DTC	P3009/526	HIGH VOLTAGE POWER SHORT CIRCUIT

DTC	P3009/611	HIGH VOLTAGE POWER SHORT CIRCUIT

DTC	P3009/612	HIGH VOLTAGE POWER SHORT CIRCUIT

DTC	P3009/613	HIGH VOLTAGE POWER SHORT CIRCUIT

DTC	P3009/614	HIGH VOLTAGE POWER SHORT CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P3009	526 *1	Insulation resistance of high voltage circuit and body is low	• Frame wire • System main relay • System main resistor • HV battery assembly • w/ motor compressor assembly • Battery ECU • HV transaxle assembly • w/ converter inverter assembly • Main battery cable • Main battery cable No. 2 • Battery plug • Frame wire No. 2 • Junction block assembly
P3009	611 *2	Insulation resistance of A/C compressor motor or A/C inverter is low	• w/ motor compressor assembly • w/ converter inverter assembly
P3009	612 *2	Insulation resistance of HV battery, battery ECU, system main relay, or system main resistor is low	• HV battery assembly • Battery ECU • System main relay • System main resistor • Main battery cable • Main battery cable No. 2 • Battery plug • Frame wire No. 2 • Junction block assembly
P3009	613 *2	Insulation resistance of HV transaxle or motor and generator inverters is low	• HV transaxle assembly • w/ converter inverter assembly
P3009	614 *2	Insulation resistance of motor and generator inverters, A/C inverter, system main relay, system main resistor, or frame wire is low	• Frame wire • System main relay • System main resistor • HV battery assembly • w/ converter inverter assembly • Main battery cable • Main battery cable No. 2 • Battery plug • Frame wire No. 2 • Junction block assembly

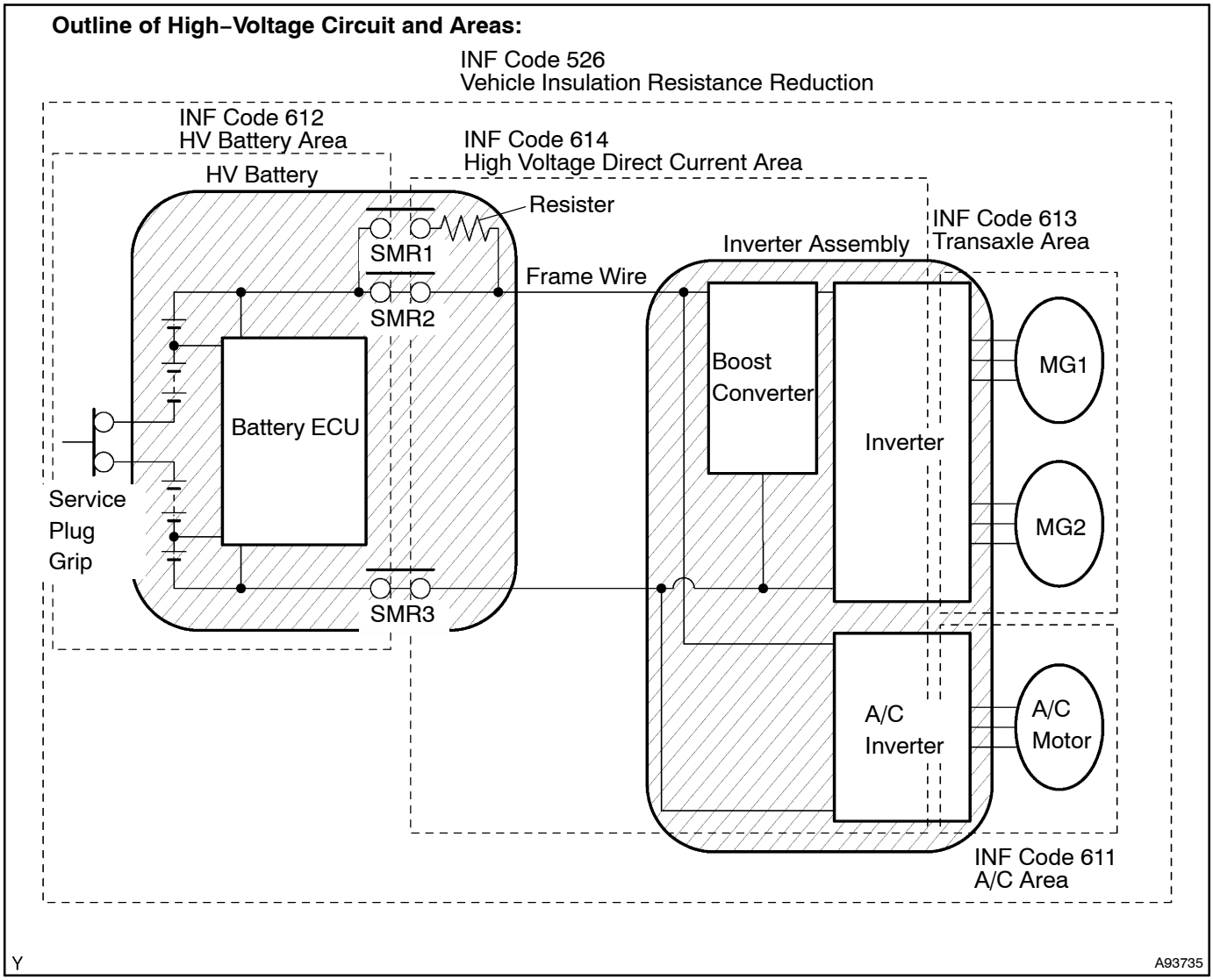
HINT:

*1: Stored simultaneously when DTC P3009 is set.

