DTC	P0200/97	INJECTOR CIRCUIT / OPEN

HINT:

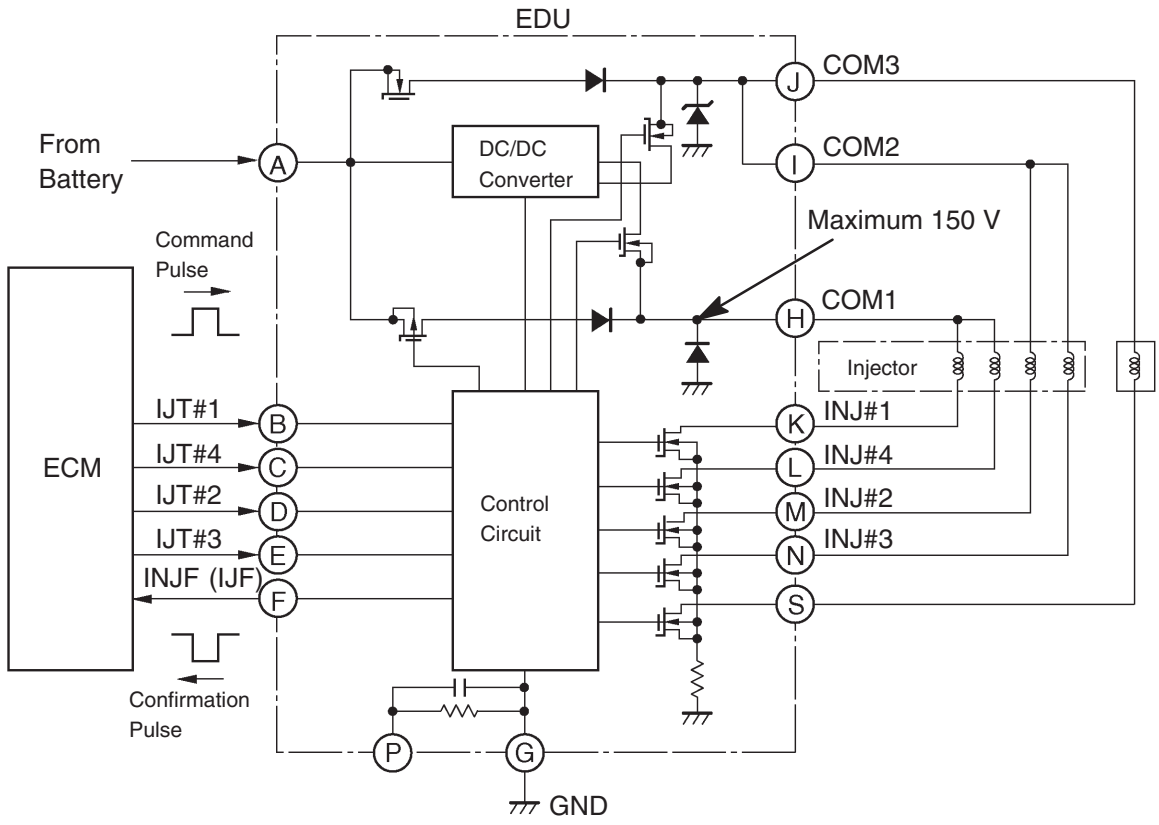
- For more information on the EDU, refer to the system description (see page 05–422).
- If P0200/97 is present, refer to the "Diagnostic Trouble Codes (DTCs) Table for Common Rail System" (see page 05–547).

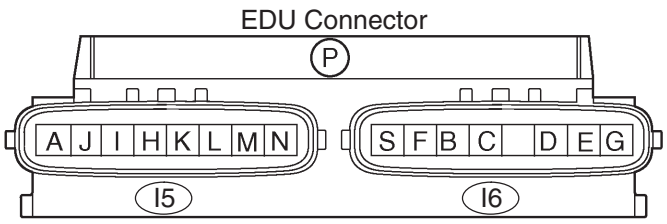
CIRCUIT DESCRIPTION

The EDU has been adopted to drive the injectors at high speeds. The EDU delivers high–speed driving under highly–pressurized fuel conditions using the DC/DC converter that provides a high–voltage, and the quick–charging system.

