

Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

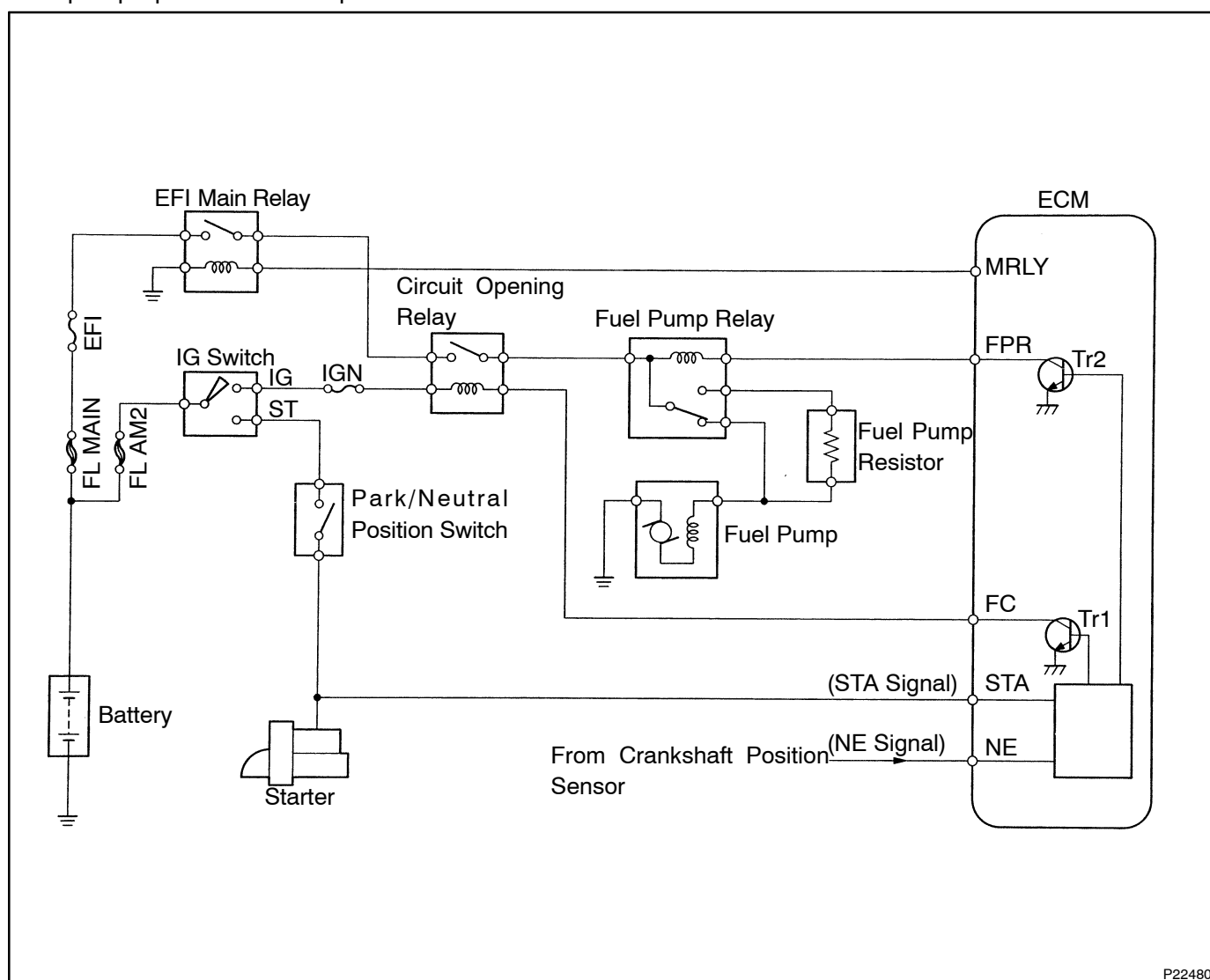
In the diagram below, when the engine is cranked, current flows from terminal ST of the ignition switch to terminal STA of ECM (STA signal).

When the STA signal and NE signal are input to the ECM, Tr1 is turned ON, current flows to coil of the circuit opening relay, the relay switches on, power is supplied to the fuel pump and the fuel pump operates.

