

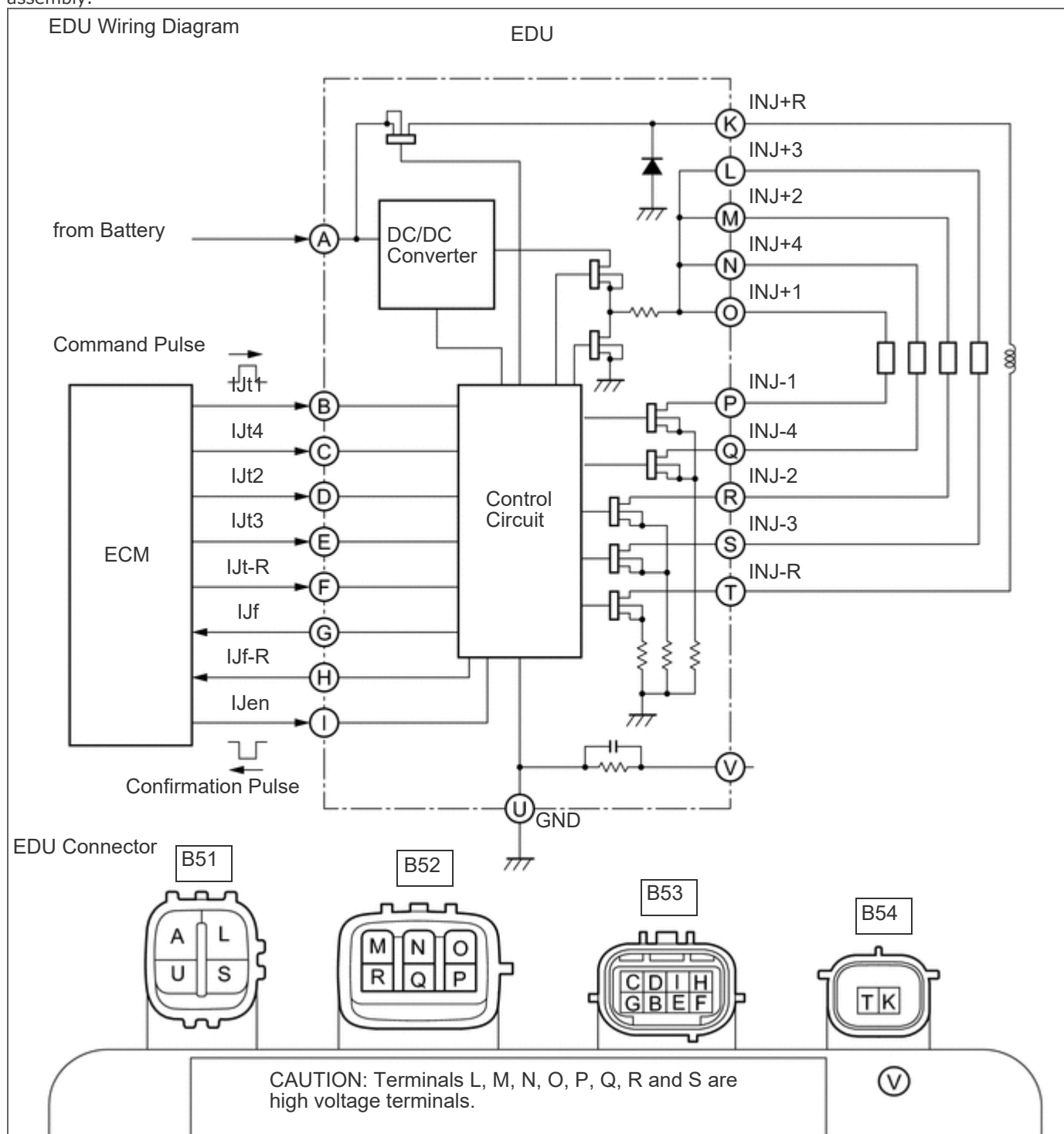
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2AD-FTV ENGINE CONTROL ECD SYSTEM(for DPF) P0201 Injector Circuit / Open - (Cylinder 1) P0202 Injector Circuit / Open - (Cylinder 2) P0203 Injector Circuit / Open - (Cylinder 3) P0204 Injector Circuit / Open - (Cylinder 4) P062D No. 1 Fuel Injector Driver Circuit Performance

DESCRIPTION

The injector driver (EDU) delivers drive signals to fuel injectors using the DC/DC converter, which provides a high-voltage and quick-charging system.

Soon after the injector driver (EDU) receives a fuel injection command (#1 to #4) signal from the ECM, the injector driver (EDU) responds to the command with an injector injection confirmation (INJF) signal when the current is applied to the injector assembly.



