Last Modified: 10-5-2010	6.4 S	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM000000OER01LX
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM: DIAGNOSTIC TROUBLE CODE CHART (2010 HS250H)		

DIAGNOSTIC TROUBLE CODE CHART

Hybrid Battery System

DTC Code	Detection Item	Trouble Area	MIL	See page
P0A1F-123	Battery Energy Control Module	1. Battery smart unit 2. Wire harness or connector 3. IGCT fuse 4. IGCT No.2 fuse 5. IGCT relay 6. Auxiliary battery	Comes on	INFO
P0A7F-123	Hybrid Battery Pack Deterioration	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P0A80-123	Replace Hybrid Battery Pack	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P0A82-123	Hybrid Battery Pack Cooling Fan 1	1. Battery cooling blower assembly 2. Battery smart unit 3. Hybrid vehicle control ECU 4. HV battery intake duct 5. Wire harness or connector	-	INFO
P0A84-	Hybrid Battery Pack Cooling Fan 1	1. Wire harness or	-	INFO

123		connector 2. Integration relay 3. Battery cooling blower assembly 4. Battery smart unit 5. Hybrid vehicle control ECU		
P0A85-123	Hybrid Battery Pack Cooling Fan 1	1. Wire harness or connector 2. Battery cooling blower assembly 3. Battery smart unit 4. HV battery assembly	-	INFO
P0A95-123	High Voltage Fuse	1. Service plug grip 2. HV battery assembly	-	INFO
P0A9C-123	Hybrid Battery Temperature Sensor "A" Range / Performance	1. HV battery assembly 2. Battery smart unit 3. Wire harness or connector	Comes on	INFO
P0A9D-123	Hybrid Battery Temperature Sensor "A" Circuit Low	1. HV battery assembly 2. Battery smart unit 3. Wire harness or connector	Comes on	INFO
P0A9E-123	Hybrid Battery Temperature Sensor "A" Circuit High	1. HV battery assembly 2. Battery smart unit 3. Wire harness or connector	Comes on	INFO
P0AAE-123	Hybrid Battery Pack Air Temperature Sensor "A" Circuit Low	1. HV battery assembly	-	INFO

		2. Battery smart unit 3. Wire harness or connector		
P0AAF-123	Hybrid Battery Pack Air Temperature Sensor "A" Circuit High	1. HV battery assembly 2. Battery smart unit 3. Wire harness or connector	-	INFO
P0ABF-123	Hybrid Battery Pack Current Sensor Circuit	1. Hybrid battery junction block assembly 2. Battery smart unit 3. Wire harness or connector	Comes on	INFO
P0AC0-123	Hybrid Battery Pack Current Sensor Circuit Range / Performance	1. Hybrid battery junction block assembly 2. Battery smart unit	Comes on	INFO
P0AC1-123	Hybrid Battery Pack Current Sensor Circuit Low	1. Hybrid battery junction block assembly 2. Battery smart unit 3. Wire harness or connector	Comes on	INFO
P0AC2-123	Hybrid Battery Pack Current Sensor Circuit High	1. Hybrid battery junction block assembly 2. Battery smart unit 3. Wire harness or connector	Comes on	INFO
P0AC6-123	Hybrid Battery Temperature Sensor "B" Range / Performance	1. HV battery assembly 2. Battery smart unit 3. Wire harness or connector	Comes on	INFO
P0AC7-123	Hybrid Battery Temperature Sensor "B" Circuit Low	1. HV battery assembly	Comes on	INFO

		2. Battery smart unit 3. Wire harness or connector		
P0AC8-123	Hybrid Battery Temperature Sensor "B" Circuit High	1. HV battery assembly 2. Battery smart unit 3. Wire harness or connector	Comes on	INFO
P0ACB-123	Hybrid Battery Temperature Sensor "C" Range / Performance	1. HV battery assembly 2. Battery smart unit 3. Wire harness or connector	Comes on	INFO
P0ACC-123	Hybrid Battery Temperature Sensor "C" Circuit Low	1. HV battery assembly 2. Battery smart unit 3. Wire harness or connector	Comes on	INFO
P0ACD-123	Hybrid Battery Temperature Sensor "C" Circuit High	1. HV battery assembly 2. Battery smart unit 3. Wire harness or connector	Comes on	INFO
P0AE9-123	Hybrid Battery Temperature Sensor "D" Range / Performance	1. HV battery assembly 2. Battery smart unit 3. Wire harness or connector	Comes on	INFO
P0AEA-123	Hybrid Battery Temperature Sensor "D" Circuit Low	1. HV battery assembly 2. Battery smart unit 3. Wire harness or connector	Comes on	INFO
P0AEB-123	Hybrid Battery Temperature Sensor "D" Circuit High	1. HV battery assembly	Comes on	INFO

		2. Battery smart unit 3. Wire harness or connector		
P0B3D-123	Hybrid Battery Voltage Sensor "A" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
P0B42-123	Hybrid Battery Voltage Sensor "B" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
P0B47-123	Hybrid Battery Voltage Sensor "C" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
P0B4C-123	Hybrid Battery Voltage Sensor "D" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
P0B51-123	Hybrid Battery Voltage Sensor "E" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
P0B56-123	Hybrid Battery Voltage Sensor "F" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
P0B5B-123	Hybrid Battery Voltage Sensor "G" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
P0B60-123	Hybrid Battery Voltage Sensor "H" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
P0B65-123	Hybrid Battery Voltage Sensor "I" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
P0B6A-123	Hybrid Battery Voltage Sensor "J" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
P0B6F-123	Hybrid Battery Voltage Sensor "K" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
P0B74-123	Hybrid Battery Voltage Sensor "L" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO

P0B79-123	Hybrid Battery Voltage Sensor "M" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
P0B7E-123	Hybrid Battery Voltage Sensor "N" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
P0B83-123	Hybrid Battery Voltage Sensor "O" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
P0B88-123	Hybrid Battery Voltage Sensor "P" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
P0B8D-123	Hybrid Battery Voltage Sensor "Q" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
P0B92-123	Hybrid Battery Voltage Sensor "R" Circuit Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
P3011-123	Battery Block 1 Becomes Weak	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P3012-123	Battery Block 2 Becomes Weak	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P3013-123	Battery Block 3 Becomes Weak	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P3014-123	Battery Block 4 Becomes Weak	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P3015-123	Battery Block 5 Becomes Weak	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P3016-123	Battery Block 6 Becomes Weak	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P3017-123	Battery Block 7 Becomes Weak	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P3018-123	Battery Block 8 Becomes Weak	1. HV battery assembly	Comes on	INFO

		2. Battery smart unit		
P3019-123	Battery Block 9 Becomes Weak	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P3020-123	Battery Block 10 Becomes Weak	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P3021-123	Battery Block 11 Becomes Weak	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P3022-123	Battery Block 12 Becomes Weak	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P3023-123	Battery Block 13 Becomes Weak	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P3024-123	Battery Block 14 Becomes Weak	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P3025-123	Battery Block 15 Becomes Weak	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P3026-123	Battery Block 16 Becomes Weak	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P3027-123	Battery Block 17 Becomes Weak	1. HV battery assembly 2. Battery smart unit	Comes on	INFO
P3065-123	Hybrid Battery Temperature Sensor Range / Perfoemance Stack A	1. HV battery assembly 2. Battery smart unit 3. Wire harness or connector	Comes on	INFO
P308A-123	Hybrid Battery Voltage Sensor All Circuits Low	1. Battery smart unit 2. HV battery assembly	Comes on	INFO
U029A-123	Lost Communication with Hybrid Battery Pack Sensor Module	1. Wire harness or connector 2. Hybrid vehicle control	Comes on	INFO

		ECU 3. Battery smart unit 4. IGCT fuse 5. IGCT No.2 fuse 6. IGCT relay		

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM0000025D100LX
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM: P0A1F-123: Battery Energy Control Module (2010 HS250H)		

DTC	P0A1F-123	Battery Energy Control Module

DESCRIPTION

- If the battery smart unit detects an internal malfunction, it sends an error signal to the hybrid vehicle control ECU. When the hybrid vehicle control ECU receives the error signal from the battery smart unit, the ECU warns the driver and performs fail-safe control.

DTC No.	DTC Detection Condition	Trouble Area
P0A1F-123	The hybrid vehicle control ECU receives an error signal from the battery smart unit.	• Battery smart unit • Wire harness or connector • IGCT fuse • IGCT No. 2 fuse • IGCT relay • Auxiliary battery

MONITOR DESCRIPTION

If the battery smart unit detects an internal malfunction in itself, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A1F (INF 123): Battery Energy Control Module
Required sensors / components	Battery smart unit
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	TMC's intellectual property
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

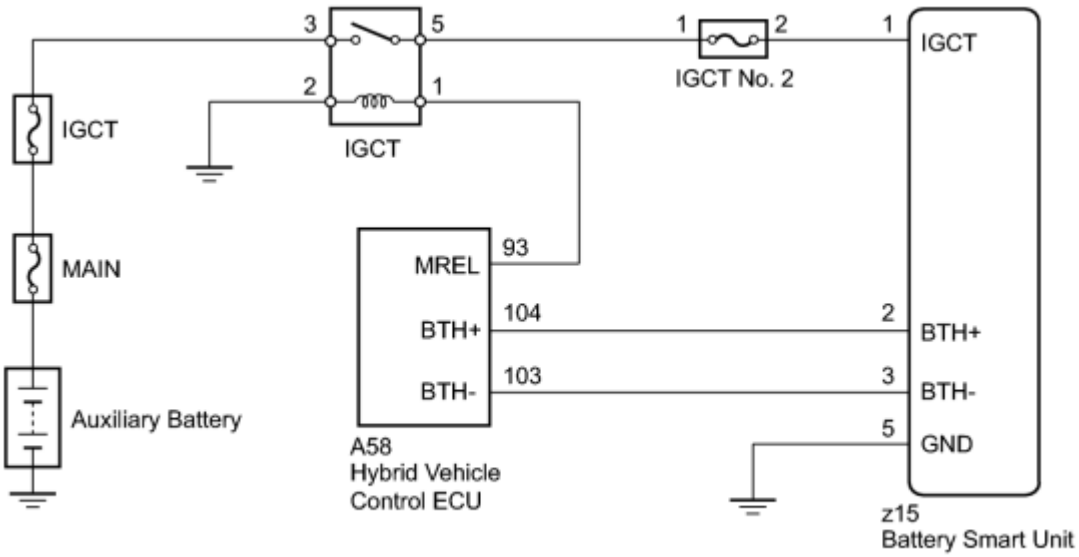
TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Battery smart unit	DTC P0A1F (INF 123) is not detected

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 accidentally reconnecting it while you are working on the high-voltage system.

- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals.

HINT:

At least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

HINT:

After repairing, restart the system (turn the power switch on (READY)) and recheck for DTCs INFO.

PROCEDURE

1.	CHECK AUXILIARY BATTERY

(a) Measure the voltage between the terminals of the auxiliary battery.

Standard voltage:

11 to 14 V

NG ▶ CHARGE OR REPLACE AUXILIARY BATTERY

OK ▼

2.	CHECK HARNESS AND CONNECTOR (IGCT VOLTAGE)

CAUTION:

Be sure to wear insulated gloves.

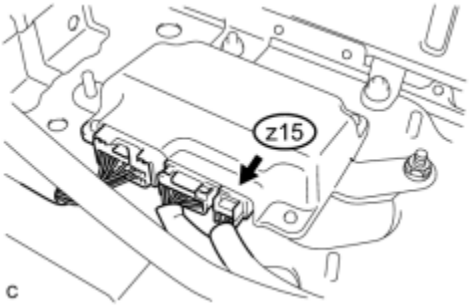
(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(c) Remove the hybrid battery junction block assembly.



(d) Disconnect the z15 connector from the battery smart unit.

(e) Connect the cable to the negative (-) battery terminal.

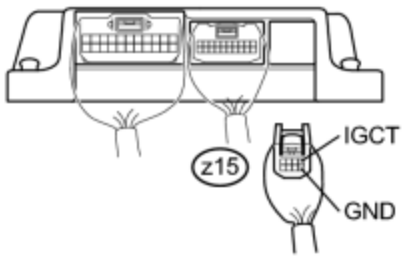
(f) Turn the power switch on (IG).

(g) Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
z15-1 (IGCT) - z15-5 (GND)	Power switch on (IG)	8.6 V or higher

*1



NOTICE:

- After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.
- Turning the power switch on (IG) with the service plug grip removed causes DTCs to be set. Use the Techstream to clear the DTCs.

Text in Illustration	
*1	Rear view of wire harness connector (to Battery Smart Unit)

(h) Turn the power switch off.

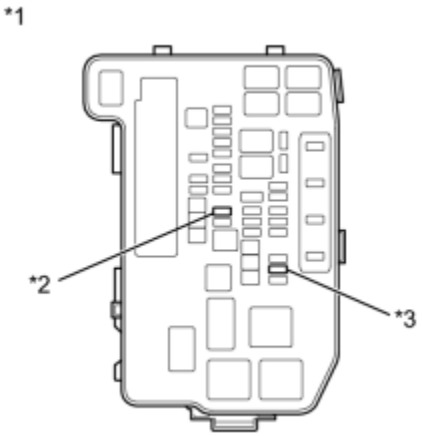
(i) Connect the z15 connector to the battery smart unit

(j) Install the hybrid battery junction block assembly.

NG ▶ CHECK FUSE (IGCT, IGCT NO. 2)
OK ▶ **REPLACE BATTERY SMART UNIT**

3.	CHECK FUSE (IGCT, IGCT NO. 2)

(a) Turn the power switch off.



(b) Remove the IGCT and IGCT No. 2 fuses from the engine room junction block assembly.

Text in Illustration	
*1	Engine Room Junction Block Assembly
*2	IGCT Fuse
*3	IGCT No. 2 Fuse

(c) Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
IGCT fuse	Always	Below 1 Ω
IGCT No. 2 fuse	Always	Below 1 Ω

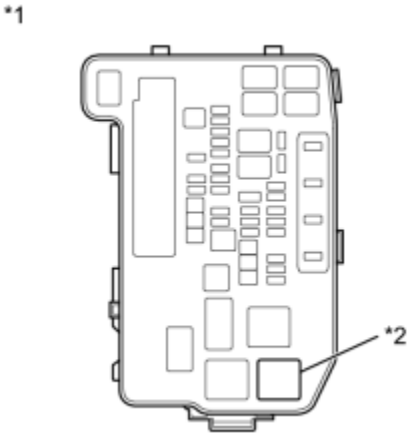
(d) Install the IGCT and IGCT No. 2 fuses to the engine room junction block assembly.

NG ▶ REPLACE FUSE (IGCT, IGCT NO. 2)
OK ▼

4.	CHECK RELAY (IGCT)

(a) Turn the power switch off.

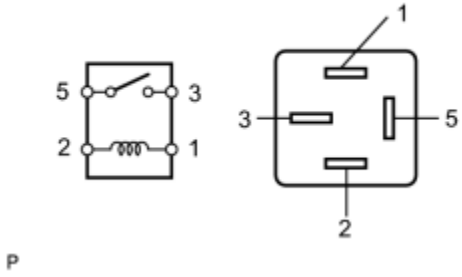
(b) Remove the IGCT relay from the engine room junction block assembly.



Text in Illustration	
*1	Engine Room Junction Block Assembly
*2	IGCT Relay

(c) Measure the resistance according to the value(s) in the table below.

Standard Resistance:



Tester Connection	Condition	Specified Condition
3 - 5	Auxiliary battery voltage is applied between terminals 1 and 2	below 1 Ω
	Auxiliary battery voltage is not applied between terminals 1 and 2	10 kΩ or more

(d) Install the IGCT relay to the engine room junction block assembly.

NG ▶ REPLACE RELAY (IGCT)

OK ▼

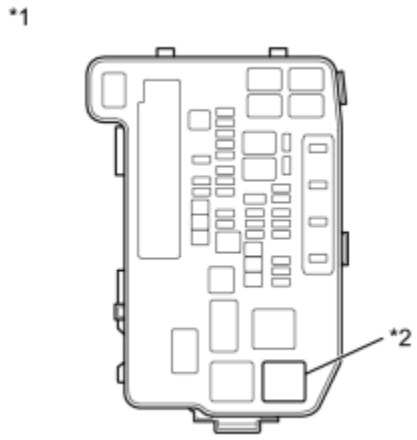
5.	CHECK HARNESS AND CONNECTOR (IGCT RELAY - BATTERY SMART UNIT)

CAUTION:

Be sure to wear insulated gloves.

(a) Disconnect the cable from the negative (-) battery terminal.

(b) Remove the IGCT relay from the engine room junction block assembly.



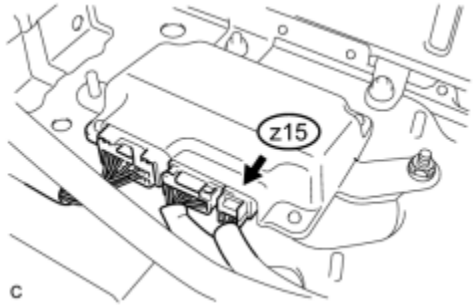
Text in Illustration	
*1	Engine Room Junction Block Assembly
*2	IGCT Relay

(c) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(d) Remove the hybrid battery junction block assembly.



(e) Disconnect only the z15 connector of the battery smart unit.

(f) Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
IGCT relay terminal 5 - z15-4 (IGCT)	Power switch off	Below 1 Ω

Text in	Rear view of wire harness

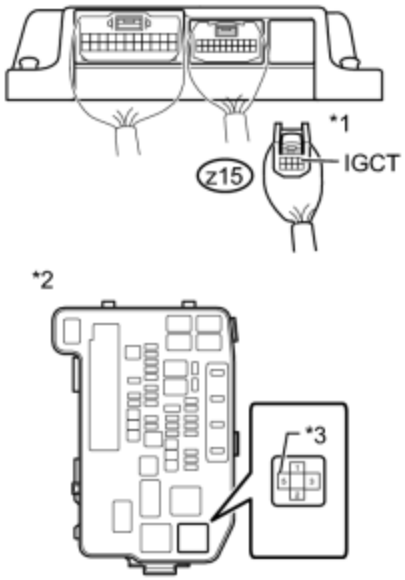


Illustration	connector (to Battery Smart Unit)
*1	
*2	Engine Room Junction Block Assembly
*3	IGCT relay terminal 5

(g) Connect the z15 connector of the battery smart unit.

(h) Install the hybrid battery junction block assembly.

(i) Install the IGCT relay to the engine room junction block assembly.

(j) Connect the cable to the negative (-) battery terminal.

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR
OK ▶ **CHECK AND REPAIR POWER SOURCE CIRCUIT**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM00000252801AX
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM: P0A7A-122: Generator Inverter Performance (2010 HS250H)		

DTC	P0A7A-122	Generator Inverter Performance

DESCRIPTION

For a description of the inverter, INFO.

If the generator inverter overheats, has a circuit malfunction, or has an internal short, the inverter transmits this information to the MG ECU via the generator inverter fail signal line.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	122	Generator inverter fail signal detection (overcurrent due to system malfunction)	• Fuel level • Engine assembly • Hybrid vehicle transaxle assembly • Wire harness or connector • Inverter with converter assembly

MONITOR DESCRIPTION

If excessive amperage flows through the generator inverter due to an internal short, the generator inverter will transmit an inverter fail signal to the MG ECU. The MG ECU will send information about the malfunction to the hybrid vehicle control ECU. Upon receiving this information, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A7A (INF 122): GFIV detection (Load short circuit)
Required sensors / components	Generator inverter
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	1 driving cycle

Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	DTC P0A7A (INF 122) is not detected

WIRING DIAGRAM

Refer to the wiring diagram for DTC P0A1A-200 INFO.

INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system or disconnecting the low voltage connector of the inverter with converter assembly, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals. After waiting for 10 minutes, check the voltage at the terminals in the inspection point in the inverter with converter assembly. The voltage should be 0 V before beginning work.

HINT:

Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Check if DTCs are output.

Result:

Result	Proceed to
P0A7A-122 only is output.	A
Any of the following DTCs are also output.	B

DTC No.	Relevant Diagnosis
P0A1A (all INF codes) *1	Generator Control Module
P0A1B (all INF codes) *1	Drive Motor "A" Control Module
P0A1D (all INF codes) *1	Hybrid Powertrain Control Module
P0A3F-243	Drive Motor "A" Position Sensor Circuit
P0A40-500	Drive Motor "A" Position Sensor Circuit Range / Performance
P0A41-245	Drive Motor "A" Position Sensor Circuit Low
P0A4B-253	Generator Position Sensor Circuit
P0A4C-513	Generator Position Sensor Circuit Range / Performance
P0A4D-255	Generator Position Sensor Circuit Low
P0A60 (all INF codes) *1	Drive Motor "A" Phase V Current
P0A63 (all INF codes) *1	Drive Motor "A" Phase W Current
P0A72 (all INF codes) *1	Generator Phase V Current
P0A75 (all INF codes) *1	Generator Phase W Current
P0A78-266, 267, 279, 287, 306, 503, 504, 505, 506, 586, 806, 807, 808	Drive Motor "A" Inverter Performance
P0A7A-325, 344, 517, 518, 809, 810, 811	Generator Inverter Performance
P0A90-509	Drive Motor "A" Performance
P0A92-521	Hybrid Generator Performance
P0A94-442, 547, 548, 549, 554, 555, 556, 585,	DC/DC Converter Performance

587, 589, 590	
P0ADB-227	Hybrid Battery Positive Contactor Control Circuit Low
P0ADC-226	Hybrid Battery Positive Contactor Control Circuit High
P0ADF-229	Hybrid Battery Negative Contactor Control Circuit Low
P0AE0-228	Hybrid Battery Negative Contactor Control Circuit High
P0C76-523	Hybrid Battery System Discharge Time Too Long
P3004-803	High Voltage Power Resource

HINT:

- *1: If any INF codes are output for this DTC, refer to the corresponding diagnostic procedure.
- P0A7A-122 may be set due to a malfunction which also causes DTCs in the preceding table to be set. In this case, first troubleshoot the output DTCs in the preceding table. Then, perform a test to attempt to reproduce the problems, and check that no DTCs are output.

(e) Turn the power switch off.

B GO TO DTC CHART

A

2.	CHECK AMOUNT OF GASOLINE

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

(b) Check the amount of fuel by referring to the fuel gauge in the meter.

Result:

Result	Proceed to
Proper amount of fuel is in the tank	A
Proper amount of fuel is not in the tank	B

(c) Turn the power switch off.

B ▶ REFUEL VEHICLE

A ▼

3.	CHECK ENGINE START

(a) Turn the power switch on (READY).

(b) Check if the engine starts.

HINT:

Depressing the accelerator pedal with park (P) selected will cause the engine to start.

Result:

Result	Proceed to
The engine does not start	A
The engine starts	B

(c) Turn the power switch off.

B ▶ CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR)

A ▼

4.	CHECK CRANKSHAFT PULLEY REVOLUTION (WITH PARK (P) SELECTED)

(a) Push the P position switch.

(b) Turn the power switch off.

(c) Lift up the vehicle.

(d) Turn the crankshaft pulley using hand tools to check if the crankshaft pulley can rotate.

CAUTION:

Do not turn the power switch on (READY) while performing this inspection. Be sure to turn the power switch off before performing this inspection to prevent the engine from starting.

NOTICE:

Engine compression causes resistance when turning the crankshaft pulley. Check if the

crankshaft rotates smoothly (or if it is locked) by manually applying sufficient torque to turn the crankshaft pulley. The torque required to turn the crankshaft pulley should be the same as for a known good vehicle of the same type.

Result:

Result	Proceed to
The crankshaft does not rotate	A
The crankshaft rotates smoothly	B

(e) Lower the vehicle.

B ▶ CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR)

A ▼

5.	CHECK CRANKSHAFT PULLEY REVOLUTION (WITH NEUTRAL (N) SELECTED)

(a) Turn the power switch on (IG), move the shift lever to N, and lift up the vehicle.

(b) Turn the crankshaft pulley using hand tools to check if the crankshaft pulley can rotate.

CAUTION:

Do not turn the power switch on (READY) while performing this inspection. Be sure to turn the power switch on (IG) before performing this inspection, to prevent the engine from starting.

NOTICE:

Engine compression causes resistance when turning the crankshaft pulley. Check if the crankshaft rotates smoothly (or if it is locked) by manually applying sufficient torque to turn the crankshaft pulley. The torque required to turn the crankshaft pulley should be the same as for a known good vehicle of the same type.

Result:

Result	Proceed to
The crankshaft rotates smoothly	A
The crankshaft does not rotate	B

(c) Lower the vehicle.

(d) Turn the power switch off.

B ▶ REPAIR OR REPLACE ENGINE ASSEMBLY

A ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

6.	CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

7.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

8.	CHECK GENERATOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR)

OK ▼

9.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

10.	CHECK MOTOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR)

OK ▼

11.	CHECK INVERTER WITH CONVERTER ASSEMBLY (GENERATOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY

B ▶ REPLACE MALFUNCTIONING PARTS

A ▼

12.	CHECK INVERTER WITH CONVERTER ASSEMBLY (MOTOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY

B ▶ REPLACE MALFUNCTIONING PARTS

A

13.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG1) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY

OK

14.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG2) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY

OK

15.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK

16.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

17.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK

18.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

19.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK

20.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM00000252900LX
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM: P0A7A-130: Generator Inverter Performance (2010 HS250H)		

DTC	P0A7A-130	Generator Inverter Performance

DESCRIPTION

For a description of the inverter, INFO.

If an abnormal amount of current flows through the generator inverter, the MG ECU detects it and sends a signal to inform the hybrid vehicle control ECU of the malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	130	Abnormal generator current value detection (System)	• Fuel level • Engine assembly • Hybrid vehicle transaxle assembly • Inverter with converter assembly • Wire harness or connector

MONITOR DESCRIPTION

If the MG ECU detects that the generator inverter current exceeds the threshold level for a specified period of time, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A7A (INF 130): Generator Inverter Abnormal Current
Required sensors / components	Generator inverter
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	DTC P0A7A (INF 130) is not detected

WIRING DIAGRAM

Refer to the wiring diagram for DTC P0A1A-200 INFO.

INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system or disconnecting the low voltage connector of the inverter with converter assembly, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals. After waiting for 10 minutes, check the voltage at the terminals in the inspection point in the inverter with converter assembly. The voltage should be 0 V before beginning work.

HINT:

Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Check if DTCs are output.

Result:

Result	Proceed to
P0A7A-130 only is output.	A
Any of the following DTCs are also output.	B

DTC No.	Relevant Diagnosis
P0A1A (all INF codes) *1	Generator Control Module
P0A1B (all INF codes) *1	Drive Motor "A" Control Module
P0A1D (all INF codes) *1	Hybrid Powertrain Control Module
P0A3F-243	Drive Motor "A" Position Sensor Circuit
P0A40-500	Drive Motor "A" Position Sensor Circuit Range / Performance
P0A41-245	Drive Motor "A" Position Sensor Circuit Low
P0A4B-253	Generator Position Sensor Circuit
P0A4C-513	Generator Position Sensor Circuit Range / Performance
P0A4D-255	Generator Position Sensor Circuit Low
P0A60 (all INF codes) *1	Drive Motor "A" Phase V Current
P0A63 (all INF codes) *1	Drive Motor "A" Phase W Current
P0A72 (all INF codes) *1	Generator Phase V Current
P0A75 (all INF codes) *1	Generator Phase W Current
P0A78-266, 267, 279, 287, 306, 503, 504, 505, 506, 586, 806, 807, 808	Drive Motor "A" Inverter Performance
P0A7A-325, 344, 517, 518, 809, 810, 811	Generator Inverter Performance
P0A90-509	Drive Motor "A" Performance
P0A92-521	Hybrid Generator Performance
P0A94-442, 547, 548, 549, 554, 555, 556, 585, 587, 589, 590	DC/DC Converter Performance

P0ADB-227	Hybrid Battery Positive Contactor Control Circuit Low
P0ADC-226	Hybrid Battery Positive Contactor Control Circuit High
P0ADF-229	Hybrid Battery Negative Contactor Control Circuit Low
P0AE0-228	Hybrid Battery Negative Contactor Control Circuit High
P0C76-523	Hybrid Battery System Discharge Time Too Long
P3004-803	High Voltage Power Resource

HINT:

- *1: If any INF codes are output for this DTC, refer to the corresponding diagnostic procedure.
- P0A7A-130 may be set due to a malfunction which also causes DTCs in the preceding table to be set. In this case, first troubleshoot the output DTCs in the preceding table. Then, perform a test to attempt to reproduce the problems, and check that no DTCs are output.

