

CHECK FOR INTERMITTENT PROBLEMS

1. CHECK FOR INTERMITTENT PROBLEMS

- (a) Perform a simulation test (see page [01-37](#)).
 - (1) In the simulation test, reproduce the driving condition at the trouble occurrence according to the customer's comments and freeze frame data recorded with DTCs.
- (b) Check the connector(s) and terminal(s) (see page [01-47](#)).
- (c) Wiggle the harness and connector(s) (see page [01-47](#)).

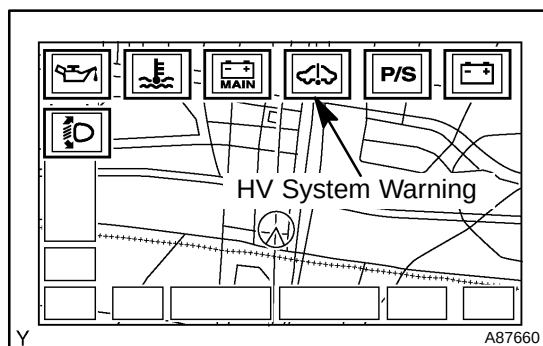
DEFINITION OF TERMS

1. Definition of terms

Each monitor description follows a standardized format using these terms:

Term	Definition
Duration	The minimum time that the battery ECU must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the "typical enabling conditions" are met
Frequency of operation	The number of times that the battery ECU checks for malfunction per driving cycle "Once per driving cycle" means that the battery ECU detects malfunction only one time during a single driving cycle "Continuous" means that the battery ECU detects malfunction every time when enabling condition is met
MIL operation	MIL illumination timing after a defect is detected "Immediately" means that the battery ECU illuminates the MIL the instant the battery ECU determines that there is malfunction "2 driving cycles" means that the battery ECU illuminates the MIL if the same malfunction is detected again in the 2nd driving cycle
Monitor description	Description of what the battery ECU monitors and how it detects malfunction (monitoring purpose and its details)
Related DTCs	A group of DTCs that is classified by a system and a troubleshooting procedure
Required sensor/components	The sensors and components that are used by the battery ECU to detect malfunction
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction While another sensor is being monitored, the next sensor or component will not be monitored until the previous monitoring has concluded
Typical enabling condition	Preconditions that allow the battery ECU to detect malfunction With all preconditions satisfied, the battery ECU sets the DTC when the monitored value(s) exceeds the malfunction threshold(s)
Typical malfunction thresholds	Beyond this value, the battery ECU will conclude that there is malfunction and set a DTC

DIAGNOSIS SYSTEM



1. DESCRIPTION

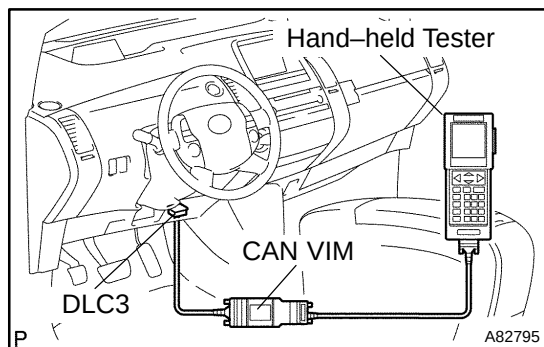
- The battery ECU has a self-diagnosis system. If the computer, the HV battery system or the components operate improperly, the ECU diagnoses improper operation to detect malfunction, and illuminates the master warning lamp in the combination meter together with the HV system warning indicator on the multi-information display.

HINT:

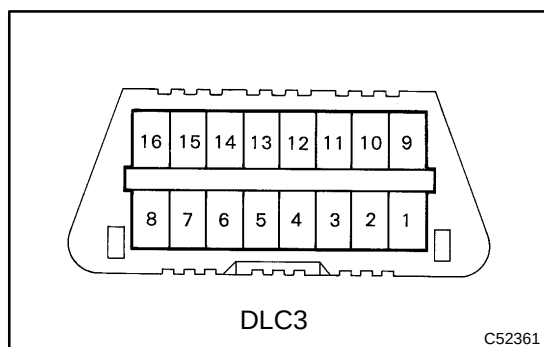
The master warning lamp illuminates when HV battery system fails and it blinks when in inspection mode.

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you need to connect the OBD II scan tool complying with SAE J1978 or the hand-held tester to the vehicle, and read various data output from the vehicle's ECUs.
- OBD II regulations require that the vehicle's on-board computer illuminates the Malfunction Indicator Lamp (MIL) in the instrument panel when the computer detects a malfunction in: 1) the emission control systems/components, or 2) the powertrain control components (which affect vehicle emissions), or 3) the computers. In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the battery ECU memory (see page 05-893).

If the malfunction does not recur in 3 consecutive trips, the MIL will go off automatically. However the DTCs remain recorded in the battery ECU memory.



- To check the DTCs, connect the hand-held tester to the Data Link Connector 3 (DLC3) with the CAN vehicle interface module (CAN VIM). Or, connect the OBD II scan tool to the DLC3. The hand-held tester or OBD II scan tool also enables you to erase DTCs and check the freeze frame data and various forms of the HV battery system data (for operating instructions, refer to their respective instruction manuals). The DTCs include SAE controlled codes and manufacturer controlled codes. SAE controlled codes must be set as prescribed by the SAE, while manufacturer controlled codes can be set by a manufacturer within the prescribed limits (see the DTC chart on page 05-893).
- Freeze frame data:
The freeze frame data records the driving condition when malfunction is detected. When troubleshooting, it can help determine if the vehicle was running, braked, stopped, or reversed.



2. CHECK DLC3

The battery ECU uses the ISO 9141-2 for communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 9141-2 format.

Symbol	Terminal No.	Name	Reference Terminal	Result	Condition
SIL	7	Bus "+" line	5 – Signal ground	Pulse generation	During transmission
CG	4	Chassis ground	Body ground	1 Ω or less	Always
SG	5	Signal ground	Body ground	1 Ω or less	Always
BAT	16	Battery positive	Body ground	11 to 14 V	Always
CANH	6	HIGH-level CAN bus line	14 – LOW-level CAN bus line	54 to 69 Ω	Power switch OFF
CANH	6	HIGH-level CAN bus line	16 – Battery positive	1 M Ω or higher	Power switch OFF
CANH	6	HIGH-level CAN bus line	4 – Chassis ground	1 k Ω or higher	Power switch OFF
CANL	14	LOW-level CAN bus line	16 – Battery positive	1 M Ω or higher	Power switch OFF
CANL	14	LOW-level CAN bus line	4 – Chassis ground	1 k Ω or higher	Power switch OFF

HINT:

If the display shows UNABLE TO CONNECT TO VEHICLE when you have connected the cable of the hand-held tester or the OBD II scan tool to the DLC3, turned the power switch ON and operated the tester, there is a problem on the vehicle side or tester side.

- If the communication is normal when the tester or scan tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If the communication is still impossible when the tester or scan tool is connected to another vehicle, the problem is probably in the tester or scan tool itself, so consult the Service Department listed in its instruction manual.

3. INSPECT AUXILIARY BATTERY

- (a) Measure the voltage of the auxiliary battery.

Voltage: 11 to 14 V

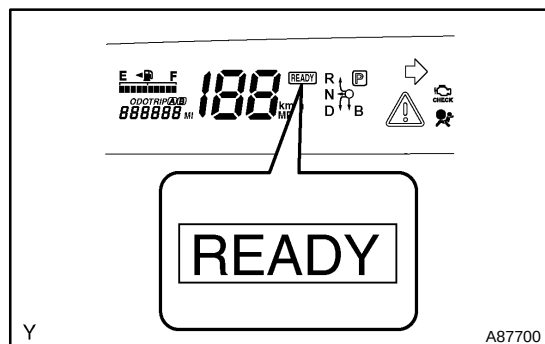
- (b) Inspect the auxiliary battery, fuses, fusible links, wiring harness, connectors and ground.



4. CHECK MIL

- (a) The MIL illuminates when the power switch is turned ON and the "READY" lamp is OFF.

If the MIL is not illuminated, troubleshoot the MIL circuit (see page [05-381](#)).



- (b) When the "READY" turns on, the MIL should turn off. If the MIL remains on, the diagnosis system has detected malfunction or abnormality in the system.

DATA LIST/ACTIVE TEST

1. DATA LIST

NOTICE:

- The values of DATA LIST could vary significantly with slight differences in measurement, differences in the environment in which the measurements are obtained, or the aging of the vehicle. Thus, definite standards or judgment values are unavailable. Therefore, there may be a malfunction even if a measured value is within the reference range.
- In case of intricate symptoms, collect sample data from another vehicle of the same model operating under identical conditions, in order to reach an overall judgment by comparing all the items of DATA LIST.

HINT:

Using DATA LIST displayed by the hand-held tester, you can read the value of the switches, sensors, actuators and so on without parts removal. Reading DATA LIST as a first step of troubleshooting is one method to shorten diagnostic time.

- Connect the hand-held tester to the DLC3.
- Turn the power switch ON (IG).
- Turn the hand-held tester ON.
- On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV ECU / DATA LIST.
- According to the display on the tester, read DATA LIST.

Hand-held Tester Display	Measurement Item/Range (Display)	Reference Range	Diagnostic Note
MIL status	MIL status/ ON or OFF	MIL ON: ON	Constant ON: Repair in accordance with detected DTCs
DRIVING MILEAGE	Accumulated driving mileage after the malfunction occurrence/ Min.: 0 km, Max.: 65,535 km	—	—
BATTERY SOC	Battery state of charge/ Min.: 0 %, Max.: 100 %	Always: 0 to 100 %	—
DELTA SOC	Difference between maximum and minimum values of SOC/ Min.: 0 %, Max.: 100 %	READY lamp ON, engine stopped and no electrical load: 0 to 60 %	—
IB BATTERY	Current value of battery pack/ Min.: -327.68 A, Max.: 327.67 A	- Instant soon after a full-load acceleration with the engine stopped: Maximum 140 A (room temperature) - When shifting into N position 1 second has elapsed after automatically engine started with P position, engine stopped, head lamp ON, A/C fan high, and READY lamp ON: Maximum 30 A	—
BATT INSIDE AIR	Temperature of inhalation ambient air into battery pack/ Min.: -327.68°C, Max.: 327.67°C	Undisturbed for 1 day: same as ambient air temperature	—
VMF FAN VOLTAGE	Battery blower motor monitoring voltage/ Min.: -25.6 V, Max.: 25.4 V	Fan mode 1 with READY lamp ON and P position: 9.5 to 11.5 V	—
AUX. BATT V	Auxiliary battery voltage/ Min.: 0 V, Max.: 25.4 V	Equivalent to auxiliary battery voltage	—

DIAGNOSTICS – HYBRID BATTERY SYSTEM

Hand-held Tester Display	Measurement Item/Range (Display)	Reference Range	Diagnostic Note
WIN	Charge control wattage which is sent from battery ECU to HV control ECU/ Min.: -64 kW, Max.: 0 kW	-25 kW or more	—
WOUT	Discharge control wattage which is sent from battery ECU to HV control ECU/ Min.: 0 kW, Max.: 63.5 kW	21 kW or less	—
COOLING FAN SPD	Battery blower motor actuation mode / Min.: 0, Max.: 6	Stopped: 0 Low to high speed actuation: 1 to 6	—
ECU CTRL MODE	ECU control mode/ Min.: 0, Max.: 4	—	—
SBLW RQST	Battery blower motor stop control request (standby blower)	ON/OFF	—
BATT TEMP 1 to 3	Temperature of HV battery/ Min.: -327.68°C, Max.: 327.67°C	Undisturbed for 1 day: Same as ambient air temperature	—
NUM OF BATT	The number of battery blocks/ Min.: 0, Max.: 255	Always: 14	—
BAT BLOCK MIN V	Battery block minimum voltage/ Min.: -327.68 V, Max.: 327.67 V	SOC 50 to 60 %: 12 V or more	—
MIN BAT BLOCK #	Battery block number with minimum voltage	One of numbers 0 to 13	—
BAT BLOCK MAX V	Battery block maximum voltage/ Min.: -327.68 V, Max.: 327.67 V	SOC 55 to 60 %: 23 V or less	—
MAX BAT BLOCK #	Battery block number with maximum voltage	One of numbers 0 to 13	—
V1 to V14 BATT BLOCK	Battery block voltage/ Min.: -327.68 V, Max.: 327.67 V	SOC 60 %: 12 to 20 V	—
R1 to R14 INTNL RESIST	Internal resistance of each battery block/ Min.: 0 Ω, Max.: 0.255 Ω	Always: 0.01 to 0.1 Ω	—
REGULATION	Compliance regulation	OBD2 (CARB)	—
#CODES	The number of emission related powertrain DTCs/ Min.: 0, Max.: 127	—	—
DTC	The number of stored DTCs/ Min.: 0, Max.: 255	—	—

2. ACTIVE TEST

NOTICE:

Beware that if the connector to the hand-held tester becomes disconnected or a communication error occurs during ACTIVE TEST, the vehicle could become inoperative (READY lamp OFF).

HINT:

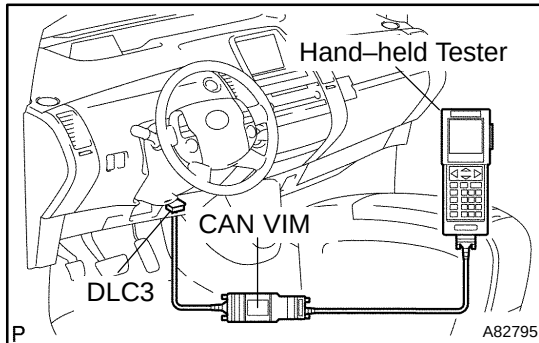
Performing ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing ACTIVE TEST as a first step of troubleshooting is one method to shorten diagnostic time.

It is possible to display items in DATA LIST during ACTIVE TEST.

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Turn the hand-held tester ON.
- (d) On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV ECU / ACTIVE TEST.
- (e) According to the display on the tester, perform ACTIVE TEST.

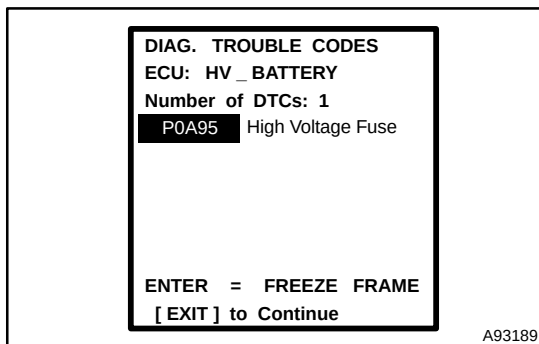
Hand-held Tester Display	Purpose	Test Details	Test Condition
COOLING FAN SPD	To check the operation and the speed of the battery blower motor	Stops the battery blower motor or operates it in modes 1 to 6	Disabled when a DTC is detected

DTC CHECK/CLEAR



1. CHECK DTC (HV BATTERY)

- Connect the hand-held tester or the OBD II scan tool to the DLC3.
- Turn the power switch ON (IG).
- Turn the hand-held tester or the OBD II scan tool ON.
- Using the hand-held tester or the OBD II scan tool, check the DTCs and freeze frame data and then write them down. For the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
- See page 05-893 to confirm the details of the DTCs.



2. CHECK FREEZE FRAME DATA

- If a DTC is present, select that DTC in order to display its freeze frame data.
- Read recorded freeze frame data at the time of detection of a DTC.

3. CHECK DTC (SYSTEMS OTHER THAN HV BATTERY)

HINT:

The battery ECU maintains mutual communication with ECUs, including the ECM, the HV control ECU, etc. Therefore, if the battery ECU outputs a warning, it is necessary to check and record the DTCs of all the systems.

- Connect the hand-held tester or the OBD II scan tool to the DLC3.
- Turn the power switch ON (IG).
- Turn the hand-held tester or the OBD II scan tool ON.
- For the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / CODES (All).
For the OBD II scan tool, see its instruction manual.
- If DTCs output, check the relevant system.

HINT:

If DTCs for the CAN communication system are present in addition to other DTCs, first troubleshoot and repair malfunction in the CAN communication (see page 05-2602).

4. CLEAR DTC

- (a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Turn the hand-held tester or the OBD II scan tool ON.
- (d) Check that the shift position is in the P position.
- (e) Clear DTCs and freeze frame data with the hand-held tester or the OBD II scan tool.

For the hand-held tester:

- (1) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DTC INFO / CLEAR CODES.
- (2) Press YES.

For the OBD II scan tool, see its instruction manual.

FREEZE FRAME DATA

1. FREEZE FRAME DATA

HINT:

The freeze frame data records the operating condition of the HV battery system and components at the time of detection of a DTC. It is used for estimating or simulating the condition of the vehicle when malfunction occurred.

- Connect the hand-held tester to the DLC3.
- Turn the power switch ON (IG).
- Turn the hand-held tester ON.
- On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DTC INFO / TROUBLE CODES.
- Select a DTC in order to display its freeze frame data.
- Check the freeze frame data of the DTC that has been detected.

Freeze frame data

Hand-held Tester Display	Measurement Item/Range	Suspected Vehicle Status When Malfunction Occurs
BATTERY SOC	Battery state of charge/ Min.: 0 %, Max.: 100 %	State of charge of HV battery
DELTA SOC	Difference between maximum and minimum values of SOC at every battery block/ Min.: 0 %, Max.: 100 %	SOC variance
IB BATTERY	Current value of battery pack/ Min.: -327.68 A, Max.: 327.67 A	Charging/discharging condition of HV battery • Discharging amperage indicated by a positive value • Charging amperage indicated by a negative value
BATT INSIDE AIR	Temperature of inhalation ambient air into battery pack/ Min.: -327.68°C, Max.: 327.67°C	Temperature of inhalation ambient air into battery pack
VMF FAN VOLTAGE	Battery blower motor voltage/ Min.: 0 V, Max.: 25.4 V	Actuation condition of battery blower motor
AUX. BATT V	Auxiliary battery voltage/ Min.: 0 V, Max.: 25.4 V	Condition of auxiliary battery
WIN	Charge control wattage which is sent from battery ECU to HV control ECU/ Min.: -64 kW, Max.: 0 kW	Charge wattage of HV battery
WOUT	Discharge control wattage which is sent from battery ECU to HV control ECU/ Min.: 0 kW, Max.: 63.5 kW	Discharge wattage of HV battery
COOLING FAN SPD	Battery blower motor drive mode/ Min.: 0, Max.: 6	Stopped: 0 Low to high speed actuation: 1 to 6
ECU CTRL MODE	ECU control mode/ Min.: 0, Max.: 4	Operating condition of HV battery
SBLW RQST	Battery blower motor stop control request (standby blower)	Presence of stop control request to battery blower motor
BATT TEMP 1 to 3	Temperature of HV battery/ Min.: -327.68°C, Max.: 327.67°C	Temperature of HV battery
V1 to V14 BATT BLOCK	Battery block voltage/ Min.: -327.68 V, Max.: 327.67 V	Voltage variance among battery blocks

FAIL-SAFE CHART

1. FAIL-SAFE CHART

DTC No.	Detection Item	Driving Condition
P0560	System Voltage	Turns on READY and drives normally
P0A1F	Battery Energy Control Module	Turns on READY and drives in fail-safe mode
P0A7F	Hybrid Battery Pack Deterioration	Turns on READY and drives normally
P0A80	Replace Hybrid Battery Pack	Turns on READY and drives normally
P0A81	Hybrid Battery Pack Cooling Fan 1	Turns on READY and drives normally
P0A82	Hybrid Battery Pack Cooling Fan 1	Turns on READY and drives normally
P0A85	Hybrid Battery Pack Cooling Fan 1	Turns on READY and drives normally
P0A95	High Voltage Fuse	Turns on READY and drives in fail-safe mode (while the engine is running) Turns off READY and stops the HV control system (while the engine stops)
P0A9B	Hybrid Battery Temperature Sensor Circuit	Turns on READY and drives normally
P0AAC	Hybrid Battery Pack Air Temperature Sensor "A" Circuit	Turns on READY and drives normally
P3011	Battery Block 1 Becomes Weak	Turns on READY and drives in fail-safe mode
P3012	Battery Block 2 Becomes Weak	Turns on READY and drives in fail-safe mode
P3013	Battery Block 3 Becomes Weak	Turns on READY and drives in fail-safe mode
P3014	Battery Block 4 Becomes Weak	Turns on READY and drives in fail-safe mode
P3015	Battery Block 5 Becomes Weak	Turns on READY and drives in fail-safe mode
P3016	Battery Block 6 Becomes Weak	Turns on READY and drives in fail-safe mode
P3017	Battery Block 7 Becomes Weak	Turns on READY and drives in fail-safe mode
P3018	Battery Block 8 Becomes Weak	Turns on READY and drives in fail-safe mode
P3019	Battery Block 9 Becomes Weak	Turns on READY and drives in fail-safe mode
P3020	Battery Block 10 Becomes Weak	Turns on READY and drives in fail-safe mode
P3021	Battery Block 11 Becomes Weak	Turns on READY and drives in fail-safe mode
P3022	Battery Block 12 Becomes Weak	Turns on READY and drives in fail-safe mode
P3023	Battery Block 13 Becomes Weak	Turns on READY and drives in fail-safe mode
P3024	Battery Block 14 Becomes Weak	Turns on READY and drives in fail-safe mode
P3030	Disconnection between battery and ECU	Turns on READY and drives normally
P3056	Battery Current Sensor Circuit Malfunction	Turns on READY and drives normally
U0100	Lost Communication with ECM/PCM "A"	Turns on READY and drives normally
U0293	Lost Communication with Hybrid Vehicle control System	Turns on READY and drives normally

DTC	P0560	SYSTEM VOLTAGE
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CIRCUIT DESCRIPTION

The battery power is constantly supplied to the AM terminal of the battery ECU for the purpose of maintaining the DTCs and freeze frame data in memory. This voltage is supplied as a backup even if the power switch is turned OFF.