DTC No.	Detection Item	DTC Detection Condition	Trouble Area	MIL	Memory
P0201	Injector Circuit / Open - (Cylinder 1)	Open or short in injector circuit occurs a certain number of times (a maximum of approx. 0.5 seconds). (1 trip detection logic)	<ul style="list-style-type: none"> Open or short in injector assembly circuit Injector assembly Injector driver (EDU) ECM 	Comes on	DTC stored
P0202	Injector Circuit / Open - (Cylinder 2)	Open or short in injector circuit occurs a certain number of times (a maximum of approx. 0.5 seconds). (1 trip detection logic)	<ul style="list-style-type: none"> Open or short in injector assembly circuit Injector assembly Injector driver (EDU) ECM 	Comes on	DTC stored
P0203	Injector Circuit / Open - (Cylinder 3)	Open or short in injector circuit occurs a certain number of times (a maximum of approx. 0.5 seconds). (1 trip detection logic)	<ul style="list-style-type: none"> Open or short in injector assembly circuit Injector assembly Injector driver (EDU) ECM 	Comes on	DTC stored
P0204	Injector Circuit / Open - (Cylinder 4)	Open or short in injector circuit occurs a certain number of times (a maximum of approx. 0.5 seconds). (1 trip detection logic)	<ul style="list-style-type: none"> Open or short in injector assembly circuit Injector assembly Injector driver (EDU) ECM 	Comes on	DTC stored
P062D	No. 1 Fuel Injector Driver Circuit Performance	Inconsistency in the injection waveforms between the injector driver (EDU) and ECM while the engine is running a certain number of times (a maximum of approx. 0.5 seconds). (1 trip detection logic)	<ul style="list-style-type: none"> Open or short in injector driver (EDU) circuit Injector assembly Injector driver (EDU) ECM 	Comes on	DTC stored

MONITOR DESCRIPTION

P0201, P0202, P0203, P0204:

The ECM compares injection command (# 1 to # 4) signals and injection confirmation (INJF) signals for each cylinder. If the ECM determines that a cylinder has a malfunction, DTC P0201, P0202, P0203 or P0204 will be stored.

P062D:

The ECM continuously monitors both injection command (#1 to #4) signals and injection confirmation (INJF) signals. This DTC will be stored if the ECM determines that the number of #1 to #4 signals and INJF signals are inconsistent.

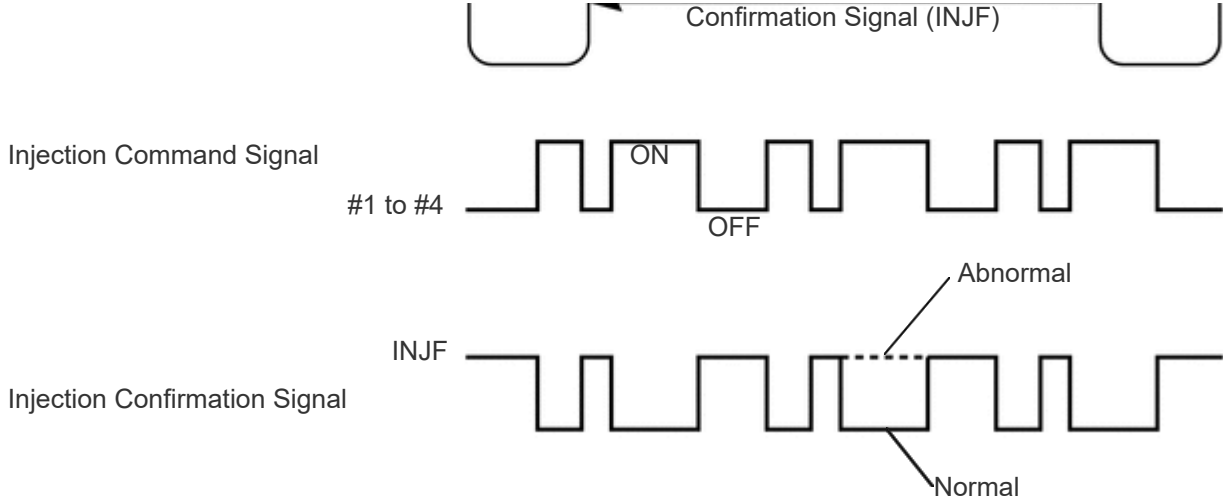
The injector assemblies are grounded over a Field Effect Transistor (FET) and a serial resistor. This resistor creates a voltage drop, which is monitored by the injector driver (EDU) (injector drive circuit) in relation to the current drawn by the injector assembly. When the injector assembly current becomes too high, the voltage drop over the resistor exceeds a specified level and no INJF signal for that cylinder is sent to the ECM.

After the engine is started, when there is no injection confirmation (INJF) signal from the injector driver (EDU) to the ECM even though the ECM sends injection command (#1 to #4) signals to the injector driver (EDU), DTC P062D is stored.

If this DTC is stored, the ECM enters fail-safe mode and limits engine power or stops the engine. The fail-safe mode continues until the ignition switch is turned off.