(e) Turn the power switch off.

B ▶ GO TO DTC CHART

A ▼

2.	CHECK AMOUNT OF GASOLINE INFO

B ▶ REFUEL VEHICLE

A ▼

3.	CHECK ENGINE START INFO

B ▶ CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR)

A ▼

4.	CHECK CRANKSHAFT PULLEY REVOLUTION (WITH PARK (P) SELECTED) INFO

B ▶ CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR)

A ▼

5.	CHECK CRANKSHAFT PULLEY REVOLUTION (WITH NEUTRAL (N) SELECTED) INFO

B ▶ REPAIR OR REPLACE ENGINE ASSEMBLY

A ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

6.	CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

7.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

8.	CHECK GENERATOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR)

OK ▼

9.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

10.	CHECK MOTOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR)

OK ▼

11.	CHECK INVERTER WITH CONVERTER ASSEMBLY (GENERATOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY

B ▶ REPLACE MALFUNCTIONING PARTS

A ▼

12.	CHECK INVERTER WITH CONVERTER ASSEMBLY (MOTOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY

B ▶ REPLACE MALFUNCTIONING PARTS

A ▼

13.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG1) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY

OK ▼

14.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG2) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY

OK ▼

15.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

16.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

17.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

18.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

19.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

20.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**


TOYOTA

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM000000YAJ01QX
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM: P0A7A-322: Generator Inverter Performance (2010 HS250H)		

DTC	P0A7A-322	Generator Inverter Performance

DESCRIPTION

For a description of the inverter, INFO.

If the generator inverter overheats, has a circuit malfunction, or has an internal short, the inverter transmits this information to the MG ECU via the generator inverter fail signal line.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	322	Generator inverter fail signal detection (overheating)	• Fuel level • Engine assembly • Inverter cooling system • Cooling fan system • Wire harness or connector • Hybrid vehicle transaxle assembly • Inverter with converter assembly • Water pump with motor assembly • Hybrid vehicle control ECU • IGCT No. 3 fuse

MONITOR DESCRIPTION

If the generator inverter overheats, it will transmit an inverter fail signal to the MG ECU. The MG ECU will send information about the malfunction to the hybrid vehicle control ECU. Upon receiving this information, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A7A (INF 322): GFIV detection (Overheat malfunction)

Required sensors / components	Generator inverter
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTC is not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	DTC P0A7A (INF 322) is not detected

WIRING DIAGRAM

Refer to the wiring diagram for DTC P0A01-725 INFO.

Refer to the wiring diagram for DTC P0A1A-200 INFO.

INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system or disconnecting the low voltage connector of the inverter with converter assembly, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals. After waiting for 10 minutes, check the voltage at the terminals in the inspection point in the inverter with converter assembly. The voltage should be 0 V before beginning work.

NOTICE:

After troubleshooting and repairing all output DTCs, be sure to replace the inverter with converter assembly.

HINT:

Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Check if DTCs are output.

Result:

Result	Proceed to
P0A7A-322 only is output.	A
Any of the following DTCs are also output.	B

DTC No.	Relevant Diagnosis
P0A1A (all INF codes) *1	Generator Control Module
P0A1B (all INF codes) *1	Drive Motor "A" Control Module
P0A1D (all INF codes) *1	Hybrid Powertrain Control Module
P0A3F-243	Drive Motor "A" Position Sensor Circuit
P0A40-500	Drive Motor "A" Position Sensor Circuit Range / Performance
P0A41-245	Drive Motor "A" Position Sensor Circuit Low
P0A4B-253	Generator Position Sensor Circuit
P0A4C-513	Generator Position Sensor Circuit Range / Performance
P0A4D-255	Generator Position Sensor Circuit Low

P0A60 (all INF codes) *1	Drive Motor "A" Phase V Current
P0A63 (all INF codes) *1	Drive Motor "A" Phase W Current
P0A72 (all INF codes) *1	Generator Phase V Current
P0A75 (all INF codes) *1	Generator Phase W Current
P0A78-266, 267, 279, 287, 306, 503, 504, 505, 506, 586, 806, 807, 808	Drive Motor "A" Inverter Performance
P0A7A-325, 344, 517, 518, 809, 810, 811	Generator Inverter Performance
P0A90-509	Drive Motor "A" Performance
P0A92-521	Hybrid Generator Performance
P0A94-442, 547, 548, 549, 554, 555, 556, 585, 587, 589, 590	DC/DC Converter Performance
P0C76-523	Hybrid Battery System Discharge Time Too Long

HINT:

- *1: If any INF codes are output for this DTC, refer to the corresponding diagnostic procedure.
- P0A7A-322 may be set due to a malfunction which also causes DTCs in the preceding table to be set. In this case, first troubleshoot the output DTCs in the preceding table. After troubleshooting and repairing all output DTCs, be sure to replace the inverter with converter assembly.

(e) Turn the power switch off.

B ▶ GO TO DTC CHART

A ▼

2.	CHECK AMOUNT OF GASOLINE INFO

B ▶ REFUEL VEHICLE

A ▼

3.	CHECK ENGINE START INFO

B ▶ CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR)

A ▼

4.	CHECK CRANKSHAFT PULLEY REVOLUTION (WITH PARK (P) SELECTED) INFO

B ▶ CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER

ASSEMBLY CONNECTOR)

A

5.	CHECK CRANKSHAFT PULLEY REVOLUTION (WITH NEUTRAL (N) SELECTED) INFO

B ▶ REPAIR OR REPLACE ENGINE ASSEMBLY

A ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

6.	CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK

7.	CHECK QUANTITY OF HV COOLANT INFO

C ▶ CHECK FOR COOLANT LEAKS AND ADD COOLANT

B ▶ ADD COOLANT

A

8.	CHECK COOLANT HOSE INFO

NG ▶ CORRECT THE PROBLEM

OK

9.	PERFORM ACTIVE TEST USING TECHSTREAM (ACTIVATE THE WATER PUMP) INFO

NG ▶ PERFORM ACTIVE TEST USING TECHSTREAM (ACTIVATE THE WATER PUMP)

OK

10.	PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE ELECTRIC COOLING FAN) INFO

NG ▶ CHECK COOLING FAN SYSTEM

OK

11.	CHECK HV COOLANT (CHECK FOR CONDITIONS THAT MAY HAVE CAUSED FREEZING) INFO

B ▶ REPLACE HV COOLANT

A

12.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

13.	CHECK GENERATOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR)

OK ▼

14.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

15.	CHECK MOTOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR)

OK ▼

16.	CHECK INVERTER WITH CONVERTER ASSEMBLY (GENERATOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY

B ▶ REPLACE MALFUNCTIONING PARTS

A ▼

17.	CHECK INVERTER WITH CONVERTER ASSEMBLY (MOTOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY

B ▶ REPLACE MALFUNCTIONING PARTS

A ▼

18.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG1) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY

OK ▼

19.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG2) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY

OK ▼

20.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

21.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

22.	PERFORM ACTIVE TEST USING TECHSTREAM (ACTIVATE THE WATER PUMP) INFO

B ▶ ADD COOLANT

A ▼

23.	CHECK FUSE (IGCT NO. 3) INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (WATER PUMP WITH MOTOR ASSEMBLY CONNECTOR)

OK ▼

24.	CHECK CONNECTOR CONNECTION CONDITION (WATER PUMP WITH MOTOR ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

25.	CHECK CONNECTOR CONNECTION CONDITION (HYBRID VEHICLE CONTROL ECU CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

26.	CHECK HARNESS AND CONNECTOR (WATER PUMP WITH MOTOR ASSEMBLY CIRCUIT) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

27.	CHECK WATER PUMP WITH MOTOR ASSEMBLY INFO

NG ▶ REPLACE WATER PUMP WITH MOTOR ASSEMBLY

OK ▶ **REPLACE HYBRID VEHICLE CONTROL ECU**

28.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER

	CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

29.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

30.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

31.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

32.	CHECK CONNECTOR CONNECTION CONDITION (WATER PUMP WITH MOTOR ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

33.	CHECK CONNECTOR CONNECTION CONDITION (HYBRID VEHICLE CONTROL ECU CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

34.	CHECK HARNESS AND CONNECTOR (WATER PUMP WITH MOTOR ASSEMBLY CIRCUIT) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

35.	CHECK WATER PUMP WITH MOTOR ASSEMBLY INFO

NG ▶ REPLACE WATER PUMP WITH MOTOR ASSEMBLY

OK ▼

36.	REPLACE HYBRID VEHICLE CONTROL ECU INFO

NEXT ▶ **REPLACE FUSE (IGCT NO. 3)**

37.	CONNECT SECURELY INFO

NEXT ▶ **REPLACE FUSE (IGCT NO. 3)**

38.	CONNECT SECURELY INFO

NEXT ▶ **REPLACE FUSE (IGCT NO. 3)**

39.	REPAIR OR REPLACE HARNESS OR CONNECTOR INFO

NEXT ▶ **REPLACE FUSE (IGCT NO. 3)**

40.	REPLACE WATER PUMP WITH MOTOR ASSEMBLY INFO

NEXT ▶ **REPLACE FUSE (IGCT NO. 3)**

41.	REPLACE HV COOLANT INFO

NEXT ▼

42.	CHECK WATER PUMP WITH MOTOR ASSEMBLY INFO

NG ▶ REPLACE WATER PUMP WITH MOTOR ASSEMBLY

OK ▶ **COMPLETED**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM000000YAK015X
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM: P0A7A-324: Generator Inverter Performance (2010 HS250H)		

DTC	P0A7A-324	Generator Inverter Performance

DESCRIPTION

For a description of the inverter, INFO.

If the generator inverter overheats, has a circuit malfunction, or has an internal short, the inverter transmits this information to the MG ECU via the generator inverter fail signal line.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	324	Generator inverter fail signal detection (circuit malfunction)	• Fuel level • Engine assembly • Hybrid vehicle transaxle assembly • Inverter cooling system • Cooling fan system • Wire harness or connector • Inverter with converter assembly • Water pump with motor assembly • Hybrid vehicle control ECU • IGCT No. 3 fuse

MONITOR DESCRIPTION

If the generator inverter detects a circuit malfunction, it will transmit a generator inverter fail signal to the MG ECU. The MG ECU will send information about the malfunction to the hybrid vehicle control ECU. Upon receiving this information, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A7A (INF 324): GFIV detection (Circuit malfunction)
Required sensors / components	Generator inverter
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTC is not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	DTC P0A7A (INF 324) is not detected

WIRING DIAGRAM

Refer to the wiring diagram for DTC P0A01-725 INFO.

Refer to the wiring diagram for DTC P0A1A-200 INFO.

INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system or disconnecting the low voltage connector of the inverter with converter assembly, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals. After waiting for 10 minutes, check the voltage at the terminals in the inspection point in the inverter with converter assembly. The voltage should be 0 V before beginning work.

NOTICE:

After troubleshooting and repairing all output DTCs, be sure to replace the inverter with converter assembly.

HINT:

Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Check if DTCs are output.

Result:

Result	Proceed to
P0A7A-324 only is output.	A
Any of the following DTCs are also output.	B

DTC No.	Relevant Diagnosis
P0A1A (all INF codes) *1	Generator Control Module
P0A1B (all INF codes) *1	Drive Motor "A" Control Module
P0A1D (all INF codes) *1	Hybrid Powertrain Control Module
P0A3F-243	Drive Motor "A" Position Sensor Circuit
P0A40-500	Drive Motor "A" Position Sensor Circuit Range / Performance
P0A41-245	Drive Motor "A" Position Sensor Circuit Low
P0A4B-253	Generator Position Sensor Circuit
P0A4C-513	Generator Position Sensor Circuit Range / Performance
P0A4D-255	Generator Position Sensor Circuit Low

P0A60 (all INF codes) *1	Drive Motor "A" Phase V Current
P0A63 (all INF codes) *1	Drive Motor "A" Phase W Current
P0A72 (all INF codes) *1	Generator Phase V Current
P0A75 (all INF codes) *1	Generator Phase W Current
P0A78-113, 128, 266, 267, 279, 284, 287, 306, 503, 504, 505, 506, 586, 806, 807, 808	Drive Motor "A" Inverter Performance
P0A7A-122, 130, 322, 325, 344, 517, 518, 809, 810, 811	Generator Inverter Performance
P0A90-509	Drive Motor "A" Performance
P0A92-521	Hybrid Generator Performance
P0A94-442, 547, 548, 549, 554, 555, 556, 585, 587, 589, 590	DC/DC Converter Performance
P0C76-523	Hybrid Battery System Discharge Time Too Long

HINT:

- *1: If any INF codes are output for this DTC, refer to the corresponding diagnostic procedure.
- P0A7A-324 may be set due to a malfunction which also causes DTCs in the preceding table to be set. In this case, first troubleshoot the output DTCs in the preceding table. After troubleshooting and repairing all output DTCs, be sure to replace the inverter with converter assembly.

(e) Turn the power switch off.

B ▶ GO TO DTC CHART

A ▼

2.	CHECK AMOUNT OF GASOLINE INFO

B ▶ REFUEL VEHICLE

A ▼

3.	CHECK ENGINE START INFO

B ▶ CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR)

A ▼

4.	CHECK CRANKSHAFT PULLEY REVOLUTION (WITH PARK (P) SELECTED) INFO

B ▶ CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR)

A ▼

5.	CHECK CRANKSHAFT PULLEY REVOLUTION (WITH NEUTRAL (N) SELECTED) INFO

B ▶ REPAIR OR REPLACE ENGINE ASSEMBLY

A ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

6.	CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

7.	CHECK QUANTITY OF HV COOLANT INFO

C ▶ CHECK FOR COOLANT LEAKS AND ADD COOLANT

B ▶ ADD COOLANT

A ▼

8.	CHECK COOLANT HOSE INFO

NG ▶ CORRECT THE PROBLEM

OK ▼

9.	PERFORM ACTIVE TEST USING TECHSTREAM (ACTIVATE THE WATER PUMP) INFO

NG ▶ PERFORM ACTIVE TEST USING TECHSTREAM (ACTIVATE THE WATER PUMP)

OK ▼

10.	PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE ELECTRIC COOLING FAN) INFO

NG ▶ CHECK COOLING FAN SYSTEM

OK ▼

11.	CHECK HV COOLANT (CHECK FOR CONDITIONS THAT MAY HAVE CAUSED FREEZING) INFO

B ▶ REPLACE HV COOLANT

A ▼

12.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER

	ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

13.	CHECK GENERATOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR)

OK ▼

14.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

15.	CHECK MOTOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR)

OK ▼

16.	CHECK INVERTER WITH CONVERTER ASSEMBLY (GENERATOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY

B ▶ REPLACE MALFUNCTIONING PARTS

A ▼

17.	CHECK INVERTER WITH CONVERTER ASSEMBLY (MOTOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY

B ▶ REPLACE MALFUNCTIONING PARTS

A ▼

18.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG1) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY

OK ▼

19.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG2) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY

OK

20.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

21.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

22.	PERFORM ACTIVE TEST USING TECHSTREAM (ACTIVATE THE WATER PUMP) INFO

B ▶ ADD COOLANT

A ▼

23.	CHECK FUSE (IGCT NO. 3) INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (WATER PUMP WITH MOTOR ASSEMBLY CONNECTOR)

OK ▼

24.	CHECK CONNECTOR CONNECTION CONDITION (WATER PUMP WITH MOTOR ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

25.	CHECK CONNECTOR CONNECTION CONDITION (HYBRID VEHICLE CONTROL ECU CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

26.	CHECK HARNESS AND CONNECTOR (WATER PUMP WITH MOTOR ASSEMBLY CIRCUIT) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

27.	CHECK WATER PUMP WITH MOTOR ASSEMBLY INFO

NG ▶ REPLACE WATER PUMP WITH MOTOR ASSEMBLY

OK ▶ **REPLACE HYBRID VEHICLE CONTROL ECU**

28.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

29.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

30.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

31.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

32.	CHECK CONNECTOR CONNECTION CONDITION (WATER PUMP WITH MOTOR ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

33.	CHECK CONNECTOR CONNECTION CONDITION (HYBRID VEHICLE CONTROL ECU CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

34.	CHECK HARNESS AND CONNECTOR (WATER PUMP WITH MOTOR ASSEMBLY CIRCUIT) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

35.	CHECK WATER PUMP WITH MOTOR ASSEMBLY INFO

NG ▶ REPLACE WATER PUMP WITH MOTOR ASSEMBLY

OK ▼

36.	REPLACE HYBRID VEHICLE CONTROL ECU INFO

NEXT ▶ **REPLACE FUSE (IGCT NO. 3)**

37.	CONNECT SECURELY INFO

NEXT ▶ **REPLACE FUSE (IGCT NO. 3)**

38.	CONNECT SECURELY INFO

NEXT ▶ **REPLACE FUSE (IGCT NO. 3)**

39.	REPAIR OR REPLACE HARNESS OR CONNECTOR INFO

NEXT ▶ **REPLACE FUSE (IGCT NO. 3)**

40.	REPLACE WATER PUMP WITH MOTOR ASSEMBLY INFO

NEXT ▶ **REPLACE FUSE (IGCT NO. 3)**

41.	REPLACE HV COOLANT INFO

NEXT ▼

42.	CHECK WATER PUMP WITH MOTOR ASSEMBLY INFO

NG ▶ REPLACE WATER PUMP WITH MOTOR ASSEMBLY

OK ▶ **COMPLETED**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM0000025BT00XX
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM: P0A7A-325: Generator Inverter Performance (2010 HS250H)		

DTC	P0A7A-325	Generator Inverter Performance

DESCRIPTION

For a description of the inverter, INFO.

If the generator inverter overheats, has a circuit malfunction, or has an internal short, the inverter transmits this information to the MG ECU via the generator inverter fail signal line.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	325	Generator inverter fail signal detection (overcurrent due to inverter assembly malfunction)	Inverter with converter assembly

MONITOR DESCRIPTION

If excessive amperage flows through the generator inverter due to an internal short, the generator inverter will transmit an inverter fail signal to the MG ECU. The MG ECU will send information about the malfunction to the hybrid vehicle control ECU. Upon receiving this information, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A7A (INF 325): GFIV detection (Load short circuit)
Required sensors / components	Generator inverter
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTC is not present	TMC's intellectual property

Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	DTC P0A7A (INF 325) is not detected

INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system or disconnecting the low voltage connector of the inverter with converter assembly, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals. After waiting for 10 minutes, check the voltage at the terminals in the inspection point in the inverter with converter assembly. The voltage should be 0 V before beginning work.

HINT:

Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Check if DTCs are output.

Result:

Result	Proceed to
P0A7A-325 only is output.	A
Any of the following DTCs are also output.	B

DTC No.	Relevant Diagnosis
P0A1A (all INF codes) *1	Generator Control Module
P0A1B (all INF codes) *1	Drive Motor "A" Control Module
P0A1D (all INF codes) *1	Hybrid Powertrain Control Module
P0A3F-243	Drive Motor "A" Position Sensor Circuit
P0A40-500	Drive Motor "A" Position Sensor Circuit Range / Performance
P0A41-245	Drive Motor "A" Position Sensor Circuit Low
P0A4B-253	Generator Position Sensor Circuit
P0A4C-513	Generator Position Sensor Circuit Range / Performance
P0A4D-255	Generator Position Sensor Circuit Low
P0A60 (all INF codes) *1	Drive Motor "A" Phase V Current
P0A63 (all INF codes) *1	Drive Motor "A" Phase W Current
P0A72 (all INF codes) *1	Generator Phase V Current
P0A75 (all INF codes) *1	Generator Phase W Current
P0A78-266, 267, 586	Drive Motor "A" Inverter Performance
P0A94-585, 587, 589, 590	DC/DC Converter Performance
P0C76-523	Hybrid Battery System Discharge Time Too Long

HINT:

- *1: If any INF codes are output for this DTC, refer to the corresponding diagnostic procedure.
- P0A7A-325 may be set due to a malfunction which also causes DTCs in the preceding table to be set. In this case, first troubleshoot the output DTCs in the preceding table. Then, perform a test to attempt to reproduce the problems, and check that no DTCs are output.

(e) Turn the power switch off.

B ▶ GO TO DTC CHART

A ▼

2.	CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM000000YAN01GX
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM: P0A7A-344: Generator Inverter Performance (2010 HS250H)		

DTC	P0A7A-344	Generator Inverter Performance

DESCRIPTION

For a description of the inverter, INFO.

If the MG1 torque execution value does not correspond to the torque command value from the MG ECU to MG1, the hybrid vehicle control ECU will store this DTC.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	344	Generator torque execution monitoring malfunction	• Hybrid vehicle transaxle assembly • Inverter with converter assembly

MONITOR DESCRIPTION

If the difference between the requested MG1 torque and the actual MG1 torque exceeds a predetermined value, the MG ECU determines that there is a malfunction in the execution or monitoring of MG1 torque. The MG ECU will send information about the malfunction to the hybrid vehicle control ECU. Upon receiving this information, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A7A (INF 344): Discrepancy between generator monitored torque and commanded torque
Required sensors / components	Generator inverter
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	1 driving cycle

Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTC is not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	DTC P07A (INF 344) is not detected

INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system or disconnecting the low voltage connector of the inverter with converter assembly, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals. After waiting for 10 minutes, check the voltage at the terminals in the inspection point in the inverter with converter assembly. The voltage should be 0 V before beginning work.

HINT:

Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Check if DTCs are output.

Result:

Result	Proceed to
P0A7A-344 only is output.	A
Any of the following DTCs are also output.	B

DTC No.	Relevant Diagnosis
P0A1A (all INF codes) *1	Generator Control Module
P0A1B (all INF codes) *1	Drive Motor "A" Control Module
P0A1D (all INF codes) *1	Hybrid Powertrain Control Module
P0A3F-243	Drive Motor "A" Position Sensor Circuit
P0A40-500	Drive Motor "A" Position Sensor Circuit Range / Performance
P0A41-245	Drive Motor "A" Position Sensor Circuit Low
P0A4B-253	Generator Position Sensor Circuit
P0A4C-513	Generator Position Sensor Circuit Range / Performance
P0A4D-255	Generator Position Sensor Circuit Low
P0A60 (all INF codes) *1	Drive Motor "A" Phase V Current
P0A63 (all INF codes) *1	Drive Motor "A" Phase W Current
P0A72 (all INF codes) *1	Generator Phase V Current
P0A75 (all INF codes) *1	Generator Phase W Current
P0A78-266, 267, 510, 586, 505, 287, 506, 503, 279, 504, 806, 807, 808	Drive Motor "A" Inverter Performance
P0A7A-517, 522, 325, 518, 809, 810, 811	Generator Inverter Performance
P0A94-585, 587, 589, 590, 554, 555, 556, 547, 548, 549	DC/DC Converter Performance
P0AA6 (all INF codes) *1	Hybrid Battery Voltage System Isolation Fault
P0C76-523	Hybrid Battery System Discharge Time Too Long
P3004-132	Power Cable Malfunction

P3233-750	Short to B+ in Blocking of HV Gate Connection

HINT:

- *1: If any INF codes are output for this DTC, refer to the corresponding diagnostic procedure.
- P0A7A-344 may be set due to a malfunction which also causes DTCs in the preceding table to be set. In this case, first troubleshoot the output DTCs in the preceding table. Then, perform a test to attempt to reproduce the problems, and check that no DTCs are output.

(e) Turn the power switch off.

B ▶ GO TO DTC CHART

A ▼

2.	CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

3.	CHECK INVERTER WITH CONVERTER ASSEMBLY (GENERATOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY

B ▶ REPLACE MALFUNCTIONING PARTS

A ▼

4.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG1) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY

OK ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM000002KIT007X
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM: P0A7A-517,P0A7A-518: Generator Inverter Performance (2010 HS250H)		

DTC	P0A7A-517	Generator Inverter Performance
DTC	P0A7A-518	Generator Inverter Performance

DESCRIPTION

For a description of the inverter, INFO.

If the generator inverter overheats, has a circuit malfunction, or has an internal short, the inverter transmits this information to the MG ECU via the generator inverter fail signal line.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	517	Generator inverter fail signal detection (overcurrent due to MG ECU malfunction)	• Wire harness or connector • Hybrid vehicle transaxle assembly • Inverter with converter assembly
P0A7A	518	Generator inverter fail signal detection (overcurrent due to hybrid vehicle transaxle assembly malfunction)	• Wire harness or connector • Hybrid vehicle transaxle assembly • Inverter with converter assembly

MONITOR DESCRIPTION

If excessive amperage flows through the generator inverter due to an internal short, the generator inverter will transmit an inverter fail signal to the MG ECU. The MG ECU will send information about the malfunction to the hybrid vehicle control ECU. Upon receiving this information, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A7A (INF 517/518): GFIV detection (Load short circuit)
Required sensors / components	Generator inverter
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTC is not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	DTC P0A7A (INF 517/518) is not detected

WIRING DIAGRAM

Refer to wiring diagram for P0A1A-200 INFO.

INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system or disconnecting the low voltage connector of the inverter with converter assembly, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals. After waiting for 10 minutes, check the voltage at the terminals in the inspection point in the inverter with converter assembly. The voltage should be 0 V before beginning work.

HINT:

Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Check if DTCs are output.

Result:

Result	Proceed to
P0A7A-517 or 518 only is output.	A
Any of the following DTCs are also output.	B

DTC No.	Relevant Diagnosis
P0A1A (all INF codes) *1	Generator Control Module
P0A1B (all INF codes) *1	Drive Motor "A" Control Module
P0A1D (all INF codes) *1	Hybrid Powertrain Control Module
P0A3F-243	Drive Motor "A" Position Sensor Circuit
P0A40-500	Drive Motor "A" Position Sensor Circuit Range / Performance
P0A41-245	Drive Motor "A" Position Sensor Circuit Low
P0A4B-253	Generator Position Sensor Circuit
P0A4C-513	Generator Position Sensor Circuit Range / Performance
P0A4D-255	Generator Position Sensor Circuit Low
P0A60 (all INF codes) *1	Drive Motor "A" Phase V Current
P0A63 (all INF codes) *1	Drive Motor "A" Phase W Current
P0A72 (all INF codes) *1	Generator Phase V Current
P0A75 (all INF codes) *1	Generator Phase W Current
P0A78-266, 267, 586	Drive Motor "A" Inverter Performance
P0A94-585, 587, 589, 590	DC/DC Converter Performance
P0C76-523	Hybrid Battery System Discharge Time Too Long

HINT:

- *1: If any INF codes are output for this DTC, refer to the corresponding diagnostic procedure.
- P0A7A-517 or P0A7A-518 may be set due to a malfunction which also causes DTCs in the preceding table to be set. In this case, first troubleshoot the output DTCs in the preceding table. Then, perform a test to attempt to reproduce the problems, and check that no DTCs are output.

