

3	Check for open and short in harness and connector in IDL circuit between engine ECU and accelerator pedal position sensor (See page IN–20).

NG → Repair or replace harness or connector.

OK

Replace accelerator pedal.

4	Connect hand–held tester, read accelerator pedal operating percentage (See page DI–42, step 1).

OK → Check for intermittent problems (See page DI–4).

OK

5	Check voltage between terminal VCC of wire harness side connector and body ground (See page DI–42, step 2).

NG → Go to step 8.

OK ↓

6	Check voltage between terminals VA, VAS and E2C of engine ECU connector (See page DI–42, step 3).

OK → Check and replace engine ECU (See page IN–20).

NG ↓

7	Check for open and short in harness and connector in VA or VAS circuit between engine ECU and accelerator pedal position sensor (See page IN–20).

NG → Repair or replace harness or connector.

OK ↓

Replace accelerator pedal.

8	Check voltage between terminals VCC and E2C of engine ECU connector (See page DI–42, step 5).

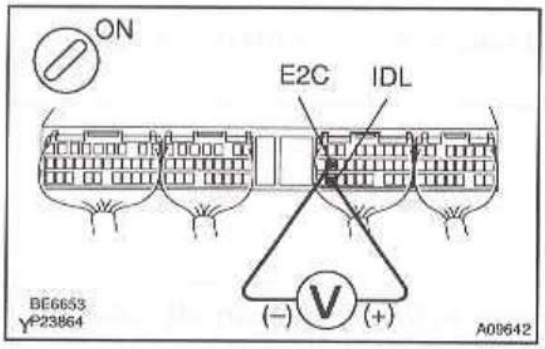
NG → Check and replace engine ECU (See page IN–20).

OK ↓

Check for open in harness and connecter in VCC circuit between engine ECU and accelerator pedal position sensor (See page IN–20).

When not using hand–held tester:

1	**Check voltage between terminals IDL and E2C of engine ECU connector.**



PREPARATION:

(a) Remove the glove compartment door.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals IDL and E2C of the engine ECU connector.

OK:

Accelerator Pedal	Voltage
Fully released	9 – 14 V
Fully depressed	0 – 3 V

OK → **Go to step 3.**

NG

2	**Check for open and short in harness and connector in IDL circuitbetween engine ECU and accelerator pedal position sensor (See page IN–20).**

NG → **Repair or replace harness or connector.**

OK

Replace accelerator pedal.

3	**Check voltage between terminal 4 of wire harness side connector and body-ground (See page DI–42, step 2).**

NG → **Go to step 6.**

OK

4	Check voltage between terminals VA, VAS and E2C of engine ECU connector (See page DI–42, step 3).

OK → Check and replace engine ECU (See page IN–20).

NG

5	Check for open and short in harness and connector in VA or VAS circuit between engine ECU and accelerator pedal position sensor (See page IN–20).

NG → Repair or replace harness or connector.

OK

Replace accelerator pedal.

6	Check voltage between terminals VCC and E2C of engine ECU connector (See page DI–42, step 5).

NG → Check and replace engine ECU (See page IN–20).

OK

Check for open in harness and connector in VCC line between engine ECU and accelerator pedal position sensor (See page IN–20).

DTC	19 (3)	Accelerator Pedal Closed Position Switch Circuit Malfunction (Short)

DTC	19 (4)	Accelerator Pedal Closed Position Switch Circuit Malfunction (Open)

CIRCUIT DESCRIPTION

Refer to DTC 19 (1) on page DI–42.

DTC No.	DTC Detection Condition	Trouble Area
19(3)	Conditions (a), (b) and (c) continue 0.5 sec. or more: (c) PDL ON (d) VA > Fully closed study voltage +0.41 V (e) VAS > Fully closed study voltage +0.41 V	• Short in accelerator pedal closed position switch circuit • Accelerator pedal closed position switch • Engine ECU
19(4)	PDL does not turn ON even once while driving vehicle (2 trip detection logic)	• Open in accelerator pedal closed position switch circuit • Accelerator pedal closed position switch • Engine ECU
	Conditions (a) and (b) continue 5 sec. or more: (a) PDL OFF (b) IDL ON	

WIRING DIAGRAM

Refer to DTC 19 (1) on page DI–42.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand–held tester, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Check accelerator pedal closed position switch (Seepage ED–20).

PREPARATION:

Disconnect the accelerator pedal closed position switch connector.

CHECK:

Measure the resistance between terminals of accelerator pedal closed position switch.

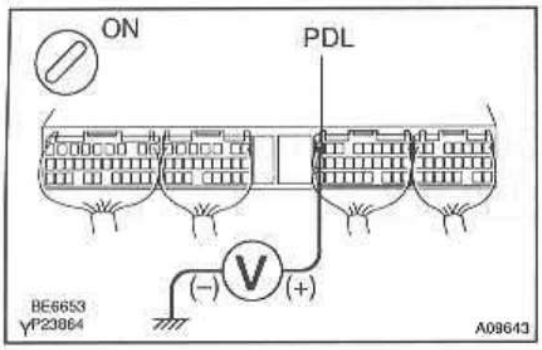
OK:

Terminals	Accelerator Pedal	Resistance
1 – 2	Fully released	∞
1 – 2	Fully depressed	0 – 20 Ω

NG → Replace accelerator pedal (See page ED–20).

OK

2	Check voltage between terminal PDL of engine ECU connector and body ground.



PREPARATION:

(a) Remove the glove compartment door.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal PDL of the engine ECU conector and the body ground.

OK:

Accelerator Pedal	Voltage
Fully released	9 – 14 V
Fully depressed	0 – 3 V

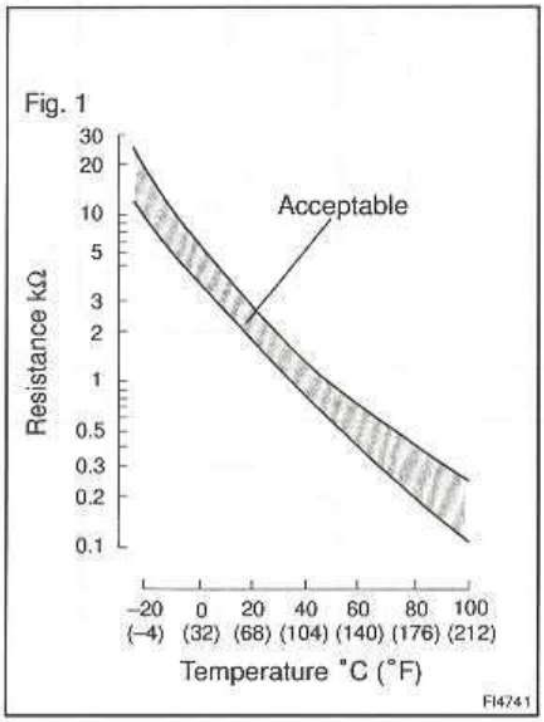
OK → **Check and replace engine ECU (See page IN–20).**

NG

Check for open and short in harness and connector between engine ECU and accelerator pedal closed position switch, and accelerator pedal closed position switch and body ground (See page IN–20).

DTC	22	Water Temp. Sensor Circuit Malfunction

CIRCUIT DESCRIPTION



The water temperature sensor senses the coolant temperature. A thermistor built in the sensor changes the resistance value according to the coolant temperature. The lower the coolant temperature, the greater the thermistor resistance value, and the higher the coolant temperature, the lower the thermistor resistance value (See Fig. 1).

The water temperature sensor is connected to the engine ECU (See below). The 5 V power source voltage in the engine ECU is applied to the water temperature sensor from terminal THW via a resistor R. That is, the resistor R and the water temperature sensor are connected in series. When the resistance value of the water temperature sensor changes in accordance with changes in the coolant temperature, the potential at terminal THW also changes. Based on this signal, the engine ECU increases the fuel injection volume to improve driveability during the cold engine operation.

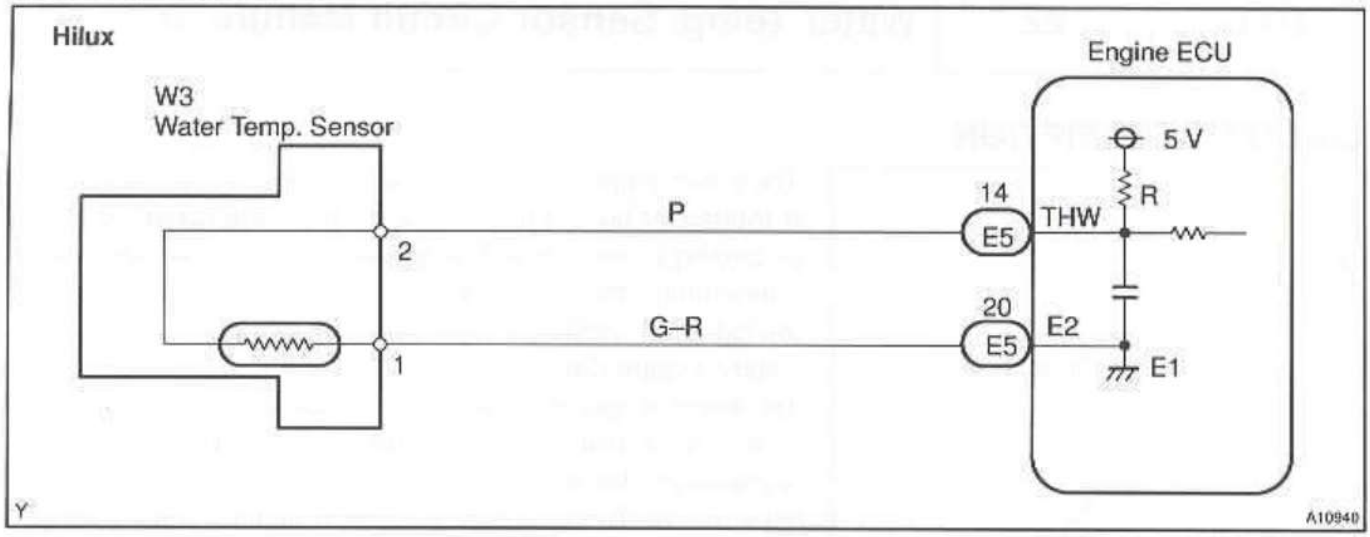
DTC No.	DTC Detection Condition	Trouble Area
22	Open or short in water temp. sensor circuit for 0.5 sec. or more	• Open or short in water temp. sensor circuit • Water temp. sensor • Engine ECU

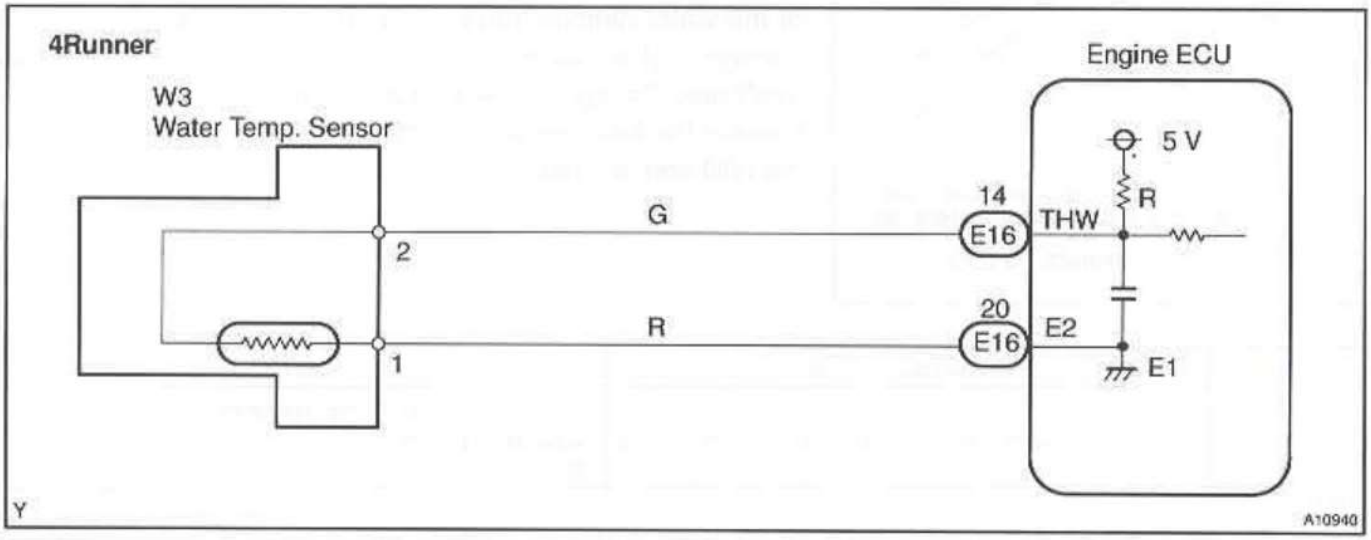
HINT:

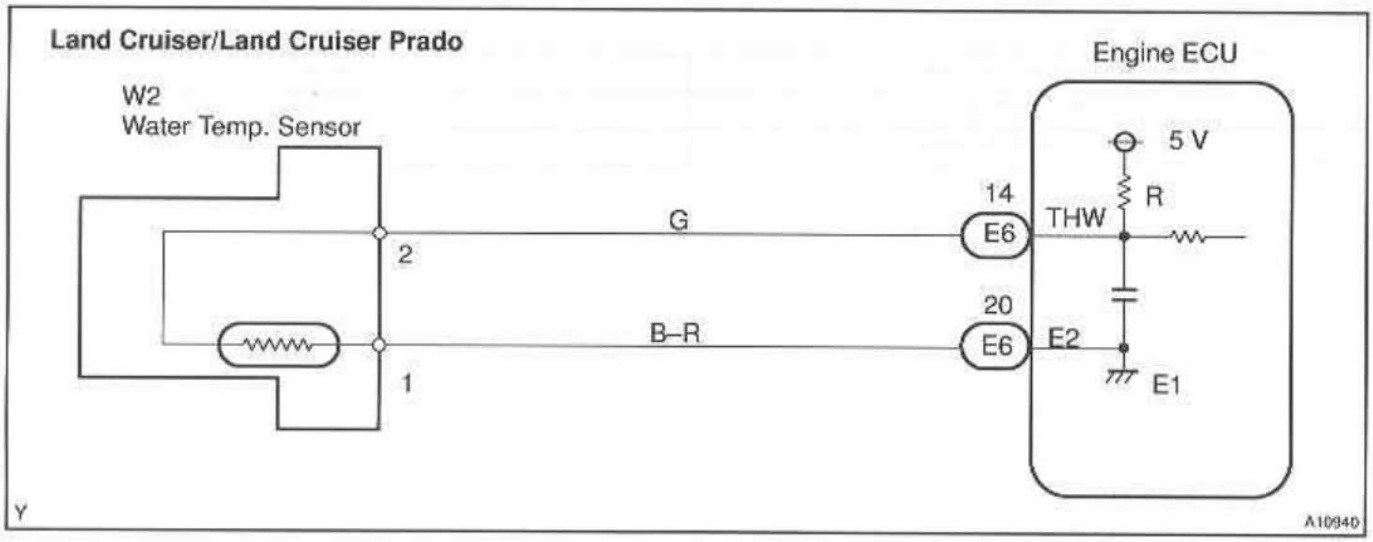
After confirming DTC22, use the hand–held tester to confirm the water temperature from the CURRENT DATA.

Displayed Temperature	Malfunction
–40°C (–40°F)	Open circuit
140°C (284°F) or more	Short circuit

WIRING DIAGRAM







INSPECTION PROCEDURE

HINT:

- If DTC22, 24 and 39 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand–held tester, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

When using hand–held tester:

1	**Connect hand–held tester, and read value of water temperature.**

PREPARATION:

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

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

CHECK:

Read the temperature value on the hand–held tester.

OK:

Same value as the actual water temperature.

HINT:

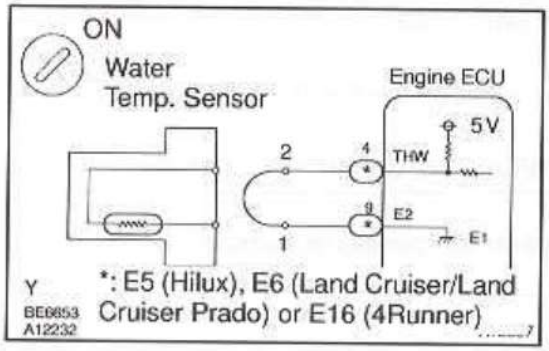
- If there is open circuit, hand–held tester indicates –40°C (–40°F).
- If there is short circuit, hand–held tester indicates 140°C (284°F) or more.

NG → **–40°C (–40°F) ... Go to step 2.**
140°C (284°F) or more ... Go to step 4.

OK

Check for intermittent problems (See page DI–4).

2	**Check for open in harness or engine ECU.**



PREPARATION:

(a) Disconnect the water temperature sensor connector.

(b) Connect the sensor wire harness terminals together.

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

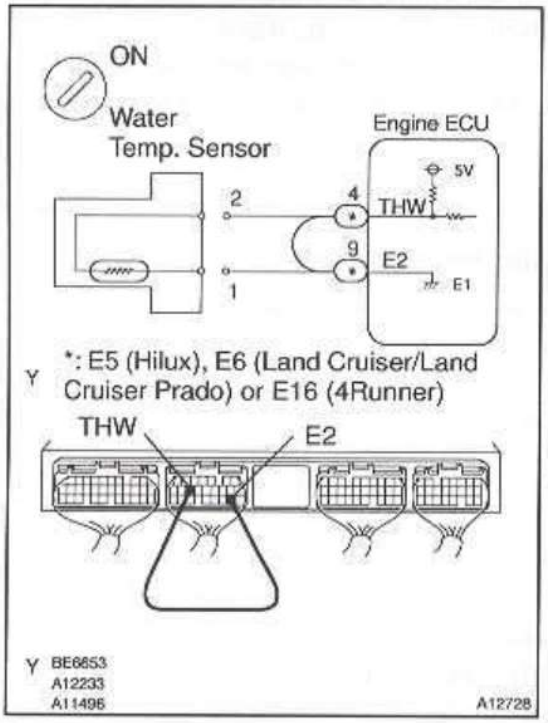
OK:

Temperature value: 140°C (284°F) or more

OK → **Confirm good connection at sensor.**
If OK, replace water temperature sensor.

NG

3	Check for open in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment door.

(b) Connect terminals THW and E2 of the engine ECU connector.

HINT:

Water temperature sensor connector is disconnected.

Before checking, do a visual and contact check of the pressure of the engine ECU connector (See page IN–20).

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

OK:

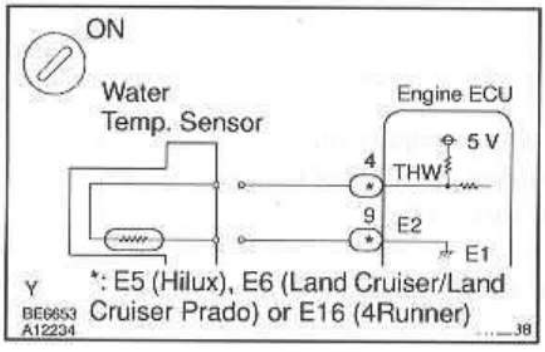
Temperature value: 140°C (284°F) or more

OK	Open in harness between terminal E2 or THW, repair or replace harness.

NG

Confirm good connection at engine ECU. If OK, replace engine ECU.

4	Check for short in harness and engine ECU.



PREPARATION:

(a) Disconnect the water temperature sensor connector.

(b) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

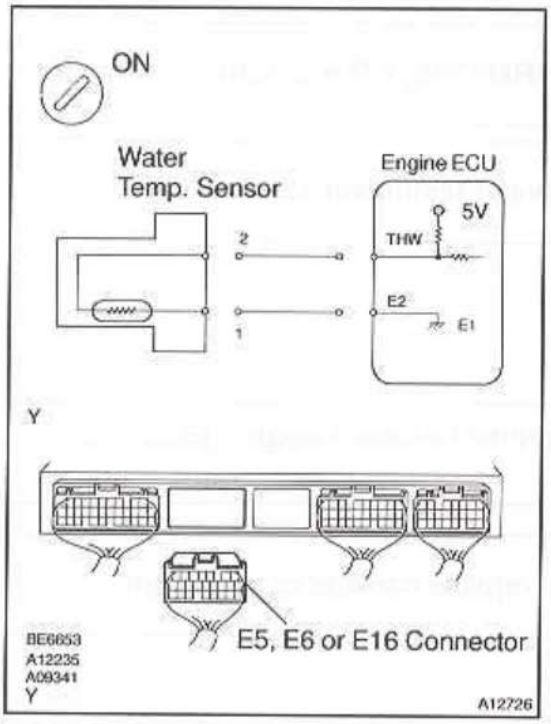
OK:

Temperature value: –40°C (–40°F)

OK	Replace water temperature sensor.

NG

5	Check for short in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment door.

(b) Disconnect the E5 (Hilux), E6 (Land Cruiser/Land Cruiser Prado) or E16 (4Runner) connector of the engine ECU.

HINT:

Water temperature sensor connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

OK:

Temperature value: –40°C (–40°F)

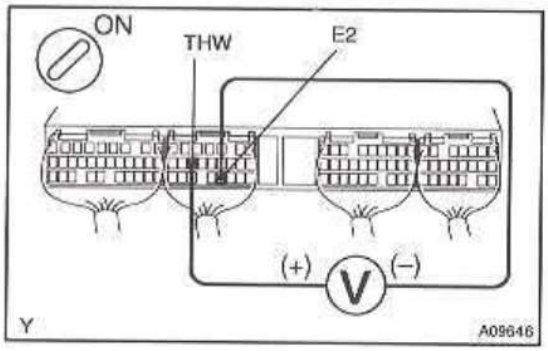
OK → **Repair or replace harness or connector.**

NG

Check and replace engine ECU (See page IN–20).

When not using hand–held tester:

1	Check voltage between terminals THW and E2 of engine ECU connector.



PREPARATION:

(a) Remove the glove compartment door.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals THW and E2 of the engine ECU connector.

OK:

Water Temp	Voltage
20°C (68°F) (Engine is cool)	0.2 – 3.8 V
80°C (176°F) (Engine is hot)	0.1 – 1.5 V

OK → **Check for intermittent problems (See page DI–4).**

NG

2	Check water temperature sensor (See Pub. No. RM710E, ED section).

NG → Replace water temperature sensor.