While the NE signal is generated (engine running), the ECM keeps Tr1 ON (circuit opening relay ON) and the fuel pump also keeps operating.

The fuel pump speed is controlled at 2 levels (high speed or low speed) by the condition of the engine (starting, light load, heavy load). When the engine starts (STA ON), Tr2 in the ECM is OFF, so battery voltage is applied directly to the fuel pump. Fuel pump operates at high speed.

After the engine starts, during idling or light loads, since Tr2 goes ON, power is supplied to the fuel pump via the fuel pump resistor. Fuel pump operates at low speed.



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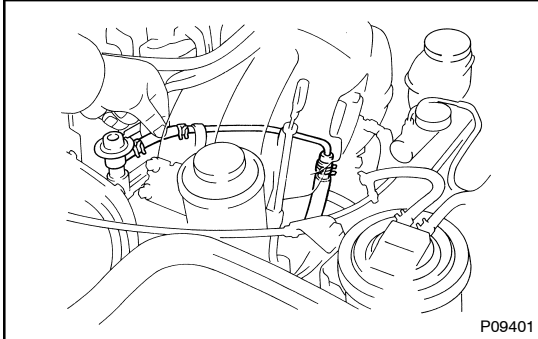
The diagram illustrates the electrical system for the 1987 Land Cruiser (DM51LH). Key components and their connections include:

- Battery:** Connected to the main power line (FL MAIN) and the Ignition Switch (IG Switch).
- Ignition Switch (IG Switch):** Controls the Ignition (IGN) and the Fuel Pump (FUEL) through the Ignition Switch (IG Switch) and the Fuel Pump (FUEL) relays.
- Fuse Block:** Contains fuses for the Ignition (IGN) and the Fuel Pump (FUEL).
- Circuit Opening Relay:** Controls the Fuel Pump (FUEL) and the Fuel Pressure Regulator (FPR).
- Fuel Pump Resistor:** Controls the Fuel Pump (FUEL) and the Fuel Pressure Regulator (FPR).
- Fuel Pump:** Delivers fuel to the engine.
- Fuel Pressure Regulator (FPR):** Maintains fuel pressure in the system.
- Fuel Control (FC):** Controls the Fuel Pump (FUEL) and the Fuel Pressure Regulator (FPR).
- ECM (Engine Control Module):** Controls the Fuel Pump (FUEL) and the Fuel Pressure Regulator (FPR).

Wire colors and terminal numbers are labeled throughout the diagram to identify specific connections. For example, the Ignition Switch (IG Switch) is connected to the Ignition (IGN) and the Fuel Pump (FUEL) through the Ignition Switch (IG Switch) and the Fuel Pump (FUEL) relays. The Fuel Pump (FUEL) is connected to the Fuel Pump (FUEL) and the Fuel Pressure Regulator (FPR) through the Fuel Pump (FUEL) and the Fuel Pressure Regulator (FPR) relays.

INSPECTION PROCEDURE**TOYOTA hand-held tester**

- | | |
|----------|--|
| 1 | Connect the TOYOTA hand-held tester and check operation of fuel pump. |
|----------|--|

**PREPARATION:**

- (a) Remove the fuse cover on the instrument panel.
- (b) Connect the TOYOTA hand-held tester to the DLC3.
- (c) Turn ignition switch ON and TOYOTA hand-held tester main switch ON.
- (d) Use ACTIVE TEST mode to operate the fuel pump.

CHECK:

Check for fuel pressure in the fuel return hose when it is pinched off.

OK:

There is pressure in the fuel return hose.

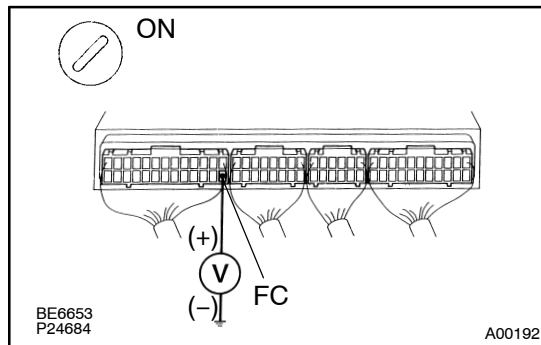
HINT:

At this time, you will hear a fuel flowing noise.