Soon after the EDU receives an injection command (IJT) signal from the ECM, the EDU responds to the command with an injector injection confirmation (IJF) signal when the current is applied to the injector.

EDU Wiring Diagram





Warning: Terminals I, H, K, L, M, N are high voltage

G38712

DTC No.	DTC Detection Condition	Trouble Area
P0200/97	Open or short in EDU or injector circuit After engine is started, there is no IJF signal from EDU to ECM, despite ECM sending IJT signal to EDU (1 trip detection logic)	• Open or short in EDU circuit • Injector • EDU • ECM

MONITOR DESCRIPTION

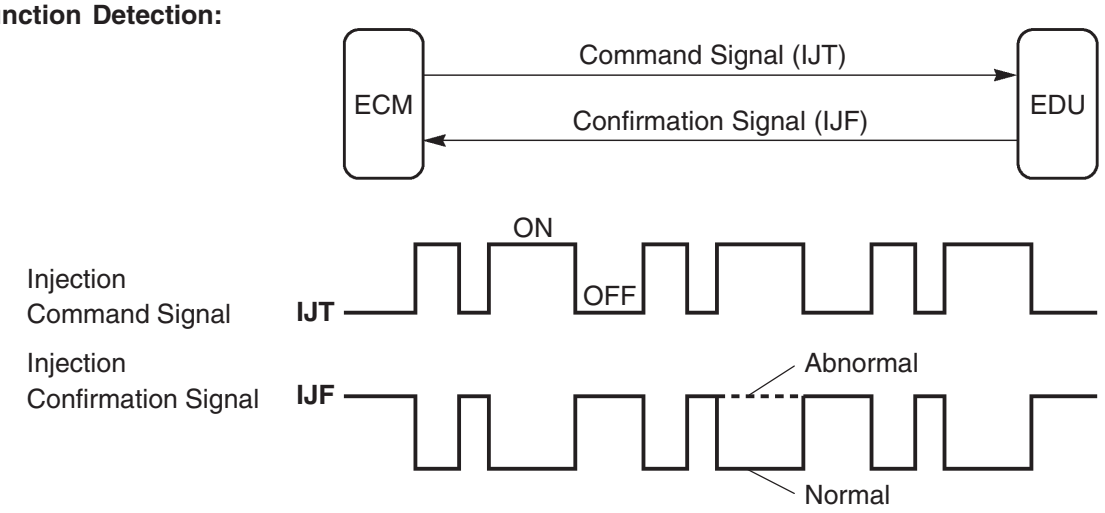
P0200/97 (Open or short in EDU or injector circuit):

The ECM continuously monitors both injection command (IJT) signals and injection confirmation (IJF) signals. This DTC will be set if the ECM judges that the number of IJT signals and IJF signals are inconsistent. The injectors are grounded over a Field Effect Transistor (FET) and a serial resistor. This resistor creates a voltage drop, which is monitored by the EDU (injector drive circuit), in relation to the current drawn by the injector. When the injector current becomes too high, the voltage drop over the resistor exceeds a specified level and no IJF signal for that cylinder is sent to the ECM.

P0200/97 refers to a malfunction in the EDU or injector circuit.

If this DTC is set, the ECM enters fail–safe mode and limits the engine power. The fail–safe mode continues until the engine switch is turned OFF.