OK

3	Check for open and short in harness and connector between engine ECU and water temperature sensor (See page IN–20).

NG → Repair or replace harness or connector.

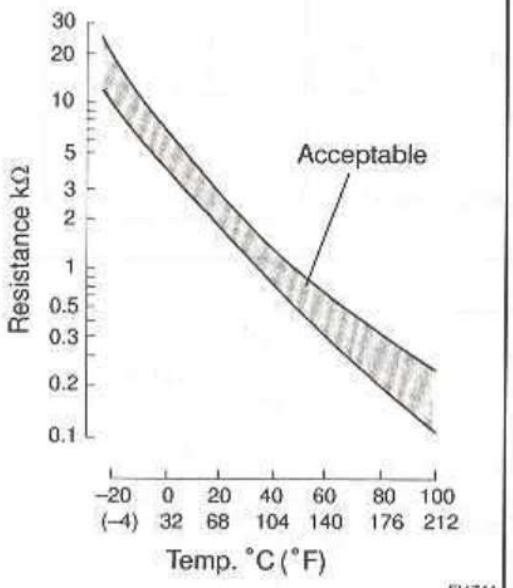
OK

Check and replace engine ECU.

DTC	24	Intake Air Temp. Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

Fig. 1



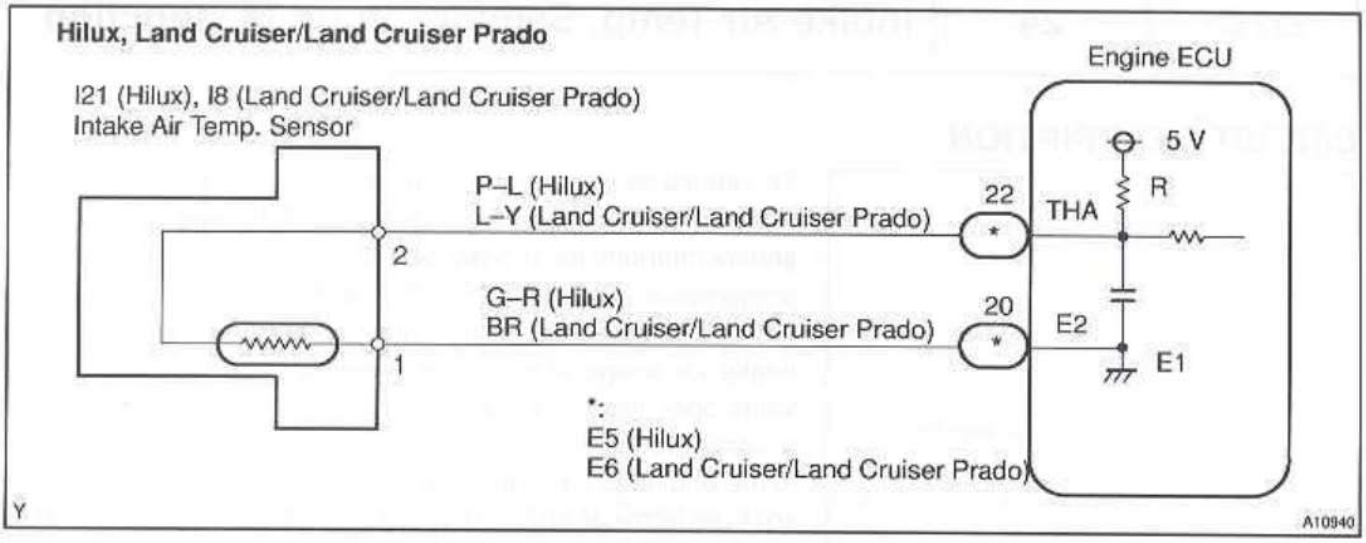
The intake air temperature sensor is built in the intake manifold and senses the intake air temperature. A thermistor built in the sensor changes the resistance value according to the intake air temperature. The lower the intake air temperature is, the greater the thermistor resistance value becomes, and the higher the intake air temperature is, the lower the thermistor resistance value becomes (See Fig. 1).The intake air temperature sensor is connected to the engine ECU. The 5 V power source voltage in the engine ECU is applied to the intake air temperature sensor from terminal THA via a resistor R. That is resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes, the potential at terminal THA also changes. Based on this signal, the engine ECU increases the fuel injection volume to improve drivability during cold engine operation.

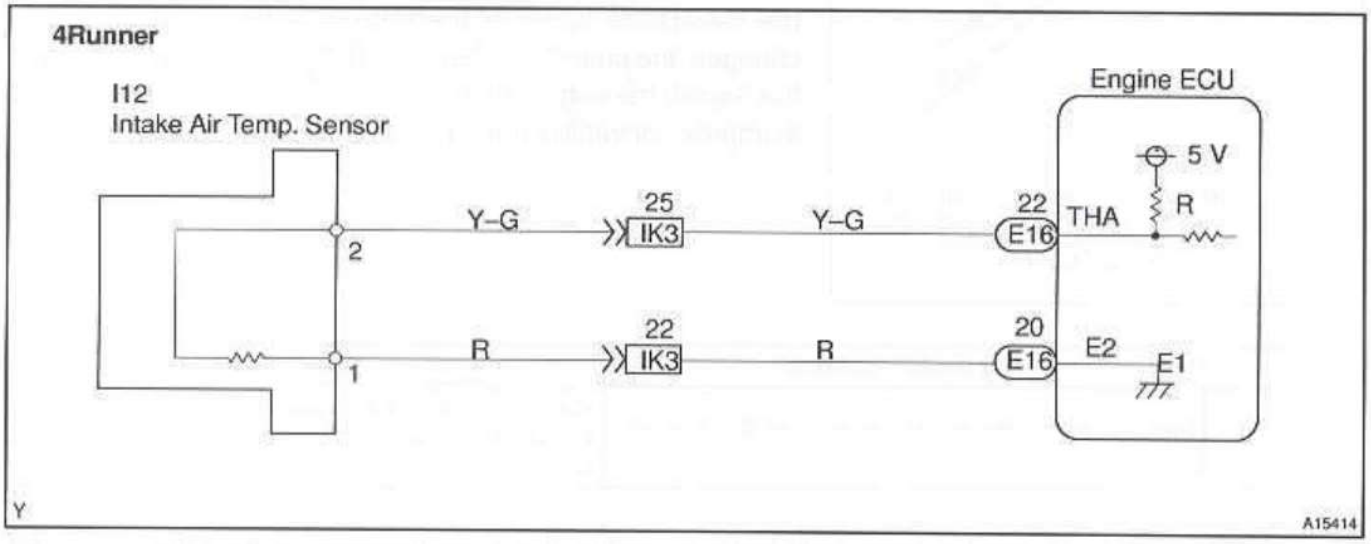
DTC No.	DTC Detection Condition	Trouble Area
24	Open or short in intake air temp. sensor circuit for 0.5 sec. or more	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • Engine ECU

HINT:
After confirming DTC 24, use the hand–held tester to confirm the water temperature from the CURRENT DATA.

Displayed Temperature	Malfunction
–40°C (–40°F)	Open circuit
140°C (284°F) or more	Short circuit

WIRING DIAGRAM





INSPECTION PROCEDURE

HINT:

- If DTC22, 24, 35 and 39 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand–held tester, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

When using hand–held tester:

1	**Connect hand–held tester, and read value of water temperature.**

PREPARATION:

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

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

CHECK:

Read the temperature value on the hand–held tester.

OK:

Same value as the actual intake air temperature.

HINT:

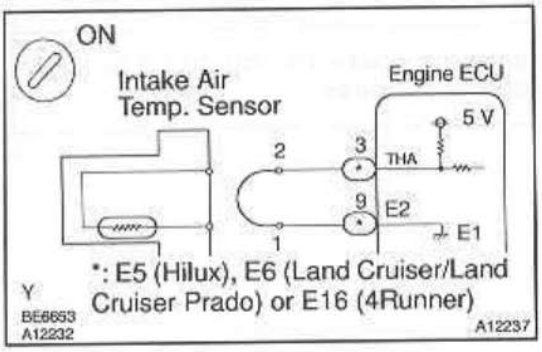
- If there is open circuit, hand–held tester indicates –40°C (–40°F).
- If there is short circuit, hand–held tester indicates 140°C (284°F) or more.

NG → **–40°C (–40°F) ... Go to step 2.**
140°C (284°F) or more ... Go to step 4.

OK →

Check for intermittent problems (See page DI–4).

2	**Check for open in harness or engine ECU.**



PREPARATION:

(a) Disconnect the intake air temperature sensor connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

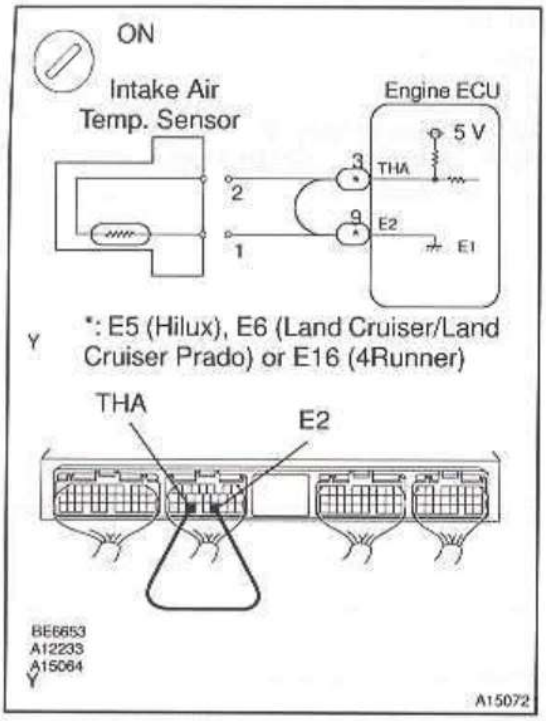
OK:

Temperature value: 140°C (284°F) or more

OK → **Confirm good connection at sensor.**
If OK, replace intake air temperature sensor.

NG →

3	Check for open in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment door.

(b) Connect between terminals THA and E2 of the engine ECU connector.

HINT:

Intake air temperature sensor connector is disconnected.

Before checking, do a visual and contact check of the pressure of the engine ECU connector (See page IN–20).

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

OK:

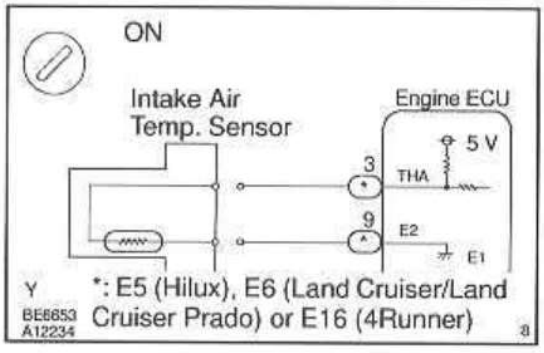
Temperature value: 140°C (284°F) or more

OK	Open in harness between terminal E2 or THA, repair or replace harness.

NG

Confirm good connection at engine ECU. If OK, replace engine ECU.

4	Check for short in harness and engine ECU.



PREPARATION:

(a) Disconnect the intake air temperature sensor connector.

(b) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

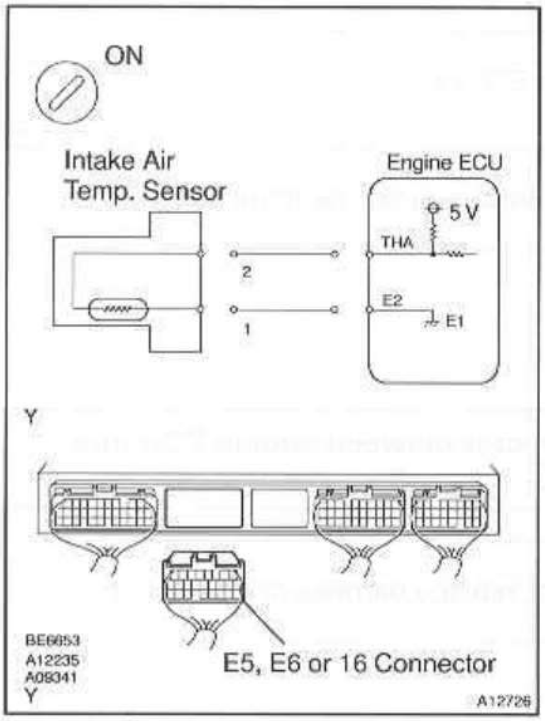
OK:

Temperature value: –40°C (–40°F)

OK	Replace intake air temperature sensor.

NG

5	Check for short in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment door.

(b) Disconnect the E5 (Hilux), E6 (Land Cruiser/Land Cruiser Prado) or E16 (4Runner) connector of the engine ECU.

HINT:

Intake air temperature sensor connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

OK:

Temperature value: –40°C (–40°F)

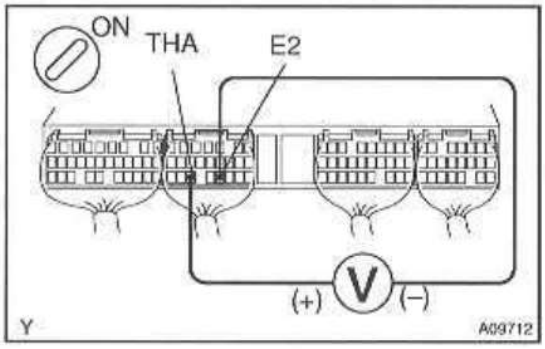
OK → **Repair or replace harness or connector.**

NG

Check and replace engine ECU (See page IN–20).

When not using hand–held tester:

1	Check voltage between terminals THA and E2 of engine ECU connector.



PREPARATION:

(a) Remove the glove compartment door.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals THA and E2 of the engine ECU connector.

OK:

Intake Air Temp.	Voltage
20°C (68°F) (Engine is cool)	0.2 – 3.8 V
80°C (176°F) (Engine is hot)	0.1 – 1.5 V

OK → **Check for intermittent problems (See page DI–4).**

NG

2	Check intake air temperature sensor (See page ED–13).

NG → Replace intake air temperature sensor.

OK

3	Check for open and short in harness and connector between engine ECU and intake air temperature sensor (See page IN–20).

NG → Repair or replace harness or connector.

OK

Check and replace engine ECU.

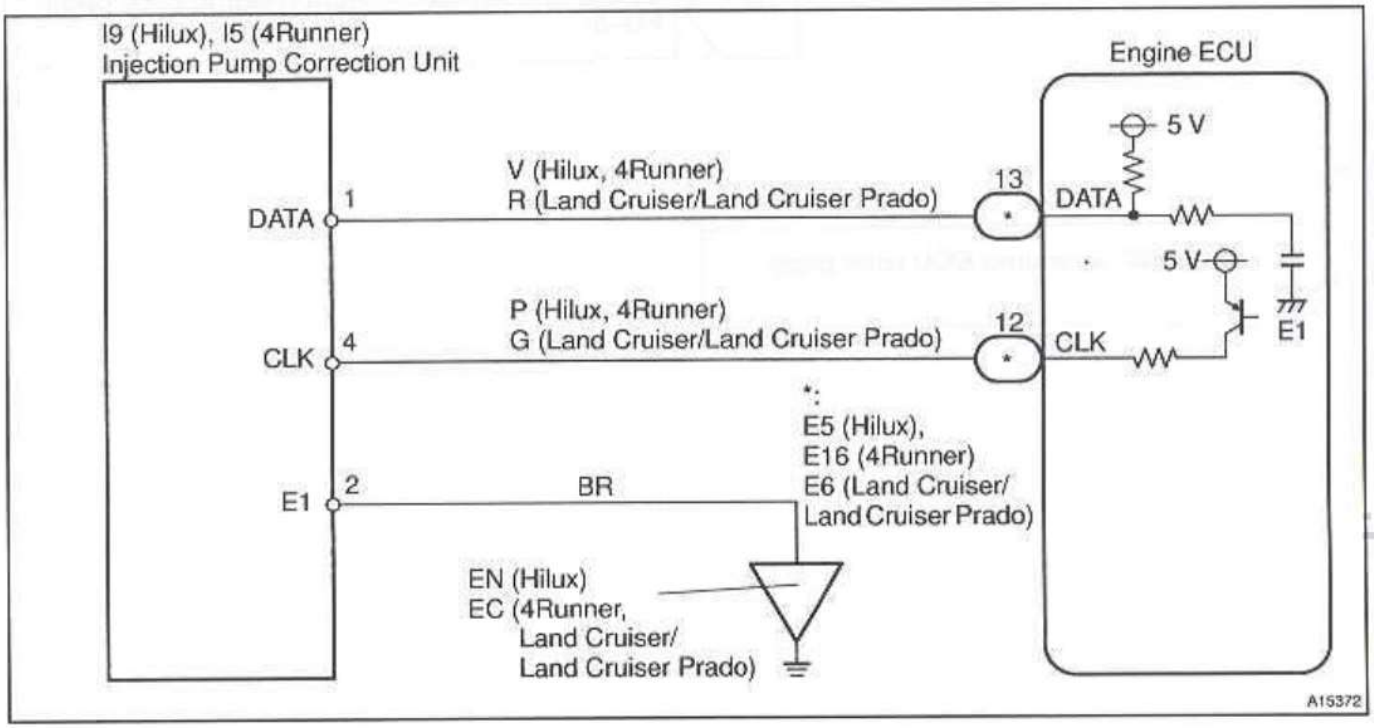
DTC	32	Injection Pump Correction System Malfunction

CIRCUIT DESCRIPTION

The correction system is the one to correct a small change between each injection pumps.

DTC No.	DTC Detection Condition	Trouble Area
32	Open or short in injection pump correction unit circuit	• Open or short in injection pump correction unit circuit • Injection pump correction unit • Engine ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand–held tester, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Check for open and short in harness and connector between engine ECU and injection pump correction unit (See page IN–20).**

NG → **Repair or replaceharness or connector.**

OK

2	Try to change injection pump correction unit to another one.

PREPARATION:

(a) Remove the injection pump correction unit from the injection pump.
(b) Install another injection pump correction unit.
(c) Clear the DTC.
(d) Turn the ignition switch ON.

CHECK:

Read the DTC again.

OK:

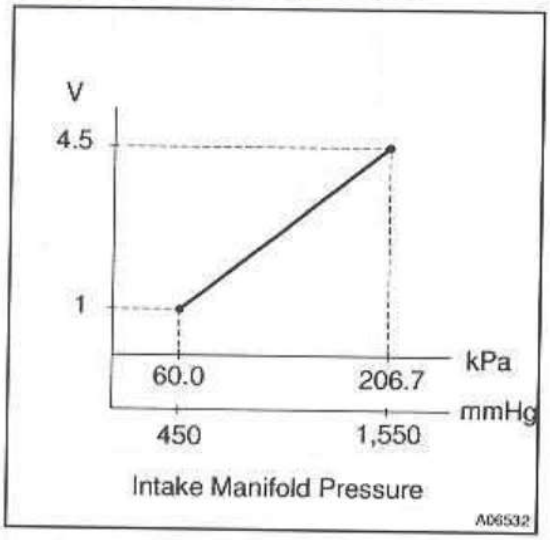
The DTC32 does not output.

OK → **Check and replace injection pump (See page FU–5).**

NG → **Check and replace engine ECU (See page IN–20).**

DTC	35	Turbo Pressure Sensor Circuit Malfunction

CIRCUIT DESCRIPTION



The turbo pressure sensor is connected to the intake manifold. The engine ECU detects the intake manifold pressure as a voltage by the sensor. The engine ECU uses the intake manifold pressure signal for a correction of the injection volume control and injection timing control.

The VSV for turbo pressure sensor switches the atmosphere applied to the turbo pressure sensor to the intake manifold pressure. The turbo pressure sensor monitors both of the atmospheric pressure and intake manifold pressure and transmits the output voltage to the engine ECU, and the engine ECU uses this atmospheric pressure value for correcting the injection volume.

DTC No.	DTC Detectiion Condition	Trouble Area
35	Open or short in turbo pressure sensor circuit for 2 sec. or more	• Open or short in turbo pressure sensor circuit • Turbo pressure sensor • Vacuum hose disconnected or blocked • Engine ECU

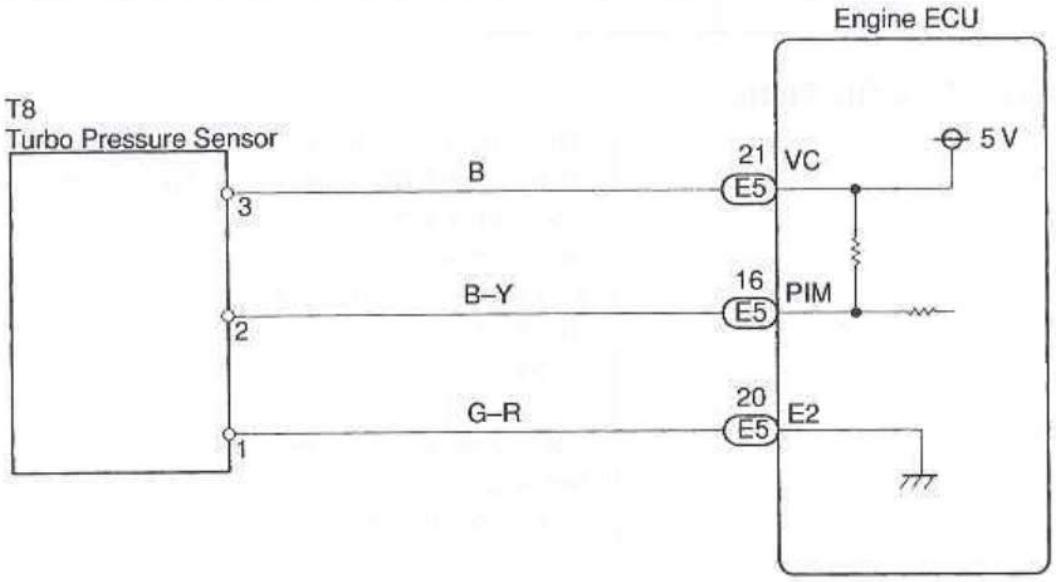
HINT:

After confirming DTC 35, use the hand–held tester to confirm the intake manifold pressure from the CURRENT DATA.