(e) Turn the power switch off.

B ▶ GO TO DTC CHART

A ▼

2.	CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

3.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

4.	CHECK GENERATOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR)

OK ▼

5.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

6.	CHECK MOTOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR)

OK ▼

7.	CHECK INVERTER WITH CONVERTER ASSEMBLY (MOTOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY
B ▶ REPLACE MALFUNCTIONING PARTS
A ▼

8.	CHECK INVERTER WITH CONVERTER ASSEMBLY (GENERATOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY
B ▶ REPLACE MALFUNCTIONING PARTS
A ▼

9.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG1) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY
OK ▼

10.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG2) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY
OK ▼

11.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY
OK ▼

12.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY
OK ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

13.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY
OK ▼

14.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR
OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

15.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

16.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM000000YAP01AX
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM: P0A7A-522: Generator Inverter Performance (2010 HS250H)		

DTC	P0A7A-522	Generator Inverter Performance

DESCRIPTION

For a description of the inverter, INFO.

If the inverter receives a generator gate shutdown signal from the MG ECU, it will turn all power transistors off which are activating MG1 to forcibly stop MG1 operation.

The MG ECU monitors generator gate shutdown signals and detects a malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	522	Generator inverter gate malfunction	Inverter with converter assembly

HINT:

- If DTC P0A7A-522 is output, the hybrid system cannot be restarted until the DTC is cleared.
- If the malfunction is not reproduced, leave the vehicle for 1 minute with neutral (N) selected in order to easily reproduce the malfunction.

MONITOR DESCRIPTION

The MG ECU monitors the current to the MG1. The MG ECU checks if current passes to the MG1 while the vehicle is stopped with the power switch on (IG) or neutral (N) selected. If current flow is detected in either of these two situations, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A7A (INF 522): Malfunction of inverter gate shutdown circuit
Required sensors / components	Generator inverter
Frequency of operation	Continuous

Duration	TMC's intellectual property
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTC is not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	DTC P0A7A (INF 522) is not detected

INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system or disconnecting the low voltage connector of the inverter with converter assembly, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals. After waiting for 10 minutes, check the voltage at the terminals in the inspection point in the inverter with converter assembly. The voltage should be 0 V before beginning work.

HINT:

Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH

	CONVERTER ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM0000025BX00BX
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM: P0A7A-809,P0A7A-811: Generator Inverter Performance (2010 HS250H)		

DTC	P0A7A-809	Generator Inverter Performance
DTC	P0A7A-811	Generator Inverter Performance

DESCRIPTION

For a description of the inverter, INFO.

If an abnormal amount of current flows through the generator inverter, the MG ECU detects it and sends a signal to inform the hybrid vehicle control ECU of the malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	809	Abnormal generator current value detection (MG ECU malfunction)	• Wire harness or connector • Hybrid vehicle transaxle assembly • Inverter with converter assembly
P0A7A	811	Abnormal generator current value detection (hybrid vehicle transaxle assembly malfunction)	• Wire harness or connector • Hybrid vehicle transaxle assembly • Inverter with converter assembly

MONITOR DESCRIPTION

If the MG ECU detects that the generator inverter current exceeds the threshold level for a specified period of time, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A7A (INF 809/811): Generator Inverter Abnormal Current
Required sensors / components	Generator inverter
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTC is not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	DTC P0A7A (INF 809/811) is not detected

WIRING DIAGRAM

Refer to wiring diagram for P0A1A-200 INFO.

INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system or disconnecting the low voltage connector of the inverter with converter assembly, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals. After waiting for 10 minutes, check the voltage at the terminals in the inspection point in the inverter with converter assembly. The voltage should be 0 V before beginning work.

HINT:

Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Check if DTCs are output.

Result:

Result	Proceed to
P0A7A-809 or 811 only is output.	A
Any of the following DTCs are also output.	B

DTC No.	Relevant Diagnosis
P0A1A (all INF codes) *1	Generator Control Module
P0A1B (all INF codes) *1	Drive Motor "A" Control Module
P0A1D (all INF codes) *1	Hybrid Powertrain Control Module
P0A3F-243	Drive Motor "A" Position Sensor Circuit
P0A40-500	Drive Motor "A" Position Sensor Circuit Range / Performance
P0A41-245	Drive Motor "A" Position Sensor Circuit Low
P0A4B-253	Generator Position Sensor Circuit
P0A4C-513	Generator Position Sensor Circuit Range / Performance
P0A4D-255	Generator Position Sensor Circuit Low
P0A60 (all INF codes) *1	Drive Motor "A" Phase V Current
P0A63 (all INF codes) *1	Drive Motor "A" Phase W Current
P0A72 (all INF codes) *1	Generator Phase V Current
P0A75 (all INF codes) *1	Generator Phase W Current
P0A78-266, 267, 586	Drive Motor "A" Inverter Performance
P0A94-585, 587, 589, 590	DC/DC Converter Performance
P0C76-523	Hybrid Battery System Discharge Time Too Long

HINT:

- *1: If any INF codes are output for this DTC, refer to the corresponding diagnostic procedure.
- P0A7A-809 or P0A7A-811 may be set due to a malfunction which also causes DTCs in the preceding table to be set. In this case, first troubleshoot the output DTCs in the preceding table. Then, perform a test to attempt to reproduce the problems, and check that no DTCs are output.

B ▶ GO TO DTC CHART

A ▼

2.	CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

3.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

4.	CHECK GENERATOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR)

OK ▼

5.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

6.	CHECK MOTOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR)

OK ▼

7.	CHECK INVERTER WITH CONVERTER ASSEMBLY (GENERATOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY
B ▶ REPLACE MALFUNCTIONING PARTS
A ▼

8.	CHECK INVERTER WITH CONVERTER ASSEMBLY (MOTOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY
B ▶ REPLACE MALFUNCTIONING PARTS
A ▼

9.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG1) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY
OK ▼

10.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG2) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY
OK ▼

11.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY
OK ▼

12.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY
OK ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

13.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY
OK ▼

14.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR
OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

15.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

16.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

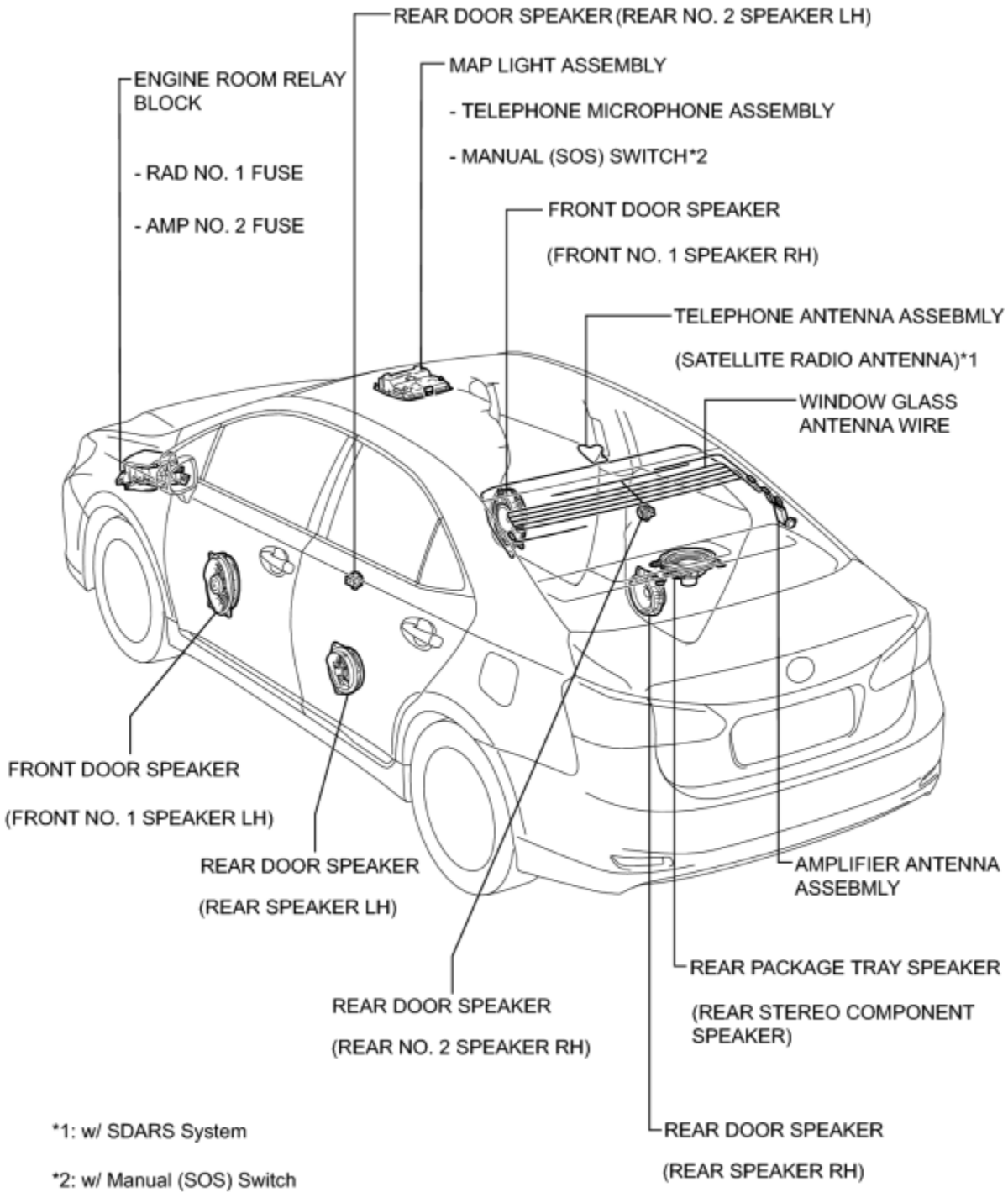
NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

Last Modified: 10-5-2010	6.4 R	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM0000012A602SX
Title: AUDIO / VIDEO: AUDIO AND VISUAL SYSTEM (w/o Navigation System): PARTS LOCATION (2010 HS250H)		

PARTS LOCATION

ILLUSTRATION

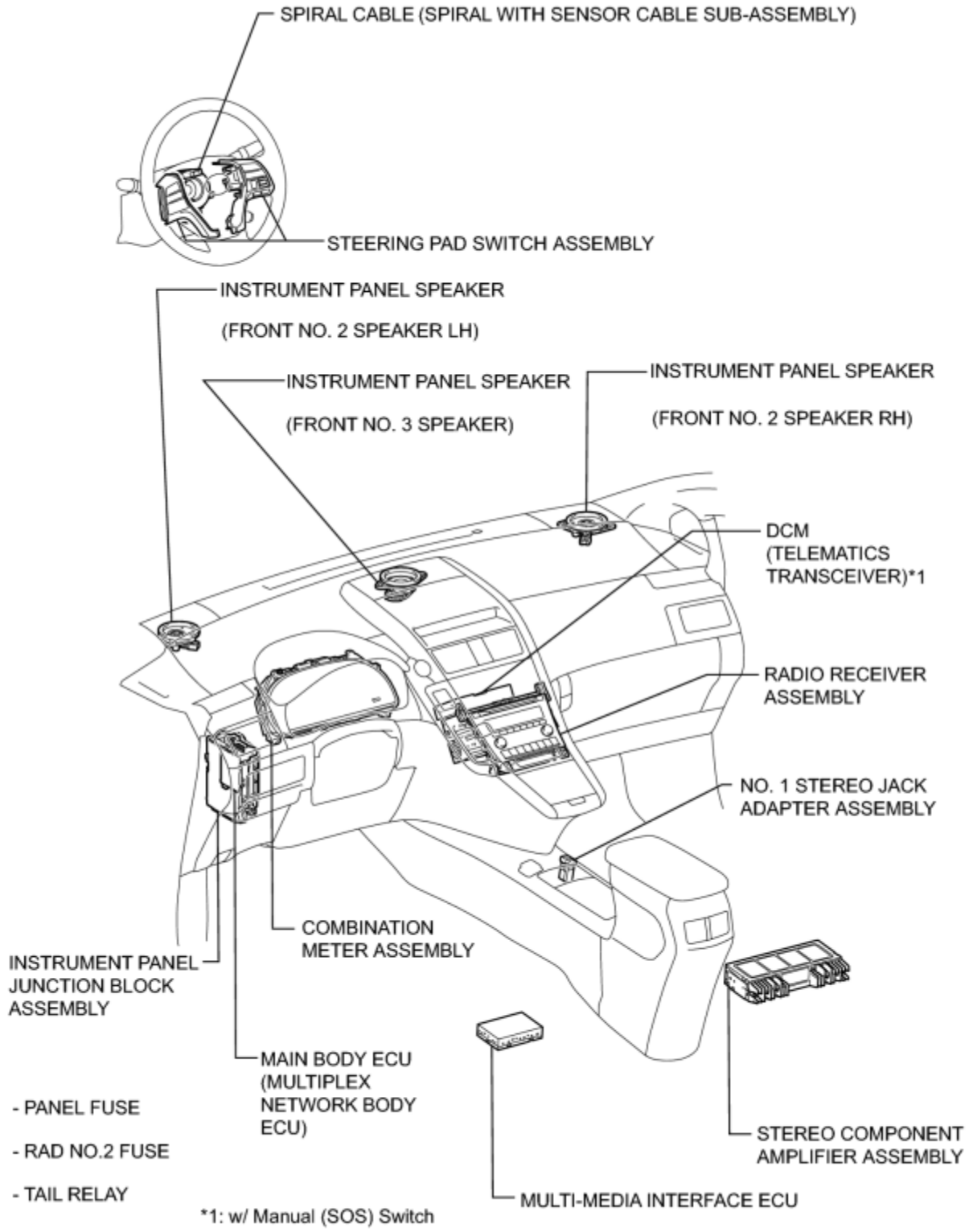


*1: w/ SDARS System

*2: w/ Manual (SOS) Switch

H

ILLUSTRATION


SPIRAL CABLE (SPIRAL WITH SENSOR CABLE SUB-ASSEMBLY)
STEERING PAD SWITCH ASSEMBLY
INSTRUMENT PANEL SPEAKER
(FRONT NO. 2 SPEAKER LH)
INSTRUMENT PANEL SPEAKER
(FRONT NO. 3 SPEAKER)
INSTRUMENT PANEL SPEAKER
(FRONT NO. 2 SPEAKER RH)
DCM
(TELEMATICS
TRANSCEIVER)*1
RADIO RECEIVER
ASSEMBLY
NO. 1 STEREO JACK
ADAPTER ASSEMBLY
COMBINATION
METER ASSEMBLY
INSTRUMENT PANEL
JUNCTION BLOCK
ASSEMBLY
MAIN BODY ECU
(MULTIPLEX
NETWORK BODY
ECU)
- PANEL FUSE
- RAD NO.2 FUSE
- TAIL RELAY
STEREO COMPONENT
AMPLIFIER ASSEMBLY
MULTI-MEDIA INTERFACE ECU
*1: w/ Manual (SOS) Switch

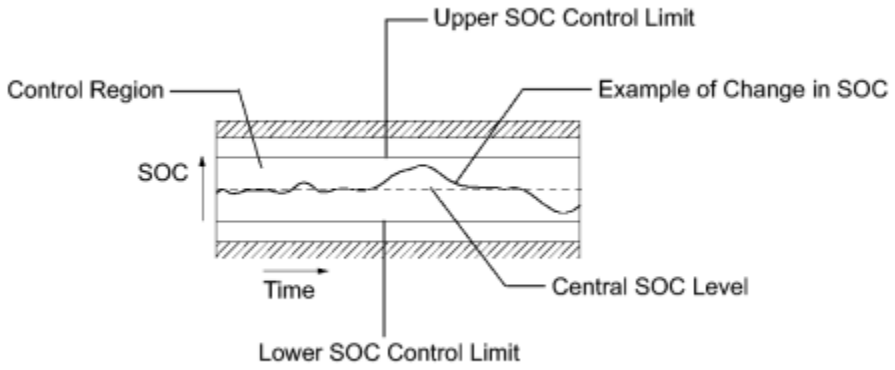
H

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM00000259Q00VX
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM: P0A7F-123: Hybrid Battery Pack Deterioration (2010 HS250H)		

DTC	P0A7F-123	Hybrid Battery Pack Deterioration

DESCRIPTION

- The battery smart unit and the hybrid vehicle control ECU calculate the SOC (state of charge) of the HV battery through the accumulated amperage in the HV battery. The battery smart unit sends the condition of the HV battery to the hybrid vehicle control ECU. Then the hybrid vehicle control ECU calculates the SOC based on the information and controls HV battery charge and discharge according to the driving condition.



DTC No.	DTC Detection Condition	Trouble Area
P0A7F-123	• Internal resistance of the HV battery is higher than the standard (1 trip detection) • Difference in the capacity between battery blocks is larger than the standard (2 trip detection)	• HV battery assembly • Battery smart unit

HINT:

P0A7F-123 will not be set unless the vehicle is driven for approximately 10 minutes after clearing the DTC.

MONITOR DESCRIPTION

- The battery smart unit calculates the resistance of the HV battery through amperage and

voltage, and uses this resistance to determine the extent of deterioration of the HV battery. If the battery smart unit detects that the resistance of the HV battery has exceeded the standard, it determines that a malfunction has occurred. In addition, the battery smart unit monitors the SOC, and if the difference between the maximum and minimum SOC values exceeds the standard, it determines that a malfunction has occurred. When either of the malfunction detection conditions is met, the hybrid vehicle control ECU illuminates the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A7F (INF 123): Hybrid Battery Pack Deterioration
Required sensors / components	Main: Battery voltage sensor inside battery smart unit, battery current sensor Sub: Battery temperature sensor
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	TMC's intellectual property
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Battery smart unit	DTC P0A7F (INF 123) is not detected

INSPECTION PROCEDURE

PROCEDURE

1.	CHECK DTC OUTPUT (DTC P0A1F-123 IS OUTPUT)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Read output DTCs.

Result:

Result	Proceed to
P0A1F-123 is not output.	A
P0A1F-123 is also output.	B

(e) Disconnect the Techstream from the DLC3.

B ▶ GO TO DTC CHART

A ▼

2.	CHECK BATTERY SMART UNIT

(a) Ensure the safety of the areas in front and at the back of the vehicle.

(b) Connect the Techstream to the DLC3.

(c) Turn the power switch on (READY).

(d) Enter the following menus: Powertrain / Hybrid Control / Data List / Battery Block Vol-V01 to 17.

(e) Fully warm up the engine and turn the air conditioning off.

(f) Firmly depress the brake pedal with your left foot.

(g) Move the shift lever to D.

(h) Record each battery block voltage from the Data List (Battery Block Vol-V01 to 17) while fully depressing the accelerator pedal.

(i) Compare the battery block voltages (Battery Block Vol-V01 to 17) between the even and odd number groups in each combination shown in the table below.

Odd number group	Even Number Group	Battery block voltages to be compared
Battery Block Vol-V01	Battery Block Vol-V02	V01 - V02
Battery Block Vol-V03	Battery Block Vol-V04	V03 - V04
Battery Block Vol-V05	Battery Block Vol-V06	V05 - V06
Battery Block Vol-V07	Battery Block Vol-V08	V07 - V08
Battery Block Vol-V09	Battery Block Vol-V10	V09 - V10
Battery Block Vol-V11	Battery Block Vol-V12	V11 - V12
Battery Block Vol-V13	Battery Block Vol-V14	V13 - V14
Battery Block Vol-V15	Battery Block Vol-V16	V15 - V16
Battery Block Vol-V17	Battery Block Vol-V14	V17 - V14

(j) Check the difference in voltage of each combination.

Result

Result	Proceed to
Difference in voltage of each combination is 0.3 V or more.	A
Other than above.	B

HINT:

If the difference in voltage of each combination is 0.3 V or more, it is due to a battery smart unit internal error.

(k) Turn the power switch off.

(l) Disconnect the Techstream from the DLC3.

B ▶REPLACE HV BATTERY ASSEMBLY
A ▶**REPLACE BATTERY SMART UNIT**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM00000259U013X
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM: P0A9C-123,P0AC6-123,P0ACB-123,P0AE9-123,P3065-123: Hybrid Battery Temperature Sensor "A" Range / Performance (2010 HS250H)		

DTC	P0A9C-123	Hybrid Battery Temperature Sensor "A" Range / Performance
DTC	P0AC6-123	Hybrid Battery Temperature Sensor "B" Range / Performance
DTC	P0ACB-123	Hybrid Battery Temperature Sensor "C" Range / Performance
DTC	P0AE9-123	Hybrid Battery Temperature Sensor "D" Range / Performance
DTC	P3065-123	Hybrid Battery Temperature Sensor Range / Perfoemance Stack A

DESCRIPTION

- The battery temperature sensors are provided at 4 locations on the bottom of the HV battery. The resistance of the thermistor, which is built into each battery temperature sensor, varies in accordance with changes in the HV battery temperature. The lower the battery temperature, the higher the thermistor resistance. Conversely, the higher the temperature, the lower the resistance. The battery smart unit uses the battery temperature sensor to detect the HV battery temperature, and sends the detected value to the hybrid vehicle control ECU. Based on the results of this detection, the hybrid vehicle control ECU controls the blower fan. (The blower fan starts when HV battery temperature rises above a predetermined level.)

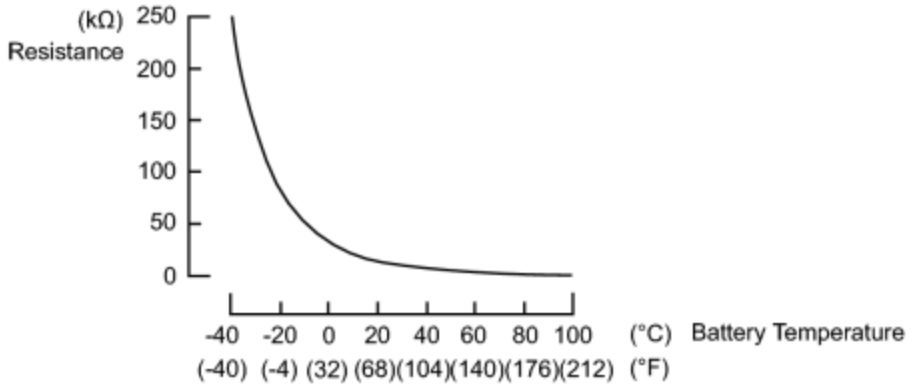
Temperature Sensor Identification Cross Reference Table:

DTC Title Sensor	Battery Temperature Sensor	Techstream Display
A	0	1
B	1	2
C	2	3
D	3	4

HINT:

For example, sensor A in the DTC title is battery temperature sensor (No. 0). This sensor is displayed as Temp of Batt TB1 in the Data List.

Reference: Battery Temperature Sensor Characteristic Graph



DTC No.	DTC Detection Condition	Trouble Area
P0A9C-123 P0AC6-123 P0ACB-123 P0AE9-123 P3065-123	When the battery temperature sensor performance is abnormal (1 trip detection/2 trip detection)	• HV battery assembly • Battery smart unit • Wire harness or connector

MONITOR DESCRIPTION

If the temperature indicated by the battery temperature sensor is lower than the standard level (open), or is higher than the standard level (short), the battery smart unit interprets this as a sensor malfunction. If the battery smart unit detects that the HV battery temperature is out of the normal range or its value is abnormal, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A9C (INF 123): Hybrid Battery Temperature Sensor "A" Range/Performance P0AC6 (INF 123): Hybrid Battery Temperature Sensor "B"

	Range/Performance P0ACB (INF 123): Hybrid Battery Temperature Sensor "C" Range/Performance P0AE9 (INF 123): Hybrid Battery Temperature Sensor "D" Range/Performance P3065 (INF 123): Hybrid Battery Temperature Sensor Range/Performance Stack A
Required sensors / components	Battery temperature sensor
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	TMC's intellectual property
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

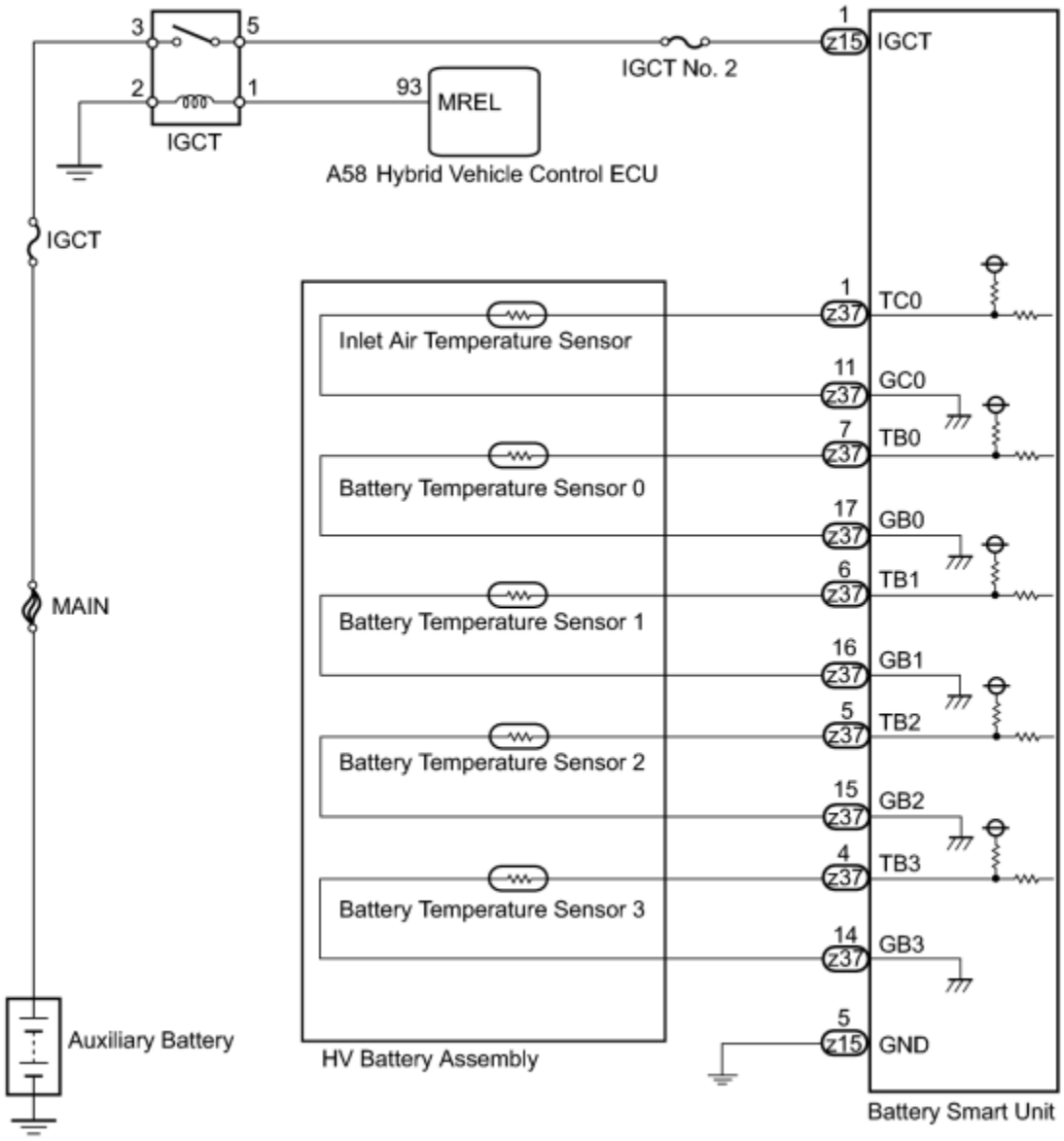
TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Battery smart unit	DTC P0A9C (INF 123) is not detected DTC P0AC6 (INF 123) is not detected DTC P0ACB (INF 123) is not detected DTC P0AE9 (INF 123) is not detected DTC P3065 (INF 123) is not detected

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 accidentally reconnecting it while you are working on the high-voltage system.

- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals.

  HINT:

  At least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (DTC P0A1F-123 IS OUTPUT) INFO

B ▶ GO TO DTC CHART

A ▼

2.	CHECK INSTALLATION OF BATTERY TEMPERATURE SENSOR

CAUTION:

Be sure to wear insulated gloves and protective goggles.

(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

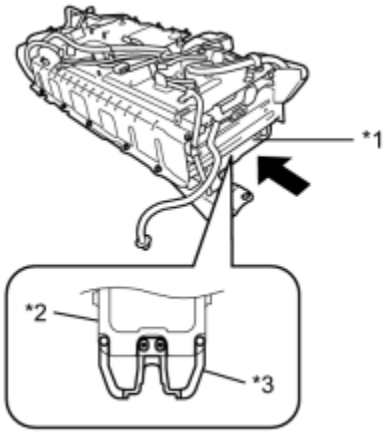
(c) Remove the HV battery assembly INFO.

(d) Visually check the installation condition of the relevant battery temperature sensor.

Standard Condition:

Each battery temperature sensor is installed in the correct location and its claws are engaged securely.

Result:



Result	Proceed to
Each battery temperature sensor is installed in the correct location and its claws are engaged securely	A
Any of battery temperature sensors are not installed correctly.	B

NOTICE:

Do not use a stick or similar object to push on the sensors when inspecting them. Doing so may result in damage to the sensors.

Text in Illustration	
*1	Duct Installation Hole
*2	Battery Module
*3	Battery Temperature Sensor

(e) Install the HV battery assembly INFO.

(f) Connect the cable to the negative (-) battery terminal.

B ▶REPLACE HV BATTERY ASSEMBLY

A ▼

3.	CHECK HV BATTERY ASSEMBLY (BATTERY TEMPERATURE SENSOR)

CAUTION:

Be sure to wear insulated gloves.

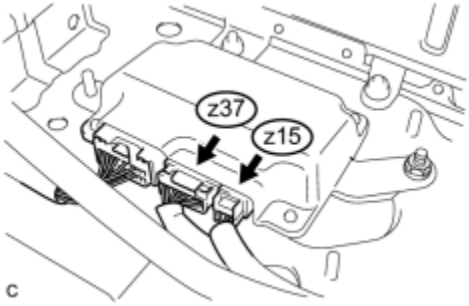
(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

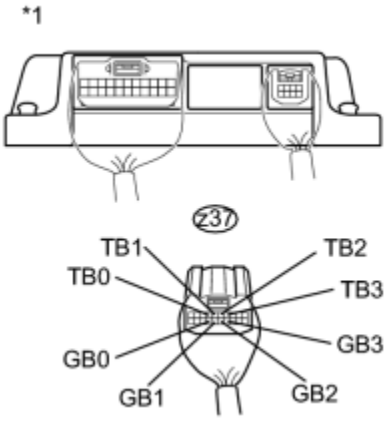
After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(c) Remove the hybrid battery junction block assembly INFO.



(d) Disconnect the z15 and z37 connectors of the battery smart unit.

(e) Measure the resistance of the circuit for the malfunctioning sensor (battery temperature sensor 0 to 2).



Tester Connection Tester Connection	Battery Temperature Sensor No.
z37-7 (TB0) - z37-17 (GB0)	0
z37-6 (TB1) - z37-16 (GB1)	1
z37-5 (TB2) - z37-15 (GB2)	2
z37-4 (TB3) - z37-14 (GB3)	3

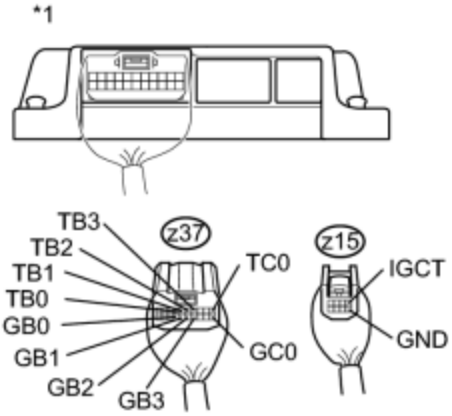
Standard Resistance Thermistor Temperature	Switch Condition	Specified Condition
0°C (32°F)	Power switch off	26.7 to 27.9 kΩ
25°C (77°F)	Power switch off	9.9 to 10.1 kΩ
40°C (104°F)	Power switch	5.7 to 6.0 kΩ

	off	

Text in Illustration *1	Rear view of wire harness connector (to Battery Smart Unit)

(f) Measure the resistance according to the value(s) in the table below.

Standard Resistance:



Tester Connection	Switch Condition	Standard Resistance
z37-7 (TB0) - z15-1 (IGCT)	Power switch off	10 kΩ or more
z37-7 (TB0) - z15-5 (GND)	Power switch off	10 kΩ or more
z37-17 (GB0) - z15-1 (IGCT)	Power switch off	10 kΩ or more
z37-17 (GB0) - z15-5 (GND)	Power switch off	10 kΩ or more
z37-6 (TB1) - z15-1 (IGCT)	Power switch off	10 kΩ or more
z37-6 (TB1) - z15-5 (GND)	Power switch off	10 kΩ or more
z37-16 (GB1) - z15-1 (IGCT)	Power switch off	10 kΩ or more
z37-16 (GB1) - z15-5 (GND)	Power switch off	10 kΩ or more
z37-5 (TB2) - z15-1 (IGCT)	Power switch off	10 kΩ or more
z37-5 (TB2) - z15-5 (GND)	Power switch off	10 kΩ or more
z37-15 (GB2) - z15-1 (IGCT)	Power switch off	10 kΩ or more
z37-15 (GB2) - z15-5 (GND)	Power switch off	10 kΩ or more
z37-4 (TB3) - z15-1 (IGCT)	Power switch off	Standard Resistance

z37-4 (TB3) - z15-5 (GND)	Power switch off	10 kΩ or more
z37-14 (GB3) - z15-1 (IGCT)	Power switch off	10 kΩ or more
z37-14 (GB3) - z15-5 (GND)	Power switch off	10 kΩ or more
z37-1 (TC0) - z15-1 (IGCT)	Power switch off	10 kΩ or more
z37-1 (TC0) - z15-5 (GND)	Power switch off	10 kΩ or more
z37-11 (GC0) - z15-1 (IGCT)	Power switch off	10 kΩ or more
z37-11 (GC0) - z15-5 (GND)	Power switch off	10 kΩ or more

Text in Illustration *1	Rear view of wire harness connector (to Battery Smart Unit)

(g) Connect the z15 and z37 connectors of the battery smart unit.

(h) Install the hybrid battery junction block assembly INFO.

(i) Connect the cable to the negative (-) battery terminal.

NG ▶ CHECK HARNESS AND CONNECTOR (BATTERY TEMPERATURE SENSOR AND INLET TEMPERATURE SENSOR)

OK ▶ **REPLACE BATTERY SMART UNIT**

4.	CHECK HARNESS AND CONNECTOR (BATTERY TEMPERATURE SENSOR AND INLET TEMPERATURE SENSOR)

CAUTION:

Be sure to wear insulated gloves.

(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(c) Remove the hybrid battery junction block assembly INFO.

(d) Check the wire harness and connectors of the battery temperature sensor and inlet air temperature sensor for abnormalities by sight and touch.

Specified Condition:

There are no open or short circuits in the wire harness and connectors. There are no short circuits to other wire harnesses.

HINT:

- Only check the wire harnesses and connectors that are visible on the outside of the battery cover.
- Do not manipulate or check the sensors in the battery.

(e) Install the hybrid battery junction block assembly INFO.

(f) Connect the cable to the negative (-) battery terminal.

NG ▶ REPAIR HARNESS OR CONNECTOR
OK ▶ **REPLACE HV BATTERY ASSEMBLY**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM0000029SL012X
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM: P0A9D-123,P0A9E-123,P0AC7-123,P0AC8-123,P0ACC-123,P0ACD-123,P0AEA-123,P0AEB-123: Hybrid Battery Temperature Sensor "A" Circuit Low (2010 HS250H)		

DTC	P0A9D-123	Hybrid Battery Temperature Sensor "A" Circuit Low
DTC	P0A9E-123	Hybrid Battery Temperature Sensor "A" Circuit High
DTC	P0AC7-123	Hybrid Battery Temperature Sensor "B" Circuit Low
DTC	P0AC8-123	Hybrid Battery Temperature Sensor "B" Circuit High
DTC	P0ACC-123	Hybrid Battery Temperature Sensor "C" Circuit Low
DTC	P0ACD-123	Hybrid Battery Temperature Sensor "C" Circuit High
DTC	P0AEA-123	Hybrid Battery Temperature Sensor "D" Circuit Low
DTC	P0AEB-123	Hybrid Battery Temperature Sensor "D" Circuit High

DESCRIPTION

- Refer to the description for DTC P0A9C-123 INFO.

DTC No.	DTC Detection Condition	Trouble Area
P0A9D-123 P0A9E-123 P0AC7-123 P0AC8-123 P0ACC-	When the temperature of the battery temperature sensor is less than the standard value (open) or higher than the standard value (shorted) (1 trip detection).	• HV battery assembly • Battery smart unit • Wire harness or connector

123 P0ACD-123 P0AEA-123 P0AEB-123		

HINT:

After confirming that a DTC is output, use the Techstream to check "Temp of Batt TB 1 to 4" in the hybrid vehicle control system ECU data list.

Temperature Displayed	Malfunction
Below -45°C (-49°F)	Open or +B short circuit
95°C (203°F) or more	GND short circuit

MONITOR DESCRIPTION

If the temperature indicated by the battery temperature sensor is lower than the standard level (open), or is higher than the standard level (short), the battery smart unit interprets this as a sensor malfunction. If the battery smart unit detects that HV battery temperature is out of the normal range or its value is abnormal, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A9D (INF 123): Hybrid Battery Temperature Sensor "A" Circuit Low P0A9E (INF 123): Hybrid Battery Temperature Sensor "A" Circuit High P0AC7 (INF 123): Hybrid Battery Temperature Sensor "B" Circuit Low P0AC8 (INF 123): Hybrid Battery Temperature Sensor "B" Circuit High P0ACC (INF 123): Hybrid Battery Temperature Sensor "C"

	Circuit Low P0ACD (INF 123): Hybrid Battery Temperature Sensor "C" Circuit High P0AEA (INF 123): Hybrid Battery Temperature Sensor "D" Circuit Low P0AEB (INF 123): Hybrid Battery Temperature Sensor "D" Circuit High
Required sensors / components	Battery temperature sensor
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	TMC's intellectual property
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Battery smart unit	DTC P0A9D (INF 123) is not detected DTC P0A9E (INF 123) is not detected DTC P0AC7 (INF 123) is not detected DTC P0AC8 (INF 123) is not detected DTC P0ACC (INF 123) is not detected DTC P0ACD (INF 123) is not detected

	DTC P0AEA (INF 123) is not detected DTC P0AEB (INF 123) is not detected

WIRING DIAGRAM

- Refer to the wiring diagram for DTC P0A9C-123 INFO.

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 accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals.

  HINT:

  At least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (DTC P0A1F-123 IS OUTPUT) INFO

B GO TO DTC CHART

A

2.	READ VALUE USING TECHSTREAM

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Data List / Temp of Batt TB 1 to 4.

HINT:

Compare the temperature of the 4 battery temperature sensors to determine the sensor with the malfunction (Temp of Batt TB1 to TB4).

NEXT

3.	CHECK CONNECTOR CONNECTION CONDITION (BATTERY TEMPERATURE SENSOR)

CAUTION:

Be sure to wear insulated gloves.

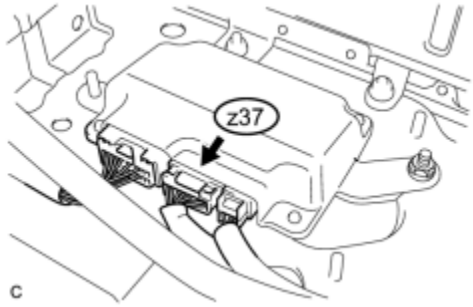
(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(c) Remove the hybrid battery junction block assembly INFO.



(d) Check the connections of the z37 connector of the battery smart unit.

OK:

The connector is connected securely and there are no contact problems.

(e) Install the hybrid battery junction block assembly INFO.

(f) Connect the cable to the negative (-) battery terminal.

NG ▶ CONNECT SECURELY

OK ▼

4.	CHECK HV BATTERY ASSEMBLY (BATTERY TEMPERATURE SENSOR) INFO

NG ▶ CHECK HARNESS AND CONNECTOR (BATTERY TEMPERATURE SENSOR)

OK ▶ **REPLACE BATTERY SMART UNIT**

5.	CHECK HARNESS AND CONNECTOR (BATTERY TEMPERATURE SENSOR) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ **REPLACE HV BATTERY ASSEMBLY**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM000000Y7Q01GX
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM: P0A78-306: Drive Motor "A" Inverter Performance (2010 HS250H)		

DTC	P0A78-306	Drive Motor "A" Inverter Performance

DESCRIPTION

For a description of the inverter, INFO.

If the MG2 torque execution value does not correspond to the torque command value from the MG ECU to MG2, the hybrid vehicle control ECU will store this DTC.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	306	Motor torque execution monitoring malfunction	• Hybrid vehicle transaxle assembly • Inverter with converter assembly

MONITOR DESCRIPTION

If the difference between the requested MG2 torque and the actual MG2 torque exceeds a predetermined value, the MG ECU determines that there is a malfunction in the execution or monitoring of MG2 torque. Then, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A78 (INF 306): Discrepancy between motor monitored torque and commanded torque
Required sensors / components	Motor inverter
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTC is not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	DTC P0A78 (INF 306) is not detected

INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system or disconnecting the low voltage connector of the inverter with converter assembly, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals. After waiting for 10 minutes, check the voltage at the terminals in the inspection point in the inverter with converter assembly. The voltage should be 0 V before beginning work.

HINT:

Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Check if DTCs are output.

Result:

Result	Proceed to
P0A78-306 only is output.	A
Any of the following DTCs are also output.	B

DTC No.	Relevant Diagnosis
P0A1A (all INF codes) *1	Generator Control Module
P0A1B (all INF codes) *1	Drive Motor "A" Control Module
P0A1D (all INF codes) *1	Hybrid Powertrain Control Module
P0A3F-243	Drive Motor "A" Position Sensor Circuit
P0A40-500	Drive Motor "A" Position Sensor Circuit Range / Performance
P0A41-245	Drive Motor "A" Position Sensor Circuit Low
P0A4B-253	Generator Position Sensor Circuit
P0A4C-513	Generator Position Sensor Circuit Range / Performance
P0A4D-255	Generator Position Sensor Circuit Low
P0A60 (all INF codes) *1	Drive Motor "A" Phase V Current
P0A63 (all INF codes) *1	Drive Motor "A" Phase W Current
P0A72 (all INF codes) *1	Generator Phase V Current
P0A75 (all INF codes) *1	Generator Phase W Current
P0A78-266, 267, 279, 287, 503, 504, 505, 506, 510, 586, 806, 807, 808	Drive Motor "A" Inverter Performance
P0A7A-517, 522, 325, 518, 809, 810, 811	Generator Inverter Performance
P0A94-585, 587, 589, 590, 554, 555, 556, 547, 548, 549	DC/DC Converter Performance
P0AA6 (all INF codes) *1	Hybrid Battery Voltage System Isolation Fault
P0C76-523	Hybrid Battery System Discharge Time Too Long
P3004-132	Power Cable Malfunction
P3233-750	Short to B+ in Blocking of HV Gate Connection

HINT:

- *1: If any INF codes are output for this DTC, refer to the corresponding diagnostic procedure.
- P0A78-306 may be set due to a malfunction which also causes DTCs in the preceding table to be set. In this case, first troubleshoot the output DTCs in the preceding table. Then, perform a test to attempt to reproduce the problems, and check that no DTCs are output.

(e) Turn the power switch off.

B ▶ GO TO DTC CHART

A ▼

2.	CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

3.	CHECK INVERTER WITH CONVERTER ASSEMBLY (MOTOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY

B ▶ REPLACE MALFUNCTIONING PARTS

A ▼

4.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG2) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY

OK ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM0000046KA000X
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM: P0A78-503: Drive Motor "A" Inverter Performance (2010 HS250H)		

DTC	P0A78-503	Drive Motor "A" Inverter Performance

DESCRIPTION

For a description of the inverter, INFO.

If an overvoltage occurs in the motor inverter or generator inverter, the MG ECU detects it and transmits this information to the hybrid vehicle control ECU.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	503	Motor inverter overvoltage signal detection (overvoltage due to MG ECU malfunction)	• Wire harness or connector • Inverter with converter assembly • Hybrid vehicle transaxle assembly

MONITOR DESCRIPTION

If the motor inverter detects overvoltage, it will transmit an overvoltage signal to the MG ECU. The MG ECU will send information about the malfunction to the hybrid vehicle control ECU. Upon receiving this information, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A78 (INF 503): OVH detection (Over Voltage malfunction)
Required sensors / components	Motor inverter
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTC is not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	DTC P0A78 (INF 503) is not detected

WIRING DIAGRAM

Refer to the wiring diagram for DTC P0A1A-200 INFO.

INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system or disconnecting the low voltage connector of the inverter with converter assembly, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals. After waiting for 10 minutes, check the voltage at the terminals in the inspection point in the inverter with converter assembly. The voltage should be 0 V before beginning work.

HINT:

Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Check if DTCs are output.

Result:

Result	Proceed to
P0A78-503 only is output.	A
Any of the following DTCs are also output.	B

DTC No.	Relevant Diagnosis
P0A1A (all INF codes) *1	Generator Control Module
P0A1B (all INF codes) *1	Drive Motor "A" Control Module
P0A1D (all INF codes) *1	Hybrid Powertrain Control Module
P0A3F-243	Drive Motor "A" Position Sensor Circuit
P0A40-500	Drive Motor "A" Position Sensor Circuit Range / Performance
P0A41-245	Drive Motor "A" Position Sensor Circuit Low
P0A4B-253	Generator Position Sensor Circuit
P0A4C-513	Generator Position Sensor Circuit Range / Performance
P0A4D-255	Generator Position Sensor Circuit Low
P0A60 (all INF codes) *1	Drive Motor "A" Phase V Current
P0A63 (all INF codes) *1	Drive Motor "A" Phase W Current
P0A72 (all INF codes) *1	Generator Phase V Current
P0A75 (all INF codes) *1	Generator Phase W Current
P0A78-266, 267, 287, 505, 506, 586, 806, 807, 808	Drive Motor "A" Inverter Performance
P0A7A-325, 517, 518, 809, 810, 811	Generator Inverter Performance
P0A94-554, 555, 556, 585, 587, 589, 590	DC/DC Converter Performance
P0ADB-227	Hybrid Battery Positive Contactor Control Circuit Low
P0ADC-226	Hybrid Battery Positive Contactor Control Circuit High

P0ADF-229	Hybrid Battery Negative Contactor Control Circuit Low
P0AE0-228	Hybrid Battery Negative Contactor Control Circuit High
P0C76-523	Hybrid Battery System Discharge Time Too Long
P3004-803	High Voltage Power Resource

HINT:

- *1: If any INF codes are output for this DTC, refer to the corresponding diagnostic procedure.
- P0A78-503 may be set due to a malfunction which also causes DTCs in the preceding table to be set. In this case, first troubleshoot the output DTCs in the preceding table. Then, perform a test to attempt to reproduce the problems, and check that no DTCs are output.

(e) Turn the power switch off.

B ▶ GO TO DTC CHART

A ▼

2.	CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

3.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

4.	CHECK GENERATOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR)

OK ▼

5.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

6.	CHECK MOTOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR)

OK ▼

7.	CHECK INVERTER WITH CONVERTER ASSEMBLY (GENERATOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY

B ▶ REPLACE MALFUNCTIONING PARTS

A ▼

8.	CHECK INVERTER WITH CONVERTER ASSEMBLY (MOTOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY

B ▶ REPLACE MALFUNCTIONING PARTS

A ▼

9.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG1) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY

OK ▼

10.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG2) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY

OK ▼

11.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

12.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

13.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK

14.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

15.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK

16.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM000002KJC007X
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM: P0A78-504: Drive Motor "A" Inverter Performance (2010 HS250H)		

DTC	P0A78-504	Drive Motor "A" Inverter Performance

DESCRIPTION

For a description of the inverter, INFO.

If an overvoltage occurs in the motor inverter or generator inverter, the MG ECU detects it and transmits this information to the hybrid vehicle control ECU.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	504	Motor inverter overvoltage signal detection (overvoltage due to hybrid vehicle transaxle assembly malfunction)	• Wire harness or connector • Inverter with converter assembly • Hybrid vehicle transaxle assembly

MONITOR DESCRIPTION

If the motor inverter detects overvoltage, it will transmit an overvoltage signal to the MG ECU. The MG ECU will send information about the malfunction to the hybrid vehicle control ECU. Upon receiving this information, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A78 (INF 504): OVH detection (Over Voltage malfunction)
Required sensors / components	Motor inverter
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTC is not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	DTC P0A78 (INF 504) is not detected

WIRING DIAGRAM

Refer to the wiring diagram for DTC P0A1A-200 INFO.

INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system or disconnecting the low voltage connector of the inverter with converter assembly, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals. After waiting for 10 minutes, check the voltage at the terminals in the inspection point in the inverter with converter assembly. The voltage should be 0 V before beginning work.

HINT:

Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Check if DTCs are output.

Result:

Result	Proceed to
P0A78- 504 only is output.	A
Any of the following DTCs are also output.	B

DTC No.	Relevant Diagnosis
P0A1A (all INF codes) *1	Generator Control Module
P0A1B (all INF codes) *1	Drive Motor "A" Control Module
P0A1D (all INF codes) *1	Hybrid Powertrain Control Module
P0A3F-243	Drive Motor "A" Position Sensor Circuit
P0A40-500	Drive Motor "A" Position Sensor Circuit Range / Performance
P0A41-245	Drive Motor "A" Position Sensor Circuit Low
P0A4B-253	Generator Position Sensor Circuit
P0A4C-513	Generator Position Sensor Circuit Range / Performance
P0A4D-255	Generator Position Sensor Circuit Low
P0A60 (all INF codes) *1	Drive Motor "A" Phase V Current
P0A63 (all INF codes) *1	Drive Motor "A" Phase W Current
P0A72 (all INF codes) *1	Generator Phase V Current
P0A75 (all INF codes) *1	Generator Phase W Current
P0A78-266, 267, 287, 505, 506, 586, 806, 807, 808	Drive Motor "A" Inverter Performance
P0A7A-325, 517, 518, 809, 810, 811	Generator Inverter Performance
P0A94-554, 555, 556, 585, 587, 589, 590	DC/DC Converter Performance
P0ADB-227	Hybrid Battery Positive Contactor Control Circuit Low
P0ADC-226	Hybrid Battery Positive Contactor Control Circuit High

P0ADF-229	Hybrid Battery Negative Contactor Control Circuit Low
P0AE0-228	Hybrid Battery Negative Contactor Control Circuit High
P0C76-523	Hybrid Battery System Discharge Time Too Long
P3004-803	High Voltage Power Resource

HINT:

- *1: If any INF codes are output for this DTC, refer to the corresponding diagnostic procedure.
- P0A78-504 may be set due to a malfunction which also causes DTCs in the preceding table to be set. In this case, first troubleshoot the output DTCs in the preceding table. Then, perform a test to attempt to reproduce the problems, and check that no DTCs are output.

(e) Turn the power switch off.

B ▶ GO TO DTC CHART

A ▼

2.	CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

3.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

4.	CHECK GENERATOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR)

OK ▼

5.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

6.	CHECK MOTOR RESOLVER INFO

NG → CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR)

OK ↓

7.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG → CONNECT SECURELY

OK ↓

8.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG → CONNECT SECURELY

OK → **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

9.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG → CONNECT SECURELY

OK ↓

10.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK → **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

11.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG → CONNECT SECURELY

OK ↓

12.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK → **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM000002KK5007X
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM: P0A78-505,P0A78-506: Drive Motor "A" Inverter Performance (2010 HS250H)		

DTC	P0A78-505	Drive Motor "A" Inverter Performance
DTC	P0A78-506	Drive Motor "A" Inverter Performance

DESCRIPTION

For a description of the inverter, INFO.

If an abnormal amount of current flows through the motor inverter, the MG ECU detects it and sends a signal to inform the hybrid vehicle control ECU of the malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	505	Motor inverter fail signal detection (overcurrent due to MG ECU malfunction)	• Wire harness or connector • Inverter with converter assembly • Hybrid vehicle transaxle assembly
P0A78	506	Motor inverter fail signal detection (overcurrent due to hybrid vehicle transaxle assembly malfunction)	• Wire harness or connector • Inverter with converter assembly • Hybrid vehicle transaxle assembly

MONITOR DESCRIPTION

If excessive amperage flows through the motor inverter due to an internal short, the motor inverter will transmit an inverter fail signal to the MG ECU. The MG ECU will send information about the malfunction to the hybrid vehicle control ECU. Upon receiving this information, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A78 (INF 505/506): MFIV detection (OVH detection (Load short circuit))
Required sensors / components	Motor inverter
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTC is not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	DTC P0A78 (INF 505/506) is not detected

WIRING DIAGRAM

Refer to the wiring diagram for DTC P0A01-200 INFO.

INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system or disconnecting the low voltage connector of the inverter with converter assembly, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals. After waiting for 10 minutes, check the voltage at the terminals in the inspection point in the inverter with converter assembly. The voltage should be 0 V before beginning work.

HINT:

Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Check if DTCs are output.

Result:

Result	Proceed to
P0A78-505 or 506 only is output.	A
Any of the following DTCs are also output.	B

DTC No.	Relevant Diagnosis
P0A1A (all INF codes) *1	Generator Control Module
P0A1B (all INF codes) *1	Drive Motor "A" Control Module
P0A1D (all INF codes) *1	Hybrid Powertrain Control Module
P0A3F-243	Drive Motor "A" Position Sensor Circuit
P0A40-500	Drive Motor "A" Position Sensor Circuit Range / Performance
P0A41-245	Drive Motor "A" Position Sensor Circuit Low
P0A4B-253	Generator Position Sensor Circuit
P0A4C-513	Generator Position Sensor Circuit Range / Performance
P0A4D-255	Generator Position Sensor Circuit Low
P0A60 (all INF codes) *1	Drive Motor "A" Phase V Current
P0A63 (all INF codes) *1	Drive Motor "A" Phase W Current
P0A72 (all INF codes) *1	Generator Phase V Current
P0A75 (all INF codes) *1	Generator Phase W Current
P0A78-266, 267, 586	Drive Motor "A" Inverter Performance
P0A94-585, 587, 589, 590	DC/DC Converter Performance

P0C76-523	Hybrid Battery System Discharge Time Too Long

HINT:

- *1: If any INF codes are output for this DTC, refer to the corresponding diagnostic procedure.
- P0A78-505 or P0A78-506 may be set due to a malfunction which also causes DTCs in the preceding table to be set. In this case, first troubleshoot the output DTCs in the preceding table. Then, perform a test to attempt to reproduce the problems, and check that no DTCs are output.