DTC No.	DTC Detection Condition	Trouble Area
P0560	Open in auxiliary battery power supply system while battery power is supplied to terminal IGCT (1trip detection logic)	• Wire harness or connector • HEV fuse • Battery ECU

MONITOR DESCRIPTION

If 1 or more seconds have elapsed with a voltage of 1 V or less at the AM terminal at the battery ECU, the battery ECU will determine that malfunction has occurred in the back-up power supply system, illuminate the MIL, and set a DTC.

MONITOR STRATEGY

Related DTCs	P0560: Battery ECU/Range check
Required sensor/components	Main: Back-up power source circuit Sub: Battery ECU
Frequency of operation	Continuous
Duration	1 second
MIL operation	Immediate after next power switch ON (IG)
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

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

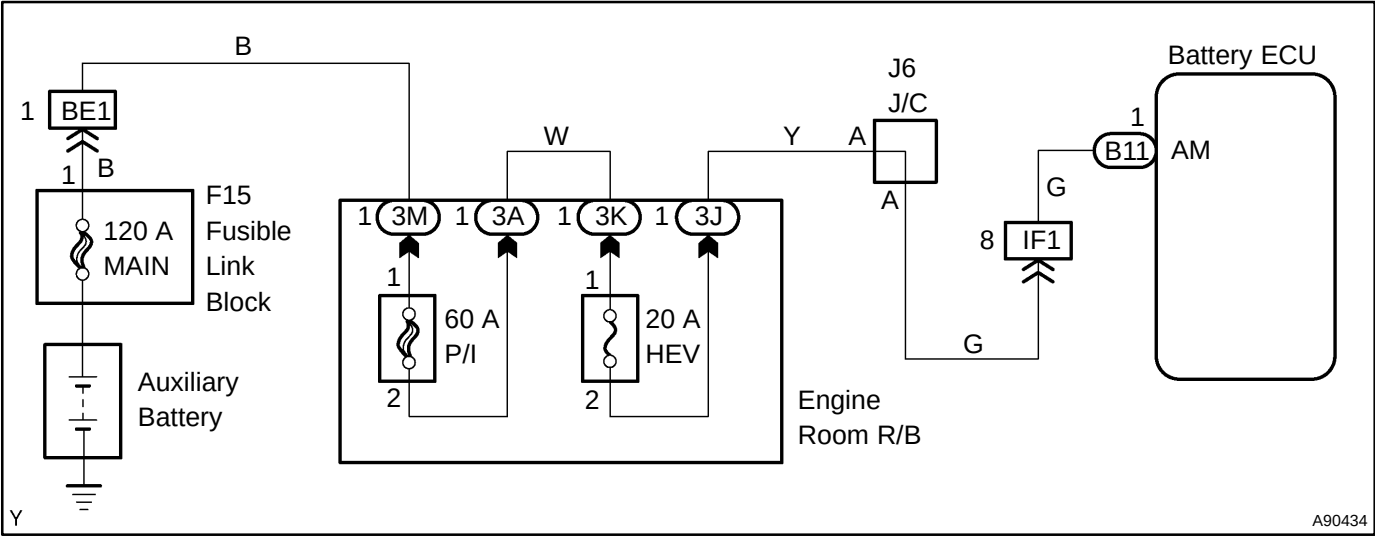
TYPICAL MALFUNCTION THRESHOLDS

Stand-by RAM back-up voltage	1 V or less
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COMPONENT OPERATING RANGE

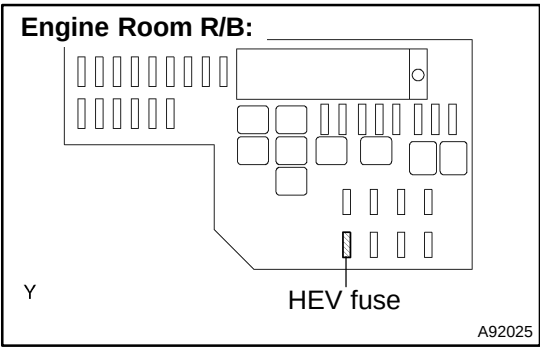
Auxiliary battery voltage	Between 9 V and 14 V
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WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK FUSE(HEV 20 A)
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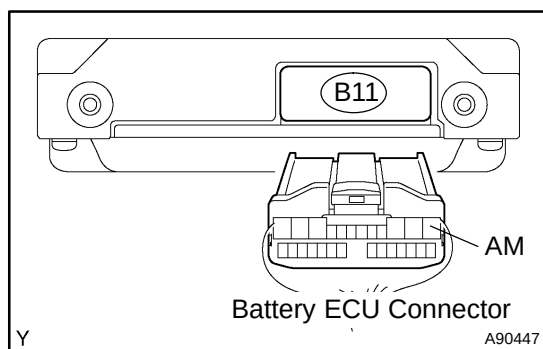


- (a) Remove the HEV fuse from the engine room R/B.
- (b) Check the resistance in the HEV fuse.
Standard: Below 1 Ω
- (c) Reinstall the HEV fuse.

NG	Go to step 3
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OK

2 CHECK HARNESS AND CONNECTOR(BATTERY ECU – AUXILIARY BATTERY)



- Disconnect the negative auxiliary battery terminal.
- Disconnect the positive auxiliary battery terminal.
- Remove the HEV fuse from the engine room R/B.
- Disconnect the B11 battery ECU connector.
- Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
AM (B11-1) – HEV fuse (2)	Below 1 Ω

NOTICE:

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

- Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
HEV fuse (1) – positive auxiliary battery terminal	Below 1 Ω

NOTICE:

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

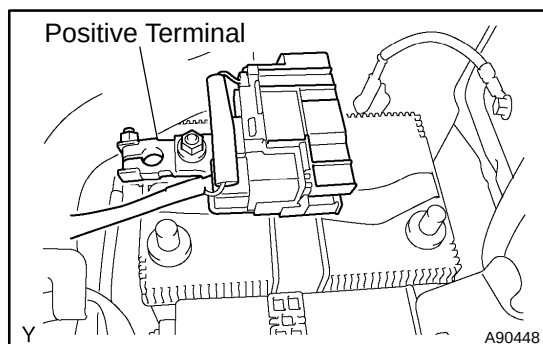
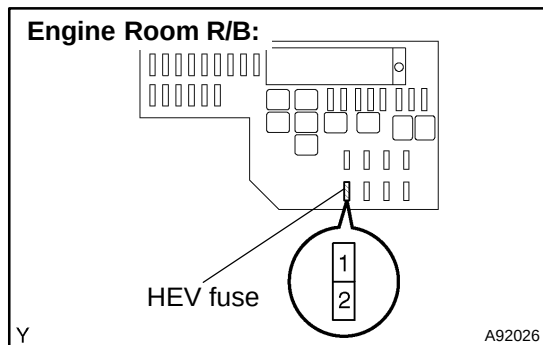
- Reconnect the battery ECU connector.
- Reinstall the HEV fuse.
- Reconnect the positive auxiliary battery terminal.
- Reconnect the negative auxiliary battery terminal.

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REPAIR OR REPLACE HARNESS OR CONNECTOR

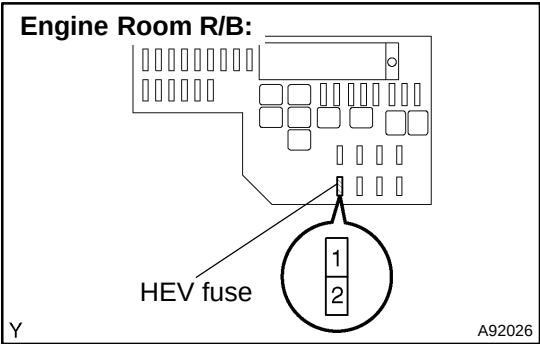
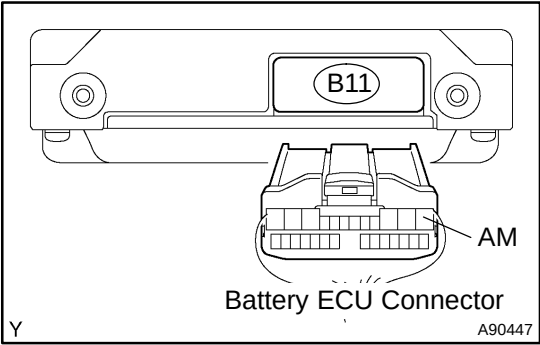
OK

CHECK AND REPAIR CONNECTOR CONNECTION



3

CHECK HARNESS AND CONNECTOR(BATTERY ECU – HEV FUSE)



- (a) Disconnect the B11 battery ECU connector.
- (b) Remove the HEV fuse from the engine room R/B.
- (c) Check the resistance between the wire harness side connector and body ground.

Standard (Check for short):

Tester Connection	Specified Condition
AM (B11-1) or HEV fuse (2) – Body ground	10 kΩ or higher

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

- (d) Reconnect the battery ECU connector.
- (e) Reinstall the HEV fuse.

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AFTER REPAIRING OR REPLACING HARNESS OR CONNECTOR, REPLACE FUSE (HEV 20A)

OK

REPLACE FUSE (HEV 20 A)

DTC	P0A1F	BATTERY ENERGY CONTROL MODULE
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CIRCUIT DESCRIPTION

For the purpose of calculating the SOC (state of charge) of the HV battery and ensuring safety in the event of malfunction in the HV battery assembly, the battery ECU provides the following control functions:

- **SOC calculation**
The battery ECU calculates the SOC by estimating the charging and discharging amperage and monitoring other values.
- **Cooling fan control**
The battery ECU controls the battery blower assembly in order to protect the HV battery assembly from the heat that is generated during charging and discharging. By maintaining a stable temperature, it promotes the effective operation of the HV battery assembly.
- **HV battery assembly malfunction monitoring**
If the battery ECU detects malfunction, it protects the HV battery assembly by limiting or stopping the charging or discharging of the HV battery in accordance with the temperature or voltage of the HV battery assembly.

DTC No.	DTC Detection Condition	Trouble Area
P0A1F	Battery ECU internal error (1 trip detection logic)	• Battery ECU

MONITOR DESCRIPTION

If the battery ECU detects an internal malfunction in the ECU itself, it illuminates the MIL and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0A1F: Battery ECU/Rationality
Required sensor/components	Battery ECU
Frequency of operation	Continuous
Duration	TOYOTA's intellectual property
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

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

TYPICAL MALFUNCTION THRESHOLDS

Battery ECU	Abnormal
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COMPONENT OPERATING RANGE

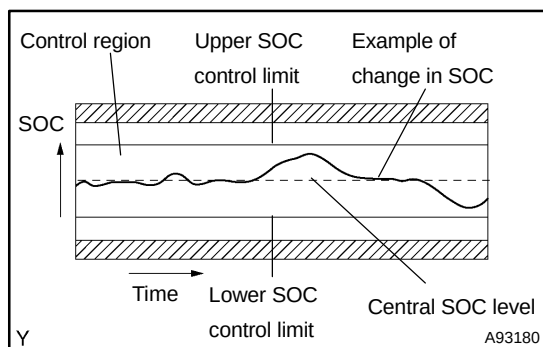
Battery ECU	DTC P0A1F is not detected
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INSPECTION PROCEDURE

REPLACE BATTERY ECU ASSY (See page 21-98)
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DTC	P0A7F	HYBRID BATTERY PACK DETERIORATION
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CIRCUIT DESCRIPTION



The battery ECU calculates the SOC (state of charge) of the HV battery by estimating the amperage that flows into the HV battery and monitoring other values.

The battery ECU sends the calculated SOC to the HV control ECU. The HV control ECU charge and discharge depending on driving patterns based on the information sent by the battery ECU.

DTC No.	DTC Detection Condition	Trouble Area
P0A7F	- Resistance of HV battery assembly is higher than standard (1 trip detection logic) - When the capacity difference between battery modules exceeds the specified value (2 trip detection logic)	- HV battery assembly - Battery ECU

MONITOR DESCRIPTION

The battery ECU 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 ECU detects that the resistance of the HV battery has exceeded the standard, it determines that malfunction has occurred. In addition, the battery ECU monitors the SOC, and if the difference between the maximum and minimum SOC values exceeds the standard, it determines that malfunction has occurred. When either of the malfunction detection conditions is met, the battery ECU illuminates the MIL and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0A7F: HV battery/Rationality
Required sensor/components	Main: Battery voltage sensor inside battery ECU, battery current sensor Sub: Battery temperature sensor
Frequency of operation	Continuous
Duration	TOYOTA's intellectual property
MIL operation	Immediately or 2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

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

TYPICAL MALFUNCTION THRESHOLDS

Either of the following condition	(1) or (2)
(1) Internal resistance	Exceeds the standard level
(2) The difference between the maximum SOC and the minimum SOC	Exceeds the standard level

COMPONENT OPERATING RANGE

TOYOTA's intellectual property	—
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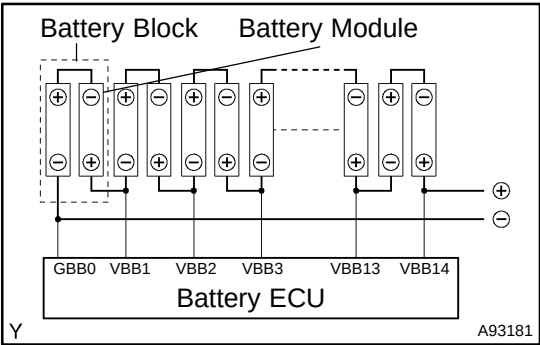
INSPECTION PROCEDURE**1 READ OUTPUT DTC(DTC P0A1F IS OUTPUT)**

- (a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Turn the hand-held tester or the OBD II scan tool ON.
- (d) On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
- (e) Read DTCs.

Result: DTC P0A1F is output**YES****REPLACE BATTERY ECU ASSY**
(See page [21-124](#))**NO****REPLACE HV SUPPLY BATTERY ASSY (See page [21-54](#))**

DTC	P0A80	REPLACE HYBRID BATTERY PACK
-----	-------	-----------------------------

CIRCUIT DESCRIPTION



The HV battery assembly consists of nickel hydride batteries. Nickel hydride batteries do not require external charging. The SOC (state of charge) of the HV battery is maintained at a constant voltage level by the HV control ECU while the vehicle is being driven. In the HV battery assembly, 28 modules are connected in series, and each module has six 1.2 V cells that are connected in series. Thus, the HV battery assembly contains a total of 168 cells which produce 201.6 V. The battery ECU, which monitors two modules as a single battery block, detects the battery block voltage at a total of 14 locations.

DTC No.	DTC Detection Condition	Trouble Area
P0A80	Voltage difference between battery blocks is higher than standard (2 trip detection logic)	• HV battery assembly • Battery ECU

MONITOR DESCRIPTION

The battery ECU, which monitors the voltage of the battery blocks, determines that malfunction has occurred if a voltage difference between the battery blocks exceeds the standard. When the malfunction detection condition is satisfied, the battery ECU illuminates the MIL and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0A80: HV battery/Rationality
Required sensor/components	Main: Battery voltage sensor inside battery ECU Sub: Battery current sensor, battery temperature sensor
Frequency of operation	Continuous
Duration	TOYOTA's intellectual property
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

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

TYPICAL MALFUNCTION THRESHOLDS

Battery voltage difference	Exceeds the standard level
----------------------------	----------------------------

COMPONENT OPERATING RANGE

TOYOTA's intellectual property	–
--------------------------------	---

INSPECTION PROCEDURE**1 READ OUTPUT DTC(DTC P0A1F IS OUTPUT)**

- (a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Turn the hand-held tester or the OBD II scan tool ON.
- (d) On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
- (e) Read DTCs.

Result: DTC P0A1F is output**YES****REPLACE BATTERY ECU ASSY**
(See page [21-98](#))**NO****REPLACE HV SUPPLY BATTERY ASSY (See page [21-54](#))**

DTC	P0A81	HYBRID BATTERY PACK COOLING FAN 1
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CIRCUIT DESCRIPTION

Refer to DTC P0A85 on page [05-908](#).

DTC No.	DTC Detection Condition	Trouble Area
P0A81	Voltage at motor is out of predetermined range in proportion to target control voltage (1 trip detection logic)	- Quarter vent duct (blower motor controller) - Battery ECU

WIRING DIAGRAM

Refer to DTC P0A85 on page [05-908](#).

INSPECTION PROCEDURE

1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)
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- Connect the hand-held tester or the OBD II scan tool to the DLC3.
- Turn the power switch ON (IG).
- Turn the hand-held tester or the OBD II scan tool ON.
- On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
- Read DTCs.

Result:

Display (DTC output)	Proceed to
P0A81	A
P0A81 and P0A1F	B
P0A81 and P0A85	C

B

REPLACE BATTERY ECU ASSY
(See page [21-98](#))

C

GO TO DTC P0A85 CHART (See page [05-908](#))

A

2	REPLACE QUARTER VENT DUCT(BATTERY BLOWER MOTOR CONTROLLER)
----------	---

- Replace the quarter vent duct (blower motor controller).
- Connect the hand-held tester or the OBD II scan tool to the DLC3.
- Turn the power switch ON (IG).
- Turn the hand-held tester or the OBD II scan tool ON.
- On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DTC INFO / CLEAR CODES.
For the OBD II scan tool, see its instruction manual.
- Perform a simulation test.

GO

3 READ OUTPUT DTC(DTC P0A81 IS OUTPUT AGAIN)

- (a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Turn the hand-held tester or the OBD II scan tool ON.
- (d) On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
- (e) Read DTCs.

Result: DTC P0A81 is output again

YES

REPLACE BATTERY ECU ASSY
(See page [21-98](#))

NO

SYSTEM OK

DTC	P0A82	HYBRID BATTERY PACK COOLING FAN 1
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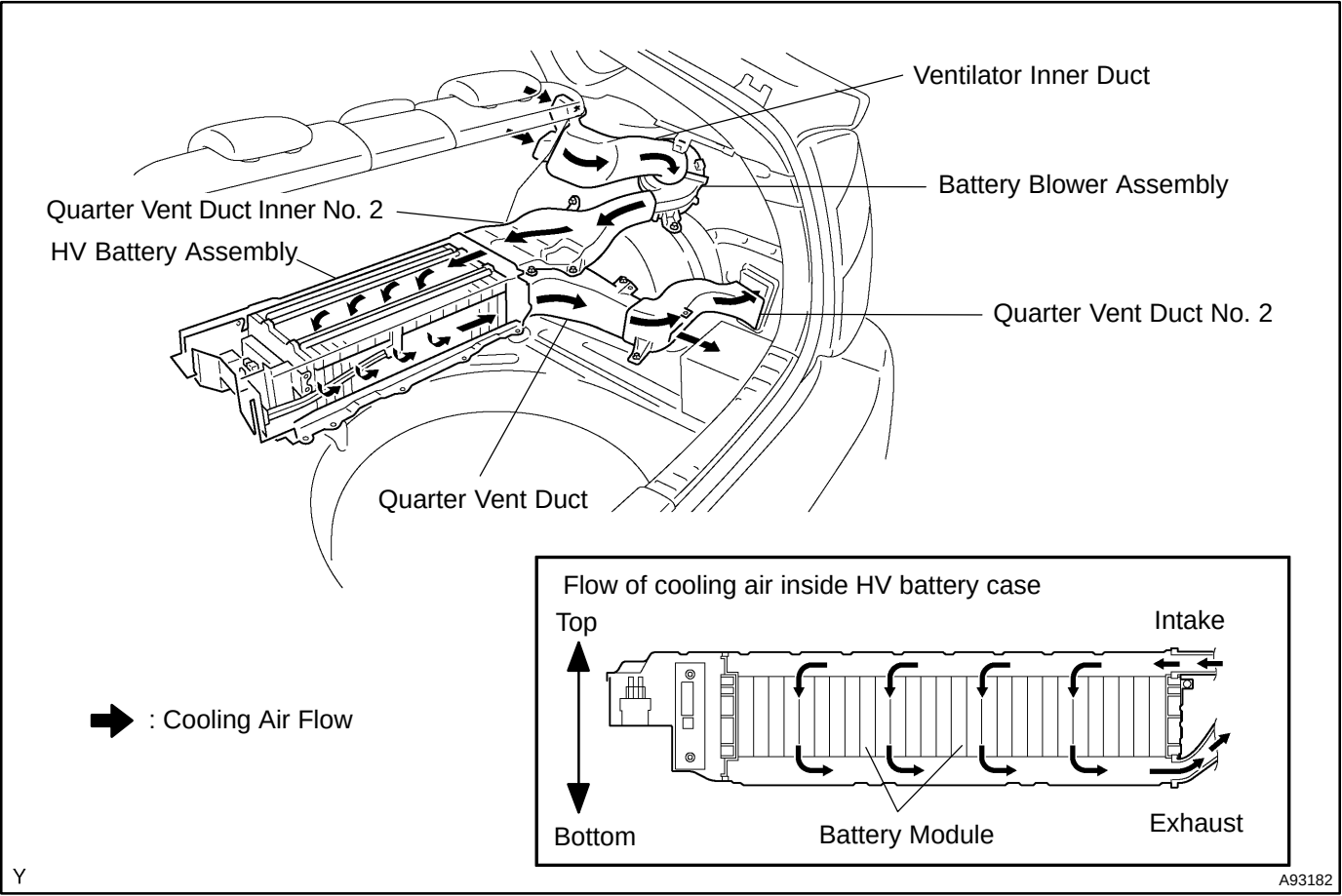
CIRCUIT DESCRIPTION

The cooling air flows into the inlet on the right of the rear seat and travels through an intake duct to the battery blower assembly on the right surface of the luggage compartment. Furthermore, the cooling air travels through an intake duct (which connects the battery blower assembly to the upper right surface of the HV battery assembly) and flows to the HV battery assembly.

The cooling air flows from the top to the bottom between the HV battery modules. After it has cooled the modules, it is discharged from the bottom right surface of the HV battery assembly.

The exhaust air travels through an exhaust duct on the right surface of luggage compartment and is discharged into the cabin as well as outside of the vehicle.

The battery ECU uses battery temperature sensors in order to detect the temperature of the HV battery assembly. Based on the results of this detection, the battery ECU controls the battery blower assembly. (Thus, the battery blower assembly starts when the HV battery temperature rises to a predetermined level.)