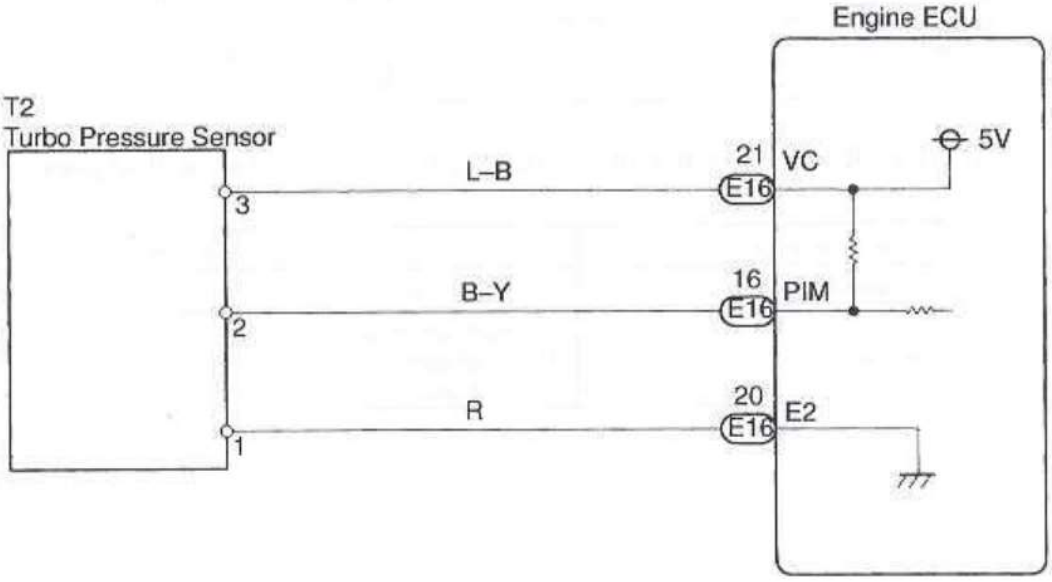
Intake Manifold Pressure (kPa)	Malfunction
Approx. 0	• PIM circuit short
206.7 or more	• VC circuit open or short • PIM circuit open • E2 circuit open

WIRING DIAGRAM

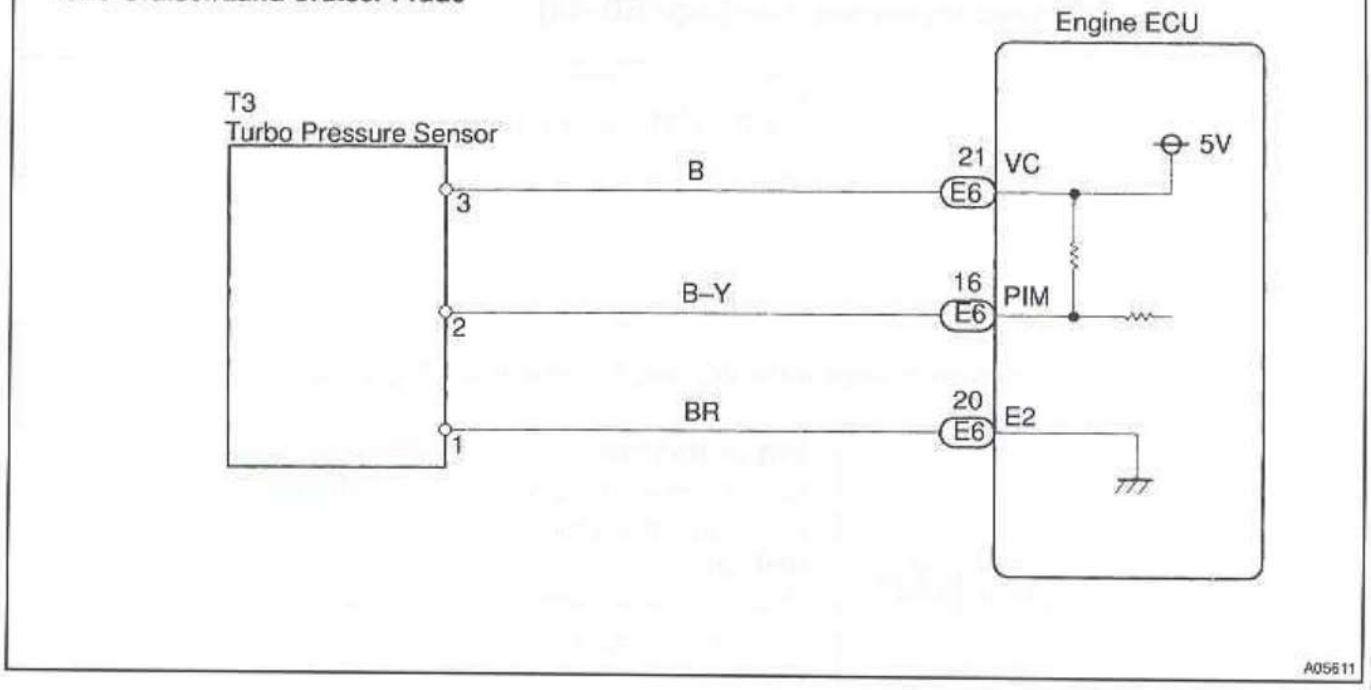
Hilux



4Runner



Land Cruiser/Land Cruiser Prado



INSPECTION PROCEDURE

HINT:

- If DTC22, 24, 35 and 39 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand–held tester, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

When using hand–held tester:

1	**Connect hand–held tester, and read value of intake manifold pressure.**

PREPARATION:

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

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

CHECK:

Read the value of the intake manifold pressure on the hand–held tester.

OK:

Same as atmospheric pressure.

OK	**Go to step 5.**

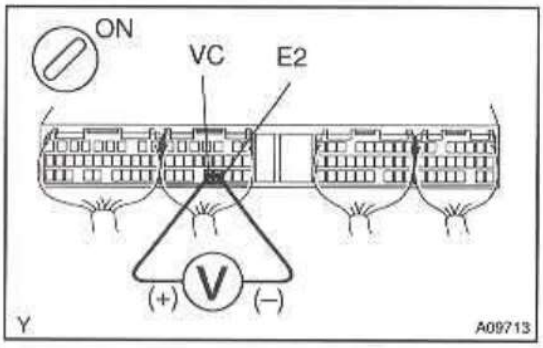
NG

2	Check turbo pressure sensor (See page ED–14).

NG → Replace turbo pressure sensor.

OK

3	Check voltage between terminals VC and E2 of engine ECU connector.



PREPARATION:
(a) Remove the glove compartment door.
(b) Turn the ignition switch ON.

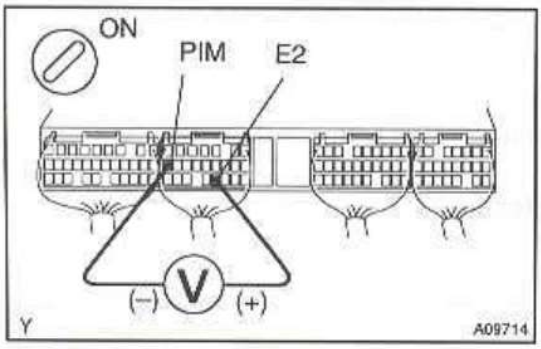
CHECK:
Measure the voltage between terminals VC and E2 of the engine ECU connector.

OK:
Voltage: 4.5 – 5.5 V

NG → Check and replace engine ECU (See page IN–20).

OK

4	Check voltage between terminals PIM and E2 of engine ECU connector.



PREPARATION:
(a) Remove the glove compartment door.
(b) Turn the ignition switch ON.

CHECK:
Measure the voltage between terminals PIM and E2 of the engine ECU connector.

OK:
Voltage: 1.0 – 2.2 V

OK → Check and replace engine ECU (See page IN–20).

NG

Check for open and short in harness and connector between engine ECU and turbo pressure sensor (See page IN–20).

5	Check connection of vacuum hose between turbo pressure sensor and intake manifold.

NG → Repair or replace.

OK

6	Check for open and short in harness and connector between engine ECU and ECD main relay (Marking: ECD) (See page IN–20).

NG → Repair of replace harness or connector.

OK

Check and replace engine ECU.

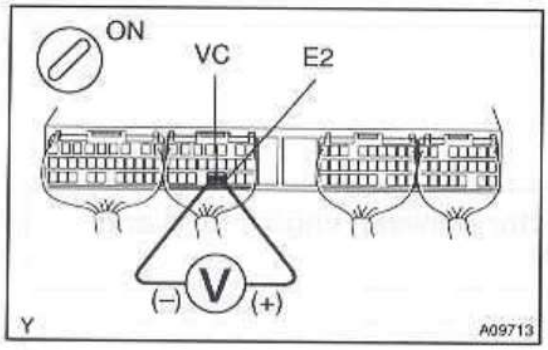
When not using hand–held tester:

1	Check turbo pressure sensor (See page ED–14).

NG → Replace turbo pressure sensor.

OK

2	Check voltage between terminals VC and E2 of engine ECU connector.



PREPARATION:

(a) Remove the glove compartment door.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the engine ECU connector.

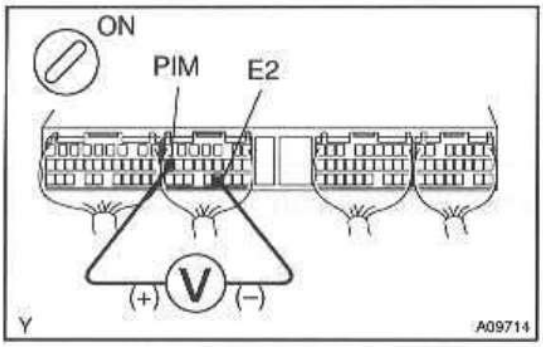
OK:

Voltage: 4.5 – 5.5 V

NG → Check and replace engine ECU (See page IN–20).

OK

3	Check voltage between terminals PIM and E2 of engine ECU connector.



PREPARATION:
(a) Remove the glove compartment door.
(b) Turn the ignition switch ON.

CHECK:
Measure the voltage between terminals PIM and E2 of the engine ECU connector.

OK:
Voltage: 1.0 – 2.2 V

OK	Check and replace engine ECU (See page IN–20).

NG

4	Check for open and short in harness and connector between engine ECU and turbo pressure sensor (See page IN–20).

NG	Repair or replace harness or connector.

OK

5	Check connection of vacuum hose between turbo pressure sensor and intake manifold.

NG	Repair or replace.

OK

6	Check for open and short in harness and connector between engine ECU and ECD main relay (Marking: ECD) (See page IN–20).

NG	Repair or replace harness or connector.

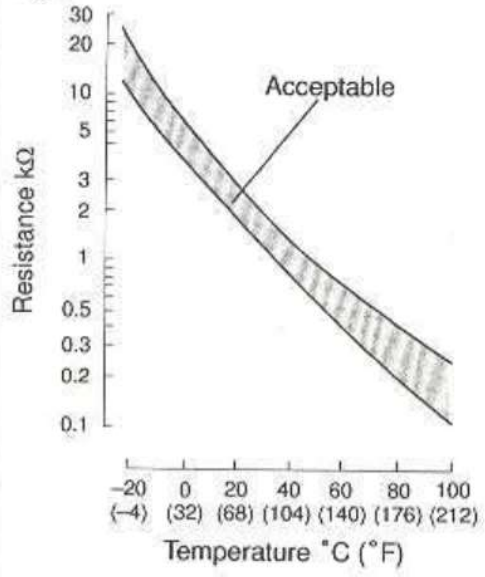
OK

Check and replace engine ECU.

DTC	39	Fuel Temp. Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

Fig. 1



The fuel temperature sensor senses the fuel temperature. A thermistor built in the sensor changes the resistance value according to the fuel temperature. The lower the fuel temperature is, the greater the thermistor resistance value becames, and the higher the fuel temperature,is the lower the thermistor resistance value (See Fig. 1) becames.

The fuel temperature sensor is connected to the engine ECU (See below). The 5 V power source voltage in the engine ECU is applied to the fuel temperature sensor from terminal THF via a resistor R. That is, resistor R and the fuel temperature sensor are connected in series. When the resistance value of the fuel temperature sensor changes in accordance with changes in the fuel temperature, the potential at terminal THF also changes. Based on this signal, the engine ECU increases the fuel injection volume to improve driveability during low engine revolution and high fuel temperature.

DTC No.	DTC Detection Condition	Trouble Area
39	Open or short in fuel temperature sensor circuit for 0.5 seconds or more	• Open or short in fuel temp. sensor circuit • Fuel temp. sensor • Engine ECU

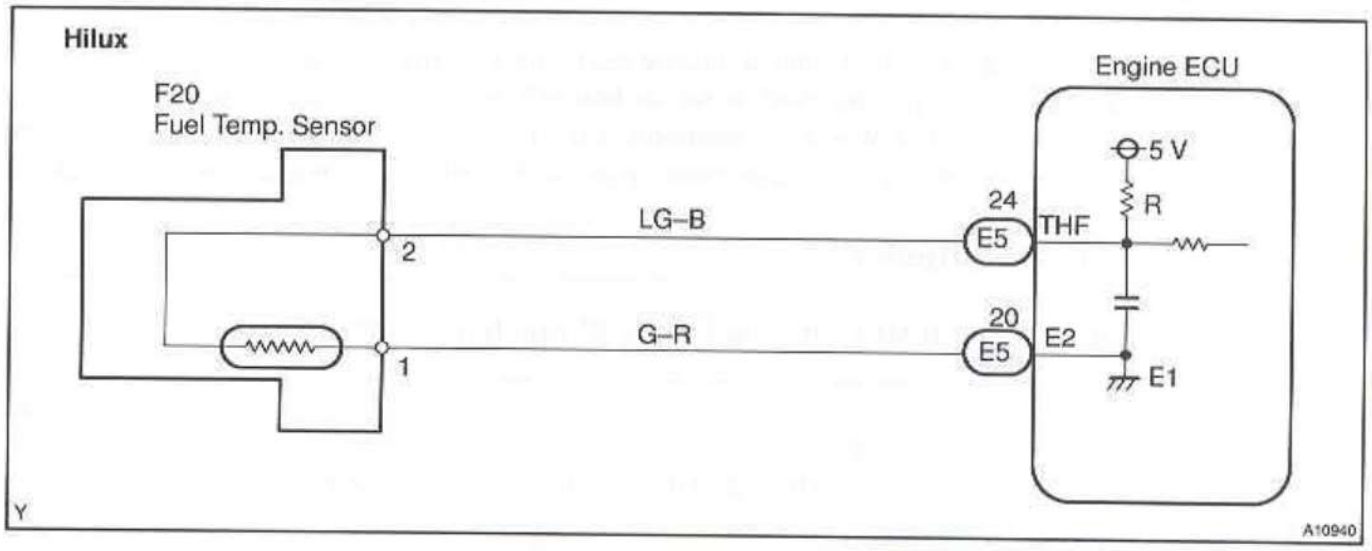
HINT:

After confirming DTC 39, use the hand–held tester to confirm the water temperature from the CURRENT DATA.

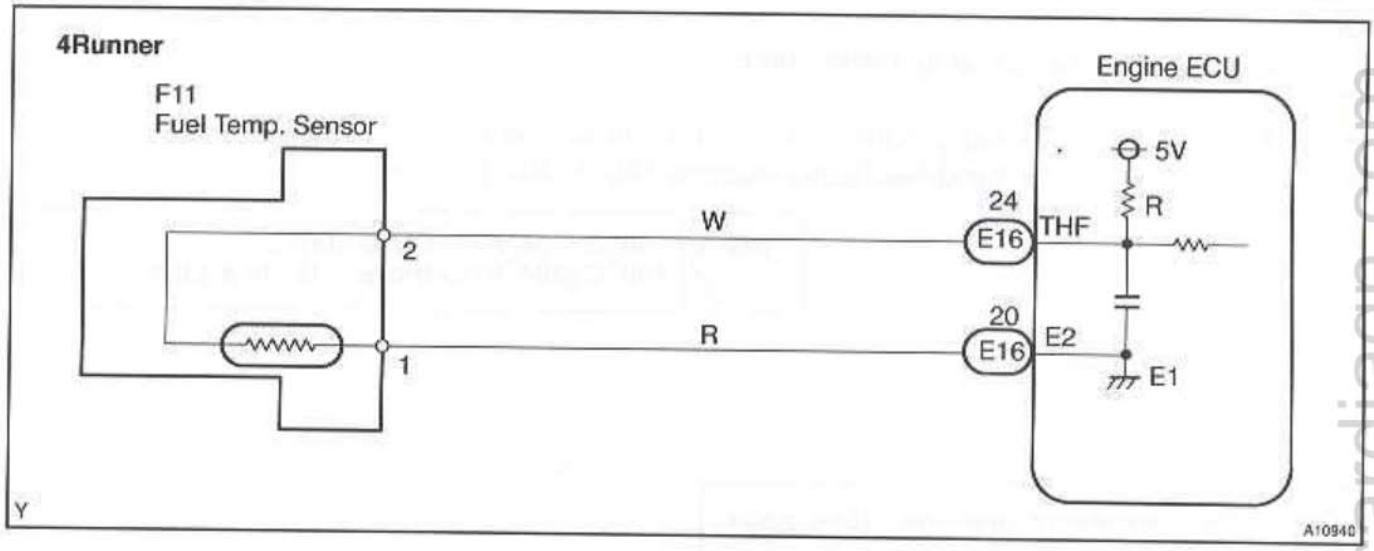
Displayed Temperature	Malfunction
–40°C (–40°F)	Open circuit
140°C (284°F) or more	Short circuit

WIRING DIAGRAM

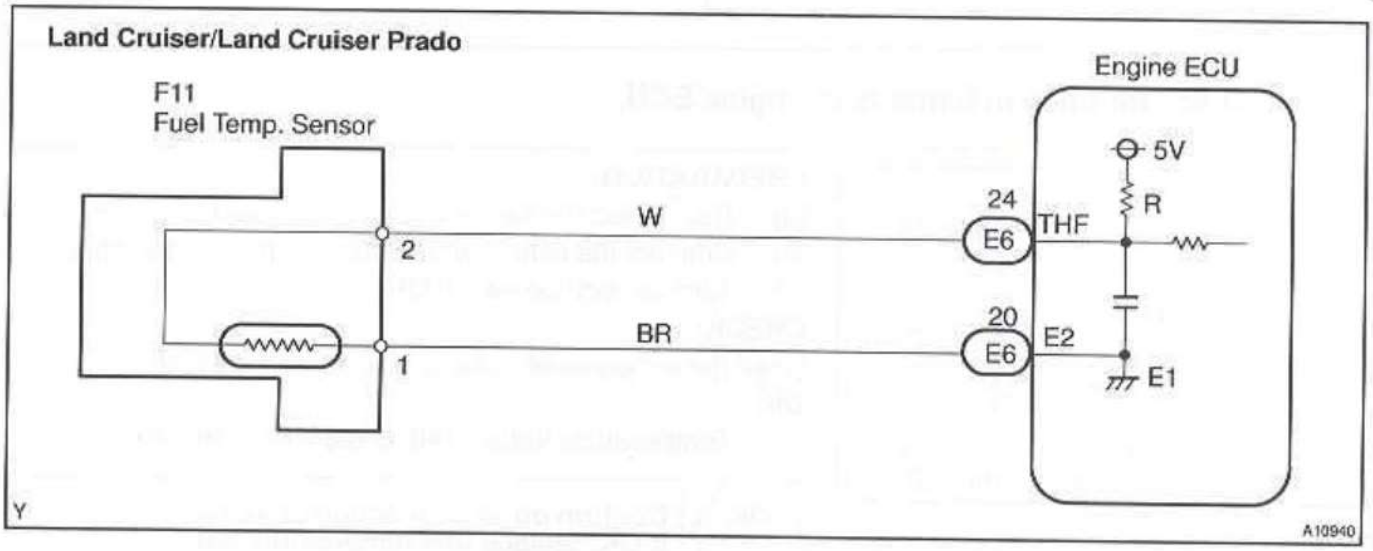
Hilux



4Runner



Land Cruiser/Land Cruiser Prado



INSPECTION PROCEDURE

HINT:

- If DTC22, 24, 35 and 39 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand–held tester, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

When using hand–held tester:

1	**Connect hand–held tester, and read value of fuel temperature.**

PREPARATION:

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

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

CHECK:

Read the temperature value on the hand–held tester.

OK:

Same value as the actual fuel temperature.

HINT:

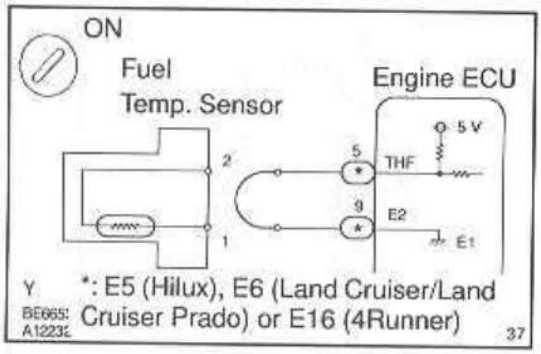
- If there is open circuit, hand–held tester indicates –40°C (–40°F).
- If there is short circuit, hand–held tester indicates 140°C (284°F) or more.

NG → **–40°C (–40°F) ... Go to step 2.**
140°C (284°F) or more ... Go to step 4.

OK

Check for intermittent problems (See page DI–4).

2	**Check for open in harness or engine ECU.**



PREPARATION:

(a) Disconnect the fuel temperature sensor connector.

(b) Connect the sensor wire harness terminals together.

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

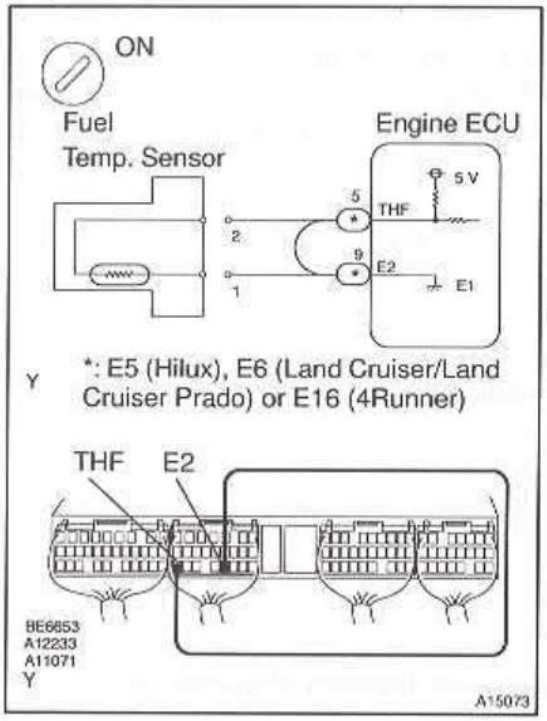
OK:

Temperature value: 140°C (284°F) or more

OK → **Confirm good connection at sensor.**
If OK, replace fuel temperature sensor.