Malfunction Detection:



MONITOR STRATEGY

Required sensors	IJF signal from EDU
Frequency of operation	Continuous
Duration	10 seconds
MIL operation	1 driving cycle

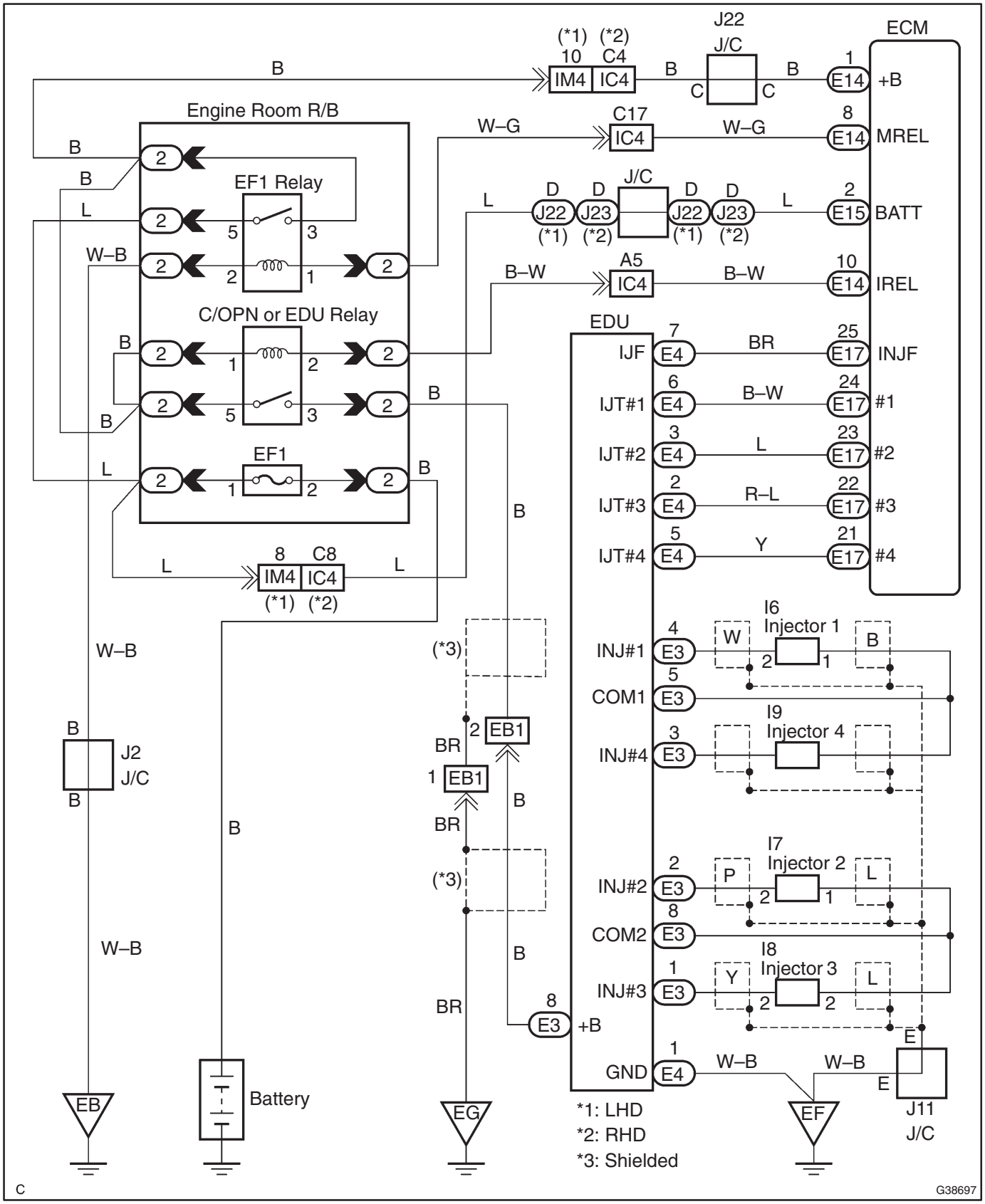
TYPICAL ENABLING CONDITIONS

	Specification	Specification
Item	Minimum	Maximum
Engine speed	Engine is running (except engine start)	–
Battery voltage	11 V	–
Ignition switch	ON	ON