DTC No.	DTC Detection Condition	Trouble Area
P0A82	Difference between estimated battery temperature based on blower fan cooling performance and actual temperature is excessive (2 trip detection logic)	• Quarter vent duct • Quarter vent duct No. 2 • Quarter vent duct inner No. 2 • Ventilator inner duct • Battery blower assembly • Battery ECU

INSPECTION PROCEDURE

1 READ OUTPUT DTC(DTC P0A1F IS OUTPUT)

- (a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Turn the hand-held tester or the OBD II scan tool ON.
- (d) On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
- (e) Read DTCs.

Result: DTC P0A1F is output

YES

REPLACE BATTERY ECU ASSY
(See page [21-98](#))

NO

2 CHECK DUCT AND BLOWER

- (a) Check the ducts and the blower listed below for disconnection and damage. Also, check if they have not clogged up with foreign substances.
 - (1) Quarter vent duct
 - (2) Quarter vent duct No. 2
 - (3) Quarter vent duct inner No. 2
 - (4) Ventilator inner duct
 - (5) Battery blower assembly

NG

**REMOVE FOREIGN SUBSTANCES OR
REPLACE AFFECTED PARTS**

OK

REPLACE BATTERY ECU ASSY (See page [21-98](#))

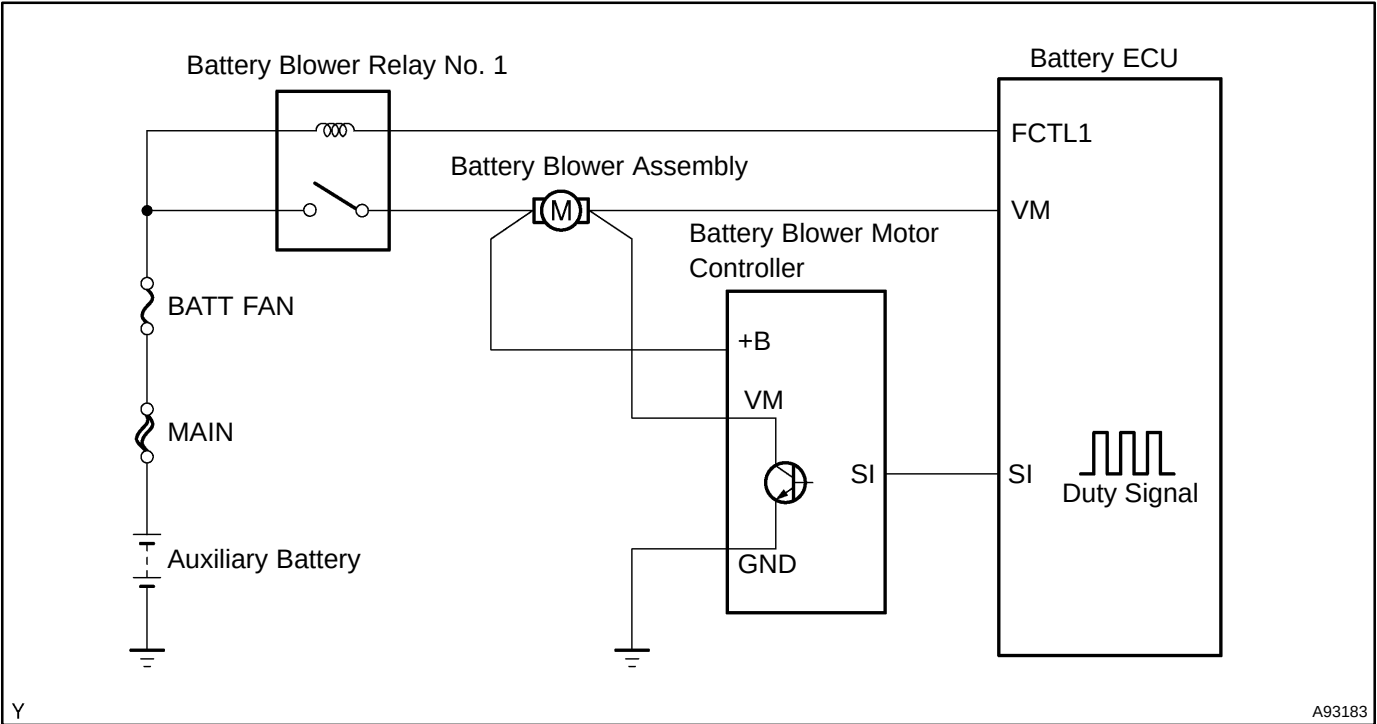
DTC	P0A85	HYBRID BATTERY PACK COOLING FAN 1
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CIRCUIT DESCRIPTION

The blower motor controller regulates the voltage of the battery blower assembly. The blower motor controller has fins made of aluminum. The exhaust air from the HV battery assembly that flows through the quarter vent duct cools the blower motor controller, which is installed in the quarter vent duct.

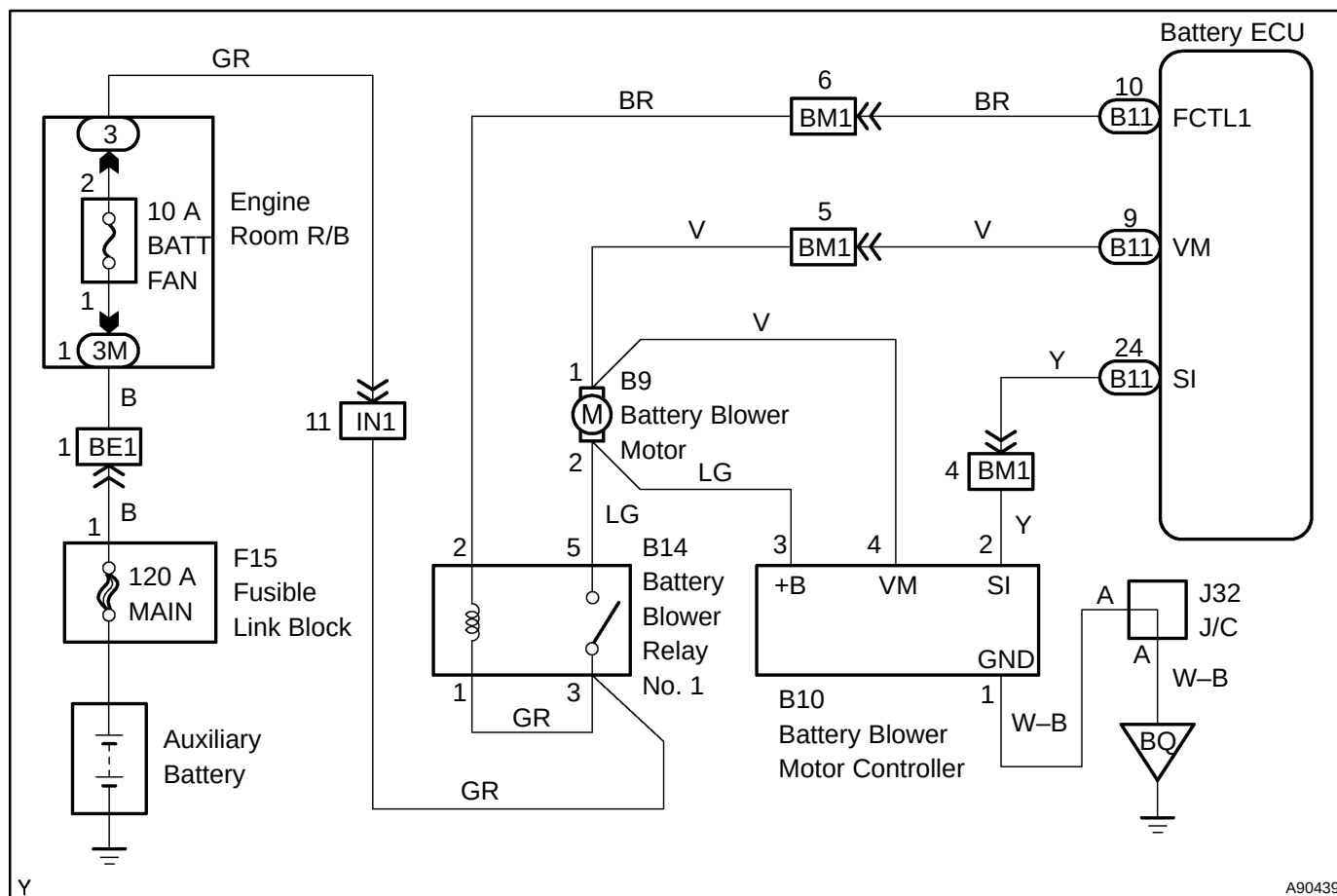
The current flows from the FCTL1 terminal of the battery ECU to the relay coil of the battery blower relay No. 1 and as the contact point of the relay closes, the power is supplied to the battery blower assembly.

When a fan actuation signal is transmitted from the battery ECU, the blower motor controller adjusts voltage (VM) which is applied to the battery blower assembly in order to get the requested fan speed. The adjusted voltage is also transmitted to the VM terminal of the battery ECU in the form of a monitoring signal. The blower motor controller corrects the voltage at the blower motor by monitoring voltage at the +B terminal of the battery blower assembly.



DTC No.	DTC Detection Condition	Trouble Area
P0A85	At a constant vehicle speed, the voltage at the blower motor is out of the predetermined range in proportion to the target control voltage for more than 10 seconds (1 trip detection logic)	• Wire harness or connector • BATT FAN fuse • Battery blower relay No. 1 • Battery blower assembly • Quarter vent duct (battery blower motor controller) • Battery ECU

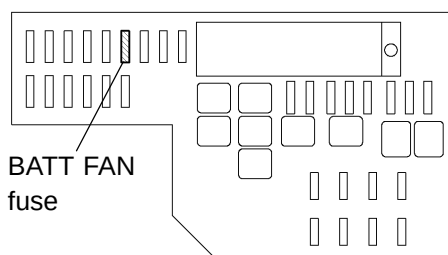
WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK FUSE(BATT FAN 10 A)

Engine Room R/B:



Y

A90449

- Remove the BATT FAN fuse from the engine room R/B.
- Check the resistance in the BATT FAN fuse.
Standard: Below 1 Ω
- Reinstall the BATT FAN fuse.

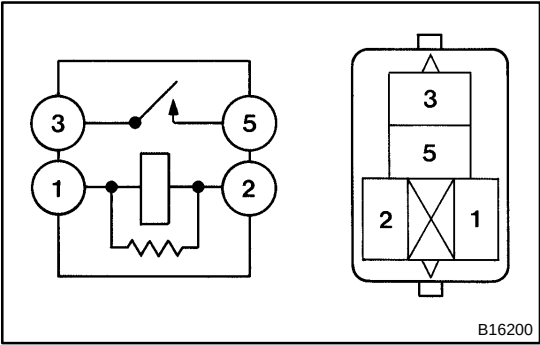
NG

Go to step 13

OK

2

INSPECT BATTERY BLOWER RELAY NO.1



- (a) Remove the battery blower relay No. 1.
- (b) Check the resistance between the terminals of the relay.
Standard:
- | Tester Connection | Specified Condition |
|-------------------|---|
| 3 – 5 | 10 kΩ or higher |
| 3 – 5 | Below 1 Ω
(Apply battery voltage to terminals 1 and 2) |
- (c) Reinstall the battery blower relay No. 1.

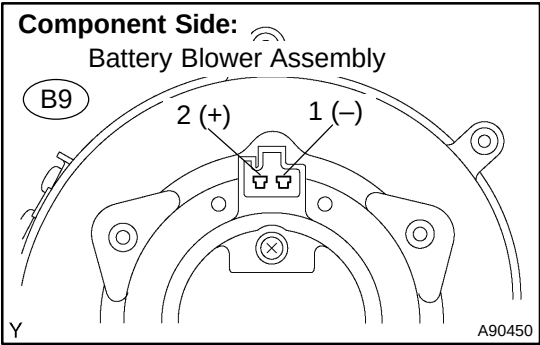
NG

REPLACE BATTERY BLOWER RELAY NO.1

OK

3

INSPECT BATTERY BLOWER ASSY



- (a) Disconnect the B9 battery blower assembly connector.
- (b) Connect the positive terminal of the battery to terminal 2 of the battery blower assembly connector, and the negative battery terminal to terminal 1 of the connector.
- (c) Check that the blower fan rotates when voltage is applied.
OK: Blower fan rotates

NG

REPLACE BATTERY BLOWER ASSY

OK

4

CHECK BATTERY BLOWER MOTOR CONTROLLER (See page 21-36)

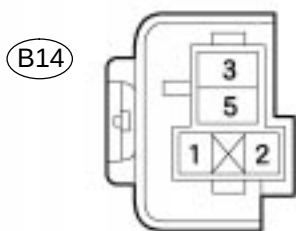
NG

REPLACE QUARTER VENT DUCT (BATTERY BLOWER MOTOR CONTROLLER)

OK

5 CHECK HARNESS AND CONNECTOR(BATTERY BLOWER RELAY NO. 1 – BATT FAN FUSE)

Relay Holder Side:



Battery Blower Relay No. 1

A90451

- Remove the B14 battery blower relay No. 1.
- Remove the BATT FAN fuse from the engine room R/B.
- Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Battery blower relay No. 1 (B14-1 and 3) – BATT FAN fuse (2)	Below 1 Ω

NOTICE:

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

- Reinstall the battery blower relay No. 1.
- Reinstall the BATT FAN fuse.

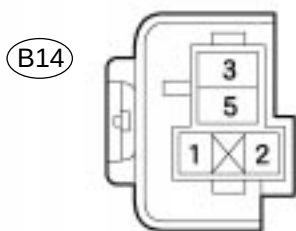
NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

6 CHECK HARNESS AND CONNECTOR(BATTERY BLOWER RELAY NO. 1 – BATTERY BLOWER ASSY)

Relay Holder Side:



Battery Blower Relay No. 1

A90451

- Remove the B14 battery blower relay No. 1.
- Disconnect the B9 battery blower assembly connector.
- Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Battery blower relay No. 1 (B14-5) – battery blower assembly (B9-2)	Below 1 Ω

NOTICE:

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

- Reinstall the battery blower relay No. 1.
- Reconnect the battery blower assembly connector.

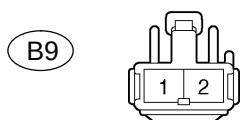
NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

Wire Harness Side:

Battery Blower Assembly Connector



Front View

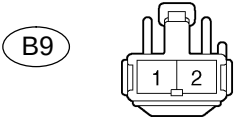
A90453

7

CHECK HARNESS AND CONNECTOR(BATTERY BLOWER ASSY – BATTERY BLOWER MOTOR CONTROLLER)

Wire Harness Side:
Battery Blower Assembly Connector

B9



Front View

Y

A90453

- (a)
- Disconnect the B9 battery blower assembly connector.
- (b)
- Disconnect the B10 battery blower motor controller connector.
- (c)
- Check the resistance between the wire harness side connectors.

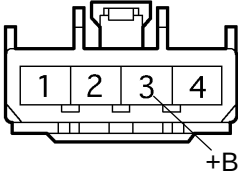
Standard (Check for open):

Tester Connection	Specified Condition
Battery blower assembly (B9-2) – +B (B10-3)	Below 1 Ω

- (d)
- Reconnect the battery blower assembly connector.
- (e)
- Reconnect the battery blower motor controller connector.

Wire Harness Side:
Battery Blower Motor Controller Connector

B10



Front View

Y

A90454

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

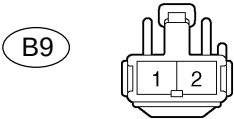
OK

8

CHECK HARNESS AND CONNECTOR(BATTERY BLOWER ASSY – BATTERY ECU)

Wire Harness Side:
Battery Blower Assembly Connector

B9



Front View

Y

A90453

- (a)
- Disconnect the B9 battery blower assembly connector.
- (b)
- Disconnect the B11 battery ECU connector.
- (c)
- Check the resistance between the wire harness side connectors.

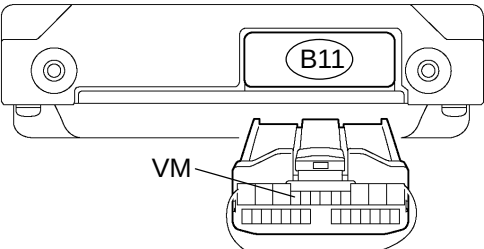
Standard (Check for open):

Tester Connection	Specified Condition
Battery blower assembly (B9-1) – VM (B11-9)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Battery blower assembly (B9-1) or VM (B11-9) – Body ground	10 kΩ or higher

- (d)
- Reconnect the battery blower assembly connector.
- (e)
- Reconnect the battery ECU connector.



Battery ECU Connector

Y

A90447

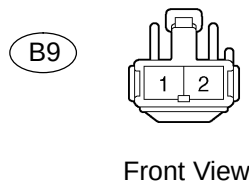
NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

9 CHECK HARNESS AND CONNECTOR(BATTERY BLOWER ASSY – BATTERY BLOWER MOTOR CONTROLLER)

Wire Harness Side: Battery Blower Assembly Connector



Y

A90453

- Disconnect the B9 battery blower assembly connector.
- Disconnect the B10 battery blower motor controller connector.
- Check the resistance between the wire harness side connectors.

Standard (Check for open):

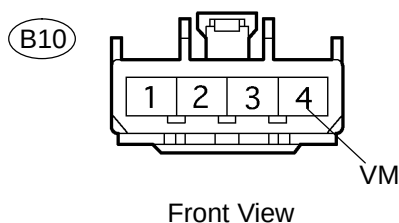
Tester Connection	Specified Condition
Battery blower assembly (B9-1) – VM (B10-4)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Battery blower assembly (B9-1) or VM (B10-4) – Body ground	10 k Ω or higher

- Reconnect the battery blower assembly connector.
- Reconnect the battery blower motor controller connector.

Wire Harness Side: Battery Blower Motor Controller Connector



A90454

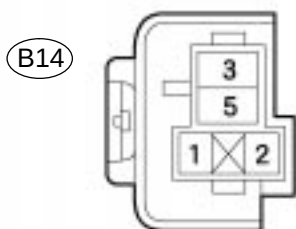
NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

10 CHECK HARNESS AND CONNECTOR(BATTERY BLOWER RELAY NO. 1 – BATTERY ECU)

Relay Holder Side:



A

Battery Blower Relay No. 1

A90451

- Remove the B14 battery blower relay No. 1.
- Disconnect the B11 battery ECU connector.
- Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Battery blower relay No. 1 (B14-2) – FCTL1 (B11-10)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Battery blower relay No. 1 (B14-2) or FCTL1 (B11-10) – Body ground	10 k Ω or higher

NOTICE:

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

- Reinstall the battery blower relay No. 1.
- Reconnect the battery ECU connector.

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

11

CHECK HARNESS AND CONNECTOR(BATTERY BLOWER MOTOR CONTROLLER – BATTERY ECU)

Wire Harness Side:
Battery Blower Motor Controller Connector

B10

Front View

A90454

Battery ECU Connector

A90447

- (a)
- Disconnect the B10 battery blower motor controller connector.
- (b)
- Disconnect the B11 battery ECU connector.
- (c)
- Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
SI (B10-2) – SI (B11-24)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
SI (B10-2) or SI (B11-24) – Body ground	10 kΩ or higher

- (d)
- Reconnect the battery blower motor controller connector.
- (e)
- Reconnect the battery ECU connector.

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

12

CHECK HARNESS AND CONNECTOR(BATTERY BLOWER MOTOR CONTROLLER – BODY GROUND)

Wire Harness Side:
Battery Blower Motor Controller Connector

B10

Front View

A90454

- (a)
- Disconnect the B10 battery blower motor controller connector.
- (b)
- Check the resistance between the wire harness side connector and body ground.

Standard (Check for open):

Tester Connection	Specified Condition
GND (B10-1) – Body ground	Below 1 Ω

- (c)
- Reconnect the battery blower motor controller connector.

NG

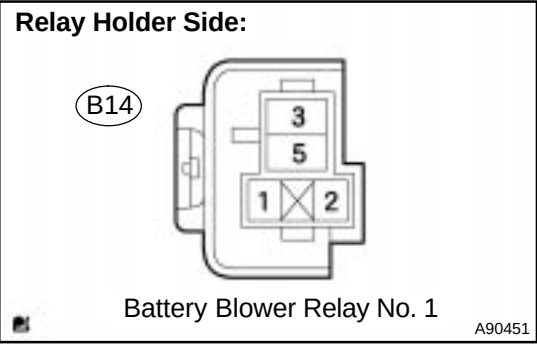
REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE BATTERY ECU ASSY (See page 21-98)

13

CHECK HARNESS AND CONNECTOR(BATTERY BLOWER RELAY NO. 1 – BATT FAN FUSE)



- (a) Remove the B14 battery blower relay No. 1.
- (b) Remove the BATT FAN fuse from the engine room R/B.
- (c) Check the resistance between the wire harness side connector and body ground.

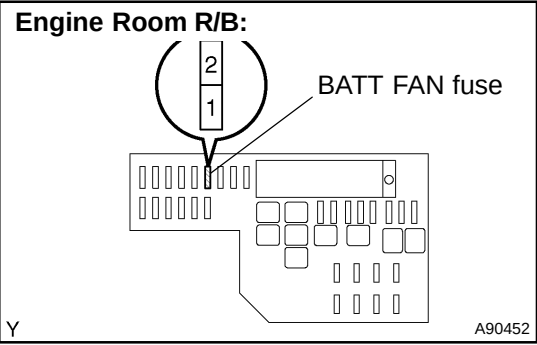
Standard (Check for short):

Tester Connection	Specified Condition
Battery blower relay No. 1 (B14-3) or BATT FAN fuse (2) – Body ground	10 kΩ or higher

NOTICE:

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

- (d) Reinstall the battery blower relay No. 1.
- (e) Reinstall the BATT FAN fuse.