NG

3	Check for open in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment door.

(b) Connect terminals THF and E2 of the engine ECU connector.

HINT:

Fuel temperature sensor connector is disconnected. Before checking, do a visual and contact check of the pressure the engine ECU connector (See page IN–20).

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

OK:

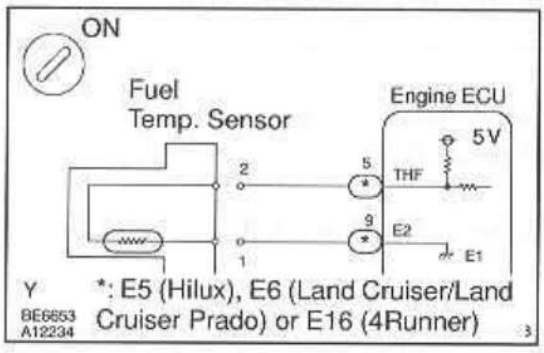
Temperature value: 140°C (284°F) or more

OK	Open in harness between terminal E2 or THF, repair or replace harness.

NG

Confirm good connection at engine ECU. If OK, replace engine ECU.

4	Check for short in harness or engine ECU.



PREPARATION:

(a) Disconnect the fuel temperature sensor connector.

(b) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

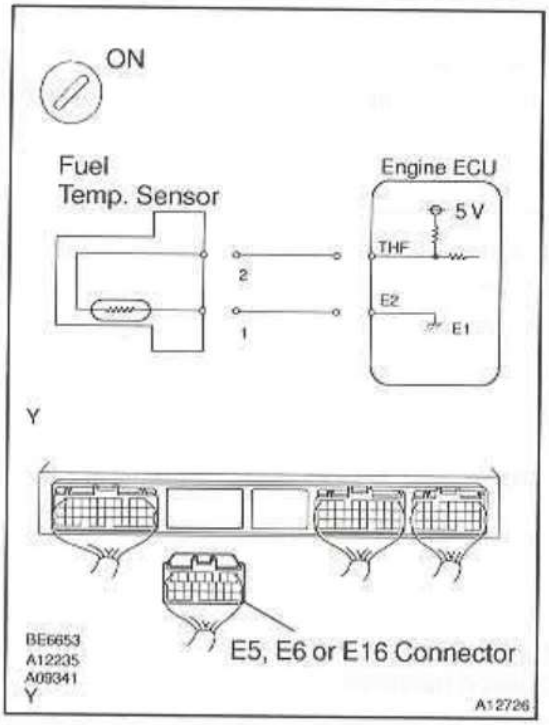
OK:

Temperature value: –40°C (–40°F)

OK	Replace fuel temperature sensor.

NG

5	Check for short in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment door.

(b) Disconnect the E5 (Hilux), E6 (Land Cruiser/Land Cruiser Prado) or E16 (4Runner) connector of the engine ECU.

HINT:

Fuel temperature sensor connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

OK:

Temperature value: –40°C (–40°F)

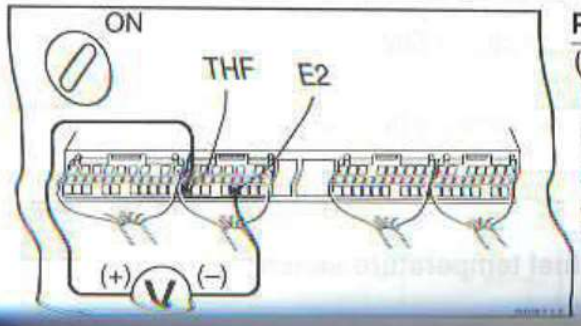
OK → **Repair or replace harness or connector.**

NG

Check and replace engine ECU (See page IN–20).

When not using hand–held tester:

1	Check voltage between terminals THF and E2 of engine ECU connector.



PREPARATION:

(a) Remove the glove compartment door.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals THF and E2 of the engine ECU connecter.

OK:

Fuel Temp.	Voltage
(Engine is cool)	

NG

2	Check fuel temperature sensor (See page ED–12).

NG → Replace fuel temperature sensor.

OK

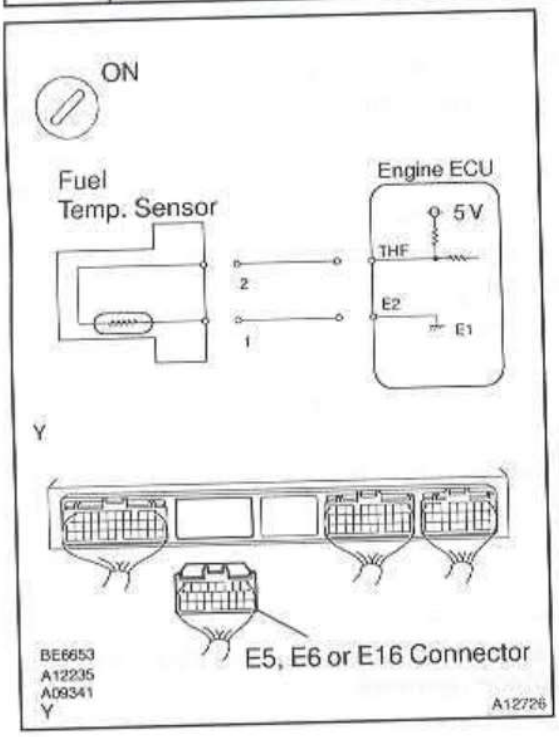
3	Check for open and short in harness and connector between engine ECU and fuel temperature sensor (See page IN–20).

NG → Repair or replace harness or connector.

OK

Check and replace engine ECU.

5	Check for short in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment door.

(b) Disconnect the E5 (Hilux), E6 (Land Cruiser/Land Cruiser Prado) or E16 (4Runner) connector of the engine ECU.

HINT:

Fuel temperature sensor connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

OK:

Temperature value: –40°C (–40°F)

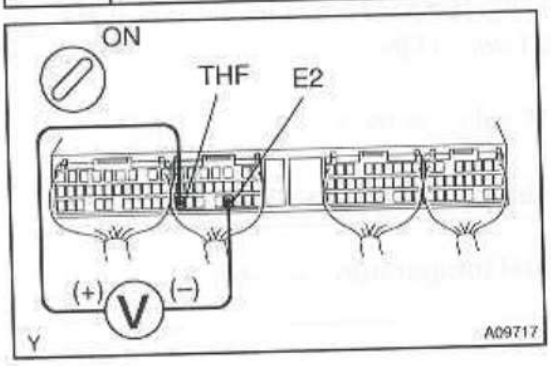
OK → **Repair or replace harness or connector.**

NG

Check and replace engine ECU (See page IN–20).

When not using hand–held tester:

1	Check voltage between terminals THF and E2 of engine ECU connector.



PREPARATION:

(a) Remove the glove compartment door.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals THF and E2 of the engine ECU connecter.

OK:

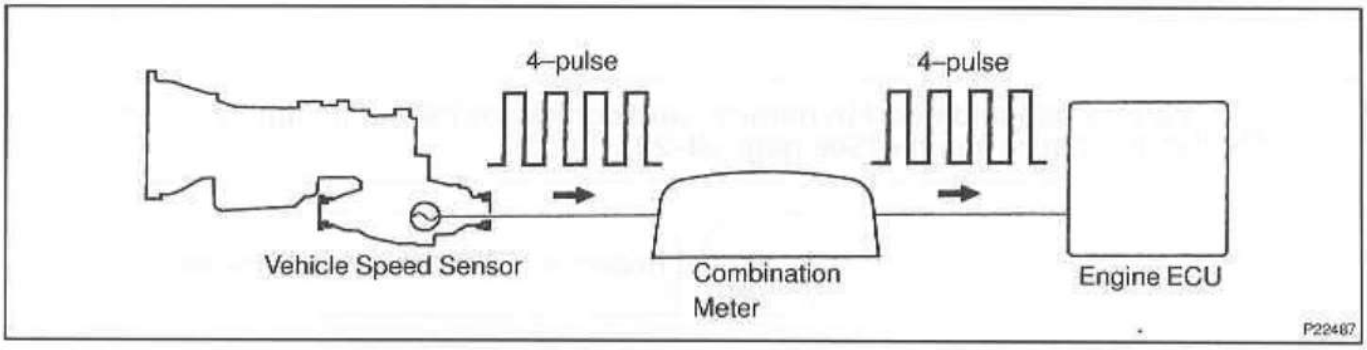
Fuel Temp.	Voltage
70°C (68°F) (Engine is cool)	0.2 – 3.8 V
80°C (176°F) (Engine is hot)	0.1 – 1.5 V

OK → **Check for intermittent problems (See page DI–4).**

DTC	42	Vehicle Speed Sensor Signal Circuit Malfunction

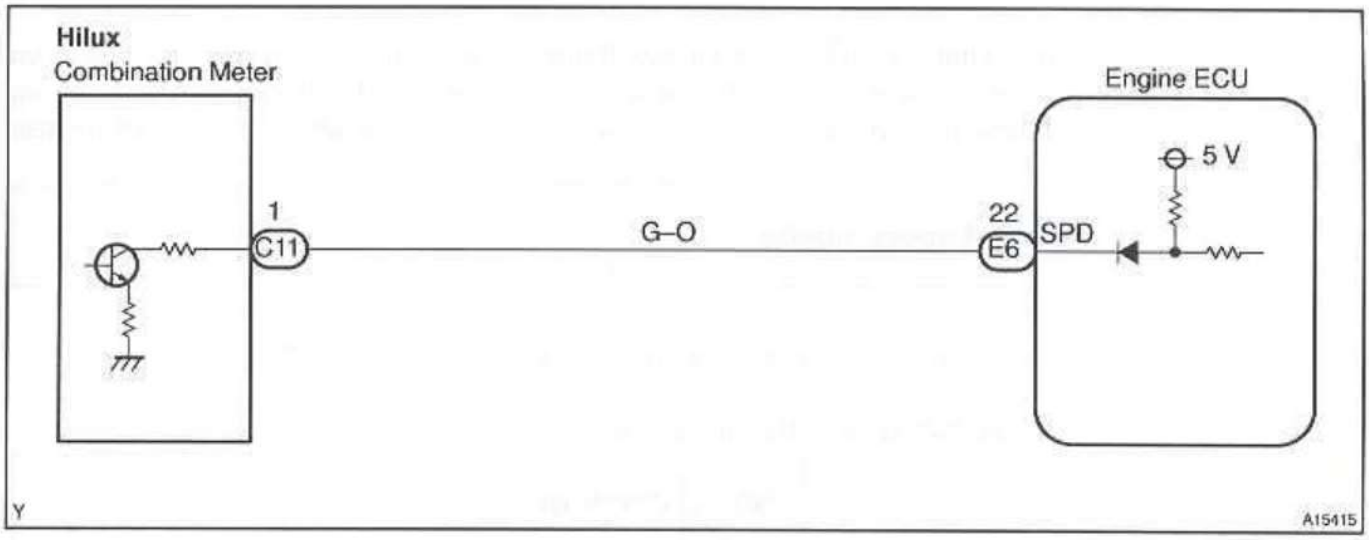
CIRCUIT DESCRIPTION

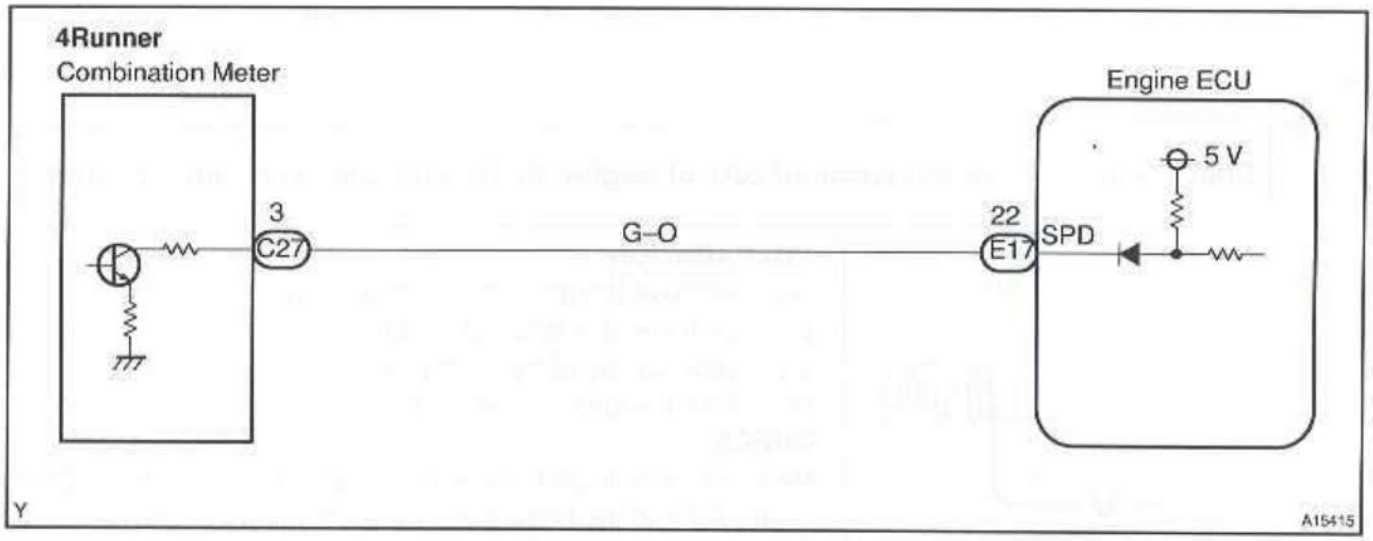
The vehicle speed sensor outputs a 4–pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear. After this signal is converted into a more precise rectangular waveform by the waveform shaping the circuit inside the combination meter, it is then transmitted to the engine ECU. The engine ECU determines the vehicle speed based on the frequency of these pulse signals.

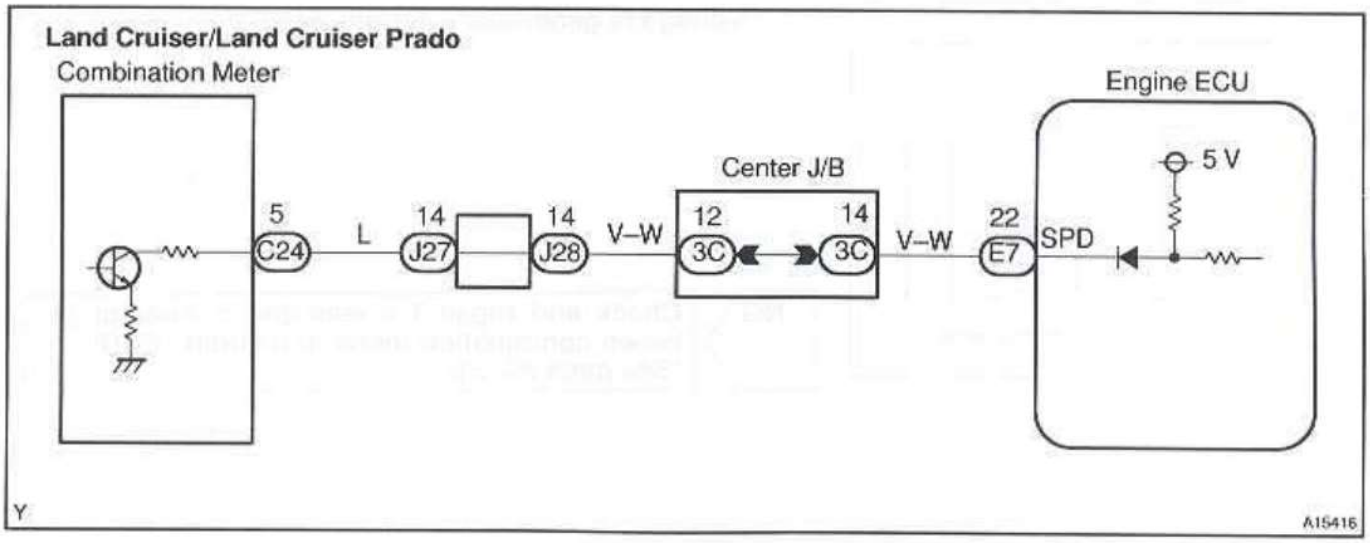


DTC No.	DTC Detection Condition	Trouble Area
42	All conditions below are detected continuously for 8 sec. or more: 1. Vehicle speed signal: 0 km/h (0 mph) 2. Engine speed: 2,400 ± 4,000 rpm 3. Engine coolant temp.: 60°C (176°F) or more 4. Accelerator pedal opening angle : 60 % or more	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • Engine ECU

WIRING DIAGRAM







INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand–held tester, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Check operation of speedometer.**

CHECK:

Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.

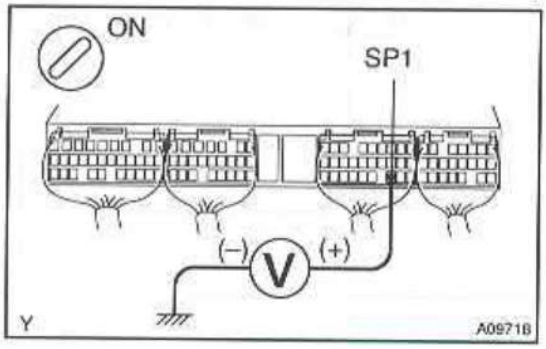
HINT:

The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → **Check speedometer.**

OK ↓

2	**Check voltage between terminal SP1 of engine ECU connector and body ground.**



PREPARATION:

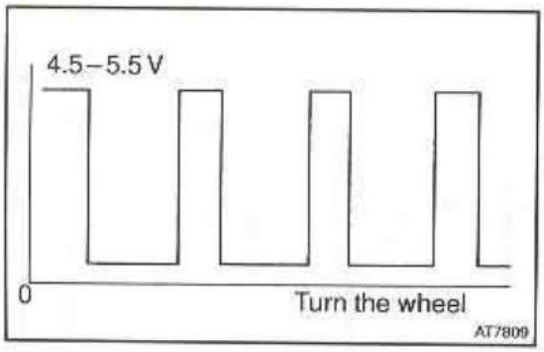
(a) Remove the glove compartment door.
(b) Shift the shift lever into neutral.
(c) Jack up one of the front wheels.
(d) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal SP1 of the engine ECU connector and the body ground when turning the wheel slowly.

OK:

Voltage is generated intermittently.



NG → **Check and repair harness and connector between combination meter and engine ECU (See page IN–20).**

OK ↓

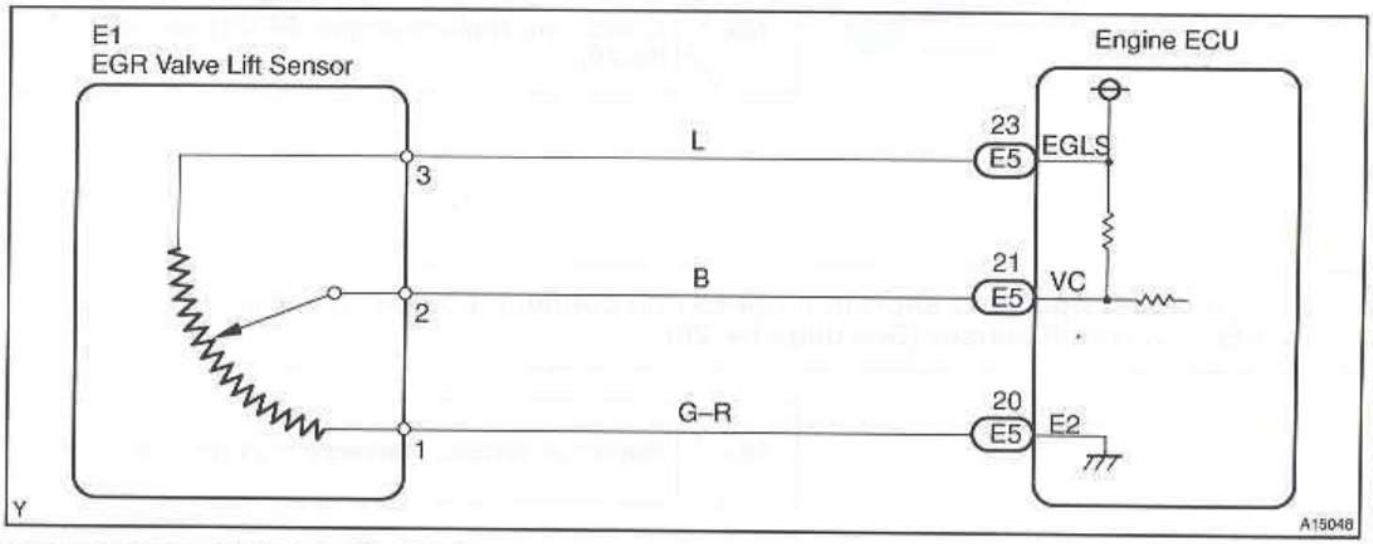
Check and replace engine ECU (See page IN–20).