*2: Stored when a malfunction area has been identified.

WIRING DIAGRAM

Outline of High–Voltage Circuit and Areas:



INSPECTION PROCEDURE

CAUTION:

- **Before inspecting the high–voltage system, take safety precautions to prevent electrical shocks, such as wearing insulated gloves and removing the service plug grip. After removing the service plug grip, put it in your pocket to prevent other technicians from reconnecting it while you are servicing the high–voltage system.**
- **After disconnecting the service plug grip, wait at least for 5 minutes before touching any of the high–voltage connectors or terminals.**

HINT:

At least 5 minutes is required to discharge the high–voltage condenser inside the inverter.

1	READ OUTPUT DTC(HYBRID CONTROL)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.

Result:

Display (DTC Output)	Proceed to
DTC P3009	A
DTCs P3009 and P0A1D (HV control ECU malfunction)	B
DTCs P3009 and P0A1F (Battery ECU malfunction)	C
DTCs P3009 and P0A78 or P0A7A (Inverter system malfunction)	D

B → **GO TO DTC CHART (See page 05–268). FIND DTC P0A1D TO PROCEED TO ITS TROUBLE-SHOOTING FLOWCHART**

C → **GO TO DTC CHART (See page 05–268). FIND DTC P0A1F TO PROCEED TO ITS TROUBLE-SHOOTING FLOWCHART**

D → **GO TO DTC CHART (See page 05–268). FIND DTC P0A78 OR P0A7A TO PROCEED TO ITS TROUBLESHOOTING FLOWCHART**

A

2	READ OUTPUT INF CODE

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Display the freeze frame data for DTC P3009 and check its information (INF) code.

Result:

Display (INF Code Output)	Proceed to
Only 526 (Insulation resistance of high voltage circuit and body is low)	A
526 and 611 (Insulation resistance of A/C area is low)	B
526 and 612 (Insulation resistance of HV battery area is low)	C
526 and 613 (Insulation resistance of transaxle area is low)	D
526 and 614 (Insulation resistance of high voltage direct current area is low)	E

B → **Go to step 18**

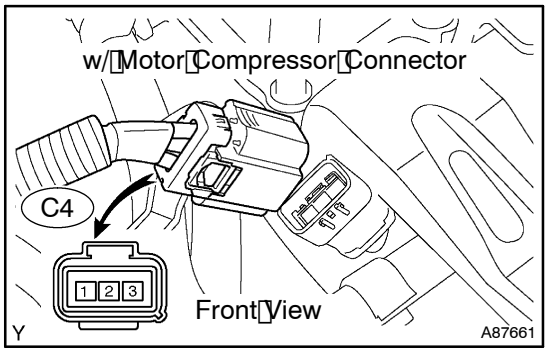
C → **Go to step 5**

D → **Go to step 20**

E → **Go to step 21**

A

3 CHECK W/MOTOR COMPRESSOR ASSY



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.
(b) Remove the service plug grip (see page 21–120).

NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.

(c) Disconnect the C4 w/ motor compressor connector.
(d) Using a megohmmeter, check the insulation resistance between the high–voltage terminals of the w/ motor compressor connector and the body ground.

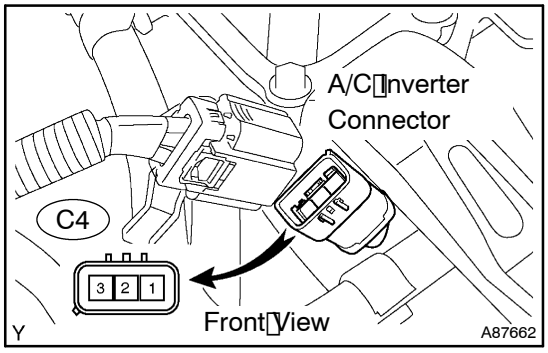
Standard:

Tester Connection	Specified Condition
C4–1 – Body ground	3.0 MΩ or higher
C4–2 – Body ground	3.0 MΩ or higher
C4–3 – Body ground	3.0 MΩ or higher

NG → **REPLACE W/MOTOR COMPRESSOR ASSY (See page 55–39)**

OK

4 CHECK INSULATION RESISTANCE(INVERTER, TRANSAXLE AND FRAME WIRE)



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip has been detached.
(b) Check that the w/ motor compressor connector has been disconnected.
(c) Using a megohmmeter, check the insulation resistance between the high–voltage terminals of the A/C inverter connector and the body ground.

Standard:

Tester Connection	Specified Condition
C4–1 – Body ground	2.0 MΩ or higher
C4–2 – Body ground	2.0 MΩ or higher
C4–3 – Body ground	2.0 MΩ or higher

NG → **Go to step 15**

OK

5	CHECK HV BATTERY AREA

CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

(b) Check that the service plug grip has been detached. If not, remove the service plug grip (see page 21–120).

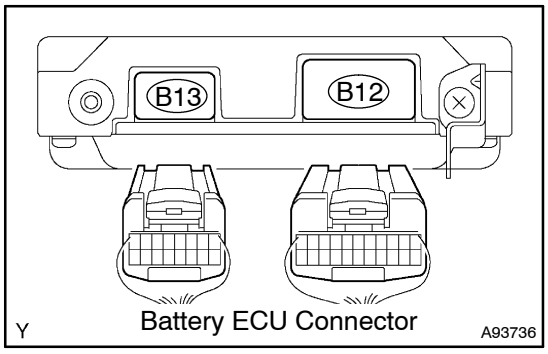
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.