OK**Go to step 4.****NG**

- | | |
|----------|--|
| 2 | Check circuit opening relay (See page SF-55). |
|----------|--|

NG**Replace circuit opening relay.****OK**

3 Check voltage between terminal FC of ECM connector and body ground.**PREPARATION:**

- (a) Remove instrument panel speaker No.1 panel (See page [SF-64](#)).
- (b) Turn ignition switch ON.

CHECK:

Measure voltage between terminal FC of ECM and body ground.

OK:

Voltage: 9 - 14 v

OK

Go to step 5.

NG

Check for open and short in harness and connector between terminal FC of ECM and circuit opening relay and fuse block (See page [IN-27](#)).

4 Connect the TOYOTA hand-held tester and check operation of fuel pump relay.**PREPARATION:**

- (a) Connect the TOYOTA hand-held tester to the DLC3.
- (b) Start the engine.
- (c) Turn TOYOTA hand-held tester main switch ON.
- (d) Select the ACTIVE TEST mode on the TOYOTA hand-held tester.

CHECK:

Check operation of fuel pump relay when it is switched ON and OFF by the TOYOTA hand-held tester.

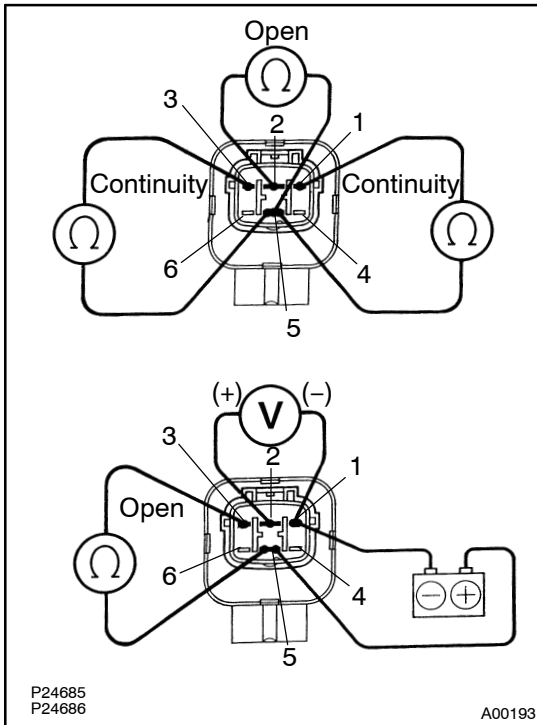
OK:

Operating noise can be heard from the relay.

OK

Go to step 8.

NG

5 Check operation of fuel pump relay.**PREPARATION:**

- (a) Disconnect fuel pump relay connector.
- (b) Remove fuel pump relay.

CHECK:

Check continuity between terminals of fuel pump relay.

OK:

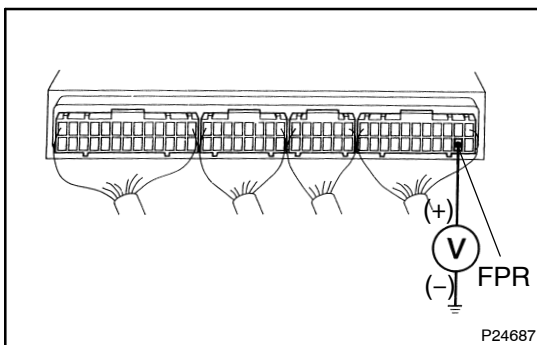
Terminals 3 and 5	Continuity
Terminals 2 and 5	Open
Terminals 1 and 5	Continuity (Reference value 80 Ω)

CHECK:

- (a) Apply battery voltage between terminals 1 and 5.
- (b) Measure voltage between terminals 1 and 2.

OK:

Terminals 1 and 2	Battery voltage
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NG**Replace fuel pump relay.****OK****6 Check voltage between terminal FPR of ECM connector and body ground.****PREPARATION:**

- (a) Remove instrument panel speaker No.1 panel
(See page [SF-64](#)).
- (b) Start the engine.