Malfunction Detection:

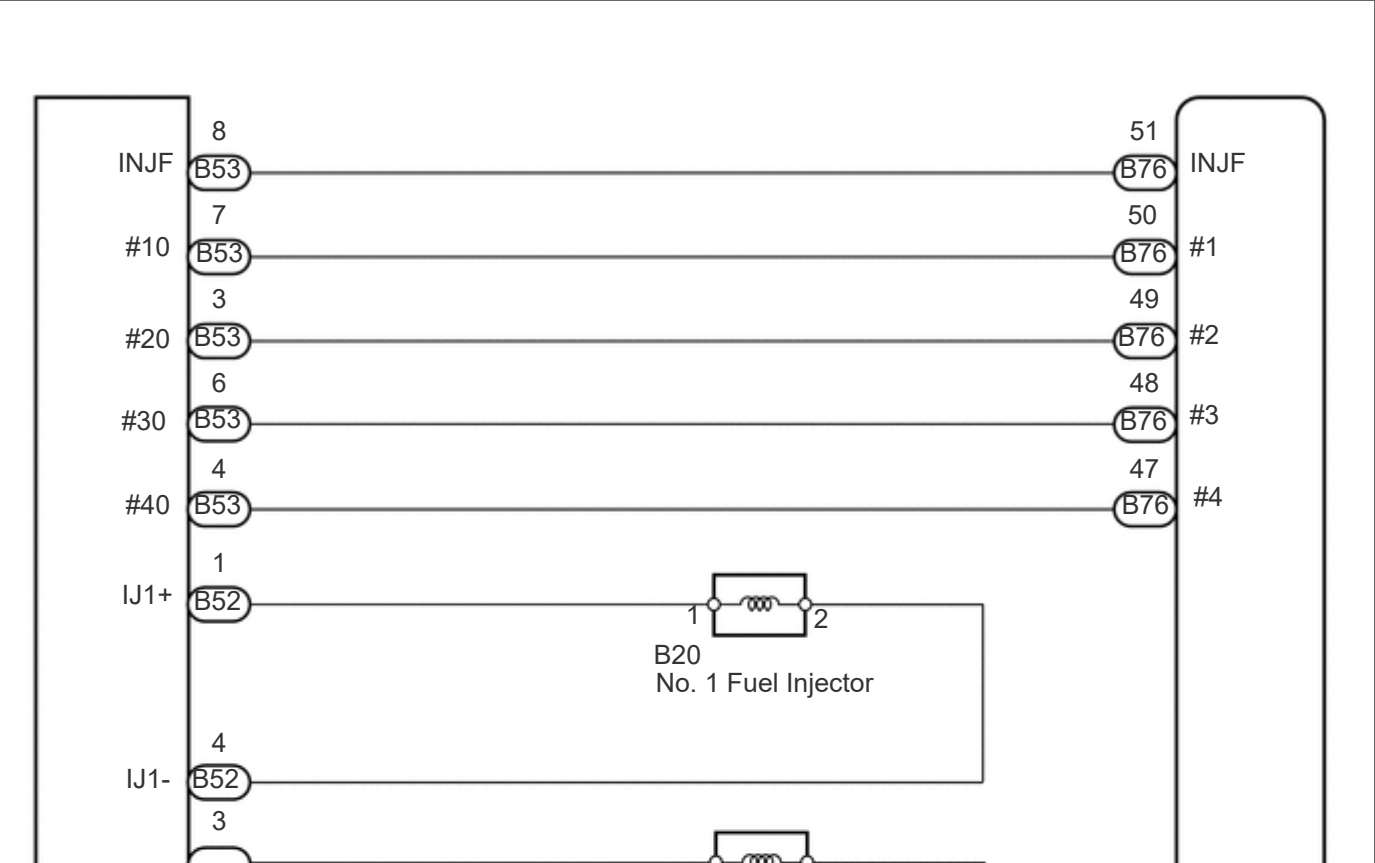