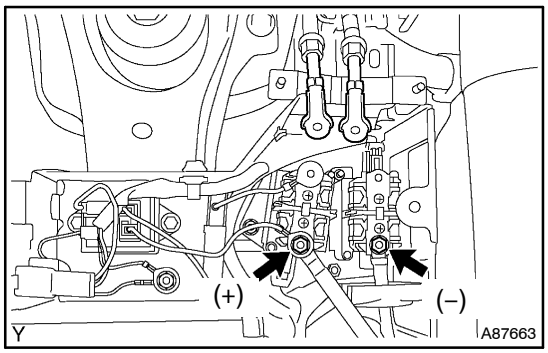
(c) Disconnect the B12 and B13 battery ECU connectors.

(d) Disconnect the main battery cables from the system main relays.

(e) Using a megohmmeter, check the insulation resistance between the positive terminal on the HV battery side of the system main relay and the body ground.
Standard: 10 MΩ or higher

(f) Using a megohmmeter, check the insulation resistance between the negative terminal on the HV battery side of the system main relay and the body ground.
Standard: 10 MΩ or higher



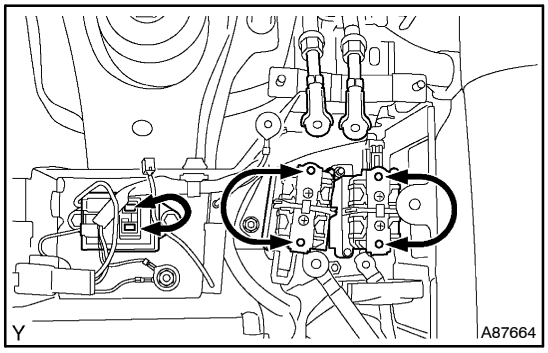


NG → **Go to step 6**

OK

REPLACE BATTERY ECU ASSY (See page 21–128)

6	CHECK SYSTEM MAIN RELAYS FOR STICKING



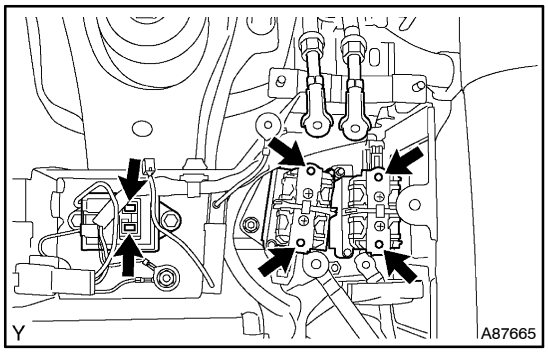
CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip has been detached.
(b) Disconnect all the high–voltage terminals of the system main relays.
(c) Check the resistance at the switch side of the system main relays.
Standard: Below 1 Ω

NG	GO TO STEP 4 AFTER REPLACE STUCK SYSTEM MAIN RELAY

OK

7	CHECK SYSTEM MAIN RELAYS FOR INSULATION



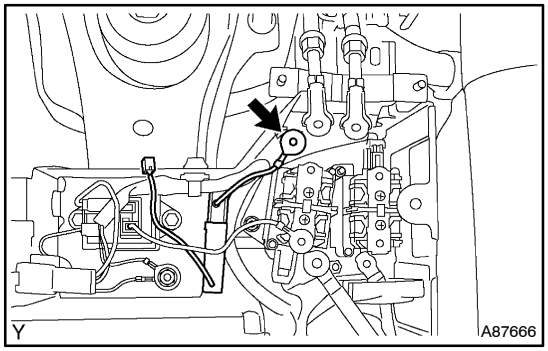
CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip has been detached.
(b) Check that all the high–voltage terminals of the system main relays have been disconnected.
(c) Using a megohmmeter, check the insulation resistance between the high–voltage terminals of the system main relays and the body ground.
Standard: 10 MΩ or higher

NG	REPLACE SYSTEM MAIN RELAY WITH REDUCED INSULATION RESISTANCE

OK

8	CHECK SYSTEM MAIN RESISTOR FOR INSULATION



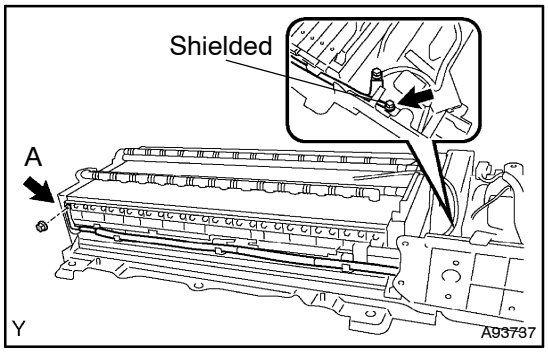
CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip has been detached.
(b) Check that both terminals of the system main resistor have been disconnected.
(c) Using a megohmmeter, check the insulation resistance between the high–voltage terminal of the system main resistor and the body ground.
Standard: 10 MΩ or higher

NG → **REPLACE SYSTEM MAIN RESISTOR**

OK

9	INSPECT MAIN BATTERY CABLE



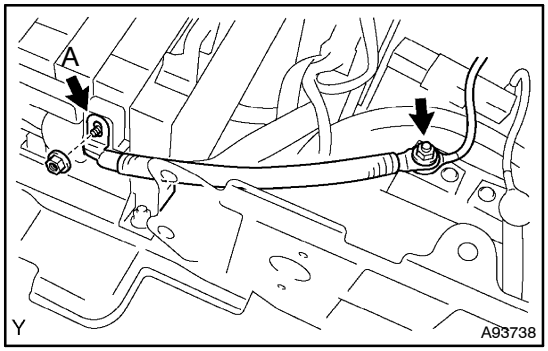
CAUTION:
Wear insulated gloves and goggles before performing the following operation.