TYPICAL MALFUNCTION THRESHOLDS

Threshold
The injection missing counter* for all the cylinders, or for one individual cylinder, reaches a specified number (taking approximately 1 second from starting the engine) *: Increments when no IJF signal is received from the EDU despite the ECM sending IJT signals

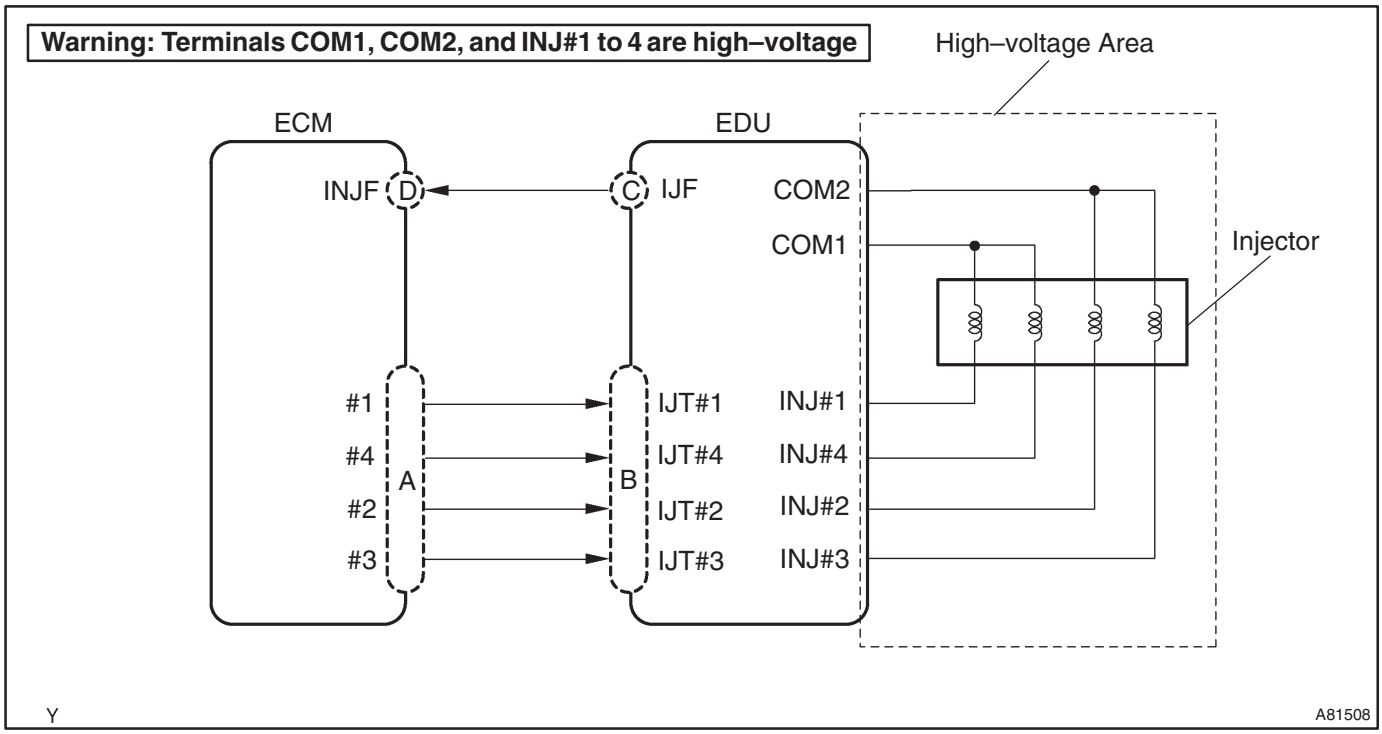
WIRING DIAGRAM



PULSE GENERATION INSPECTION

HINT:

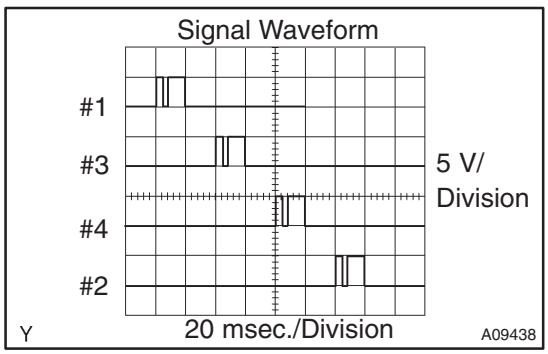
Problem areas can be located by checking the waveform at the following terminals.