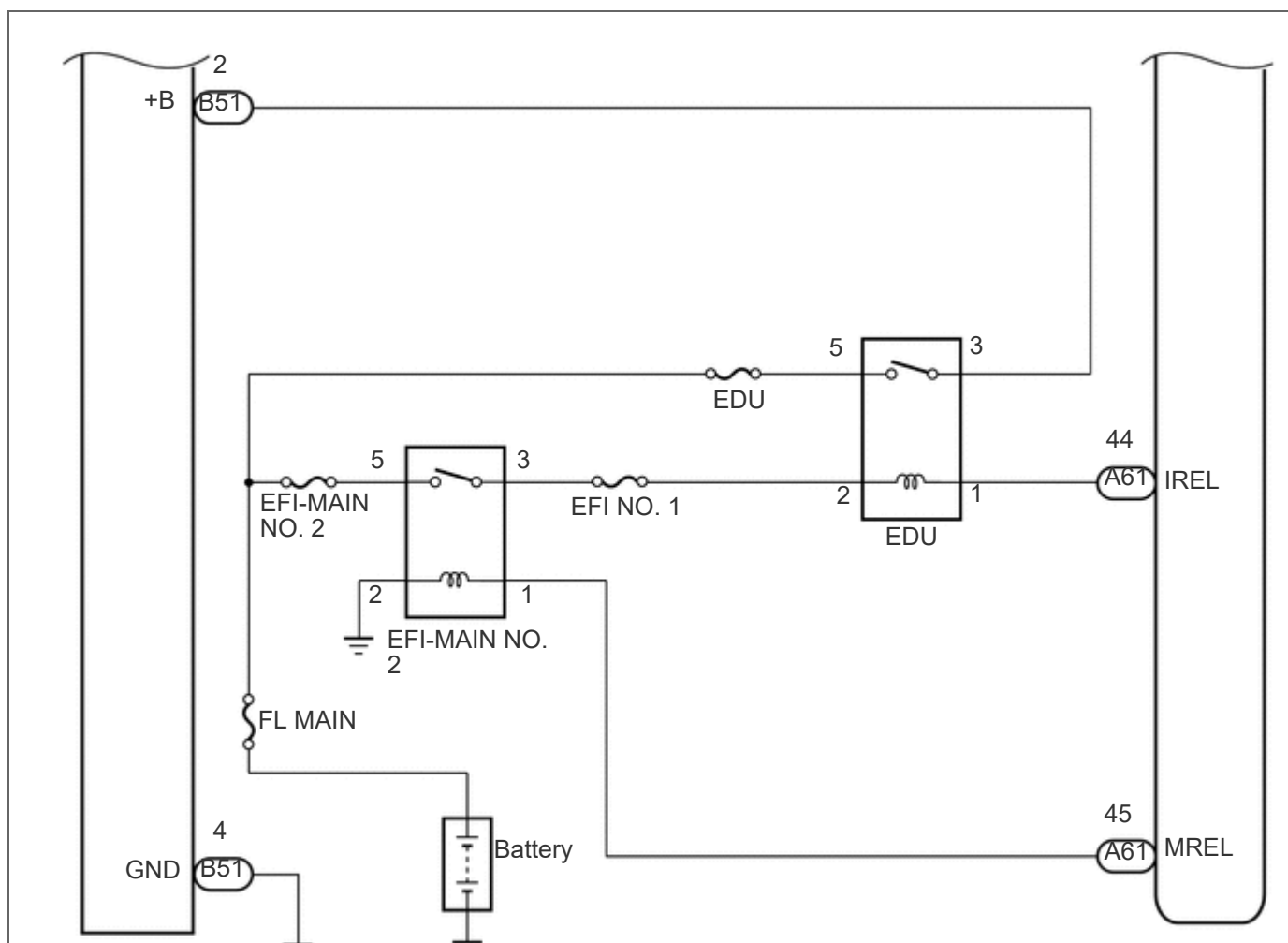
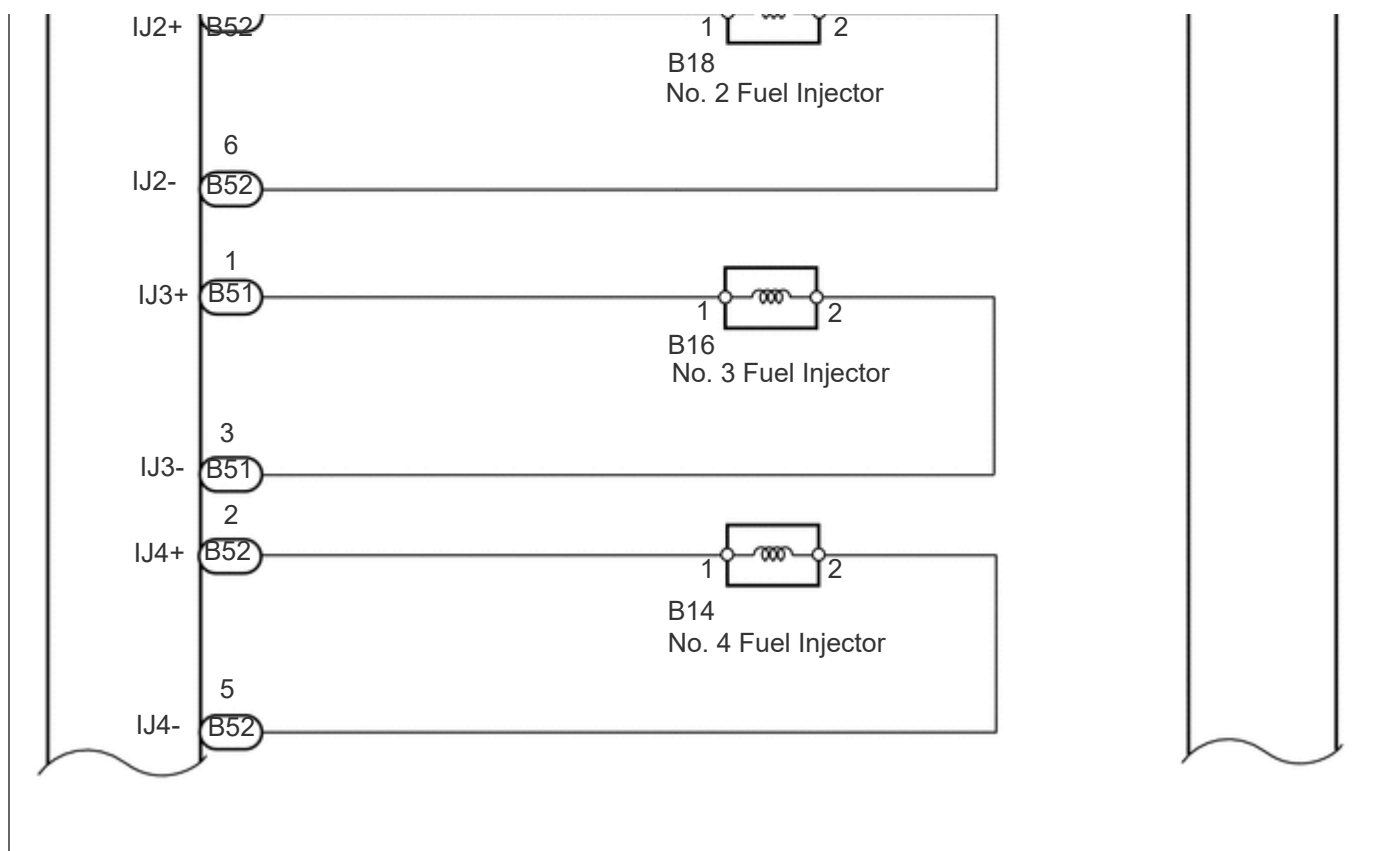