(a) Remove the HV battery assembly (see page 21–56).
(b) Remove the battery cover (see page 21–56).
(c) Check if the main battery cable cover is not damaged or internal electrical leads are not in contact with the battery case or body.
OK: Electrical leads are not in contact with the battery case or body
(d) Remove the terminal (A in the illustration) on the battery module side of the main battery cable only.
(e) Using a megohmmeter, check the insulation resistance between each terminal of the main battery cable and shield ground.
Standard: 10 MΩ or higher

NG → **REPLACE MAIN BATTERY CABLE**

OK

10	INSPECT MAIN BATTERY CABLE NO.2



CAUTION:
Wear insulated gloves and goggles before performing the following operation.

(a) Following the previous step, check if the main battery cable No. 2 cover is not damaged or internal electrical leads are not in contact with the battery case or body.
OK: Electrical leads are not in contact with the battery case or body

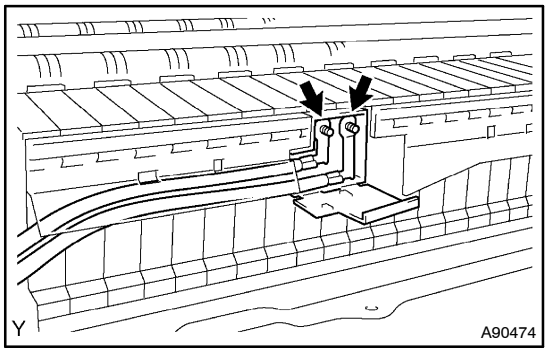
(b) Remove the terminal (A in illustration) on the battery module side of the main battery cable No. 2 only.

(c) Using a megohmmeter, check the insulation resistance between each terminal of the main battery cable No. 2 and shield ground.
Standard: 10 MΩ or higher

NG	REPLACE MAIN BATTERY CABLE NO.2

OK

11	INSPECT BATTERY PLUG



CAUTION:
Wear insulated gloves and goggles before performing the following operation.

(a) Following the previous step, disconnect only the connecting terminal of the battery plug.

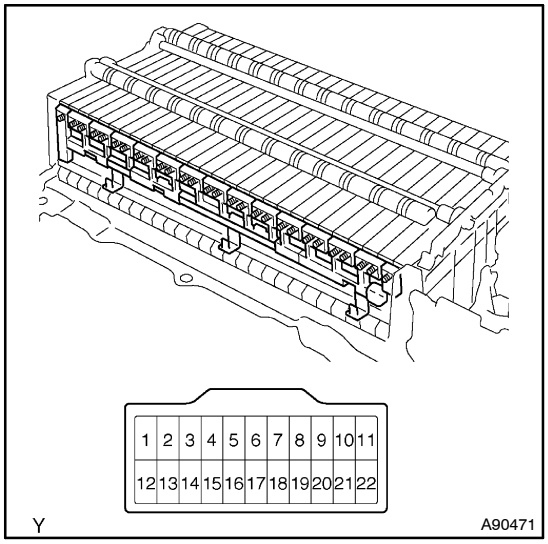
NOTICE:
Do not reinstall the service plug grip.

(b) Using a megohmmeter, check the insulation resistance between each terminal of the battery plug wire harness and body ground.
Standard: 10 MΩ or higher

NG	REPLACE BATTERY PLUG

OK

12	INSPECT FRAME WIRE NO.2



CAUTION:
Wear insulated gloves and goggles before performing the following operation.

(a) Following the previous step, check if the frame wire No. 2 cover is not damaged or internal electrical leads are not in contact with the battery case or body.
OK: Electrical leads are not in contact with the battery case or body.

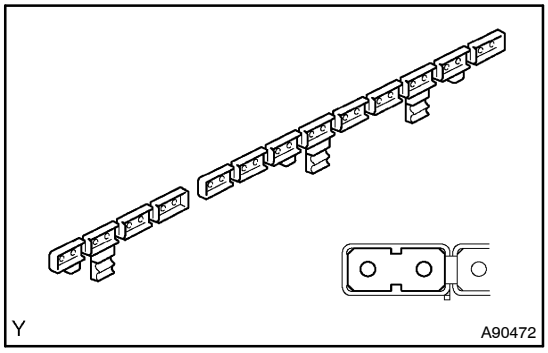
(b) Remove all the terminals on the battery module side of the frame wire No. 2.

(c) Using a megohmmeter, check the insulation resistance between each terminal of the frame wire No. 2 connector and the battery case.
Standard: 10 MΩ or higher

NG → **REPLACE FRAME WIRE NO.2**

OK

13	INSPECT JUNCTION BLOCK ASSY



CAUTION:
Wear insulated gloves and goggles before performing the following operation.

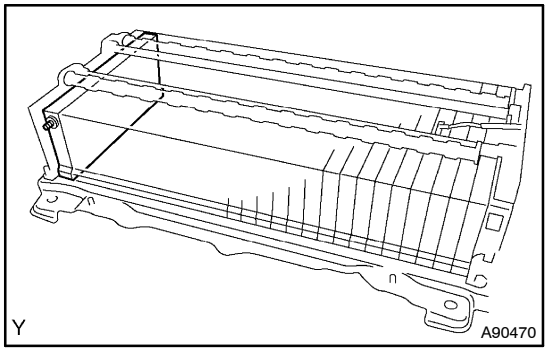
(a) Following the previous step, remove the junction block assembly.

(b) Visually check the junction block assembly for any damage.
OK: No crack or damage

NG → **REPLACE JUNCTION BLOCK ASSY**

OK

14	INSPECT HV BATTERY ASSY



CAUTION:
Wear insulated gloves and goggles before performing the following operation.