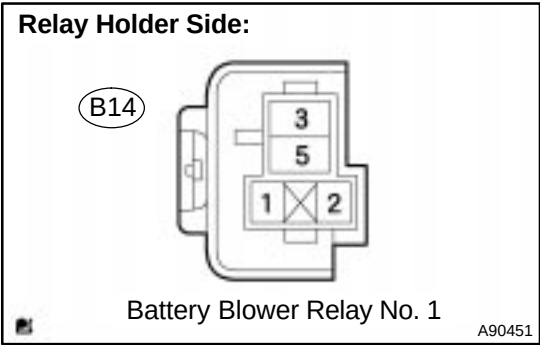
NG

REPAIR OR REPLACE HARNESS OR CONNECTOR AND REPLACE FUSE (BATT FAN)

OK

14

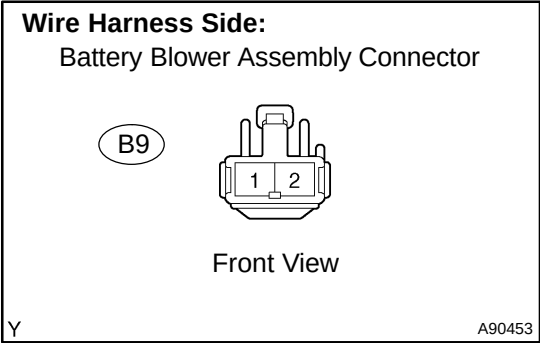
CHECK HARNESS AND CONNECTOR(BATTERY BLOWER RELAY NO. 1 – BATTERY BLOWER ASSY)



- (a) Remove the B14 battery blower relay No. 1.
- (b) Disconnect the B9 battery blower assembly connector.
- (c) Disconnect the B10 battery blower motor controller connector.
- (d) Check the resistance between the wire harness side connector and body ground.

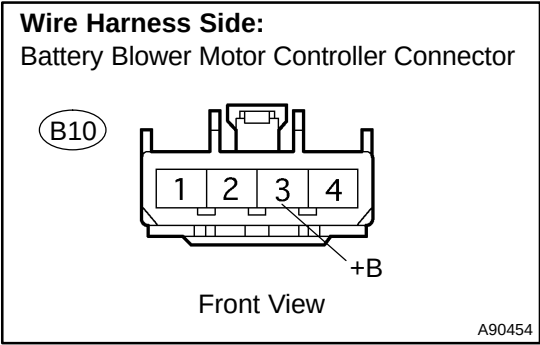
Standard (Check for short):

Tester Connection	Specified Condition
Battery blower relay No. 1 (B14-5), battery blower assembly (B9-2) or +B (B10-3) – Body ground	10 kΩ or higher



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

- (e) Reinstall the battery blower relay No. 1.
- (f) Reconnect the battery blower assembly connector.
- (g) Reconnect the battery blower motor controller connector.



NG

REPAIR OR REPLACE HARNESS OR CONNECTOR AND REPLACE FUSE (BATT FAN)

OK

15

CHECK BATTERY BLOWER MOTOR CONTROLLER (See page 21-36)

NG

REPLACE QUARTER VENT DUCT (BATTERY BLOWER MOTOR CONTROLLER)

OK

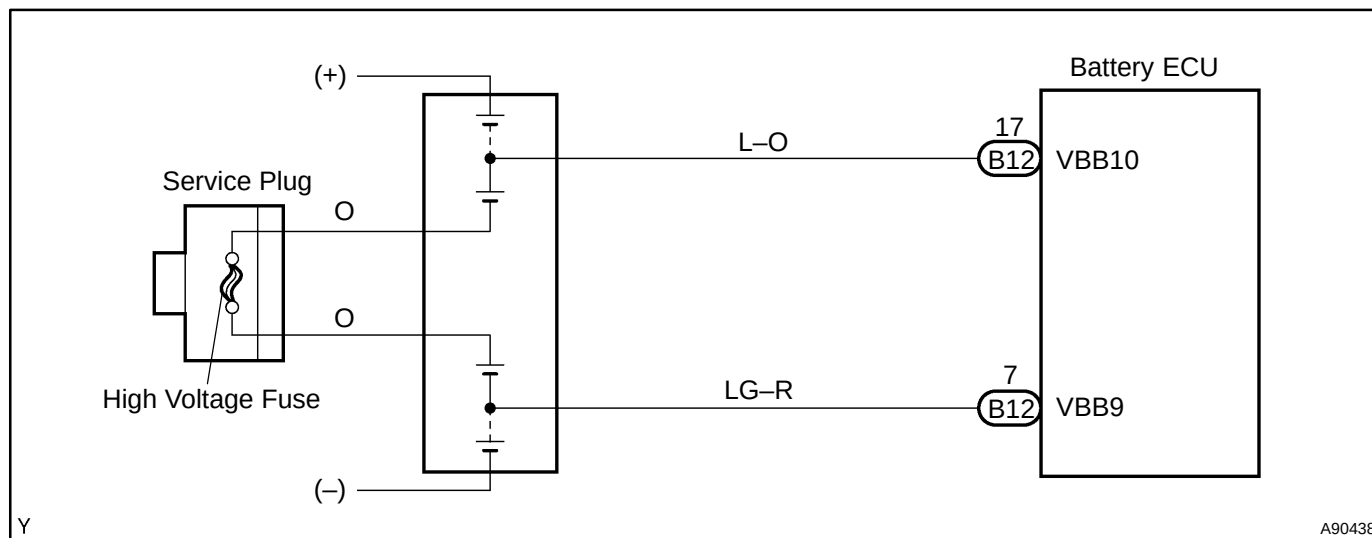
REPLACE BATTERY ECU ASSY (See page 21-98)

DTC	P0A95	HIGH VOLTAGE FUSE
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CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0A95	Voltage between VBB9 and VBB10 terminals is below standard in spite of interlock switch being engaged (1 trip detection logic)	• High voltage fuse • Service plug grip • Battery plug • Battery ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

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

HINT:

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

1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)
---	--------------------------------------

- Connect the hand-held tester or the OBD II scan tool to the DLC3.
- Turn the power switch ON (IG).
- Turn the hand-held tester or the OBD II scan tool ON.
- On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DTC INFO / TROUBLE CODES.

For the OBD II scan tool, see its instruction manual.

- Read DTCs.

Result: DTC P0A1F is output

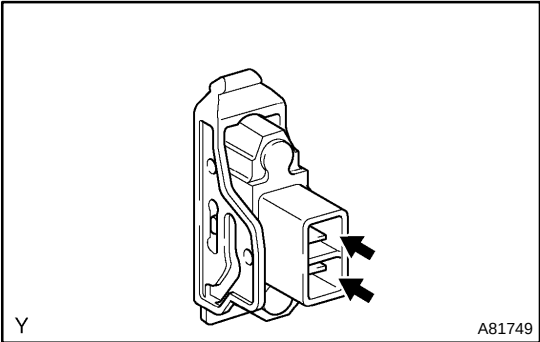
YES

REPLACE BATTERY ECU ASSY
(See page 21-98)

NO

2

INSPECT SERVICE PLUG GRIP



CAUTION:
Wear insulated gloves before performing the following operation.

- (a) Turn the power switch OFF.
- (b) Remove the service plug grip (see page 21-116).

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

- (c) Check the resistance between the terminals of the service plug grip.

Standard: Below 1 Ω

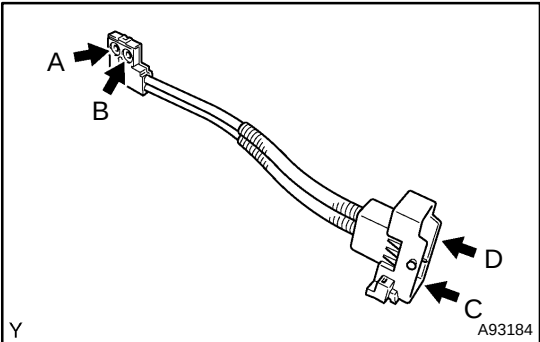
NG

Go to step 4

OK

3

INSPECT BATTERY PLUG



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

- (a) Remove the HV battery assembly (see page 21-54).
- (b) Remove the battery plug (see page 21-77).
- (c) Check the resistance between the terminals of the battery plug.

Standard:

Tester Connection	Specified Condition
A – C	Below 1 Ω
B – D	Below 1 Ω

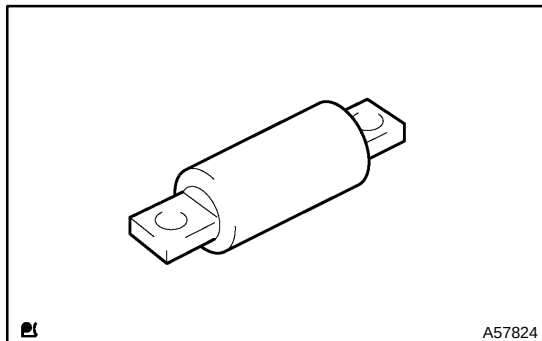
- (d) Reinstall the battery plug (see page 21-77).
- (e) Reinstall the HV battery assembly (see page 21-54).

NG

REPLACE BATTERY PLUG

OK

REPLACE BATTERY ECU ASSY (See page 21-98)

4 INSPECT HIGH VOLTAGE FUSE**CAUTION:**

Wear insulated gloves before performing the following operation.

(a) Remove the high voltage fuse (see page [21-116](#)).

HINT:

The high voltage fuse is enclosed in the service plug grip.

(b) Check the resistance between the terminals of the high voltage fuse.

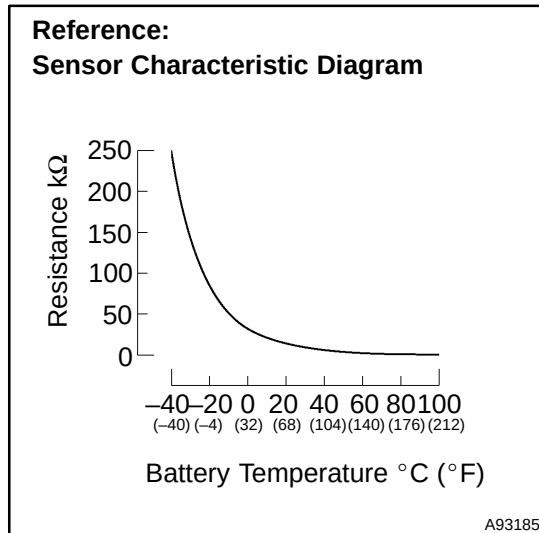
Standard: Below 1 Ω

(c) Reinstall the high voltage fuse.

NG**REPLACE HIGH VOLTAGE FUSE****OK****REPLACE SERVICE PLUG GRIP**

DTC	P0A9B	HYBRID BATTERY TEMPERATURE SENSOR CIRCUIT
------------	--------------	--

CIRCUIT DESCRIPTION



Three battery temperature sensors are located on the bottom of the HV battery assembly. The resistance of the thermistor, which is enclosed in each battery temperature sensor, changes in accordance with the changes in the temperature of the HV battery assembly. The lower the battery temperature, the higher the resistance of the thermistor. Conversely, the higher the temperature, the lower the resistance.

The battery ECU uses the battery temperature sensors to detect the temperature of the HV battery assembly. Based on the results of this detection, the battery ECU controls the battery blower assembly. (Thus, the blower fan starts when the HV battery temperature rises to a predetermined level.)

DTC No.	DTC Detection Condition	Trouble Area
P0A9B	- Temperature detected by battery temperature sensors is lower than standard (open), or higher than standard (short) (1 trip detection logic) - Malfunction in battery temperature sensor characteristics (1 trip detection logic)	- HV battery assembly (HV battery temperature sensor) - Battery ECU

HINT:

After confirming DTC P0A9B, confirm BATT TEMP 1 to 3 in DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DATA LIST using the hand-held tester or the OBD II scan tool.

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

MONITOR DESCRIPTION

If the temperature indicated by the battery temperature sensors is lower than the standard level (open), or is higher than the standard level (short), the battery ECU interprets this as a sensor malfunction. If the battery ECU detects that HV battery temperature is out of a normal range or its value is abnormal, it illuminates the MIL and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0A9B: Battery temperature sensor/Range check Battery temperature sensor/Rationality
Required sensor/components	Battery temperature sensor
Frequency of operation	Continuous
Duration	TOYOTA's intellectual property
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

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

TYPICAL MALFUNCTION THRESHOLDS

Range check:

Resistance of battery temperature sensor	1.108 k Ω or less or 247.7 k Ω or more
--	--

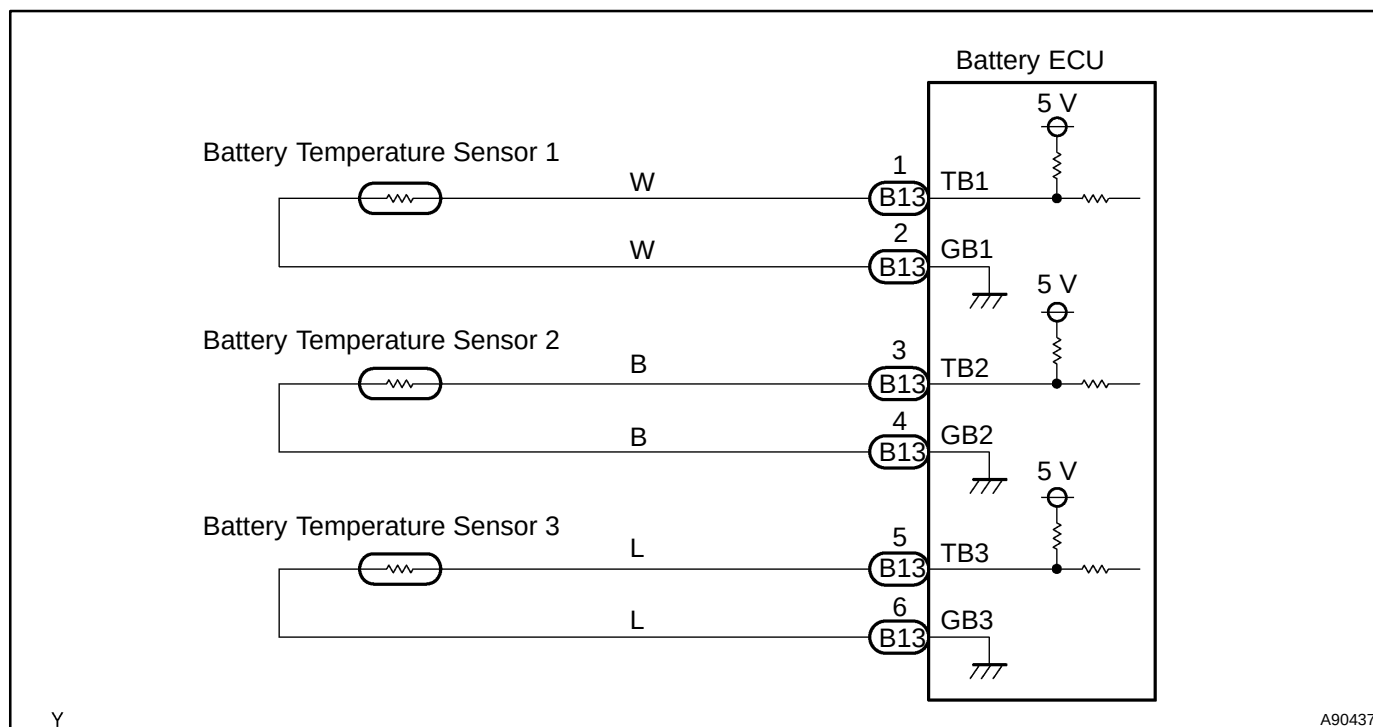
Rationality:

Temperature deviation among batteries (Maximum temperature – Minimum temperature)	Exceeds the standard level
--	----------------------------

COMPONENT OPERATING RANGE

Battery temperature sensor	9 to 11 k Ω (at 25°C (77°F))
----------------------------	-------------------------------------

WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

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

HINT:

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

1 READ OUTPUT DTC(DTC P0A1F IS OUTPUT)

- (a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Turn the hand-held tester or the OBD II scan tool ON.
- (d) On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
- (e) Read DTCs.

Result: DTC P0A1F is output

YES

REPLACE BATTERY ECU ASSY
(See page 21-98)

NO

2 CHECK CONNECTION OF BATTERY TEMPERATURE SENSOR CONNECTOR

CAUTION:

Wear insulated gloves before performing the following operation.

- (a) Turn the power switch OFF.
- (b) Remove the service plug grip (see page 21-116).

NOTICE:

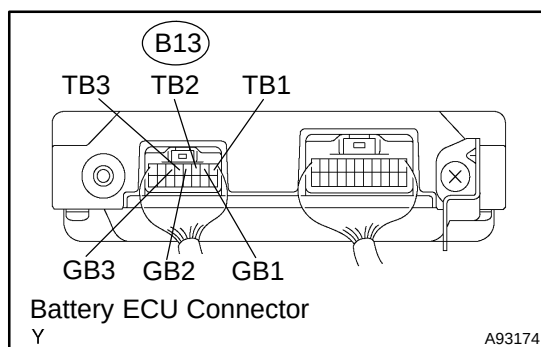
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.

- (c) Check the connection condition of the B13 battery ECU connector.

OK: Connector has been connected securely and there is no poor connection.

HINT:

Since the battery temperature sensor is not available as a unit and if replacement is required, replace the entire HV battery assembly.



NG

CONNECT SECURELY

OK

REPLACE HV SUPPLY BATTERY ASSY (See page 21-54)

DTC	P0AAC	HYBRID BATTERY PACK AIR TEMPERATURE SENSOR "A" CIRCUIT
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CIRCUIT DESCRIPTION

The intake air temperature sensor is provided on the HV battery assembly. Its resistance value varies with the changes in the intake air temperature. The characteristics of the intake air temperature sensor are the same as the battery temperature sensors (see page 05-920 for details).

The battery ECU uses the signals from the intake air temperature sensor for adjusting the air flow speed of the battery blower assembly.

DTC No.	DTC Detection Condition	Trouble Area
P0AAC	Temperature detected by intake air temperature sensor is lower than standard (open) or higher than standard (short) (1 trip detection logic)	• HV battery assembly (intake air temperature sensor) • Battery ECU

HINT:

After confirming DTC P0AAC, confirm BATT INSIDE AIR in DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DATA LIST using the hand-held tester or the OBD II scan tool.

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

MONITOR DESCRIPTION

If the temperature indicated by the intake air temperature sensor is lower than the standard level (open), or is higher than the standard level (short), the battery ECU determines that a malfunction has occurred. If the battery ECU detects an abnormal intake air temperature, it will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0AAC: Intake cooling air temperature sensor/Range check
Required sensor/components	Intake air temperature sensor
Frequency of operation	Continuous
Duration	TOYOTA's intellectual property
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

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

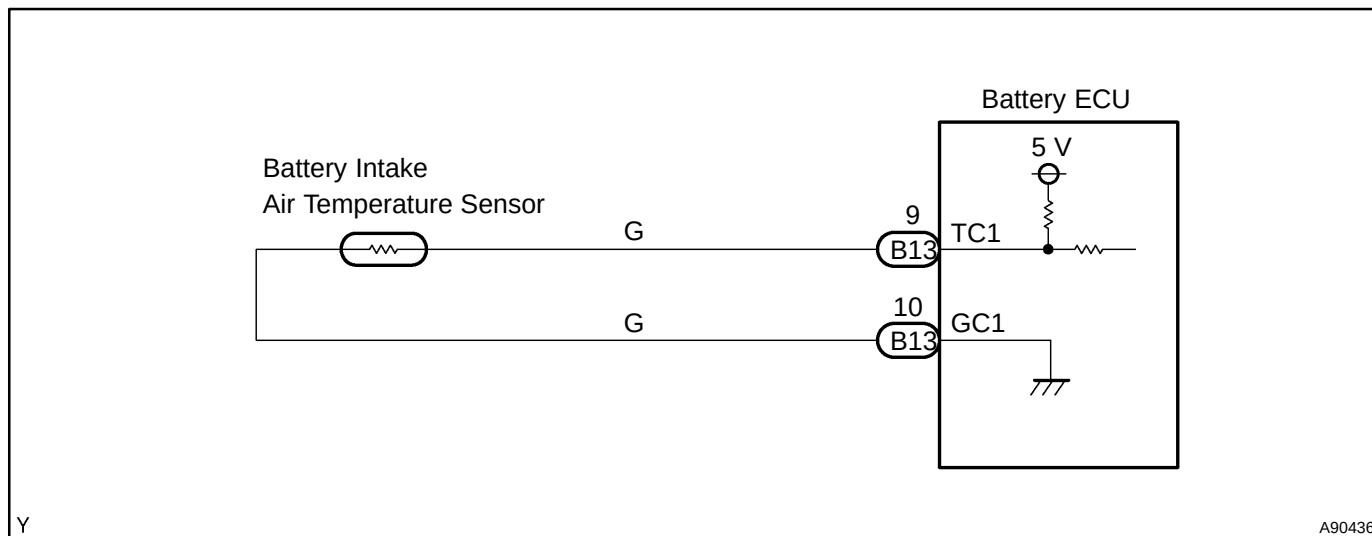
TYPICAL MALFUNCTION THRESHOLDS

Resistance of intake air temperature sensor	1.108 kΩ or less or 247.7 kΩ or more
---	--------------------------------------

COMPONENT OPERATING RANGE

Intake air temperature sensor	9 to 11 kΩ (at 25°C (77°F))
-------------------------------	-----------------------------

WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

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

HINT:

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

1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)
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- Connect the hand-held tester or the OBD II scan tool to the DLC3.
- Turn the power switch ON (IG).
- Turn the hand-held tester or the OBD II scan tool ON.
- On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DTC INFO / TROUBLE CODES.

For the OBD II scan tool, see its instruction manual.

- Read DTCs.

Result: DTC P0A1F is output

YES

REPLACE BATTERY ECU ASSY
(See page 21-98)

NO

2 CHECK CONNECTION OF INTAKE AIR TEMPERATURE SENSOR CONNECTOR

CAUTION:

Wear insulated gloves before performing the following operation.

- (a) Turn the power switch OFF.
- (b) Remove the service plug grip (see page 21-116).

NOTICE:

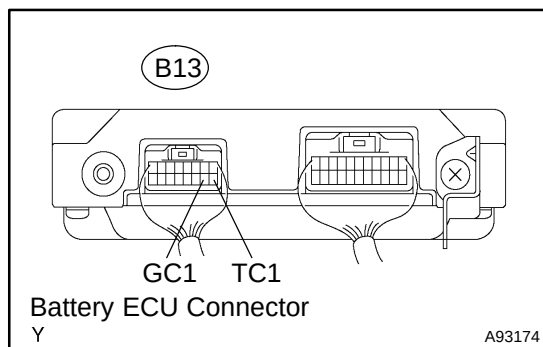
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.