(e) Turn the power switch off.

B ▶ GO TO DTC CHART

A ▼

2.	CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

3.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

4.	CHECK GENERATOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR)

OK ▼

5.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

6.	CHECK MOTOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR)

OK

7.	CHECK INVERTER WITH CONVERTER ASSEMBLY (GENERATOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY
B ▶ REPLACE MALFUNCTIONING PARTS
A

8.	CHECK INVERTER WITH CONVERTER ASSEMBLY (MOTOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY
B ▶ REPLACE MALFUNCTIONING PARTS
A

9.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG1) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY
OK

10.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG2) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY
OK

11.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY
OK

12.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY
OK ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

13.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY
OK

14.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

15.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

16.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM000000Y7S01AX
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM: P0A78-510: Drive Motor "A" Inverter Performance (2010 HS250H)		

DTC	P0A78-510	Drive Motor "A" Inverter Performance

DESCRIPTION

For a description of the inverter, INFO.

If the inverter receives a motor gate shutdown signal from the MG ECU, it will turn all power transistors off which are activating MG2 to forcibly stop MG2 operation.

The MG ECU monitors motor gate shutdown signals and detects a malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	510	Motor inverter gate malfunction	Inverter with converter assembly

HINT:

- When P0A78-510 has been stored, the hybrid system cannot be restarted until the DTC is cleared.
- If the problem symptom cannot be reproduced, leaving the vehicle with the power switch on (READY) and neutral (N) selected for 1 minute will make it easier to reproduce the symptom.

MONITOR DESCRIPTION

The MG ECU monitors the current to MG2. If current passes to MG2 while the vehicle is stopped with the power switch on (IG) or neutral (N) selected, the MG ECU will detects an abnormality. The hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A78 (INF 510): Malfunction of inverter gate shutdown circuit
Required sensors / components	Motor inverter
Frequency of operation	Continuous

Duration	TMC's intellectual property
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTC is not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	DTC P0A78 (INF 510) is not detected

INSPECTION PROCEDURE

PROCEDURE

1.	CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM000000Y7U01DX
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM: P0A78-586: Drive Motor "A" Inverter Performance (2010 HS250H)		

DTC	P0A78-586	Drive Motor "A" Inverter Performance

DESCRIPTION

Refer to the description for DTC P0A78-266 INFO

The signal line from the inverter voltage (VH) sensor is connected to the MG ECU inside the inverter with converter assembly. If P0A78-586 is output, replace the inverter with converter assembly.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	586	Inverter voltage (VH) sensor performance problem	Inverter with converter assembly

MONITOR DESCRIPTION

The hybrid vehicle control ECU monitors the inverter voltage (VH) sensor signal. If the hybrid vehicle control ECU detects a fault in the sensor signal, the hybrid vehicle control ECU interprets this as a VH sensor failure. The hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A78 (INF 586): Voltage (VH) sensor deviation
Required sensors / components	Motor inverter
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	DTC P0A78 (INF 586) is not detected

INSPECTION PROCEDURE

PROCEDURE

1.	CHECK DTC OUTPUT (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Check if DTCs are output.

Result:

Result	Proceed to
P0A78-586 only is output.	A
Any of the following DTCs are also output.	B

DTC No.	Relevant Diagnosis
P0A1A (all INF codes)*1	Generator Control Module
P0A1B (all INF codes)*1	Drive Motor "A" Control Module
P0A1D (all INF codes)*1	Hybrid Powertrain Control Module

HINT:

- *1: If any INF codes are output for this DTC, refer to the corresponding diagnostic

procedure.

- P0A78-586 may be output due to a malfunction which causes the DTCs in the table above to be output. In this case, first troubleshoot the output DTCs in the table above. Then, perform a reproduction test to check that no DTCs are output.

(e) Turn the power switch off.

B GO TO DTC CHART

A **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM0000025BW00BX
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM: P0A78-806,P0A78-808: Drive Motor "A" Inverter Performance (2010 HS250H)		

DTC	P0A78-806	Drive Motor "A" Inverter Performance
DTC	P0A78-808	Drive Motor "A" Inverter Performance

DESCRIPTION

For a description of the inverter, INFO.

If an abnormal amount of current flows through the motor inverter, the MG ECU detects it and sends a signal to inform the hybrid vehicle control ECU of the malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	806	Abnormal motor current value detection (MG ECU malfunction)	• Wire harness or connector • Hybrid vehicle transaxle assembly • Inverter with converter assembly
P0A78	808	Abnormal motor current value detection (Hybrid vehicle transaxle assembly malfunction)	• Wire harness or connector • Hybrid vehicle transaxle assembly • Inverter with converter assembly

MONITOR DESCRIPTION

The MG ECU monitors the motor inverter electric current. If the current exceeds the threshold for a specified period of time, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A78 (INF 806/808): Motor Inverter Abnormal Current

Required sensors / components	Motor inverter
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTC is not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	DTC P0A78 (INF 806/808) is not detected

WIRING DIAGRAM

Refer to the wiring diagram for DTC P0A1A-200 INFO.

INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system or disconnecting the low voltage connector of the inverter with converter assembly, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals. After waiting for 10 minutes, check the voltage at the terminals in the inspection point in the inverter with converter assembly. The voltage should be 0 V before beginning work.

HINT:

Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Check if DTCs are output.

Result:

Result	Proceed to
P0A78-806 or 808 only is output.	A
Any of the following DTCs are also output.	B

DTC No.	Relevant Diagnosis
P0A1A (all INF codes) *1	Generator Control Module
P0A1B (all INF codes) *1	Drive Motor "A" Control Module
P0A1D (all INF codes) *1	Hybrid Powertrain Control Module
P0A3F-243	Drive Motor "A" Position Sensor Circuit
P0A40-500	Drive Motor "A" Position Sensor Circuit Range / Performance
P0A41-245	Drive Motor "A" Position Sensor Circuit Low
P0A4B-253	Generator Position Sensor Circuit
P0A4C-513	Generator Position Sensor Circuit Range / Performance
P0A4D-255	Generator Position Sensor Circuit Low
P0A60 (all INF codes) *1	Drive Motor "A" Phase V Current
P0A63 (all INF codes) *1	Drive Motor "A" Phase W Current
P0A72 (all INF codes) *1	Generator Phase V Current
P0A75 (all INF codes) *1	Generator Phase W Current
P0A78-266, 267, 586	Drive Motor "A" Inverter Performance
P0A94-585, 587, 589, 590	DC/DC Converter Performance
P0C76-523	Hybrid Battery System Discharge Time Too Long

HINT:

- *1: If any INF codes are output for this DTC, refer to the corresponding diagnostic procedure.
- P0A78-806 or P0A78-808 may be set due to a malfunction which also causes DTCs in the preceding table to be set. In this case, first troubleshoot the output DTCs in the preceding table. Then, perform a test to attempt to reproduce the problems, and check that no DTCs are output.

(e) Turn the power switch off.

B ▶ GO TO DTC CHART

A ▼

2.	CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

3.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

4.	CHECK GENERATOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR)

OK ▼

5.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

6.	CHECK MOTOR RESOLVER INFO

NG ▶ CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR)

OK ▼

7.	CHECK INVERTER WITH CONVERTER ASSEMBLY (GENERATOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY
B ▶ REPLACE MALFUNCTIONING PARTS
A ▼

8.	CHECK INVERTER WITH CONVERTER ASSEMBLY (MOTOR CABLE CONNECTION CONDITION) INFO

C ▶ CONNECT SECURELY
B ▶ REPLACE MALFUNCTIONING PARTS
A ▼

9.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG1) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY
OK ▼

10.	CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (MG2) INFO

NG ▶ REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY
OK ▼

11.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY
OK ▼

12.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY
OK ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

13.	CHECK CONNECTOR CONNECTION CONDITION (GENERATOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY
OK ▼

14.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - GENERATOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR
OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

15.	CHECK CONNECTOR CONNECTION CONDITION (MOTOR RESOLVER CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▼

16.	CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - MOTOR RESOLVER) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM000002KKO007X
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM: P0A78-807: Drive Motor "A" Inverter Performance (2010 HS250H)		

DTC	P0A78-807	Drive Motor "A" Inverter Performance

DESCRIPTION

For a description of the inverter, INFO.

If an abnormal amount of current flows through the motor inverter, the MG ECU detects it and sends a signal to inform the hybrid vehicle control ECU of the malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	807	Abnormal motor current value detection (Inverter malfunction)	Inverter with converter assembly

MONITOR DESCRIPTION

The MG ECU monitors the motor inverter electric current. If the current exceeds the threshold for a specified period of time, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A78 (INF 807): Motor Inverter Abnormal Current
Required sensors / components	Motor inverter
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	DTC P0A78 (INF 807) is not detected

INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system or disconnecting the low voltage connector of the inverter with converter assembly, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals. After waiting for 10 minutes, check the voltage at the terminals in the inspection point in the inverter with converter assembly. The voltage should be 0 V before beginning work.

HINT:

Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Check if DTCs are output.

Result:

Result	Proceed to
P0A78-807 only is output.	A
Any of the following DTCs are also output.	B

DTC No.	Relevant Diagnosis
P0A1A (all INF codes) *1	Generator Control Module
P0A1B (all INF codes) *1	Drive Motor "A" Control Module
P0A1D (all INF codes) *1	Hybrid Powertrain Control Module
P0A3F-243	Drive Motor "A" Position Sensor Circuit
P0A40-500	Drive Motor "A" Position Sensor Circuit Range / Performance
P0A41-245	Drive Motor "A" Position Sensor Circuit Low
P0A4B-253	Generator Position Sensor Circuit
P0A4C-513	Generator Position Sensor Circuit Range / Performance
P0A4D-255	Generator Position Sensor Circuit Low
P0A60 (all INF codes) *1	Drive Motor "A" Phase V Current
P0A63 (all INF codes) *1	Drive Motor "A" Phase W Current
P0A72 (all INF codes) *1	Generator Phase V Current
P0A75 (all INF codes) *1	Generator Phase W Current
P0A78-266, 267, 586	Drive Motor "A" Inverter Performance
P0A94-585, 587, 589, 590	DC/DC Converter Performance
P0C76-523	Hybrid Battery System Discharge Time Too Long

HINT:

- *1: If any INF codes are output for this DTC, refer to the corresponding diagnostic procedure.
- P0A78-807 may be set due to a malfunction which also causes DTCs in the preceding table to be set. In this case, first troubleshoot the output DTCs in the preceding table. Then, perform a test to attempt to reproduce the problems, and check that no DTCs are output.

(e) Turn the power switch off.

B ▶GO TO DTC CHART

A ▼

2.	CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH

	CONVERTER ASSEMBLY CONNECTOR) INFO

NG ▶ CONNECT SECURELY

OK ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

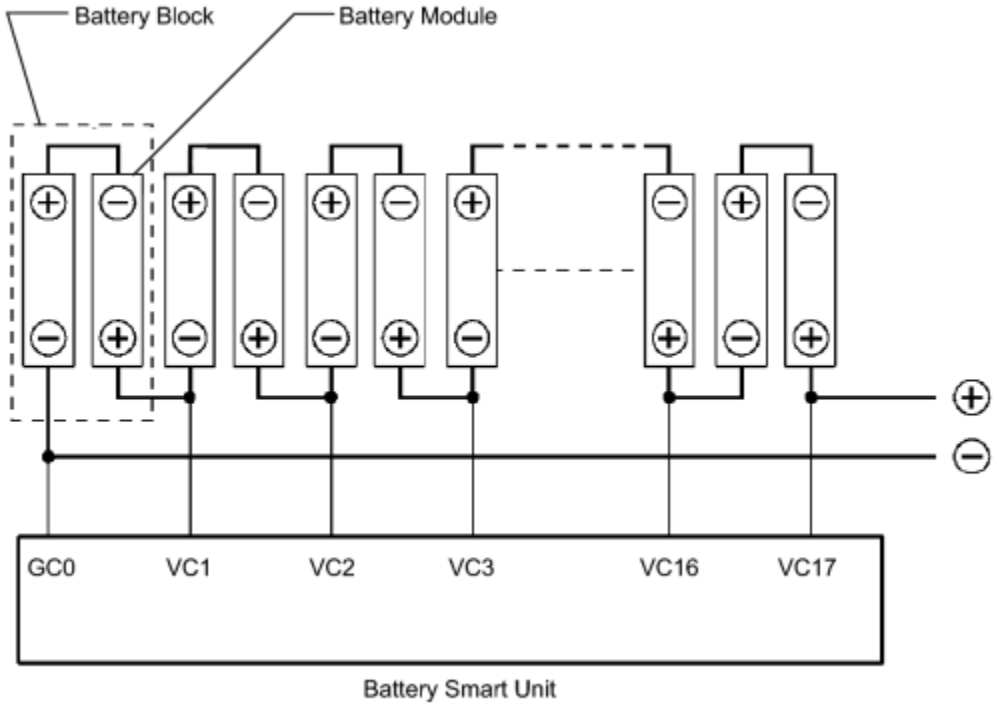
Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM0000025AI00VX
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM: P0A80-123: Replace Hybrid Battery Pack (2010 HS250H)		

DTC	P0A80-123	Replace Hybrid Battery Pack

DESCRIPTION

- The HV battery uses nickel metal-hydride batteries and does not require external charging.

The hybrid vehicle control ECU controls the SOC (state of charge) of the HV battery at a constant level during driving. The HV battery is composed of 34 modules, and each module consists of eight 1.2 V cells in series. The battery smart unit monitors battery block voltage at 17 locations. Each battery block is composed of 2 modules in a set.



DTC No.	DTC Detection Condition	Trouble Area
P0A80-123	Difference in voltage between battery blocks is larger than the standard (2 trip detection)	• HV battery assembly • Battery smart unit

HINT:

- P0A80-123 will not be set unless the vehicle is driven for approximately 10 minutes after clearing the DTC.

MONITOR DESCRIPTION

The battery smart unit, which monitors the voltage of the battery blocks, determines that malfunction has occurred if it detects that a voltage difference between the battery blocks exceeds the standard. When the malfunction detection condition is satisfied, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0A80 (INF 123): Replace Hybrid Battery Pack
Required sensors / components	Main: Battery voltage sensor inside battery smart unit Sub: Battery current sensor, battery temperature sensor
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	TMC's intellectual property
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Battery smart unit	DTC P0A80 (INF 123) is not detected

INSPECTION PROCEDURE

PROCEDURE

1.	CHECK DTC OUTPUT (DTC P0A1F-123 IS OUTPUT) INFO

B ▶ GO TO DTC CHART

A ▼

2.	CHECK BATTERY SMART UNIT INFO

B ▶ REPLACE HV BATTERY ASSEMBLY

A ▶ **REPLACE BATTERY SMART UNIT**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM00000259R00XX
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM: P0A82-123: Hybrid Battery Pack Cooling Fan 1 (2010 HS250H)		

DTC	P0A82-123	Hybrid Battery Pack Cooling Fan 1

DESCRIPTION

- Refer to the circuit description for DTC P0A84-123 INFO.

DTC No.	DTC Detection Condition	Trouble Area
P0A82-123	The speed of the battery cooling blower assembly is not within the specified range (1 trip detection)	• Battery cooling blower assembly • Battery smart unit • Hybrid vehicle control ECU • HV battery intake duct • Wire harness or connector

WIRING DIAGRAM

Refer to the wiring diagram for DTC P0A84-123 INFO.

INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals.

  HINT:

  Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

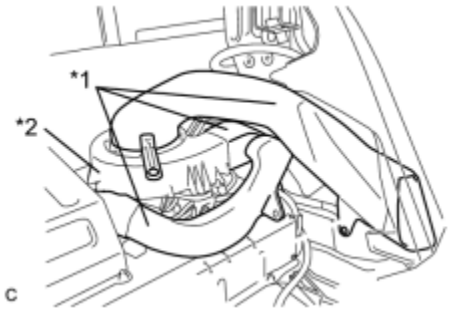
1.	CHECK DTC OUTPUT (DTC P0A1F-123 IS OUTPUT) INFO

B ▶ GO TO DTC CHART

A ▼

2.	CHECK DUCT AND BLOWER

(a) Remove the luggage compartment trim cover.



(b) Check that the intake duct and battery cooling blower are not disconnected, damaged, or clogged with foreign objects, and that the acoustical materials have not peeled.

OK:

The duct and blower are not disconnected, damaged, or clogged with foreign objects and the acoustical materials have not peeled.

Text in Illustration	
*1	Intake Duct
*2	Battery Cooling Blower Assembly

(c) Install the luggage compartment trim cover.

NG ▶ CORRECT THE PROBLEM

OK ▼

3.	CHECK HARNESS AND CONNECTOR (BATTERY COOLING BLOWER ASSEMBLY - HYBRID VEHICLE CONTROL ECU)

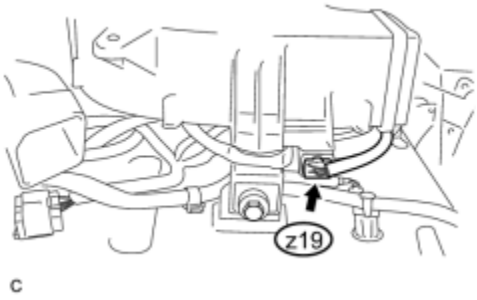
(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

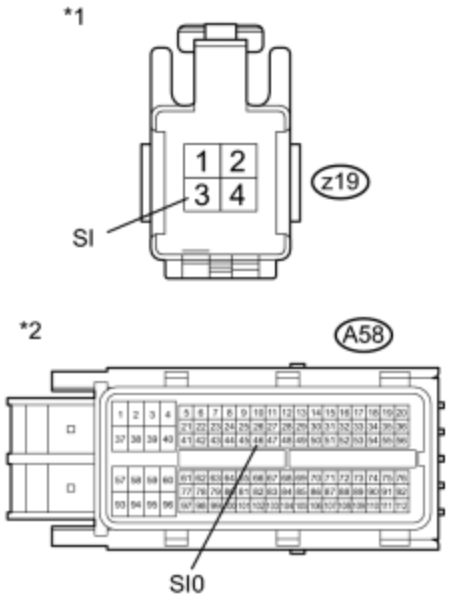
(c) Remove the No. 4 HV battery intake duct.



(d) Disconnect the z19 connector from the battery cooling blower assembly.

(e) Disconnect the A58 connector from the hybrid vehicle control ECU.

(f) Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Specified Condition
z19-3 (SI) or A58-46 (SI0) - Body ground	10 kΩ or higher
z19-3 (SI) - A58-46 (SI0)	Below 1 Ω

Text in Illustration	
*1	Front view of wire harness connector (to Battery Cooling Blower Assembly)
*2	Front view of wire harness connector (to Hybrid Vehicle Control ECU)

(g) Connect the z19 connector to the battery cooling blower assembly.

(h) Install the No. 4 HV battery intake duct.

(i) Connect the A58 connector to the hybrid vehicle control ECU.

(j) Connect the cable to the negative (-) battery terminal.

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

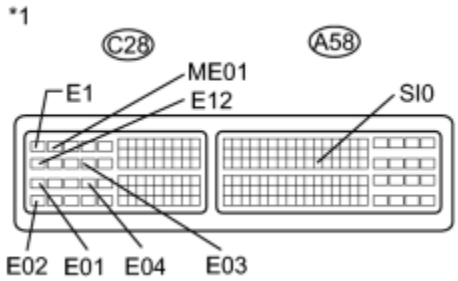
OK ▼

4.	CHECK HYBRID VEHICLE CONTROL ECU (GROUND SHORT CHECK)

(a) Remove the hybrid vehicle control ECU INFO.

(b) Measure the resistance according to the value(s) in the table below.

Standard Resistance:



Tester Connection	Switch Condition	Specified Condition
A58-46 (SI0) - C28-14 (E1)	Power switch off	10 kΩ or higher
A58-46 (SI0) - C28-28 (E12)	Power switch off	10 kΩ or higher
A58-46 (SI0) - C28-51 (E01)	Power switch off	10 kΩ or higher
A58-46 (SI0) - C28-65 (E02)	Power switch off	10 kΩ or higher
A58-46 (SI0) - C28-13 (ME01)	Power switch off	10 kΩ or higher
A58-46 (SI0) - C28-25 (E03)	Power switch off	10 kΩ or higher
A58-46 (SI0) - C28-48 (E04)	Power switch off	10 kΩ or higher

Text in Illustration	
*1	Component without harness connected (Hybrid Vehicle Control ECU)

(c) Install the hybrid vehicle control ECU INFO.

NG ▶ REPLACE HYBRID VEHICLE CONTROL ECU

OK ▼

5.	READ VALUE USING TECHSTREAM

(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(c) Remove the No. 4 HV battery intake duct.

(d) Connect the cable to the negative (-) battery terminal.

(e) Connect the Techstream to the DLC3.

(f) Turn the power switch on (IG).

NOTICE:

- After removing the service plug grip, do not turn the power switch on (READY) unless instructed by the repair manual because this may cause a malfunction.
- If the power switch is turned on (IG) with the service plug grip removed, DTCs will be stored. If DTCs are output, clear the DTCs using the Techstream.

(g) Enter the following menus: Powertrain / Hybrid Control / Active Test / Driving the Battery Cooling Fan.

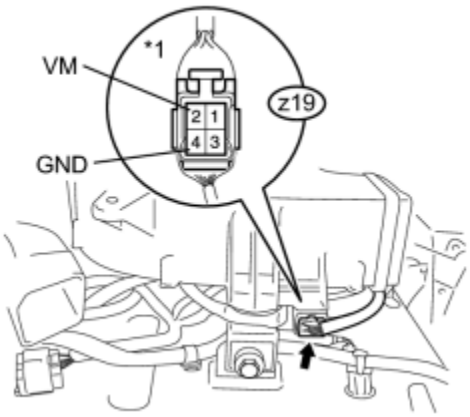
HINT:

Check "Cooling Fan Mode1" in the Data List using the Techstream. If the "Cooling Fan Mode1" is 40, it is not necessary to perform the Active Test.

(h) Enter the following menus: All Data / VMF Fan Motor Voltage1.

(i) Select each air volume mode (1 to 6) in the "Driving the Battery Cooling Fan" Active Test to operate the battery cooling blower assembly.

(j) While the cooling fan is operating, compare the value in the Data List (VMF Fan Motor Voltage1) with the voltage value that was actually measured at the battery cooling blower assembly connector.



Standard:

Tester Connection	Condition	Specified Condition
z19-2 (VM) - z19-4 (GND)	Battery cooling blower is operating	The value of VMF Fan Motor Voltage1 in the Data List and the actual measured value are both 1 V or less, and the difference between the value of VMF Fan Motor Voltage1 and the actual measured value is 1 V or less.

Text in Illustration	
*1	Component with harness connected (Battery Cooling Blower Assembly)

HINT:

Compare the values in each air volume mode (1 to 6).

(k) Install the No. 4 HV battery intake duct.

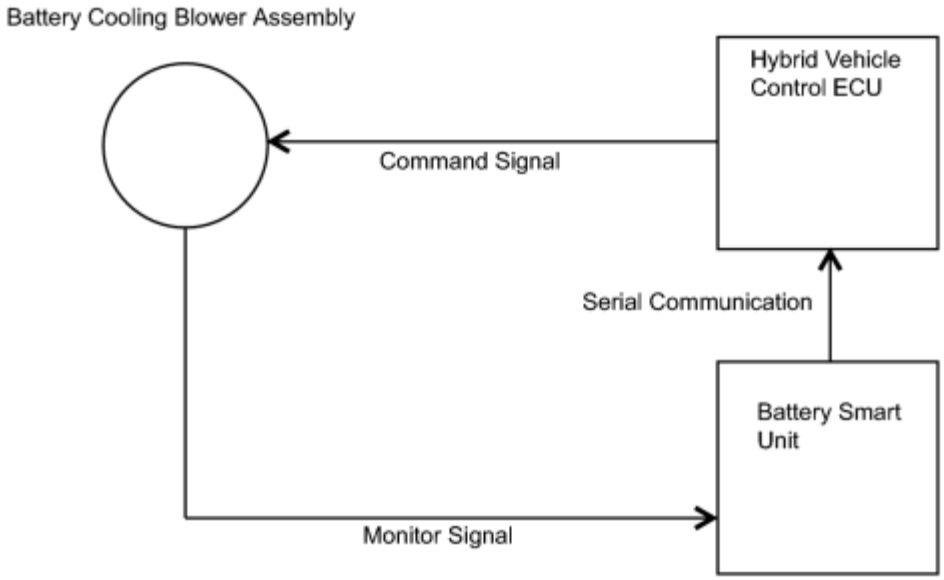
NG ▶ REPLACE BATTERY SMART UNIT
OK ▶ **REPLACE BATTERY COOLING BLOWER ASSEMBLY**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM0000259S00VX
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM: P0A84-123: Hybrid Battery Pack Cooling Fan 1 (2010 HS250H)		

DTC	P0A84-123	Hybrid Battery Pack Cooling Fan 1

DESCRIPTION

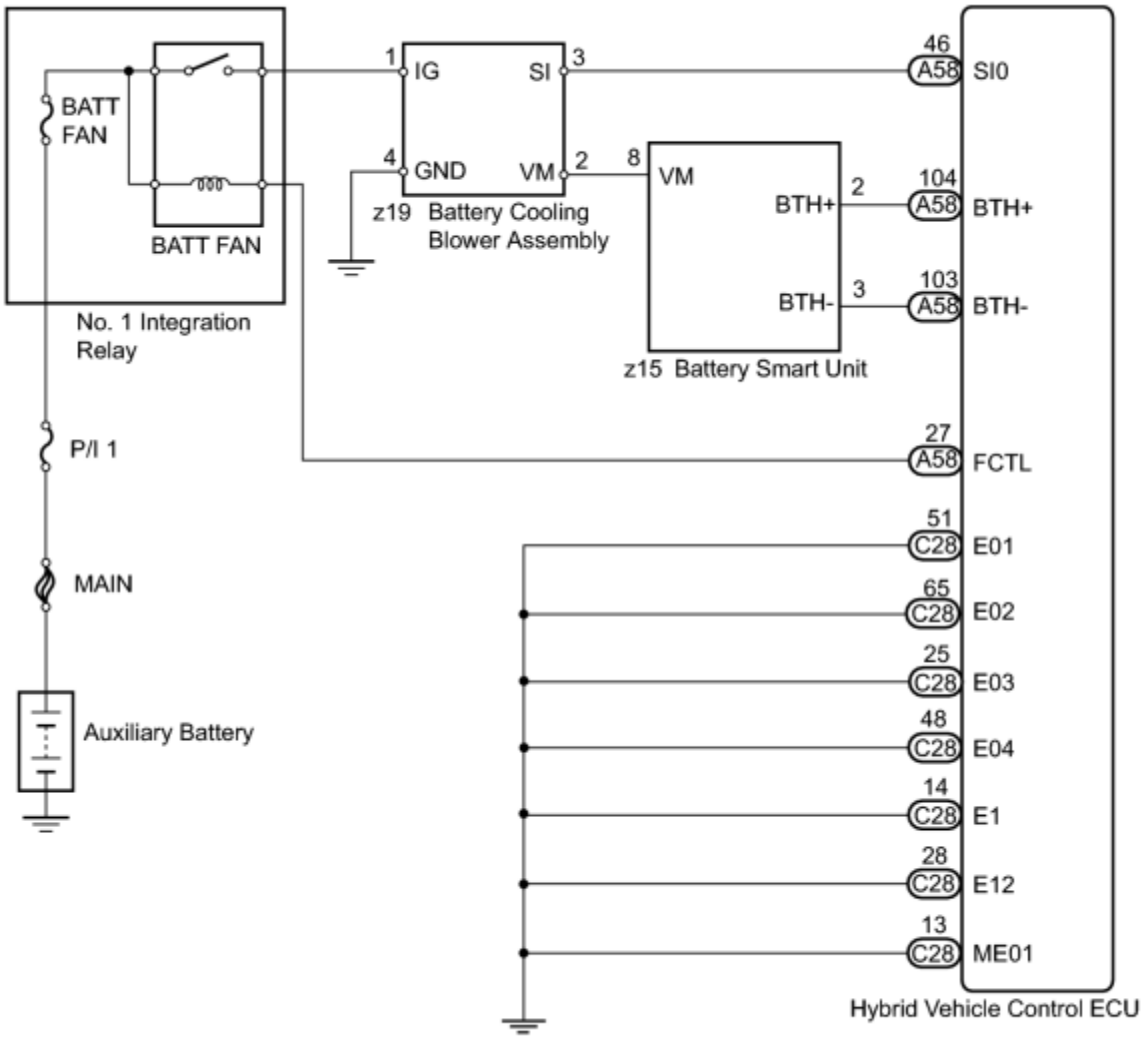
- The speed of the battery cooling blower assembly is controlled by the hybrid vehicle control ECU. Battery cooling blower assembly power is supplied when the FCTL terminal of the hybrid vehicle control ECU turns on the battery blower relay. The hybrid vehicle control ECU sends command signals (SI) to the battery cooling blower assembly to get the fan speed corresponding to the HV battery temperature. Information about the voltage applied to the battery cooling blower assembly (VM) is sent to the hybrid vehicle control ECU as a monitor signal using serial communication via the battery smart unit.