CHECK:

Measure voltage between terminal FPR of ECM and body ground while racing the engine.

OK:

Time after engine started	Voltage
60 seconds or more	0 - 3 V
Less than 60 seconds	9 - 14 V

OK**Check and replace ECM (See page [IN-27](#)).****NG**

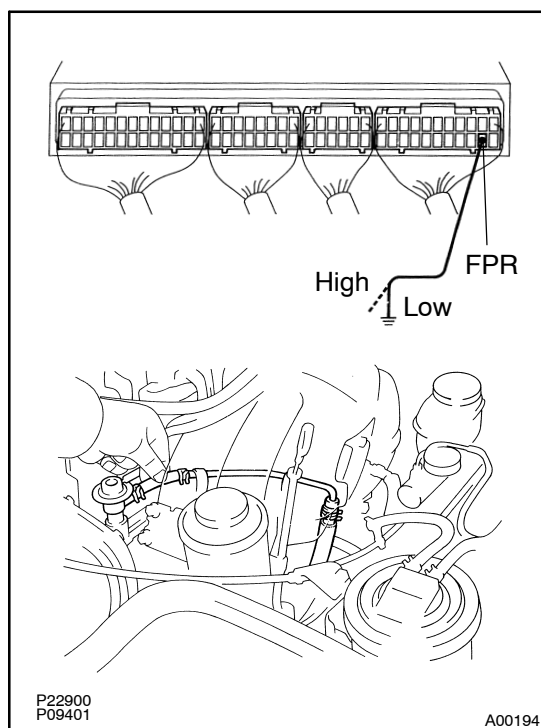
- 7 Check for open and short in harness and connector between terminal FPR of ECM connector and fuel pump relay (See page [IN-27](#)).**

NG

Repair or replace harness or connector.

OK

- 8 Check operation of fuel pump.**



PREPARATION:

- Remove instrument panel speaker No.1 panel (See page [SF-64](#)).
- Connect the TOYOTA hand – held tester to the DLC3.
- Turn ignition switch ON and TOYOTA hand-held tester main switch ON..
- Use ACTIVE TEST mode to operate the fuel pump.

CHECK:

Check operation of fuel pump, when it is operated by the TOYOTA hand-held tester and terminal FPR of ECM is grounded and is not grounded.

OK:

There is pressure in the inlet hose.

HINT:

At this time, you will hear a fuel flowing noise.

FPR is grounded (Low speed)	FPR is not grounded (High speed)	
NG	NG	Go to step 9
NG	OK	Go to step 10
OK	NG	Repair or replace harness or connector between fuel pump relay and fuel pump.

- 9 Check fuel pump (See page [SF-6](#)).**

NG

Repair or replace fuel pump.

OK

Check for open or short in harness and connector between EFI main relay (Marking: EFI) and circuit opening relay and fuel pump relay and fuel pump and body ground (See page [IN-27](#)).

10 Check fuel pump resistor. (See page [SF-57](#)).

NG

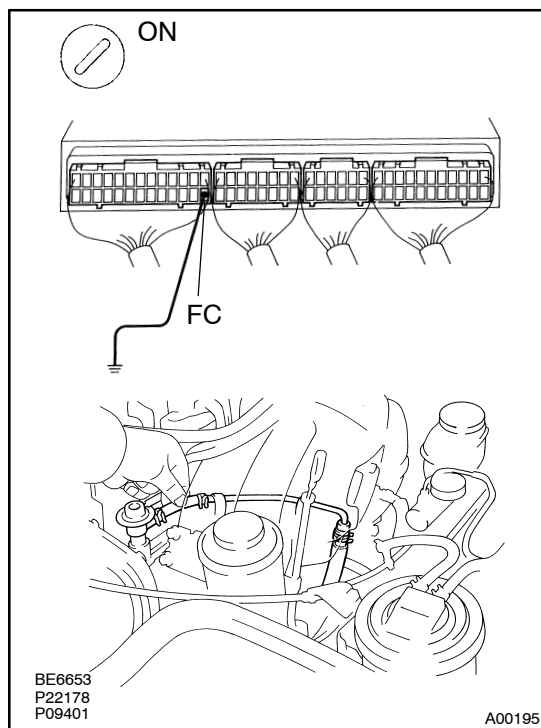
Replace fuel pump resistor.