- (c) Check the connection condition of the B13 battery ECU connector.

OK: Connector has been connected securely and there is no poor connection.

HINT:

Since the intake air temperature sensor is not available as a unit and if replacement is required, replace the entire HV battery assembly.

**NG****CONNECT SECURELY****OK**

REPLACE HV SUPPLY BATTERY ASSY (See page 21-54)

DTC	P3011	BATTERY BLOCK 1 BECOMES WEAK
DTC	P3012	BATTERY BLOCK 2 BECOMES WEAK
DTC	P3013	BATTERY BLOCK 3 BECOMES WEAK
DTC	P3014	BATTERY BLOCK 4 BECOMES WEAK
DTC	P3015	BATTERY BLOCK 5 BECOMES WEAK
DTC	P3016	BATTERY BLOCK 6 BECOMES WEAK
DTC	P3017	BATTERY BLOCK 7 BECOMES WEAK
DTC	P3018	BATTERY BLOCK 8 BECOMES WEAK
DTC	P3019	BATTERY BLOCK 9 BECOMES WEAK
DTC	P3020	BATTERY BLOCK 10 BECOMES WEAK
DTC	P3021	BATTERY BLOCK 11 BECOMES WEAK
DTC	P3022	BATTERY BLOCK 12 BECOMES WEAK
DTC	P3023	BATTERY BLOCK 13 BECOMES WEAK
DTC	P3024	BATTERY BLOCK 14 BECOMES WEAK

CIRCUIT DESCRIPTION

Refer to DTC P0A80 on page [05-902](#).

DTC No.	DTC Detection Condition	Trouble Area
P3011 P3012 P3013 P3014 P3015 P3016 P3017 P3018 P3019 P3020 P3021 P3022 P3023 P3024	Presence of a malfunctioning block is determined based on the voltages from the battery blocks (1 trip detection logic)	• HV battery assembly • Battery ECU

MONITOR DESCRIPTION

If there is an abnormal internal resistance or electromotive voltage in the battery blocks, the battery ECU determines that a malfunction has occurred. When the malfunction detection condition is satisfied, the battery ECU illuminates the MIL and sets a DTC.

MONITOR STRATEGY

Related DTCs	P3011 to P3024: HV battery/Rationality
Required sensor/components	HV battery
Frequency of operation	Continuous
Duration	TOYOTA's intellectual property
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

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

TYPICAL MALFUNCTION THRESHOLDS

HV battery	Abnormal
------------	----------

COMPONENT OPERATING RANGE

HV battery	DTCs P3011 to P3024 are not detected
------------	--------------------------------------

WIRING DIAGRAM

Refer to DTC P0A80 on page [05-902](#).

INSPECTION PROCEDURE

1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)
----------	---

- (a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Turn the hand-held tester or the OBD II scan tool ON.
- (d) On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
- (e) Read DTCs.

Result: DTC P0A1F is output

YES

REPLACE BATTERY ECU ASSY
(See page [21-98](#))

NO

REPLACE HV SUPPLY BATTERY ASSY (See page [21-54](#))

DTC	P3030	DISCONNECTION BETWEEN BATTERY AND ECU
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CIRCUIT DESCRIPTION

Refer to DTC P0A80 on page 05-902.

DTC No.	DTC Detection Condition	Trouble Area
P3030	Either of the following conditions occurs (1 trip detection logic) • Voltage at a battery blocks is below 2V • Voltage of all the battery block is between -24 V and 2 V	• Junction block assembly (busbar module) • Frame wire No. 2 (busbar and wire harness) • Battery ECU

MONITOR DESCRIPTION

The battery ECU monitors a voltage of the battery blocks to detect an open malfunction in internal battery voltage sensor circuits of the battery ECU and the wire harness between each battery block and battery ECU. If a voltage at one of the battery blocks is below a standard level or of all the battery blocks is within a specified range, the battery ECU judges that there is an open in the internal sensor circuit(s) or wire harness. The battery ECU then illuminates the MIL and sets a DTC.

MONITOR STRATEGY

Related DTCs	P3030: Battery voltage sensor/Range check
Required sensor/components	The wire harness from each battery block to the battery ECU
Frequency of operation	Continuous
Duration	TOYOTA's intellectual property
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

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

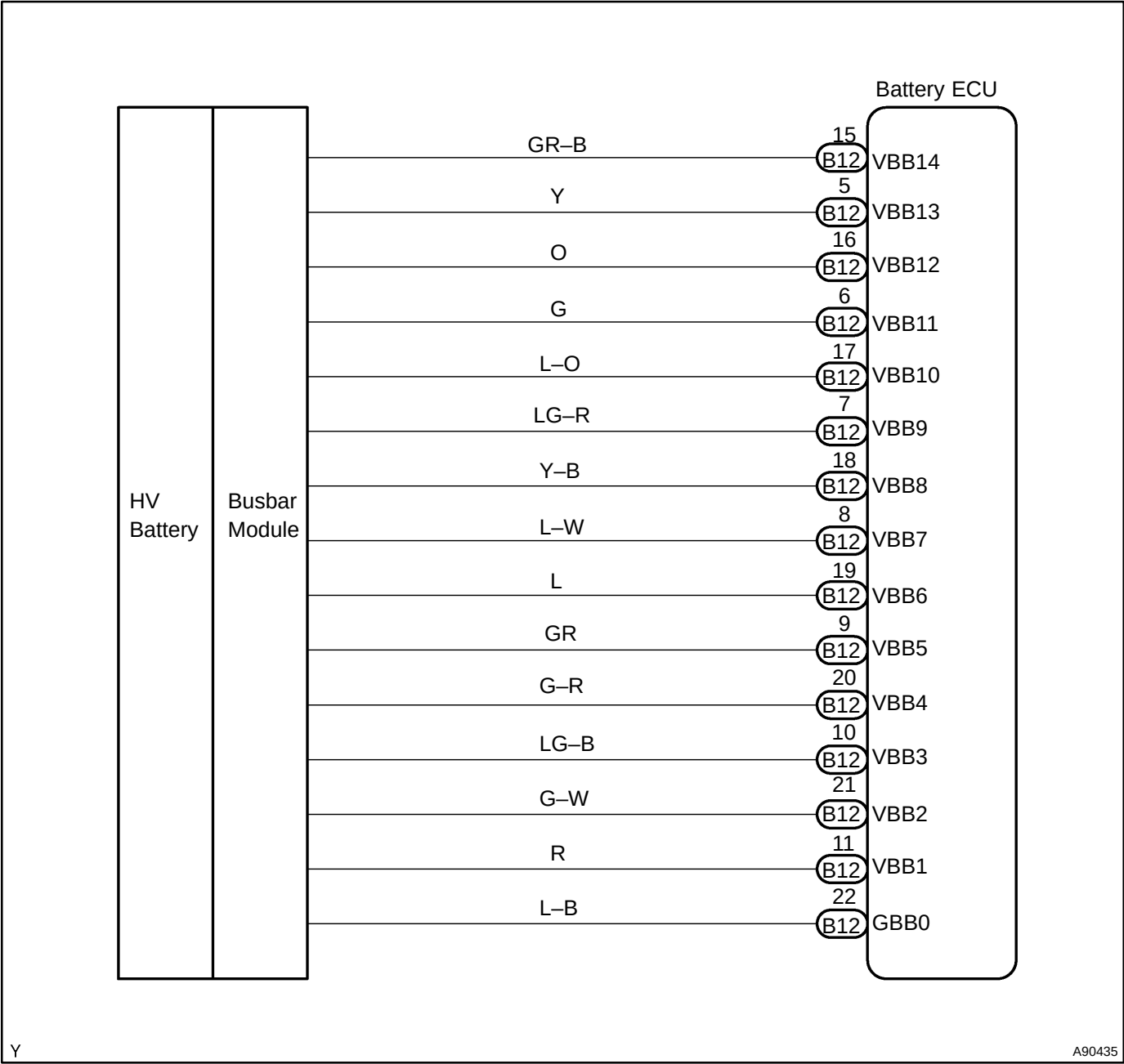
TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is satisfied:	(a) or (b)
(c) Voltage at single battery block	Below 2 V
(d) Voltage of all battery blocks	Between -24 V and 2 V

COMPONENT OPERATING RANGE

Battery ECU	No open malfunction
-------------	---------------------

WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

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

HINT:

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

Hand-held tester:**1 READ OUTPUT DTC(DTC P0A1F IS OUTPUT)**

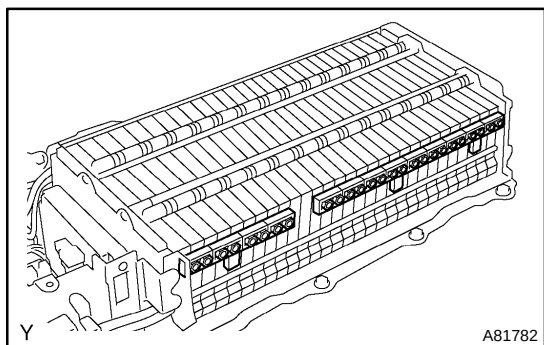
- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Turn the hand-held tester ON.
- (d) On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DTC INFO / TROUBLE CODES.
- (e) Read DTCs.

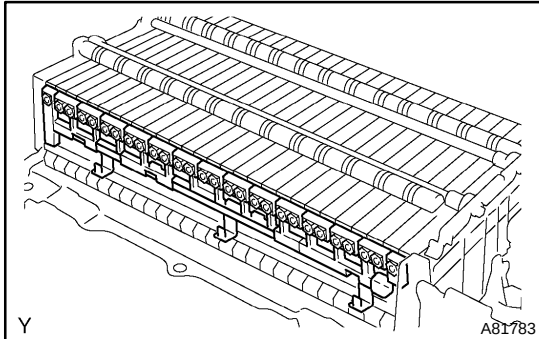
Result: DTC P0A1F is output**YES****REPLACE BATTERY ECU ASSY**
(See page [21-98](#))**NO****2 READ VALUE OF HAND-HELD TESTER(V1 TO V14 BATT BLOCK)**

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Turn the hand-held tester ON.
- (d) On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DATA LIST.
- (e) Read the V1 to V14 BATTERY BLOCK on the hand-held tester.

Standard: 2 V or more**OK****Go to step 5****NG****3 CHECK JUNCTION BLOCK ASSY(BUSBAR MODULE)****CAUTION:****Wear insulated gloves and goggles before performing the following operation.**

- (a) Remove the HV battery assembly (see page [21-54](#)).
- (b) Remove the battery cover (see page [21-54](#)).
- (c) Check that the nuts retaining the junction block assembly are tightened to the specified torque.

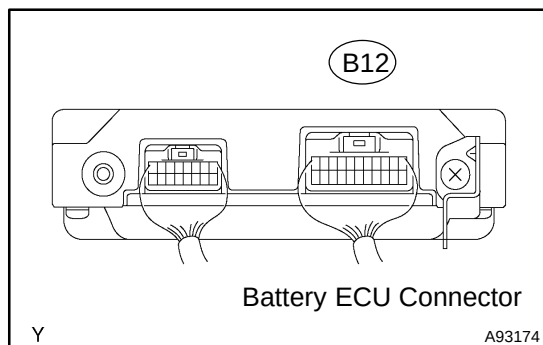
Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)**NG****TIGHTEN THEM TO SPECIFIED TORQUE****OK**

4 CHECK FRAME WIRE NO.2(BUSBAR MODULE)**CAUTION:**

Wear insulated gloves and goggles before performing the following operation.

- (a) Check that the nuts retaining frame wire No. 2 are tightened to the specified torque.

Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)

NG**TIGHTEN THEM TO SPECIFIED TORQUE****OK****5 CHECK CONNECTION OF FRAME WIRE NO. 2 CONNECTOR****CAUTION:**

Wear insulated gloves before performing the following operation.

- (a) Check the connection condition of the B12 battery ECU connector.

OK: Connector has been connected securely and there is no poor connection.

NG**CONNECT SECURELY****OK**

6

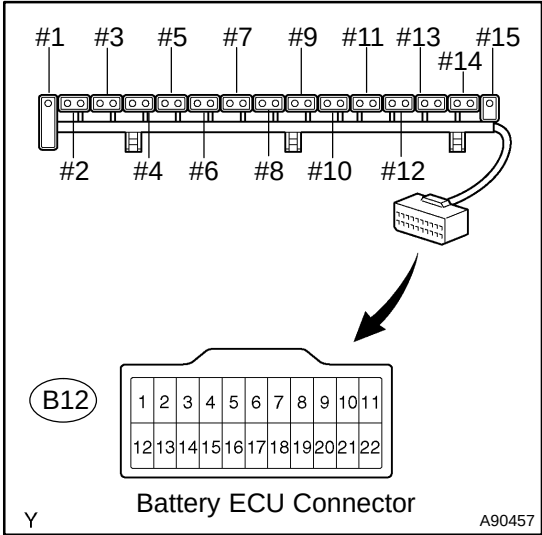
INSPECT FRAME WIRE NO.2(BUSBAR MODULE)

CAUTION:

Wear insulated gloves and goggles before performing the following operation.

- (a) Remove the frame wire No. 2 (see page 21-74).
- (b) Check the resistance between each connector of frame wire No. 2 and the metal portion.

Standard (Check for open):



Tester Connection	Specified Condition
GBB0 (B12-22) – #1	Below 1 Ω
VBB1 (B12-11) – #2	Below 1 Ω
VBB2 (B12-21) – #3	Below 1 Ω
VBB3 (B12-10) – #4	Below 1 Ω
VBB4 (B12-20) – #5	Below 1 Ω
VBB5 (B12-9) – #6	Below 1 Ω
VBB6 (B12-19) – #7	Below 1 Ω
VBB7 (B12-8) – #8	Below 1 Ω
VBB8 (B12-18) – #9	Below 1 Ω
VBB9 (B12-7) – #10	Below 1 Ω
VBB10 (B12-17) – #11	Below 1 Ω
VBB11 (B12-6) – #12	Below 1 Ω
VBB12 (B12-16) – #13	Below 1 Ω
VBB13 (B12-5) – #14	Below 1 Ω
VBB14 (B12-15) – #15	Below 1 Ω

- (c) Reinstall the frame wire No. 2.

NG

REPLACE FRAME WIRE NO.2
(See page 21-74)

OK

REPLACE BATTERY ECU ASSY (See page 21-98)

OBD II scan tool (excluding hand-held tester):**1 READ OUTPUT DTC(DTC P0A1F IS OUTPUT)**

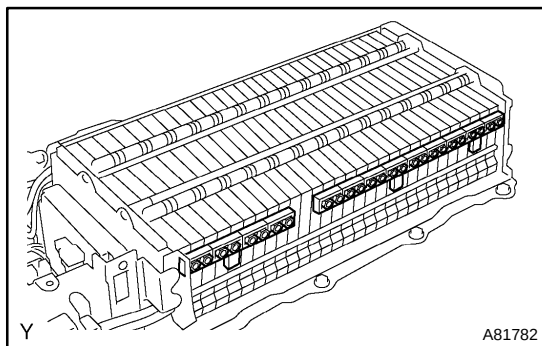
- (a) Connect the OBD II scan tool to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Turn the OBD II scan tool ON.
- (d) Read DTCs using the OBD II scan tool.

Result: DTC P0A1F is output

YES

REPLACE BATTERY ECU ASSY
(See page [21-98](#))

NO

2 CHECK JUNCTION BLOCK ASSY(BUSBAR MODULE)**CAUTION:**

Wear insulated gloves and goggles before performing the following operation.

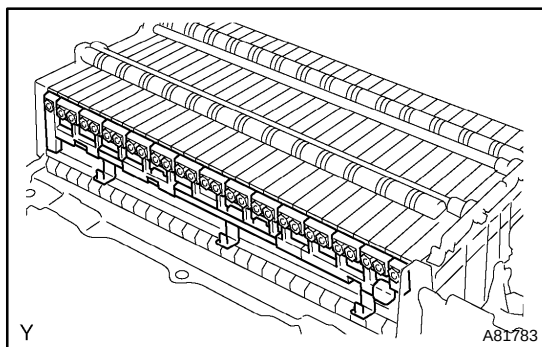
- (a) Remove the HV battery assembly (see page [21-54](#)).
- (b) Remove the battery cover (see page [21-54](#)).
- (c) Check that the nuts retaining the junction block assembly are tightened to the specified torque.

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

NG

TIGHTEN THEM TO SPECIFIED TORQUE

OK

3 CHECK FRAME WIRE NO.2(BUSBAR MODULE)**CAUTION:**

Wear insulated gloves and goggles before performing the following operation.

- (a) Check that the nuts retaining frame wire No. 2 are tightened to the specified torque.

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

NG

TIGHTEN THEM TO SPECIFIED TORQUE

OK

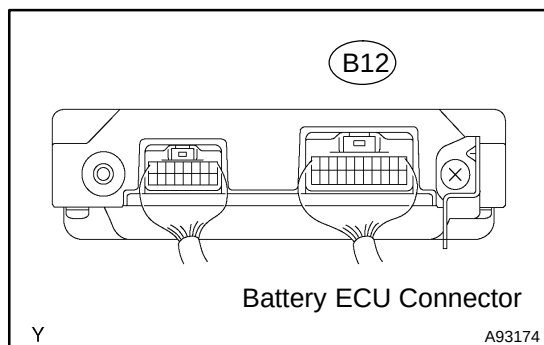
4 CHECK CONNECTION OF FRAME WIRE NO. 2 CONNECTOR

CAUTION:

Wear insulated gloves before performing the following operation.

- (a) Check the connection condition of the B12 battery ECU connector.

OK: Connector has been connected securely and there is no poor connection.



NG

CONNECT SECURELY

OK

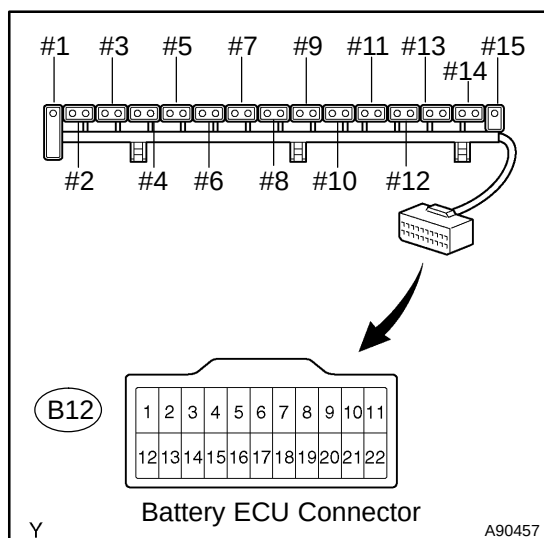
5 INSPECT FRAME WIRE NO.2(BUSBAR MODULE)

CAUTION:

Wear insulated gloves and goggles before performing the following operation.

- (a) Remove the frame wire No. 2 (see page 21-74).
 (b) Check the resistance between each connector of frame wire No. 2 and the metal portion.

Standard (Check for open):



Tester Connection	Specified Condition
GBB0 (B12-22) – #1	Below 1 Ω
VBB1 (B12-11) – #2	Below 1 Ω
VBB2 (B12-21) – #3	Below 1 Ω
VBB3 (B12-10) – #4	Below 1 Ω
VBB4 (B12-20) – #5	Below 1 Ω
VBB5 (B12-9) – #6	Below 1 Ω
VBB6 (B12-19) – #7	Below 1 Ω
VBB7 (B12-8) – #8	Below 1 Ω
VBB8 (B12-18) – #9	Below 1 Ω
VBB9 (B12-7) – #10	Below 1 Ω
VBB10 (B12-17) – #11	Below 1 Ω
VBB11 (B12-6) – #12	Below 1 Ω
VBB12 (B12-16) – #13	Below 1 Ω
VBB13 (B12-5) – #14	Below 1 Ω
VBB14 (B12-15) – #15	Below 1 Ω

- (c) Reinstall the frame wire No. 2.