DTC	96	EGR Valve Lift Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
96	No EGLS signal to engine ECU for 1.0 sec. or more	• Open or short in EGR valve lift sensor circuit • EGR valve lift sensor • Engine ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

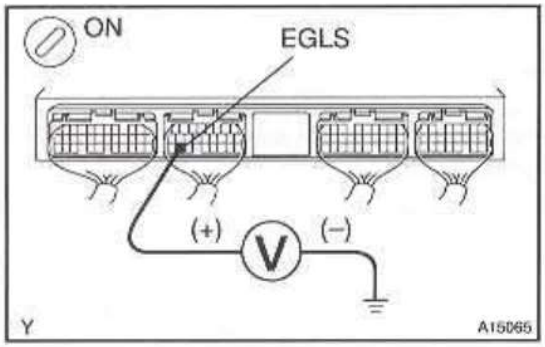
Read freeze frame data using hand–held tester, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Check EGR valve lift sensor (See page EC–6).**

NG → **Replace EGR valve.**

OK

2	**Check voltage between terminal EGLS of engine ECU connector and body ground (See page EC–6).**



PREPARATION:
Remove the glove compartment door.
CHECK:
Check the voltage between terminal EGLS of the engine ECU connector and the body ground.
OK:
0.6 – 1.4 V

NG	**Check and replace engine ECU (See page IN–20).**

OK

3	**Check for open and short in harness and connector between engine ECU and EGR valve lift sensor (See page IN–20).**

NG	**Repair or replace harness or connector.**

OK

4	**Inspect sensor installation.**

NG	**Tighten sensor.**

OK

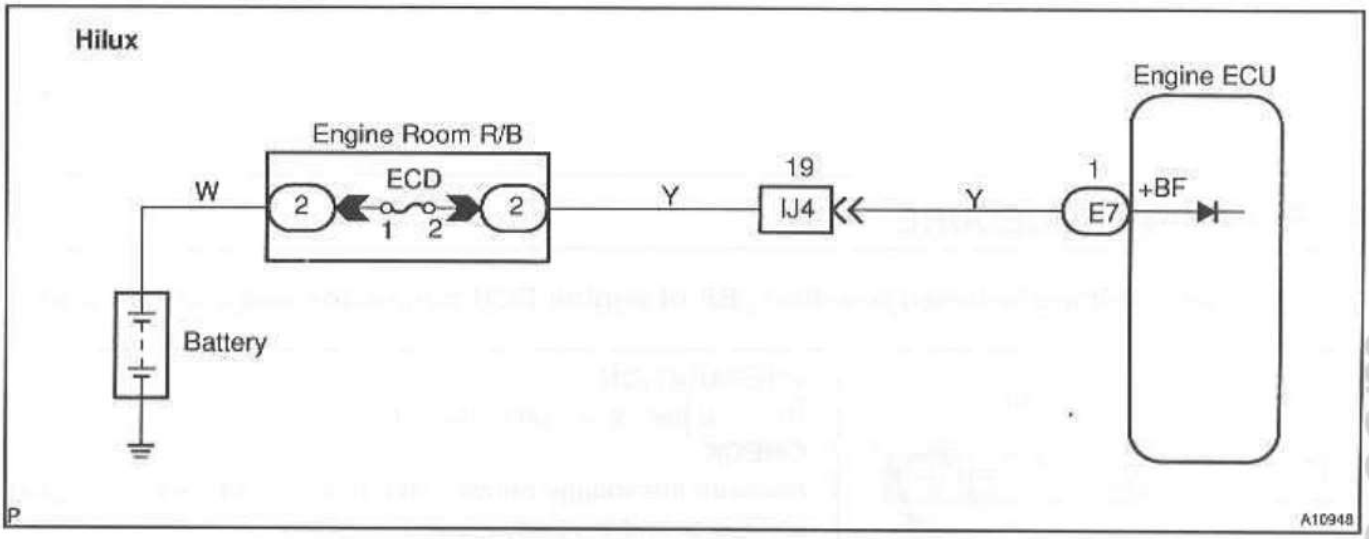
Check and replace engine ECU (See page IN–20).

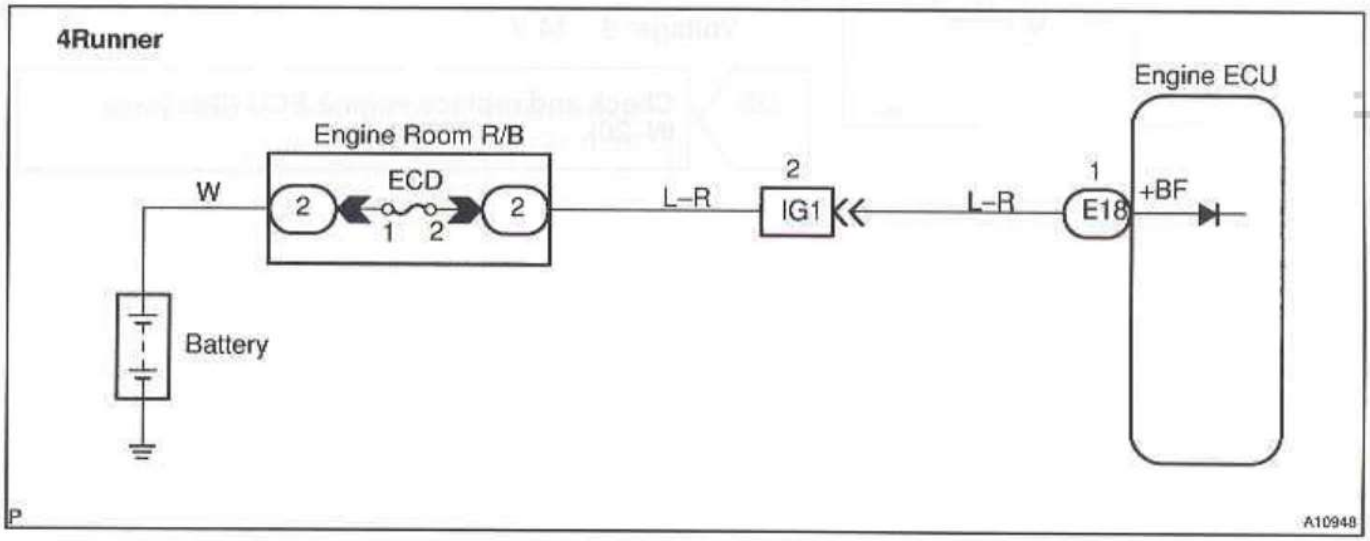
Back Up Power Source Circuit

CIRCUIT DESCRIPTION

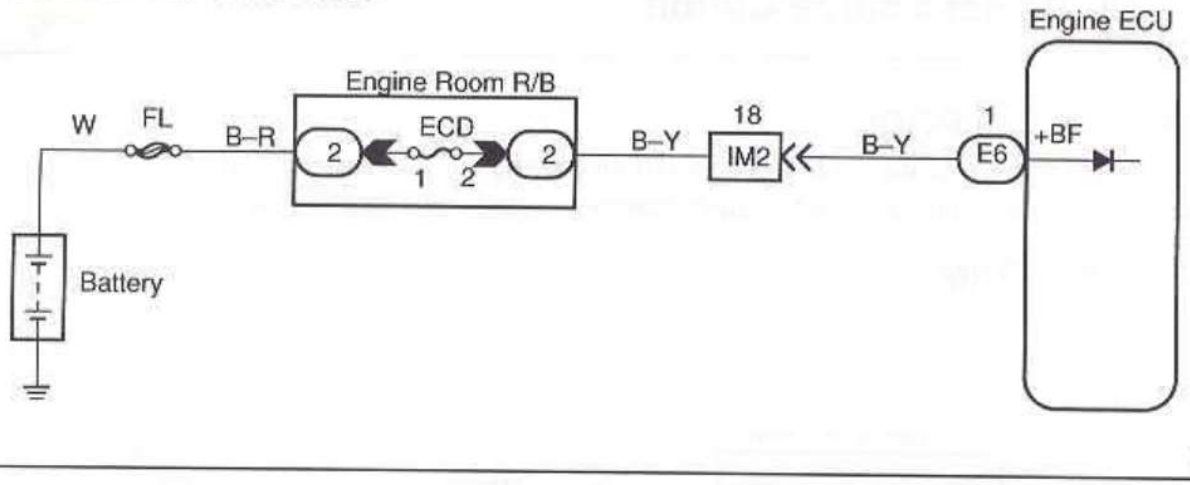
Battery positive voltage is applied to terminal +BF of the engine ECU even when the ignition switch is OFF for the use of the DTC memory, air–fuel ratio adaptive control value memory and etc.

WIRING DIAGRAM



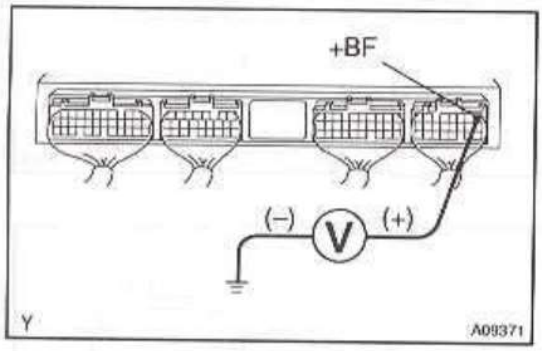


Land Cruiser/Land Cruiser Prado



INSPECTION PROCEDURE

1	**Check voltage between terminal +BF of engine ECU connector and body ground.**



PREPARATION:
Remove the glove compartment.

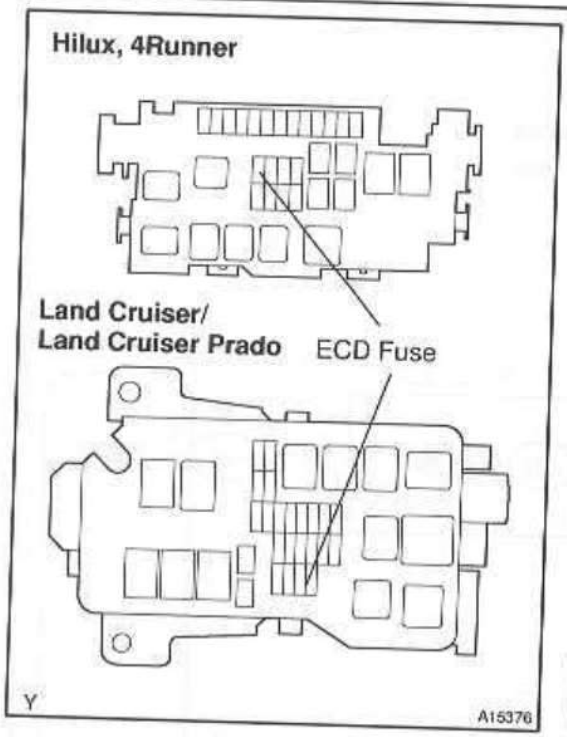
CHECK:
Measure the voltage between terminal +BF of the engine ECU connector and the body ground.

OK:
Voltage: 9 – 14 V

OK → **Check and replace engine ECU (See page IN–20).**

NG

2	Check ECD fuse.



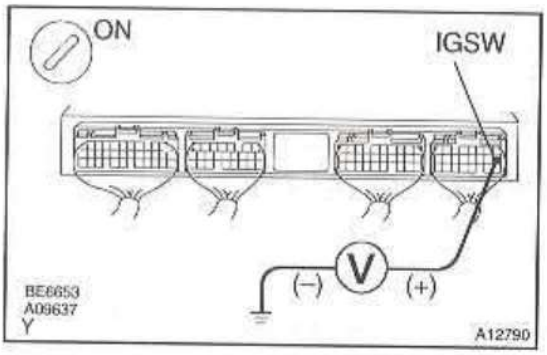
PREPARATION:
Remove the ECD fuse from the engine room R/B.
CHECK:
Check the continuity of the ECD fuse.
OK:
Continuity

NG → Replace ECD fuse.

OK →

Check and repair harness or connector between battery and ECD fuse, and ECD fuse and engine ECU (See page IN–20).

6	Check voltage between terminal IGSW of engine ECU connector and body ground.



PREPARATION:

(a) Remove the glove compartment door.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal IGSW of the engine ECU connector and the body ground.

OK:

Voltage: 9 – 14 V

OK	Go to step 9.

NG

7	Check ignition switch (See Pub. No. RM789E (Hilux), RM805E (Land Cruiser/Land Cruiser Prado) or RM663U (4Runner) BE section).

NG	Replace ignition switch.

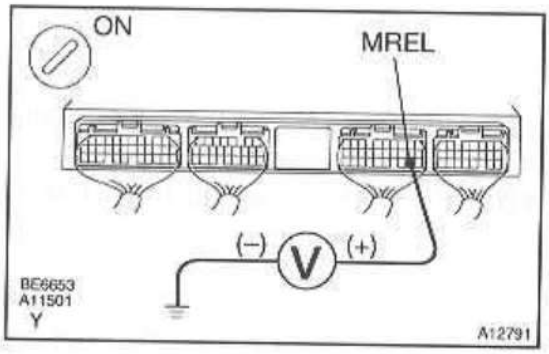
OK

8	Check for open in harness and connector between ignition switch and engine ECU (See page IN–20).

NG	Repair or replace harness or connector.

OK

9	Check voltage between terminal MREL of engine ECU connector and body ground.



PREPARATION:

(a) Remove the glove compartment door.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal MREL of the engine ECU connector and the body ground.

OK:

Voltage: 9 – 14 V

OK → **Check and replace engine ECU (See page IN–20).**

NG

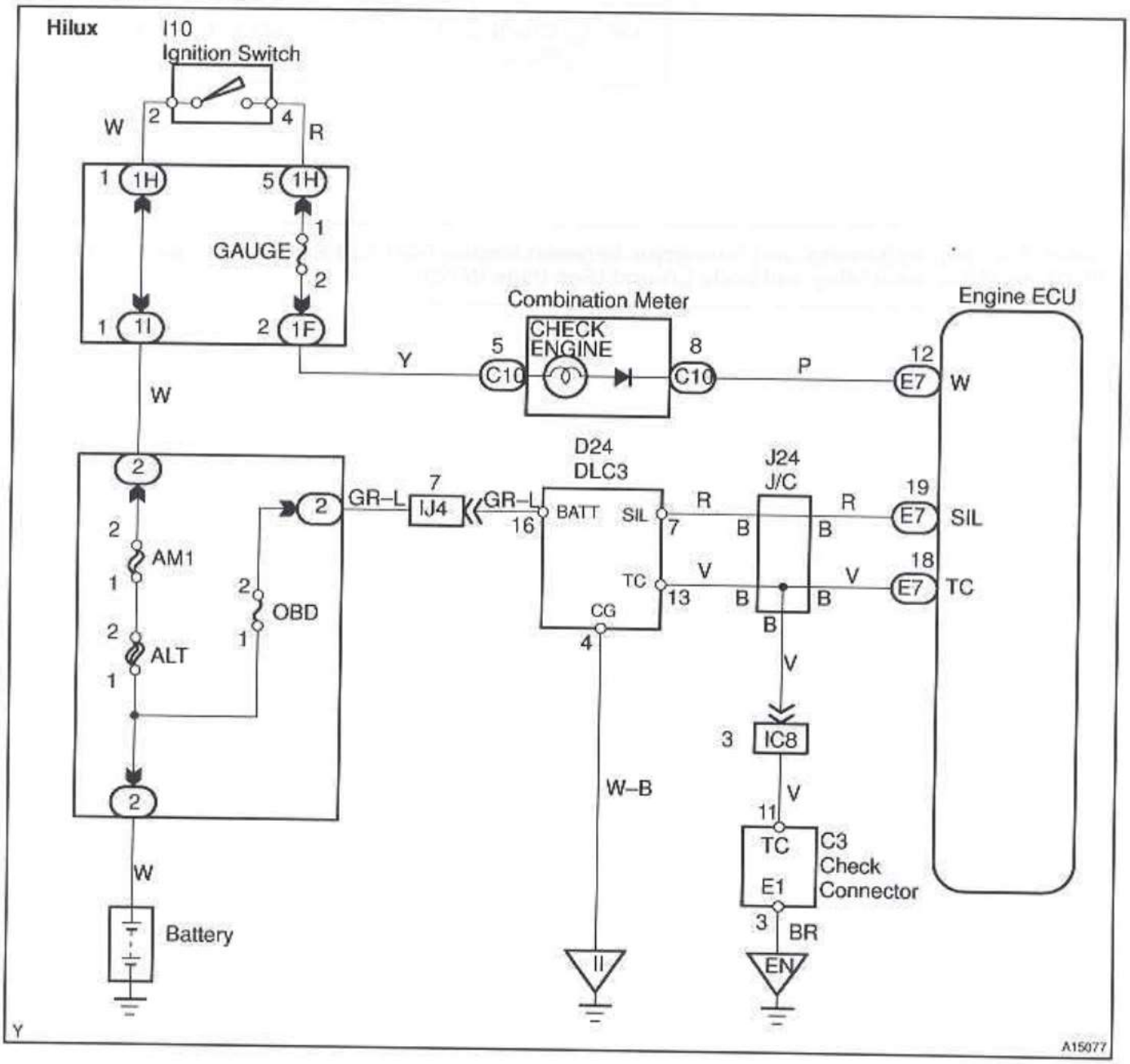
Check for open in harness and connector between engine ECU and ECD main relay (Marking: ECD), and ECD main relay and body ground (See page IN–20).

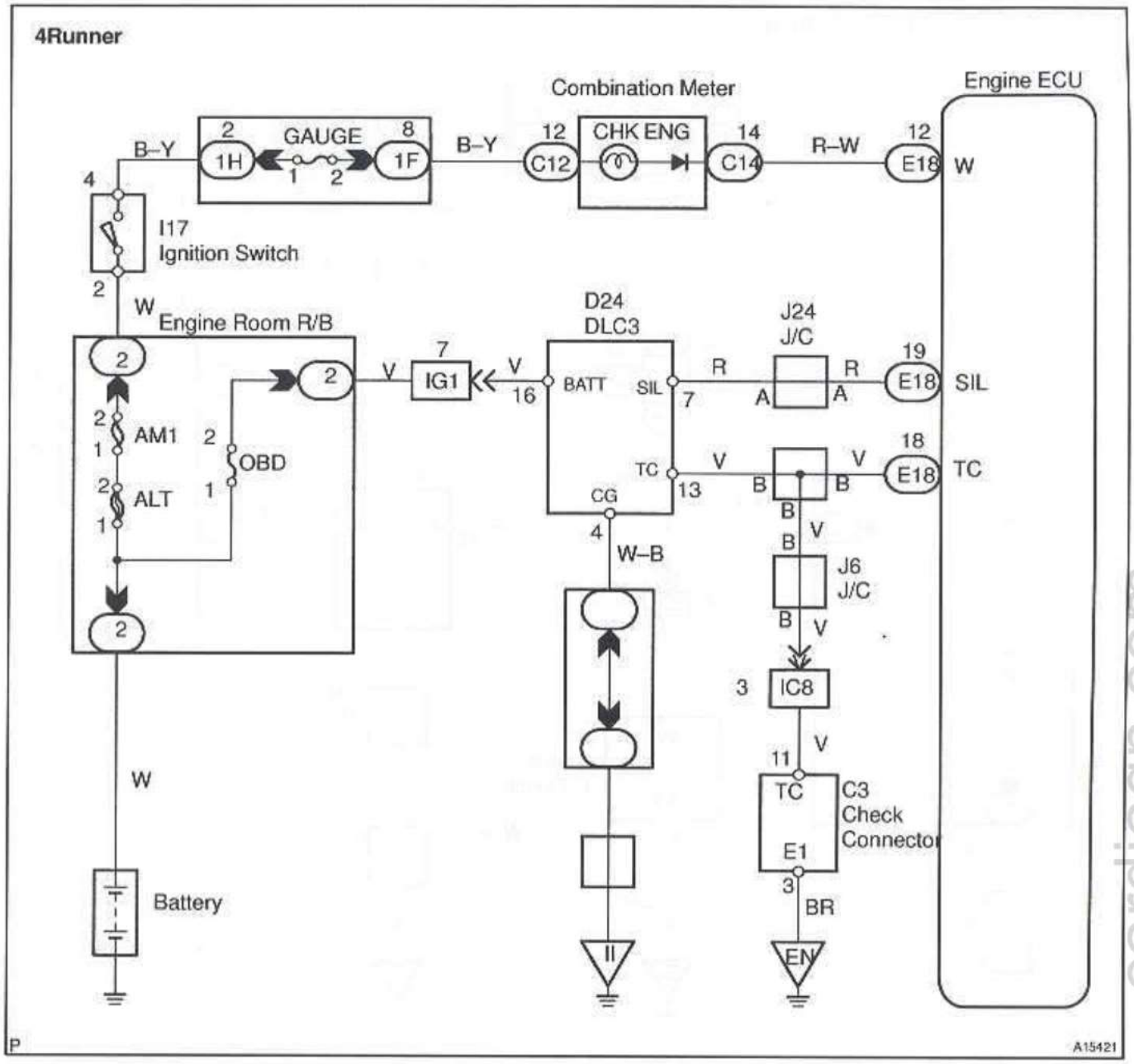
Diagnostic Connector (DLC3) Circuit

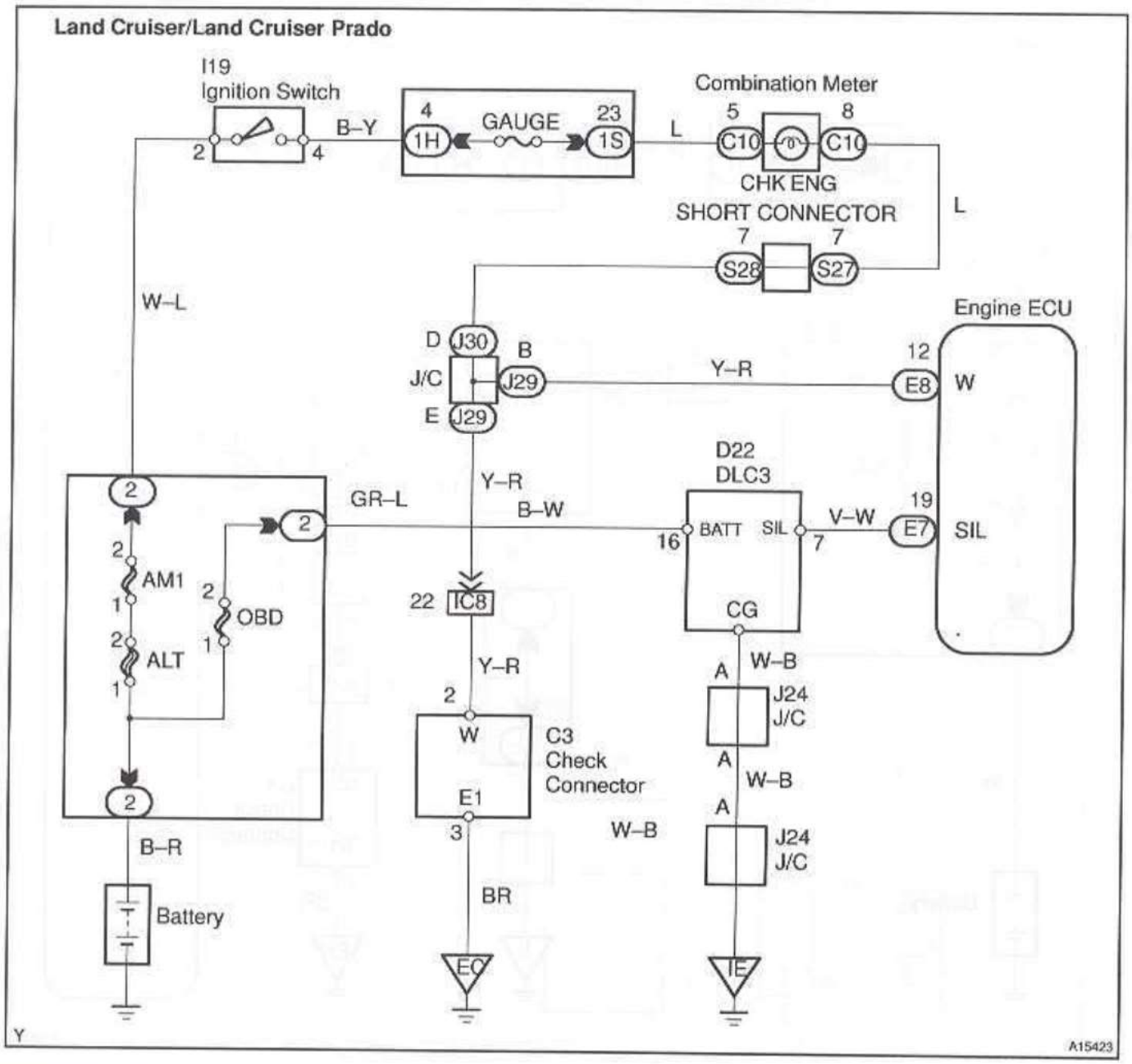
CIRCUIT DESCRIPTION

Terminals TC and CG are located in the DLC3.
The DLC3 is located under the finish lower panel. When terminals TC and CG are connected, a DTC in the normal mode or test mode can be read from the check engine warning light in the combination meter.
Also, terminal SIL is located in the DLC3. This terminal is used for the M–OBD communication with hand–held tester.