DTC No.	DTC Detection Condition	Trouble Area
P0A84-123	When the output voltage of the battery cooling blower assembly (VM) is too low compared to the target control voltage range (1 trip detection)	• Wire harness or connector • Integration relay • Battery cooling blower assembly • Battery smart unit • Hybrid vehicle

		control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system, take safety precautions such as wearing

insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.

- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals.

  HINT:

  Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (DTC P0A1F-123 IS OUTPUT) INFO

B GO TO DTC CHART

A

2.	PERFORM ACTIVE TEST USING TECHSTREAM

(a) Remove the luggage compartment trim cover.

(b) Connect the Techstream to the DLC3.

(c) Turn the power switch on (IG).

(d) Enter the following menus: Powertrain / Hybrid Control / Active Test / Driving the Battery Cooling Fan.

HINT:

Check "Cooling Fan Mode1" in the Data List using the Techstream. If the "Cooling Fan Mode1" is 40, it is not necessary to perform the Active Test.

(e) Select air volume mode 6 in the "Driving the Battery Cooling Fan" Active Test to operate the battery cooling blower assembly.

(f) Check that the fan operates and air is sucked into the inlet duct.

HINT:

The cooling fan may not stop even when turning the cooling fan off in the "Driving the Battery Cooling Fan" Active Test. This is due to HV system control and not a malfunction.

OK:

The fan operates.

(g) Install the luggage compartment trim cover.

NG ▶CHECK NO. 1 INTEGRATION RELAY (BATT FAN)

OK ▼

3.	CHECK HARNESS AND CONNECTOR (BATTERY COOLING BLOWER ASSEMBLY - BATTERY SMART UNIT)

CAUTION:

Be sure to wear insulated gloves.

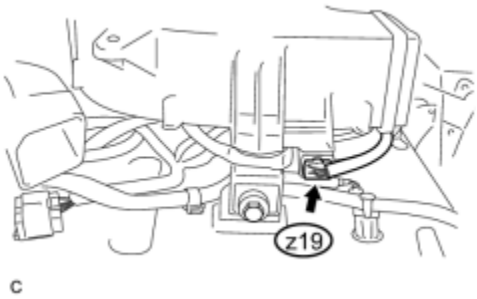
(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

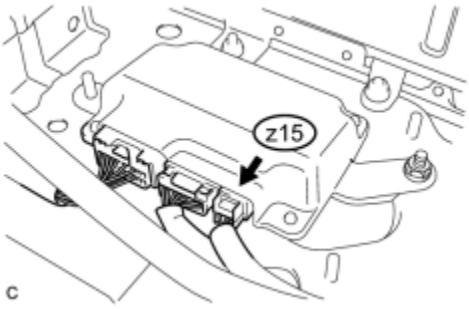
(c) Remove the No. 4 hybrid vehicle battery intake duct.



(d) Disconnect the z19 connector of the battery cooling blower assembly.

(e) Remove the hybrid battery junction block assembly INFO.

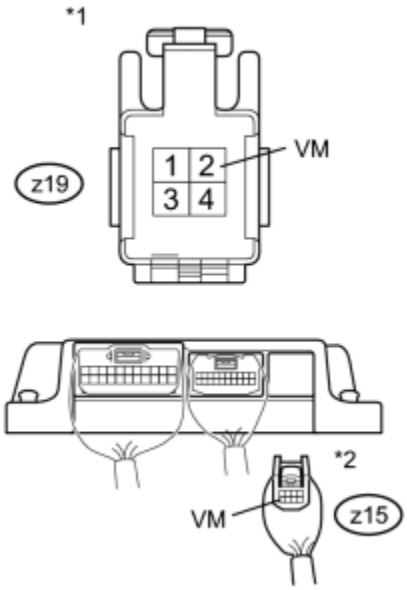
(f) Disconnect the z15 connector of the battery smart unit.



(g) Measure the resistance according to the value(s) in the table below.

Standard Resistance (Check for Open):

Tester Connection	Switch Condition	Specified Condition
z19-2 (VM) - z15-8 (VM)	Power switch off	Below 1 Ω



Standard Resistance (Check for Short):

Tester Connection	Switch Condition	Specified Condition
z19-2 (VM) or z15-8 (VM) - Body ground	Power switch off	10 kΩ or higher

Text in Illustration	
*1	Front view of wire harness connector (to Battery Cooling Blower Assembly)
*2	Rear view of wire harness connector (to Battery Smart Unit)

(h) Connect the z15 connector of the battery smart unit.

(i) Install the hybrid battery junction block assembly INFO.

(j) Connect the z19 connector of the battery cooling blower assembly.

(k) Install the No. 4 hybrid vehicle battery intake duct.

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

4.	CHECK BATTERY COOLING BLOWER ASSEMBLY (VOLTAGE) INFO

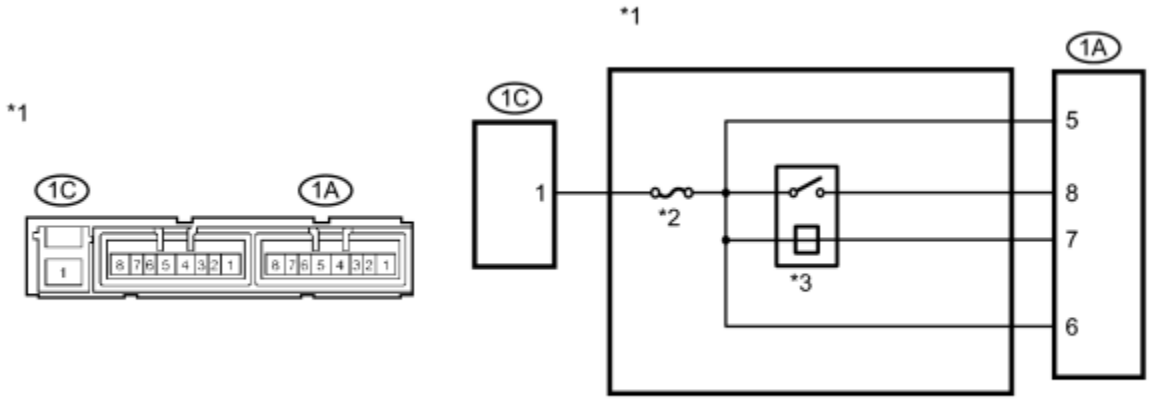
NG ▶ REPLACE BATTERY SMART UNIT

OK ▶ **REPLACE BATTERY COOLING BLOWER ASSEMBLY**

5.	CHECK NO. 1 INTEGRATION RELAY (BATT FAN)

(a) Remove the No. 1 integration relay from the engine room junction block assembly INFO.

(b) Measure the voltage and resistance according to the value(s) in the table below.



Standard Condition:

Tester Connection	Condition	Specified Condition
1A-8 - 1A-7	A positive (+) lead from the battery is connected to terminal 1A-6 and a negative (-) lead is connected to terminal 1A-7	11 to 14 V
1C-1 - 1A-7		
1C-1 - 1A-8	No battery voltage is applied across terminals 1A-6 and 1A-7	10 kΩ or higher

Text in Illustration

*1	No. 1 Integration Relay	*2	BATT FAN Fuse
*3	BATT FAN Relay	-	-

(c) Install the No. 1 integration relay INFO.

NG ▶ REPLACE NO. 1 INTEGRATION RELAY

OK ▼

6.	CHECK HARNESS AND CONNECTOR (IG VOLTAGE)

(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(c) Remove the No. 4 HV battery intake duct.

(d) Connect the cable to the negative (-) battery terminal.

(e) Connect the Techstream to the DLC3.

(f) Turn the power switch on (IG).

NOTICE:

- After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.
- If the power switch is turned on (IG) with the service plug grip removed, DTCs will be stored. If DTCs are output, clear the DTCs using the Techstream.

(g) Enter the following menus: Powertrain / Hybrid Control / Active Test / Driving the Battery Cooling Fan.

HINT:

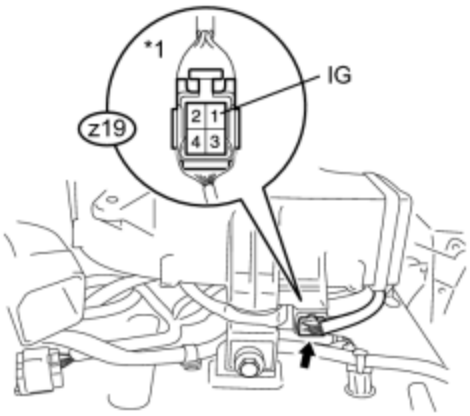
Check "Cooling Fan Mode1" in the Data List using the Techstream. If the "Cooling Fan Mode1" is 40, it is not necessary to perform the Active Test.

(h) Enter the following menus: All Data / VMF Fan Motor Voltage1.

(i) Select each air volume mode (1 to 6) in the "Driving the Battery Cooling Fan" Active Test to operate the battery cooling blower assembly.

(j) Measure the voltage according to the value(s) in the table below.

Standard Voltage:



Tester Connection	Condition	Specified Condition
z19-1 (IG) - Body ground	Battery cooling blower is operating	11 to 14 V

Text in Illustration	
*1	Component with harness connected (Battery Cooling Blower)

HINT:

Measure the voltage on the wire side of the connector that is part of the battery cooling blower.

(k) Turn the power switch off.

(l) Install the No. 4 HV battery intake duct.

NG ▶ CHECK HARNESS AND CONNECTOR (NO. 1 INTEGRATION RELAY - HYBRID VEHICLE CONTROL ECU)

OK ▼

7.	CHECK BATTERY COOLING BLOWER ASSEMBLY

CAUTION:

Be sure to wear insulated gloves.

(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

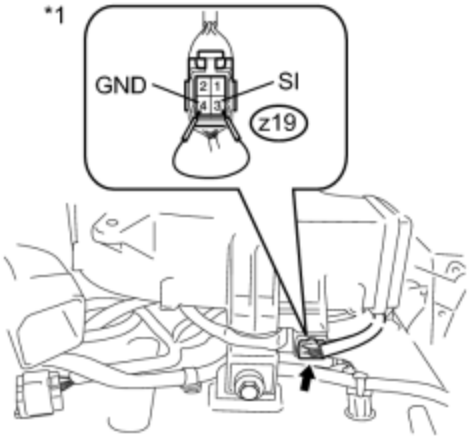
(c) Remove the No. 4 HV battery intake duct.

(d) Connect the cable to the negative (-) battery terminal.

(e) Turn the power switch on (IG).

NOTICE:

- After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.
- If the power switch is turned on (IG) with the service plug grip removed, DTCs will be stored. If DTCs are output, clear the DTCs using the Techstream.



(f) Using a service wire, connect terminals 3 (SI) and 4 (GND) of the battery cooling blower assembly connector.

Specified Condition:

Terminal Connection	Switch Condition	Specified Condition
z19-3 (SI) - z19-4 (GND)	Power switch on (IG)	The fan operates

Text in Illustration

*1	Component with harness connected (Battery Cooling Blower Assembly)

HINT:

If DTCs are output after the check, clear the DTCs using the Techstream.

(g) Turn the power switch off.

(h) Install the No. 4 HV battery intake duct.

NG ▶REPLACE BATTERY COOLING BLOWER ASSEMBLY

OK ▼

8.	CHECK HARNESS AND CONNECTOR (BATTERY COOLING BLOWER ASSEMBLY - HYBRID VEHICLE CONTROL ECU)

CAUTION:

Be sure to wear insulated gloves.

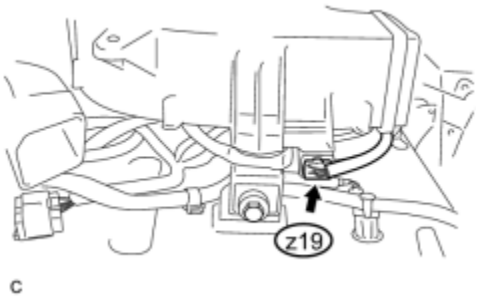
(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(c) Remove the No. 4 HV battery intake duct.



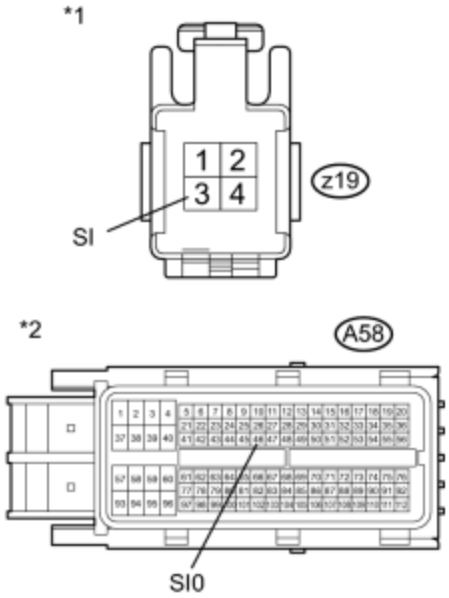
(d) Disconnect the z19 connector of the battery cooling blower assembly.

(e) Disconnect the A58 connector of the hybrid vehicle control ECU.

(f) Measure the resistance according to the value(s) in the table below.

Standard Resistance (Check for Open):

Tester Connection	Switch Condition	Specified Condition
z19-3 (SI) - A58-46	Power switch	Below 1 Ω



(SI0)	off	

Standard Resistance (Check for Short):

Tester Connection	Switch Condition	Specified Condition
z19-3 (SI) or A58-46 (SI0) - Body ground	Power switch off	10 kΩ or higher

Text in Illustration	
*1	Front view of wire harness connector (to Battery Cooling Blower Assembly)
*2	Front view of wire harness connector (to Hybrid Vehicle Control ECU)

NOTICE:

When taking a measurement with a tester, do not apply excessive force to the tester probe to avoid damaging the holder.

(g) Connect the cable to the negative (-) battery terminal.

(h) Turn the power switch on (IG).

NOTICE:

- After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.
- If the power switch is turned on (IG) with the service plug grip removed, DTCs will be stored. If DTCs are output, clear the DTCs using the Techstream.

(i) Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
z19-3 (SI) - Body ground	Power switch on (IG)	Below 1 V

(j) Turn the power switch off.

(k) Connect the z19 connector of the battery cooling blower assembly.

(l) Install the No. 4 HV battery intake duct.

(m) Connect the A58 connector of the hybrid vehicle control ECU.

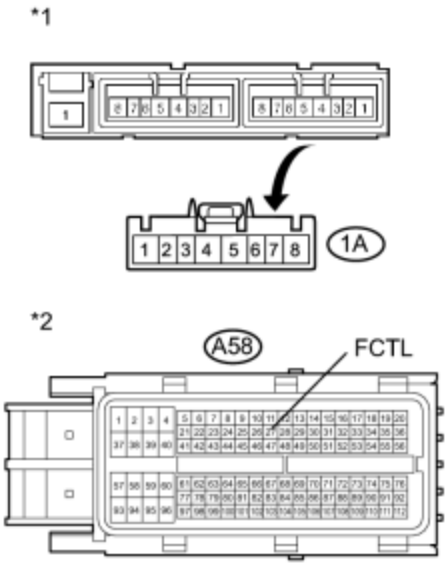
NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR
OK ▶ **REPLACE HYBRID VEHICLE CONTROL ECU**

9.	CHECK HARNESS AND CONNECTOR (NO. 1 INTEGRATION RELAY - HYBRID VEHICLE CONTROL ECU)

(a) Disconnect the cable from the negative (-) battery terminal.

(b) Disconnect the A58 connector of the hybrid vehicle control ECU.

(c) Remove the No. 1 integration relay INFO.



(d) Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
1A-7 - A58-27 (FCTL)	Power switch off	Below 1 Ω

Text in Illustration	
*1	Front view of wire harness connector (to Integration Relay)
*2	Front view of wire harness connector (to Hybrid Vehicle Control ECU)

NOTICE:

When taking a measurement with a tester, do not apply

excessive force to the tester probe to avoid damaging the holder.

(e) Connect the cable to the negative (-) battery terminal.

(f) Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
A58-27 (FCTL) - Body ground	Power switch off	Below 1 V
	Power switch on (IG)	Below 1 V

NOTICE:

If the power switch is turned on (IG) with the connector removed, DTCs will be stored. If the DTCs are output, clear the DTCs using the Techstream.

(g) Connect the A58 connector of the hybrid vehicle control ECU.

(h) Install the No. 1 integration relay INFO.

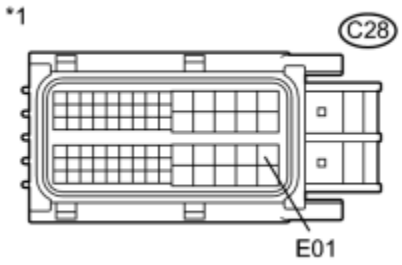
NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

10.	CHECK HARNESS AND CONNECTOR (HYBRID VEHICLE CONTROL ECU - BODY GROUND)

(a) Disconnect the cable from the negative (-) battery terminal.

(b) Disconnect the C28 connector of the hybrid vehicle control ECU.



(c) Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
C28-51 (E01) - Body ground	Power switch off	Below 1 Ω

Text in Illustration	
*1	Front view of wire harness connector (to Hybrid Vehicle Control ECU)

NOTICE:

When taking a measurement with a tester, do not apply excessive force to the tester probe to avoid damaging the holder.

(d) Connect the C28 connector of the hybrid vehicle control ECU.

(e) Connect the cable to the negative (-) battery terminal.

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

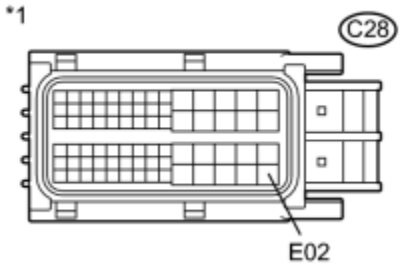
11.	CHECK HARNESS AND CONNECTOR (HYBRID VEHICLE CONTROL ECU - BODY GROUND)

(a) Disconnect the cable from the negative (-) battery terminal.

(b) Disconnect the C28 connector of the hybrid vehicle control ECU.

(c) Measure the resistance according to the value(s) in the table below.

Standard Resistance:



Tester Connection	Switch Condition	Specified Condition
C28-65 (E02) - Body ground	Power switch off	Below 1 Ω

Text in Illustration	
*1	Front view of wire harness connector (to Hybrid Vehicle Control ECU)

NOTICE:

When taking a measurement with a tester, do not apply excessive force to the tester probe to avoid damaging the holder.

(d) Connect the C28 connector of the hybrid vehicle control ECU.

(e) Connect the cable to the negative (-) battery terminal.

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

12.	CHECK HARNESS AND CONNECTOR (NO. 1 INTEGRATION RELAY - BATTERY COOLING BLOWER ASSEMBLY)

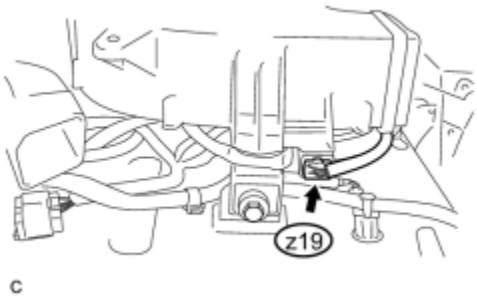
CAUTION:

Be sure to wear insulated gloves.

(a) Disconnect the cable from the negative (-) battery terminal.

(b) Remove the No. 1 integration relay INFO.

(c) Remove the No. 4 HV battery intake duct.

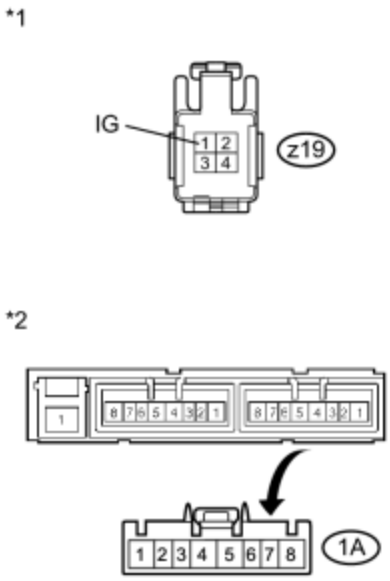


(d) Disconnect the z19 connector of the battery cooling blower assembly.

(e) Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition



1A-8 - z19-1 (IG)	Power switch off	Below 1 Ω

Text in Illustration *1	Front view of wire harness connector (to Battery Cooling Blower Assembly)
*2	Front view of wire harness connector (to Integration Relay)

NOTICE:

When taking a measurement with a tester, do not apply excessive force to the tester probe to avoid damaging the holder.

(f) Install the No. 1 integration relay INFO.

(g) Connect the z19 connector of the battery cooling blower assembly.

(h) Install the No. 4 HV battery intake duct.

(i) Connect the cable to the negative (-) battery terminal.

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR
OK ▶ **REPLACE HYBRID VEHICLE CONTROL ECU**

13.	REPLACE NO. 1 INTEGRATION RELAY

(a) Replace the integration relay INFO.

NEXT ▼

14.	CHECK HARNESS AND CONNECTOR (NO. 1 INTEGRATION RELAY - BATTERY COOLING BLOWER ASSEMBLY)

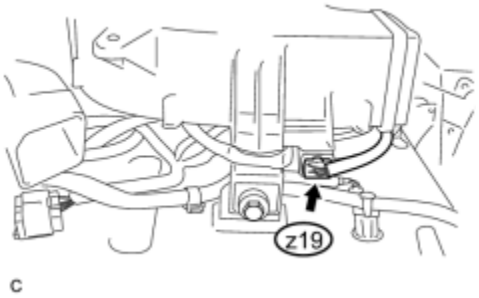
CAUTION:

Be sure to wear insulated gloves.

(a) Disconnect the cable from the negative (-) battery terminal.

(b) Remove the No. 1 integration relay INFO.

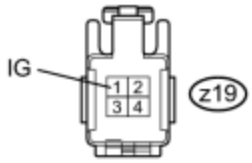
(c) Remove the No. 4 HV battery intake duct.



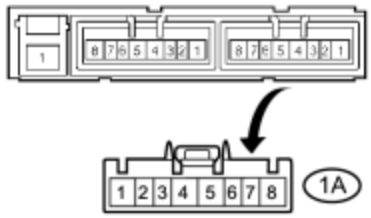
(d) Disconnect the z19 connector of the battery cooling blower assembly.

(e) Measure the resistance according to the value(s) in the table below.

*1



*2



Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
z19-1 (IG) - Terminals other than 1A-8 and body ground	Power switch off	10 kΩ or higher

Text in Illustration	
*1	Front view of wire harness connector (to Battery Cooling Blower Assembly)
*2	Front view of wire harness connector (to Integration Relay)

NOTICE:

When taking a measurement with a tester, do not apply excessive force to the tester probe to avoid damaging the holder.

(f) Install the No. 1 integration relay INFO.

(g) Connect the z19 connector of the battery cooling blower assembly.

(h) Install the No. 4 HV battery intake duct.

(i) Connect the cable to the negative (-) battery terminal.

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

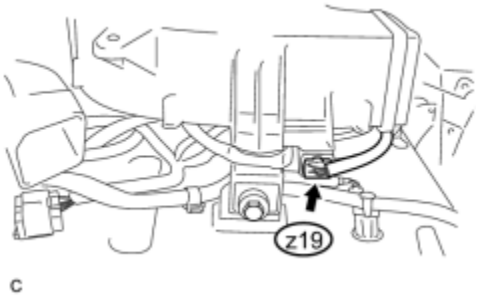
15.	CHECK BATTERY COOLING BLOWER ASSEMBLY

CAUTION:

Be sure to wear insulated gloves.

(a) Disconnect the cable from the negative (-) battery terminal.

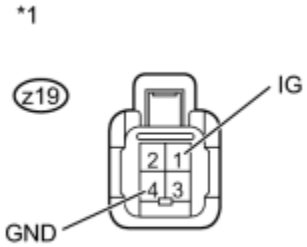
(b) Remove the No. 4 HV battery intake duct.



(c) Disconnect the z19 connector of the battery cooling blower assembly.

(d) Measure the resistance according to the value(s) in the table below.

Standard Resistance:



Tester Connection	Switch Condition	Specified Condition
z19-1 (IG) - z19-4 (GND) and body ground	Power switch off	10 kΩ or higher

Text in Illustration *1	Component without harness connected (Battery Cooling Blower Assembly)

NOTICE:

When taking a measurement with a tester, do not apply excessive force to the tester probe to avoid damaging the holder.

(e) Connect the z19 connector of the battery cooling blower assembly.

(f) Install the No. 4 HV battery intake duct.

(g) Connect the cable to the negative (-) battery terminal.