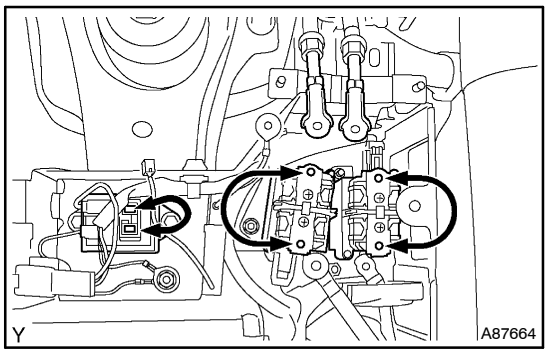
(a) Following the previous step, check the insulation resistance between each terminal (either the positive and negative side) of each battery module of the HV battery assembly and the battery case using a megohmmeter.
Standard: Some of the battery modules have continuity of below 10 MΩ

NG → **REPLACE BATTERY ECU ASSY (See page 21–128)**

OK

REPLACE HV SUPPLY BATTERY ASSY (See page 21–56)

15	CHECK SYSTEM MAIN RELAYS FOR STICKING



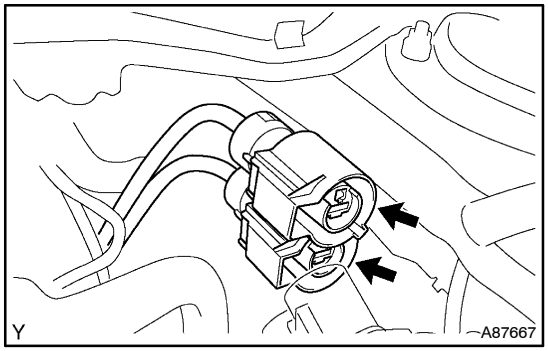
CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip has been detached.
(b) Disconnect all the high–voltage terminals of the system main relays.
(c) Check the resistance at the switch side of the system main relays.
Standard: Below 1 Ω

NG → **GO TO STEP 4 AFTER REPLACE STUCK SYSTEM MAIN RELAY**

OK

16	CHECK FRAME WIRE FOR INSULATION



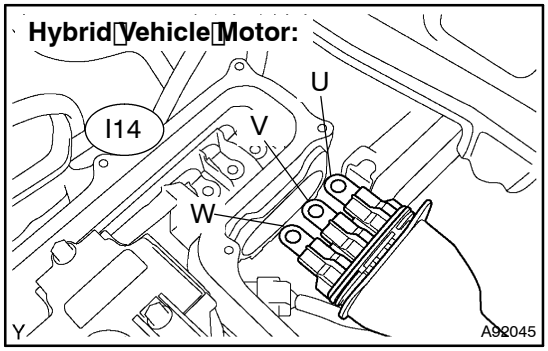
CAUTION:
Wear insulated gloves before performing the following operation.

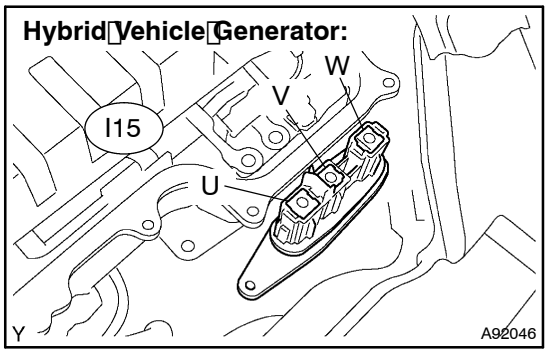
(a) Check that the service plug grip has been detached.
(b) Disconnect the frame wire from the inverter.
(c) Using a megohmmeter, check the insulation resistance between the high–voltage terminals of the frame wire and the body ground.
Standard: 10 MΩ or higher

NG → **REPLACE FRAME WIRE (See page 21–76)**

OK

17	CHECK HV TRANSAXLE ASSY FOR INSULATION





CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip has been detached.
(b) Remove the inverter cover (see page 21–25).
(c) Disconnect the three–phase alternating current cables for the motor and generator from the inverter.
(d) Using a megohmmeter, check the insulation resistance between the six terminals of the three–phase alternating current cables on the transaxle side and the body ground.
Standard:

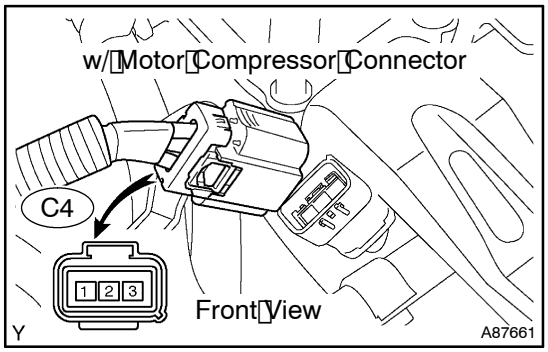
Tester Connection	Specified Condition
U (I14–1) – Body ground	10 MΩ or higher
V (I14–2) – Body ground	10 MΩ or higher
W (I14–3) – Body ground	10 MΩ or higher
U (I15–1) – Body ground	10 MΩ or higher
V (I15–2) – Body ground	10 MΩ or higher
W (I15–3) – Body ground	10 MΩ or higher

NG → **REPLACE HYBRID VEHICLE TRANSAXLE ASSY (See page 22–11)**

OK

REPLACE W/CONVERTER INVERTER ASSY (See page 21–25)

18 CHECK A/C AREA FOR INSULATION



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

(b) Remove the service plug grip (see page 21–120).

NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.

(c) Disconnect the C4 w/ motor compressor connector.