OK

Check for open and short in harness and connector between fuel pump relay and fuel pump resistor and fuel pump (See page [IN-27](#)).

OBD II scan tool (excluding TOYOTA hand-held tester)

1 Check fuel pump operation.



PREPARATION:

- (a) Remove instrument panel speaker No.1 panel (See page [SF-64](#)).
- (b) Turn ignition switch ON.

CHECK:

- (a) Connect between terminal FC of ECM and body ground.
- (b) Check for fuel pressure in the fuel inlet hose when it is pinched off.

OK:

There is pressure in the fuel inlet hose.

HINT:

At this time, you will hear a fuel flowing noise.

OK

Go to step 4.

OK

2 Check circuit opening relay (See page [DI-84](#)).

NG

Replace circuit opening relay.

OK

3 Check voltage between terminal FC of ECM connector and body ground (See step 3 of TOYOTA hand-held tester).

OK

Go to step 4

NG

Check for open and short in harness and connector between terminal FC of ECM and circuit opening relay and fuse block (See page [IN-27](#)).

4 Check operation of fuel pump relay (See step 5 of TOYOTA hand-held tester).

NG

Replace fuel pump relay.

OK

5 Check voltage between terminal FPR of ECM connector and body ground (See step 6 of TOYOTA hand-held tester).

NG

Check and replace ECM (See page [IN-27](#)).

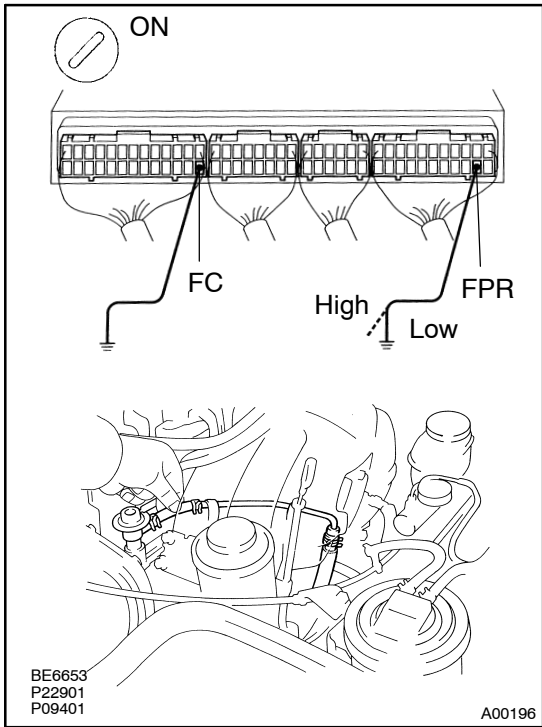
6 Check for open and short in harness and connector between terminal FC of ECM connector and fuel pump relay (See page [IN-27](#)).

NG

Repair or replace harness or connector.

OK

7 Check operation of fuel pump.



PREPARATION:

- (a) Remove instrument panel speaker No.1 panel (See page [SF-64](#)).
- (b) Turn ignition switch ON.

CHECK:

- (a) Connect terminal FC of ECM and body ground.
- (b) Check operation of fuel pump when terminal FPR of ECM is grounded and is not grounded.

OK:

There is pressure in the inlet hose.

HINT:

At this time, you will hear a fuel flowing noise.

FPR is grounded (Low speed)	FPR is not grounded (High speed)	
NG	NG	Go to step 8
NG	OK	Go to step 9
OK	NG	Repair or replace harness or connector between fuel pump relay and fuel pump.

8 Check fuel pump (See page [SF-6](#)).

NG

Repair or replace fuel pump.

OK

Check for open or short in harness and connector between EFI main relay (Marking: EFI) and circuit opening relay and fuel pump relay and fuel pump and body ground (See page [IN-27](#)).

9**Check fuel pump resistor (See page [SF-57](#)).****NG****Replace fuel pump resistor.****OK**

Check for open and short in harness and connector between fuel pump relay and fuel pump resistor and fuel pump (See page [IN-27](#)).