CONFIRMATION DRIVING PATTERN

DTC No.	DTC Detection Drive Pattern
P0201	Idling for 5 seconds
P0202	
P0203	
P0204	
P062D	

WIRING DIAGRAM





Injector Driver (EDU) ▾

ECM

CAUTION / NOTICE / HINT**CAUTION:**

Make sure to perform work on high voltage circuits with the ignition switch off.

NOTICE:

- Inspect the fuses of circuits related to this system before performing the following inspection procedure.
- After replacing the ECM, the new ECM needs registration (Click here [Engine / Hybrid System>2AD-FTV ENGINE CONTROL>ECD SYSTEM\(for DPF\)>REGISTRATION](#)) and initialization (Click here [Engine / Hybrid System>2AD-FTV ENGINE CONTROL>ECD SYSTEM\(for DPF\)>INITIALIZATION](#)).
- After replacing a fuel injector, the ECM needs registration (Click here [Engine / Hybrid System>2AD-FTV ENGINE CONTROL>ECD SYSTEM\(for DPF\)>REGISTRATION](#)).

HINT:

Read freeze frame data using the GTS. Freeze frame data records the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

PROCEDURE**1.CHECK ENGINE CRANKING CONDITION**

- a. Check the engine cranking condition.

Result:

Result	Proceed to
Engine does not start*1	A
Engine starts, but idling is rough*2	B
Except above	C

HINT:

- *1: Once DTC P062D is cleared, it is not stored again even when the engine does not start due to a malfunction in the injector driver (EDU).When the engine cannot be started due to a malfunction in the injector driver (EDU), the value for "Common Rail Pressure" is higher than the value for "Target Common Rail Pressure"
- *2: DTC P0201, P0202, P0203, P0204 and P062D are stored at this time.

A

2.INSPECT ECM

B

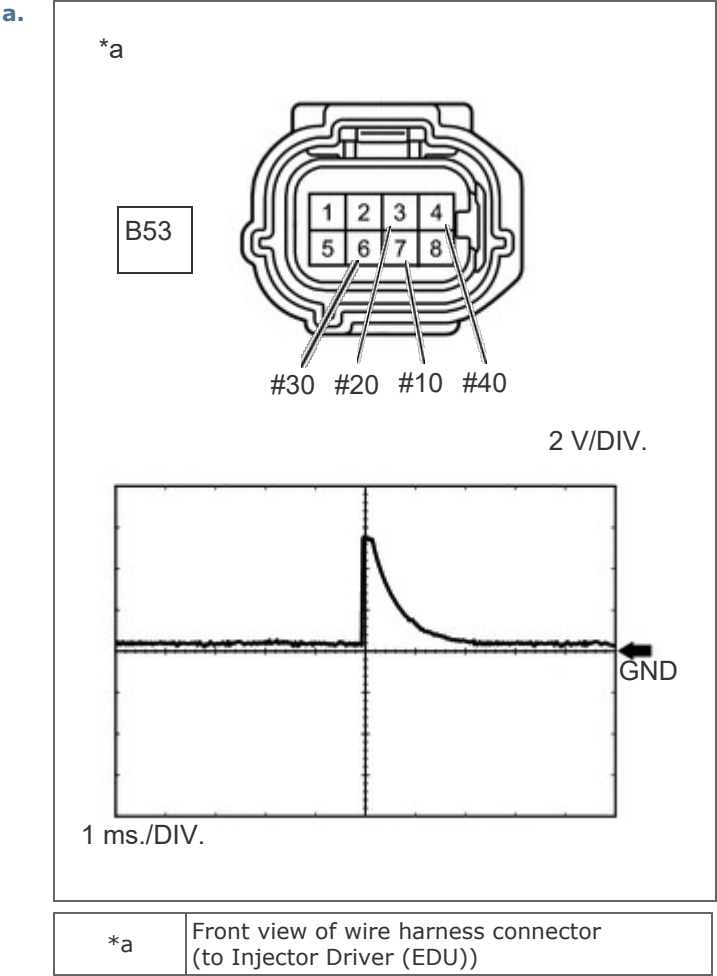
9.CHECK WHETHER DTC OUTPUT RECURS

C

CHECK FOR INTERMITTENT PROBLEMS

Click here [Engine / Hybrid System>2AD-FTV ENGINE CONTROL>ECD SYSTEM\(for DPF\)>CHECK FOR INTERMITTENT PROBLEMS](#)

2.INSPECT ECM



Disconnect the injector driver (EDU) connector.