NG ▶ REPLACE BATTERY COOLING BLOWER ASSEMBLY
OK ▶ **RECOVERY TO NORMAL**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM000002D1K00VX
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM: P0A85-123: Hybrid Battery Pack Cooling Fan 1 (2010 HS250H)		

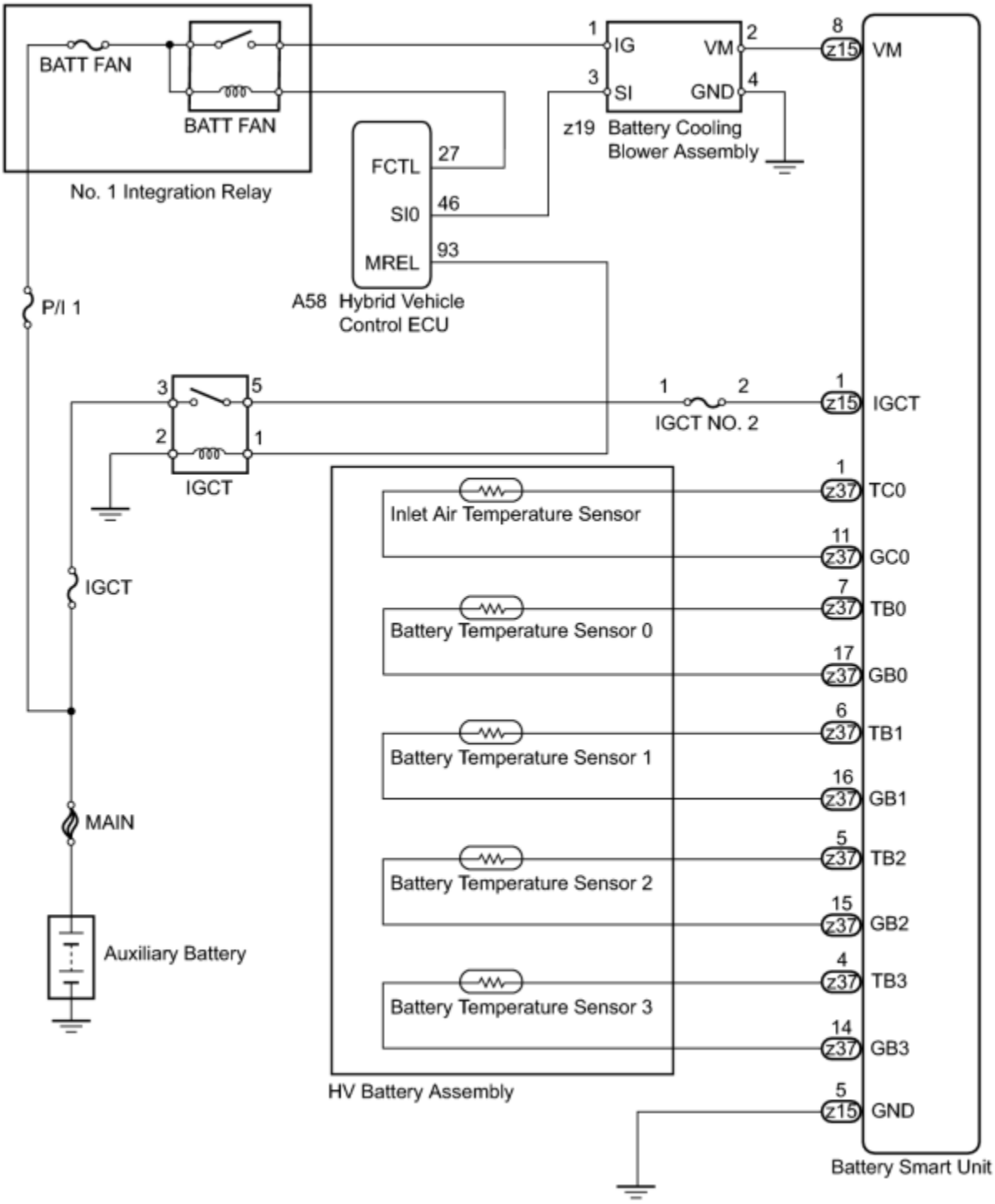
DTC	P0A85-123	Hybrid Battery Pack Cooling Fan 1

DESCRIPTION

Refer to the circuit description for DTC P0A84-123 INFO.

DTC No.	DTC Detection Condition	Trouble Area
P0A85-123	When the output voltage of the battery cooling blower assembly (VM) is too high compared to the target control voltage range (1 trip detection)	• Wire harness or connector • Battery cooling blower assembly • Battery smart unit • HV battery assembly

WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals.

  HINT:

  Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (DTC P0A1F-123 IS OUTPUT) INFO

B GO TO DTC CHART

A

2.	CHECK HARNESS AND CONNECTOR (VOLTAGE)

CAUTION:

Be sure to wear insulated gloves.

(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(c) Remove the No. 4 HV battery intake duct.

(d) Connect the cable to the negative (-) battery terminal.

(e) Connect the Techstream to the DLC3.

(f) Turn the power switch on (IG).

NOTICE:

- After removing the service plug grip, do not turn the power switch on (READY), unless

instructed by the repair manual because this may cause a malfunction.

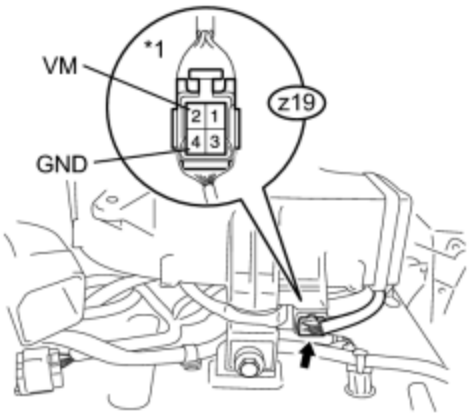
- If the power switch is turned on (IG) with the service plug grip removed, DTCs will be stored. If DTCs are output, clear the DTCs using the Techstream.

(g) Enter the following menus: Powertrain / Hybrid Control / Active Test / Driving the Battery Cooling Fan.

HINT:

Check "Cooling Fan Mode1" in the Data List using the Techstream. If the "Cooling Fan Mode1" is 40, it is not necessary to perform the Active Test.

(h) Select each air volume mode (1 to 6) in the "Driving the Battery Cooling Fan" Active Test to operate the battery cooling blower assembly.



(i) Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Condition	Specified Condition
z19-2 (VM) - z19-4 (GND)	Battery cooling blower is operating	5 V or less

Text in Illustration	
*1	Component with harness connected (Battery Cooling Blower Assembly)

HINT:

Measure the voltage on the wire side of the connector that is part of the battery cooling blower.

(j) Turn the power switch off.

(k) Install the No. 4 HV battery intake duct.

NG ▶ CHECK HARNESS AND CONNECTOR (VOLTAGE)

OK ▼

3.	CHECK HV BATTERY ASSEMBLY (BATTERY TEMPERATURE SENSOR AND INLET AIR TEMPERATURE SENSOR)

CAUTION:

Be sure to wear insulated gloves.

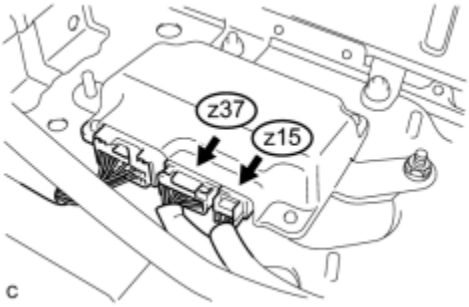
(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

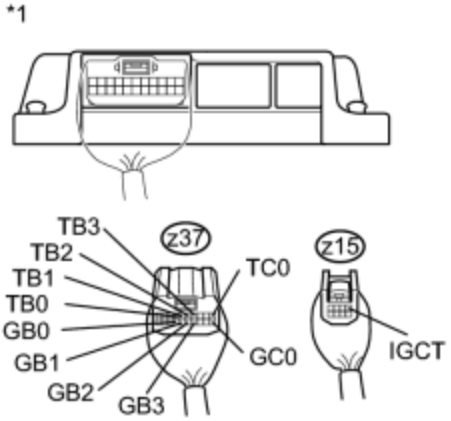
(c) Remove the hybrid battery junction block assembly INFO.



(d) Disconnect the z15 and z37 connectors from the battery smart unit.

(e) Measure the resistance according to the value(s) in the table below.

Standard Resistance:



Tester Connection	Switch Condition	Specified Condition
z37-7 (TB0) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-17 (GB0) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-6 (TB1) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-16 (GB1) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-5 (TB2) - z15-1 (IGCT)	Power switch off	10 kΩ or higher

z37-15 (GB2) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-4 (TB3) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-14 (GB3) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-1 (TC0) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-11 (GC0) - z15-1 (IGCT)	Power switch off	10 kΩ or higher

Text in Illustration *1	Rear view of wire harness connector (to Battery Smart Unit)

(f) Connect the z15 and z37 connectors to the battery smart unit.

(g) Install the hybrid battery junction block assembly INFO.

(h) Connect the cable to the negative (-) battery terminal.

NG ▶ CHECK HARNESS AND CONNECTOR (INLET AIR TEMPERATURE SENSOR AND BATTERY TEMPERATURE SENSOR)

OK ▶ **REPLACE BATTERY SMART UNIT**

4.	CHECK HARNESS AND CONNECTOR (INLET AIR TEMPERATURE SENSOR AND BATTERY TEMPERATURE SENSOR)

CAUTION:

Be sure to wear insulated gloves.

(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(c) Remove the hybrid battery junction block assembly INFO.

(d) Check the wire harness and connectors of the battery temperature sensor and inlet air temperature sensor for abnormalities by sight and touch.

Specified Condition:

There are no open or short circuits in the wire harness and connectors. There are no short circuits to other wire harnesses.

HINT:

- Only check the wire harnesses and connectors that are visible on the outside of the battery cover.
- Do not manipulate or check the sensors in the battery.

(e) Install the hybrid battery junction block assembly INFO.

(f) Connect the cable to the negative (-) battery terminal.

NG ▶ REPAIR HARNESS OR CONNECTOR
OK ▶ **REPLACE HV BATTERY ASSEMBLY**

5.	CHECK HARNESS AND CONNECTOR (VOLTAGE)

CAUTION:

Be sure to wear insulated gloves.

(a) Disconnect the cable from the negative (-) battery terminal.

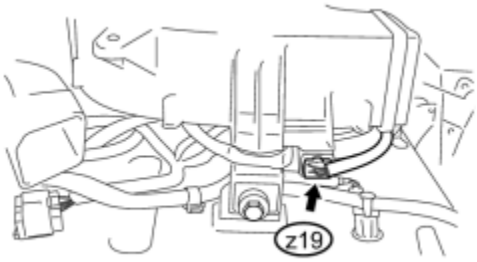
(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(c) Remove the No. 4 HV battery intake duct.

(d) Disconnect the z19 connector of the battery cooling blower assembly.



C

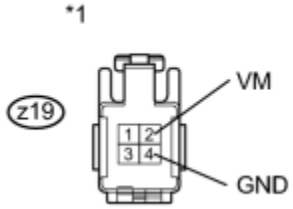
(e) Connect the cable to the negative (-) battery terminal.

(f) Turn the power switch on (IG).

(g) Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
z19-2 (VM) - z19-4 (GND)	Power switch on (IG)	5 V or less



Text in Illustration	
*1	Front view of wire harness connector (to Battery Cooling Blower Assembly)

NOTICE:

If the power switch is turned on (IG) with the battery cooling blower assembly connector removed, DTCs will be stored. If DTCs are output, clear the DTCs using the Techstream.

(h) Connect the z19 connector of the battery cooling blower assembly.

(i) Install the No. 4 HV battery intake duct.

NG ▶ CHECK HARNESS AND CONNECTOR (BATTERY COOLING BLOWER ASSEMBLY - BATTERY SMART UNIT)

OK ▶ **REPLACE BATTERY COOLING BLOWER ASSEMBLY**

6.	CHECK HARNESS AND CONNECTOR (BATTERY COOLING BLOWER

	ASSEMBLY - BATTERY SMART UNIT)

CAUTION:

Be sure to wear insulated gloves.

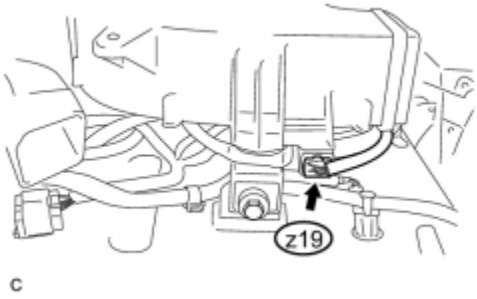
(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

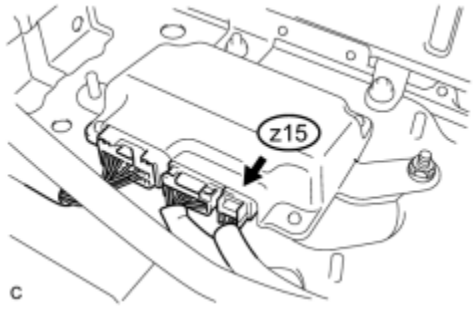
After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(c) Remove the No. 4 HV battery intake duct.



(d) Disconnect the z19 connector of the battery cooling blower assembly.

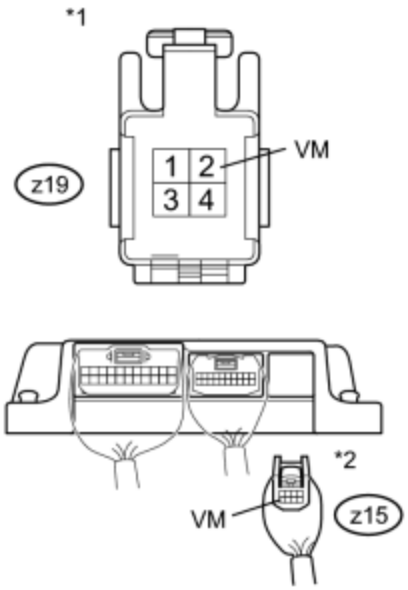
(e) Remove the hybrid battery junction block assembly INFO.



(f) Disconnect the z15 connector of the battery smart unit.

(g) Measure the resistance according to the value(s) in the table below.

Standard Resistance:



Tester Connection	Switch Condition	Specified Condition
z19-2 (VM) and z15-8 (VM) - Other terminal	Power switch off	10 kΩ or higher

Text in Illustration	
*1	Front view of wire harness connector (to Battery Cooling Blower Assembly)
*2	Rear view of wire harness connector (to Battery Smart Unit)

(h) Connect the z15 connector of the battery smart unit.

(i) Install the hybrid battery junction block assembly INFO.

(j) Connect the z19 connector of the battery cooling blower assembly.

(k) Install the No. 4 HV battery intake duct.

(l) Connect the cable to the negative (-) battery terminal.

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR
OK ▶ **REPLACE BATTERY SMART UNIT**

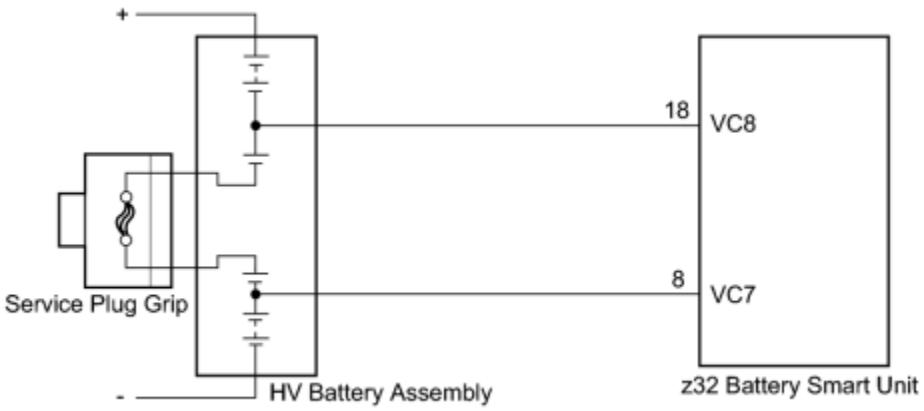
Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM00000259T00YX
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM: P0A95-123: High Voltage Fuse (2010 HS250H)		

DTC	P0A95-123	High Voltage Fuse

DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0A95-123	Voltage between VC7 and VC8 terminals is below the standard despite the interlock switch being engaged (1 trip detection)	• Service plug grip • HV battery assembly

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

accidentally reconnecting it while you are working on the high-voltage system.

- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals.

  HINT:

  At least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (DTC P0A1F-123 IS OUTPUT) INFO

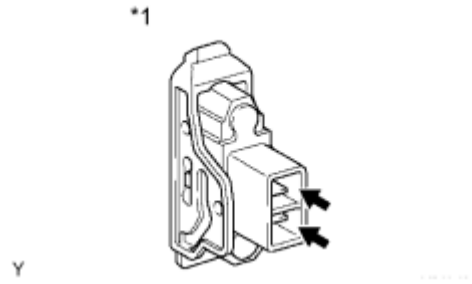
B ▶ GO TO DTC CHART

A ▼

2.	CHECK SERVICE PLUG GRIP

(a) Turn the power switch off.

(b) Remove the service plug grip.



(c) Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Standard Resistance
Service plug grip	Below 1 Ω

Text in Illustration	
*1	Service Plug Grip

NG ▶ REPLACE SERVICE PLUG GRIP

OK ▶ **REPLACE HV BATTERY ASSEMBLY**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM0000025AJ00UX
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM: P0AAE-123,P0AAF-123: Hybrid Battery Pack Air Temperature Sensor "A" Circuit Low (2010 HS250H)		

DTC	P0AAE-123	Hybrid Battery Pack Air Temperature Sensor "A" Circuit Low
DTC	P0AAF-123	Hybrid Battery Pack Air Temperature Sensor "A" Circuit High

DESCRIPTION

- The inlet air temperature sensor (battery) is mounted on the HV battery. The resistance of the sensor varies in accordance with changes in the intake air temperature. The characteristics of the inlet air temperature sensor are the same as those of the battery temperature sensor INFO. The battery smart unit uses signals from the inlet air temperature sensor to control the air volume of the battery cooling blower assembly.

DTC No.	DTC Detection Condition	Trouble Area
P0AAE-123 P0AAF-123	When the temperature indicated by the inlet air temperature sensor is lower than a predetermined limit (open circuit) or is higher than a predetermined limit (short circuit)	• HV battery assembly • Battery smart unit • Wire harness or connector

HINT:

After confirming that DTC P0AAE-123 or P0AAF-123 is output, use the Techstream to check "Inhaling Air Temp" in the HV ECU data list.

Displayed Temperature	Malfunction
-45°C (-49°F) or less	Open or +B short circuit
95°C (203°F) or more	GND short

WIRING DIAGRAM

Refer to the wiring diagram for DTC P0A9D-123 INFO.

INSPECTION PROCEDURE

CAUTION:

- Before inspecting the high-voltage system, take safety precautions such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals.

  HINT:

  Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (DTC P0A1F-123 IS OUTPUT) INFO

B GO TO DTC CHART

A

2.	CHECK INSTALLATION OF INLET AIR TEMPERATURE SENSOR

CAUTION:

Be sure to wear insulated gloves and protective goggles.

(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

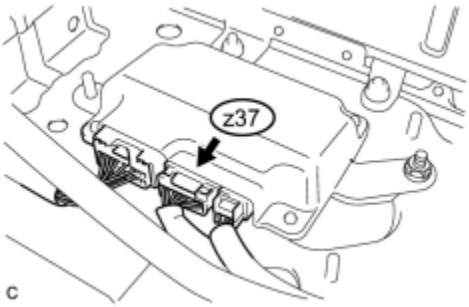
NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(c) Remove the hybrid battery junction block assembly INFO.

(d) Check installation of the inlet air temperature sensor

(1) Check the connection of the z37 connector of the



battery smart unit.

OK:

The connector is connected securely and there are no contact problems.

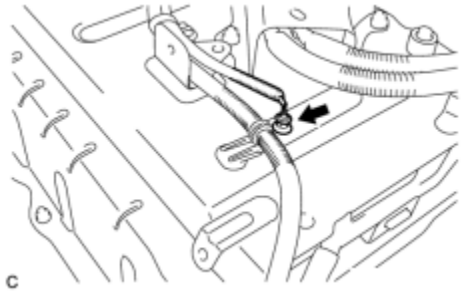
Result:

Result	Proceed to
NG	B
OK	Go to next step

(2) Visually check the installation condition of the inlet air temperature sensor.

OK:

The inlet air temperature sensor is installed in the correct location and its claws are engaged securely.



Result:

Result	Proceed to
The inlet air temperature sensor is installed in the correct location and its claws are engaged securely	A
Claws are damaged.	C
Inlet air temperature sensor is not installed correctly, but claws are not damaged.	D

(e) Install the hybrid battery junction block assembly INFO.

(f) Connect the cable to the negative (-) battery terminal.

D ▶ INSTALL PARTS CORRECTLY
C ▶ REPLACE HV BATTERY ASSEMBLY
B ▶ CONNECT SECURELY
A ▼

3.	CHECK HV BATTERY ASSEMBLY (INLET AIR TEMPERATURE SENSOR AND

	BATTERY TEMPERATURE SENSOR)

CAUTION:

Be sure to wear insulated gloves.

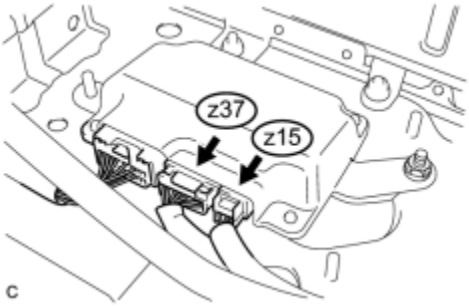
(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

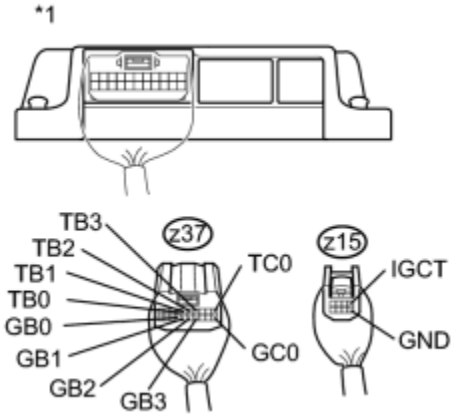
(c) Remove the hybrid battery junction block assembly INFO.



(d) Disconnect the z15 and z37 connectors from the battery smart unit.

(e) Measure the resistance according to the value(s) in the table below.

Standard Resistance:



Tester Connection	Condition	Specified Condition
z37-1 (TC0) - z37-11 (GC0)	0°C (32°F)	26.7 to 27.9 kΩ
	25°C (77°F)	9.9 to 10.1 kΩ
	40°C (104°F)	5.7 to 6.0 kΩ

Text in Illustration	
*1	Rear view of wire harness connector (to Battery Smart Unit)

(f) Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
z37-1 (TC0) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-1 (TC0) - z15-5 (GND)	Power switch off	10 kΩ or higher
z37-11 (GC0) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-11 (GC0) - z15-5 (GND)	Power switch off	10 kΩ or higher

(g) Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
z37-7 (TB0) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-7 (TB0) - z15-5 (GND)	Power switch off	10 kΩ or higher
z37-17 (GB0) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-17 (GB0) - z15-5 (GND)	Power switch off	10 kΩ or higher
z37-6 (TB1) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-6 (TB1) - z15-5 (GND)	Power switch off	10 kΩ or higher
z37-16 (GB1) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-16 (GB1) - z15-5 (GND)	Power switch off	10 kΩ or higher
z37-5 (TB2) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-5 (TB2) - z15-5 (GND)	Power switch off	10 kΩ or higher
z37-15 (GB2) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-15 (GB2) - z15-5 (GND)	Power switch off	10 kΩ or higher
z37-4 (TB3) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-4 (TB3) - z15-5 (GND)	Power switch off	10 kΩ or higher
z37-14 (GB3) - z15-1 (IGCT)	Power switch off	10 kΩ or higher
z37-14 (GB3) - z15-5 (GND)	Power switch off	10 kΩ or higher

(h) Connect the z15 and z37 connectors to the battery smart unit.

(i) Install the hybrid battery junction block assembly INFO.

(j) Connect the cable to the negative (-) battery terminal.

NG ▶ CHECK HARNESS AND CONNECTOR (INLET AIR TEMPERATURE SENSOR AND BATTERY TEMPERATURE SENSOR)

OK ▶ **REPLACE BATTERY SMART UNIT**

4.	CHECK HARNESS AND CONNECTOR (INLET AIR TEMPERATURE SENSOR AND BATTERY TEMPERATURE SENSOR) INFO

NG ▶ REPAIR HARNESS OR CONNECTOR

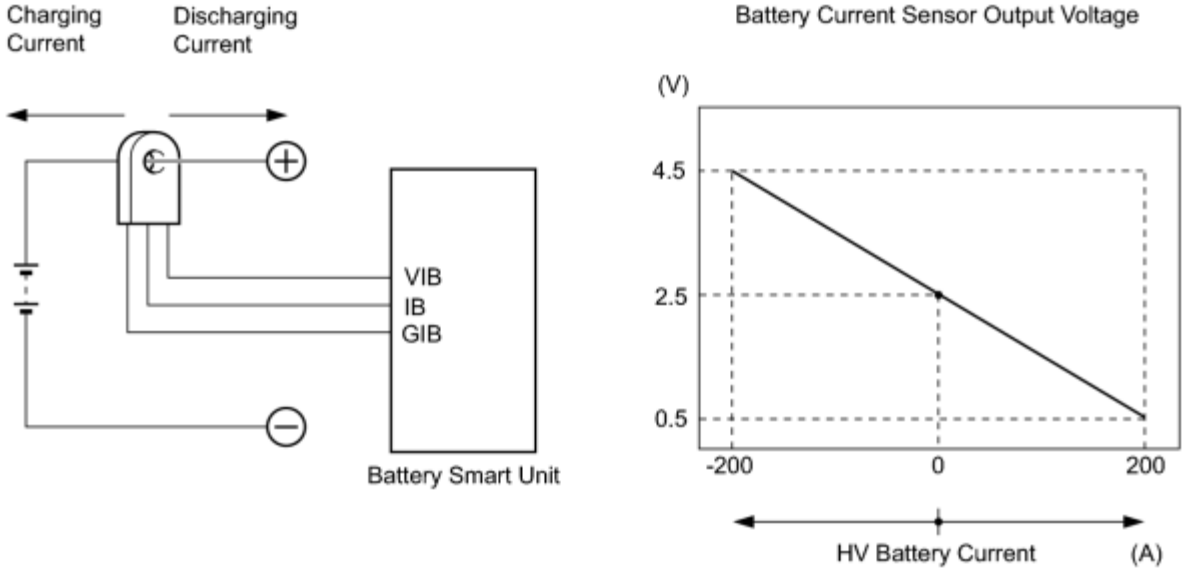
OK ▶ **REPLACE HV BATTERY ASSEMBLY**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM00000259V00YX
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM: P0ABF-123,P0AC1-123,P0AC2-123: Hybrid Battery Pack Current Sensor Circuit (2010 HS250H)		

DTC	P0ABF-123	Hybrid Battery Pack Current Sensor Circuit
DTC	P0AC1-123	Hybrid Battery Pack Current Sensor "A" Circuit Low
DTC	P0AC2-123	Hybrid Battery Pack Current Sensor "A" Circuit High

DESCRIPTION

- The battery current sensor, which is mounted on the positive cable side of the HV battery assembly, detects the amperage that flows into the HV battery. The battery smart unit inputs a voltage, which varies between 0 and 5 V in proportion to the amperage, into the IB terminal from the battery current sensor. An output voltage of the battery current sensor below 2.5 V indicates that the HV battery is being discharged, and above 2.5 V indicates that the HV battery is being charged. The hybrid vehicle control ECU determines the charging and discharging amperage of the HV battery based on the signals that are input to its IB terminal from the battery smart unit, and calculates the SOC (state of charge) of the HV battery through the accumulated amperage.