HINT:

In order to save time during the inspection, follow these instructions. When checking the ECM side first, inspect the trouble areas listed to the right of A to D (in that order).

Malfunction Point	Trouble Area
A	ECM
B (if A is normal)	Open or short in "#1 to #4 (ECM)" – "IJT#1 to IJT#4 (EDU)" harness or connector
C (if A and B are normal)	• Open or short in "INJ#1 to INJ#4 (EDU)" – "COM1 and/or COM2" (EDU) circuit • Injector • EDU
D (if A, B and C are normal)	Open or short in "INJ (EDU)" – "INJF (ECM)" circuit

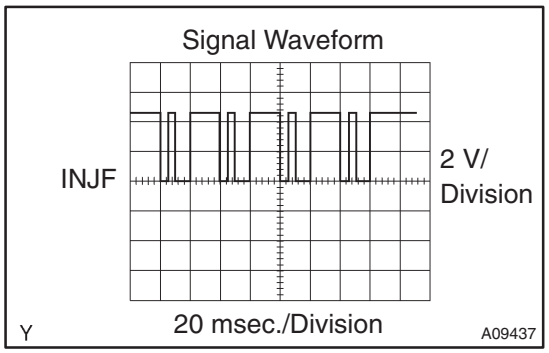


(a) Reference:

Inspection using an oscilloscope.

While idling the engine, the correct waveform is shown in the diagram on the left.

Inspection Points	Specified Condition
A and B	Correct waveform is shown



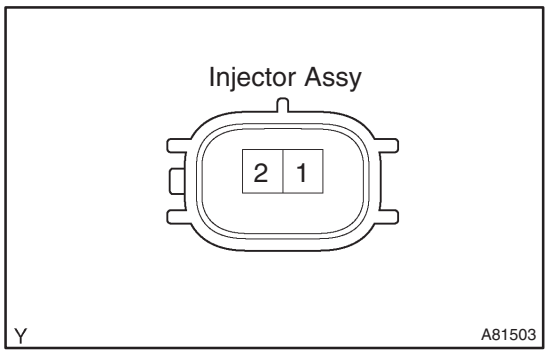
(b) Reference:
Inspection using an oscilloscope.
While idling the engine, the correct waveform is shown in the diagram on the left.

Inspection Points	Specified Condition
C and D	Correct waveform is shown

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the intelligent tester II. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	INSPECT INJECTOR ASSY



(a) Disconnect the I6, I7, I8 and I9 injector connectors.
(b) Measure the resistance of the injector.
Standard:

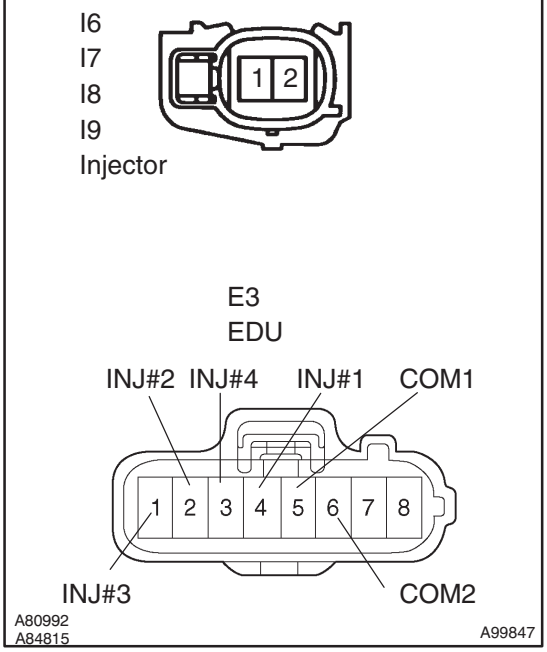
Tester Connection	Specified Condition
1 – 2	0.85 to 1.05 Ω at 20°C (68°F)