NG

REPLACE FRAME WIRE NO.2
 (See page 21-74)

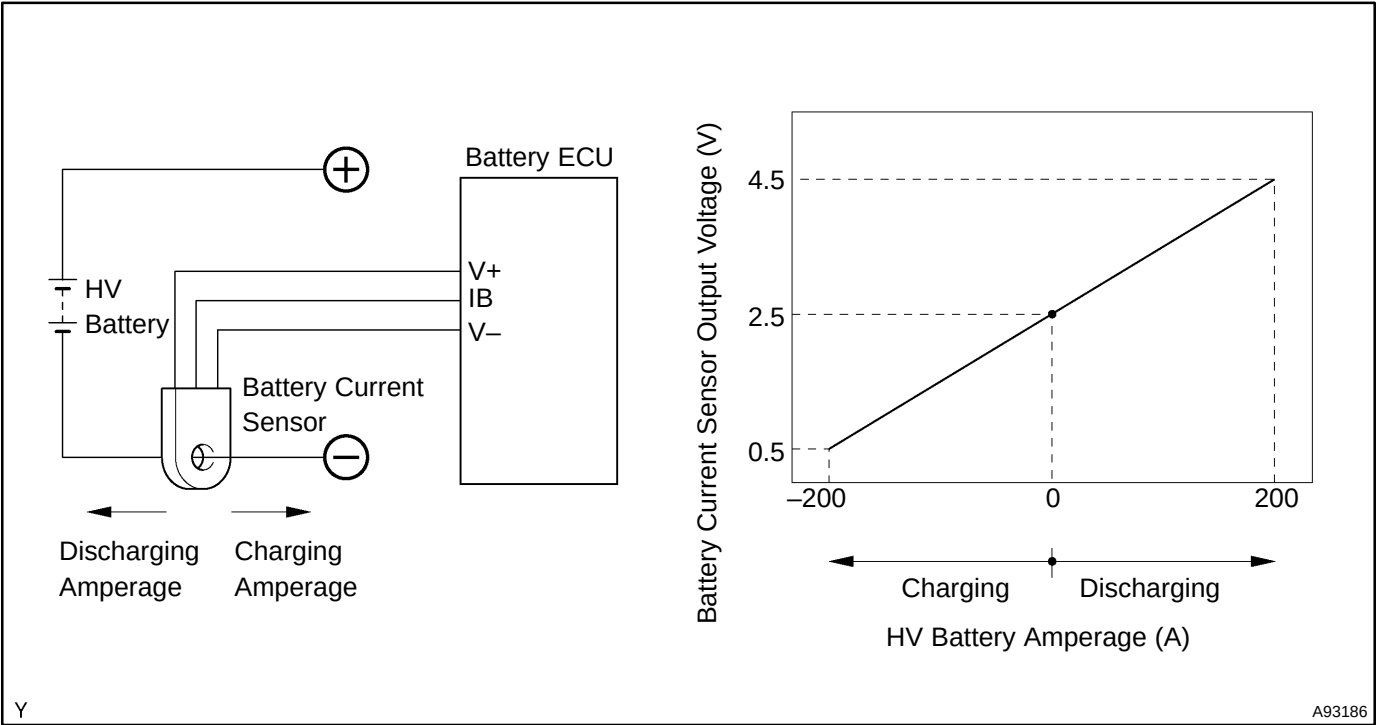
OK

REPLACE BATTERY ECU ASSY (See page 21-98)

DTC	P3056	BATTERY CURRENT SENSOR CIRCUIT MALFUNCTION
-----	-------	--

CIRCUIT DESCRIPTION

The battery current sensor, which is mounted on the negative cable side of the HV battery assembly, detects the amperage that flows into the HV battery. The battery current sensor inputs a voltage (which varies between 0 to 5 V in proportion to the amperage) into the IB terminal of the battery ECU. An output voltage of the battery current sensor below 2.5 V indicates that the HV battery assembly is being charged, and above 2.5 V indicates that the HV battery assembly is being discharged. The battery ECU determines the charging and discharging amperage of the HV battery assembly based on the signals that are input to its IB terminal, and calculates the SOC (state of charge) of the HV battery through the estimation of the amperage.



DTC No.	DTC Detection Condition	Trouble Area
P3056	Malfunction in battery current sensor (1 or 2 trip detection logic)	• HV battery assembly (wire harness or connector) • Battery current sensor • Battery ECU

MONITOR DESCRIPTION

If the battery ECU detects malfunction in the battery current sensor, it will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P3056: Battery current sensor/Range check Battery current sensor/Rationality
Required sensor/components	Battery current sensor
Frequency of operation	Continuous
Duration	TOYOTA's intellectual property
MIL operation	Rationality: Immediately Range check: Immediately or 2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

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

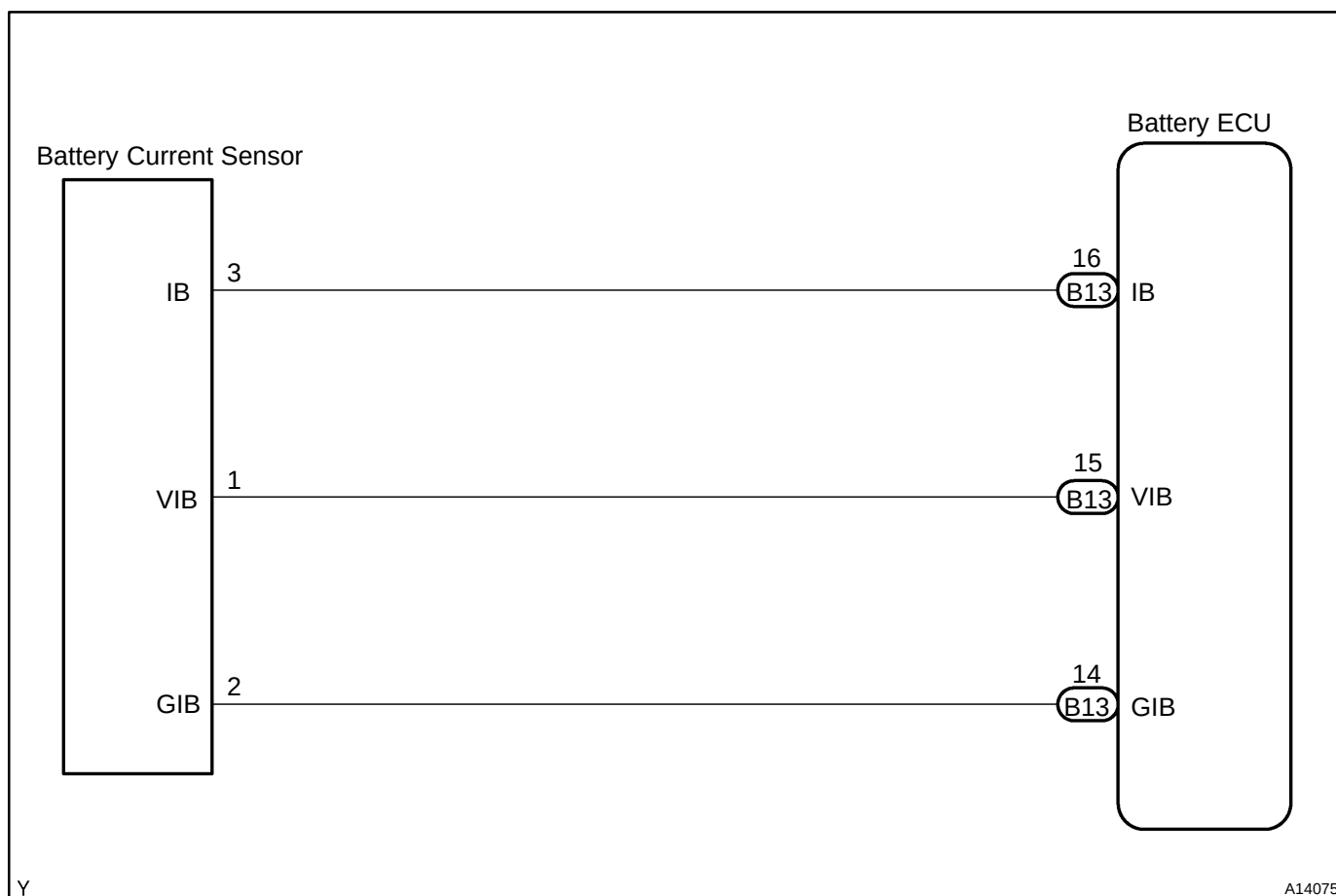
TYPICAL MALFUNCTION THRESHOLDS

Battery current sensor	Abnormal
------------------------	----------

COMPONENT OPERATING RANGE

Battery current sensor	DTC P3056 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 reconnecting it while you are servicing the high-voltage system.
- After disconnecting the service plug grip, wait at least for 5 minutes before touching any of the high-voltage connectors or terminals.

HINT:

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

1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)
----------	---

- Connect the hand-held tester or the OBD II scan tool to the DLC3.
- Turn the power switch ON (IG).
- Turn the hand-held tester or the OBD II scan tool ON.
- On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.

- Read DTCs.

Result: DTC P0A1F is output

YES

REPLACE BATTERY ECU ASSY
(See page [21-98](#))

NO

2 CHECK HARNESS AND CONNECTOR(BATTERY ECU – BATTERY CURRENT SENSOR)

CAUTION:

Wear insulated gloves before performing the following operation.

- (a) Turn the power switch OFF.
- (b) Remove the service plug grip (see page 21-116).

NOTICE:

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

- (c) Disconnect the B13 battery ECU connector.
- (d) Disconnect the battery current sensor connector.
- (e) Turn the power switch ON (IG).

HINT:

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

- (f) Measure the voltage between the terminals of the B13 battery ECU connector and body ground.

Standard:

Tester Connection	Specified Condition
IB (B13-16) – Body ground	Below 1 V
GIB (B13-14) – Body ground	Below 1 V
VIB (B13-15) – Body ground	Below 1 V

- (g) Turn the power switch OFF.
- (h) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
IB (B13-16) – battery current sensor (3)	Below 1 Ω
GIB (B13-14) – battery current sensor (2)	Below 1 Ω
VIB (B13-15) – battery current sensor (1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
IB (B13-16) or battery current sensor (3) – Body ground	10 k Ω or higher
GIB (B13-14) or battery current sensor (2) – Body ground	10 k Ω or higher
VIB (B13-15) or battery current sensor (1) – Body ground	10 k Ω or higher

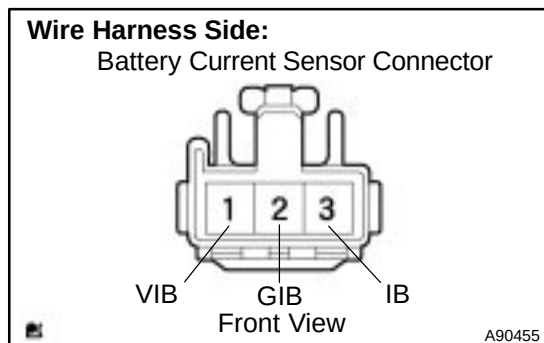
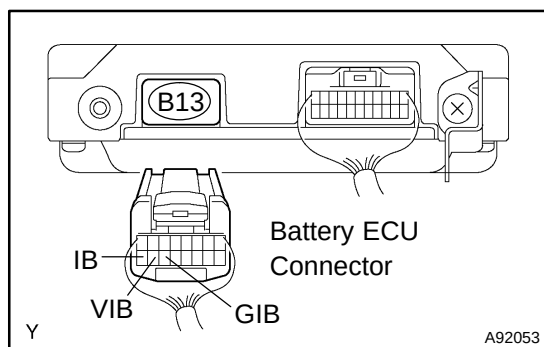
- (i) Reconnect the battery current sensor connector.
- (j) Reconnect the battery ECU connector.
- (k) Reinstall the service plug grip (see page 21-116).

HINT:

Since the wire harness is not available as a unit and if it is impossible to repair, replace the entire HV battery assembly.

NG

REPAIR HARNESS OR CONNECTOR, OR REPLACE HV SUPPLY BATTERY ASSY (See page 21-54)

**OK**

3 REPLACE BATTERY CURRENT SENSOR

- (a) Replace battery current sensor (see page [21-95](#)).
- (b) Connect the hand-held tester or the OBD II scan tool to the DLC3.
- (c) Turn the power switch ON (IG).
- (d) Turn the hand-held tester or the OBD II scan tool ON.
- (e) On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DTC INFO / CLEAR CODES.
For the OBD II scan tool, see its instruction manual.
- (f) Perform a simulation test.

HINT:

Some of the steps involve the detection of 2 trips. Therefore, after performing a simulation test, turn the power switch OFF, and perform the simulation test again.

GO**4 READ OUTPUT DTC(DTC P3056 IS NOT OUTPUT AGAIN)**

- (a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Turn the hand-held tester or the OBD II scan tool ON.
- (d) On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
- (e) Read DTCs.

Result: DTC P3056 is not output again

NO

REPLACE BATTERY ECU ASSY
(See page [21-98](#))

YES**SYSTEM OK**

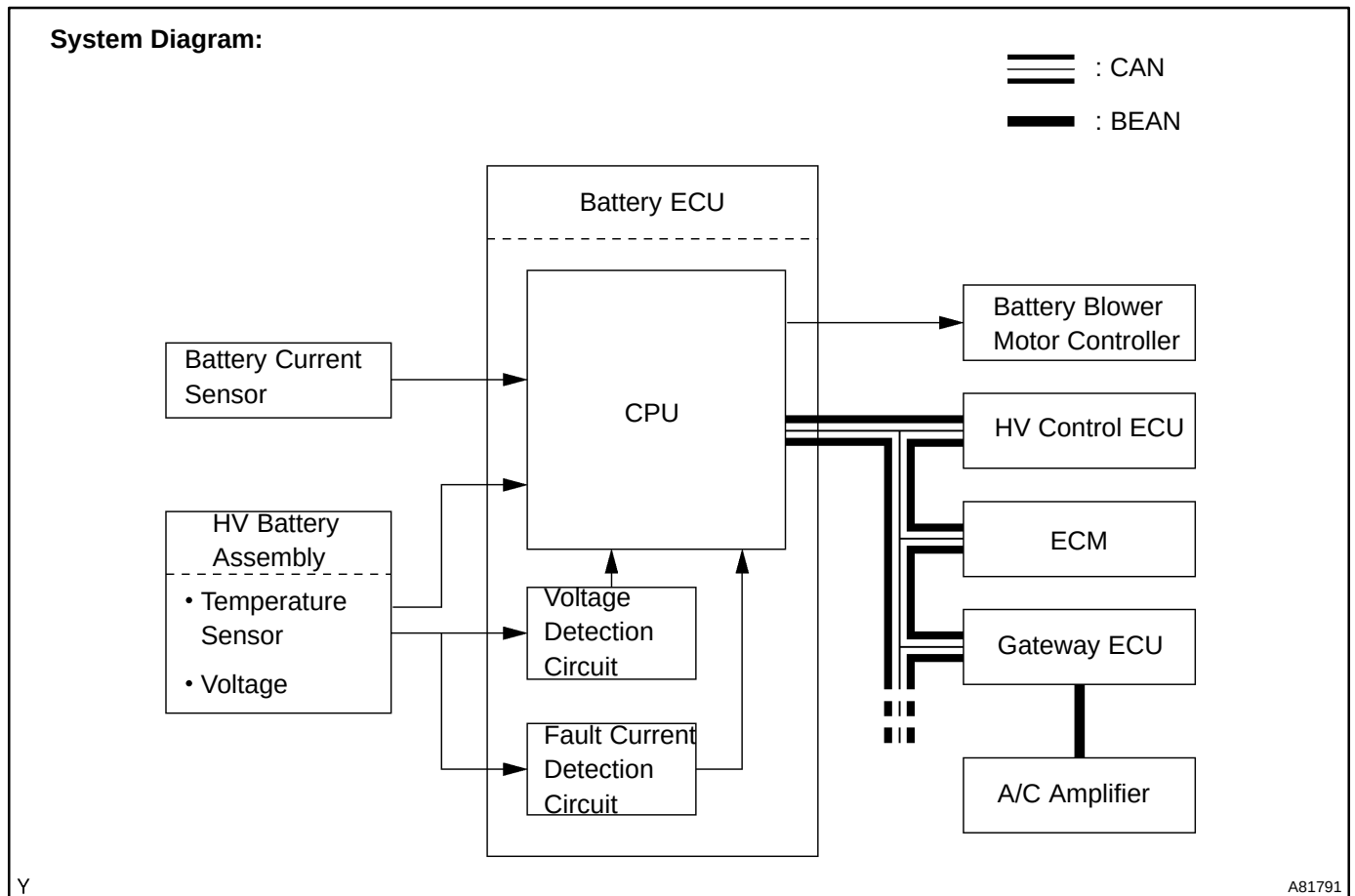
SYSTEM DESCRIPTION

1. OUTLINE

The principal role of the hybrid battery system is to monitor the condition of the HV battery assembly through the use of the battery ECU and transmit this information to the HV control ECU. Furthermore, this system controls the battery blower motor controller in order to maintain a proper temperature at the HV battery assembly.

The battery ECU uses CAN (Controller Area Network) to maintain communication with the following devices: the HV control ECU, ECM, and A/C amplifier.*

*: Because it is connected to BEAN (Body Electronics Area Network), data is transmitted via the gateway ECU.

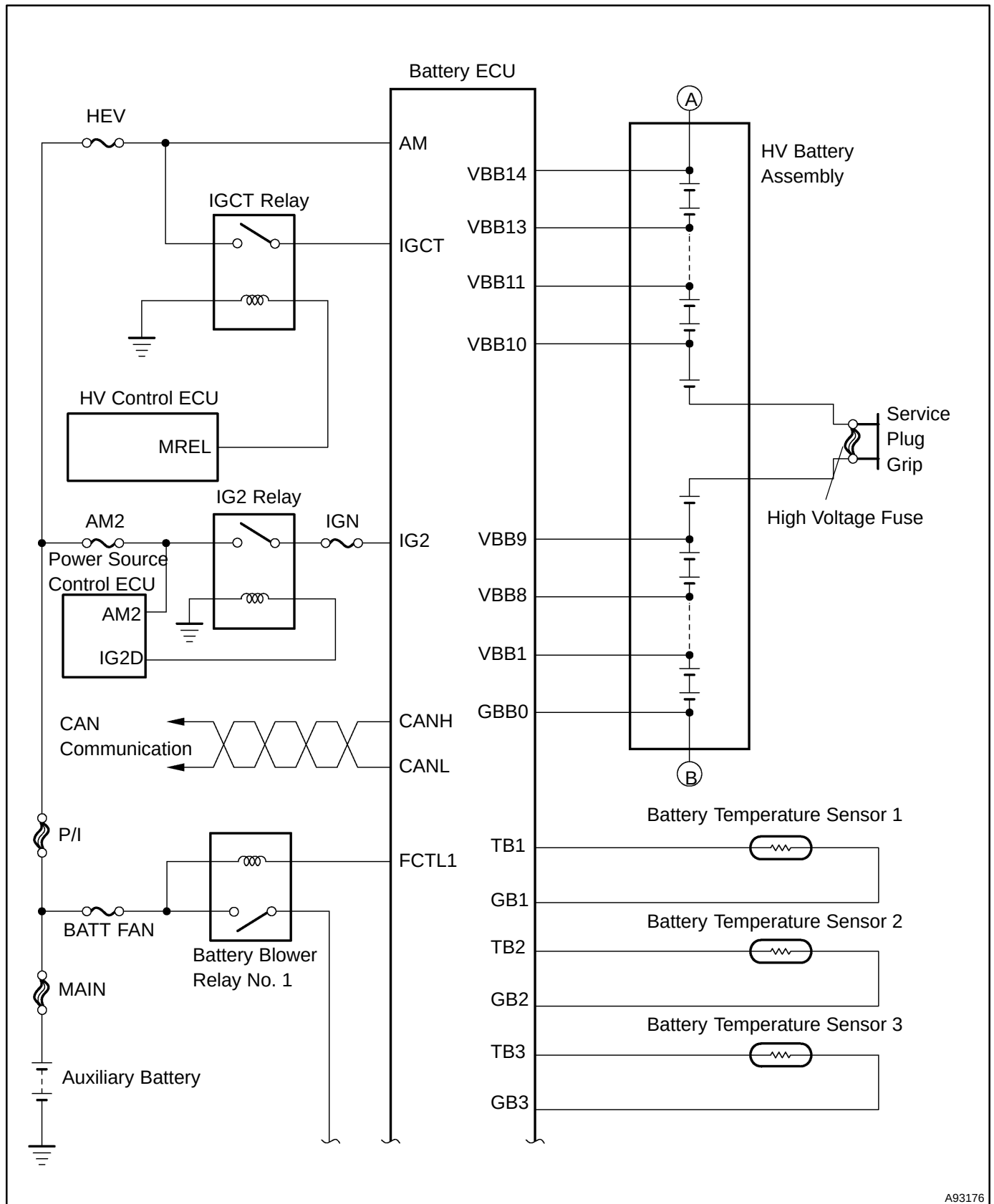


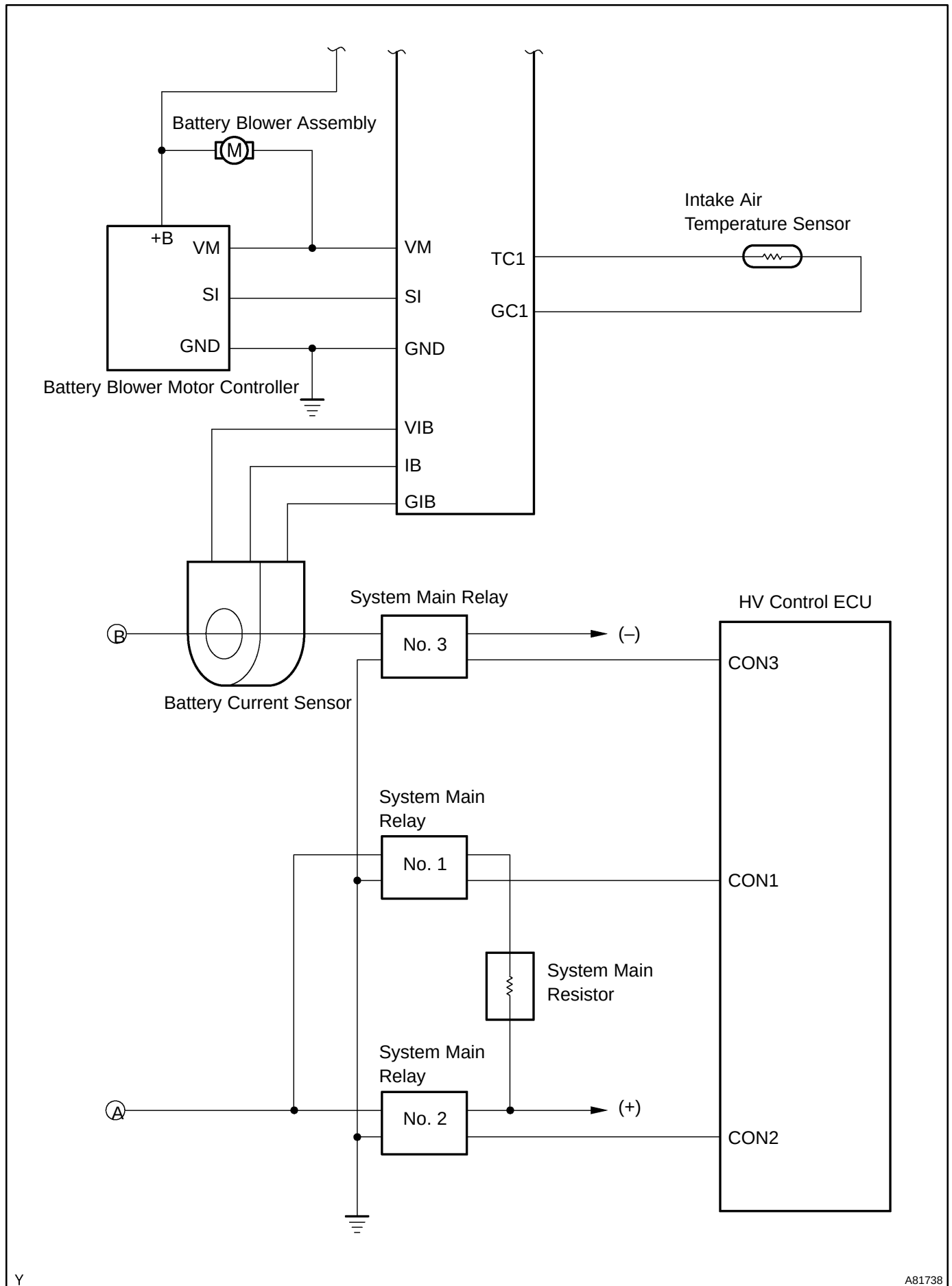
2. CONTROL DESCRIPTION

- (a) HV battery assembly management and fail-safe function.
 - (1) The battery assembly is repeatedly discharged at acceleration and charged by regenerating brakes at deceleration while driving. The battery ECU calculates SOC (state of charge) of the HV battery based on voltage, current, and temperature, and then sends the results to the HV control ECU. As a result, charge and discharge control is performed in the HV control ECU depending on the SOC.
 - (2) If malfunction occurs, the battery ECU performs a fail-safe function and protects the HV battery assembly in accordance with the extent of the malfunction.
- (b) Battery blower motor control.
 - (1) To control an increase in the temperature of the HV battery assembly while the vehicle is being driven, the battery ECU determines and controls the operating mode of the battery blower assembly in accordance with the temperature of the HV battery assembly.

