DTC	P3222/313	GENERATOR INVERTER TEMPERATURE SENSOR CIRCUIT HIGH/LOW

DTC	P3223/312	GENERATOR INVERTER TEMPERATURE SENSOR CIRCUIT HIGH

CIRCUIT DESCRIPTION

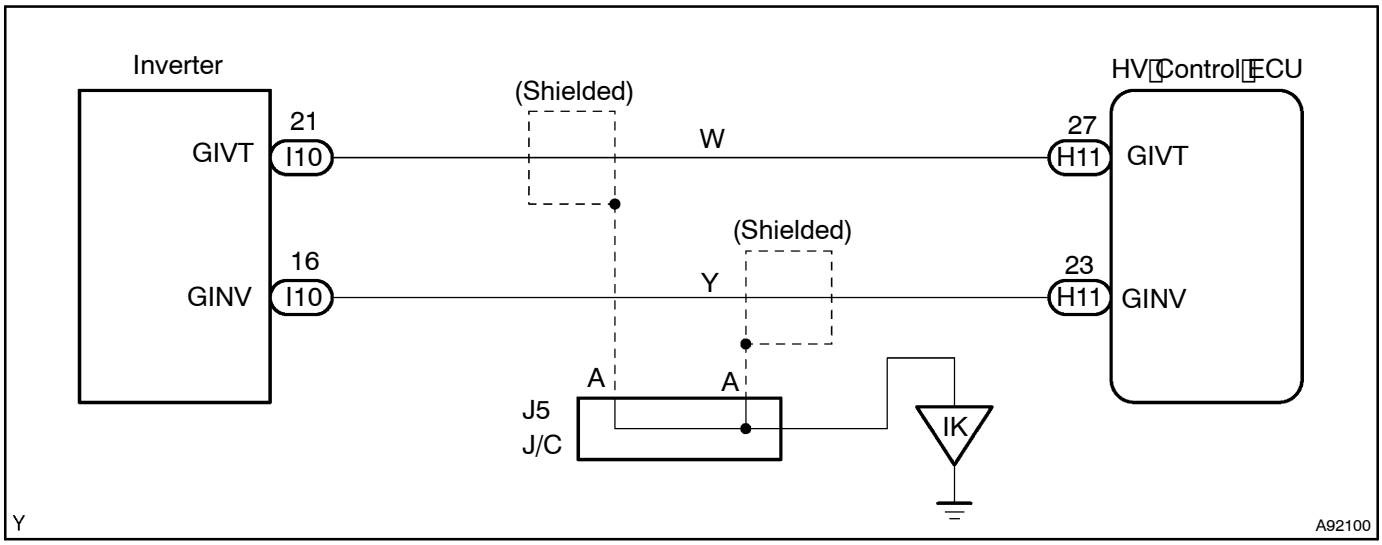
The HV control ECU uses a temperature sensor, which is built into the inverter, to detect the temperature of the generator inverter. The same cooling system that is routed to the MG1 and MG2 cools the inverter. This cooling system is independent from the engine cooling system.
The characteristic of the generator inverter temperature sensor is the same as the boost converter temperature sensor (see the description on page 05–517).
The HV control ECU limits the load based on the signals transmitted by the generator inverter temperature sensor, in order to check the effectiveness of the inverter cooling system and prevent the inverter from overheating. Furthermore, the HV control ECU detects a malfunction in the wiring of the generator inverter temperature sensor, as well as in the sensor itself.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P3222	313	Open or GND short in generator inverter temperature sensor circuit	• Wire harness or connector • w/ converter inverter assembly • HV control ECU
P3223	312	+B short in generator inverter temperature sensor circuit	• Wire harness or connector • w/ converter inverter assembly • HV control ECU

HINT:
After confirming DTC P3222 (INF 313) or P3223 (INF 312), confirm Inverter Temp–(MG1) in Powertrain / Hybrid Control / Data List using the intelligent tester II.

Temperature Displayed	Malfunction
–50°C (–58°F)	+B short circuit
205°C (401°F)	Open or GND short circuit

WIRING DIAGRAM



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 VALUE OF INTELLIGENT TESTER II (INVERTER TEMP–(MG1))**

(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 / Data List.
(e) Read the Inverter Temp–(MG1) value on the intelligent tester II.