(d) Using a megohmmeter, check the insulation resistance between the high–voltage terminals of the w/ motor compressor connector and the body ground.

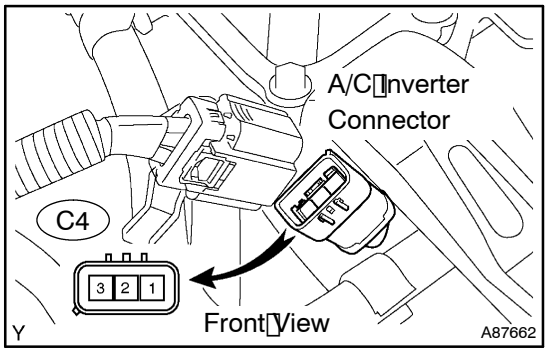
Standard:

Tester Connection	Specified Condition
C4–1 – Body ground	3.0 MΩ or more
C4–2 – Body ground	3.0 MΩ or more
C4–3 – Body ground	3.0 MΩ or more

NG → **REPLACE W/ MOTOR COMPRESSOR ASSY (See page 55–39)**

OK

19 CHECK INVERTER FOR INSULATION



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip has been detached.

(b) Check that the w/ motor compressor connector has been disconnected.

(c) Using a megohmmeter, check the insulation resistance between the high–voltage terminals of the A/C inverter connector and the body ground.

Standard:

Tester Connection	Specified Condition
C4–1 – Body ground	2.0 MΩ or more
C4–2 – Body ground	2.0 MΩ or more
C4–3 – Body ground	2.0 MΩ or more

NG → **REPLACE W/ CONVERTER INVERTER ASSY (See page 21–25)**

OK

REPLACE W/ MOTOR COMPRESSOR ASSY (See page 55–39)

20	CHECK HV TRANSAXLE AREA FOR INSULATION

CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

(b) Remove the service plug grip (see page 21–120).

NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.

(c) Remove the inverter cover (see page 21–25).

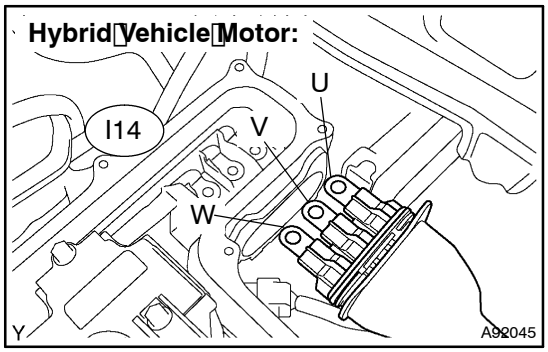
(d) Disconnect the three–phase alternating current cables for the motor and generator from the inverter.

(e) Using a megohmmeter, check the insulation resistance between the six terminals of the three–phase alternating current cables on transaxle side and the body ground.

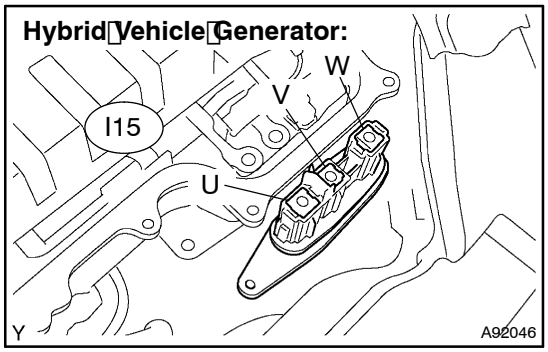
Standard:

Tester Connection	Specified Condition
U (I14–1) – Body ground	10 MΩ or higher
V (I14–2) – Body ground	10 MΩ or higher
W (I14–3) – Body ground	10 MΩ or higher
U (I15–1) – Body ground	10 MΩ or higher
V (I15–2) – Body ground	10 MΩ or higher
W (I15–3) – Body ground	10 MΩ or higher

Hybrid Vehicle Motor:



Hybrid Vehicle Generator:

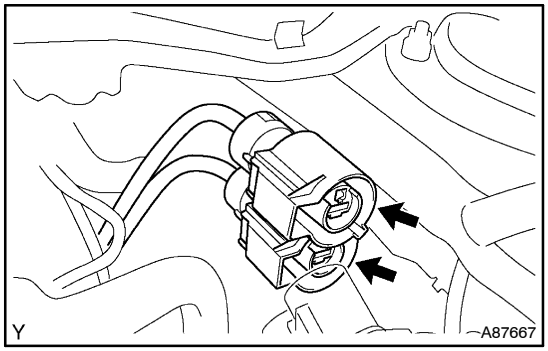


NG → **REPLACE HYBRID VEHICLE TRANSAXLE ASSY (See page 22–11)**

OK →

REPLACE W/CONVERTER INVERTER ASSY (See page 21–25)

21	CHECK HIGH VOLTAGE DIRECT CURRENT AREA FOR INSULATION



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.
(b) Remove the service plug grip (see page 21–120).

NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.