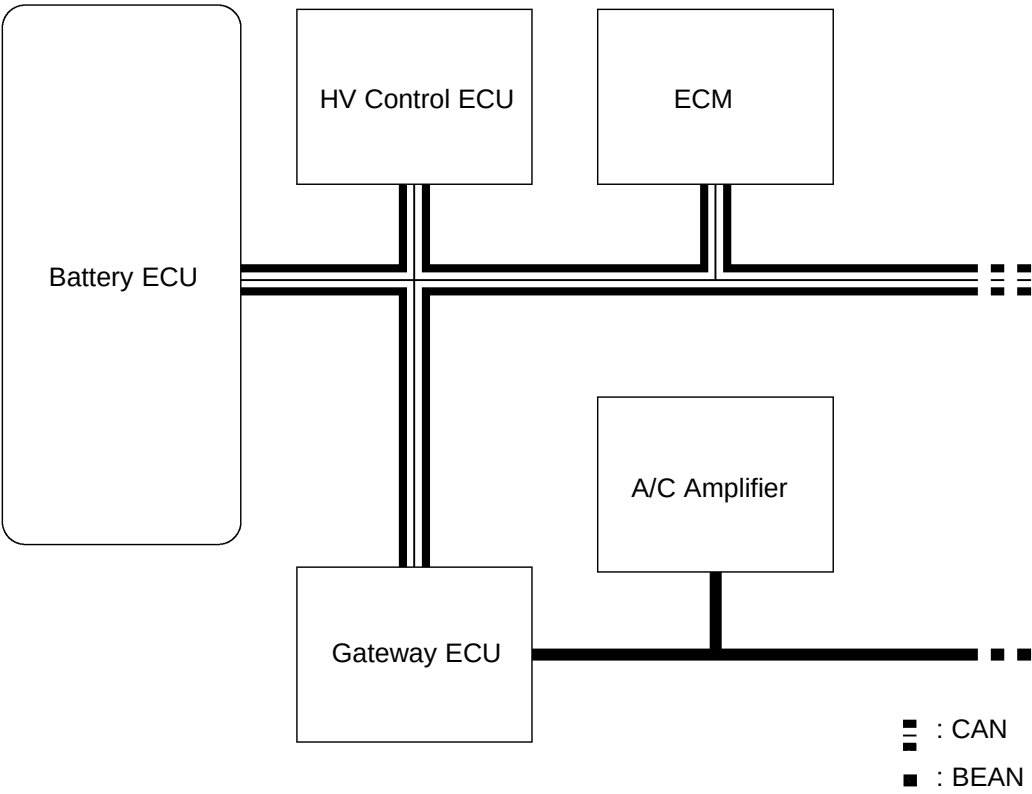
- (c) MIL illumination control.
 - (1) If the battery ECU detects malfunction that affects the exhaust gas emissions, it will transmit an MIL (malfunction indicator lamp) illumination request to the HV control ECU. (The battery ECU does not directly illuminate the MIL.)

SYSTEM DIAGRAM





Communication System Diagram:



Y

A81780

PART AND SYSTEM NAME LIST

1. PART AND SYSTEM NAME LIST

This reference list indicates the part names used in this manual along with their definitions.

TOYOTA name	Definition
Toyota HCAC system	HC adsorptive three-way catalytic converter
Hydrocarbon absorptive catalyst (HCAC) system	HC adsorptive three-way catalytic converter
HC adsorptive three-way catalyst	HC adsorptive three-way catalytic converter
Variable valve timing sensor, VVT sensor	Camshaft position sensor
Variable valve timing system, VVT system	Camshaft timing control system
Oil control valve for variable valve timing, OCV for VVT, VVT OCV	Camshaft timing oil control valve
Variable timing and lift, VVTL	Camshaft timing and lift control
Engine speed sensor	Crankshaft position sensor
Knock control module	Engine knock control module
Knock sensor	Engine knock sensor
Vacuum sensor	Manifold air pressure sensor
Internal control module, Control module, Engine control ECU, PCM	Power train control module
FC idle	Deceleration fuel cut
Idle air control	Idle speed control
CCV, Canister closed valve	Evaporative emissions canister vent valve
VSV for EVAP	Evaporative emissions canister purge valve
VSV for bypass valve, VSV for vapor pressure sensor	Evaporative emission pressure switching valve
Vapor pressure sensor	Fuel tank pressure sensor
Charcoal canister, Canister	Evaporative emissions canister
ORVR system	On-board refueling vapor recovery system
Intake manifold runner control	Intake manifold tuning system
Intake manifold runner valve, IMRV, IACV (runner valve)	Intake manifold tuning valve
Intake control VSV	Intake manifold tuning solenoid valve
O2 sensor	Heater oxygen sensor
Oxygen sensor pumping current circuit	Oxygen sensor output signal
Oxygen sensor reference ground circuit	Oxygen sensor signal ground
Accel position sensor	Accelerator pedal position sensor
Throttle actuator control motor, Actuator control motor, Electronic throttle motor, Throttle control motor	Electronic throttle actuator
Electronic throttle control system, Throttle actuator control system	Electronic throttle control system
Throttle/pedal position sensor, Throttle/pedal position switch, Throttle position sensor/switch	Throttle position sensor
Turbo press sensor	Turbocharger pressure sensor
Turbo VSV	Turbocharger pressure control solenoid valve
P/S pressure switch	Power-steering pressure switch
Speed sensor, Vehicle speed sensor "A", Speed sensor for skid control ECU	Vehicle speed sensor
ATF temperature sensor, Trans. fluid temp. sensor, ATF temperature sensor "A"	Transmission fluid temperature sensor
Electronic controlled automatic transmission, ECT	Electronically controlled automatic transmission
Intermediate shaft speed sensor "A"	Counter gear speed sensor
Output speed sensor	Output shaft speed sensor
Input speed sensor, Input turbine speed sensor "A", Speed sensor (NT), Turbine speed sensor	Input turbine speed sensor
PNP switch, NSW	Park/neutral position switch
Pressure control solenoid	Transmission pressure control solenoid

TOYOTA name	Definition
Shift solenoid	Transmission shift solenoid valve
Transmission control switch, Shift lock control unit	Shift lock control module
Engine immobilizer system, Immobilizer system	Vehicle anti-theft system

2. ABBREVIATIONS LIST IN THIS MANUAL

Abbreviations	Meaning
AC	Alternating Current
A/C	Air Conditioning
A/D	Analog/Digital Converter
ACM	Active Control Engine Mount
AFS	Air Fuel Ratio Sensor
AP	Accelerator Pedal
A/T	Automatic Transmission (Transaxle)
ATF	Automatic Transmission Fluid
Ave.	Average
B+	Battery Positive Voltage
BARO	Barometric Pressure
CAN	Controller Area Network
CL	Closed Loop
Calif.	California
CCV	Charcoal Canister Vent
CPU	Central Processing Unit
DC	Direct Current
DLC1	Data Link Connector 1
DLC2	Data Link Connector 2
DLC3	Data Link Connector 3
DTC	Diagnostic Trouble Code
DTM	Diagnostic Test Mode
ECM	Engine Control Module
ECT	Engine Coolant Temperature
ECU	Electronic Control Unit
EEPROM	Electrically Erasable Programmable Read Only Memory
EPS	Electric Power Steering
ETCS	Electronic Throttle Control System
EVAP	Evaporative Emissions
F/B	Feedback
FC	Fan Control
Fed.	Federal
EEPROM	Flash Electrically Erasable Programmable Read Only Memory
FEPRM	Flash Erasable Programmable Read Only Memory
Fr	Front
FTP	Fuel Tank Pressure
GND	Ground
GSA	Gear Shift Actuator
HC	Hydrocarbons
HPU	Hydraulic Power Unit
HV	Hybrid Vehicle
IAC	Idle Air Control
IAT	Intake Air Temperature
INF	Information
ISC	Idle Speed Control
J/B	Junction Block

Abbreviations	Meaning
J/C	Junction Connector
LH	Left-Hand
MG1	Motor Generator No. 1
MG2	Motor Generator No. 2
MIL	Malfunction Indicator Lamp
Min.	Minute(s)
MY	Model Year
No.	Number
NVRAM	Non-Volatile Random Access Memory
OBD	On-Board Diagnostic
OCV	Oil Control Valve
O/D	Overdrive
OP	Open Loop
PCM	Powertrain Control Module
PNP	Park/Neutral Position
PROM	Programmable Read Only Memory
PS, P/S	Power Steering
PSP	Power Steering Pressure
PWM	Pulse Width Modulation
RAM	Random Access Memory
R/B	Relay Block
Rev.	Revolutions
RH	Right-Hand
RM	Relay Module
ROM	Read Only Memory
RPM	Revolution Per Minutes (RPM)
Rr	Rear
SAE	Society of Automotive Engineers Inc.
Sec.	Second(s)
SMR	System Main Relay
SMT	Sequential Manual Transmission
SOC	State Of Charge
SRI	Service Reminder Indicator
SRT	System Readiness Test
ST	Scan Tool
STD	Standard
SW	Switch
TCM	Transmission Control Module
THA	Intake Air Temperature
THS	TOYOTA Hybrid System
TR	Transmission Range
TWC	Three-Way Catalytic Converter
VIN	Vehicle Identification Number
VM	Voltage Monitor
VR	Voltage Regulator
VSS	Vehicle Speed Sensor
VSV	Vacuum Switching Valve
VVT	Variable Valve Timing (System)
VVTL	Variable Valve Timing and Lift (System)
w/	With
w/o	Without

DTC	U0100	LOST COMMUNICATION WITH ECM/PCM "A"
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DTC	U0293	LOST COMMUNICATION WITH HYBRID VEHICLE CONTROL SYSTEM
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CIRCUIT DESCRIPTION

The battery ECU receives signals from the HV control ECU, ECM, and gateway ECU via CAN (Controller Area Network) communication.

DTC No.	DTC Detection Condition	Trouble Area
U0100	CAN communication malfunction (no signal reception) with ECM	• CAN communication system
U0293	CAN communication malfunction (no signal reception) with HV control ECU	• CAN communication system

MONITOR DESCRIPTION

If the battery ECU detects malfunction in the CAN communication with the ECM or HV control ECU, it illuminates the MIL and sets a DTC.

MONITOR STRATEGY

U0100:

Related DTCs	U0100: Communication between ECM and battery ECU/Non-received check
Required sensor/components	Main: ECM Sub: CAN bus line
Frequency of operation	Continuous
Duration	0.68 second or more
MIL operation	Immediately
Sequence of operation	None

U0293:

Related DTCs	U0293: Communication between hybrid vehicle control and battery ECU/Non-received check
Required sensor/components	Main: Hybrid vehicle control ECU Sub: CAN bus line
Frequency of operation	Continuous
Duration	0.68 second or more
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

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

TYPICAL MALFUNCTION THRESHOLDS

Receiving data	No reception
----------------	--------------

COMPONENT OPERATING RANGE

ECM	DTC U0100 is not detected
Hybrid vehicle control ECU	DTC U0293 is not detected

INSPECTION PROCEDURE**1 READ OUTPUT DTC(CODES ALL)**

- (a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Turn the hand-held tester or the OBD II scan tool ON.
- (d) On the hand-held tester or the OBD II scan tool, enter the following menus: DIAGNOSIS / ENHANCED OBD II / CODES ALL.
- (e) On the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / CODES ALL. For the OBD II scan tool, see its instruction manual.
- (f) Read and record DTCs.

HINT:

When DTCs other than CAN communication malfunction DTCs are output simultaneously, first correct the CAN communication problem, and then perform troubleshooting for other DTCs.

GO**GO TO CAN COMMUNICATION SYSTEM (See page [05-2602](#))**

CUSTOMER PROBLEM ANALYSIS CHECK

Prius Problem Check Sheet

Please fill in the blanks within bold frame

Name of Dealer			Person in Charge at Headquarters		Person in Charge at Dealer				
Office									
Vehicle Specifications	Model Code	NHW 20 –AHE	Problem Occurrence Date		. . .				
	Licence No.		Service Entry Date		. . .				
	VIN		Option		☐ Navigation (☐ equipped by manufacturer ☐ dealer) ☐ Cold climate specifications ☐ others ()				
Interview Results	Contents of complaint (Status when and before/after occurring in the order of events as correct as possible)			Characteristics of Customer					
				Vehicle used before					
				Main use area					
				☐ city area ☐ suburbs ☐ mountain area ☐ other ()					
				Frequency in use					
				☐ every day ☐ times/week or month					
	Driving Condition		Road Condition	Vehicle Condition					
	Vehicle Speed _____ mph _____ km/h ☐ when starting ☐ when accelerating ☐ when normal driving ☐ when decelerating ☐ when braking ☐ when stopping ☐ when parking ☐ when turning ☐ when ABS actuating ☐ cruise control driving ☐ others ()		☐ level road ☐ up hill or down hill ☐ dry paved road ☐ wet paved road ☐ rough paved road ☐ unpaved road ☐ snowy or frozen road ☐ bump or curb ☐ others ()	☐ Power switch ON (not getting ready) ☐ when starting ☐ right after starting ☐ until _____ minute after starting ☐ until _____ minute after starting of driving ☐ when stopping system Status of engine ☐ while stopping engine ☐ when revolving engine HV battery indication ☐ _____/8 segments ☐ unidentified A/C status ☐ ON ☐ OFF ☐ unidentified			Power switch indicator ☐ illumination (orange or green) ☐ blink ☐ no illumination Shift position (indication) ☐ P ☐ R ☐ N ☐ D ☐ B ☐ when operating _____ → _____ ☐ no indication ☐ blink ☐ unidentified P position switch status ☐ illumination ☐ blink ☐ no illumination ☐ unidentified	Warning lamp ☐ ☐ engine ☐ charge ☐ PS ☐ HV battery ☐ HV ☐ brake (yellow or red) ☐ ABS ☐ VSC ☐ slip ☐ coolant ☐ other warning () ☐ no warning lamp	Brake operation ☐ brake slowly ☐ brake suddenly ☐ operation with a left foot ☐ not operating Accelerator pedal operation ☐ when depressing ☐ when releasing ☐ when getting a foot off from the pedal Frequency in occurrence ☐ always ☐ times/ week or month ☐ only once
	Weather: _____ Temperature: _____ F _____ C Fuel level _____/10 segments		☐ unidentified ☐ unidentified ☐ unidentified	LLC maintenance record () Frequency in use ☐ every day ☐ times/week or month					
	Diagnostic trouble code								
HV ★					Brake ★				
INF					INF				
SFI ★			Power Source control		Gate way				
Battery ★			A/C		Smart				
Transmission Control ★			SRS		Immobilizer				
EPS ★			Body		Theft Deterrent				
★: Indicates that the system has a function to store the freeze frame data. If DTCs have been set, please attach the freeze frame data.									
Vehicle Inspection Results (Verification items, reason to identify/presume the cause parts, etc.)						Duplication Status			
						☐ always ☐ sometimes conditions when the malfunction occurred () ☐ no reproduction			
Replacement Parts						Confirmation Results After Repair			
						☐ normal ☐ reproduction ☐ other ()			
Problem parts: No/Yes (Sending date: . . .)									

DIAGNOSTIC TROUBLE CODE CHART

DTC No. (See Page)	Detection Item	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3	Memory
P0560 (05-895)	System Voltage	•Wire harness or connector •HEV fuse •Battery ECU	○	○	•HV system	○
P0A1F (05-899)	Battery Energy Control Module	•Battery ECU	○	○	•HV system	○
P0A7F (05-900)	Hybrid Battery Pack Deterioration	•HV battery assembly •Battery ECU	○	○	•HV system	○
P0A80 (05-902)	Replace Hybrid Battery Pack	•HV battery assembly •Battery ECU	○	○	•HV system	○
P0A81 (05-904)	Hybrid Battery Pack Cooling Fan 1	•Quarter vent duct (blower motor controller) •Battery ECU	X	○	•HV system	○
P0A82 (05-906)	Hybrid Battery Pack Cooling Fan 1	•Quarter vent duct •Quarter vent duct No. 2 •Quarter vent duct inner No. 2 •Ventilator inner duct •Battery blower assembly •Battery ECU	X	○	•HV system	○
P0A85 (05-908)	Hybrid Battery Pack Cooling Fan 1	•Wire harness or connector •BATT FAN fuse •Battery blower relay No. 1 •Battery blower assembly •Quarter vent duct (blower motor controller) •Battery ECU	X	○	•HV system	○
P0A95 (05-917)	High Voltage Fuse	•High voltage fuse •Service plug grip •Battery plug •Battery ECU	X	○	•HV system	○
P0A9B (05-920)	Hybrid Battery Temperature Sensor Circuit	•HV battery assembly (battery temperature sensor) •Battery ECU	○	○	•HV system	○
P0AAC (05-923)	Hybrid Battery Pack Air Temperature Sensor "A" Circuit	•HV battery assembly (intake air temperature sensor) •Battery ECU	○	○	•HV system	○
P3011 (05-926)	Battery Block 1 Becomes Weak	•HV battery assembly •Battery ECU	○	○	•HV system	○
P3012 (05-926)	Battery Block 2 Becomes Weak	•HV battery assembly •Battery ECU	○	○	•HV system	○
P3013 (05-926)	Battery Block 3 Becomes Weak	•HV battery assembly •Battery ECU	○	○	•HV system	○
P3014 (05-926)	Battery Block 4 Becomes Weak	•HV battery assembly •Battery ECU	○	○	•HV system	○
P3015 (05-926)	Battery Block 5 Becomes Weak	•HV battery assembly •Battery ECU	○	○	•HV system	○
P3016 (05-926)	Battery Block 6 Becomes Weak	•HV battery assembly •Battery ECU	○	○	•HV system	○
P3017 (05-926)	Battery Block 7 Becomes Weak	•HV battery assembly •Battery ECU	○	○	•HV system	○
P3018 (05-926)	Battery Block 8 Becomes Weak	•HV battery assembly •Battery ECU	○	○	•HV system	○
P3019 (05-926)	Battery Block 9 Becomes Weak	•HV battery assembly •Battery ECU	○	○	•HV system	○
P3020 (05-926)	Battery Block 10 Becomes Weak	•HV battery assembly •Battery ECU	○	○	•HV system	○

DTC No. (See Page)	Detection Item	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3	Memor y
P3021 (05-926)	Battery Block 11 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○
P3022 (05-926)	Battery Block 12 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○
P3023 (05-926)	Battery Block 13 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○
P3024 (05-926)	Battery Block 14 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○
P3030 (05-929)	Disconnection between Battery and ECU	• Junction block assembly (busbar module) • Frame wire No. 2 (busbar and wire harness) • Battery ECU	○	○	• HV system	○
P3056 (05-936)	Battery Current Sensor Circuit Malfunction	• HV battery assembly (wire harness or connector) • Battery current sensor • Battery ECU	○	○	• HV system	○
U0100 (05-941)	Lost Communication with ECM/PCM "A"	• CAN communication system	○	○	• HV system	○
U0293 (05-941)	Lost Communication with Hybrid Vehicle Control System	• CAN communication system	○	○	• HV system	○

*1: "○" ... MIL is illuminated, "X" ... MIL is not illuminated.

*2: "○" ... Master warning lamp is illuminated, "X" ... Master warning lamp is not illuminated.

*3: Warning on the multi-information display.

HOW TO PROCEED WITH TROUBLESHOOTING

The hand-held tester can be used at step 3, 4, 5, 8.

1 VEHICLE BROUGHT TO WORKSHOP



2 CUSTOMER PROBLEM ANALYSIS (See page 05-878)



3 CONNECT HAND-HELD TESTER OR OBD II SCAN TOOL TO DLC3

HINT:

If the display indicates a communication fault in the tester, inspect the DLC3.



4 CHECK AND RECORD DTC AND FREEZE FRAME DATA (See page 05-886)

HINT:

If a DTC related to the CAN communication system malfunction is output, first troubleshoot and repair the CAN communication (see page 05-2602).



5 CLEAR DTC (See page 05-886)



6 PROBLEM SYMPTOM CONFIRMATION

(a) When the malfunction does not occur, go to A.

(b) When the malfunction occurs, go to B.