NG → **REPLACE INJECTOR ASSY (See page 11–52)**

OK

2 CHECK WIRE HARNESS (EDU – INJECTOR ASSY)

Wire Harness Side



(a) Check the wire harness between the injector and EDU (INJ terminal).
(1) Disconnect the I6, I7, I8 and I9 injector connectors.
(2) Disconnect the E3 EDU connector.
(3) Measure the resistance of the wire harness side connectors.

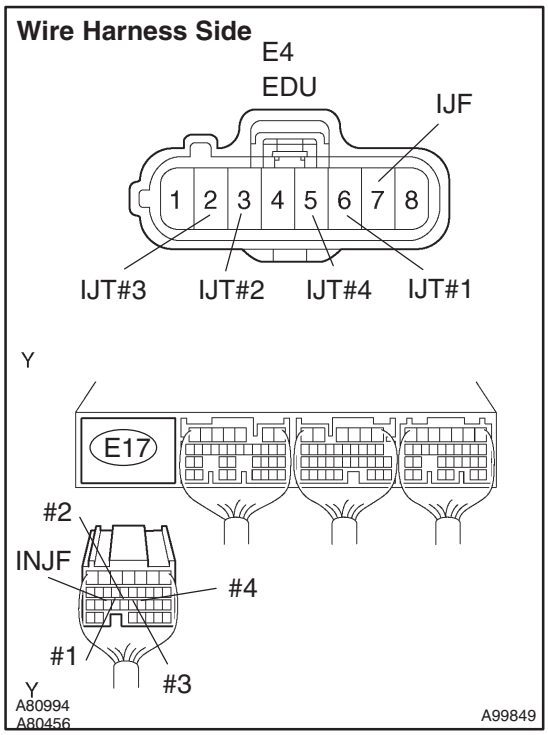
Standard:

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

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

OK

3 CHECK WIRE HARNESS (EDU – ECM)



(a) Disconnect the E4 EDU connector.
(b) Disconnect the E17 ECM connector.
(c) Measure the resistance of the wire harness side connectors.

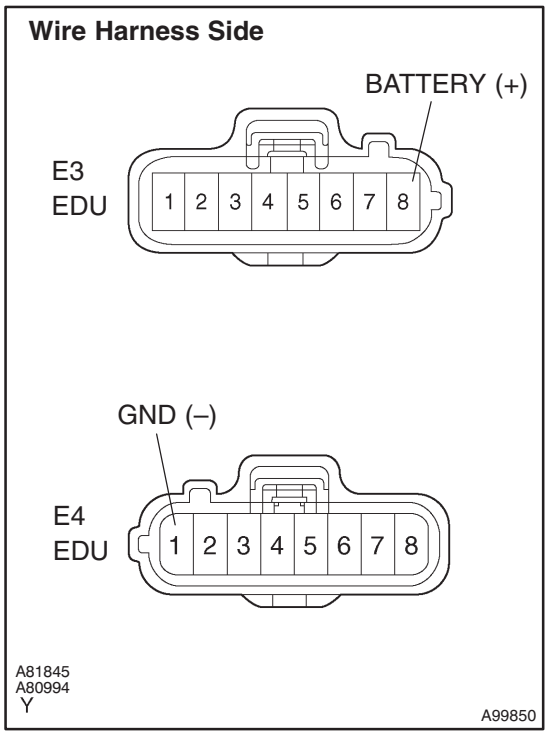
Standard:

Tester Connection	Specified Condition
E4–6 (IJT#1) – E17–24 (#1)	Below 1 Ω
E4–3 (IJT#2) – E17–23 (#2)	Below 1 Ω
E4–2 (IJT#3) – E17–22 (#3)	Below 1 Ω
E4–5 (IJT#4) – E17–21 (#4)	Below 1 Ω
E4–7 (IJF) – E17–25 (INJF)	Below 1 Ω
E4–6 (IJT#1) or E17–24 (#1) – Body ground	10 kΩ or higher
E4–3 (IJT#2) or E17–23 (#2) – Body ground	10 kΩ or higher
E4–2 (IJT#3) or E17–22 (#3) – Body ground	10 kΩ or higher
E4–5 (IJT#4) or E17–21 (#4) – Body ground	10 kΩ or higher
E4–7 (IJF) or E17–25 (INJF) – Body ground	10 kΩ or higher

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

OK

4 CHECK INJECTOR DRIVER (BATTERY VOLTAGE)



(a) Disconnect the E3 and E4 EDU connectors.
(b) Turn the ignition switch ON.
(c) Measure the voltage of the wire harness side connectors.

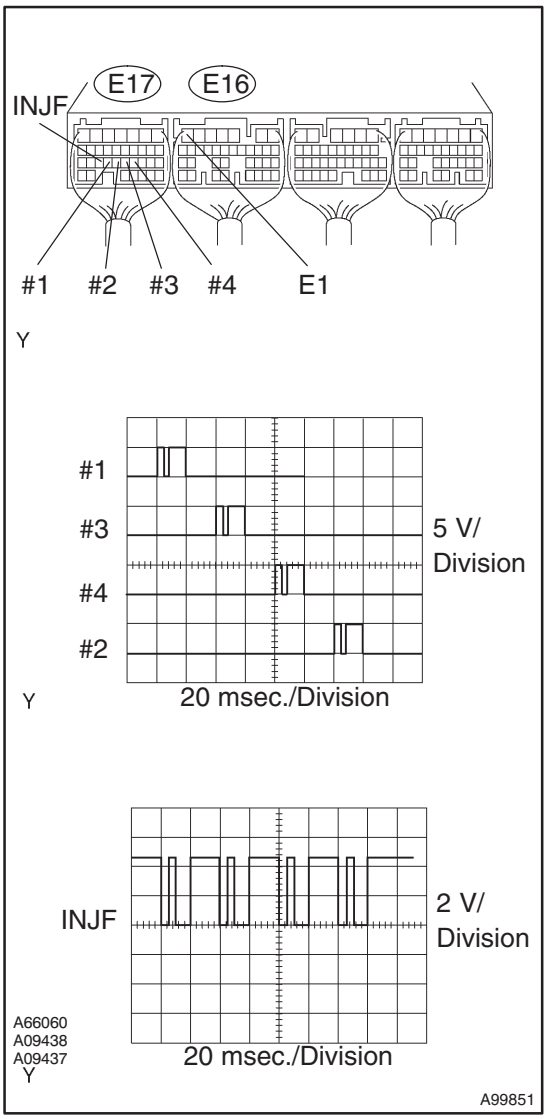
Standard:

Tester Connection	Specified Condition
E3–8 (BATTERY) – E4–1 (GND)	9 to 14 V

NG → **CHECK INJECTOR DRIVER POWER SOURCE CIRCUIT (BATTERY – EDU)**

OK

5 CHECK ECM (INJECTOR VOLTAGE)



(a) While idling the engine, check the waveform of the ECM connectors using an oscilloscope.

Standard:

Tester Connection	Specified Condition
E17–24 (#1) – E16–7 (E1)	Correct waveform is shown
E17–23 (#2) – E16–7 (E1)	Correct waveform is shown
E17–22 (#3) – E16–7 (E1)	Correct waveform is shown
E17–21 (#4) – E16–7 (E1)	Correct waveform is shown
E17–25 (INJF) – E16–7 (E1)	Correct waveform is shown

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

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

OK

6 REPLACE INJECTOR DRIVER

NEXT

CHECK IF DTC OUTPUT RECURS (DTC P0200/97)

HINT:
After clearing the DTC, start the engine and let it idle for 30 seconds. Confirm that P0200/97 is not output again.