WIRING DIAGRAM

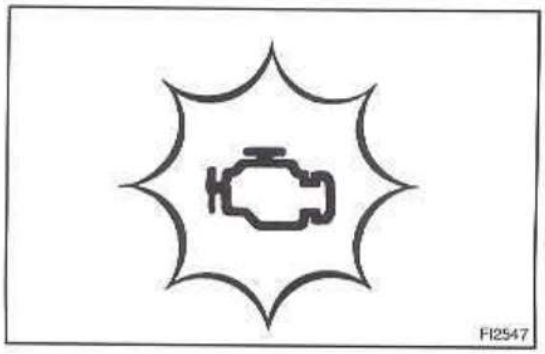






INSPECTION PROCEDURE

1	**Check check engine warning light condition.**



PREPARATION:

(a) Turn the ignition switch ON.

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

CHECK:

Check the check engine warning light condition.

OK:

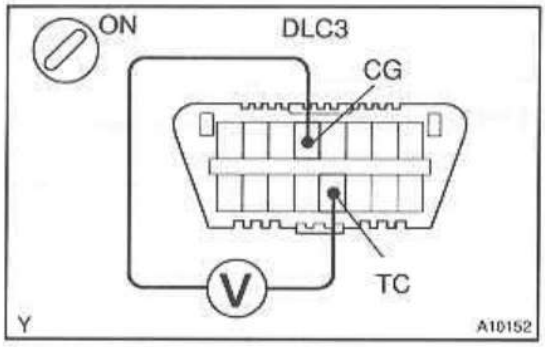
Check engine warning light: Blinking

HINT:
If this inspection is OK and there is no hand–held tester, the following steps are unnecessary because this circuit is OK. Proceed to next circuit inspection shown on problem symptoms table (See page DI–24).

OK → **Go to step 7.**

NG

2	**Check voltage between terminals TC and CG of DLC3.**



PREPARATION:
Turn the ignition switch ON.
CHECK:
Measure the voltage between terminals TC and CG of the DLC3.
OK:
Voltage: 9 – 14 V

OK → **Go to step 5.**

NG

3	**Check continuity terminal CG of DLC3 and body ground.**

NG → **Repair or replace harness or connector.**

OK

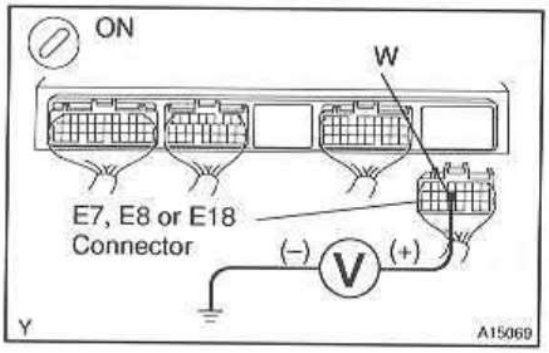
4	**Check for open and short in harness and connector between terminal TC of DLC3 and terminal TC of engine ECU (See page IN–20).**

NG → **Repair or replace harness or connector.**

OK

Check and replace engine ECU.

5	Check voltage between terminal W of engine ECU connector and body ground.



PREPARATION:

(a) Remove the glove compartment door.
(b) Disconnect the E7 (Hilux), E8 (Land Cruiser/Land Cruiser Prado) or E18 (4Runner) connector of the engine ECU.
(c) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal W of the engine ECU connector and the body ground.

OK:

Voltage: 9 – 14 V

OK	Check and replace engine ECU (See page IN–20).

NG

6	Check bulb of check engine warning light.

NG	Replace bulb.

OK

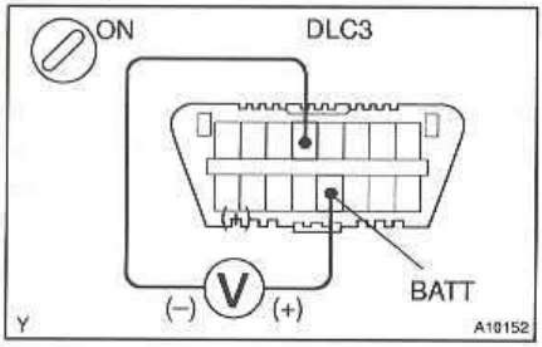
Check for open in harness and connector between terminal W of engine ECU and combination meter (See page IN–20).

7	Can you read DTC (including normal DTC) using hand–held tester?

YES	Proceed to next circuit inspection shown on problem symptoms table (See page DI–24).

NO

8	Check voltage between terminal BATT of DLC3 and body ground.



CHECK:

Measure the voltage between terminal BATT of the DLC3 and the body ground.

OK:

Voltage: 9 – 14 V

NG → **Check for open and short in harness and connector between terminal BATT of DLC3 and fusible link block (See page IN–20).**

OK →

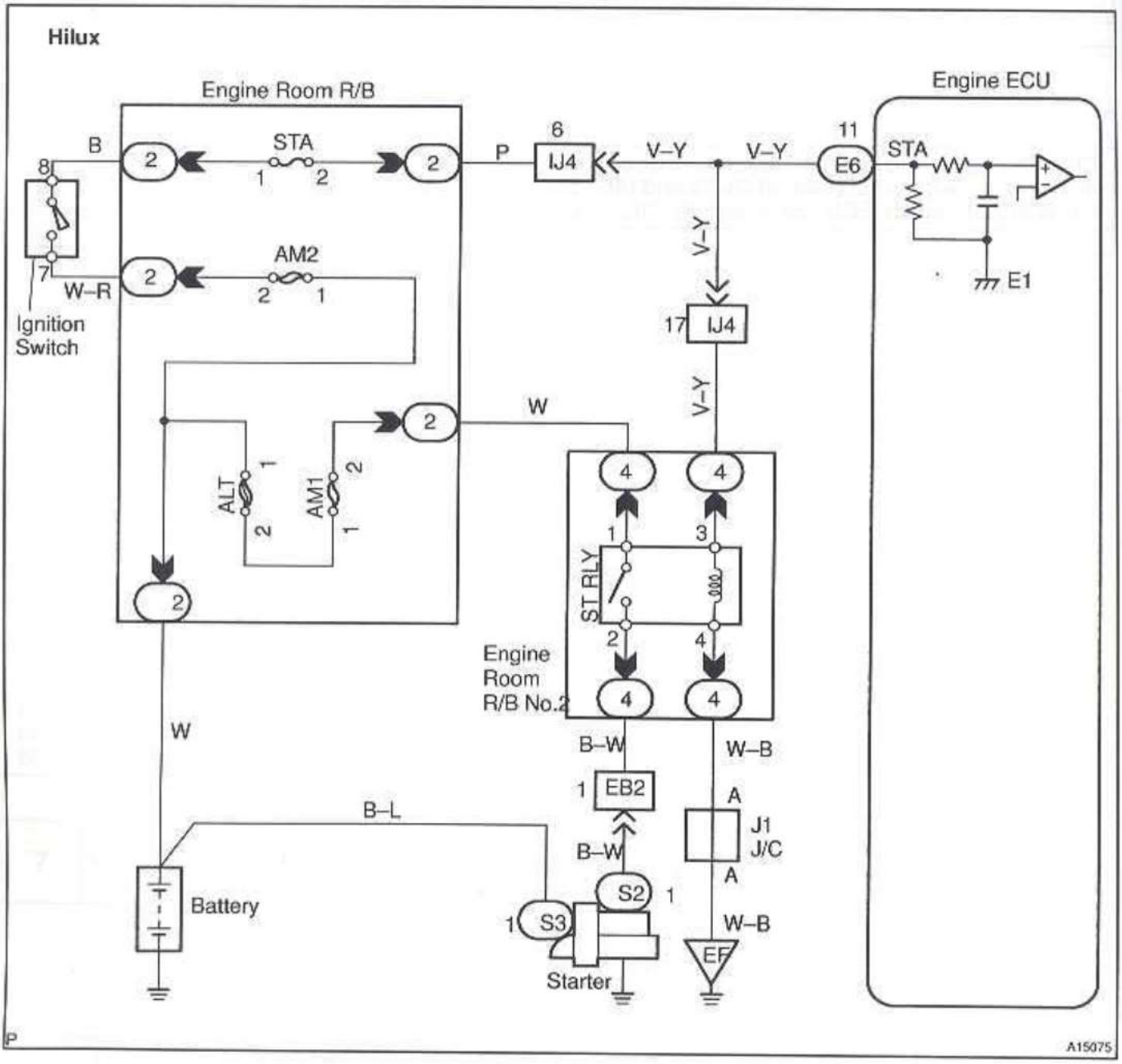
Check for open and short in harness and connector between terminal SIL of DLC3 and terminal SIL of engine ECU (See page IN–20).

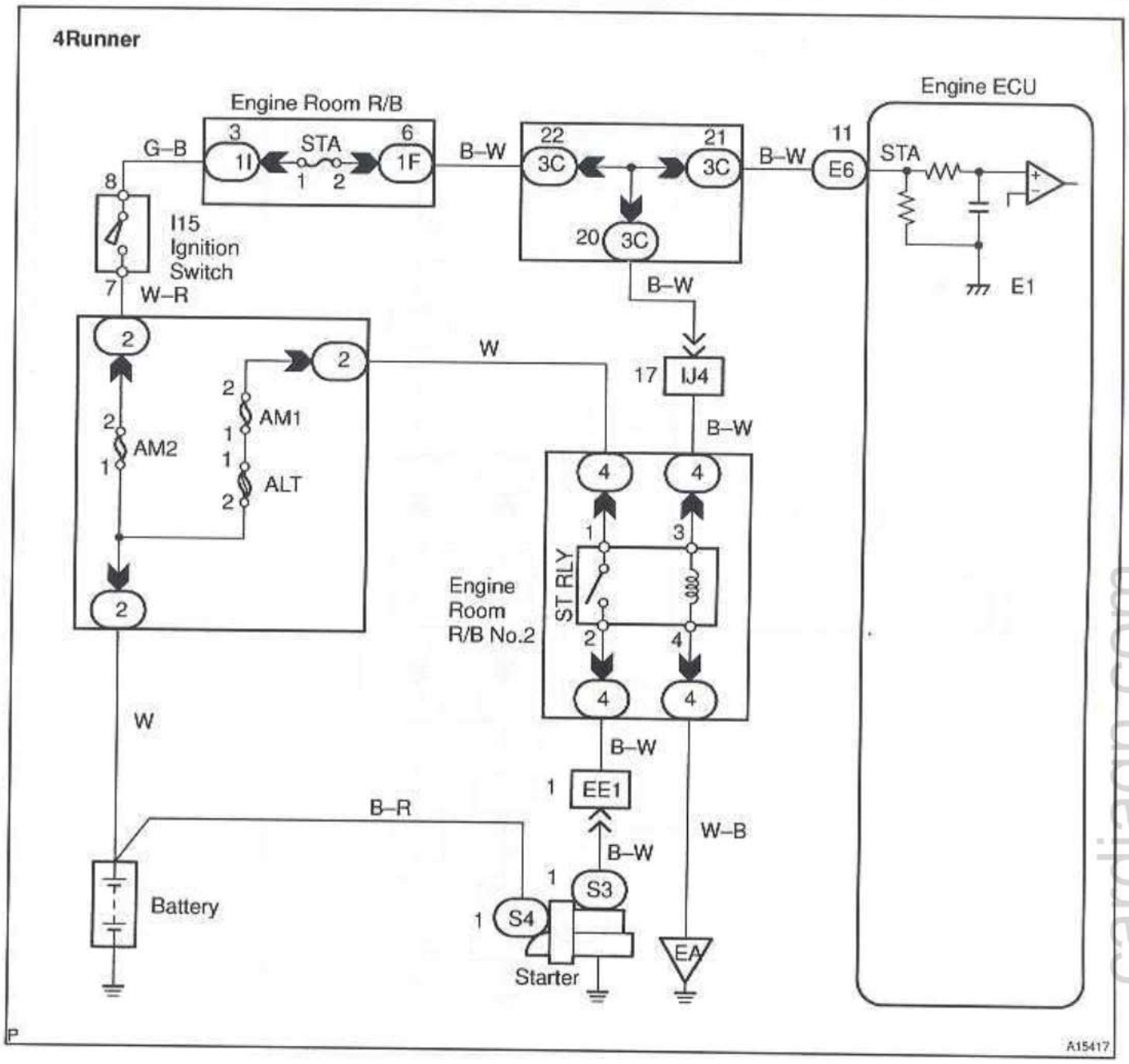
Starter Signal Circuit

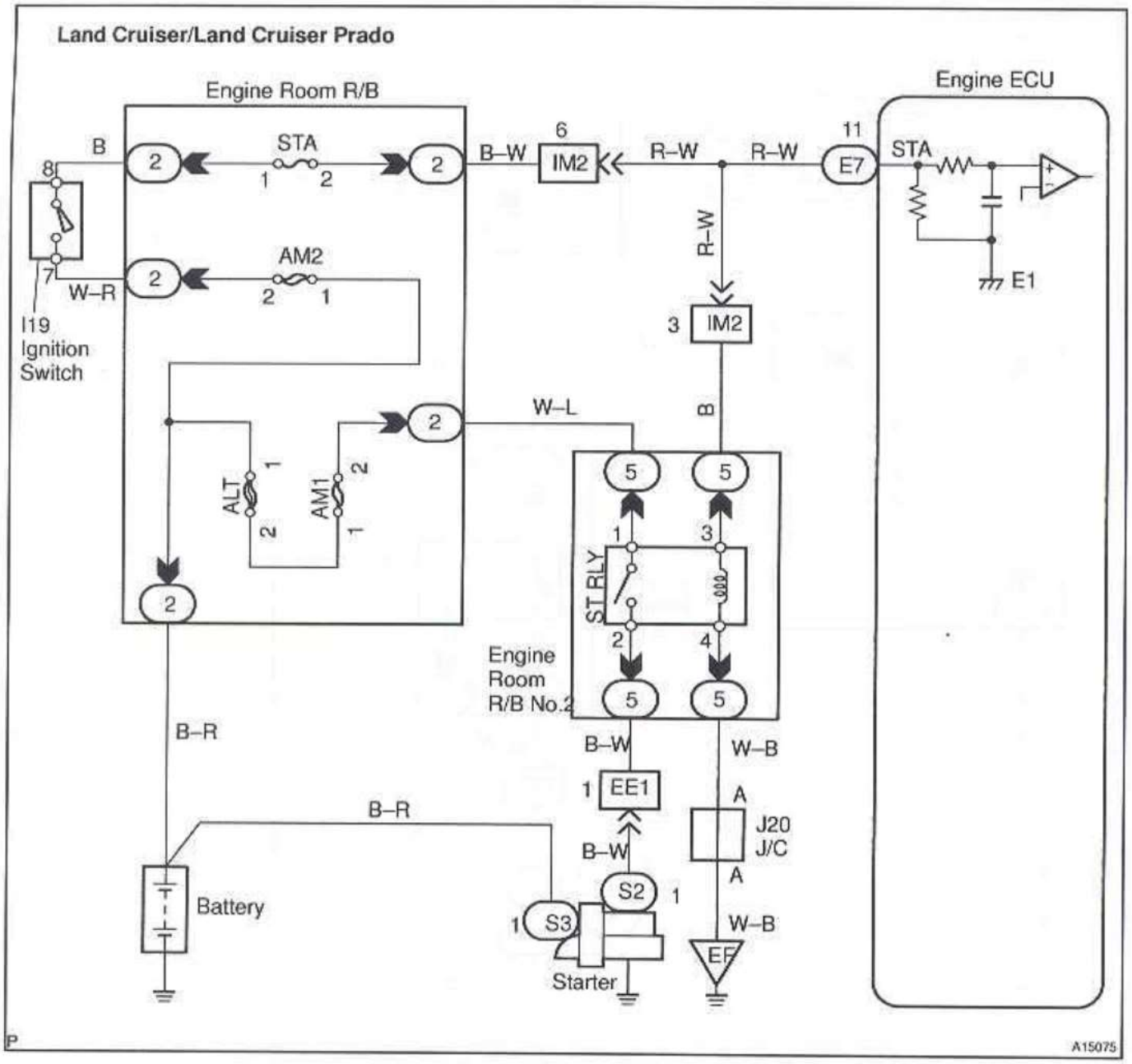
CIRCUIT DESCRIPTION

While the engine is cranking, the intake air flow is slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve a good start ability. While the engine is being cranked, the battery positive voltage is applied to terminal STA of the engine ECU. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–starting injection control.

WIRING DIAGRAM







INSPECTION PROCEDURE

HINT:
This diagnostic chart is based on the premise that the engine is being cranked under the normal conditions.
If the engine does not crank, proceed to the problem symptoms table on page DI–24.

When using hand–held tester:

1	**Connect hand–held tester and check STA signal.**

PREPARATION:
(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
CHECK:
Read the STA signal on the hand–held tester while the starter is operating.
OK:

Ignition Switch Position	ON	STA
STA Signal	OFF	ON

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–24).**

NG

2	**Check for open in harness and connector between engine ECU and starter relay (Marking : ST RLY for Land Cruiser/Land Cruiser Prado or ST for Hilux and 4Runner) (See page IN–20).**

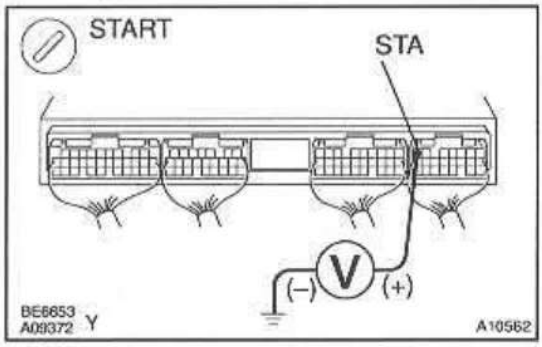
NG → **Repair or replace harness or connector.**

OK

Check and replace engine ECU.

When not using hand–held tester:

1	**Check voltage between terminal STA of engine ECU connector and body ground.**



PREPARATION:
(a) Remove the glove compartment door.
(b) Turn the ignition switch ON.

CHECK:
Measure the voltage between terminal STA of the engine ECU connector and the body ground during cranking.

OK:
Voltage: 6.0 V or more

OK	**Proceed to next circuit inspection shown on problem symptoms table (See page DI–24).**

NG

2	**Check for open in harness and connector between engine ECU and starter relay (Marking : ST RLY for Land Cruiser/Land Cruiser Prado or ST for Hilux and 4Runner) (See page IN–20).**

NG	**Repair or replace harness or connector.**

OK

Check and replace engine ECU.

EGR Control Circuit

CIRCUIT DESCRIPTION

The EGR system recirculates exhaust gas, which is controlled to the proper quantity to suit the driving conditions into the intake air mixture to slow down combustion, reduce the combustion temperature and reduce NOx emissions. The lift amount of the EGR valve is controlled by the vacuum which is regulated by the E–VRV operated by the engine ECU.

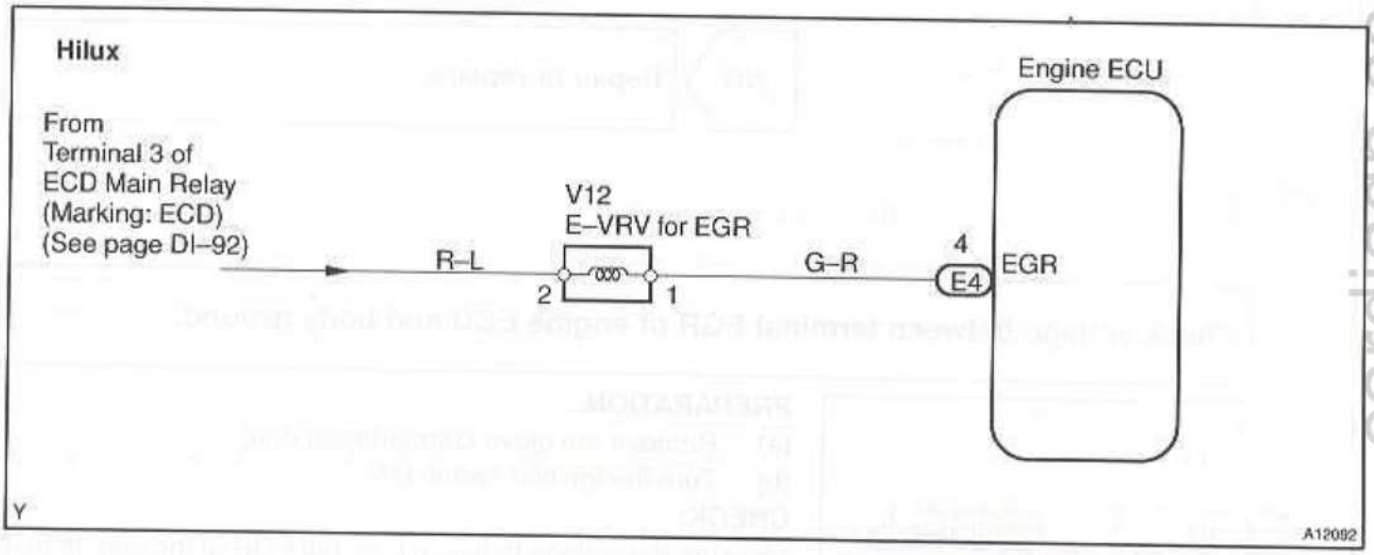
If even one of the following conditions is fulfilled, the E–VRV for EGR is turned ON by a signal from the ECU. This results in atmospheric air acting on the EGR valve, closing the EGR valve and shutting off the exhaust gas (EGR cutoff).