B

Go to step 8

A

7 SYMPTOM SIMULATION



8 CHECK DTC (See page 05-886)



9 DTC CHART (See page 05-893)



10	CIRCUIT INSPECTION
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11	IDENTIFICATION OF PROBLEM
----	---------------------------



12	ADJUSTMENT AND/OR REPAIR
----	--------------------------



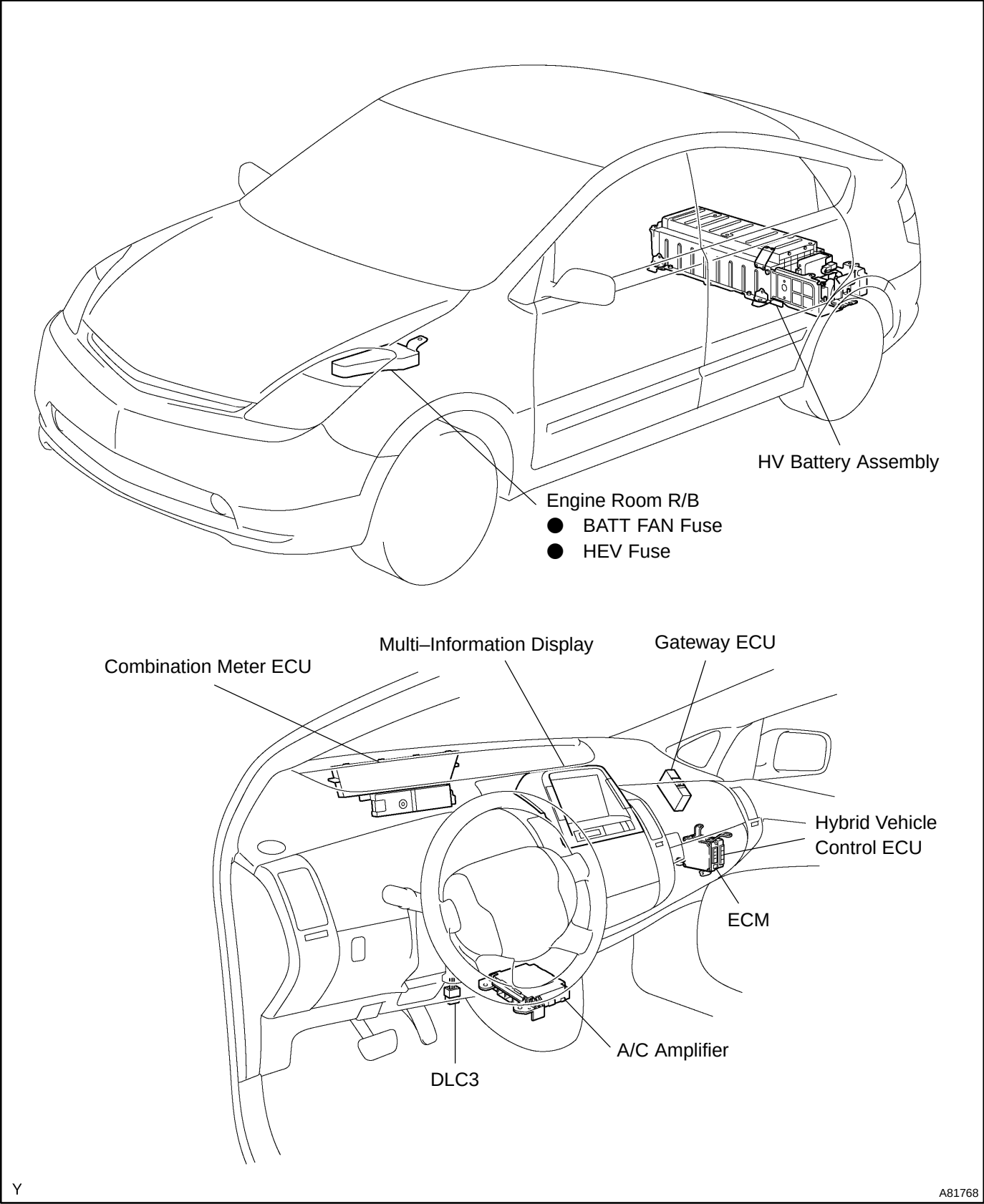
13	CONFIRMATION TEST
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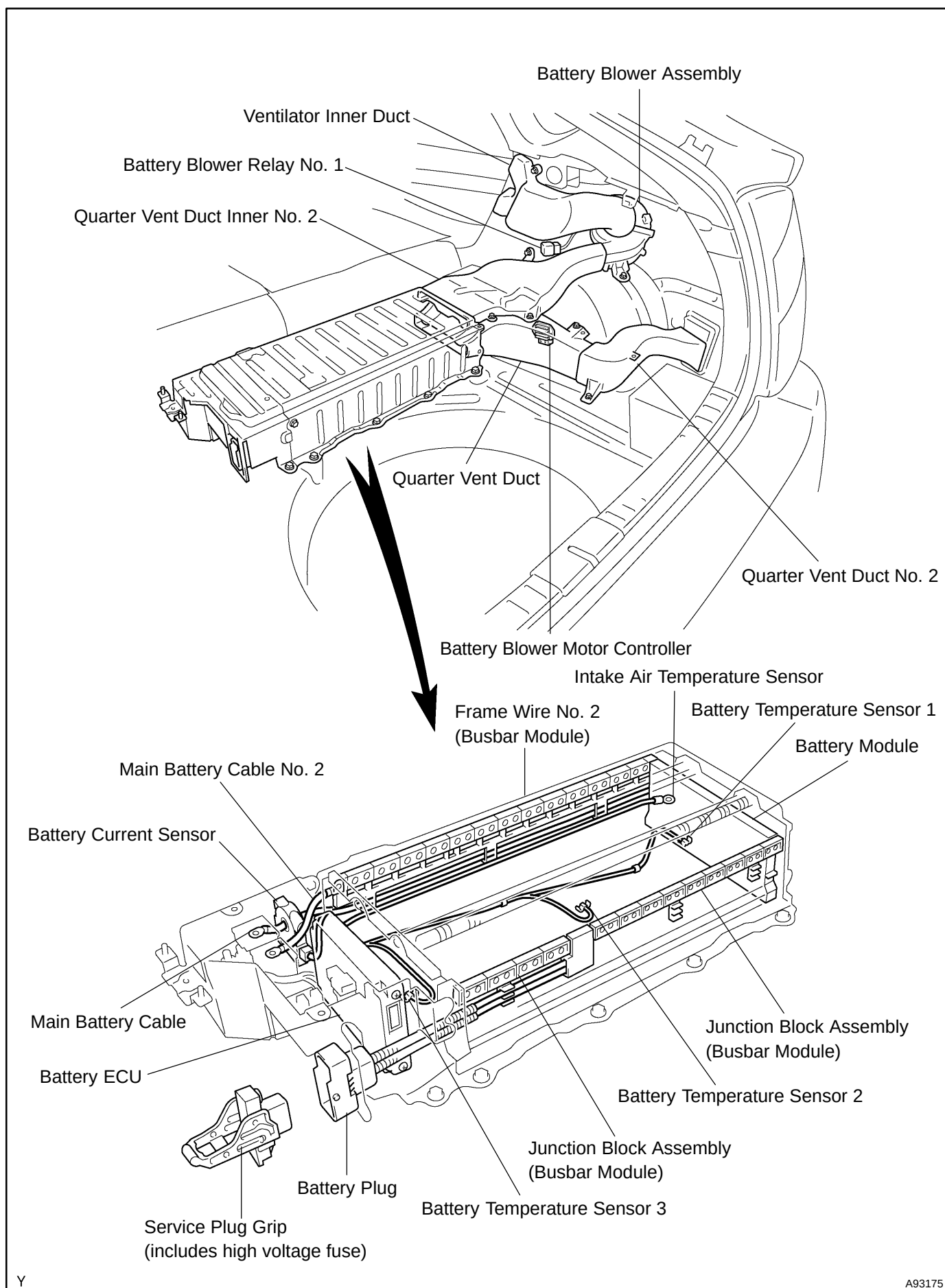


END

cardiagn.com

LOCATION

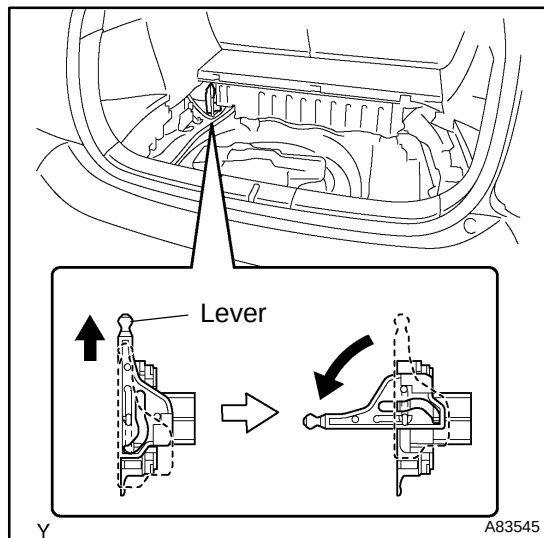




HYBRID BATTERY SYSTEM

PRECAUTION

05J89-01



1. Precautions for inspecting the hybrid battery system

- (a) Before inspecting the high-voltage system, take safety precautions to prevent electrical shocks, such as wearing insulated gloves and removing the service plug grip (see page 01-5). After removing the service plug grip, put it in your pocket to prevent other technicians from reconnecting it while you are servicing the high-voltage system.

NOTICE:

Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, do not turn the power switch ON (READY) unless instructed by the repair manual.

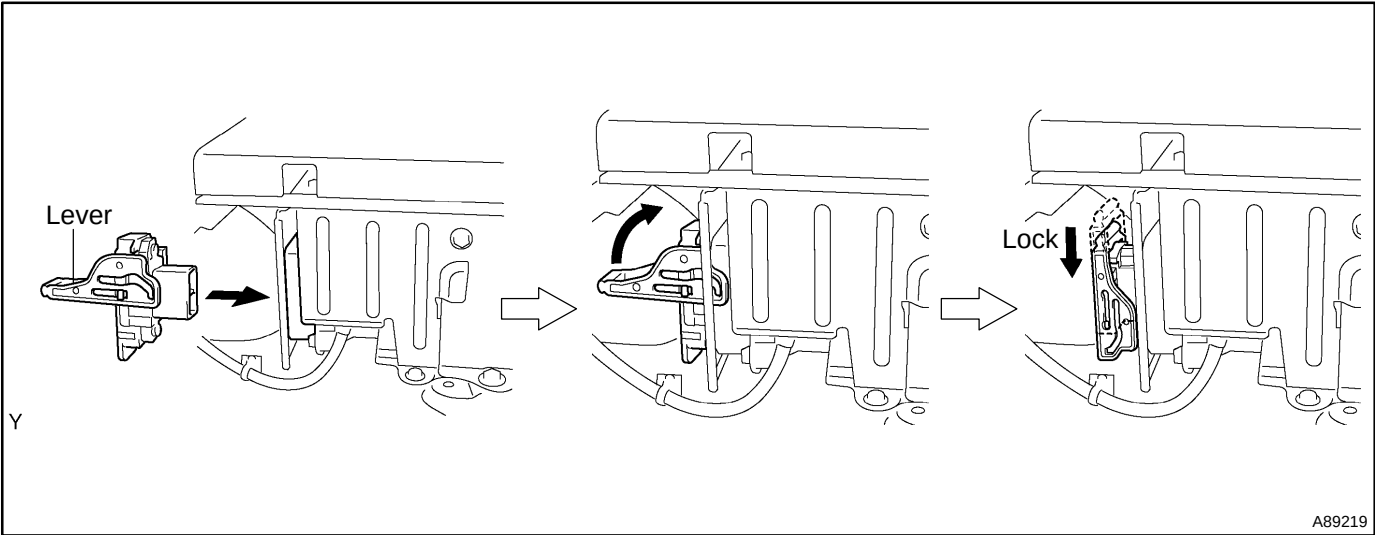
- (b) After disconnecting the service plug grip, wait at least for 5 minutes before touching any of high-voltage connectors or terminals.

HINT:

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

- (c) Since liquid leakage may occur, wear protective goggles when checking inside the HV battery.
- (d) Wear insulated gloves, turn the power switch OFF, and disconnect the negative terminal of the auxiliary battery before touching any of the orange-colored wires of the high-voltage system.
- (e) Turn the power switch OFF before performing a resistance check.
- (f) Turn the power switch OFF before disconnecting or reconnecting any connector.

- (g) To install this service plug grip, the lever must be flipped and locked downward. Once it is locked in place, it turns the interlock switch ON. Make sure to lock it securely because if you leave it unlocked, the system will output a DTC pertaining to the interlock switch system.



2. NOTICE FOR INITIALIZATION

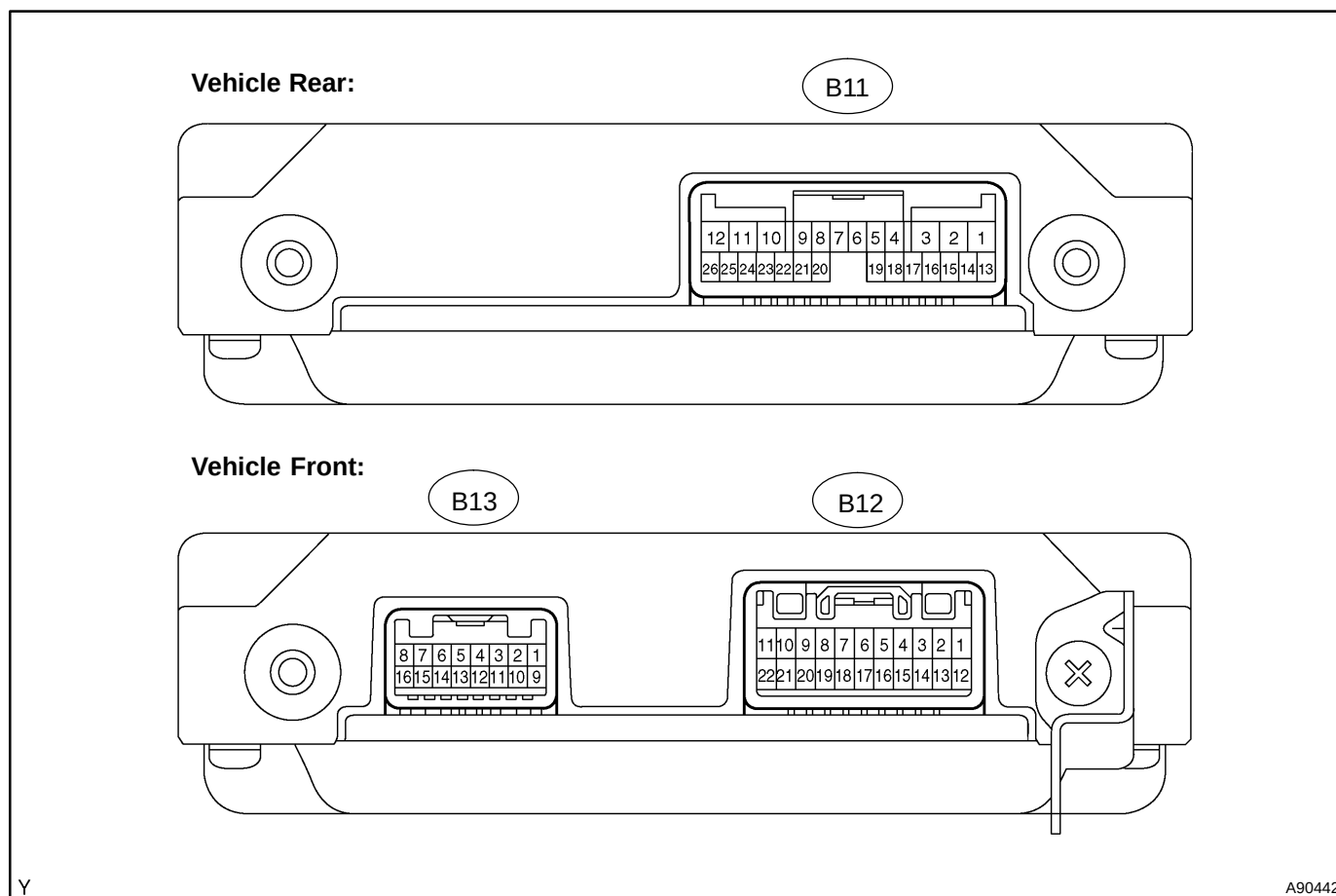
When disconnecting the negative (-) battery terminal, initialize the following systems after the terminal is reconnected.

System Name	See Page
Power Window Control System	05-2028

3. NOTICE FOR HYBRID SYSTEM ACTIVATION

- When the warning lamp is illuminated or the battery has been disconnected and reconnected, pressing the power switch may not start the system on the first try. If so, press the power switch again.
- With the power switch's power mode changed to ON (IG), disconnect the battery. If the key is not in the key slot during reconnection, DTC B2799 may be output.

TERMINALS OF ECU



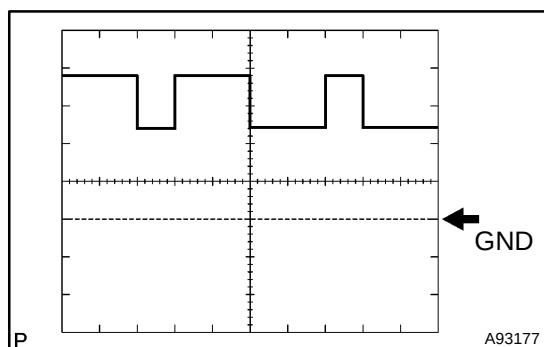
Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
AM (B11 – 1) – GND (B11 – 12)	G – W-B	Auxiliary battery (for measuring the battery voltage and for the battery ECU memory)	Always	9 to 14
IGCT (B11 – 2) – GND (B11 – 12)	L – W-B	Control signal	Power switch ON (READY)	9 to 14
VM (B11 – 9) – GND (B11 – 12)	V – W-B	Battery blower motor monitoring signal	Battery blower motor mode 1 actuation (at low speed)	10 to 14
VM (B11 – 9) – GND (B11 – 12)	V – W-B	Battery blower motor monitoring signal	Battery blower motor mode 6 actuation (at high speed)	2 to 6
FCTL1 (B11 – 10) – GND (B11 – 12)	BR – W-B	Battery blower relay No. 1	Battery blower motor actuation	Below 1
IG2 (B11 – 13) – GND (B11 – 12)	O – W-B	IG signal	Power switch ON (IG)	9 to 14
CANH (B11 – 18) – GND (B11 – 12)	B – W-B	HIGH-level CAN bus line	Power switch ON (IG)	Pulse generation See waveform 1
CANL (B11 – 19) – GND (B11 – 12)	W – W-B	LOW-level CAN bus line	Power switch ON (IG)	Pulse generation See waveform 2
SI (B11 – 24) – GND (B11 – 12)	Y – W-B	Battery blower motor actuation signal	Battery blower motor modes 1 to 6 actuation	Pulse generation See waveform 3
TB1 (B13 – 1) – GB1 (B13 – 2)	W – W	HV battery temperature sensor 1	HV battery temperature: –40 to 90°C (–40 to 194°F)	4.8 to 1.0
TB2 (B13 – 3) – GB2 (B13 – 4)	B – B	HV battery temperature sensor 2	HV battery temperature: –40 to 90°C (–40 to 194°F)	4.8 to 1.0

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
TB3 (B13 – 5) – GB3 (B13 – 6)	L – L	HV battery temperature sensor 3	HV battery temperature: –40 to 90°C (–40 to 194°F)	4.8 to 1.0
TC1 (B13 – 9) – GC1 (B13 – 10)	G – G	Intake air temperature sensor	Intake air temperature: –40 to 90°C (–40 to 194°F)	4.8 to 1.0
VIB (B13 – 15) – GIB (B13 – 14)	—	Power source of battery current sensor (a specific voltage)	Power switch ON (IG)	4.5 to 5.5
IB (B13 – 16) – GIB (B13 – 14)	—	Battery current sensor	Power switch ON (READY)	0.5 to 4.5
GND (B11 – 12) – Body ground	W-B – Body ground	Ground	Always (resistance check)	Below 6 Ω

1. Oscilloscope waveforms

HINT:

In the oscilloscope waveform samples, which are provided here for informational purposes. Noise and fluttering waveforms have been omitted.

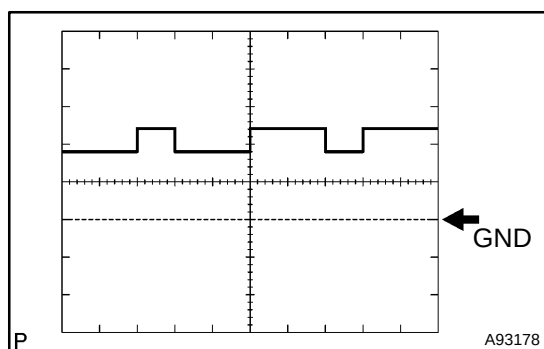


(a) Waveform 1 (HIGH-level CAN bus line)

Item	Contents
Terminal	CANH – GND
Equipment Setting	1 V/Division, 2 μ s/Division
Condition	Power switch ON (IG)

HINT:

The waveform varies depending on the contents of the communication.

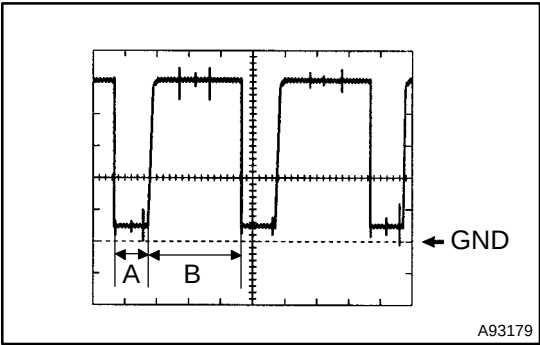


(b) Waveform 2 (LOW-level CAN bus line)

Item	Contents
Terminal	CANH – GND
Equipment Setting	1 V/Division, 2 μ s/Division
Condition	Power switch ON (IG)

HINT:

The waveform varies depending on the contents of the communication.



(c) Waveform 3 (battery blower motor actuation signal)

Item	Contents
Terminal	SI – GND
Equipment Setting	1 V/Division, 50 μ s/Division
Condition	During vehicle stop

HINT:
Amplitude A and B in the diagram vary by mode.

Mode	A	B
1	44.4 μ s	155.6 μ s
2	44.4 μ s	155.6 μ s
3	51.6 μ s	148.4 μ s
4	59.0 μ s	141.0 μ s
5	59.0 μ s	141.0 μ s
6	146.4 μ s	53.6 μ s