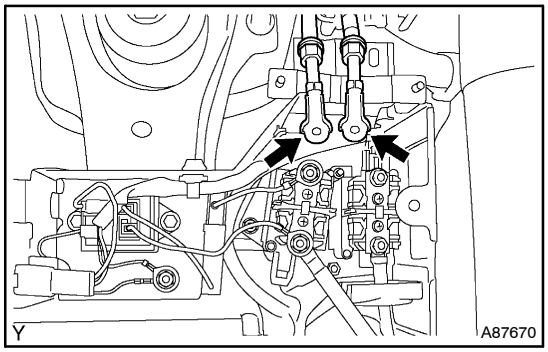
(c) Disconnect the frame wire from the inverter.
(d) Using a megohmmeter, check the insulation resistance between the high–voltage terminals of the frame wire and the body ground.
Standard: 10 MΩ or higher

NG	Go to step 22

OK

REPLACE W/CONVERTER INVERTER ASSY (See page 21–25)

22	CHECK FRAME WIRE FOR INSULATION



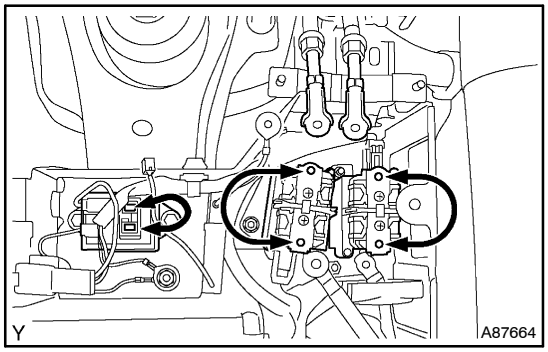
CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip has been detached.
(b) Disconnect the frame wire from the system main relays.
(c) Using a megohmmeter, check the insulation resistance between the high–voltage terminals of the frame wire and the body ground.
Standard: 10 MΩ or higher

NG	REPLACE FRAME WIRE (See page 21–76)

OK

23	CHECK SYSTEM MAIN RELAYS FOR STICKING



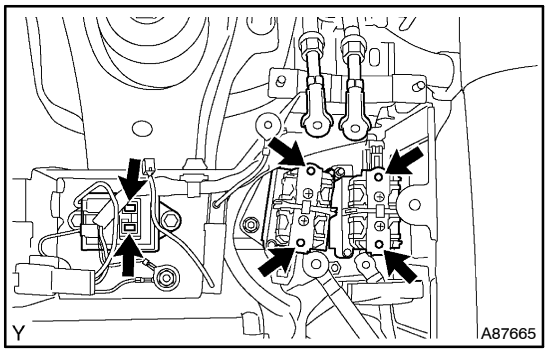
CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip has been detached.
(b) Disconnect all the high–voltage terminals of the system main relays.
(c) Check the resistance at the switch side of the system main relays.
Standard: Below 1 Ω

NG	GO TO STEP 4 AFTER REPLACE STUCK SYSTEM MAIN RELAY

OK

24	CHECK SYSTEM MAIN RELAYS FOR INSULATION



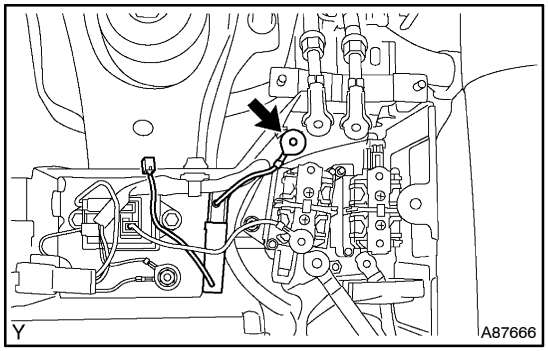
CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip has been detached.
(b) Check that all the high–voltage terminals of the system main relays have been disconnected.
(c) Using a megohmmeter, check the insulation resistance between the high–voltage terminals of the system main relays and the body ground.
Standard: 10 MΩ or higher

NG	REPLACE SYSTEM MAIN RELAY WITH REDUCED INSULATION RESISTANCE

OK

25	CHECK SYSTEM MAIN RESISTOR FOR INSULATION



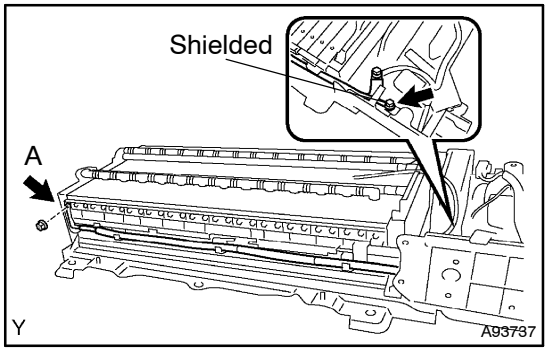
CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip has been detached.
(b) Check that both terminals of the system main resistor have been disconnected.
(c) Using a megohmmeter, check the insulation resistance between the high–voltage terminal of the system main resistor and the body ground.
Standard: 10 MΩ or higher

NG	REPLACE SYSTEM MAIN RESISTOR

OK

26	INSPECT MAIN BATTERY CABLE



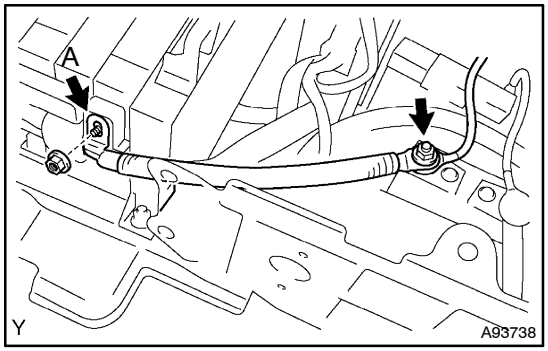
CAUTION:
Wear insulated gloves and goggles before performing the following operation.

(a) Remove the HV battery assembly (see page 21–56).
(b) Remove the battery cover (see page 21–56).
(c) Check if the main battery cable cover is not damaged or internal electrical leads are not in contact with the battery case or body.
OK: Electrical leads are not in contact with the battery case or body
(d) Remove the terminal (A in the illustration) on the battery module side of the main battery cable only.
(e) Using a megohmmeter, check the insulation resistance between each terminal of the main battery cable and shield ground.
Standard: 10 MΩ or higher

NG	REPLACE MAIN BATTERY CABLE

OK

27	INSPECT MAIN BATTERY CABLE NO.2



CAUTION:
Wear insulated gloves and goggles before performing the following operation.