Under the following conditions, the EGR is cut to maintain driveability.

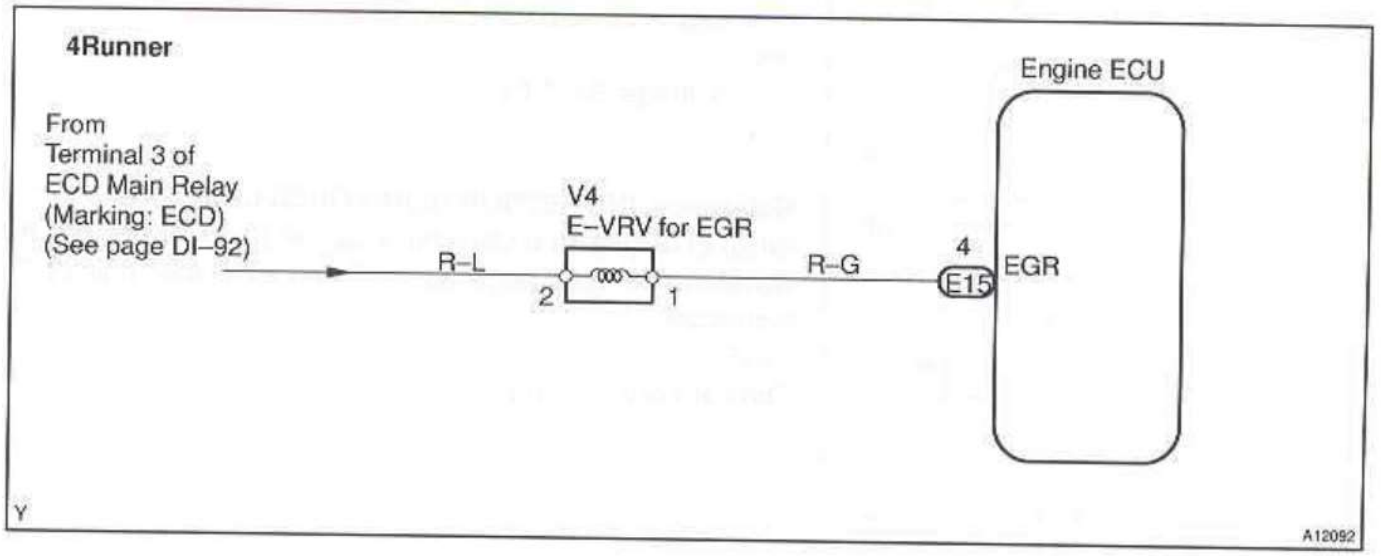
- Before the engine is warmed up
- During deceleration (Diesel throttle valve closed)
- Light engine load (very small amount of intake air)
- Engine speed over 3,000 rpm

WIRING DIAGRAM

Hilux



4Runner



6	Check EGR valve (See page EC–3).

NG → Replace EGR valve.

OK →

Check and replace engine ECU (See page IN–20).

When not using hand–held tester:

1	Check connection of vacuum hose.

NG → Repair or replace.

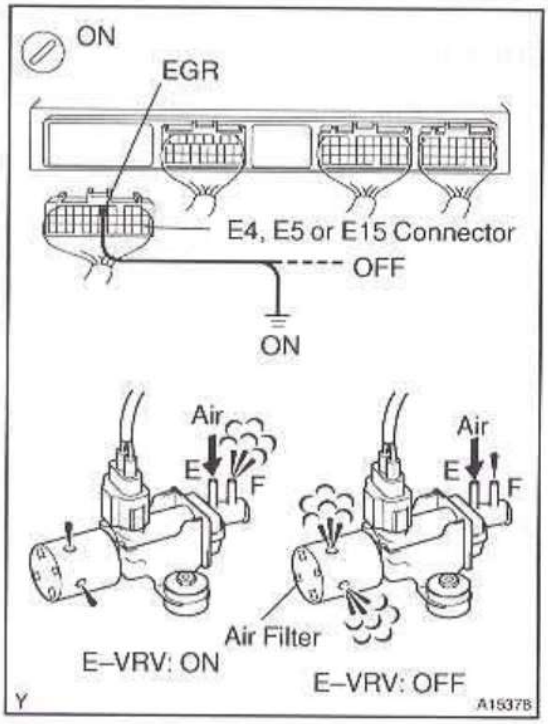
OK →

2	Check voltage between terminal EGR of engine ECU connector and body ground (See page DI–109, Step 5).

NG → Check and replace engine ECU (See page IN–20).

OK →

3	Check operation of E–VRV for EGR.



PREPARATION:

(a) Remove the glove compartment door.
(b) Disconnect the E4 (Hilux), E5 (Land Cruiser Land Cruiser Prado) or E15 (4Runner) connector of the engine ECU.
(c) Turn the ignition switch ON.

CHECK:

Check the E–VRV operation.

(1) Connect terminal EGR of the engine ECU connector and the body ground (ON).
(2) Disconnect terminal EGR of the engine ECU connector and the body ground (OFF).

OK:

E–VRV ON:
Air from port E flows out through port F.
E–VRV OFF:
Air from port E flows out through air filter.

OK → **Go to step 9.**

NG

4	Check E–VRV for EGR (See page EC–3).

NG → **Replace E–VRV for EGR.**

OK

5	Check for open and short in harness and connector between E–VRV for EGR and engine ECU, and E–VRV for EGR and ECD main relay (Marking: ECD) (See page IN–20).

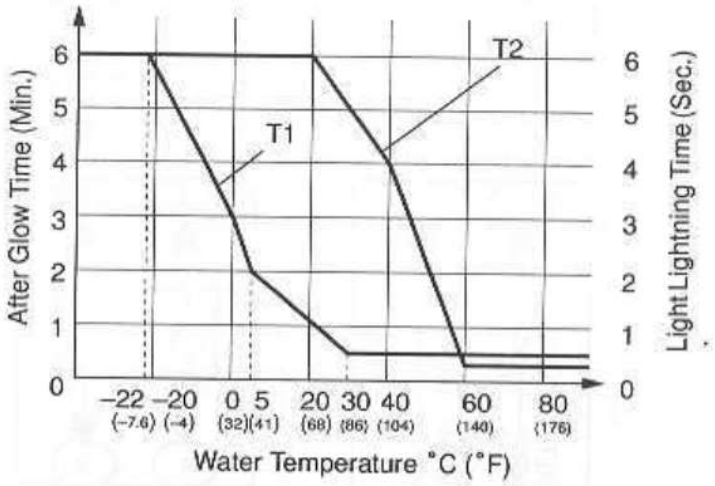
NG → **Repair or replace harness or connector.**

OK

Pre–heating Control Circuit

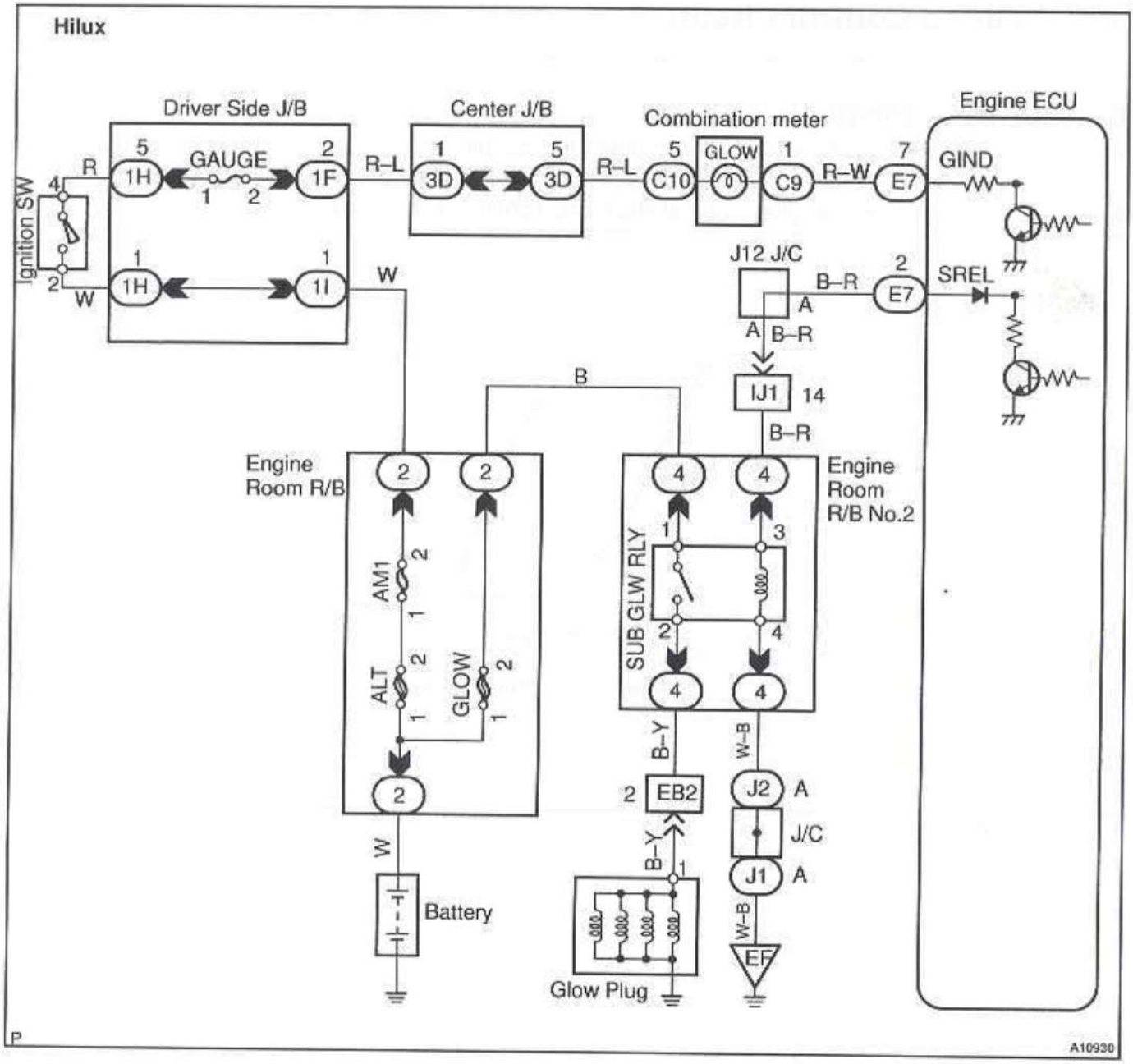
CIRCUIT DESCRIPTION

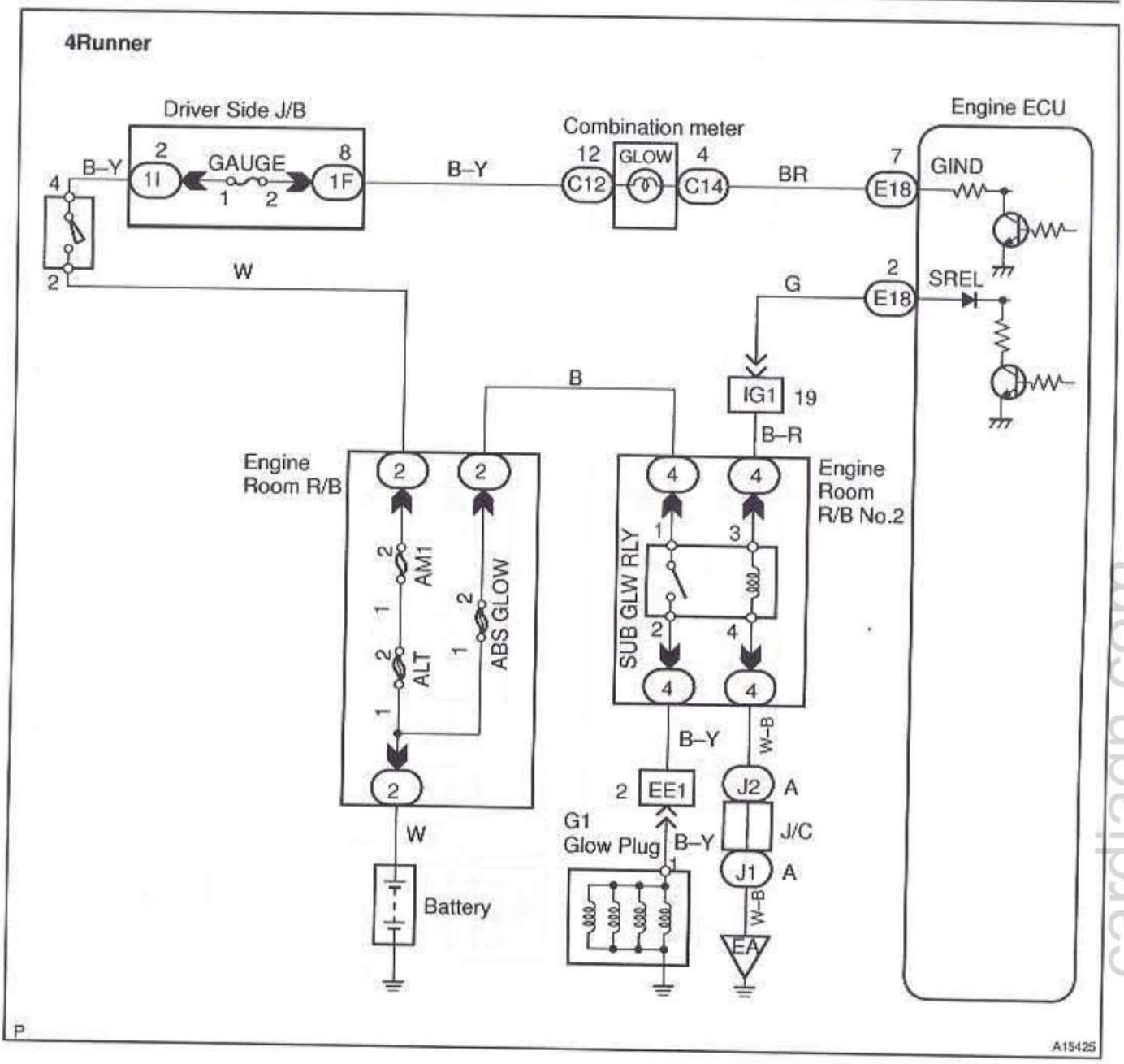
When the ignition switch is turned ON, the engine ECU calculates the glow indicator lighting time/heating corresponding to the coolant temperature at that time and turns on the glow indicator light/glow plug relay. As ceramics is used for a glow plug material, the current control is impossible.



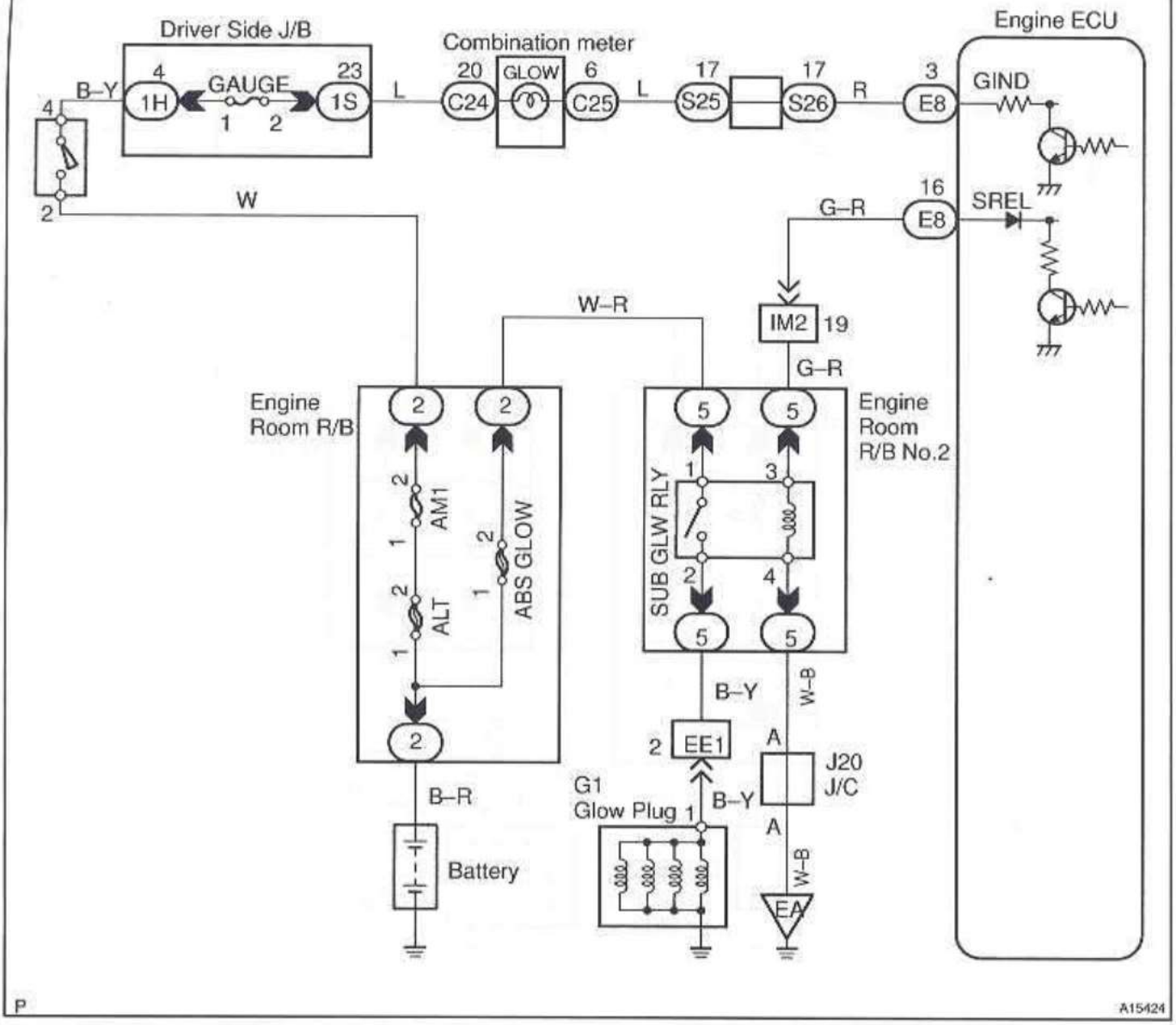
B13253 A15427

WIRING DIAGRAM



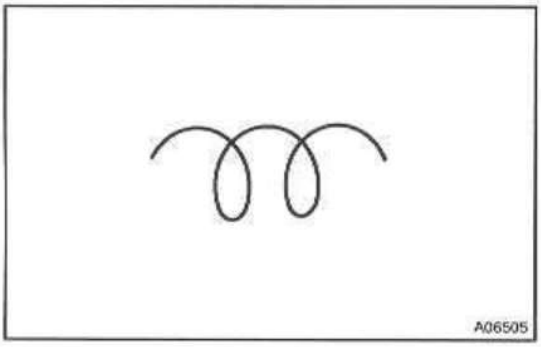


Land Cruiser/Land Cruiser Prado



INSPECTION PROCEDURE

1	**Does glow indicator light up?**

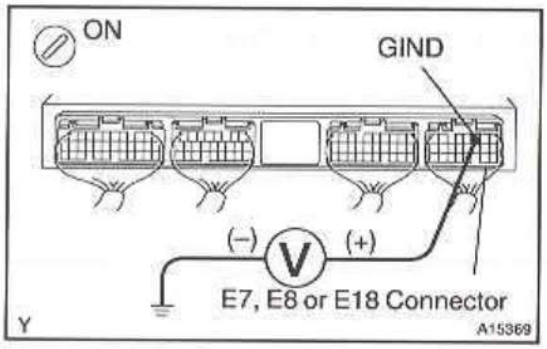


PREPARATION:
Turn the ignition switch ON.
CHECK:
Does the glow indicator light up?
OK:
The glow indicator lights up for 0.5 sec. or more.

OK	**Go to step 5.**

NG

2	Check voltage between terminal GIND of engine ECU connector and body ground.



PREPARATION:

(a) Remove the glove compartment.
(b) Disconnect the E7 (Hilux), E8 (Land Cruiser/Land Cruiser/Prado) or E18 (4Runner) connector from the engine ECU.
(c) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal GIND of the engine ECU connector and the body ground.

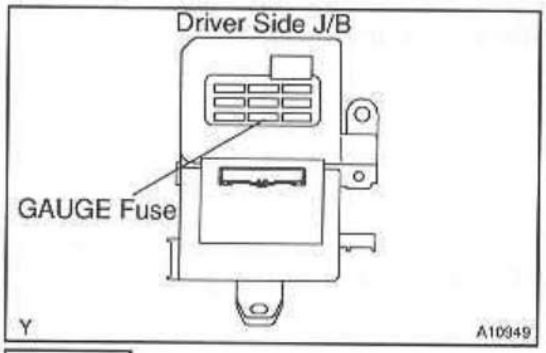
OK:

Voltage: 9 – 14 V

OK → **Check and replace engine ECU (See page IN–20).**

NG

3	Check GAUGE fuse.



PREPARATION:

Remove the GAUGE fuse from the driver side J/B.

CHECK:

Check the continuity of the GAUGE fuse.