- b. Check the waveform of the injector driver (EDU) connectors using an oscilloscope while cranking the engine.
- OK:**

Tester Connection	Condition	Specified Condition
B53-7 (#10)- Body ground	Cranking	Correct waveform is as shown
B53-3 (#20) - Body ground	Cranking	Correct waveform is as shown
B53-6 (#30) - Body ground	Cranking	Correct waveform is as shown
B53-4 (#40) - Body ground	Cranking	Correct waveform is as shown

Result:

Proceed to
OK
NG

OK

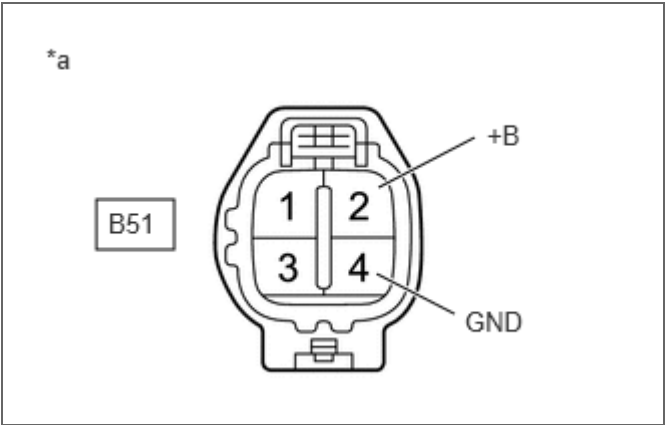
3.CHECK TERMINAL VOLTAGE (POWER SOURCE OF INJECTOR DRIVER (EDU))

NG

7.CHECK HARNESS AND CONNECTOR (INJECTOR DRIVER (EDU) - ECM)

3.CHECK TERMINAL VOLTAGE (POWER SOURCE OF INJECTOR DRIVER (EDU))

a.



*a

Front view of wire harness connector
(to Injector Driver (EDU))

Disconnect the injector driver (EDU) connector.

- b. Turn the ignition switch to ON.
- c. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Condition	Specified Condition
B51-2 (+B) - B51-4 (GND)	Ignition switch ON	11 to 14 V

Result:

Proceed to
OK
NG

OK

4.CHECK HARNESS AND CONNECTOR (INJECTOR DRIVER (EDU) - ECM)

NG

6.CHECK INJECTOR CIRCUIT

4.CHECK HARNESS AND CONNECTOR (INJECTOR DRIVER (EDU) - ECM)

- a. Disconnect the injector driver (EDU) connector.
- b. Disconnect the ECM connector.
- c. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
B53-7 (#10) - B76-50 (#1)	Always	Below 1 Ω
B53-3 (#20) - B76-49 (#2)	Always	Below 1 Ω
B53-6 (#30) - B76-48 (#3)	Always	Below 1 Ω
B53-4 (#40) - B76-47 (#4)	Always	Below 1 Ω
B53-8 (INJF) - B76-51 (INJF)	Always	Below 1 Ω
B53-7 (#10) or B76-50 (#1) - Body ground	Always	10 k Ω or higher
B53-3 (#20) or B76-49 (#2) - Body ground	Always	10 k Ω or higher
B53-6 (#30) or B76-48 (#3) - Body ground	Always	10 k Ω or higher
B53-4 (#40) or B76-47 (#4) - Body ground	Always	10 k Ω or higher
B53-8 (INJF) or B76-51 (INJF) - Body ground	Always	10 k Ω or higher

Result:

Proceed to
OK
NG

OK

5.REPLACE INJECTOR DRIVER (EDU)

NG

16.REPAIR OR REPLACE HARNESS OR CONNECTOR**5.REPLACE INJECTOR DRIVER (EDU)**

- a. Replace the injector driver (EDU).
Click here [Engine / Hybrid System>2AD-FTV FUEL>INJECTOR DRIVER>REMOVAL](#)

Result:

Proceed to
NEXT

NEXT

17.CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED**6.CHECK INJECTOR CIRCUIT**

- a.** Check the injector circuit.
Click here [Engine / Hybrid System>2AD-FTV ENGINE CONTROL>ECD SYSTEM\(for DPF\)>Injector Circuit](#)

Result:

Proceed to
NEXT

NEXT

17.CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED**7.CHECK HARNESS AND CONNECTOR (INJECTOR DRIVER (EDU) - ECM)**