Result:

Temperature Displayed	Proceed to
–50°C (–58°F)	A
205°C (401°F)	B
–49°C to 204°C (–57°F to 400°F)	C

HINT:

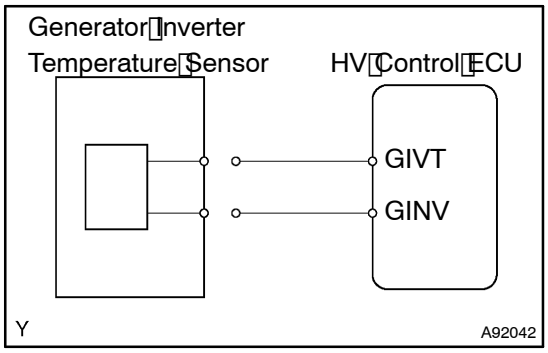
- If there is a +B short circuit, the intelligent tester II indicates –50°C (–58°F).
- If there is an open or GND short circuit, the intelligent tester II indicates 205°C (401°F).

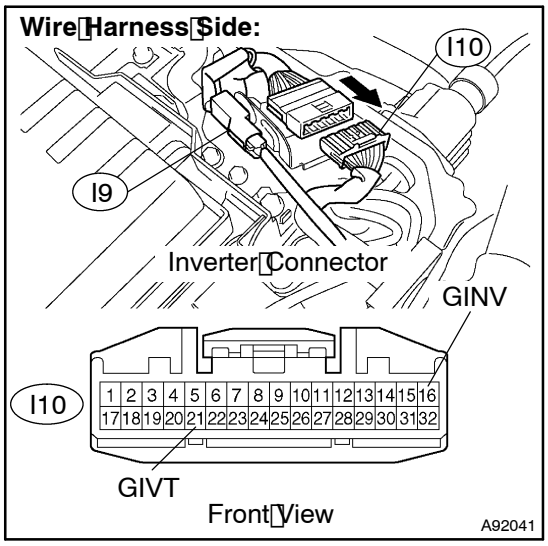
B → **Go to step 4**

C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–232)**

A

2	READ VALUE OF INTELLIGENT TESTER II (CHECK FOR +B SHORT IN WIRE HARNESS)





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 I10 inverter connector.
(e) Turn the power switch ON (IG).

HINT:
DTCs for the interlock switch system are output when turning the power switch ON (IG) with both service plug grip and inverter cover removed.

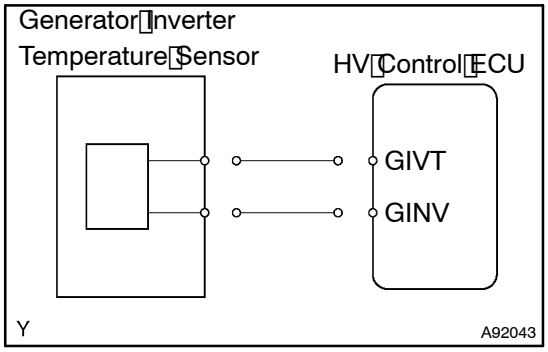
(f) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Data List.
(g) Read the Inverter Temp–(MG1) value on the intelligent tester II.
Standard: 205°C (401°F)
(h) Turn the power switch OFF.
(i) Reconnect the inverter connector.
(j) Reinstall the inverter cover (see page 21–25).
(k) Reinstall the service plug grip (see page 21–120).

NG → **Go to step 3**

OK

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

3	READ VALUE OF INTELLIGENT TESTER II (CHECK FOR +B SHORT IN HYBRID VEHICLE CONTROL ECU)

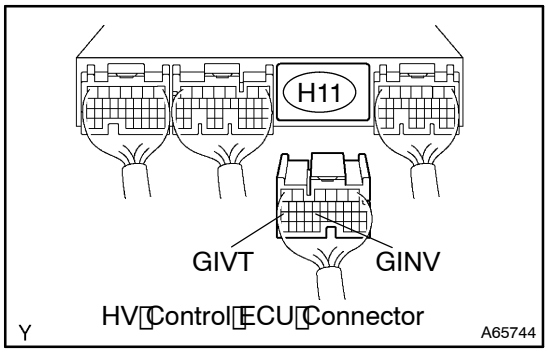


(a) Disconnect the H11 HV control ECU connector.
(b) Turn the power switch ON (IG).