DTC No.	DTC Detection Condition	Trouble Area
P0ABF-	When the battery current sensor is abnormal (1 trip detection)	• Hybrid battery junction block assembly

123 P0AC1-123 P0AC2-123		• Battery smart unit • Wire harness or connector

MONITOR DESCRIPTION

If the battery smart unit detects a malfunction in the battery current sensor, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0ABF (INF 123): Hybrid Battery Pack Current Sensor "A" Circuit P0AC1 (INF 123): Hybrid Battery Pack Current Sensor "A" Circuit Low P0AC2 (INF 123): Hybrid Battery Pack Current Sensor "A" Circuit High
Required sensors / components	Battery current sensor
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	TMC's intellectual property
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

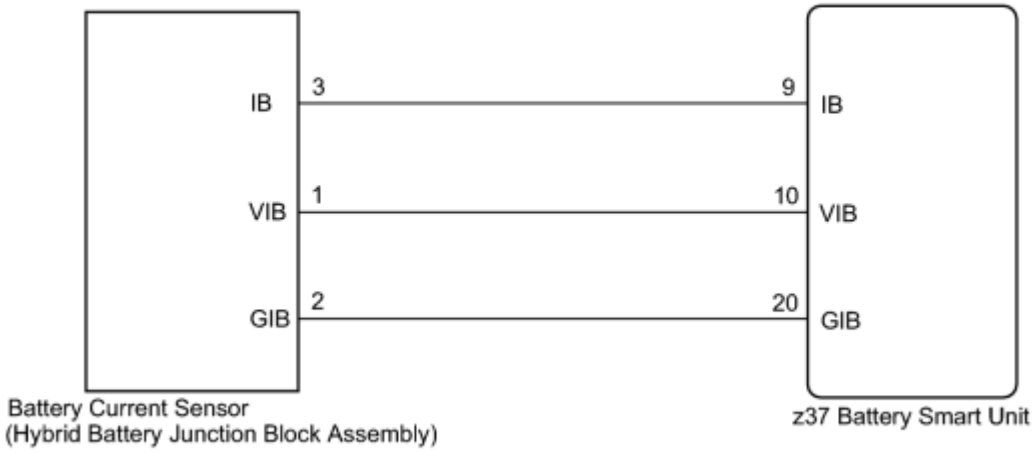
TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Battery smart unit	DTC P0ABF (INF 123) is not detected DTC P0AC1 (INF 123) is not detected DTC P0AC2 (INF 123) is not detected

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 accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals.

HINT:

At least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (DTC P0A1F-123 IS OUTPUT) INFO

B GO TO DTC CHART

A

2.	CHECK HARNESS AND CONNECTOR (HYBRID BATTERY JUNCTION BLOCK ASSEMBLY - BATTERY SMART UNIT)

NOTICE:

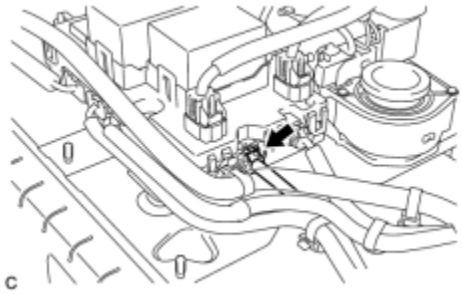
Be sure to wear insulated gloves.

(a) Disconnect the cable from the negative (-) battery terminal.

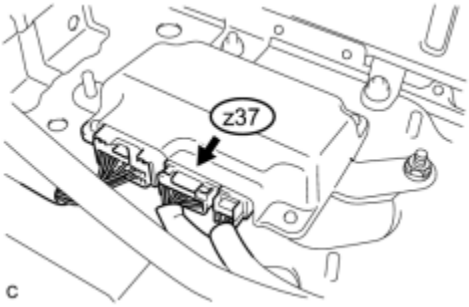
(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.



(c) Disconnect the battery current sensor connector from the hybrid battery junction block assembly.

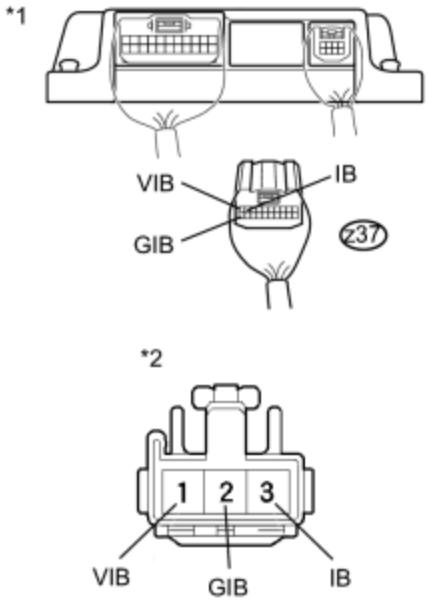


(d) Disconnect only the z37 connector of the battery smart unit.

(e) Measure the resistance according to the value(s) in the tables below.

Standard Resistance (Check for Open):

Tester Connection	Switch Condition	Specified Condition
z37-9 (IB) - 3 (IB)	Power switch off	Below 1 Ω
z37-20 (GIB) - 2 (GIB)	Power switch off	Below 1 Ω
z37-10 (VIB) - 1 (VIB)	Power switch off	Below 1 Ω



Standard Resistance (Check for Short):

Tester Connection	Switch Condition	Specified Condition
z37-9 (IB) or 3 (IB) - Body ground and other terminals	Power switch off	10 kΩ or higher
z37-20 (GIB) or 2 (GIB) - Body ground and other terminals	Power switch off	10 kΩ or higher
z37-10 (VIB) or 1 (VIB) - Body ground and other terminals	Power switch off	10 kΩ or higher

Text in Illustration	
*1	Rear view of wire harness connector (to Battery Smart Unit)
*2	Front view of wire harness connector (to Hybrid Battery Junction Block Assembly)

(f) Connect the z37 connector to the battery smart unit.

(g) Connect the battery current sensor connector to the hybrid battery junction block assembly.

(h) Connect the cable to the negative (-) battery terminal.

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

3.	CHECK BATTERY SMART UNIT (VIB VOLTAGE)

NOTICE:

Be sure to wear insulated gloves.

(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(c) Remove the hybrid battery junction block assembly INFO.

(d) Connect the cable to the negative (-) battery terminal.

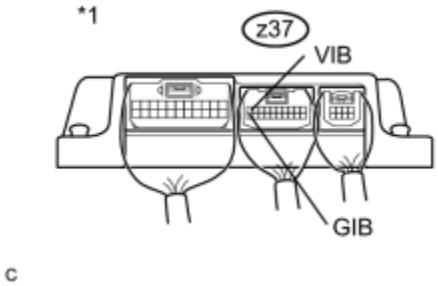
(e) Turn the power switch on (IG).

NOTICE:

If the power switch is turned on (IG) with the service plug grip removed, DTCs will be stored. If DTCs are output, clear the DTCs using the Techstream

(f) Measure the voltage according to the value(s) in the table below.

Standard Voltage:



Tester Connection	Switch Condition	Specified Condition
z37-10 (VIB) - z37-20 (GIB)	Power switch on (IG)	4.6 to 5.4 V

Text in Illustration	
*1	Component with harness connected (Battery Smart Unit)

(g) Turn the power switch off.

(h) Disconnect the cable from the negative (-) battery terminal.

(i) Install the hybrid battery junction block assembly INFO.

(j) Connect the cable to the negative (-) battery terminal.

NG ▶ REPLACE BATTERY SMART UNIT

OK ▼

4.	CHECK BATTERY SMART UNIT

CAUTION:

Be sure to wear insulated gloves.

(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(c) Remove the hybrid battery junction block assembly INFO.

(d) Connect the cable to the negative (-) battery terminal.

(e) Turn the power switch on (IG).

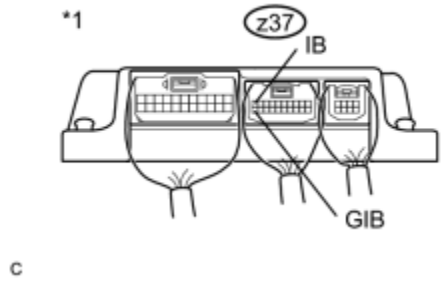
NOTICE:

If the power switch is turned on (IG) with the service plug grip removed, DTCs will be stored. If DTCs are output, clear the DTCs using the Techstream

(f) Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Switch	Specified



	Condition	Condition
z37-9 (IB) - z37-20 (GIB)	Power switch on (IG)	2.46 to 2.54 V

Text in Illustration	
*1	Component with harness connected (Battery Smart Unit)

(g) Turn the power switch off.

(h) Disconnect the cable from the negative (-) battery terminal.

(i) Install the hybrid battery junction block assembly INFO.

(j) Connect the cable to the negative (-) battery terminal.

NG ▶ REPLACE HYBRID BATTERY JUNCTION BLOCK ASSEMBLY
OK ▶ **REPLACE BATTERY SMART UNIT**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM00000259W00YX
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM: P0AC0-123: Hybrid Battery Pack Current Sensor Circuit Range / Performance (2010 HS250H)		

DTC	P0AC0-123	Hybrid Battery Pack Current Sensor Circuit Range / Performance

DESCRIPTION

Refer to the Description for DTC P0ABF-123 INFO.

DTC No.	DTC Detection Condition	Trouble Area
P0AC0-123	When the battery current sensor is abnormal (1 or 2 trip detection)	• Hybrid battery junction block assembly • Battery smart unit

MONITOR DESCRIPTION

If the battery smart unit detects a malfunction in the battery current sensor, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0AC0 (INF 123): Hybrid Battery Pack Current Sensor "A" Circuit Range/Performance
Required sensors / components	Battery current sensor
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	TMC's intellectual property
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Battery smart unit	P0AC0 (INF 123) is not detected

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 accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals.

  HINT:

  At least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (DTC P0A1F-123 IS OUTPUT) INFO

B ▶ GO TO DTC CHART

A ▼

2.	REPLACE HYBRID BATTERY JUNCTION BLOCK ASSEMBLY

(a) Replace the hybrid battery junction block assembly INFO.

NEXT ▼

3.	CLEAR DTC (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Clear the DTCs and freeze frame data.

(e) Perform a road test to charge and discharge the HV battery assembly.

HINT:

2 trip detection logic is used. After the first road test, turn the power switch off and perform a road test again.

(f) Disconnect the Techstream from the DLC3.

NEXT

4.	RECONFIRM DTC OUTPUT (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Read output DTCs.

Result

Result	Proceed to
DTCs P0AC0-123 is not output.	A
DTCs P0AC0-123 is output.	B

(e) Disconnect the Techstream from the DLC3.

B REPLACE BATTERY SMART UNIT

A **RECOVERY TO NORMAL**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM00000259Z00ZX
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM: P0B3D-123,P0B42-123,P0B47-123,P0B4C-123,P0B51-123,P0B56-123,P0B5B-123,P0B60-123,P0B65-123,P0B6A-123,P0B6F-123,P0B74-123,P0B79-123,P0B7E-123,P0B83-123,P0B88-123,P0B8D-123,P0B92-123,P308A-123: Hybrid Battery Voltage Sensor "A" Circuit Low (2010 HS250H)		

DTC	P0B3D-123	Hybrid Battery Voltage Sensor "A" Circuit Low
DTC	P0B42-123	Hybrid Battery Voltage Sensor "B" Circuit Low
DTC	P0B47-123	Hybrid Battery Voltage Sensor "C" Circuit Low
DTC	P0B4C-123	Hybrid Battery Voltage Sensor "D" Circuit Low
DTC	P0B51-123	Hybrid Battery Voltage Sensor "E" Circuit Low
DTC	P0B56-123	Hybrid Battery Voltage Sensor "F" Circuit Low
DTC	P0B5B-123	Hybrid Battery Voltage Sensor "G" Circuit Low
DTC	P0B60-123	Hybrid Battery Voltage Sensor "H" Circuit Low
DTC	P0B65-123	Hybrid Battery Voltage Sensor "I" Circuit Low
DTC	P0B6A-123	Hybrid Battery Voltage Sensor "J" Circuit Low
DTC	P0B6F-123	Hybrid Battery Voltage Sensor "K" Circuit Low
DTC	P0B74-123	Hybrid Battery Voltage Sensor "L" Circuit Low
DTC	P0B79-123	Hybrid Battery Voltage Sensor "M" Circuit Low
DTC	P0B7E-123	Hybrid Battery Voltage Sensor "N" Circuit Low
DTC	P0B83-123	Hybrid Battery Voltage Sensor "O" Circuit Low

DTC	P0B88-123	Hybrid Battery Voltage Sensor "P" Circuit Low
DTC	P0B8D-123	Hybrid Battery Voltage Sensor "Q" Circuit Low
DTC	P0B92-123	Hybrid Battery Voltage Sensor "R" Circuit Low
DTC	P308A-123	Hybrid Battery Voltage Sensor All Circuits Low

DESCRIPTION

- Refer to the description for DTC P0A80-123 INFO.

DTC No.	DTC Detection Condition	Trouble Area
P0B3D-123 P0B42-123 P0B47-123 P0B4C-123 P0B51-123 P0B56-123 P0B5B-123 P0B60-123 P0B65-123 P0B6A-	Each battery block voltage becomes less than 2.5 V (open) (1 trip detection)	• Battery smart unit • HV battery assembly

123 P0B6F-123 P0B74-123 P0B79-123 P0B7E-123 P0B83-123 P0B88-123 P0B8D-123 P0B92-123 P308A-123		

HINT:

- Values smaller than 2.0 V may not be shown in the Data List because a fail-safe value is substituted.
- Hybrid battery voltage sensor in the DTC titles refers to the battery smart unit.

MONITOR DESCRIPTION

If the battery smart unit detects a voltage drop in a battery module, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0B3D (INF 123): Hybrid Battery Voltage Sense "A" Circuit

	Low P0B42 (INF 123): Hybrid Battery Voltage Sense "B" Circuit Low P0B47 (INF 123): Hybrid Battery Voltage Sense "C" Circuit Low P0B4C (INF 123): Hybrid Battery Voltage Sense "D" Circuit Low P0B51 (INF 123): Hybrid Battery Voltage Sense "E" Circuit Low P0B56 (INF 123): Hybrid Battery Voltage Sense "F" Circuit Low P0B5B (INF 123): Hybrid Battery Voltage Sense "G" Circuit Low P0B60 (INF 123): Hybrid Battery Voltage Sense "H" Circuit Low P0B65 (INF 123): Hybrid Battery Voltage Sense "I" Circuit Low P0B6A (INF 123): Hybrid Battery Voltage Sense "J" Circuit Low P0B6F (INF 123): Hybrid Battery Voltage Sense "K" Circuit Low P0B74 (INF 123): Hybrid Battery Voltage Sense "L" Circuit Low P0B79 (INF 123): Hybrid Battery Voltage Sense "M" Circuit Low P0B7E (INF 123): Hybrid Battery Voltage Sense "N" Circuit Low P0B83 (INF 123): Hybrid Battery Voltage Sense "O" Circuit Low P0B88 (INF 123): Hybrid Battery Voltage Sense "P" Circuit

	Low P0B8D (INF 123): Hybrid Battery Voltage Sense "Q" Circuit Low P0B92 (INF 123): Hybrid Battery Voltage Sense "R" Circuit Low P308A (INF 123): Hybrid Battery Voltage Sense All Circuits Low
Required sensors / components	Battery smart unit
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	TMC's intellectual property
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Battery smart unit	DTC P0B3D (INF 123) / P0B42 (INF 123) / P0B47 (INF 123) / P0B4C (INF 123) / P0B51 (INF 123) / P0B56 (INF 123) / P0B5B (INF 123) / P0B60 (INF 123) / P0B65 (INF 123) / P0B6A (INF 123) / P0B6F (INF 123) / P0B74 (INF 123) / P0B79 (INF 123) / P0B7E (INF 123) / P0B83 (INF 123) / P0B88 (INF 123) / P0B8D (INF 123) / P0B92 (INF 123) / P308A (INF 123) is not detected

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 accidentally reconnecting it while you are working on the high-voltage system.

- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals.

  HINT:

  At least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK DTC OUTPUT (DTC P0A1F-123 IS OUTPUT) INFO

B ▶ GO TO DTC CHART

A ▼

2.	CHECK CONNECTOR CONNECTION CONDITION

CAUTION:

Be sure to wear insulated gloves.

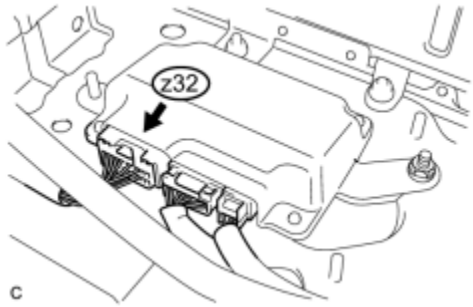
(a) Disconnect the cable from the negative (-) battery terminal.

(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(c) Remove the hybrid battery junction block assembly INFO.



(d) Check the connection of the z32 connector of the battery smart unit.

OK:

The connector is connected securely and there are no contact problems.

(e) Install the hybrid battery junction block assembly INFO.

(f) Connect the cable to the negative (-) battery terminal.

NG ▶ CONNECT SECURELY

OK ▼

3.	REPLACE BATTERY SMART UNIT

(a) Replace the battery smart unit INFO.

NEXT ▼

4.	CLEAR DTC (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Clear the DTCs and freeze frame data.

(e) Perform a road test to charge and discharge the HV battery assembly.

(f) Disconnect the Techstream from the DLC3.

NEXT ▼

5.	RECONFIRM DTC OUTPUT (HV)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.

(d) Read output DTCs.

Result

Result	Proceed to

Hybrid battery voltage sensor DTCs for this diagnostic procedure are not output	A
Hybrid battery voltage sensor DTCs for this diagnostic procedure are output	B

(e) Disconnect the Techstream from the DLC3.

B REPLACE HV BATTERY ASSEMBLY

A **RETURN TO NORMAL OPERATION**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM00000259X00VX
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM: P3011-123-P3019-123,P3020-123-P3027-123: Battery Block 1 Becomes Weak (2010 HS250H)		

DTC	P3011-123	Battery Block 1 Becomes Weak
DTC	P3012-123	Battery Block 2 Becomes Weak
DTC	P3013-123	Battery Block 3 Becomes Weak
DTC	P3014-123	Battery Block 4 Becomes Weak
DTC	P3015-123	Battery Block 5 Becomes Weak
DTC	P3016-123	Battery Block 6 Becomes Weak
DTC	P3017-123	Battery Block 7 Becomes Weak
DTC	P3018-123	Battery Block 8 Becomes Weak
DTC	P3019-123	Battery Block 9 Becomes Weak
DTC	P3020-123	Battery Block 10 Becomes Weak
DTC	P3021-123	Battery Block 11 Becomes Weak
DTC	P3022-123	Battery Block 12 Becomes Weak
DTC	P3023-123	Battery Block 13 Becomes Weak
DTC	P3024-123	Battery Block 14 Becomes Weak
DTC	P3025-123	Battery Block 15 Becomes Weak
DTC	P3026-123	Battery Block 16 Becomes Weak

DTC	P3027-123	Battery Block 17 Becomes Weak

DESCRIPTION

- Refer to the Description for DTC P0A9C-123 INFO.

DTC No.	DTC Detection Condition	Trouble Area
P3011-123 P3012-123 P3013-123 P3014-123 P3015-123 P3016-123 P3017-123 P3018-123 P3019-123 P3020-123 P3021-123 P3022-123	Presence of a malfunctioning block is determined based on each battery block voltage (1 trip detection).	• HV battery assembly • Battery smart unit

P3023-123 P3024-123 P3025-123 P3026-123 P3027-123		

HINT:

P3011-123 and P3027-123 will not be set unless the vehicle is driven for approximately 10 minutes after clearing the DTCs.

MONITOR DESCRIPTION

If there is an abnormal internal resistance or voltage in the battery blocks, the battery smart unit determines that a malfunction has occurred. When the malfunction detection condition is satisfied, the hybrid vehicle control ECU will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P3011 to P3027 (INF 123): Battery Block 1 becomes weak - Battery Block 17 becomes weak
Required sensors / components	HV battery
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	TMC's intellectual property
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Battery smart unit	DTC P3011 (INF 123) to P3027 (INF 123) is not detected

INSPECTION PROCEDURE

PROCEDURE

1.	CHECK DTC OUTPUT (DTC P0A1F-123 IS OUTPUT) INFO

B GO TO DTC CHART

A

2.	CHECK BATTERY SMART UNIT INFO

B REPLACE HV BATTERY ASSEMBLY

A **REPLACE BATTERY SMART UNIT**

Last Modified: 10-5-2010	6.4 C	**From:** 200907
Model Year: 2010	**Model:** HS250H	**Doc ID:** RM0000025QE011X
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM: U029A-123: Lost Communication with Hybrid Battery Pack Sensor Module (2010 HS250H)		

DTC	U029A-123	Lost Communication with Hybrid Battery Pack Sensor Module

DESCRIPTION

The battery smart unit detects the HV battery conditions (voltage, current, and temperature) and the battery cooling fan voltage, and sends the detected signals to the hybrid vehicle control ECU via the serial communication system.

DTC No.	DTC Detection Condition	Trouble Area
U029A-123	Problem in serial communication between the battery smart unit and hybrid vehicle control ECU (1 trip detection)	• Wire harness or connector • Hybrid vehicle control ECU • Battery smart unit • IGCT fuse • IGCT NO. 2 fuse • IGCT relay

MONITOR DESCRIPTION

If a malfunction in communication line between the battery smart unit and hybrid vehicle control ECU is detected, the hybrid vehicle control ECU illuminates the MIL and sets a DTC.

MONITOR STRATEGY

Related DTCs	U029A (INF 123): Battery smart unit Communication Malfunction
Required sensors / components	Main: Battery smart unit Sub: Communication line
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	1 driving cycle

Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Battery smart unit	DTC U029A (INF 123) is not detected

WIRING DIAGRAM

Refer to the wiring diagram for DTC P0A1F-123 INFO.

INSPECTION PROCEDURE

CAUTION:

- If the battery cover is removed, install it before turning the power switch on (IG) or (READY). If the power switch is turned on (IG) or (READY) with the battery cover removed, U029A-123 may be set.
- 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 accidentally reconnecting it while you are working on the high-voltage system.
- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals.

  HINT:

  At least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

PROCEDURE

1.	CHECK HARNESS AND CONNECTOR (IGCT VOLTAGE) INFO

NG ▶ CHECK FUSE (IGCT, IGCT NO. 2)

OK ▼

2.	CHECK HARNESS AND CONNECTOR (HYBRID VEHICLE CONTROL ECU - BATTERY SMART UNIT)

CAUTION:

Be sure to wear insulated gloves.

(a) Disconnect the cable from the negative (-) battery terminal.

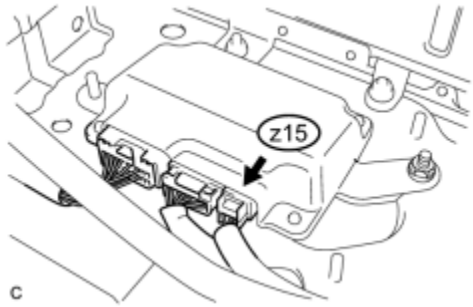
(b) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(c) Disconnect the A58 connector from the hybrid vehicle control ECU.

(d) Remove the hybrid battery junction block assembly INFO.

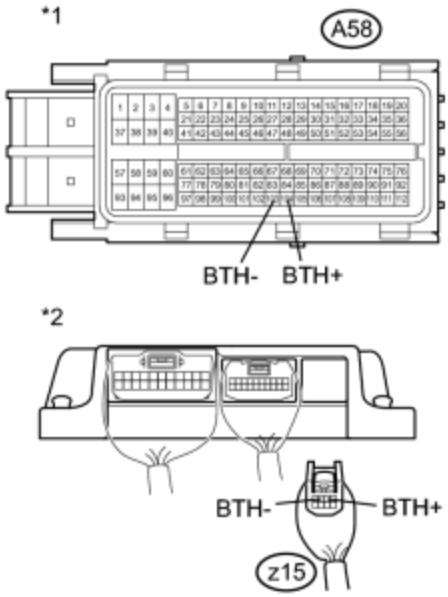


(e) Disconnect only the z15 connector of the battery smart unit.

(f) Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
A58-104 (BTH+) - z15-2 (BTH+)	Power switch off	Below 1 Ω



A58-103 (BTH-) - z15-3 (BTH-)	Power switch off	Below 1 Ω
A58-104 (BTH+) - Body ground and other terminals	Power switch off	10 kΩ or more
A58-103 (BTH-) - Body ground and other terminals	Power switch off	10 kΩ or more

Text in Illustration	
*1	Front view of wire harness connector (to Hybrid Vehicle Control ECU)
*2	Rear view of wire harness connector (to Battery Smart Unit)

(g) Connect the cable to the negative (-) battery terminal.

(h) Turn the power switch on (IG).

(i) Measure the voltage according to the value(s) in the table below.

NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
A58-104 (BTH+) - Body ground	Power switch on (IG)	Below 1 V
A58-103 (BTH-) - Body ground	Power switch on (IG)	Below 1 V

NOTICE:

- If the power switch is turned on (IG) with the service plug grip removed, DTCs will be stored. If DTCs are output, clear the DTCs using the Techstream
- If the power switch is turned on (IG) with the connector removed from the sensor, DTCs will be stored. If DTC are stored, clear the DTCs using the Techstream.

(j) Connect the z15 connector of the battery smart unit.

(k) Install the hybrid battery junction block assembly INFO.

(l) Connect the A58 connector to the hybrid vehicle control ECU.

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

3.	CHECK WAVEFORM

CAUTION:

Be sure to wear insulated gloves.

(a) Disconnect the cable from the negative (-) battery terminal.

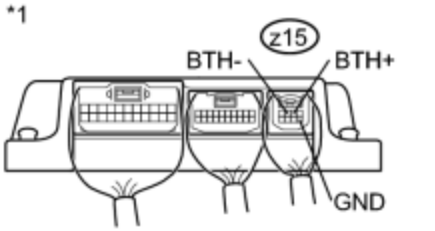
(b) Check that the service plug grip is not installed.

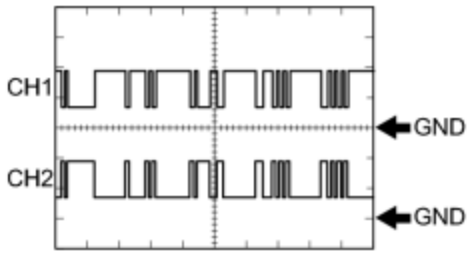
NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(c) Remove the hybrid battery junction block assembly INFO.

(d) Connect the cable to the negative (-) battery terminal.





(e) Connect an oscilloscope between the battery smart unit terminals specified in the table below, and measure the waveform.

Item	Content
Tester Connection	CH1: z15-2 (BTH+) - z15-5 (GND) CH2: z15-3 (BTH-) - z15-5 (GND)
Equipment Setting	2 V/DIV., 500 µs./DIV.
Condition	Power switch on (IG)

NOTICE:

- After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.
- If the power switch is turned on (IG) with the service plug grip removed, DTCs will be stored. If DTCs are output, clear the DTCs using the Techstream

Text in Illustration

*1	Component with harness connected (Battery Smart Unit)

(f) Turn the power switch off.

(g) Disconnect the cable from the negative (-) battery terminal.

(h) Install the hybrid battery junction block assembly INFO.

(i) Connect the cable to the negative (-) battery terminal.

NG ▶ REPLACE BATTERY SMART UNIT
OK ▶ **REPLACE HYBRID VEHICLE CONTROL ECU**

4.	CHECK FUSE (IGCT, IGCT NO. 2) INFO

NG ▶ REPLACE FUSE (IGCT, IGCT NO. 2)
OK ▼

5.	CHECK RELAY (IGCT) INFO

NG ▶ REPLACE RELAY (IGCT)
OK ▼

6.	CHECK HARNESS AND CONNECTOR (IGCT RELAY - BATTERY SMART UNIT) INFO

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR
OK ▶ **CHECK AND REPAIR POWER SOURCE CIRCUIT**