- a.** Disconnect the injector driver (EDU) connector.
- b.** Disconnect the ECM connector.
- c.** Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
B53-7 (#10) - B76-50 (#1)	Always	Below 1 Ω
B53-3 (#20) - B76-49 (#2)	Always	Below 1 Ω
B53-6 (#30) - B76-48 (#3)	Always	Below 1 Ω
B53-4 (#40) - B76-47 (#4)	Always	Below 1 Ω
B53-8 (INJF) - B76-51 (INJF)	Always	Below 1 Ω
B53-7 (#10) or B76-50 (#1) - Body ground	Always	10 kΩ or higher
B53-3 (#20) or B76-49 (#2) - Body ground	Always	10 kΩ or higher
B53-6 (#30) or B76-48 (#3) - Body ground	Always	10 kΩ or higher
B53-4 (#40) or B76-47 (#4) - Body ground	Always	10 kΩ or higher
B53-8 (INJF) or B76-51 (INJF) - Body ground	Always	10 kΩ or higher

Result:

Proceed to
OK
NG

OK

8.REPLACE ECM

NG

16.REPAIR OR REPLACE HARNESS OR CONNECTOR**8.REPLACE ECM**

- a.** Replace the ECM.

Click hereEngine / Hybrid System>2AD-FTV ENGINE CONTROL>ECM>REMOVAL

Result:

Proceed to
NEXT

NEXT

17.CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED

9.CHECK WHETHER DTC OUTPUT RECURS

- a. Connect the GTS to the DLC3.
- b. Turn the ignition switch to ON and turn the GTS on.
- c. Clear the DTCs.

Powertrain > Engine > Clear DTCs

Execute

- d. Turn the ignition switch off for 30 seconds.
- e. Start the engine and idle it for 30 seconds.
- f. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

Powertrain > Engine > Trouble Codes

Execute

- g. Check the DTCs.

HINT:

- The cylinder with the malfunctioning injector assembly can be determined based on the output DTCs.
- If the DTC P0201 is output, check the No. 1 injector assembly circuit.
- If the DTC P0202 is output, check the No. 2 injector assembly circuit.
- If the DTC P0203 is output, check the No. 3 injector assembly circuit.
- If the DTC P0204 is output, check the No. 4 injector assembly circuit.

Result:

Proceed to
NEXT

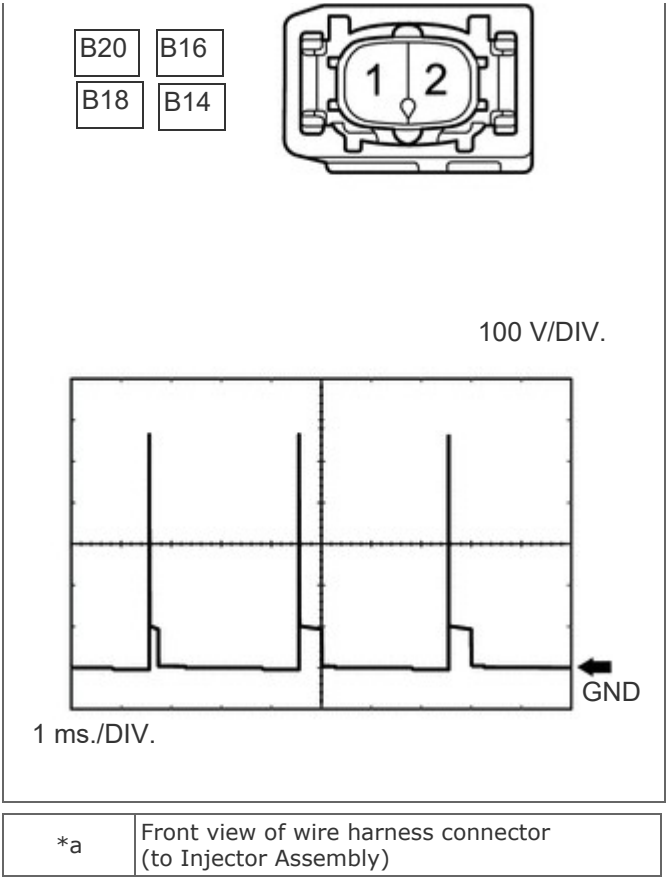
NEXT

10.INSPECT INJECTOR DRIVER (EDU)

10.INSPECT INJECTOR DRIVER (EDU)

- a.

*a



Disconnect the injector assembly connectors for all cylinders.

NOTICE:
If only the injector assembly connector of the malfunctioning cylinder is disconnected, the engine will start and there will be rough idling. Therefore, disconnect all injector assembly connectors before inspecting the waveform.

- b. Check the waveform of the injector assembly connectors using an oscilloscope while cranking the engine.