HINT:

DTCs for the interlock switch system are output when turning the power switch ON (IG) with both service plug grip and inverter cover removed.

(c) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Data List.
(d) Read the Inverter Temp–(MG1) value on the intelligent tester II.
Standard: 205°C (401°F)
(e) Reconnect the HV control ECU connector.

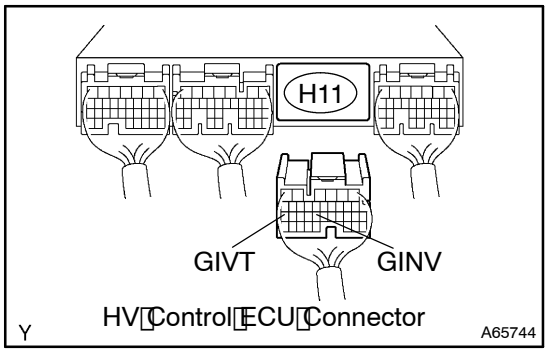


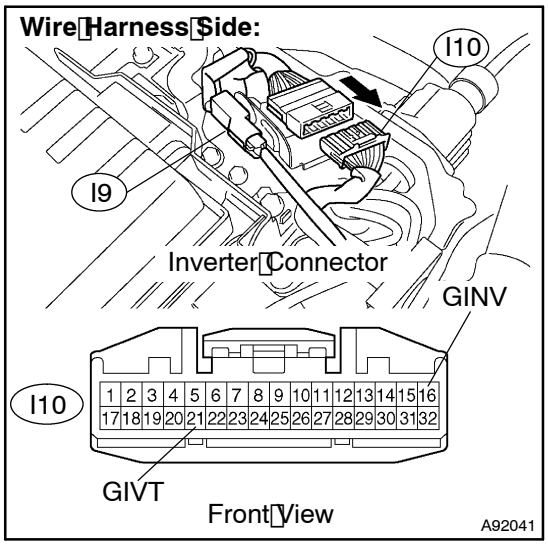
NG → **REPLACE HYBRID VEHICLE CONTROL ECU (See page 21–128)**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

4	CHECK HARNESS AND CONNECTOR(HYBRID VEHICLE CONTROL ECU – INVERTER)





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 H11 HV control ECU connector.

(e) Disconnect the I10 inverter connector.

(f) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
GIVT (H11–27) – GIVT (I10–21)	Below 1 Ω
GINV (H11–23) – GINV (I10–16)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
GIVT (H11–27) or GIVT (I10–21) – Body ground	10 kΩ or higher
GINV (H11–23) or GINV (I10–16) – Body ground	10 kΩ or higher

(g) Reconnect the inverter connector.

(h) Reconnect the HV control ECU connector.

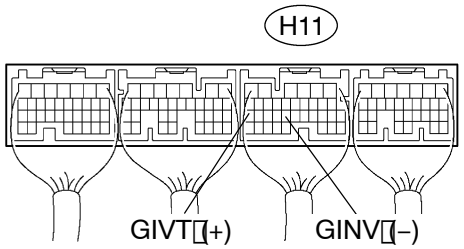
(i) Reinstall the inverter cover (see page 21–25).

(j) Reinstall the service plug grip (see page 21–120).

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

OK

5	INSPECT HYBRID VEHICLE CONTROL ECU (GIVT VOLTAGE)



(a) Turn the power switch ON (IG).

HINT:

DTCs for the interlock switch system are output when turning the power switch ON (IG) with both service plug grip and inverter cover removed.

(b) Measure the voltage between the terminals of the H11 HV control ECU connector.

Standard:

Tester Connection	Specified Condition
GIVT (H11–27) – GINV (H11–23)	2.0 to 4.5 V

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

OK

REPLACE HYBRID VEHICLE CONTROL ECU (See page 21–128)