OK:

Continuity

NG → **Replace GAUGE fuse.**

OK

4	Check glow indicator light bulb.

NG → **Replace bulb.**

OK

Check for open in harness and connector between combination meter and engine ECU, and combination meter and GAUGE fuse (See page IN–20).

5	Check glow indicator lighting time (See page ST–1).

NG → Check and replace engine ECU (See page IN–20).

OK

6	Are there any DTC being output?

YES → Go to relevant DTC chart (See page DI–14).

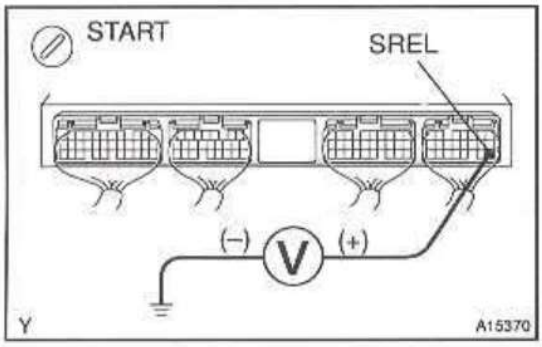
NO

7	Check glow plug relay (Marking: SUB GLW RLY for Hilux and 4Runner, SUB GLW for Land Cruiser/Land Cruiser Prado) (See page ST–1).

NG → Replace glow plug relay.

OK

8	Check voltage between terminal SREL of engine ECU connector and body ground at cranking.



PREPARATION:

(a) Remove the glove compartment.
(b) Disconnect the E7 (Hilux), E8 (Land Cruiser/Land Cruiser Prado) orE18 (4Runner) connector from the engine ECU.
(c) Turn the ignition switch START.

CHECK:

Measure the voltage between terminal SREL of the engine ECU connector and the body ground at cranking.

OK:

Voltage: 9 – 14 V

NG → Check and replace engine ECU (See page IN–20).

OK

9	Check for open and short in harness and connector between glow plug relay and engine ECU, and glow plug relay and body ground (See page IN–20).

NG → Repair or replace harness or connector.

OK

10	Check resistance of glow plug (See Pub. No. RM710E, ST section).

NG → Replace glow plug.

OK

11	Inspect glow plug installation.

NG → Tighten glow plug.

OK

12	Check for open in harness and connector between glow plug relay and glow plug (See page IN–20).

NG → Repair or replace harness or connector.

OK

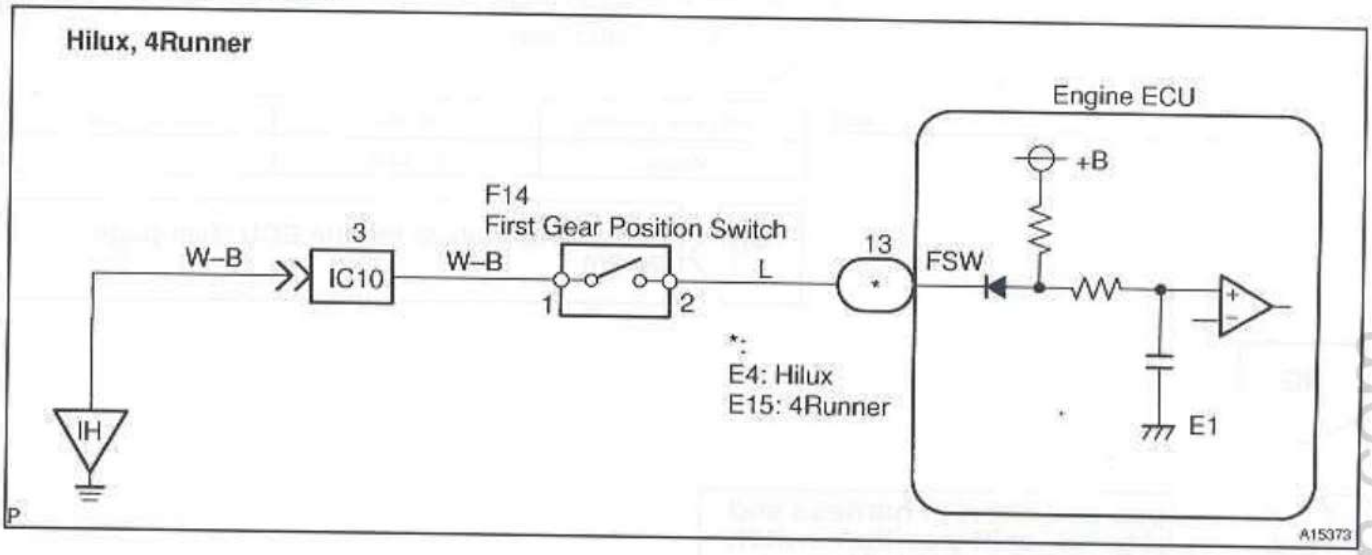
1st Gear Position Switch Circuit (only for M/T)

CIRCUIT DESCRIPTION

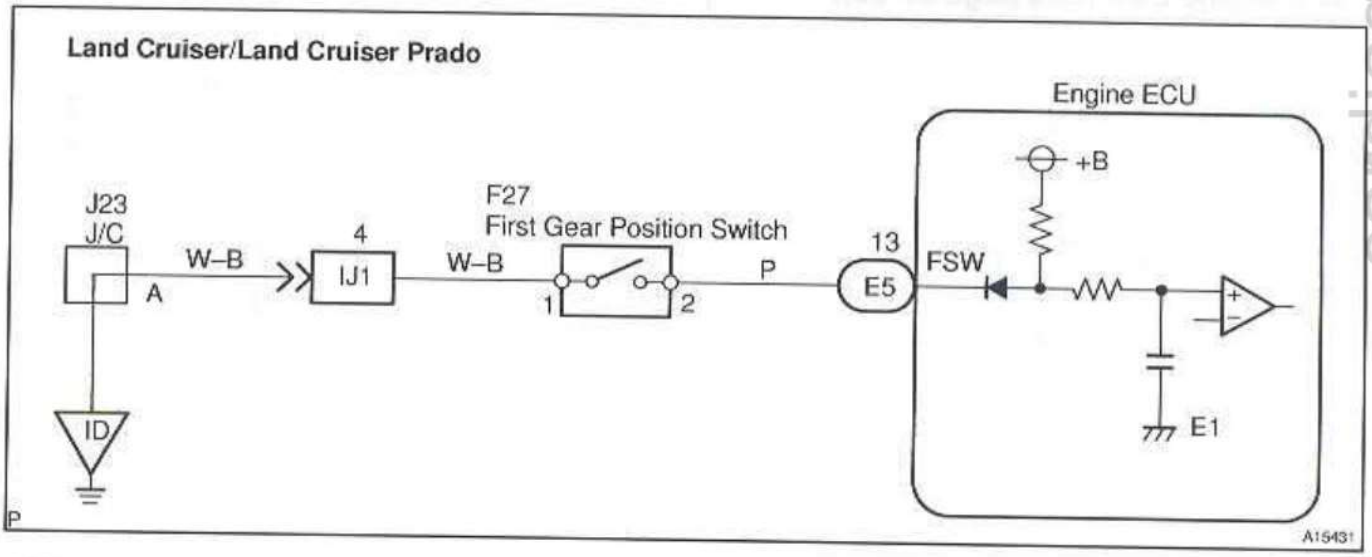
The shift position switch on the side of transmission detects the 1st gear and limits the engine output when high load is applied during the vehicle running in the 1st gear.

WIRING DIAGRAM

Hilux, 4Runner



Land Cruiser/Land Cruiser Prado



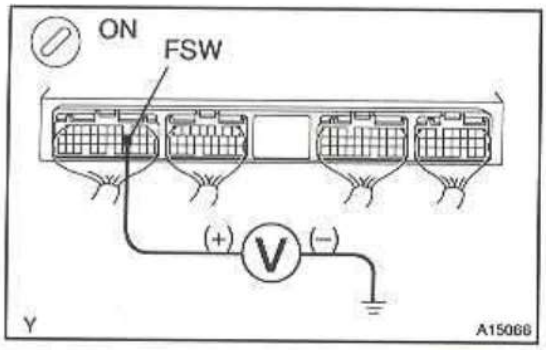
INSPECTION PROCEDURE

1	Check shift position switch (See page ED–21).

NG → Replace shift position switch.

OK

2	**Check voltage between terminal FSW of engine ECU connector and body ground.**



PREPARATION:

(a) Remove the glove compartment door.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal FSW of the engine ECU connector and the body ground after the shift lever is moved into the following positions.

OK:

Shift Lever Position	1st Gear	Except 1st Gear
Voltage	9 – 14 V	0 – 3 V

OK → **Check and replace engine ECU (See page IN–20).**

NG → **Check for open and short in harness and connector between shift position switch and engine ECU (See page IN–20).**

05FT-01

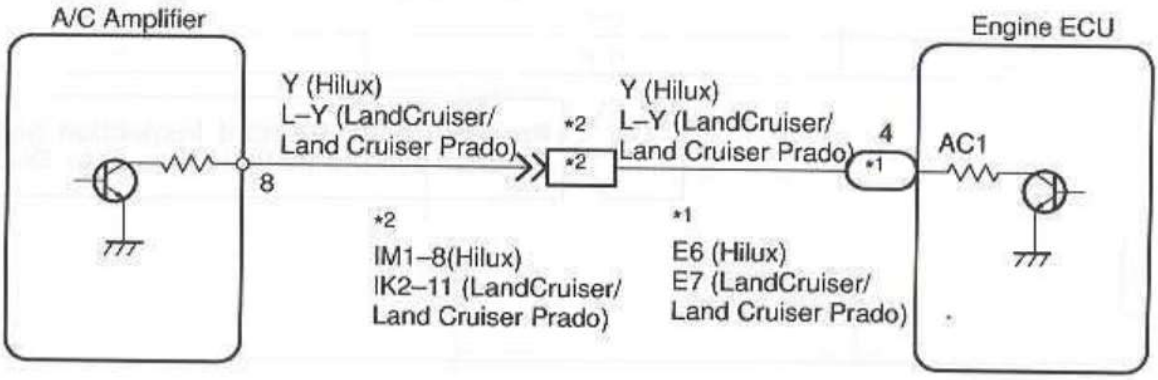
A/C Signal Circuit

CIRCUIT DESCRIPTION

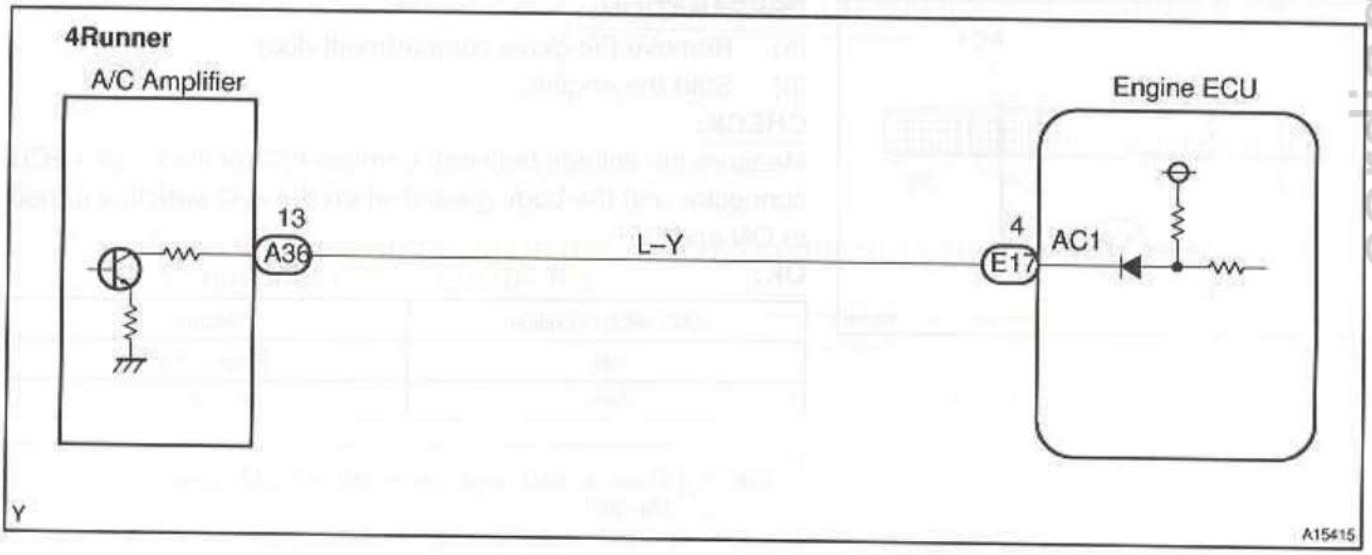
When the A/C compressor is on, the A/C amplifier sends an A/C signal to the engine ECU, then engine ECU increases the fuel injection volume to improve the driveability during the engine idling.

WIRING DIAGRAM

Hilux, Land Cruiser/LandCruiser Prado



4Runner



INSPECTION PROCEDURE

When using hand–held tester:

1	**Connect hand–held tester, and check A/C signal.**

PREPARATION:

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

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

CHECK:

Read the A/C signal on the hand–held tester while the A/C compressor is on.

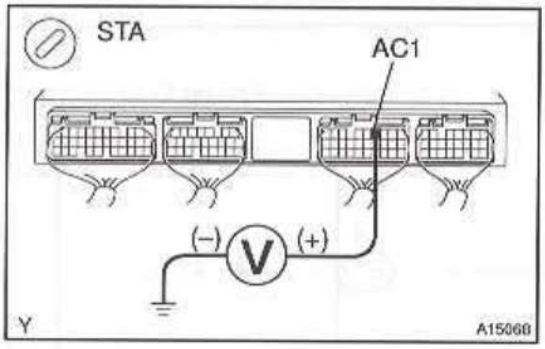
OK:

A/C Switch Condition	OFF	ON
A/C Signal	OFF	ON

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–24).**

NG

2	**Check voltage between terminal AC1 of engine ECU connector and body ground.**



PREPARATION:

(a) Remove the glove compartment door.

(b) Start the engine.

CHECK:

Measure the voltage between terminal AC1 of the engine ECU connector and the body ground when the A/C switch is turned to ON and OFF.

OK:

A/C Switch Condition	Voltage
ON	Below 1.5 V
OFF	9 – 14 V

OK → **Check and replace engine ECU (See page IN–20).**

NG

3	**Check for open and short in harness and connector between engine ECU and A/C amplifier (See page IN–20).**

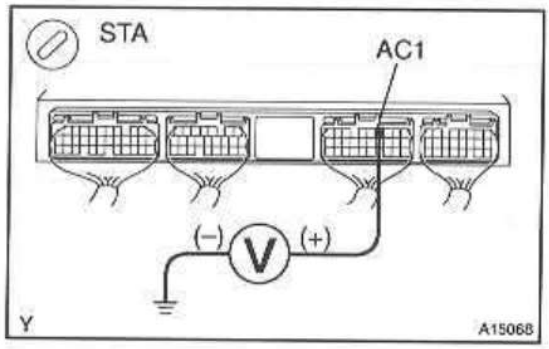
NG → **Repair or replace harness or connector.**

OK

Check and replace A/C amplifier.

When not using hand–held tester:

1	Check voltage between terminal AC1 of engine ECU connector and body ground.



PREPARATION:

(a) Remove the glove compartment door.

(b) Start the engine.

CHECK:

Measure the voltage between terminal AC1 of the engine ECU connector and the body ground when the A/C switch is turned to ON and OFF.

OK:

A/C Switch Condition	Voltage
ON	Below 1.5 V
OFF	9 – 14 V

OK → Proceed to next circuit inspection shown on problem symptoms table (See page DI–24).

NG

2	Check for open and short in harness and connector between engine ECU and A/C amplifier (See page IN–20).

NG → Repair or replace harness or connector.

OK

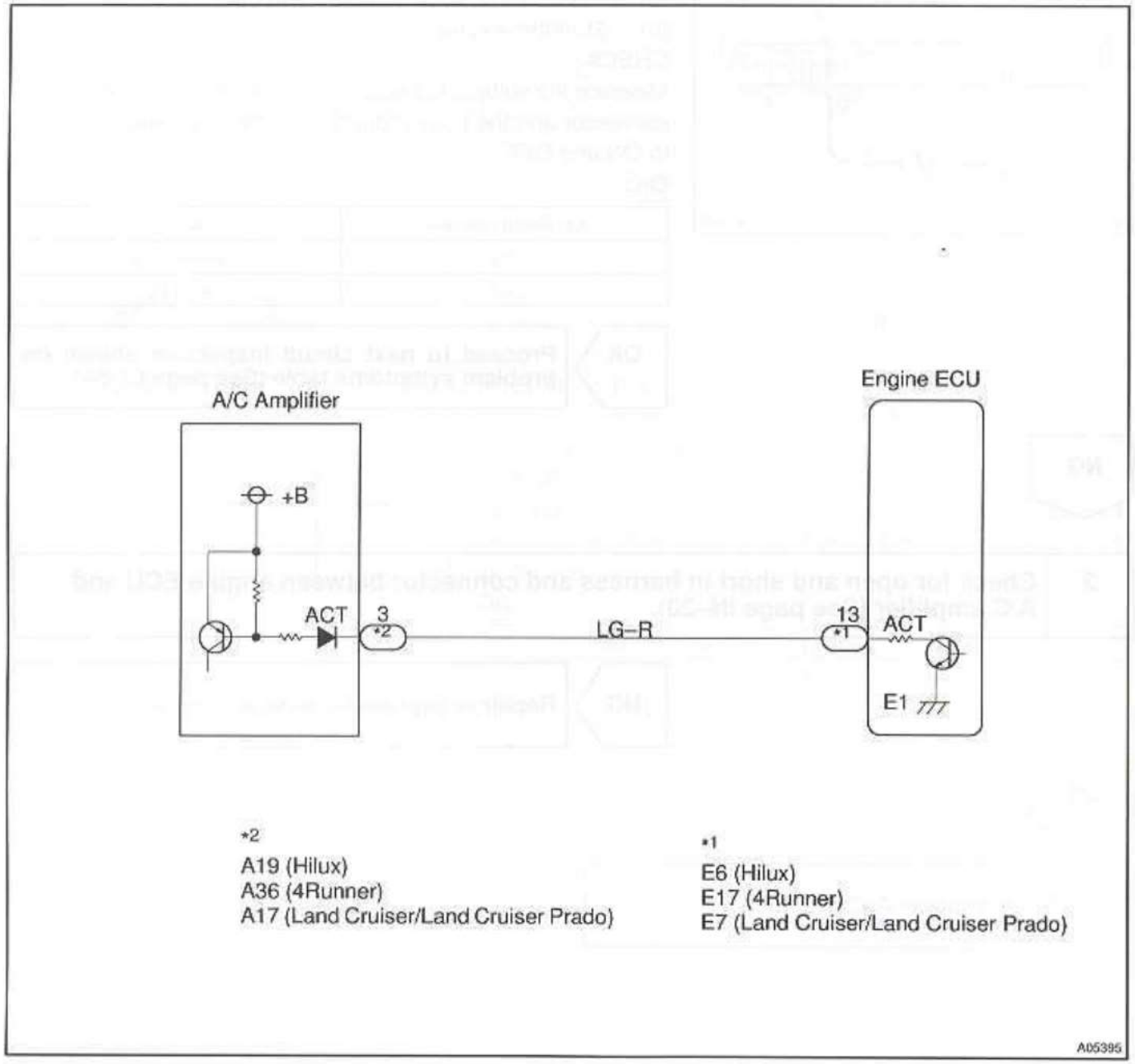
Check and replace A/C amplifier.

A/C Cut Control Circuit

CIRCUIT DESCRIPTION

This circuit cuts the air conditioning operation during the vehicle acceleration in order to increase an acceleration performance. During the acceleration with the vehicle speed of 30 km/h (19 mph) or less and accelerator pedal opening angle of 45° or more, the A/C magnetic switch is turned off for several seconds.
The air conditioning is also controlled by the ECU outputting the engine coolant temperature to the A/C amplifier.

WIRING DIAGRAM



*2
A19 (Hilux)
A36 (4Runner)
A17 (Land Cruiser/Land Cruiser Prado)

*1
E6 (Hilux)
E17 (4Runner)
E7 (Land Cruiser/Land Cruiser Prado)

INSPECTION PROCEDURE

When using hand–held tester:

1	**Connect hand–held tester, and check operation of air conditioning cut control.**

PREPARATION:

(a) Connect the hand held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine and turn the A/C switch ON.

HINT:

A/C magnetic clutch is turned ON.

(d) Select the ACTIVE TEST mode on the hand–held tester.

CHECK:

Check the operation of the A/C magnetic clutch cut when the A/C cut control is operated by the hand–held tester.

OK:

A/C magnet clutch is turned off.

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–24).**

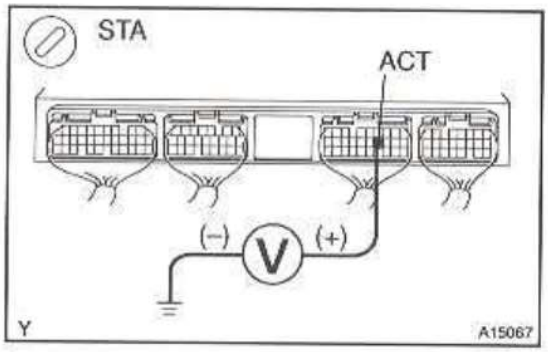
NG

2	**Check for open and short in harness and connector between engine ECU and A/C amplifier (See page IN–20).**

NG → **Repair or replace harness or connector.**

OK

3	**Check voltage between terminal ACT of engine ECU connector and body ground.**



PREPARATION:

(a) Remove the glove compartment door.
(b) Start the engine.

CHECK:

Measure the voltage between terminal ACT of the engine ECU connector and the body ground when the A/C switch is turned to ON and OFF.

OK:

A/C Switch Condition	Voltage
ON	9 – 14 V
OFF	0 – 3 V

NG → Check and replace A/C amplifier.

OK

Check and replace engine ECU (See page IN–20).

When not using hand–held tester:

1	Check voltage between terminal ACT of engine ECU connector and body ground (See page DI–128, step 3).

OK → Check and replace engine ECU (See page IN–20).

NG

2	Check for open and short in harness and connector between engine ECU and A/C amplifier (See page IN–20).

NG → Repair or replace harness or connector.

OK

Check and replace A/C amplifier.