OK:

Tester Connection	Condition	Specified Condition
B20-1 - B20-2	Cranking	Voltage increases by 50 V or higher
B18-1 - B18-2	Cranking	Voltage increases by 50 V or higher
B16-1 - B16-2	Cranking	Voltage increases by 50 V or higher
B14-1 - B14-2	Cranking	Voltage increases by 50 V or higher

Result:

Proceed to
OK
NG

OK

11.REPLACE INJECTOR ASSEMBLY (RELEVANT CYLINDER)

NG

14.CHECK HARNESS AND CONNECTOR (INJECTOR ASSEMBLY - INJECTOR DRIVER (EDU))

11.REPLACE INJECTOR ASSEMBLY (RELEVANT CYLINDER)

- a. Replace the injector assembly of the cylinder relevant to the DTC.
Click hereEngine / Hybrid System>2AD-FTV FUEL>FUEL INJECTOR>REMOVAL

- NOTICE:**
- When replacing the injector assembly for a cylinder, always be sure to use a new injection pipe.
 - Follow the procedure in the repair manual and temporarily install the injection pipes and nozzle leakage pipe, and then correctly position the injector assemblies. After that, tighten parts according to the torque specifications.
 - If the installation procedure is not performed correctly, injector assemblies may become out of position, which may cause the injector assemblies to deteriorate, resulting in malfunctions.
 - If an injector assembly deteriorates and malfunctions, other problems such as knocking, rough idle, etc. may occur.
 - If an injector assembly becomes out of position, it is possible that the seal between the injector assembly and injection pipe may become incomplete, resulting in a fuel leak.

Result:

Proceed to
NEXT

NEXT

12.BLEED AIR FROM FUEL SYSTEM

12.BLEED AIR FROM FUEL SYSTEM

- a. Bleed the air from the fuel system.
Click hereEngine / Hybrid System>2AD-FTV FUEL>FUEL SYSTEM>ON-VEHICLE INSPECTION

Result:

Proceed to
NEXT

NEXT

13.REGISTER INJECTOR COMPENSATION CODE AND PERFORM PILOT QUANTITY LEARNING

13.REGISTER INJECTOR COMPENSATION CODE AND PERFORM PILOT QUANTITY LEARNING

- a. Register the injector compensation code.
Click hereEngine / Hybrid System>2AD-FTV ENGINE CONTROL>ECD SYSTEM(for DPF)>REGISTRATION
- b. Perform the pilot quantity learning.
Click hereEngine / Hybrid System>2AD-FTV ENGINE CONTROL>ECD SYSTEM(for DPF)>REGISTRATION

Result:

Proceed to
NEXT

NEXT

17.CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED

14.CHECK HARNESS AND CONNECTOR (INJECTOR ASSEMBLY - INJECTOR DRIVER (EDU))

- a. Disconnect the injector assembly connectors.
- b. Disconnect the injector driver (EDU) connectors.
- c. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
B20-1 - B52-1 (IJ1+)	Always	Below 1 Ω
B20-2 - B52-4 (IJ1-)	Always	Below 1 Ω
B18-1 - B52-3 (IJ2+)	Always	Below 1 Ω
B18-2 - B52-6 (IJ2-)	Always	Below 1 Ω
B16-1 - B51-1 (IJ3+)	Always	Below 1 Ω
B16-2 - B51-3 (IJ3-)	Always	Below 1 Ω
B14-1 - B52-2 (IJ4+)	Always	Below 1 Ω
B14-2 - B52-5 (IJ4-)	Always	Below 1 Ω
B20-1 or B52-1 (IJ1+) - Body ground	Always	Below 1 Ω
B20-2 or B52-4 (IJ1-) - Body ground	Always	10 k Ω or higher
B18-1 or B52-3 (IJ2+) - Body ground	Always	10 k Ω or higher
B18-2 or B52-6 (IJ2-) - Body ground	Always	10 k Ω or higher
B16-1 or B51-1 (IJ3+) - Body ground	Always	10 k Ω or higher
B16-2 or B51-3 (IJ3-) - Body ground	Always	10 k Ω or higher
B14-1 or B52-2 (IJ4+) - Body ground	Always	10 k Ω or higher
B14-2 or B52-5 (IJ4-) - Body ground	Always	10 k Ω or higher

Result:

Proceed to
OK
NG

OK

15.REPLACE INJECTOR DRIVER (EDU)

NG

16.REPAIR OR REPLACE HARNESS OR CONNECTOR

15.REPLACE INJECTOR DRIVER (EDU)

- a. Replace the injector driver (EDU).
Click here [Engine / Hybrid System>2AD-FTV FUEL>INJECTOR DRIVER>REMOVAL](#)

Result:

Proceed to
NEXT

NEXT

17.CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED

16.REPAIR OR REPLACE HARNESS OR CONNECTOR

- a. Repair or replace the harness or connector.

Result:

Proceed to
NEXT

NEXT

17.CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED

17.CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED

- a. Connect the GTS to the DLC3.
- b. Turn the ignition switch to ON.
- c. Turn the GTS on.
- d. Clear the DTCs.

Powertrain > Engine > Clear DTCs

Execute

- e. Turn the ignition switch off and wait for 30 seconds or more.
- f. Start the engine and idle it for 5 seconds or more.
- g. Turn the GTS on.
- h. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

Powertrain > Engine > Trouble Codes

Execute

- i. Confirm that the DTC is not output again.

Result:

Proceed to
NEXT

NEXT

END

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