(a) Following the previous step, check if the main battery cable No. 2 cover is not damaged or internal electrical leads are not in contact with the battery case or body.
OK: Electrical leads are not in contact with the battery case or body

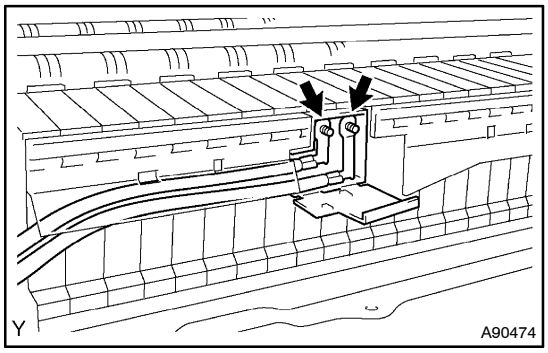
(b) Remove the terminal (A in illustration) on the battery module side of the main battery cable No. 2 only.

(c) Using a megohmmeter, check the insulation resistance between each terminal of the main battery cable No. 2 and shield ground.
Standard: 10 MΩ or higher

NG	REPLACE MAIN BATTERY CABLE NO.2

OK

28	INSPECT BATTERY PLUG



CAUTION:
Wear insulated gloves and goggles before performing the following operation.

(a) Following the previous step, disconnect only the connecting terminal of the battery plug.

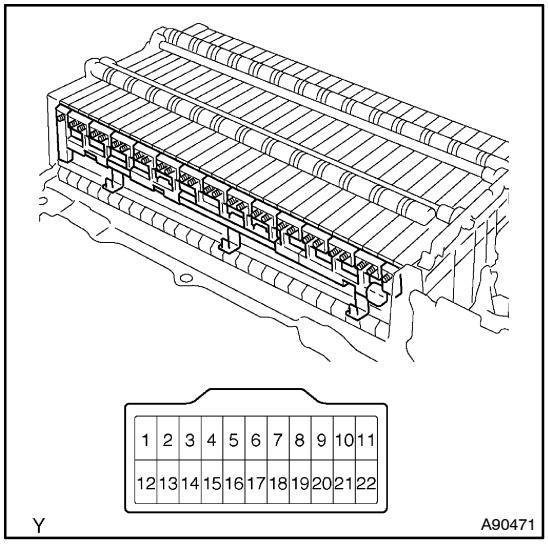
NOTICE:
Do not reinstall the service plug grip.

(b) Using a megohmmeter, check the insulation resistance between each terminal of the battery plug wire harness and body ground.
Standard: 10 MΩ or higher

NG	REPLACE BATTERY PLUG

OK

29	INSPECT FRAME WIRE NO.2



CAUTION:
Wear insulated gloves and goggles before performing the following operation.

(a) Following the previous step, check if the frame wire No. 2 cover is not damaged or internal electrical leads are not in contact with the battery case or body.
OK: Electrical leads are not in contact with the battery case or body.

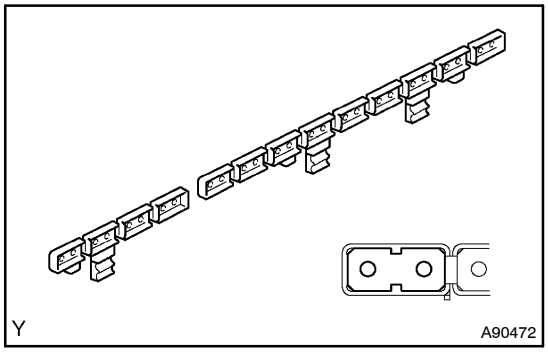
(b) Remove all the terminals on the battery module side of the frame wire No. 2.

(c) Using a megohmmeter, check the insulation resistance between each terminal of the frame wire No. 2 connector and the battery case.
Standard: 10 MΩ or higher

NG → **REPLACE FRAME WIRE NO.2**

OK

30	INSPECT JUNCTION BLOCK ASSY



CAUTION:
Wear insulated gloves and goggles before performing the following operation.

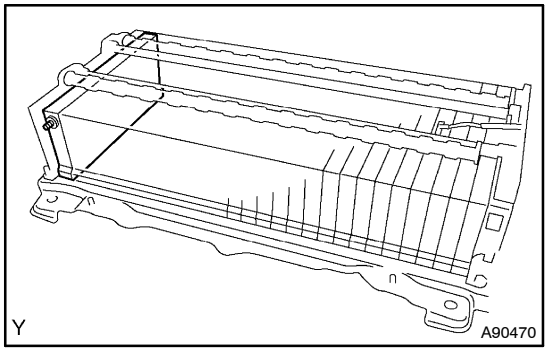
(a) Following the previous step, remove the junction block assembly.

(b) Visually check the junction block assembly for any damage.
OK: No crack or damage

NG → **REPLACE JUNCTION BLOCK ASSY**

OK

31	INSPECT HV BATTERY ASSY



CAUTION:
Wear insulated gloves and goggles before performing the following operation.

(a) Following the previous step, check the insulation resistance between each terminal (either the positive and negative side) of each battery module of the HV battery assembly and the battery case using a megohmmeter.
Standard: Some of the battery modules have continuity of below 10 MΩ

NG → **REPLACE BATTERY ECU ASSY (See page 21–100)**

OK

REPLACE HV SUPPLY BATTERY ASSY (See page 21–56)